Cat. No.
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SYSMAC
C-series and CVM1 PCs

SYSMAC Support Software

OPERATION MANUAL:
CVM1 PCs

OMRON

SYSMAC C-series and CVM1 PCs
SYSMAC Support Software

Operation Manual: CVM1 PCs

Produced May 1996

Notice:

OMRON products are manufactured for use according to proper procedures by a qualified operator and only for the purposes described in this manual.

The following conventions are used to indicate and classify precautions in this manual. Always heed the information provided with them. Failure to heed precautions can result in injury to people or damage to the product.

⚠ **DANGER!** Indicates information that, if not heeded, is likely to result in loss of life or serious injury.

⚠ **WARNING** Indicates information that, if not heeded, could possibly result in loss of life or serious injury.

⚠ **Caution** Indicates information that, if not heeded, could result in relatively serious or minor injury, damage to the product, or faulty operation.

OMRON Product References

All OMRON products are capitalized in this manual. The word "Unit" is also capitalized when it refers to an OMRON product, regardless of whether or not it appears in the proper name of the product.

The abbreviation "Ch," which appears in some displays and on some OMRON products, often means "word" and is abbreviated "Wd" in documentation in this sense.

The abbreviation "PC" means Programmable Controller and is not used as an abbreviation for anything else.

Visual Aids

The following headings appear in the left column of the manual to help you locate different types of information.

Note Indicates information of particular interest for efficient and convenient operation of the product.

1, 2, 3... 1. Indicates lists of one sort or another, such as procedures, checklists, etc.

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About this Manual:

This manual describes operating procedures for SYSMAC CVM1 Programmable Controllers (PCs) using the SYSMAC Support Software (SSS) running on an IBM PC/AT or compatible computer.

This manual is designed to be used together with two other SSS Operation Manuals. The entire set of SSS manuals is listed below. (The revision numbers have been omitted from the catalog numbers; be sure you are using the most current revision for your version of the SSS.)

Manual	Content	Cat. No.
SYSMAC Support Software Operation Manual: **Basics**	SSS installation procedures, hardware information for the SSS, and general basic operating procedures (including data conversion between C-series and CVM1 PCs).	W247-E1
SYSMAC Support Software Operation Manual: **C-series PC Operations**	Detailed operating procedures for the C-series PCs.	W248-E1
SYSMAC Support Software Operation Manual: **CVM1 Operations**	Detailed operating procedures for CVM1 PCs.	W249-E1

This manual does not cover basic operating procedures for the SSS. If you are not yet familiar with SSS operating procedures, refer to the *SYSMAC Support Software Operation Manual: Basics* for installation procedures and basic information.

This manual does not cover details on programming and on the operation of specific Units. This information is covered in the *Operation Manual* and *Installation Guide* for individual PCs or PC Units. Use these manuals together with the SSS manuals. Manuals on any special Units (e.g., SYSMAC NET Link Units or SYSMAC LINK Units) used with the PC will also be necessary.

Please read this manual completely together with the other manuals related to your PC system and be sure you understand the information provide before attempting to program or operate a CVM1 PC.

The basic content of each section of this manual is outlined below.

Part 1: Introduction

Section 1 describes in detail the methods for inputting drive, path, and file names when carrying out operations involving saving or retrieving files.

Section 2 describes the differences between the three CVM1 models.

Part 2: Offline Operation

Section 3 explains how to input, edit, save, retrieve, and delete programs in both ladder and mnemonic form. In particular, it explains how to use the various items on the Programming Menu and how to use the Read, Write, Insert, and Delete modes.

Section 4 explains the various commands within the DM Menu, which operate on both DM. These operations are used to enter data to the DM Area as 4-digit hexadecimal or ASCII, to save and retrieve the contents of the DM Area to and from a data disk, and to print a memory map of the DM contents.

Section 5 explains the various commands on the offline I/O Table Menu. These operations can be used to create and edit the I/O table at the computer and store it in the system work area, to check that the I/O table is correct, to save and retrieve the contents of the I/O table to and from a data disk, and to print the contents of the I/O table.

Section 6 explains the various commands under the Utility Menu except the Network Support Table commands.

Section 7 describes the various parameters that are set to control SSS operation and communications with the PCs.

Section 8 explains how to manage files on the data disk.

Section 9 describes how to register optional programs for execution from the Option Menu.

Part 3: Online Operation

Section 10 describes the operations used to monitor PC operation and transfer the program between the computer and PC.

Section 11 explains the various operations accessed through the online DM Menu. These operations are used to edit and transfer DM/EM Area data.

Section 12 explains the various commands within the I/O Table Menu. These operations can be used to create, edit, and transfer the PC's I/O table from the computer.

Section 13 explains the various commands within the Utility Menu. The Utility Menu contains a variety of useful operations.

Part 4: Networks

Section 14 provides an overview of the operations required to set up, diagnose, and control networks. These include SYSMAC NET, SYSMAC LINK, and SYSMAC BUS/2 Systems. Also included is an overview of the operations to set up and control CPU Bus Units.

Section 15 describes the operations required to set up, check, and transfer data link tables, to save and retrieve data link tables, and to start and stop data links for SYSMAC NET Systems.

Section 16 describes the operations required to set up, check, and transfer data link tables, to save and retrieve data link tables, and to start and stop data links for SYSMAC LINK Systems.

Section 17 describes the operations to input, check, save, retrieve, and transfer routing tables. Routing tables are required to communicate with remote network. Routing tables are not required if communications are only made within on network.

Section 18 describes the operations to set parameters for CPU Bus Units, including parameters for data links.

Section 19 describes the operations that can be used to diagnose SYSMAC NET and SYSMAC LINK networks.

Section 20 describes the operations used to support SYSMAC BUS/2 Systems, including displaying status, testing communications, reading the cycle time, displaying Slave connection status, and switching the optical line mode.

Part 5: Appendices

Appendix A provides a list of error messages.

Appendix B provides a list of data file extensions.

Appendix C provides a list of PC data areas.

Appendix D provides a list of function codes.

Appendix E provides a list of mnemonics.

Appendix F provides a list of offline operations.

Appendix G provides a list of online operations.

Appendix H provides a list of network operations.

Appendix I describes how to correct converted programs.

Note: The SYSMAC Support Software uses the file compression utility DIET and the compress library management program LHA. LHA is the creation of Mr. H. Yoshisaki and all rights to this program belong to him.

> ⚠ **WARNING** Failure to read and understand the information provided in this manual may result in personal injury or death, damage to the product, or product failure. Please read each section in its entirety and be sure you understand the information provided in the section and related sections before attempting any of the procedures or operations given.

PRECAUTIONS

This section provides general precautions for using the Programmable Controller (PC) and related devices.

The information contained in this section is important for the safe and reliable application of the PC. You must read this section and understand the information contained before attempting to set up or operate a PC system.

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1 Intended Audience

This manual is intended for the following personnel, who must also have knowledge of electrical systems (an electrical engineer or the equivalent).

- Personnel in charge of installing FA systems.
- Personnel in charge of designing FA systems.
- Personnel in charge of managing FA systems and facilities.

2 General Precautions

The user must operate the product according to the performance specifications described in the operation manuals.

Before using the product under conditions which are not described in the manual or applying the product to nuclear control systems, railroad systems, aviation systems, vehicles, combustion systems, medical equipment, amusement machines, safety equipment, and other systems, machines, and equipment that may have a serious influence on lives and property if used improperly, consult your OMRON representative.

Make sure that the ratings and performance characteristics of the product are sufficient for the systems, machines, and equipment, and be sure to provide the systems, machines, and equipment with double safety mechanisms.

This manual provides information for programming and operating OMRON PCs. Be sure to read this manual before attempting to use the software and keep this manual close at hand for reference during operation.

⚠ **WARNING** It is extreme important that a PC and all PC Units be used for the specified purpose and under the specified conditions, especially in applications that can directly or indirectly affect human life. You must consult with your OMRON representative before applying a PC System to the abovementioned applications.

3 Safety Precautions

⚠ **WARNING** Never attempt to disassemble any Units while power is being supplied. Doing so may result in serious electrical shock or electrocution.

⚠ **WARNING** Never touch any of the terminals while power is being supplied. Doing so may result in serious electrical shock or electrocution.

4 Operating Environment Precautions

Do not operate the control system in the following places.

- Where the PC is exposed to direct sunlight.
- Where the ambient temperature is below 0°C or over 55°C.
- Where the PC may be affected by condensation due to radical temperature changes.
- Where the ambient humidity is below 10% or over 90%.
- Where there is any corrosive or inflammable gas.
- Where there is excessive dust, saline air, or metal powder.
- Where the PC is affected by vibration or shock.
- Where any water, oil, or chemical may splash on the PC.

⚠ Caution The operating environment of the PC System can have a large effect on the longevity and reliability of the system. Improper operating environments can lead to malfunction, failure, and other unforeseeable problems with the PC System. Be sure that the operating environment is within the specified conditions at installation and remains within the specified conditions during the life of the system.

5 Application Precautions

Observe the following precautions when using the PC.

⚠ WARNING Failure to abide by the following precautions could lead to serious or possibly fatal injury. Always heed these precautions.

- Always ground the system to 100 Ω or less when installing the system to protect against electrical shock.
- Always turn off the power supply to the PC before attempting any of the following. Performing any of the following with the power supply turned on may lead to electrical shock:
  - Mounting or removing any Units (e.g., I/O Units, CPU Unit, etc.) or memory cassettes.
  - Assembling any devices or racks.
  - Connecting or disconnecting any cables or wiring.

⚠ Caution Failure to abide by the following precautions could lead to faulty operation or the PC or the system or could damage the PC or PC Units. Always heed these precautions.

- Use the Units only with the power supplies and voltages specified in the operation manuals. Other power supplies and voltages may damage the Units.
- Take measures to stabilize the power supply to conform to the rated supply if it is not stable.
- Provide circuit breakers and other safety measures to provide protection against shorts in external wiring.
- Do not apply voltages exceeding the rated input voltage to Input Units. The Input Units may be destroyed.
- Do not apply voltages exceeding the maximum switching capacity to Output Units. The Output Units may be destroyed.
- Always disconnect the LG terminal when performing withstand voltage tests.
- Install all Units according to instructions in the operation manuals. Improper installation may cause faulty operation.
- Provide proper shielding when installing in the following locations:
  - Locations subject to static electricity or other sources of noise.
  - Locations subject to strong electromagnetic fields.
  - Locations subject to possible exposure to radiation.
  - Locations near to power supply lines.
- Be sure to tighten Backplane screws, terminal screws, and cable connector screws securely.
- Do not attempt to take any Units apart, to repair any Units, or to modify any Units in any way.

⚠ Caution The following precautions are necessary to ensure the general safety of the system. Always heed these precautions.

- Provide double safety mechanisms to handle incorrect signals that can be generated by broken signal lines or momentary power interruptions.
- Provide external interlock circuits, limit circuits, and other safety circuits in addition to any provided within the PC to ensure safety.

6 Software Operating Precautions

Observe the following precautions when using the Support Software.

⚠ WARNING Never transfer programs to other nodes, change I/O memory at other nodes, or perform any other operations at other nodes without first confirming that the results of the action will not create a dangerous situation. Depending on the controlled system, changes to programs or data can result in serious injury or death.

⚠ Caution Never edit a program or other data online without first confirming that no problems will result even if the cycle time is extended. Online editing can cause the cycle time to increase, possibly causing input signals to be read late or not at all. Depending on the controlled system, changes to cycle time can have serious and unexpected results.

⚠ Caution Never use an incorrect program. Never change to a different program without first confirming operation and safety. Depending on the controlled system, an incorrect or inappropriate program can have serious and unexpected results.

⚠ Caution Never change the PC's operating mode without first confirming that no problems will result in the controlled system. Depending on the controlled system, changes to the PC's operating mode can have serious and unexpected results.

⚠ Caution Never force-set or force-reset bits in memory without first confirming that no problems will result in the controlled system. Depending on the controlled system, force-setting or force-resetting bits in memory can have serious and unexpected results.

⚠ Caution Never change the present value of a timer or counter without first confirming that no problems will result in the controlled system. Depending on the controlled system, changes to the present value of a timer or counter can have serious and unexpected results.

⚠ Caution Never change the set value of a timer or counter without first confirming that no problems will result in the controlled system. Depending on the controlled system, changes to the set value of a timer or counter can have serious and unexpected results.

Part 1
Introduction

This part of the manual covers procedures for saving and retrieving data from files and the differences between the various models of CVM1 PC. Refer to the *SYSMAC Support Software Operation Manual: Basics* for basic operating procedures for the SSS.

SECTION 1
Saving and Retrieving Data

The operations for saving and retrieving programs and data are standardized throughout the SYSMAC Support Software. This section describes in detail the methods for inputting drive, path, and file names when carrying out operations involving saving or retrieving files. These operations are not explained in detail in subsequent sections, so it will be helpful to master them now before proceeding further.

1-1 File Formats 4
1-2 Saving and Retrieving DOS Files 4

1-1 File Formats

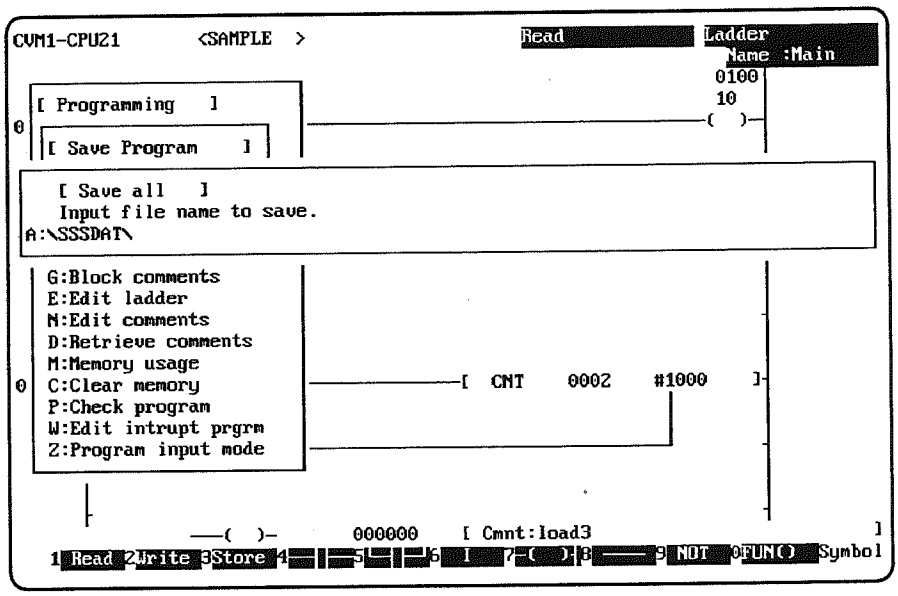
The SSS allows you to save and retrieve PC data as DOS files. It is also still possible to save and retrieve in the LSS data format (see *SSS Operation Manual: C-series PCs* for details).

Regardless of the type of data that is being saved or retrieved, whether programs, I/O comment data, or DM data, the default setting is for saving and retrieving DOS files.

1-2 Saving and Retrieving DOS Files

The procedures for saving and retrieving DOS files are explained here using "S:Save program" from the Programming Menu as an example.

When the desired operation (i.e., saving or retrieving a program or data) is selected, the following menu will be displayed.



As mentioned above, the default setting is saving and retrieving DOS files. The path name that is set for the data disk drive under the System Setup will be displayed as the default. The default path name can be changed.

Inputting the Path Name

Input path names of no more than 78 normal characters.

Example: B:\CCV\PROG

Inputting the File Name

Input file names of no more than 8 normal characters.

Example 1: PROG001

Example 2: Proc 1

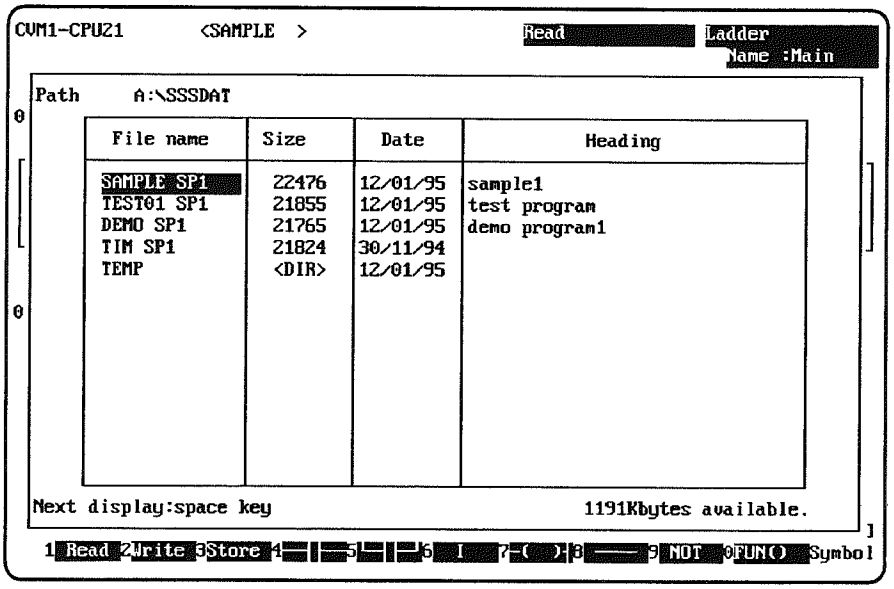
Inputting the Title

When the path and file names are input, and the Enter Key is pressed, the screen for inputting a title will be displayed. Input a title of no more than 30 normal characters. The title input here will be displayed when a file list screen is displayed.

Selecting Files from a List

A list of files stored on a data disk can be displayed, and file names can be selected from that list.

To display the list, press the Escape Key while the screen for inputting path and file names is being displayed. The following screen will then be displayed.



First use the Up and Down Cursor Keys to select a file, and then input the file name by pressing the Enter Key.

SECTION 2
CVM1 Models

This section describes the differences between the three CVM1 models.

2-1 Main Differences between CVM1 Models 8

2-1 Main Differences between CVM1 Models

The main differences between the three CVM1 models are outlined in the following table. When creating programs, be sure to take into account these differences in program capacity, number of I/O points, specifications, and so on.

Item		CVM1-CPU01-EV2	CVM1-CPU11-EV2	CVM1-CPU21-EV2
Program type	Ladder	Can be used.	Can be used.	Can be used.
	SFC + ladder	Cannot be used.	Cannot be used.	Can be used.
Instruction execution time	Basic instructions	0.15 to 0.45 μs	0.125 to 0.375 μs	0.125 to 0.375 μs
	Special instructions	0.6 to 9.9 μs	0.5 to 8.25 μs	0.5 to 8.25 μs
Program capacity		30K words	30K words	62K words
Basic Rack I/O points		512	1,024	2,048
Remote I/O points	SYSMAC BUS/2	1,024	2,048	2,048
	SYSMAC BUS	512	1,024	2,048
DM Area		8K words	24K words	24K words
Expansion DM Area		Cannot be used.	Cannot be used.	32K words x 8 banks
Timers		512	1,024	1,024
Counters		512	1,024	1,024
Number of SFC steps		Cannot be used.	Cannot be used.	1,024
Step flags		Cannot be used.	Cannot be used.	1,024
Transition flags		Cannot be used.	Cannot be used.	1,024

Part 2
Offline Operations

This part of the manual covers procedures for operations performed offline (i.e., while not connected to a PC). These operations are used to write programs and otherwise prepare and manage data for later transfer to PCs online or to manage data transferred from PCs.

SECTION 3
Programming

This section explains how to input, edit, save, retrieve, and delete programs in both ladder and mnemonic form. In particular, it explains how to use the various items on the Programming Menu and how to use the Read, Write, Insert, and Delete modes.

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3-1 Getting Started

This section explains the preliminary procedures that must be carried out before beginning programming.

3-1-1 Before Programming

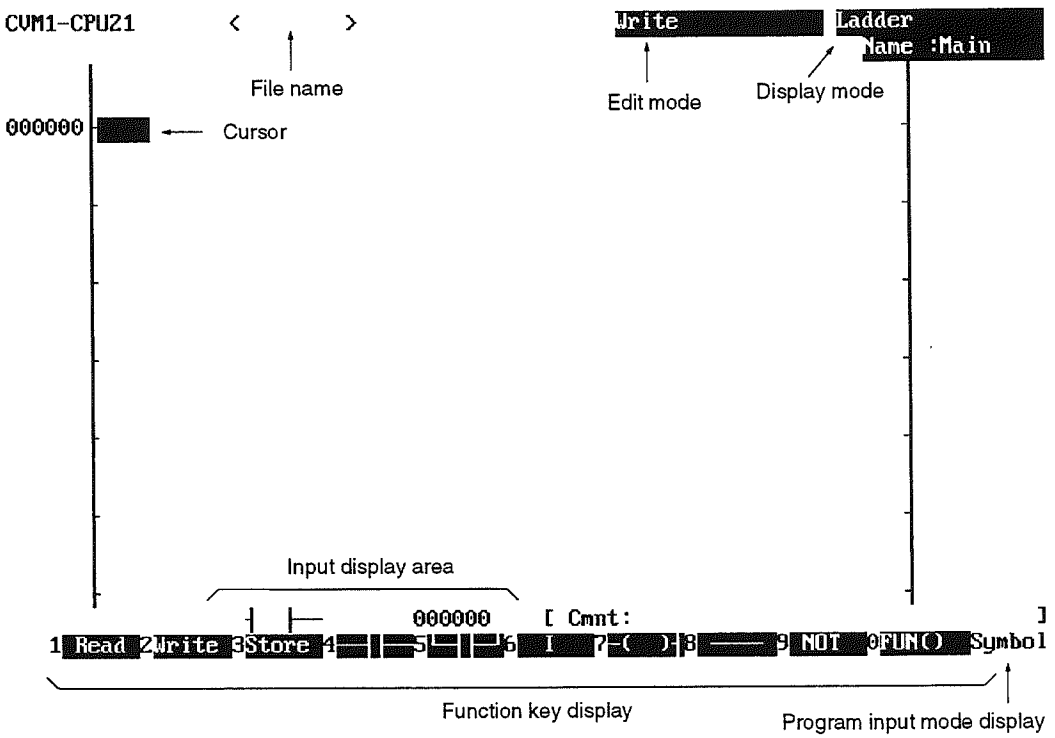
The basic operations that must be carried out before beginning programming are outlined below. For details, refer to the relevant sections in the manual.

1, 2, 3...

1. Make the appropriate settings in the System Setup menu according to the system that is to be employed. (See *Section 7 System Setup.*)
2. In the Programming Menu, use "C:Clear memory" to clear all user programs from the system work area. It is also possible to specify a range to be cleared. (See *3-1-2 Clearing Memory.*)
3. In the Programming Menu, use "H:Change display" to change the way in which the basic programming screen is displayed. (See *3-1-3 Changing the Display.*)
4. To begin actual programming, refer to sections *3-2* through *3-8.* (See the table of contents for this section.)

Ladder Programming Display

The ladder programming display is a screen for creating ladder programs. The function keys at the bottom of the screen can be used to carry out functions such as changing the editing mode and writing, storing, finding, and reading programs.



Shift + Function Keys



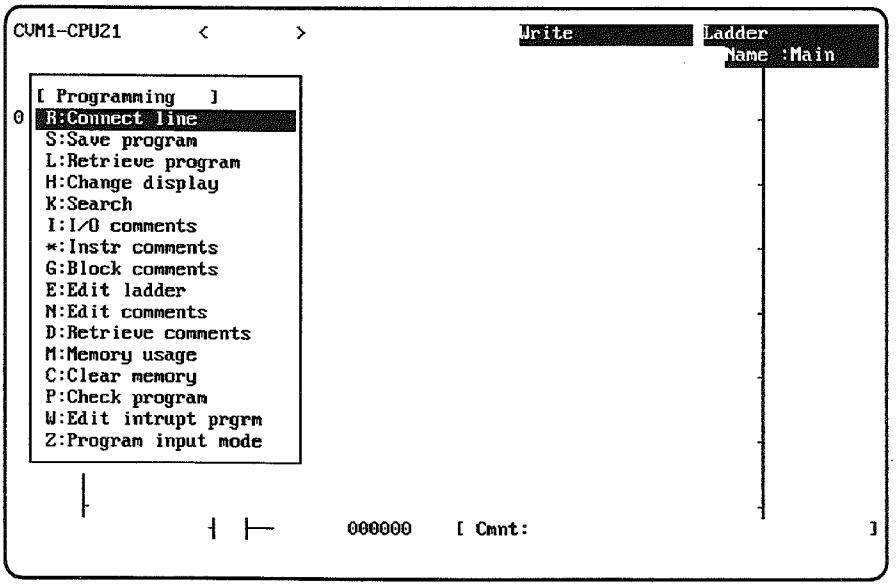
Editing Modes

The following editing modes can be selected with the function keys located at the bottom-left of the screen.

Editing mode		Function
Read	Read (F1)	Set to display the program from the system work area on the screen. Set to find a program address, instruction, operand, text string, I/O comment, or block comment, and display it on the screen.
Write	Write (F2)	Set to input or edit a program on the screen.
	Store (F3) Store insert (Shift + F3)	Set to write a ladder program created on the screen to the system work area. Ladder programs created on the screen are not saved in when input in ladder form, so always execute "Store" or "Store insert" after creating or revising a program. This mode is not available when creating mnemonic programs on the screen as these programs are automatically written to the system work area as they are input.
Insert (Shift + F2)		Set to insert data into a program displayed on the screen.

Programming Menu

To access the Programming Menu from the programming screen, either press the End Key or press Control + M. To return to the programming screen,press Control + \.



The following operations can be carried out from the Programming Menu.

Menu item	Operation	Page
R:Connect line	Creates connecting lines between programming elements (vertical line, symbols, etc.).	34
S:Save program	Writes the ladder or mnemonic program in the system work area to the data disk.	71
L:Retrieve program	Reads the ladder or mnemonic program on the data disk to the system work area.	73
H:Change display	Sets the method for displaying ladder diagrams and mnemonic programs.	16
K:Search	Searches for instructions through their operands. Specified by alphanumeric keys.	75
I:I/O comment	Finds and displays ladder diagrams, by means of writing and specifying I/O comments.	81
G:Block comment	Writes block comments to the leading line of a program or to programs configured as a group. Also searches for block comments.	61

Menu item	Operation	Page
E:Edit ladder	Moves, copies, or deletes instruction blocks for a program in the system work area.	84
N:Edit comments	Displays I/O comments on the screen 16 at a time, and edits the comments.	58
D:Retrieve comments	Reads I/O comments and block comments from programs stored on the data disk.	75
M:Memory usage	Displays how the memory area is being used in the system work area.	20
C:Clear memory	Clears the user program in the system work area.	14
P:Check program	Checks whether ladder and mnemonic programs in the system work area are correct.	68
W:Edit interrupt program	Edits I/O interrupt, scheduled interrupt, power failure interrupt, and power-up interrupt ladder programs.	86
Z:Program input mode	Specifies the mode for inputting instructions (including operands) when creating ladder programs.	21

Note "R:Connect line," "E:Edit ladder," and "Z:Program input mode" cannot be executed in the mnemonic display mode.

3-1-2 Clearing Memory

The "C:Clear memory" operation is used to clear user programs (including I/O comments and block comments and interrupt programs) from the system work area. It can be executed in all display modes and editing modes.

The "C:Clear memory" operation has two options: "A:Clear all" and "B:Clear set range." Use "A:Clear all" to delete the entire user program, including I/O comments and block comments. Use "B:Clear set range" to specify and clear a particular range of addresses within a specific memory area. A range of addresses can be deleted from any of the following programs, beginning with the specified address.

Main program (normal ladder program)
I/O interrupt program
Scheduled interrupt program
Power off interrupt program
Power on interrupt program

Note

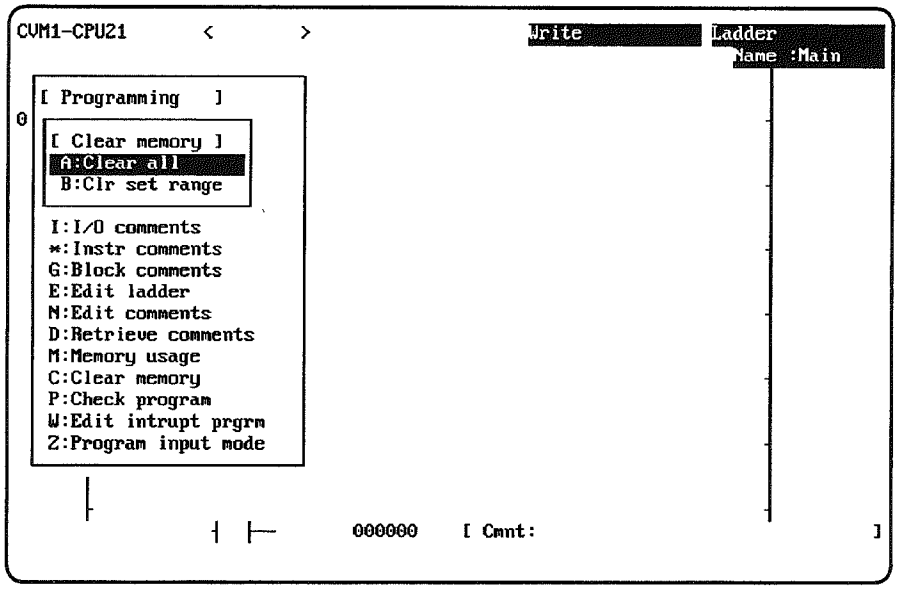
1. Only the I/O interrupt and scheduled interrupt program of the specified numbers will be deleted.
2. To clear only part of a program, use the "E:Edit ladder" operation. (Refer to *3-6 Editing Ladder Programs.*)

Clearing the Entire Program

1, 2, 3...

The procedure for clearing the entire program from memory is as follows:

1. Select "C:Clear memory" from the Programming Menu.



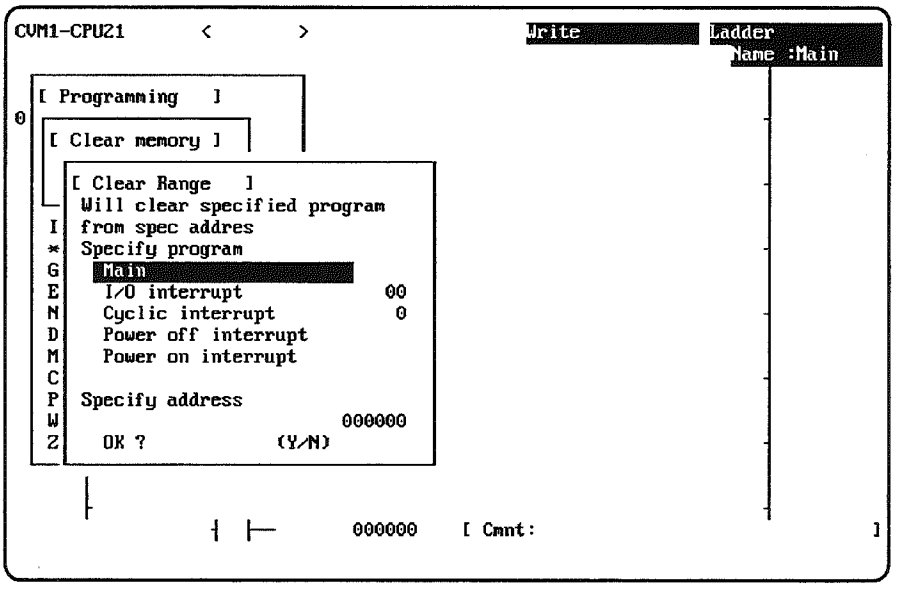
2. Select "A:Clear all." A confirmation message will be displayed.
3. Either press the Enter Key to confirm that the program is to be cleared or input "N" and press the Enter Key to cancel the operation. Once the program has been cleared, the programming screen will return.

Clearing a Specified Range

1, 2, 3...

The procedure for clearing a specified range of program address is as follows:

1. Select "C:Clear memory" from the Programming Menu.
2. Select "B:Clear set range." The following screen will appear.



3. Use the Up and Down Cursor Keys to specify the program. Then specify the beginning program address for the range of addresses that is to be deleted and press the Enter Key. To delete the entire program, input 000000.

To delete I/O interrupts and scheduled interrupts, input the numbers that are to be deleted and then press the Enter Key.

In either case, a confirmation message will be displayed.

4. To delete the specified range, input "Y" and press the Enter Key. To cancel the operation, input "N" and press the Enter Key. Once the specified range has been cleared, the programming screen will return.

3-1-3 Changing the Display Mode

Use the "H:Change display" operation to change the display mode of the basic programming screen to any of the four modes shown in the following table. It is also possible to toggle between the three ladder diagram modes by using Control + G.

Program Display Modes

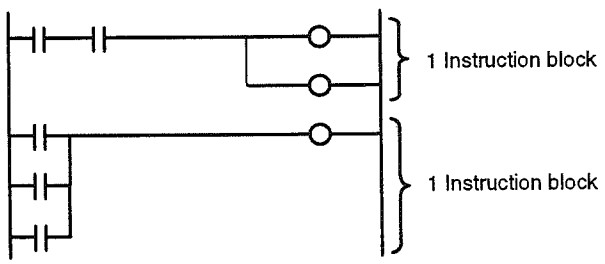
Display mode	Function
Ladder (no comments)	Set to create and display ladder programs with no comments.
Ladder (2 comment rows)	Set to create and display ladder programs with I/O comments. I/O comments are displayed in two rows.
Ladder (4 comment rows)	Set to create and display ladder programs with I/O comments. I/O comments are displayed in four rows.
Mnemonic	Set to create and display programs in mnemonic coding. Alphanumeric keys are used to write instructions.

⚠**Caution** After creating a program using either of the ladder display modes, be sure to execute "Store/Store insert." If this is not done, the ladder program will be cleared when the display is changed to mnemonic. After "Store/Store insert" has been executed, the display can be changed without losing the ladder program.

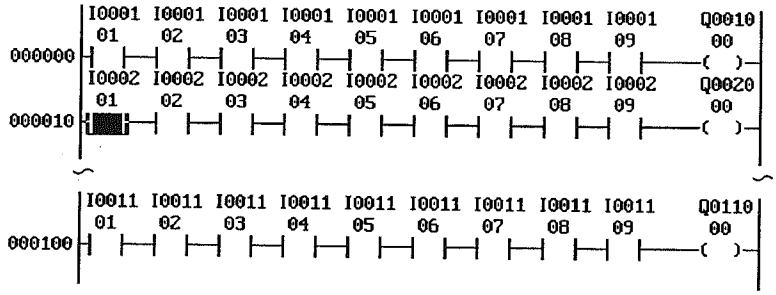
Instruction Blocks

An instruction line and all the instruction lines with which it interconnects are called an instruction block. When the maximum number of 22 instruction lines is reached, execute the "Store" operation. Instruction blocks requiring more than 22 instruction lines cannot be written in ladder form and must be written in mnemonic form instead.

When several inputs are placed in an OR configuration or when there are multiple input conditions, as in special instructions, these are counted as multiple instruction lines within the instruction block.



Number of Lines that Can be Written in One Instruction Block

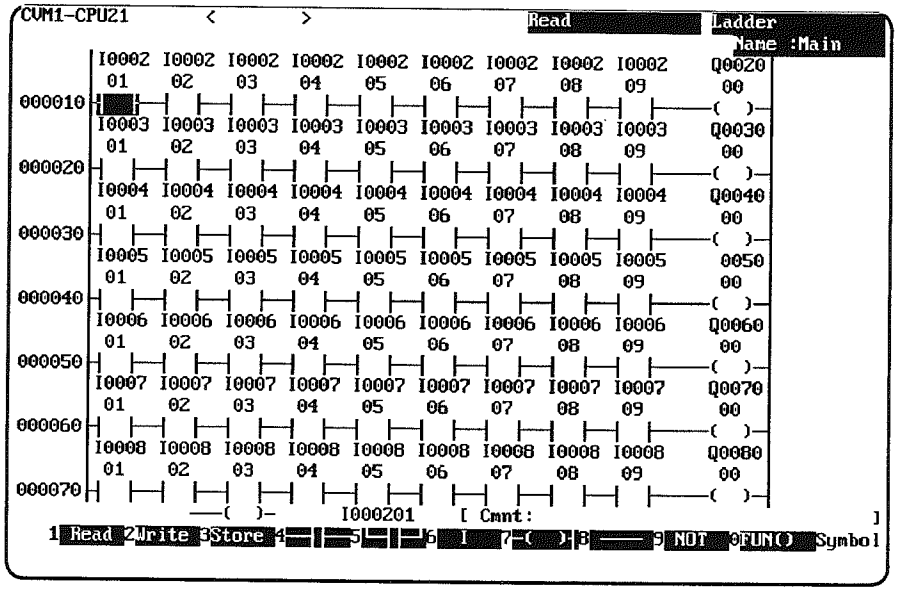


Display Mode Screens

The screens for each of the display modes are shown below.

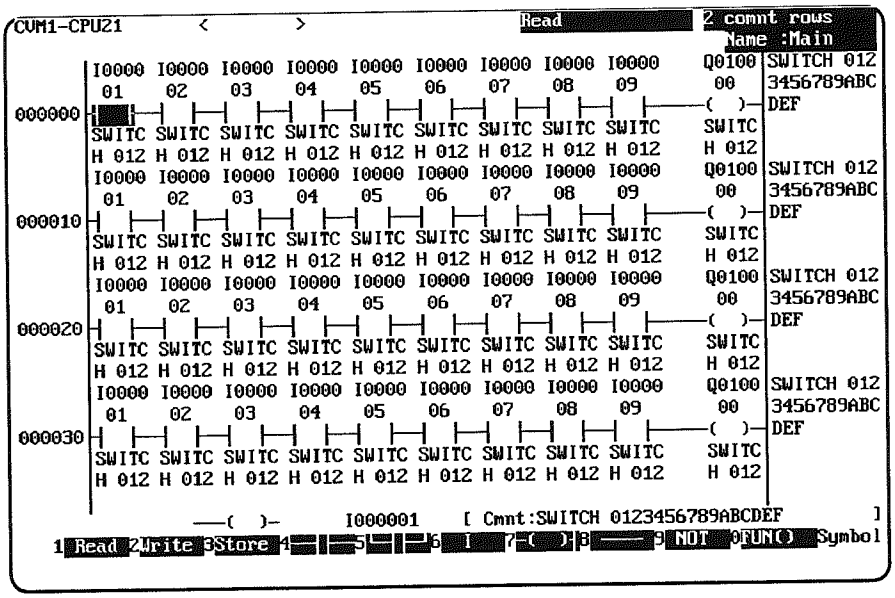
Ladder Diagram (No Comments)

Up to 7 instruction lines can be displayed on the screen at a time.



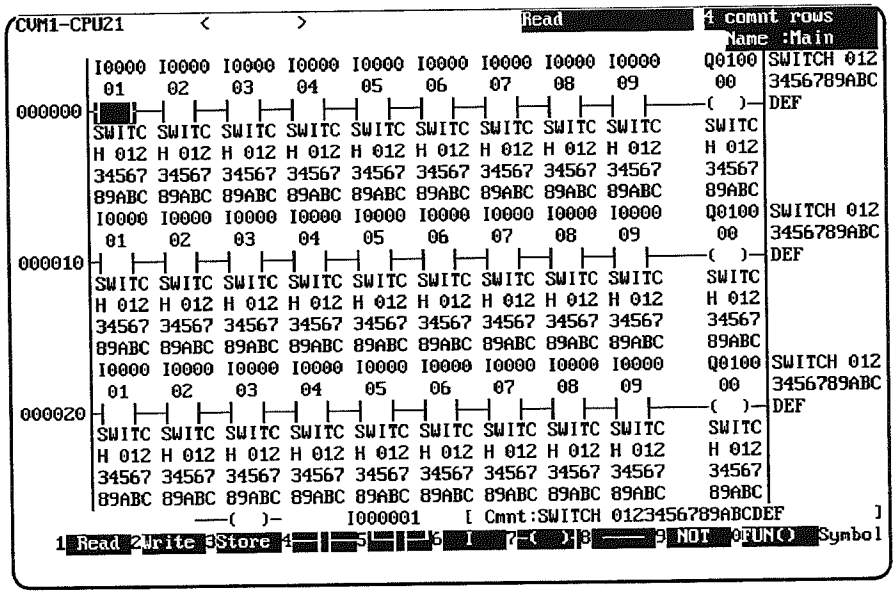
Ladder Diagram (With 2 Comment Rows)

Up to 4 instruction lines can be displayed on the screen at a time. I/O comments are displayed in two rows each, with up to five characters per row for each comment.



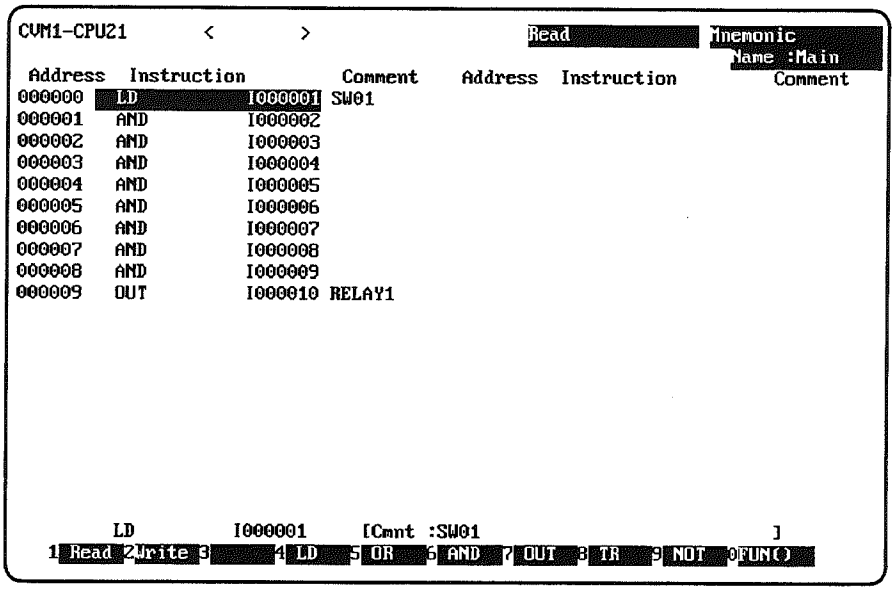
Ladder Diagram (With 4 Comment Rows)

Up to 3 instruction lines can be displayed on the screen at a time. I/O comments are displayed in two rows each, with up to five characters per row for each comment.



Mnemonic Input Screen

On a mnemonic screen, the first 10 characters of all I/O comments that have been created are displayed. The program is displayed in two columns, as shown in the following illustration.

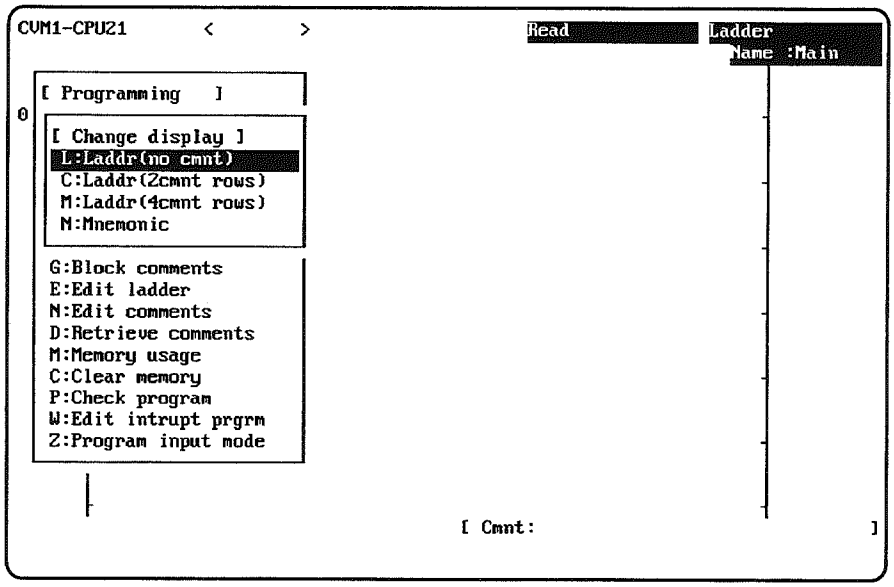


Block comments cannot be created on a mnemonic screen. They must be created on a ladder diagram screen.

The program is automatically written to the system work area as it is input.

Changing the Display Mode

1, 2, 3... 1. Select "H:Change display" from the Programming Menu.



2. Move the cursor to select the desired display mode, and press the Enter Key. The selected mode will appear, and the display mode will be shown at the upper right of the screen. The default setting is "L:Ladder (no comments)."
3. If the store or store insert operations have are not executed when a ladder program is created, a warning message will be displayed when "H:Change display" is selected to display to or from mnemonic program display.

Press the Enter Key to cancel and then execute the store operation before changing the display mode. You can then change the display mode without losing the program.

3-1-4 Displaying Memory Usage

The "M:Memory usage" operation displays the number of words currently being used in the program memory in the system work area, and also displays the memory capacity required when transferring a program to the Programmable Controller.

The following conditions are displayed:

- Amount of PC user memory currently being used.
- Amount of PC user memory remaining.
- Amount of internal memory remaining
- Number of I/O comments currently being used.
- Number of block comments currently being used.

The maximum numbers that can be used for each memory area are shown in the following table.

Memory area	Maximum usable
User memory (system information, reserved areas, ladder space requirements)	CVM1-CPU01-EV2: 32K words CVM1-CPU11-EV2: 32K words CVM1-CPU21-EV2: 64K words
I/O comments	10,000
Block comments	512

PC Memory Required/Left

The amount of memory that would be required if the user program stored in the system work area is transferred to the Programmable Controller, along with the available memory capacity that would remain in the Programmable Controller.

Internal Memory Available (%)

The percentage of user program capacity still available in the system work area is displayed. The user program area includes block comments.

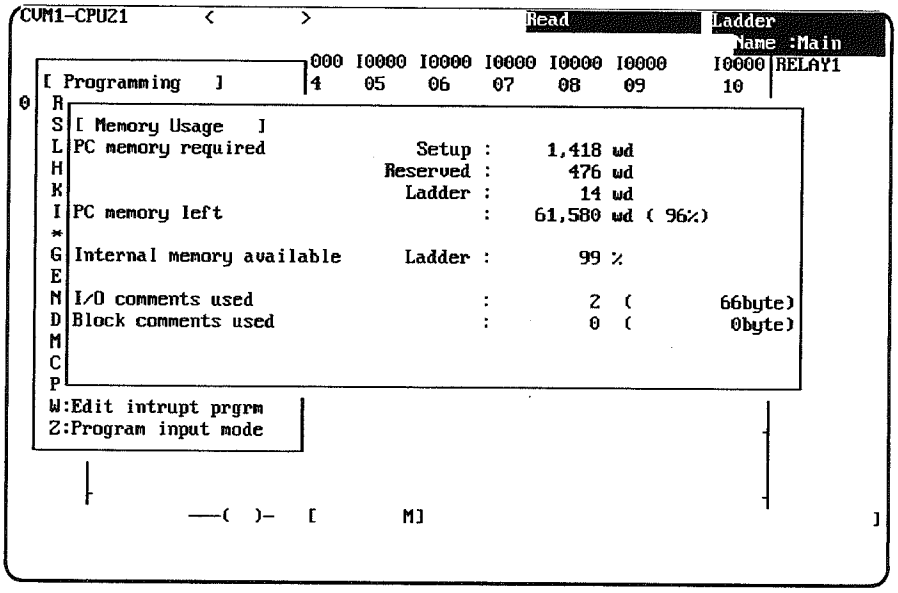
I/O Comments Used

The number of I/O comments used is displayed. A maximum of 10,000 I/O comments can be used.

Block Comments Used

The number of block comments used is displayed. A maximum of 512 block comments can be used.

Procedure To display the current memory usage conditions, simply select "M. Memory usage" from the Programming Menu. The conditions will then be displayed.



3-1-5 Changing the Input Mode

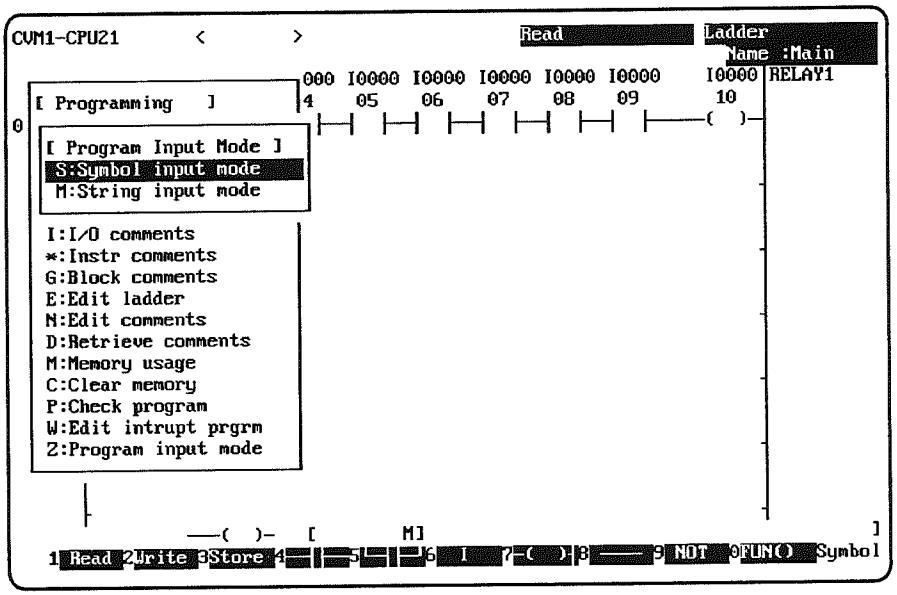
The "Z:Program input mode" operation can be used to select whether ladder program instructions are to be written using symbols or by typing strings (mnemonics). The default setting is for symbol input.

Input mode	Operation
S:Symbol input mode	In this mode, symbols are selected by means of function keys, and operands are input using the Control Key plus function keys or alphanumeric keys. It is possible to go into the string input mode for one operation only by means of Control + Z. (See note.)
M:String input mode	In this mode, mnemonics and operands, mnemonics only, or operands only are input as text strings using alphanumeric keys. Input example: Writing a MOV instruction on the programming screen 1. Input "M." The letter "M" will then be displayed at the bottom of the screen, followed by the cursor. 2. Continue by inputting "OV 10 100" and the press the Enter Key. The instruction "MOV 0010 0100" will then be written on the screen. It is possible to go into the symbol input mode for one operation only by pressing the function key for the instruction symbol. (See note.)

Note Even if the symbol input mode is set, the mode will automatically go into string input mode for mnemonic editing (reading or writing).

Procedure

1, 2, 3... 1. Select "Z:Program input mode" from the Programming Menu.



2. Select either "S:Symbol input mode" or "M"String input mode." The input mode will be displayed in the lower left corner of the screen.

3-2 Programming in Ladder Form

This section explains how to create and revise ladder programs.

3-2-1 Creating a Ladder Program

Preparations

System Setup Set the Programmable Controller model that is to be used, and set all of the required items according to the system that is to be used.

Clearing Memory Use the "C:Clear memory" command to delete the contents of the memory before creating a new program. Existing programs will be overwritten if not deleted before a new program is written.

Retrieving the Program When modifying or adding to an existing program, use the "L:Retrieve program" command to write the program stored on the data disk to the system work area.

Setting the Display Mode The default display mode is "Ladder (no comments)." To set another display mode, execute "H:Change display" from the Programming Menu.

Program Checks When the program is checked, the maximum values for the model of PC set in the System Setup will be used for I/O points and operand ranges. Execute "P:Check program" for each Programmable Controller.

Program Input Mode The default setting is for symbol input. To change to string input, execute the "Z:Program input mode" operation from the Programming Menu. This section is explained using the symbol input mode.

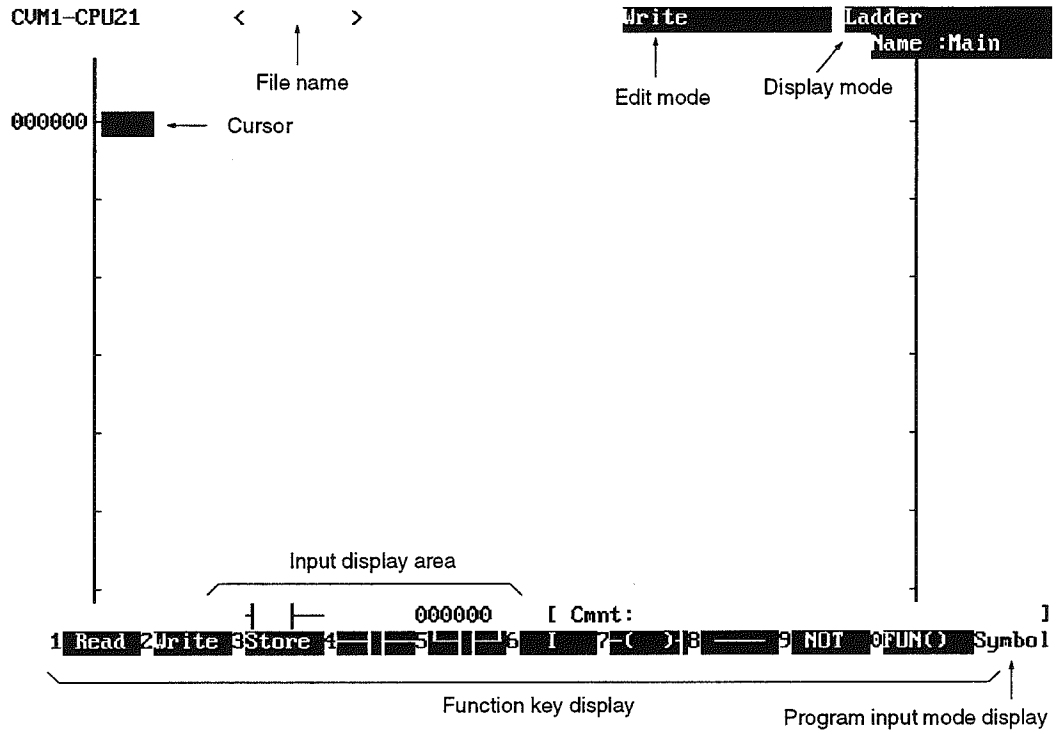
⚠Caution Whenever creating a new program or modifying an existing one, be sure to store the program by executing the "Store" operation (i.e., the F3 Key). After the program has been stored, save the program to the data disk by executing "S:Save program" from the Programming Menu.

Ladder Program Input Screen

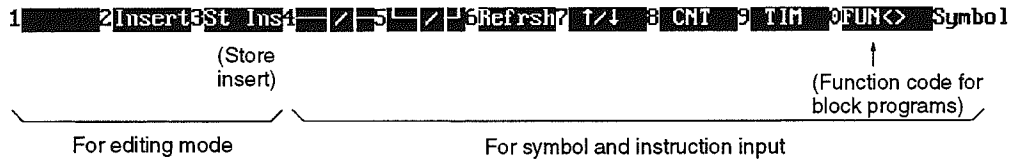
Editing Mode

The editing mode and display mode are displayed at the top-right of the screen. The default editing mode is the read mode. Use function keys F1 through F3 to change the editing mode.

To create or modify a ladder program, press the F2 key to enter the write mode. The write mode screen appears as follows:



Shift + Function Keys



Function Keys

The function keys (F1 to F10) are located at the bottom of the screen. The function keys can be changed by pressing the Shift Key together with any of the ten function keys.

Number of Instruction Lines

The maximum number of instruction lines possible for one instruction block is 22, including the portion of the instruction block which is not appearing on the screen. The number of instruction lines that can be displayed on the screen at one time is as follows:

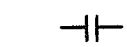
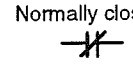
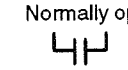
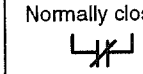
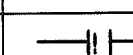
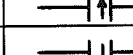
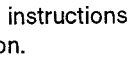
Ladder (no comments): 7
Ladder (2 comment rows): 4
Ladder (4 comment rows): 3

Moving the Cursor

Press the Up and Down Cursor Keys to move the cursor up and down through the 22 instruction lines (to the top and the bottom). Press the Left Cursor Key to move the cursor to the left; from the left edge of the screen, the cursor will move to the right edge. Press the Right Cursor Key to move the cursor to the right; from the right edge of the screen, the cursor will move to the left edge.

3-2-2 Entering Input Conditions

There are eight types of input conditions that can be entered in a ladder diagram. To enter an input condition, press the function key represented by the appropriate symbol. Then enter the bit address for that input. The eight types of conditions and their symbols are shown in the following table.

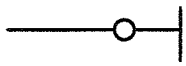
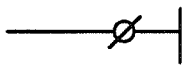
Instruction	Symbol	Function key inputs
LD AND	Normally open 	*Bit_address* **Enter**
LD NOT AND NOT (See note 1.)	Normally closed 	**F9** *Bit_address* **Enter** **Shift+F4** *Bit_address* **Enter**
OR	Normally open 	**F5** *Bit_address* **Enter**
OR NOT (See note 1.)	Normally closed 	**F5 F9** *Bit_address* **Enter** **Shift+F5** *Bit_address* **Enter**
Immediate refresh		**Shift+F6** *Bit_address* **Enter**
Differentiate Up LD or AND		**Shift+F7** *Bit_address* **Enter**
Differentiate Down LD or AND		**Shift+F7+F7** *Bit_address* **Enter** (See note 2.)
Intermediate special instructions		**F10** *Function_code* **Enter** *(Operand* **Enter** *Operand* **Enter)**

Note

1. The various NOT instructions can only use immediate refresh, and not up or down differentiation.
2. The F7 Key toggles between differentiated up and differentiated down.
3. For information on inputting bit addresses, refer to *3-2-4 Entering Bit/Word Addresses and Data.*
4. If there are too many input conditions to fit on one program line, use the "continue" operation. For details, refer to *3-2-8 Continuing Instruction Lines.*

3-2-3 Entering Right-hand Instructions

The right-hand instructions used in ladder programs are shown in the following table, along with their symbols. Operands are designated by bit address, word address, timer number, or counter number.

Instruction	Symbol
OUT	
OUT NOT	
TIMER	TIM
COUNTER	CNT
Instruction with function code	FUN
Immediate refresh instructions	! FUN
DIFFERENTIATE UP instructions	↑ FUN
DIFFERENTIATE DOWN instructions	↓ FUN
Block program instructions (with <>)	FUN < >

The following table shows the function key sequences for entering each of the above instruction.

Instruction	Function key inputs
OUT	**F7** *Bit_address* **Enter**
OUT NOT	**F7 F9** *Bit_address* **Enter**
TIMER	**Shift+F9** *Timer_number* **Enter** Then *Set_value* **Enter**
COUNTER	**Shift+F8** *Counter_number* **Enter** Then *Set_value* **Enter**
Instructions with function codes	**F10** *Function_number* **Enter** (*Operand* **Enter**) (*Operand* **Enter**) (*Operand* **Enter**)
Immediate refresh instructions (See note 1.)	**OUT, OUT NOT** *Instruction Bit_address* **Shift+F6 Enter** **Special Instructions** *Mnemonic Bit_address* **Shift+F6 Enter** (*Operand* **Enter**) *Operand* **Enter** *Operand* **Enter**
Differentiated up instructions	Mnemonic **Shift+F7 Enter** (*Operand* **Enter**) *Operand* **Enter**
Differentiated down instructions (See note 2.)	*Mnemonic* **Shift+F7 F7 Enter** *Operand* **Enter**
Block programming instructions (with <>)	Store program, switch to mnemonic display, then **Shift+F10** *Function_code* (*Operand*) (*Operand*) (*Operand*) **(F9) Enter**

Note

1. Can be used for OUT, OUT NOT, KEEP(011), DIFU(013), DIFD(014), SET(016), RSET(017), CPS(026), CMP(028), and MOV(030).
2. Can be used for SET(016) and RSET(017).

To set the SV from an external device, specify input of a word address by inputting Control + F7, and then input an input word address.

The number of operands varies according to the instruction. (For details, refer to the operation manual for the PC.)

Entering Function Codes

For a list of function codes, refer to *Appendix E Function Codes.*

If the wrong function code is input by mistake, press the F10 Key and then input the function code again.

Function codes can also be entered in the following way:

1, 2, 3...

1. Pressing the F10 Key to display "FUN(???)" or Shift+F10 to display "FUN<???>." Then press the Enter Key or input Control + F to display a list of instructions.
2. Move the cursor to select the instruction that is to be entered, and then press the Enter Key. The instruction that is entered will be displayed at the bottom of the screen.

3-2-4 Entering Bit/Word Addresses and Data

This section explains how to enter bit, word addresses, and other operands.

- Leading zeroes in addresses and numbers can be omitted.
- If the wrong address is input by mistake, press the Home Key and then input the address again.
- For instructions such as ADB(080) that involve constants and binary data for operands, constants can be input in BCD form with or without a sign.
- Use alphanumeric keys to input the prefixes used for index registers.

The following table shows the key sequences for entering bit addresses, word addresses, and data.

Memory area	Bit addresses	Word addresses	Display
CIO Area	*Bit_address*	*Word_address*	I (Input) Q (Output) (See note 1.)
CPU Bus Link Area	**Ctrl+F2** *Bit_address*	**Ctrl+F2** *Word_address*	G
Auxiliary Area	**Ctrl+F1** *Bit_address*	**Ctrl+F1** *Word_address*	A
DM Area	–	**Ctrl+F4** *DM_address*	D
Indirect DM addresses	–	**Ctrl+F8** *DM_address*	*D
EM Area	–	**Shift+Ctrl+F4** *EM_address*	E
Indirect EM addresses	–	**Shift+Ctrl+F8** *EM_address*	*E
Timer Area	**Ctrl+F6** *Timer_number*	**Ctrl+F6** *Timer_number*	T
Counter Area	**Ctrl+F5** *Counter_number*	**Ctrl+F5** *Counter_number*	C
Constants	–	**Ctrl+F10** *Set_value*	#
Data registers	–	**D R** *Number*	DR
Index registers	–	**I R** *Number*	IR

Note I and Q are displayed after creation, editing, changing, or transfer of the I/O table. They will not be display is there is no I/O table and will not be accurate unless the I/O table is accurate.

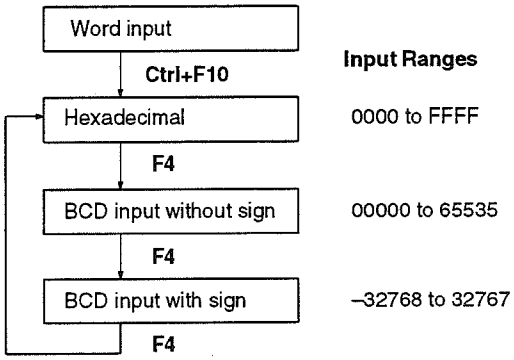
Inputting BCD Constants

To input a constant for an operand, first press Control + F10. At this point hexadecimal input will be possible.

To change the input method, press the F4 Key. Each time the F4 Key is pressed, the input method will changed in order as follows: BCD without sign to BCD with sign to hexadecimal.

When BCD with sign is selected, the F5 Key serves as the +/– key. Pressing the F5 Key will toggle between "+" and "–."

The displays for F4 will should the next constant input mode. Permissible input ranges are shown below.



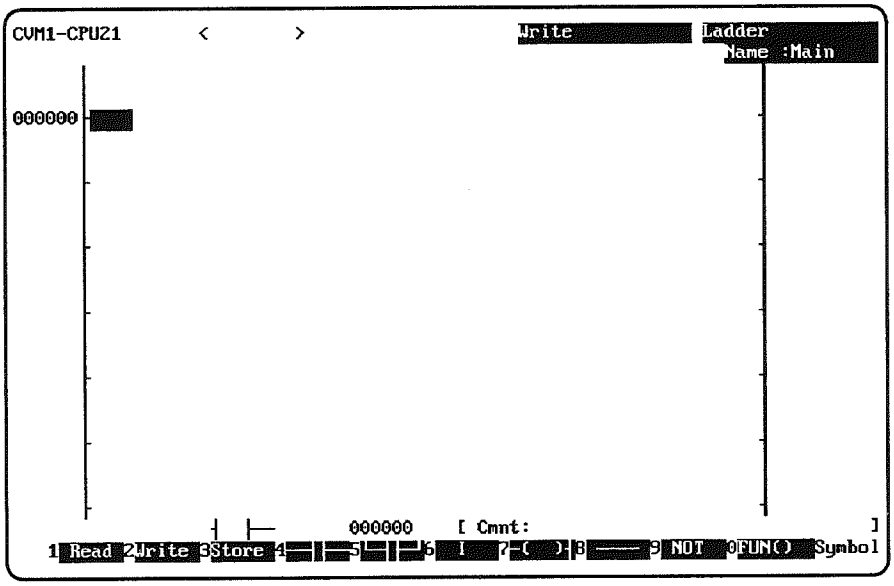
3-2-5 Entering Inputs and Outputs

This section provides examples of entering input conditions and right-hand instructions for ladder programs.

Example 1: Entering Input Conditions

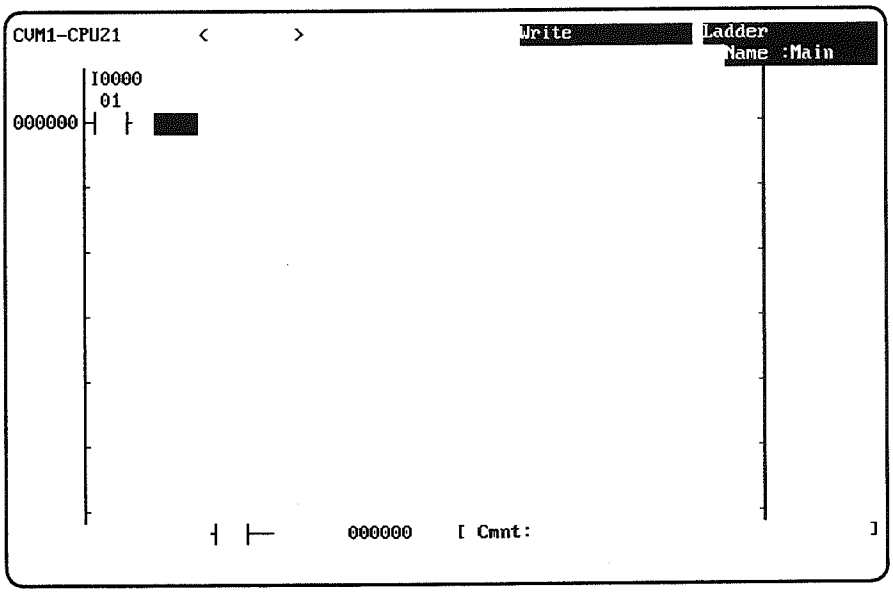
1, 2, 3...

1. Press the F2 Key to go into the write mode. The cursor will be displayed at the beginning program line, "00000."



2. Move the cursor to the desired position. If a program is already written at the cursor position, the symbol and bit address will be displayed at the bottom of the screen.
3. Using the function keys, input the symbol and instruction. (In the example above, F4 has been input.)
4. Input the bit address. Leading zeroes can be omitted. For example, to change the "00000" shown in the screen above to "00001," it is sufficient to simply input "1."

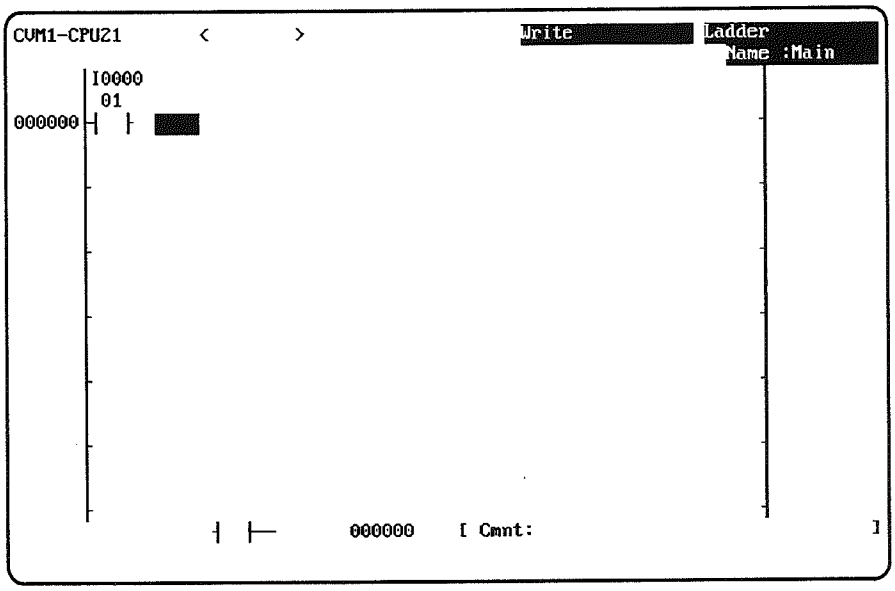
5. Press the Enter Key to write the new input into the program.



Example 2: Entering OUTPUT Instructions

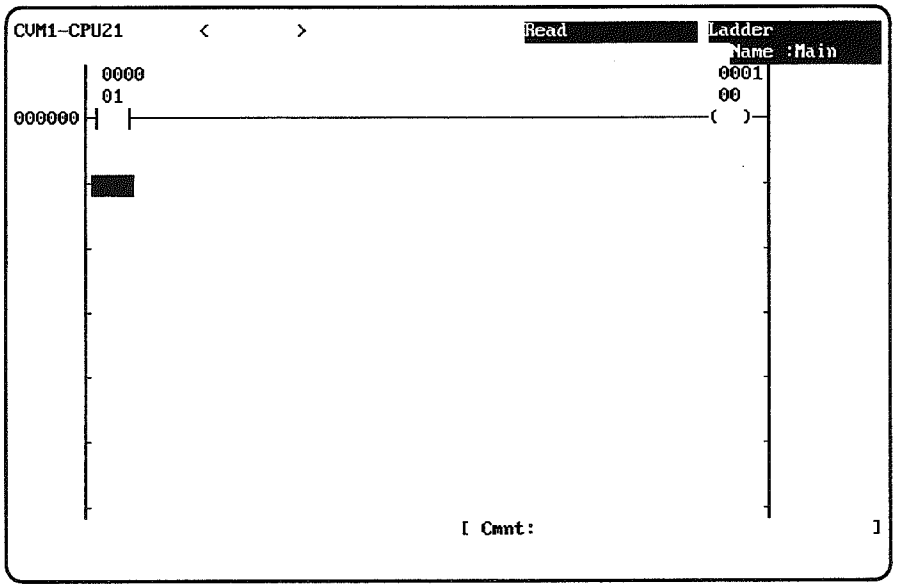
1, 2, 3...

1. Press the F2 Key to go into the write mode.
2. Move the cursor to the right of the input condition. Use the "Connect line" operation to fill in the line between the input and output symbols.



3. Use the function keys to input the symbols. (For example, input F7.)
4. For each output, enter the function code, the set value, and the operand. (For example, input "100.")

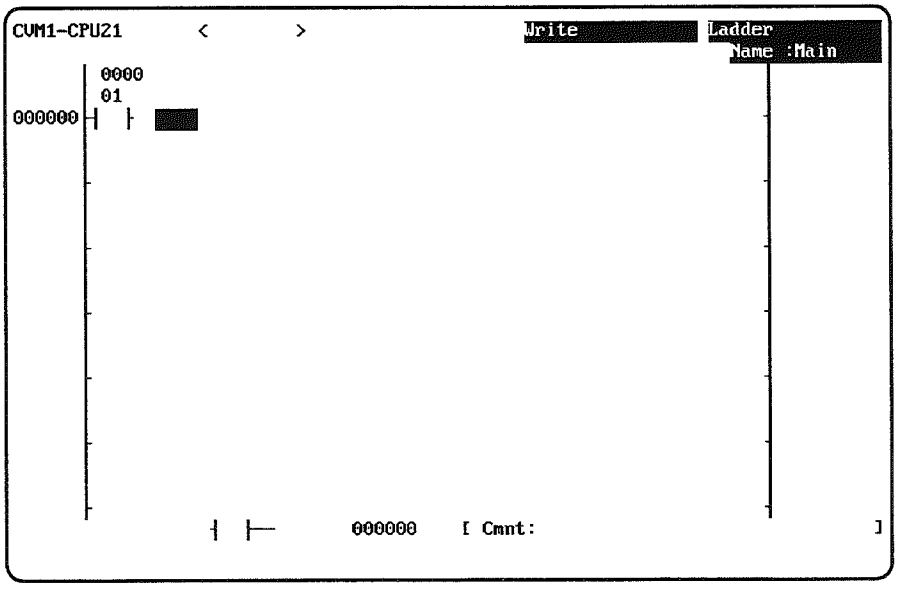
5. Press the Enter Key to write the new output into the program.



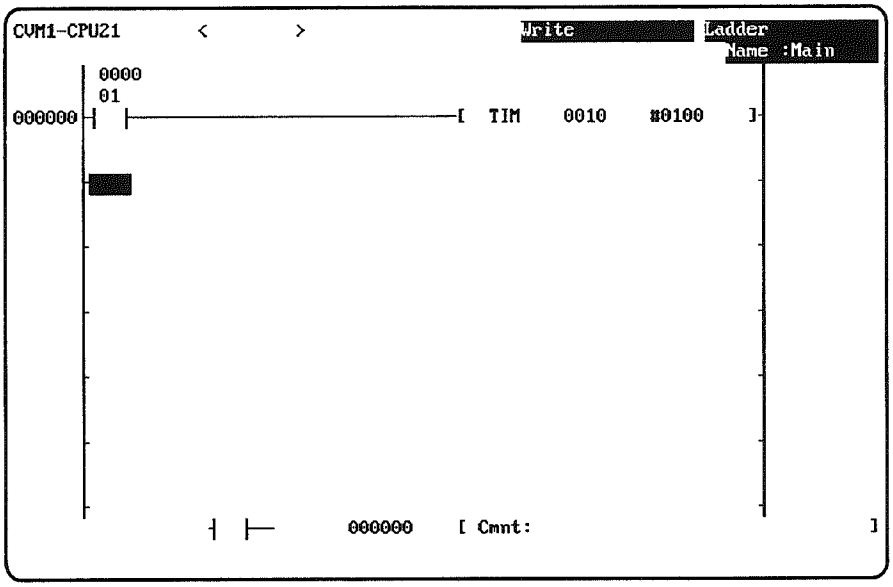
Example 3: Entering Timer Instructions and Operands

1, 2, 3...

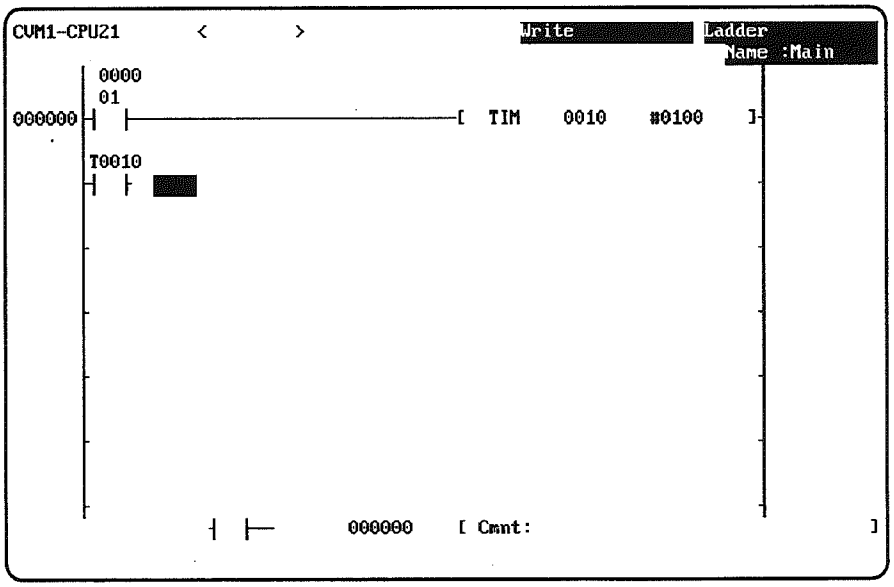
1. Type "1" followed by the Enter Key to input the bit address for the first LD instruction. Leading zeros can be omitted.



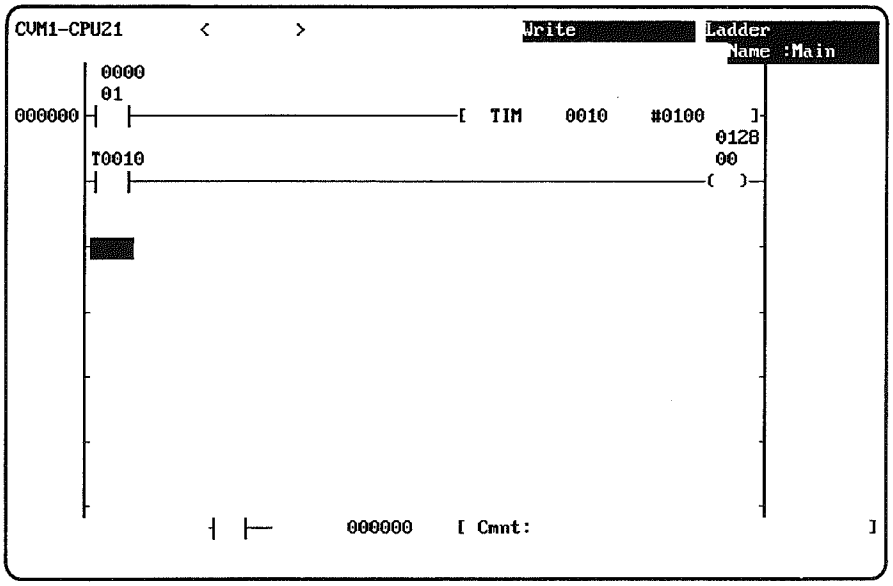
2. To enter the timer instruction, input "Shift+F9" followed by the number ("10" in this example). Then enter the set value by inputting "100."



3. Then F4 to specify a LD or AND instruction, input "Control+F5" or "Control+F6" followed by the number of the timer/counter ("10" in this example).



4. To enter the OUTPUT, press F7 followed by the bit address (12800 in this example), and then press the Enter Key.

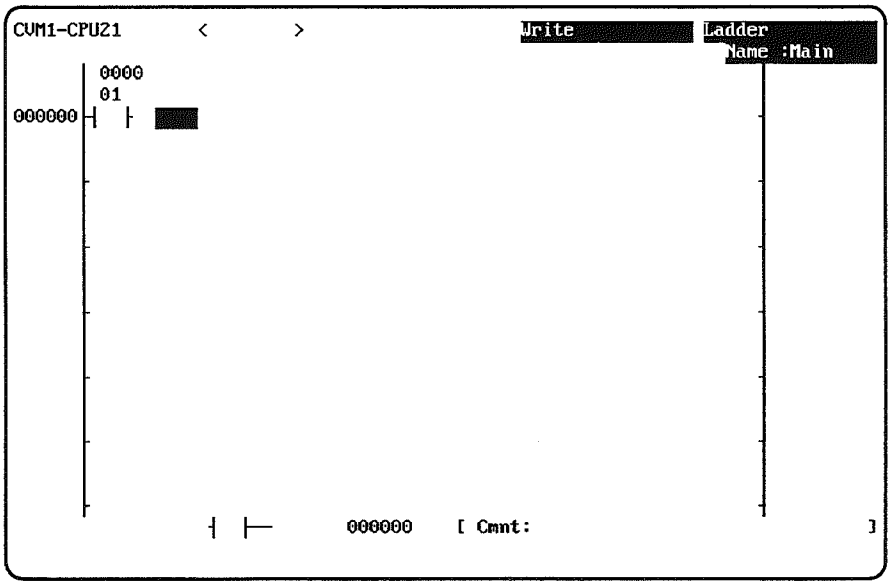


5. Press F3 and the Enter Key to store the program.

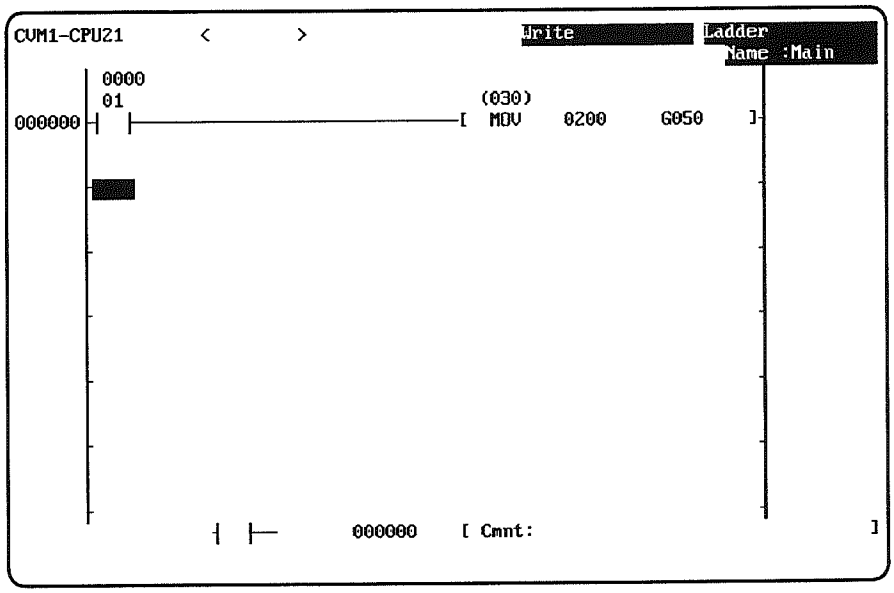
Example 4: Entering Special Instructions

This example will show the procedure for entering the special instructions in a ladder diagram. The MOV instruction in the second line will be entered using the string input mode.

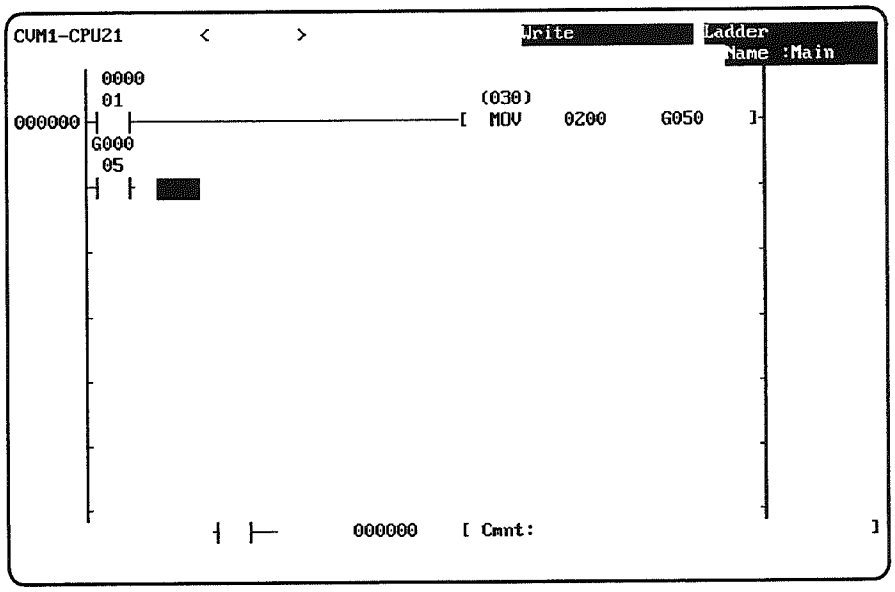
1, 2, 3... 1. Input "1" and press the Enter Key to enter the first input condition.



2. Input the following key sequence: **F10** 030 **Enter** 200 **Enter** G50 **Enter**.

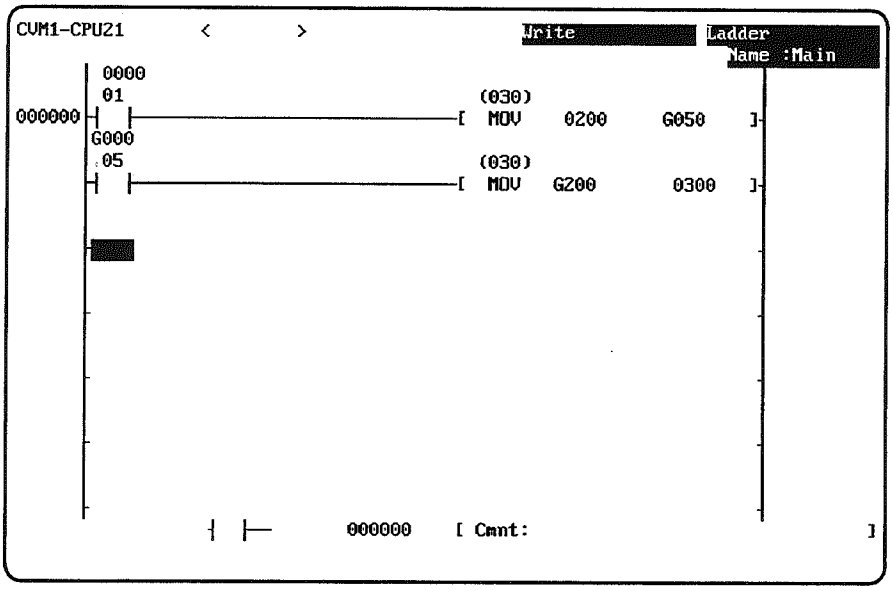


3. Input "G5" and press the Enter Key.

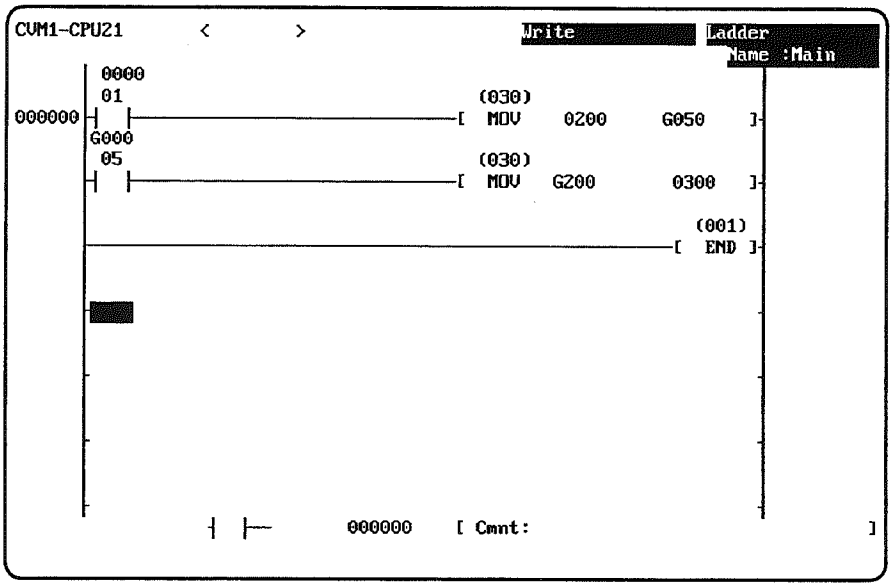


4. Press the End Key, and select "Z:Program input mode" from the Programming Menu.
5. Select "M:String input mode." "String" will be displayed in the lower right corner of the screen. (It is also possible to go into the string input mode for a single operation by inputting Control+Z and then pressing the Enter Key.)

6. Input the following key sequence: MOV G200 300 **Enter.** (When inputting instructions in the string input mode, be sure to use the Space Key to separate the mnemonic from operands and operands from each other.)



7. Input the following key sequence: **F10** 001 **Enter.**



8. Press the F3 Key followed by the Enter Key to store the program.

3-2-6 Inputting Basic Comparison Instructions

There are two sets of basic comparison instructions supported by V2 CVM1 PCs: CMP(028)/CMPL(029) and CMP(020)/CMPL(021). The older CVM1 PCs support only CMP(020)/CMPL(021).

The only difference between these instructions is in the input methods for them (see below) and in the fact that CMP(028)/CMPL(029) and right-hand instruction (i.e., connect to the right bus bar) and CMP(020)/CMPL(021) are intermediate instructions (i.e., appear in the middle of instruction lines like input conditions).

Online input methods are different than offline ones. Refer to the online programming section of this manual for details.

Inputting CMP(020)/CPML(021) These instruction cannot be input in string input mode, and must be input through their function codes. They do not, however, appear on the special instruction list that appears when Enter is pressed after F10 (FUN( )).

Inputting CMP(028)/CPML(029) These instruction can be input using either function keys (function code) or string input. They also appear on the instruction list that appears when Enter is pressed after F10 (FUN( )).

3-2-7 Writing Line Connections

There are two ways to write connecting lines. The first is to write vertical or horizontal lines one cursor movement at a time, and the second is to use the "Connect line" operation to write the line by designating the beginning and ending points.

Connections cannot be made for more than 22 instruction lines (the maximum number permitted in an instruction block).

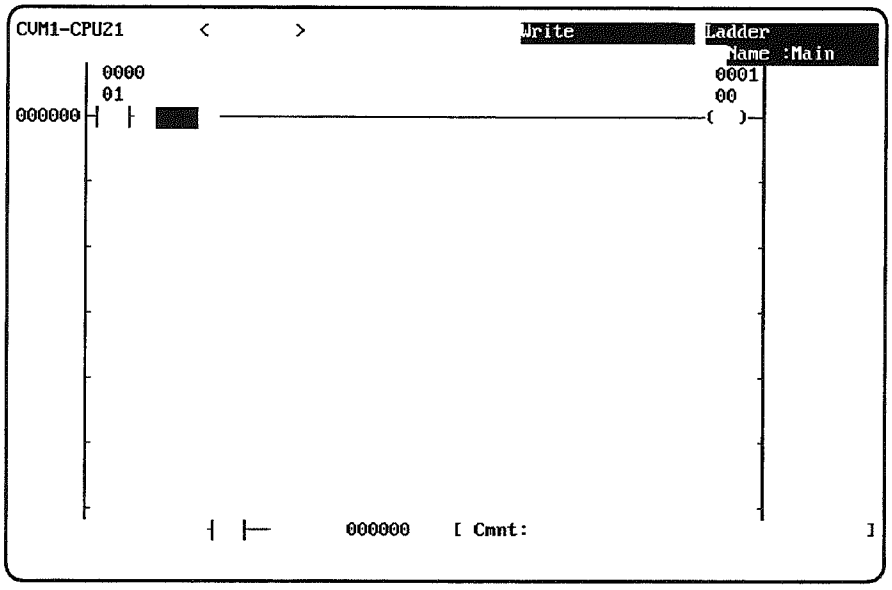
Use the Backspace Key to delete connecting lines one at a time. When the Backspace Key is pressed, the connecting line (the size of one condition) to the left of the cursor will be deleted. For details on how to delete connecting lines, refer to *3-2-9 Editing Ladder Programs.*

The operations shown in the following table can be used to write and delete vertical and horizontal lines and connections between symbols.

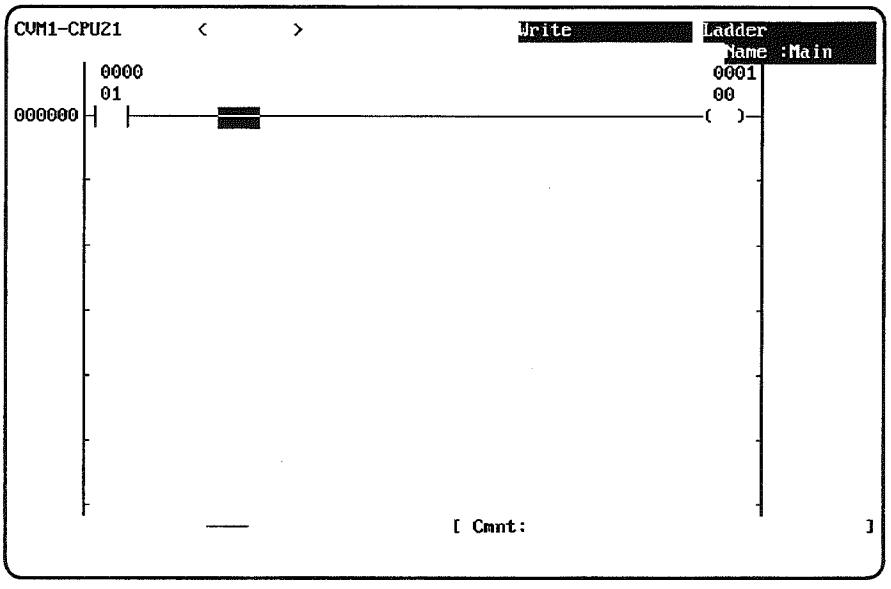
Connection	Key sequence	Function
Horizontal line	**F8 Enter**	Creates a horizontal line the size of one condition, at the position of the cursor.
Vertical line	**F6 Enter**	Creates a vertical line the size of one instruction line, to the upper left of the cursor.
Connect line	(Move cursor to start point) **End Enter** (Move cursor to end point) **Enter** Or (Move cursor to start point) **Ctrl+L** (Move cursor to end point) **Enter**	Makes long horizontal lines to connect one instruction line or to connect an instruction line to a vertical line from another instruction line.

Example 1: Connecting a Single Horizontal Line

1, 2, 3... 1. Move the cursor to the position of the break in the horizontal line.

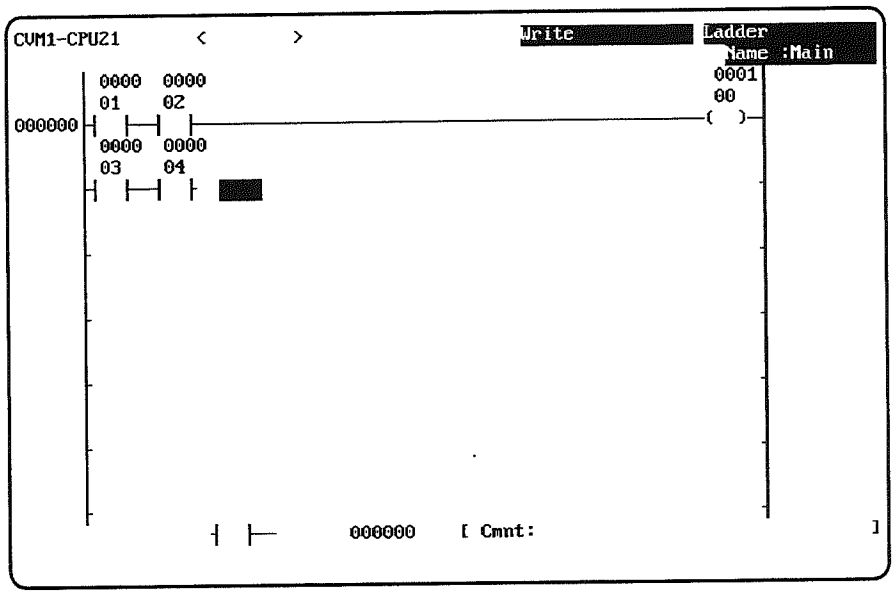


2. Press the F8 Key followed by the Enter Key. The line will be connected.

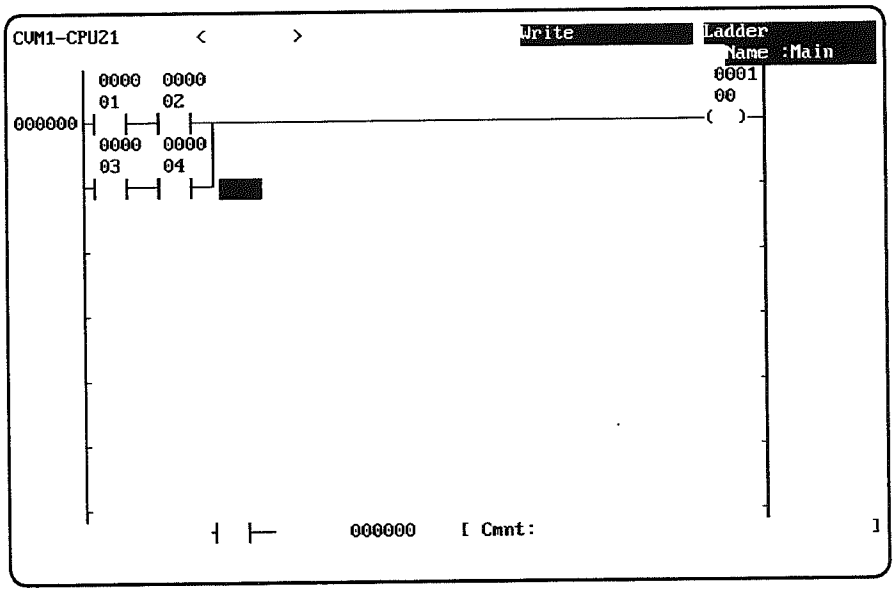


Example 2: Connecting a Single Vertical Line

1, 2, 3... 1. Move the cursor to the lower right of the position where the vertical line is to be written. (In this example, an OR LD instruction is being created.)

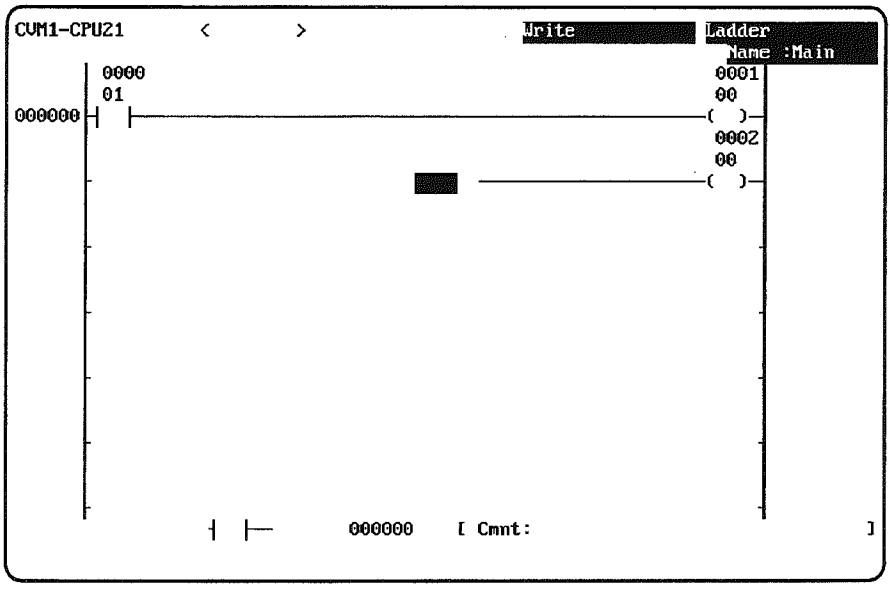


2. Press the F6 Key followed by the Enter Key. The line will be connected.

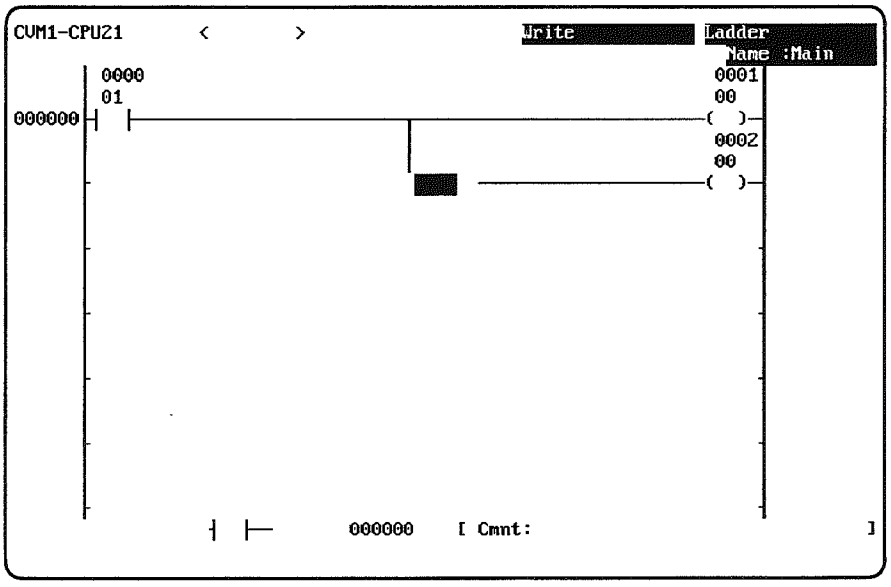


Example 3: Connecting Parallel Outputs

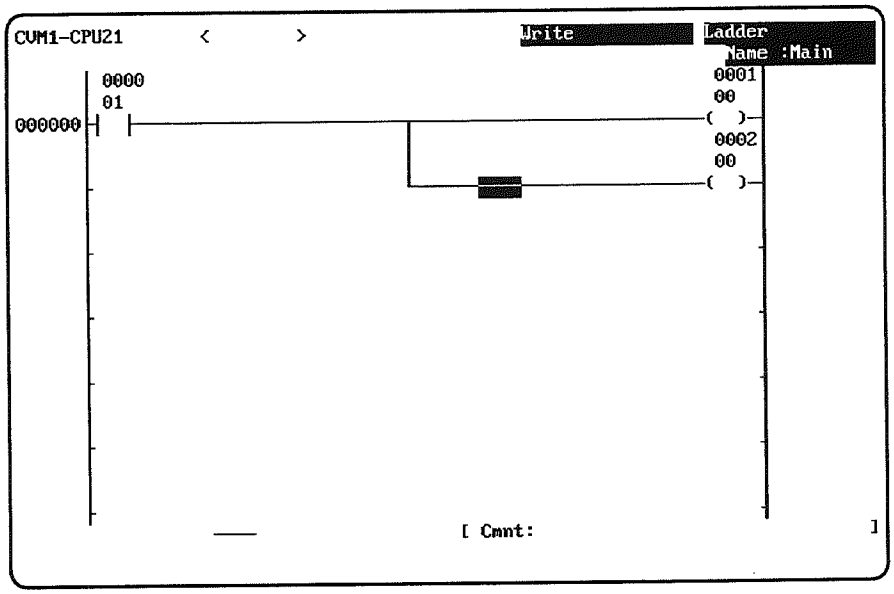
1, 2, 3... 1. Move the cursor to the left of the lower output instruction.



2. To connect the vertical line, press the F6 Key followed by the Enter Key.



3. To connect the horizontal line, press the F8 Key followed by the Enter Key.



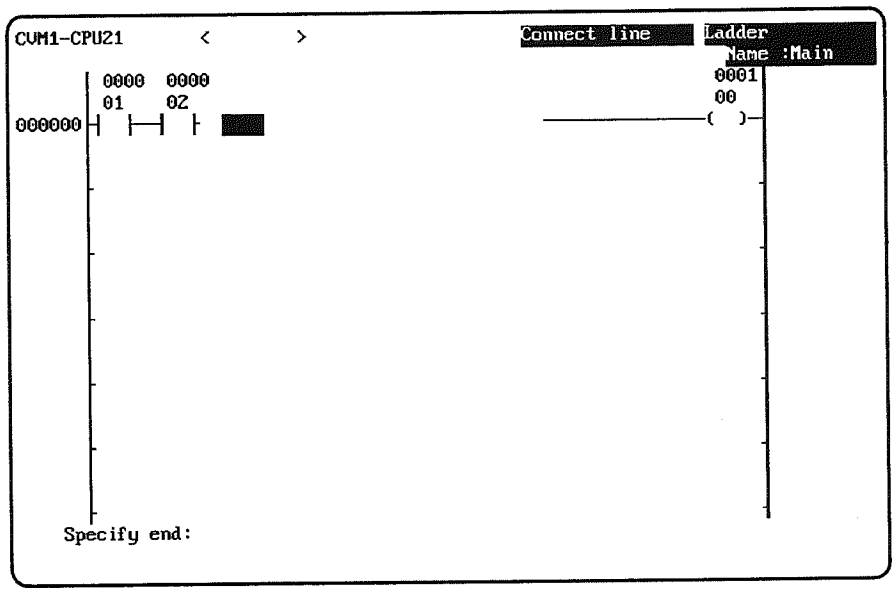
Example 4: Using Line Connection Operations

"Connect line" can be used for connecting long horizontal lines, connecting from one instruction line to the next, and connecting between multiple inputs.

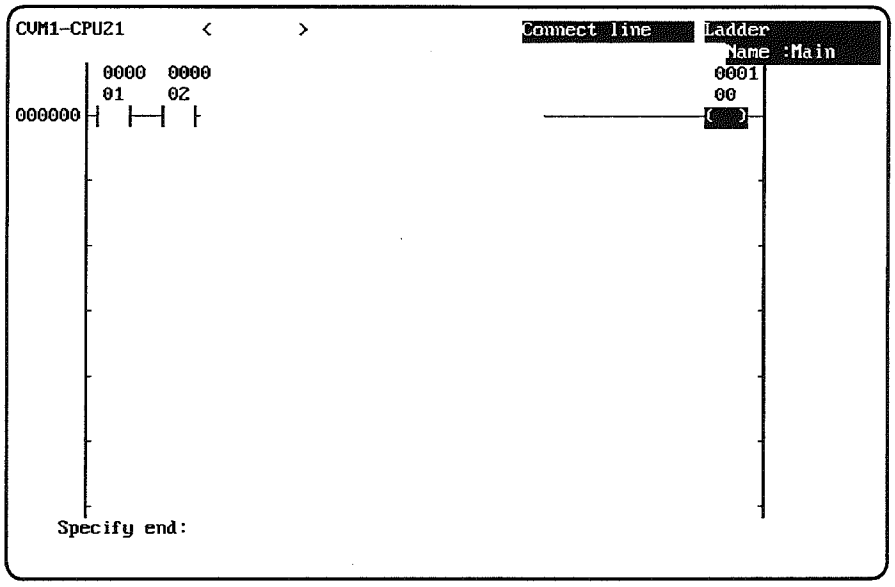
Connecting Long Horizontal Lines

1, 2, 3...

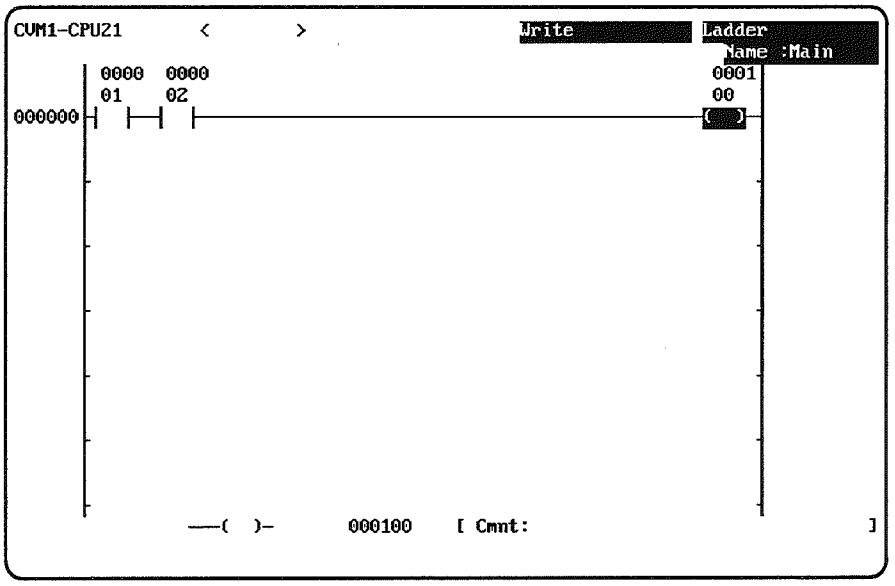
1. Move the cursor to the start point and press the End Key followed by the Enter Key. Alternatively, input Control+L to go into the line connect mode.



2. Move the cursor to the end point.



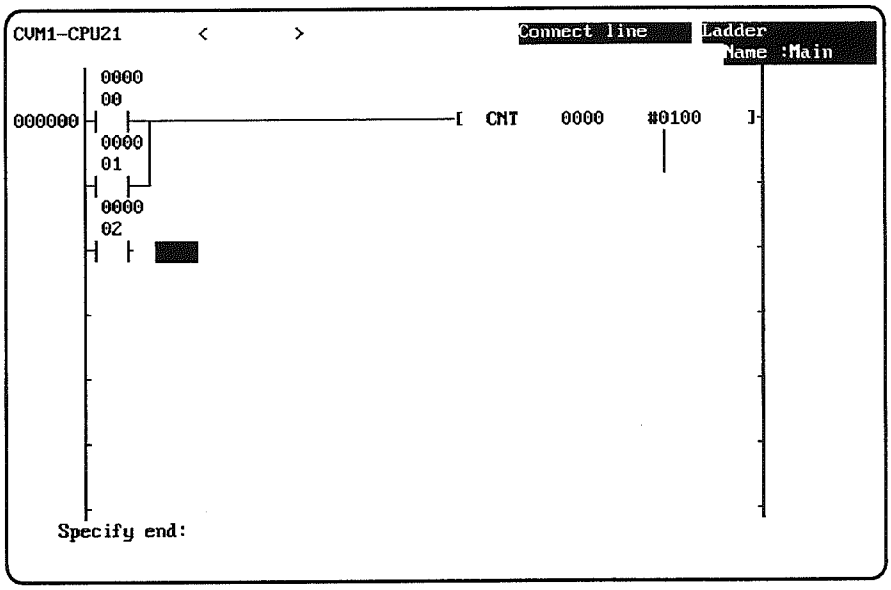
3. Press the Enter Key. The line will then be connected.



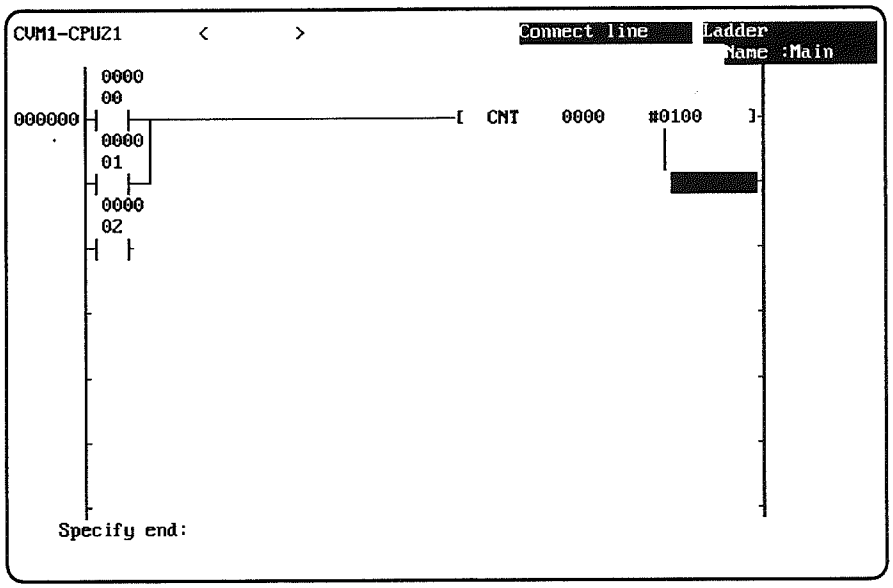
Connecting from One Line to the Next

1, 2, 3...

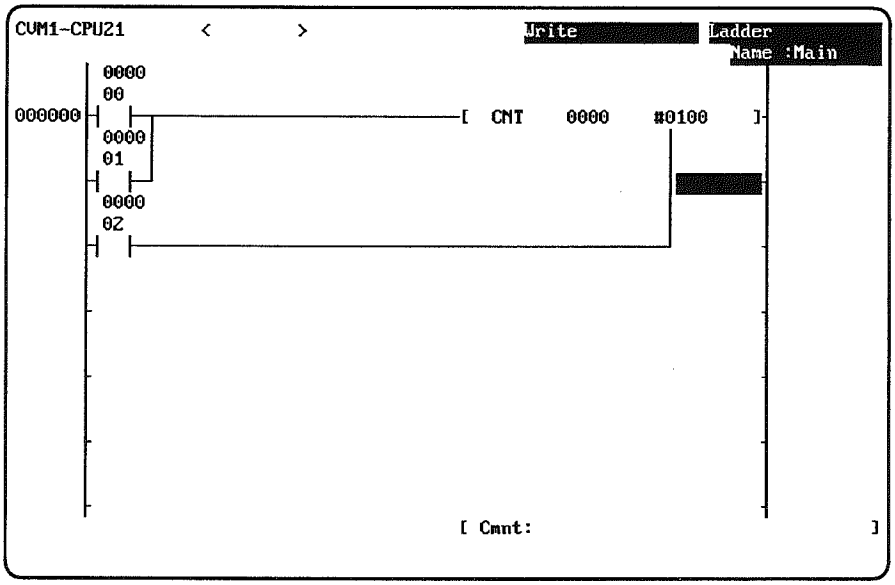
1. Move the cursor to the start point and press the End Key followed by the Enter Key. Alternatively, input Control+L to go into the line connect mode.



2. Move the cursor to the end point.



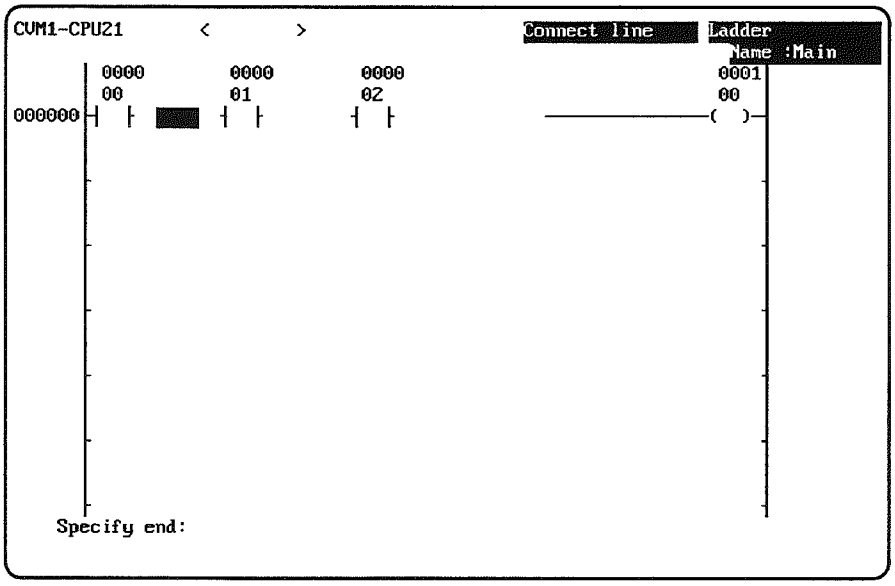
3. Press the Enter Key. The line will then be connected.



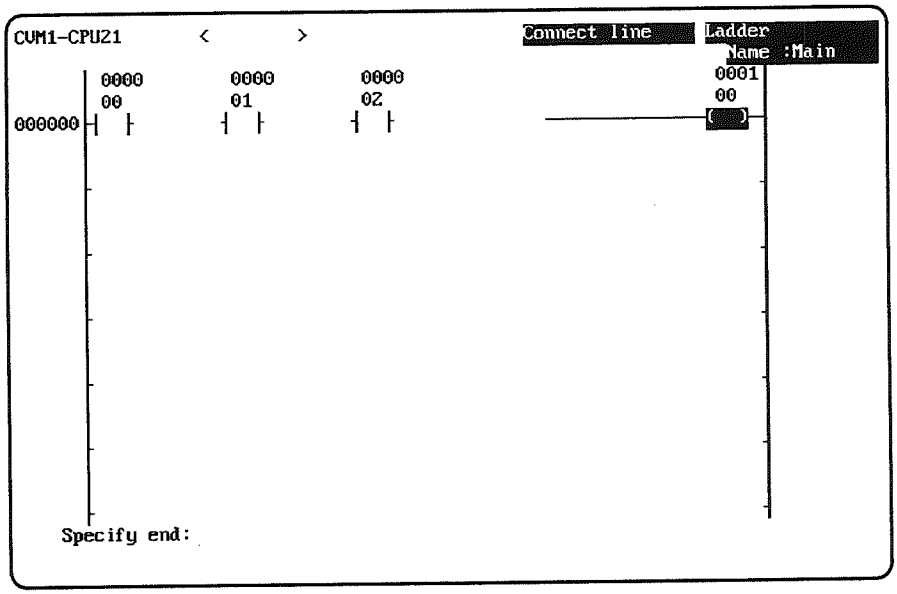
Connecting Multiple Inputs

1, 2, 3...

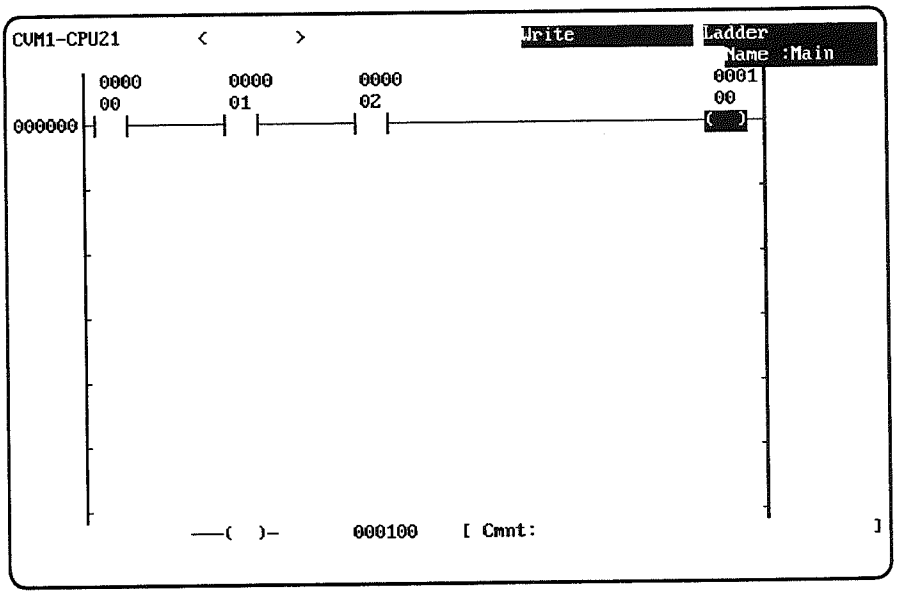
1. Move the cursor to the start point and press the End Key followed by the Enter Key. Alternatively, input Control+L to go into the line connect mode.



2. Move the cursor to the end point.

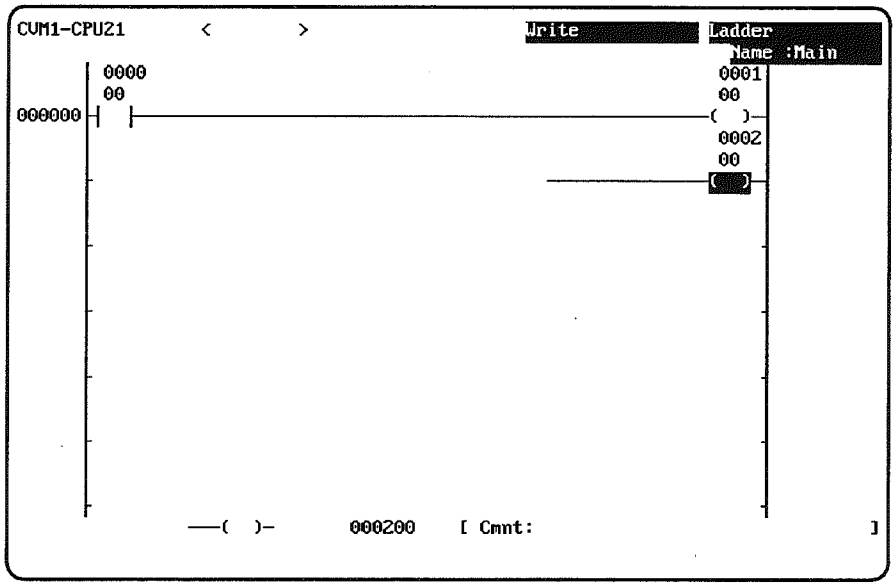


3. Press the Enter Key. All of the inputs will be connected at once.

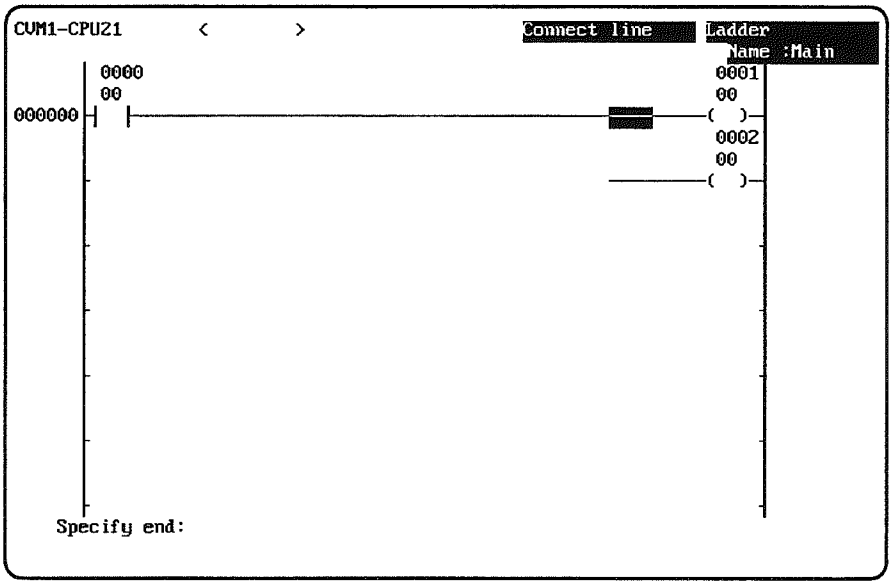


Connecting Parallel Outputs

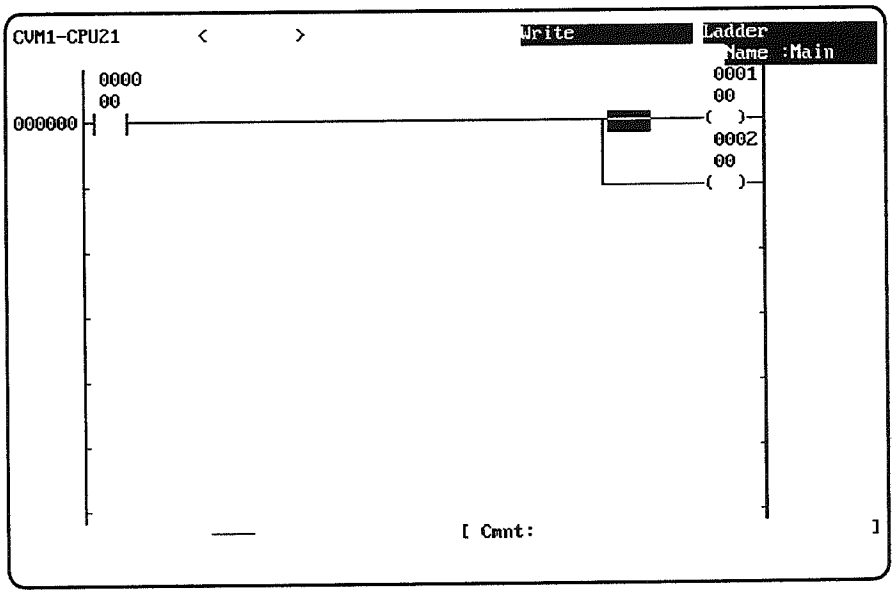
1, 2, 3... 1. Move the cursor to the output that is to be connected.



2. Press the End Key followed by the Enter Key. Alternatively, input Control+L to go into the line connect mode.
3. Move the cursor to the other output.



4. Press the Enter Key. The connection will be made between the two outputs.

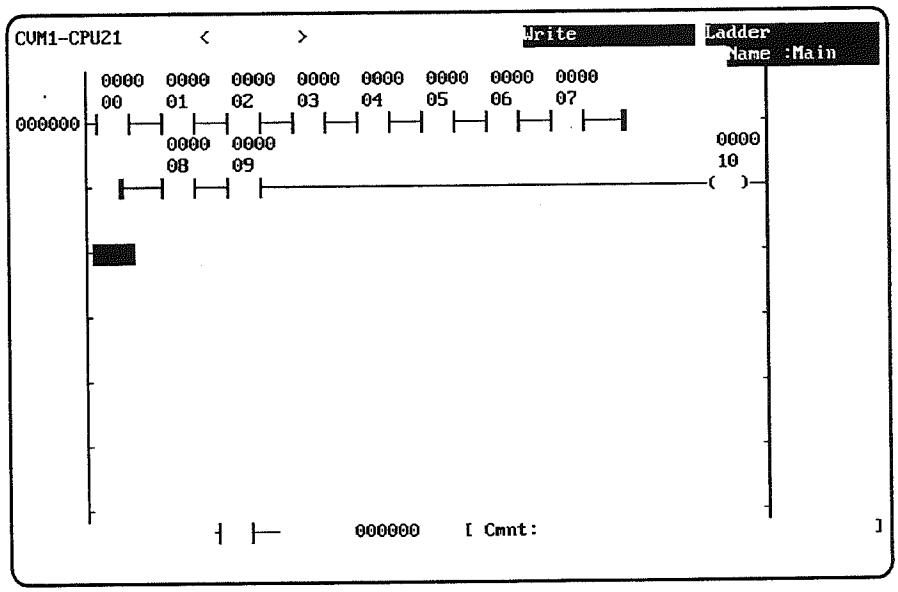


3-2-8 Continuing Instruction Lines

The continue operation is used to continue an instruction line when the maximum number of input conditions already exists on an instruction line.

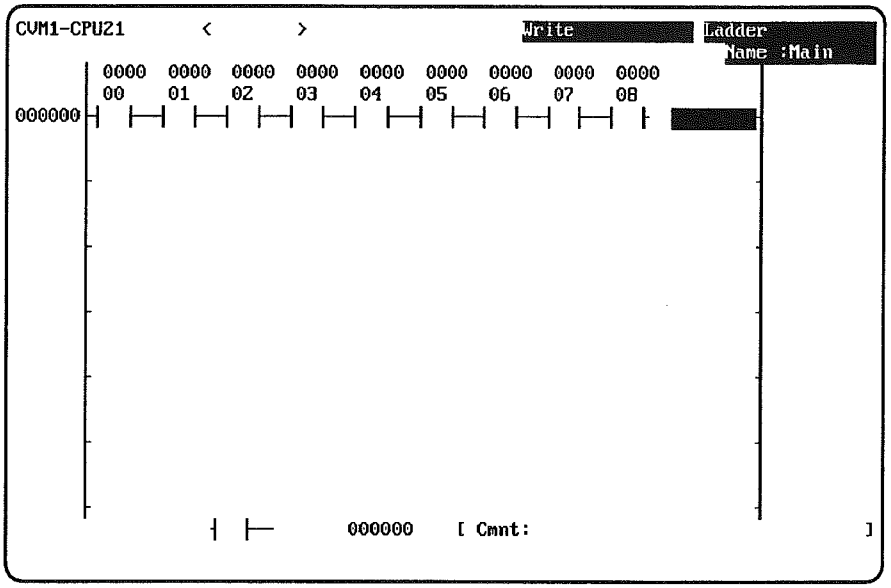
Up to 9 conditions and 1 OUTPUT instruction can be connected in a single line. If all required conditions and instructions cannot be written in a single line, use the continue operation to link it to the next instruction line.

The following diagram illustrates how **not** to connect multiple conditions and instructions in a single line. Connecting lines with the "Connect line" operation, as shown here, will result in a program error. Use the continue operation instead.

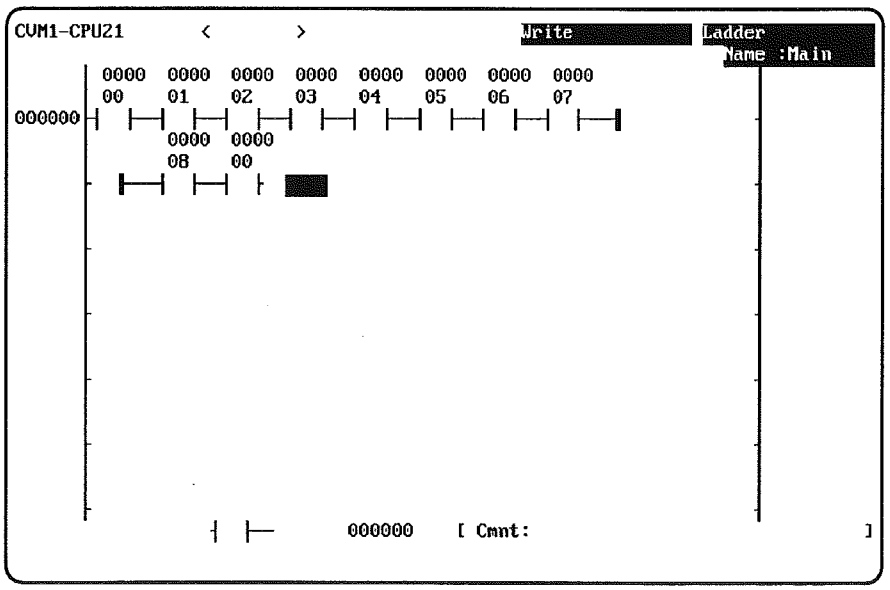


Procedure The procedure outlined below is an example of the correct way to construct a ladder diagram with more than the maximum number of input conditions for a single line.

1, 2, 3... 1. Move the cursor to the 10th column (i.e., the extreme right) of the instruction line. The continue operation can only be executed from this position.



2. Up to this point, no symbol will be displayed in the 10th column. Enter the input condition address (10, in this example) and then press the Enter Key. The connection symbols will then be displayed and the conditions in the 9th and 10th columns will be displayed on the next line.



3-2-9 Editing Ladder Programs

The procedure for editing a ladder program is described below. Ladder programs can be edited either in the Write or Insert modes. Do not forget to store the edited program.

The key sequences for the main editing operations are shown in the following table.

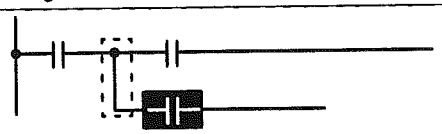
Operation	Key input	Operation	Key input
Inserting or deleting a symbol	**Insert/Backspace**	Deleting all 22 lines	**Shift + Home**
Inserting or deleting a blank column	**Insert/Delete**	Deleting input data (bit, word address	**Home**
Inserting or deleting a blank line	**PageUp/PageDown**	Reversing normally open and normally closed conditions	**@, F9**

To add an instruction block, first insert a blank line and then write the instruction block.

See *3-6 Editing Ladder Programs* for details on moving, copying, and deleting instruction blocks.

See *6-3 Changing Addresses* for globally changing bit or word addresses in the entire program in a single operation.

The same editing functions can be accomplished in the Write mode as in the Insert mode, but the Insert mode is especially handy for continuously inputting symbols. For most other operations, it is generally better to use the Write mode in order to save having to change modes back and forth by means of Shift+F2.

Continuously inserting symbols	Insert mode	There is no need to repeatedly press the Insert Key. (See *Editing in Insert Mode* on page 56.)
Deleting vertical lines	Write mode	 The vertical connecting line can be deleted by pressing the F6 and Backspace Keys with the cursor positioned after (i.e., to the right of) the line.

⚠Caution Be sure to store the ladder program again after it has been edited. If it is not stored after editing, the edited contents will not be saved.

Editing in Write Mode

Operation	Key sequence	Comments
Deleting all 22 instruction lines of the ladder diagram	**Shift+Home**	—
Clearing input data from input display area	Re-input the symbol.	—
Clearing bit and word addresses from input area	Home	—
Inserting a symbol	Move cursor **Ins** Insert symbol *Bit_address* **Enter**	The cursor position goes blank and a symbol is entered.
Deleting the symbol to left of cursor	Deleting a condition, instruction, or horizontal line: Move cursor **Backspace** Deleting a vertical line: Move cursor **F6 Backspace**	• The symbol to the left of the cursor will be deleted. To delete an output instruction, place the cursor on the far left of the same instruction line and press the Backspace Key. • After making the deletion, edit as required to complete the program.

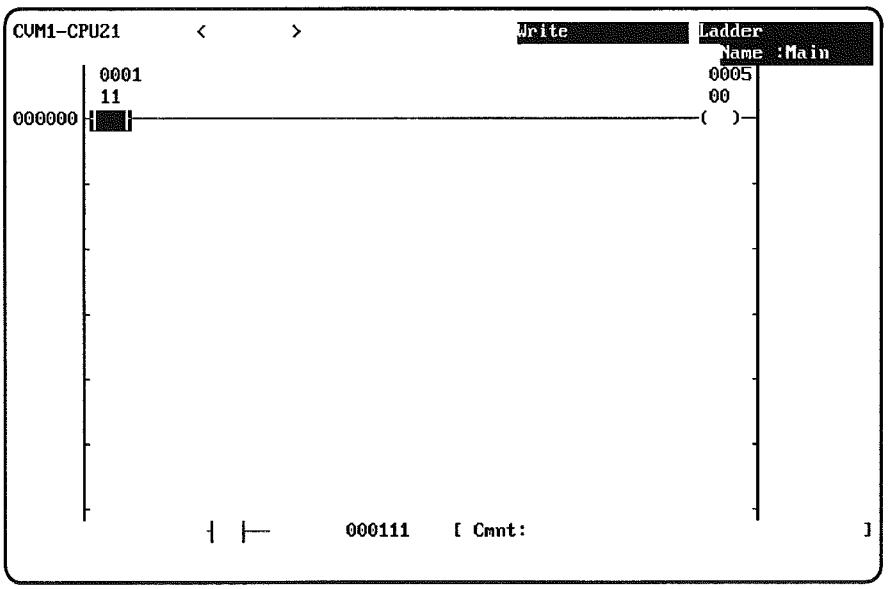
Operation	Key sequence	Comments
Creating a blank column	Move cursor **Ins**	• A blank column is created at the cursor position. • If an instruction block contains more than one line, a blank column is created at the cursor position in every line of the instruction block. • A blank column cannot be created if there are nine input symbols in a single line. In that case, first use the continue operation to change to a continuing instruction line, and then create the blank column.
Deleting a blank column	Move cursor **Del**	• The blank column at the cursor position is deleted • If an instruction block contains more than one line, the blank column is deleted at the cursor position in every line of the instruction block at the cursor position. The delete operation will be cancelled unless a blank column exists at the cursor position in every line of the instruction block.
Creating a blank line	Move cursor **PageUp**	• A blank line is created at the cursor position. • No blank line can be created if the program already contains 22 instruction lines.
Deleting a blank line	Move cursor **PageDown**	The blank line at the cursor position is deleted. The deleted operation will be cancelled if the line at the cursor position contains ladder elements, including any instructions.
Reversing normally open and normally closed conditions	Move cursor **F9 Enter** or Move cursor **@ Enter**	The condition at the cursor changes from normally open to normally closed or from normally closed to normally open.
Deleting a symbol	Move cursor **Space**	The symbol and line at the cursor are deleted.

Editing Examples

Changing a Bit Address

In this example, the input address is changed from 000111 to 000300.

1, 2, 3... 1. Move the cursor to the input symbol for the address that is to be changed.



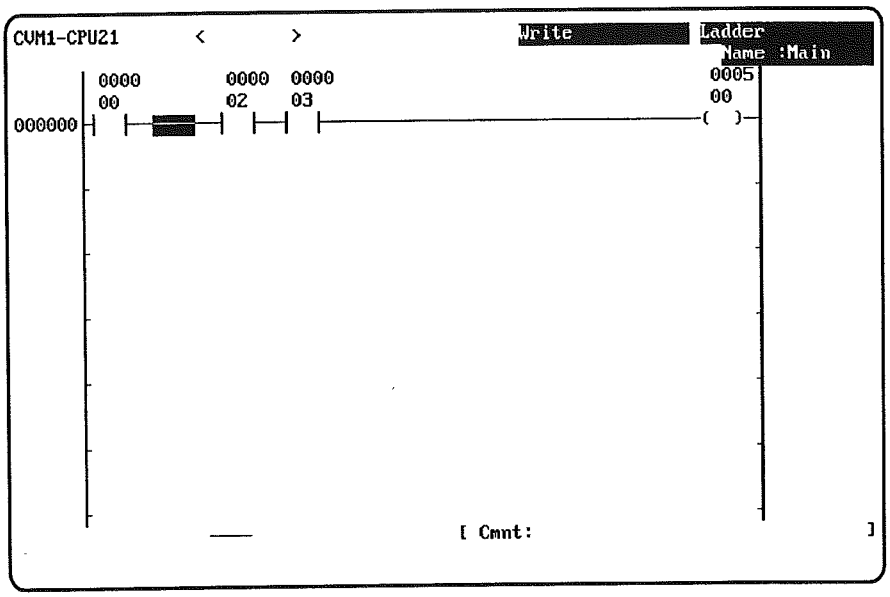
2. Input the new address (300 in this example), and press the Enter Key. The address will be changed, and the new address will be displayed.

Inserting a Symbol

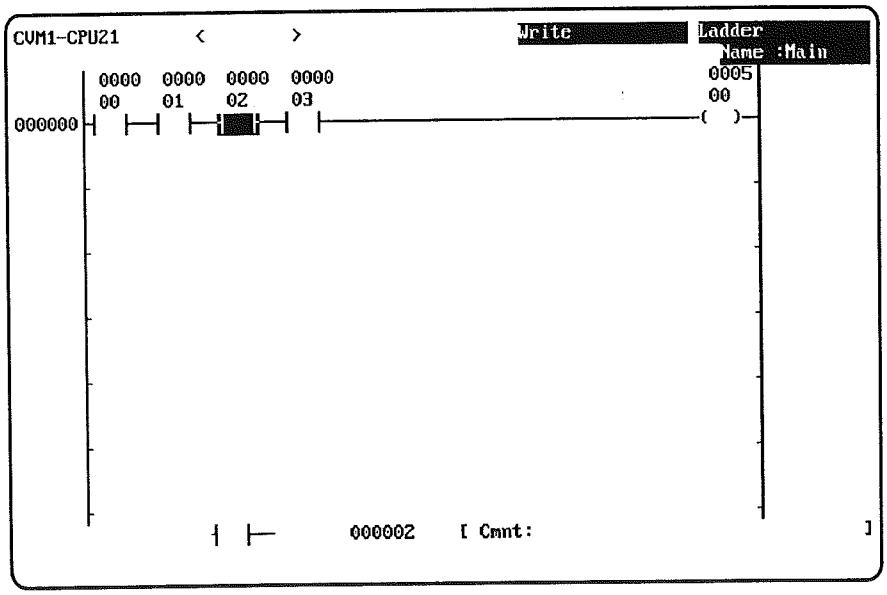
In this example, another input condition (bit address: 000001) is inserted into the program.

1, 2, 3...

1. Move the cursor to the position where the symbol is to be inserted.



2. Input the symbol that is to be inserted (F4 followed by 1, in this example), and press the Enter Key.

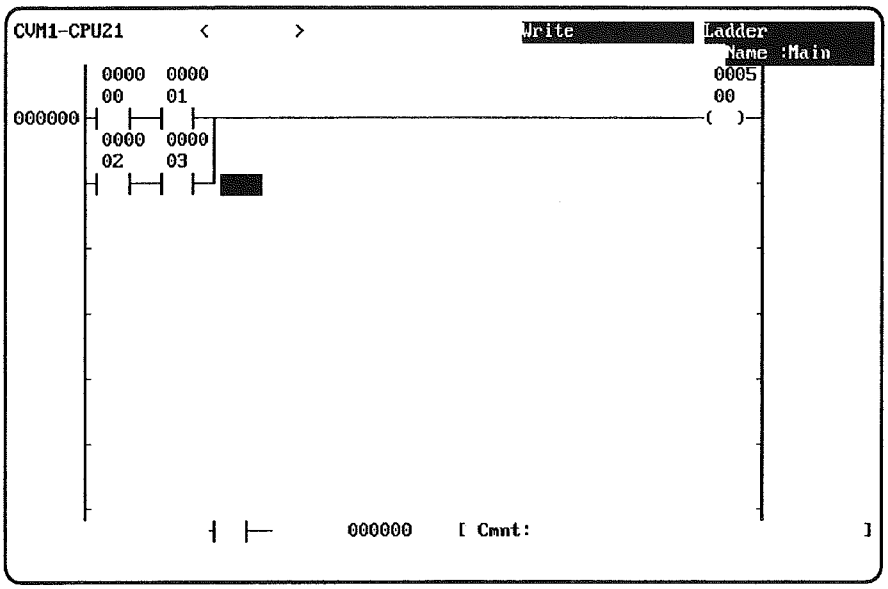


Deleting a Vertical Connection

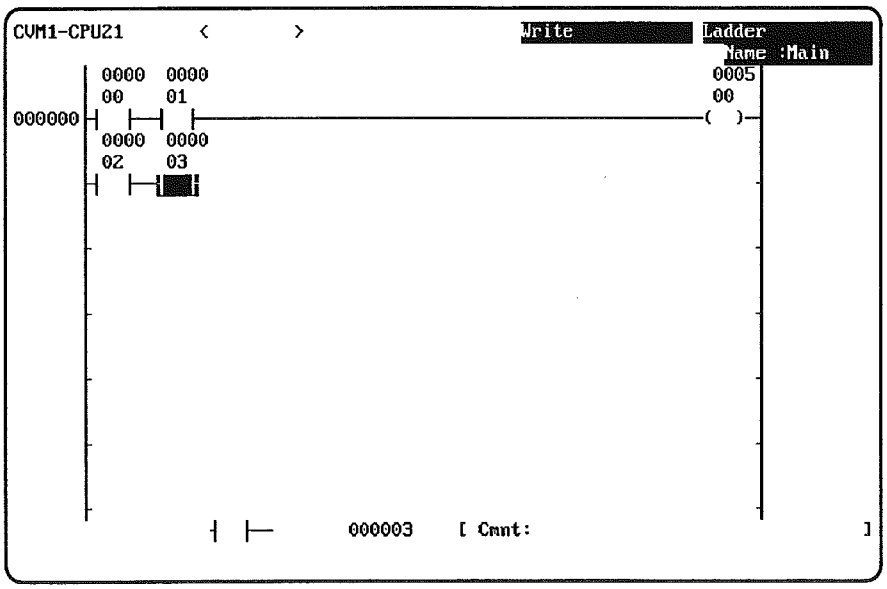
In this example, the vertical connection in the OR LD instruction is deleted from the program.

1, 2, 3...

1. Move the cursor to the right of the vertical connecting line that is to be deleted.



2. Press the F6 Key to designate the vertical connection, and then press the Backspace Key.

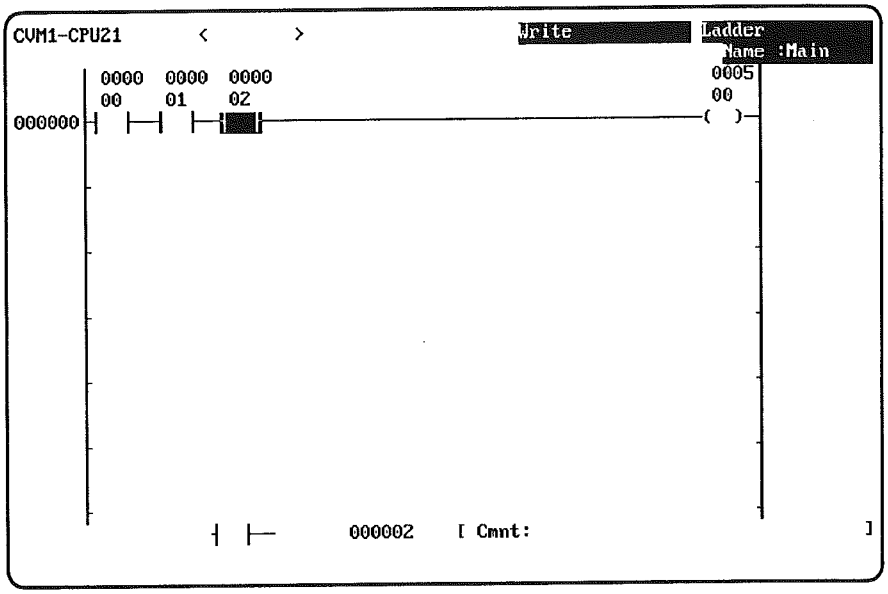


Deleting a Symbol to the Left of the Cursor

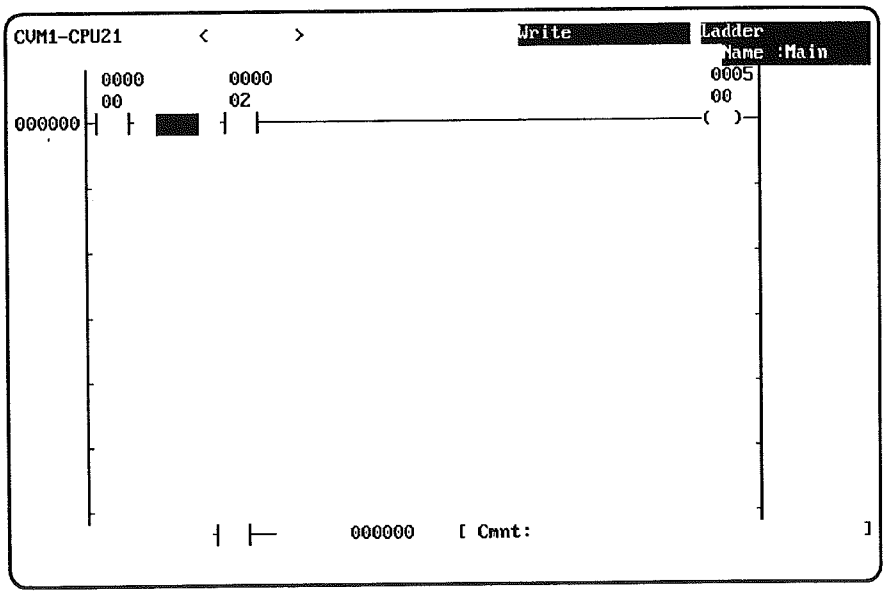
In this example, the symbol to the left of the cursor is deleted from the program.

1, 2, 3...

1. Move the cursor to the right of the symbol that is to be deleted.



2. Press the Backspace Key. The symbol will be deleted and a blank space will be created in its place.

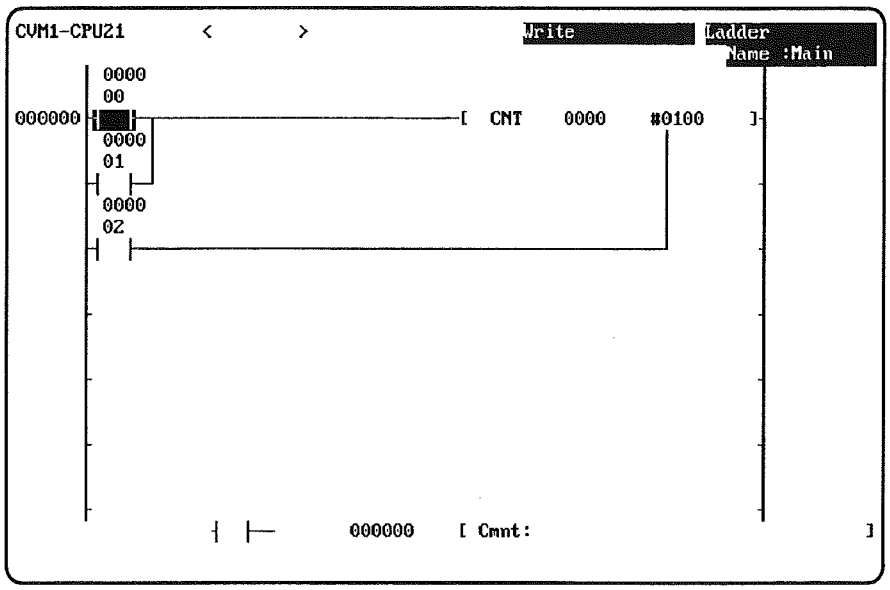


Deleting the Reset Line for a CNT Instruction

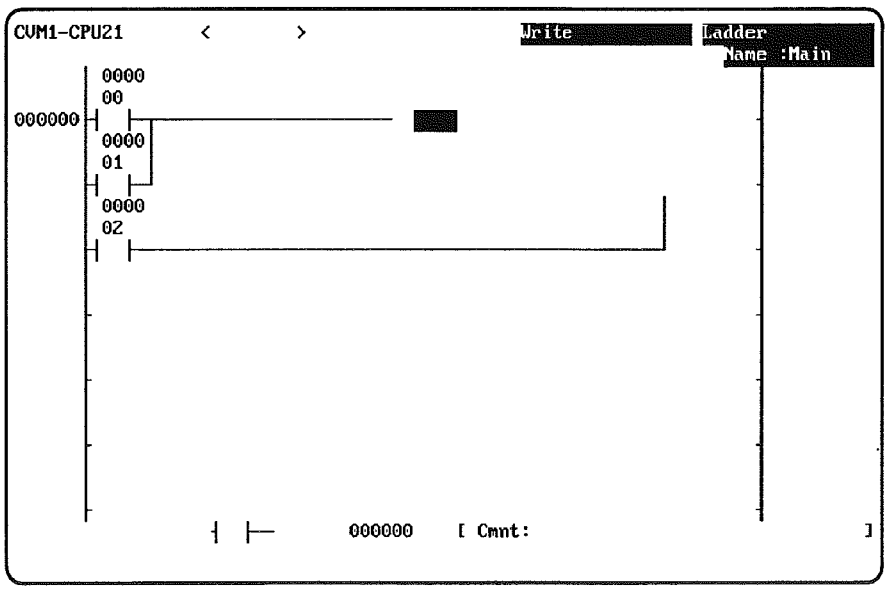
In this example, the reset input line for a CNT instruction is deleted. This operation cannot be carried out by means of the procedure described above for deleting a vertical connection. The reset input line must be deleted by deleting the CNT instruction.

1, 2, 3...

1. Move the cursor to the first line of the CNT instruction.



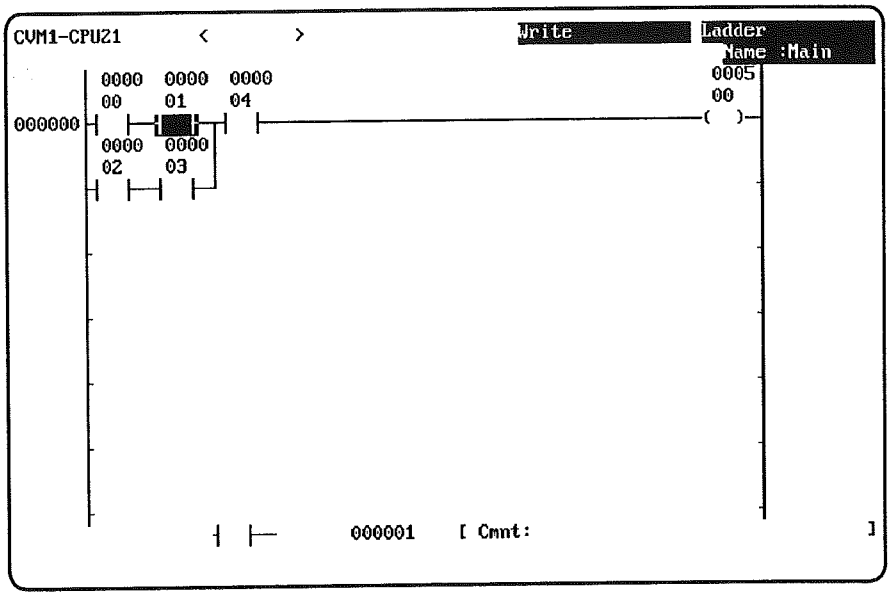
2. Press the Backspace Key. The CNT instruction will be deleted and a blank space will be created in its place.



Creating and Deleting a Blank Column

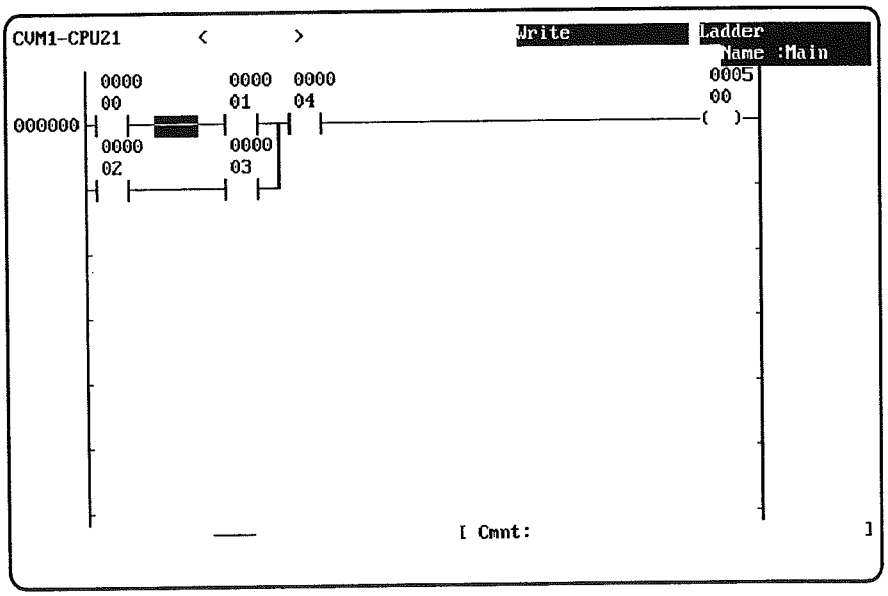
1, 2, 3...

1. To create a blank column, move the cursor to the right of the column that is to be created. To delete the column, move the cursor to the column.

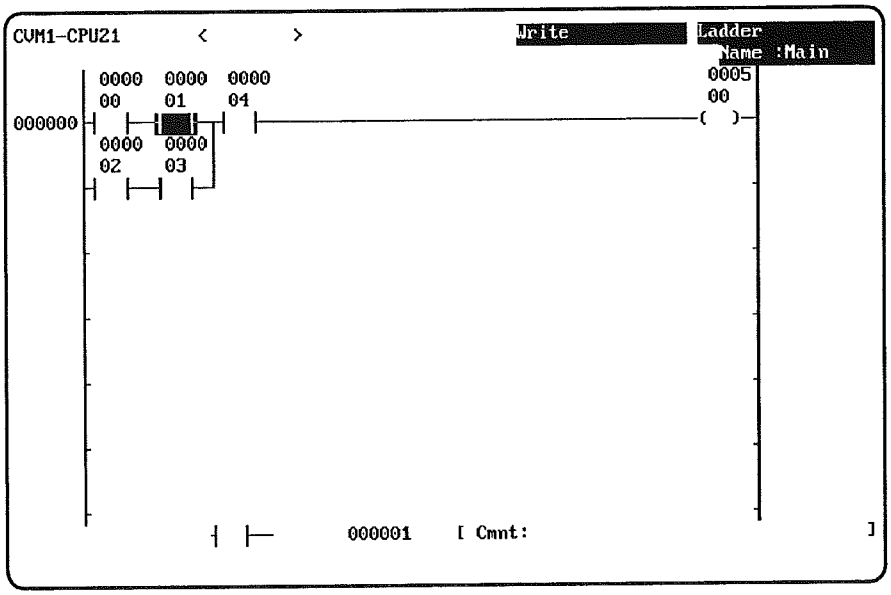


2. To create a blank column, press the Insert Key. To delete the column, press the Delete Key.

Insert Key (Create)



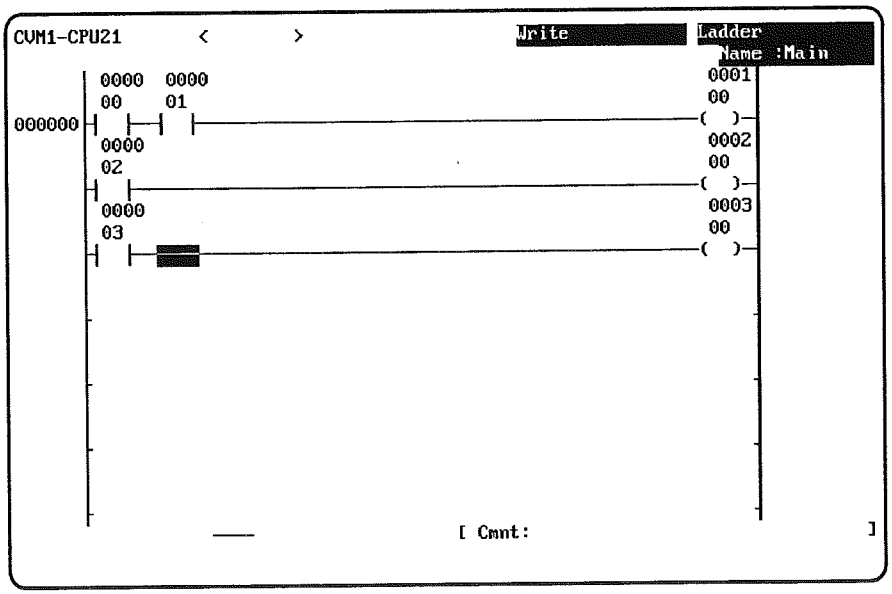
Delete Key (Delete)



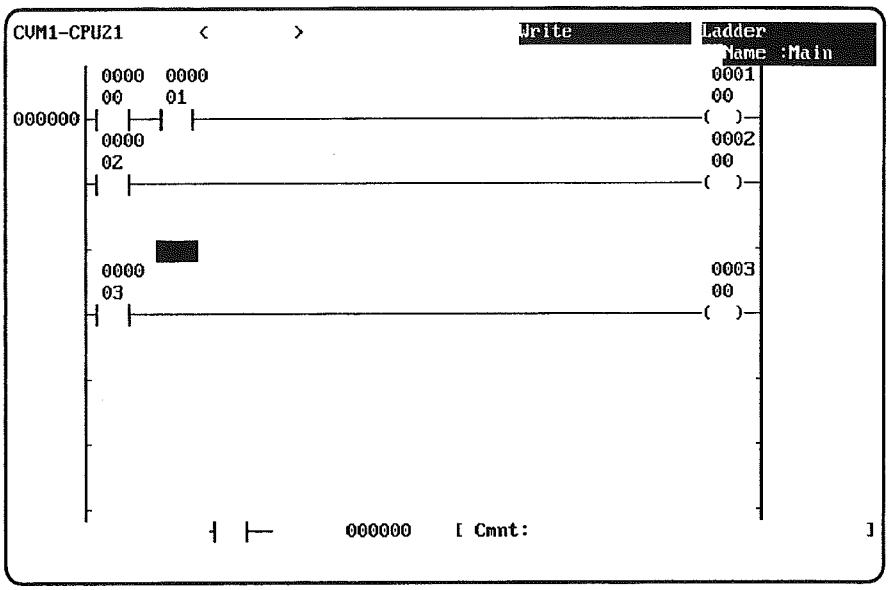
Creating and Deleting a Blank Line

1, 2, 3...

1. To create a blank line, move the cursor to the line below the line that is to be created. To delete the line, move the cursor to the line.

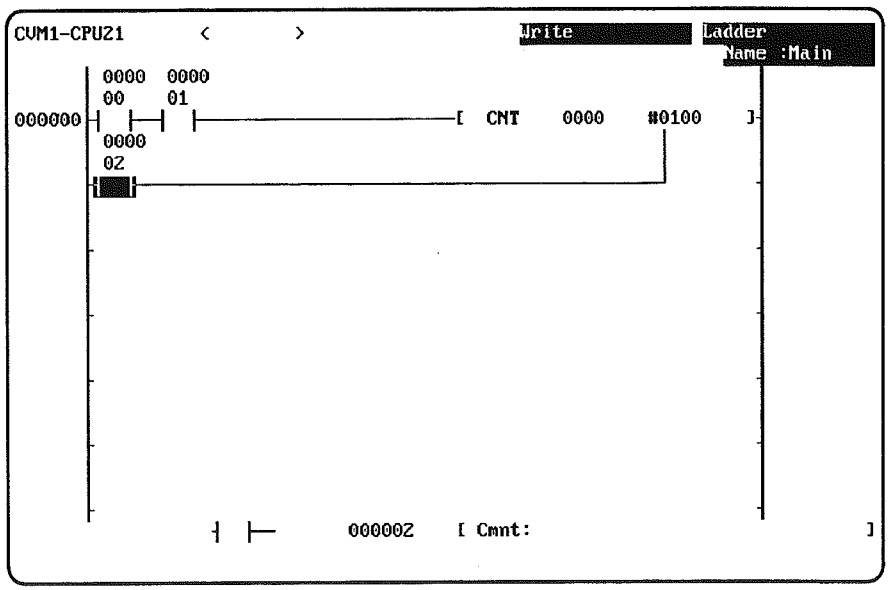


2. To create a blank line, press the PageUp Key. To delete the line, press the Page-Down Key. In the following illustration, the PageUp Key is used to create a blank line.

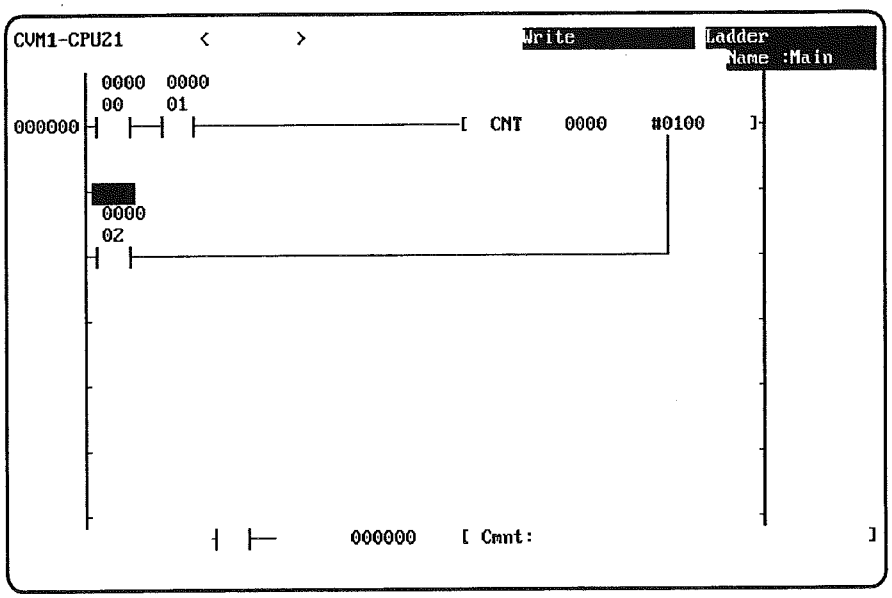


Creating a Blank Line for a CNT, CNTR, SFT, or KEEP Instruction

1, 2, 3... 1. Move the cursor to the line of the last operand for the symbol.



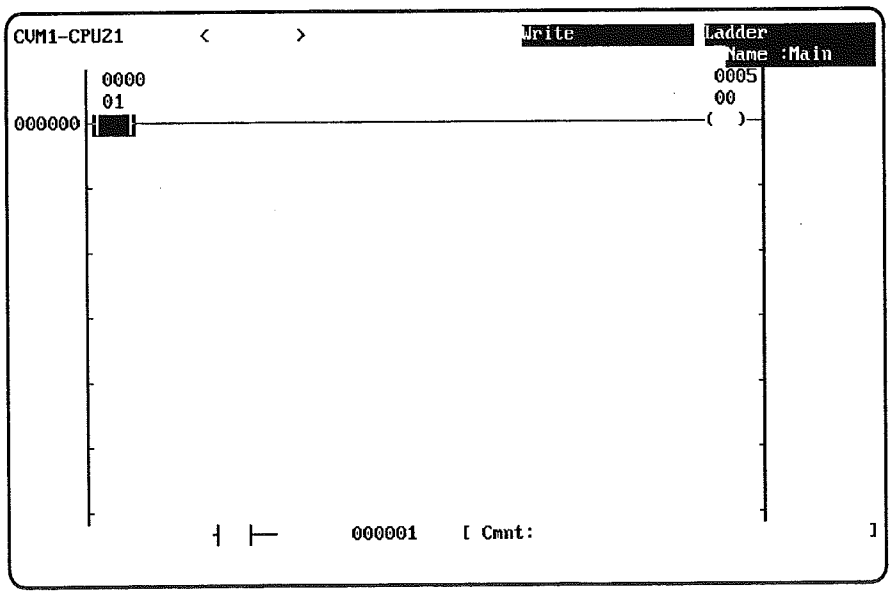
2. Press the PageUp Key. The blank line will be created as shown below.



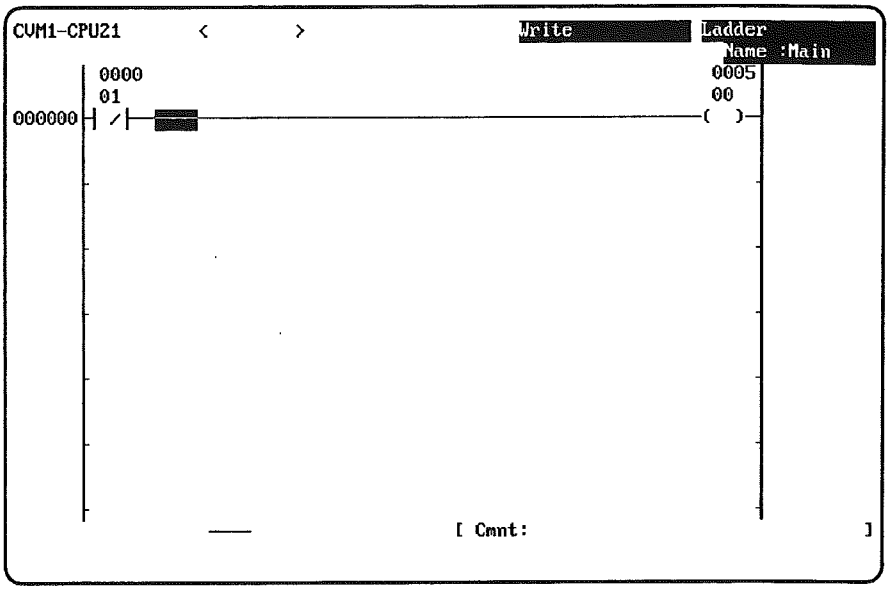
Reversing NO and NC Conditions

1, 2, 3...

1. Move the cursor to the condition that is to be changed. In this example, a normally open condition is changed to normally closed, but the procedure is the same for changing a normally closed condition to normally open.



2. Press the @ Key or the F9 Key, followed by the Enter Key. The condition will be reversed.

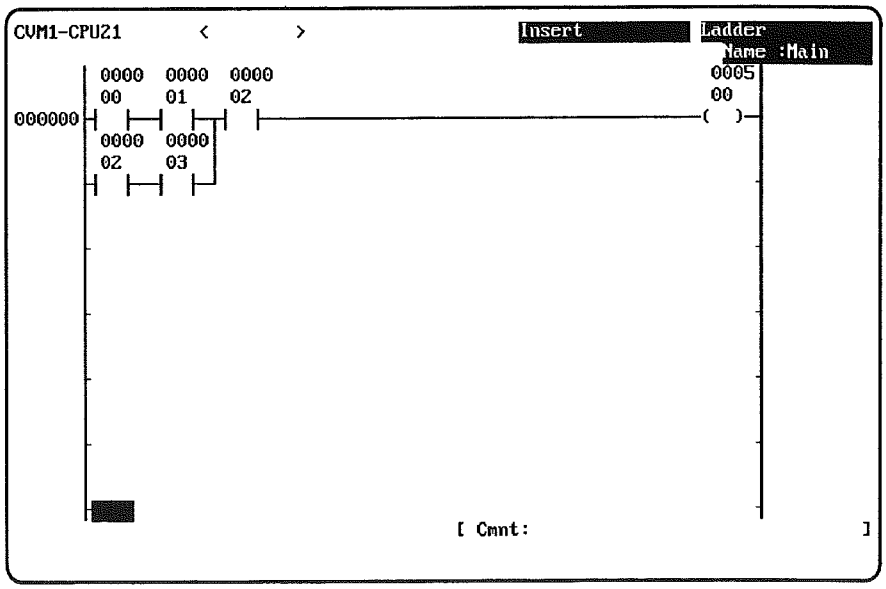


Editing In Insert Mode

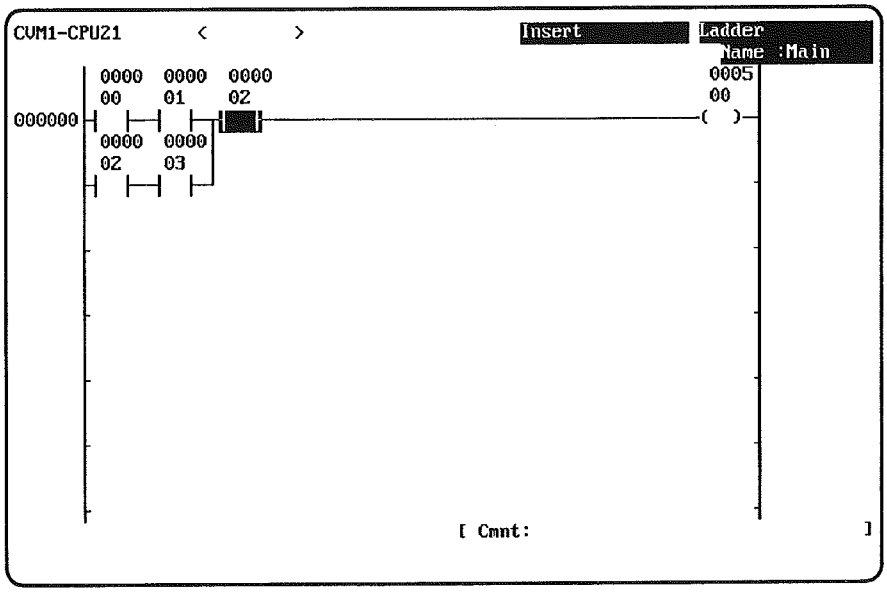
When there are a number of conditions to be input consecutively, the Insert mode can be used to save having to repeatedly press the Insert Key.

1, 2, 3...

1. To go into the Insert mode, press Shift+F2.

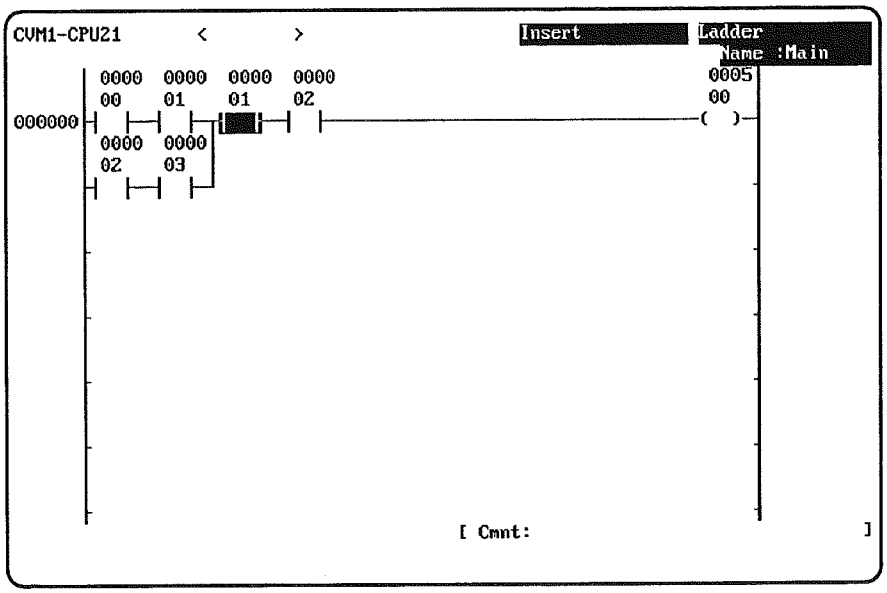


2. Move the cursor to the position where the condition is to be inserted.



3. Enter the symbol and bit address (by pressing the F4 Key followed by "1" in this example).

   When the Enter Key is pressed, the new condition will be inserted.



3-2-10 Creating I/O and Block Comments

You must be in one of the I/O comment display modes to create I/O comments. Block comments can be created in ladder display mode.

Block comments can be created in ladder diagrams regardless of whether "with comments" or "no comments" is specified.

Select "Ladder (2 comment rows)" or "Ladder (4 comment rows)" from the "H: Change Display" menu.

The operation for editing comments is the same as for writing them.

The following table shows the basic functions of these two types of comments.

Comment Functions

Item	Function
I/O comments	Created at the bottom of inputs and outputs, and serve as comments. Can be created even at the operands of instructions. Correspond one-to-one to bit addresses.
Block comments	Created between instruction blocks in a ladder diagram.

⚠**Caution** Be sure to store ladder diagrams after they are written or edited.

The number of characters that can be input and displayed for each type of comment is shown in the following table.

Item	Characters input	Characters displayed
I/O comment	30	5/line x 2 lines (for 2 comment rows)
		5/line x 4 lines (for 4 comment rows)
Block comment	60/line x 86 lines	60/line x 86 lines

All of the characters that have been input will be printed out, even if they are not displayed on the screen.

3-2-11 Creating I/O Comments

An I/O comment can be written for each input or output. I/O comments can be input or changed during ladder diagram input or debugging, thereby making debugging and maintenance operations more efficient.

I/O comments can be written in order of bit address by means of the "N:Edit comments" operation. This operation enters the comments for each input and output in the I/O comment table.

Another way of writing I/O comments is to input them directly while creating the ladder diagram. This is the way described here.

To use this method, select either the "Ladder (2 comment rows)" or "Ladder (4 comment rows)" display mode from the "H:Change display" operation in the Programming Menu. I/O comments can then be input or displayed. The maximum number of characters that can be written for an I/O comment is 30. The number that can be displayed is 10 for 2 comment rows or 20 for 4 comment rows.

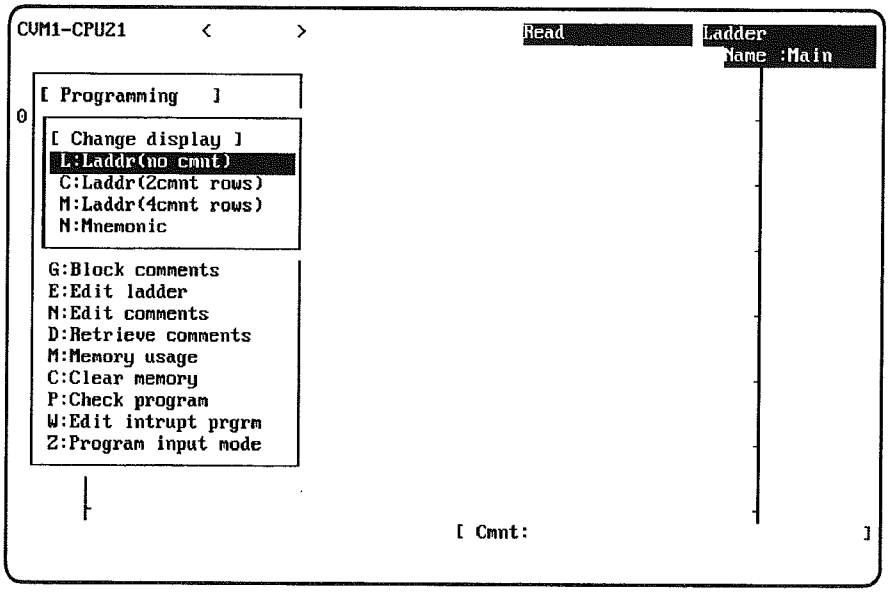
I/O comments created by means of this procedure will also be displayed on the "Edit comments" screen. Likewise, I/O comments created by means of "N:Edit comments" will be displayed when changing to either of the "Ladder (2 comment rows)" or "Ladder (4 comment rows)" display modes using "H:Change display."

After being input, an I/O comment is actually written when the Enter Key is pressed. The ladder diagram still must be stored, however, after the program has been created. If the ladder program is not stored, then any changes will be lost.

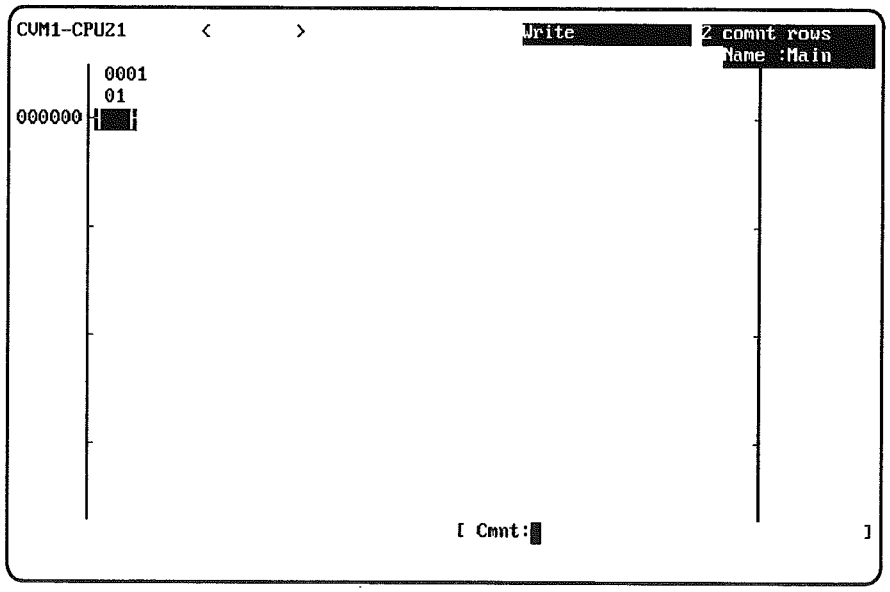
Note For information on using the "D:Retrieve comments" operation to retrieve I/O or block comments from programs stored on the data disk, refer to *3-4-3 Retrieving Comments.*

Example 1: Writing I/O Comments at the Same Time as Conditions

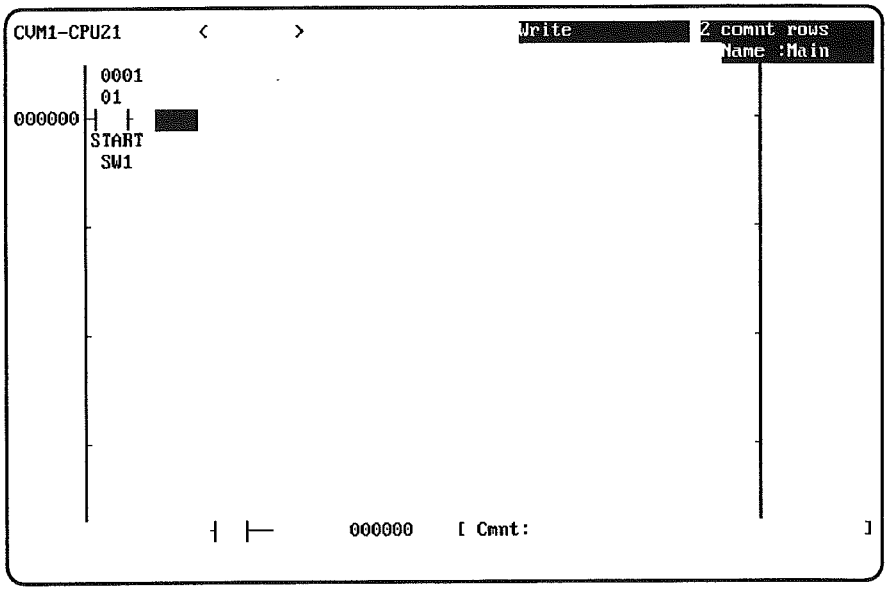
1, 2, 3... 1. Select "H:Change display" from the Programming Menu.



2. Select either "C:Ladder (2 comment rows)" or "M:Ladder (4 comment rows)." In this example, "C:Ladder (2 comment rows)" is selected.
3. If in the Read mode, press the F2 Key to change to the Write mode.
4. Input the bit address ("101" in this example), and then press the Enter Key. A cursor will appear in the I/O comment input area in the lower right corner of the screen.



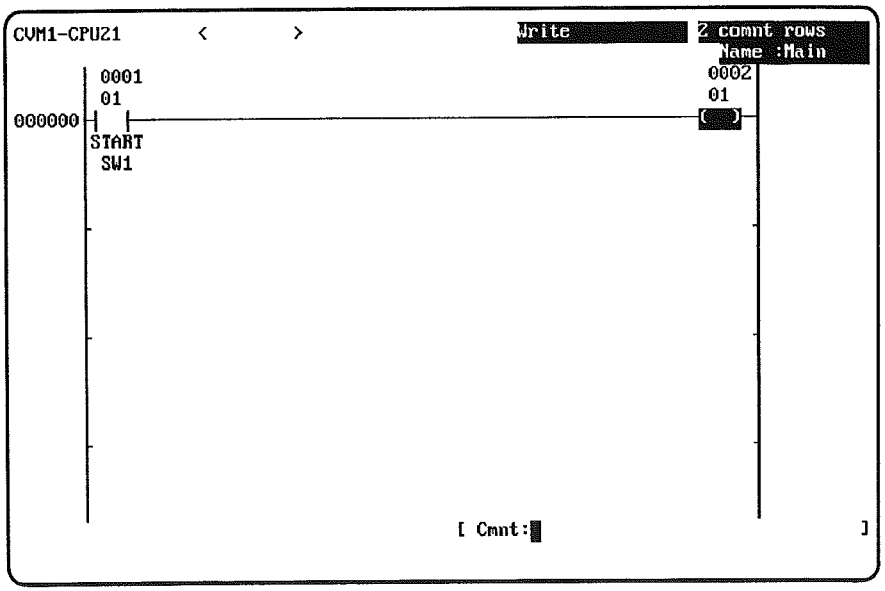
5. Input the I/O comment. (In this example, first press the Caps Key, and then input "START SW1.") Then press the Enter Key. The input bit address and the comment will be displayed.



Example 2: Inputting I/O Comments for Existing Ladder Programs

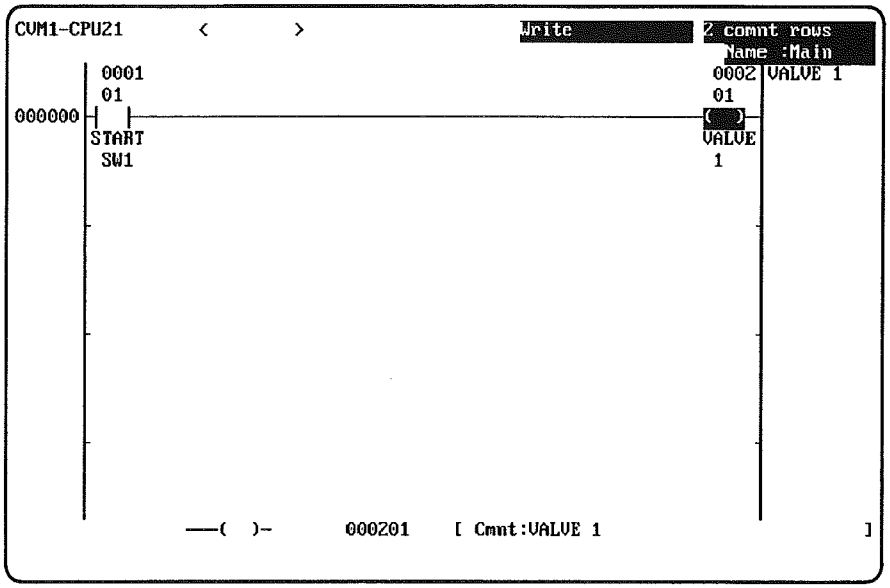
1, 2, 3...

1. If in the Read mode, press the F2 Key to change to the Write mode.
2. Move the cursor to the condition where the I/O comment is to be written or edited.



3. Press the Enter Key. An input area will appear.

4. Input the I/O comment. (In this example, press the Caps Key and input "VALVE 1.")



3-2-12 Creating Block Comments

Block comments can be written to comment on different parts of the program. All letters and numbers are permitted in block comments. Each block comment is denoted with an asterisk (*) before it.

A maximum of 60 letters and numbers can be used in one line, and 86 lines can be created at one time. At first up to 16 lines can be displayed in the frame for creating block comments, and additional lines can then be scrolled one line at a time. A maximum of 65,535 characters of block comments can be created in a single program.

To create a block comment, place the cursor at the beginning of a blank line next to the left bus line (the vertical line on the left side of the ladder diagram). After the comment has been created, be sure to store it.

If there is no blank line, then create one by pressing the PageUp Key in Write mode. After the blank line has been created, then the block comment can be created.

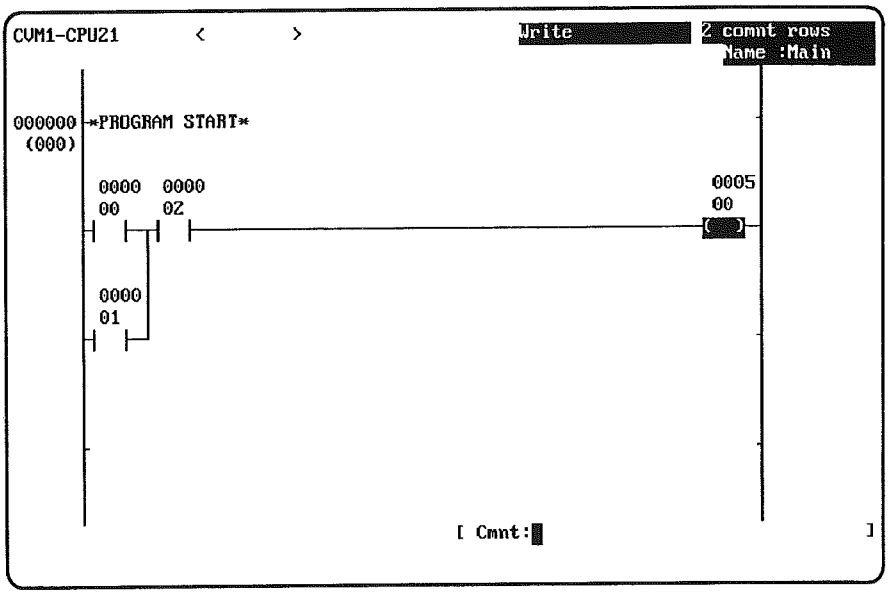
There is also a way to create a block comment without first creating a blank line. First read the instruction block before the line where the block comment is to be inserted. Then go into Write mode and create the block comment. After writing the block comment, be sure to store it. When a block comment is inserted between two instruction blocks in this way, it will be inserted automatically with no need to create a blank line first.

Procedure

1, 2, 3...

1. Select "H:Change display" from the Programming Menu, and then select one of the three ladder display modes (i.e., with 2 comment rows, with 4 comment rows, or no comments). In this example, "C:Ladder (2 comment rows)" is selected.
2. Press the F2 Key to go into the Write mode.
3. Move the cursor to a blank line. If there is no blank line, press the PageUp Key to create one.
4. Press the End Key to display the Programming Menu. Then select "G:Block comment." An input area will appear.
5. Write the block comment ("PROGRAM START," in this example).
   To input on the next line, move the cursor down using the Down Cursor Key.

6. After the block comment has been written, press the Enter Key. The comment will be denoted with asterisks (*) before and after it.



7. After all block comments have been written, store the program by pressing the F3 Key followed by the Enter Key.

3-2-13 Summary of Operations in Write Mode

Write Mode Operations

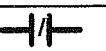
Write mode operations are summarized in the following table.

Item	Key sequence
Normally open	**(F4)** *Bit_address* **Enter**
Normally closed	**(F4) F9** *Bit_address* **Enter**
	Shift+F4 *Bit_address* **Enter**
OR Normally open	**F5** *Bit_address* **Enter**
OR Normally closed	**F5 F9** *Bit_address* **Enter**
	Shift+F5 *Bit_address* **Enter**
OUT	**F7** *Bit_address* **Enter**
OUT NOT	**F7 F9** *Bit_address* **Enter**
TIMER	**Shift+F9** *Timer_number* **Enter** *Set_value* **Enter**
COUNTER	**Shift+F8** *Counter_number* **Enter** *Set_value* **Enter**
Instructions with function codes	**F10** *Function_number* **Enter** (*Operand* **Enter**) (*Operand* **Enter**) (*Operand* **Enter**)
Immediate refresh instructions (See note 1.)	[OUT, OUT NOT] *Instruction Bit_address* **Shift+F6 Enter** [Special instructions] *Mnemonic Bit_address* **Shift+F6 Enter** (*Operand* **Enter**) *Operand* **Enter**
Differentiated up instructions	Mnemonic **Shift+F7 Enter** (*Operand* **Enter**) *Operand* **Enter**
Differentiated down instructions	*Mnemonic* **Shift+F7 Shift+F7 Enter** *Operand* **Enter**
Block programming instructions (with <>)	Store program, switch to mnemonic display, then **Shift+F10** *Function_code* (*Operand*) (*Operand*) (*Operand*) **(F9) Enter**

Item	Key sequence
Horizontal connections	**F8 Enter**
Vertical connections	**F6 Enter**
Connection lines	(Move cursor to start point) **End Enter** (Move cursor to end point) **Enter** Or (Move cursor to start point) **Ctrl+L** (Move cursor to end point) **Enter**

Write Mode Function Keys

The following table provides a list of function keys available in Write mode.

Key		Function
F1	READ	Used to switch to the Read mode. Once in the Read mode, you can scroll through the program in the system user area using the cursor keys and PageUp/PageDown.
F2	WRITE	Used to switch to the Write mode. The Write mode can be used to input instructions or to edit instruction in the instruction block(s) that are currently being displayed.
F3	STORE	Used to save the instruction block shown on the display to the program section last read from the system work area. The ladder diagram must be stored each time it is altered or added to. The previous section will be overwritten.
F4		Used to designate LD and LD AND instructions at the cursor position.
F5		Used to designate OR instructions at the cursor position.
F6		Used to create vertical lines at the top-left of the cursor position.
F7		Used to designate OUT instructions
F8		Used to create horizontal lines at the cursor position.
F9	NOT	Used to change a symbol to a NOT instruction.
F10	FUN( )	Used to designate instructions via function codes.
Shift+F2	INSERT	Used to switch to the INSERT mode.
Shift+F3	STINS	Used to add the instruction block shown on the display to the front of the program section last read from the system work area.
Shift+F4		Used to specify LD NOT and AND NOT instructions at the cursor position.
Shift+F5		Use to specify OR NOT instructions at the cursor position.
Shift+F6	REFRESH	Used to specify immediate refresh instructions.
Shift+F7	↑ / ↓	Used to specify differentiated up and differentiated down instructions.
Shift+F8	CNT	Used to specify counter instructions.
Shift+F9	TIM	Used to specify timer instructions.
Shift+F10	FUN<>	Used to specify block instructions via function codes.
Ctrl + F1	A	Used to specify bit and word addresses in the Auxiliary Area.
Ctrl + F2	G	Used to specify bit and word addresses in the CPU Bus Link Area.
Ctrl + F4	D	Used to specify word addresses in the DM Area.
Ctrl + F5	C	Used to specify counter numbers.
Ctrl + F6	T	Used to specify timer numbers.
Ctrl + F7	Wd	Used to specify word addresses in CIO Area
Ctrl + F8	*D	Used to specify indirect DM addresses

Key		Function
Ctrl + F9	BIT	Used to specify bit addresses in CIO Area. (See note 1.)
Ctrl + F10	#	Used to specify constants (see note 2).
Shift+Ctrl+F4	E	Used to write EM Area addresses.
Shift+Ctrl+F8	*E	Used to write indirect addresses for the EM Area.

Note
1. Either bit or word addresses can be specified for HIS instructions. The default setting is for word input. To input a bit address, press Control+F9.
2. For information on inputting BCD (with and without sign), for constants, refer to *3-2-4 Entering Bit/Word Address and Data.*

3-3 Storing and Checking Programs

This section explains how to use the "Store," "Store insert," and "Check program" operations.

3-3-1 Store/Store Insert

The "Store" and "Store insert" operations are used to write a ladder program created on the screen to the system work area. Use "Store" when newly creating or editing ladder programs. Use "Store insert" to insert a an edited ladder instruction block while leaving the original ladder program unchanged.

The "Store" and "Store insert" operations can be used on up to 22 instruction lines (the maximum number permitted in a instruction block) at a time.

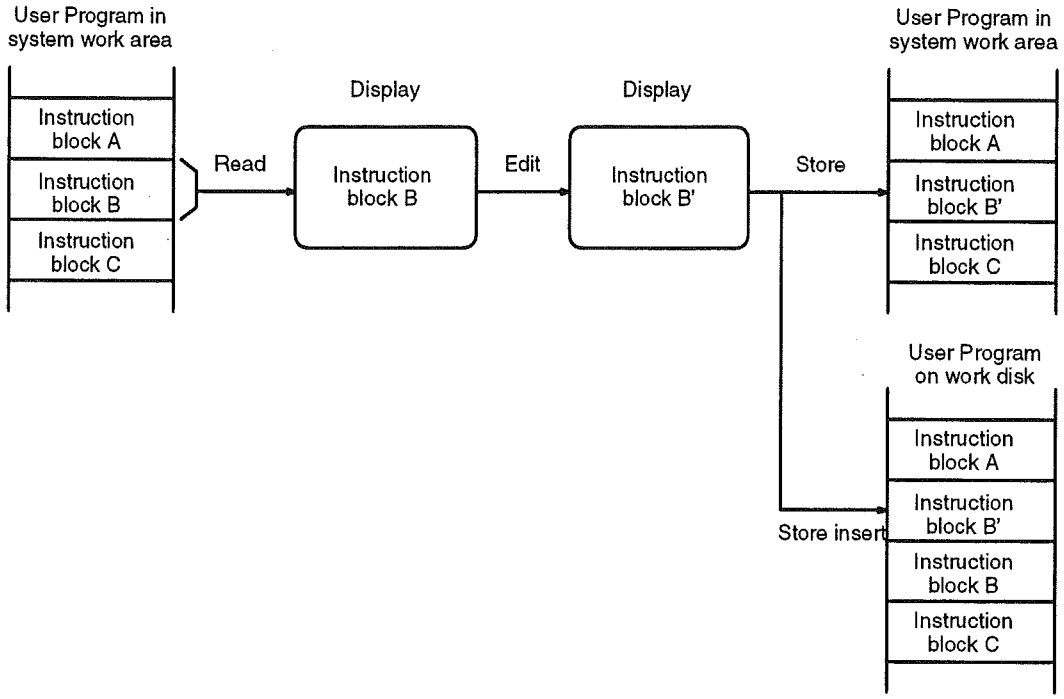
When an instruction block that is read is edited and stored using "Store," the ladder program in the system work area will be replaced by the edited version. With "Store insert," on the other hand, a instruction block that is read will be retained just as it is, and the edited instruction block will be inserted just before it. Subsequent instruction blocks will be moved down.

Program addresses are determined when the program is stored (or store-inserted) and will be displayed the next time the program is displayed.

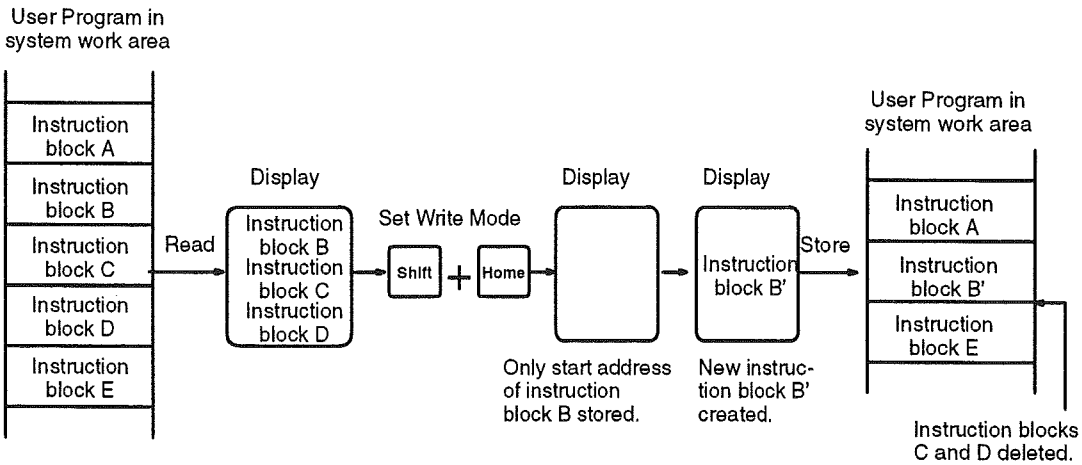
⚠Caution Ladder programs created on the screen but not saved with the "Store" or "Store insert" operations will be lost when menus are switched, the reset switch is pressed, or the POWER switch is turned off.

Store vs Store Insert

The "Store" operation is used to write a new ladder program section when editing program sections stored in the system work area. The "Store insert" operation is used to insert an unchanged or partially edited program section into the system work area in front of the instruction block that was originally read for editing.



⚠Caution An instruction block read from the system work area and then deleted on the screen will be permanently lost if the Store operation is used to write it back to the system work area after deletion. Take particular care in cases like the example below, where several Instruction blocks are read and deleted on screen and another Instruction block is created. When the new instruction block is stored to the system work area, the instruction blocks read originally will all be permanently lost. They would not be lost if the Store Insert operation was used.



Store/Store Insert Functions

Item	Key sequence	Comments
Store	**F3 Enter**	Writes the ladder program section created on the screen (with a maximum of 22 instruction lines) to the system work area. A message will flash to indicate that the program is being stored. After the program is stored, the screen will return to the Write mode and the next address will be displayed. The addresses of each instruction is fixed when the program is stored. The addresses will be displayed again the next time the program is read. After a program section is read, edited and stored, only the edited version of the program section is stored on the system work area.
Store insert	**Shift+F3 Enter**	Writes the ladder program section created on the screen (with a maximum of 22 instruction lines) to the system work area in front of the previously read program section. The previous program section remains unchanged on the system work area, behind the new, inserted program section. A message will flash to indicate that the program is being stored. After the program is stored, the screen will return to the Write mode and the next address will be displayed.

Program Sections Not Applicable to Store/Store Insert

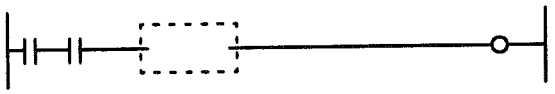
An error message will be displayed and the "Store" or "Store insert" operation cancelled if an attempt is made to use the store/store insert operations with an incorrect program section or one which cannot be processed by the SSS. Correct and edit the program section if this problem occurs.

Incomplete Instruction Lines

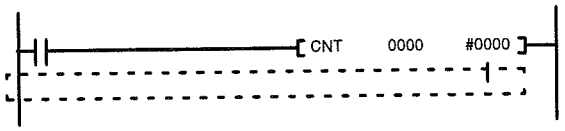
a) No output instruction



b) Broken connection



c) Instruction line not entered for an execution condition



d) Surplus line



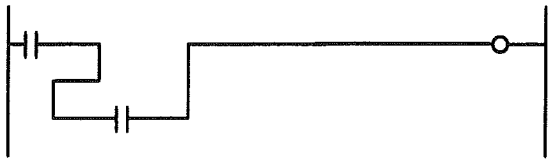
e) No conditions on an instruction line



f) Short-circuited conditions



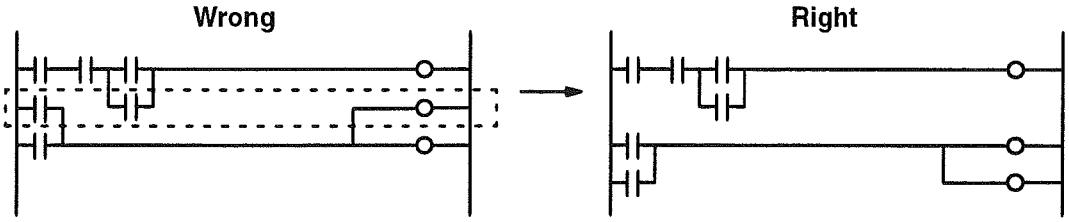
g) Instruction line doubles back



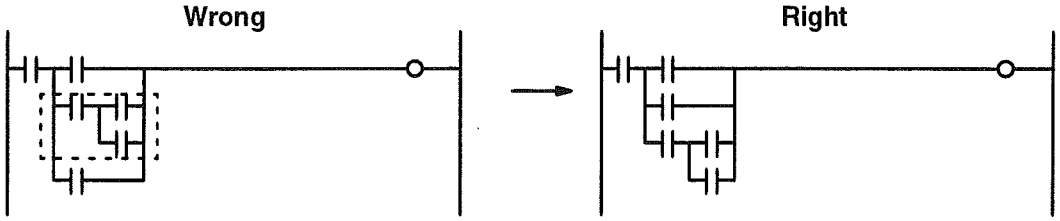
Incorrect Instruction Blocks

The following instruction blocks (on the left) cannot be processed. Correct them as shown on the right. (Although the wrong version of programming in item "a)" will be stored, the program will not be executable unless the ladder diagram is rewritten like that shown on the right.)

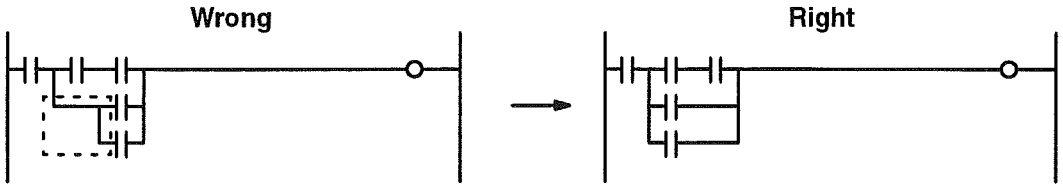
a) Two instruction blocks included on a single line



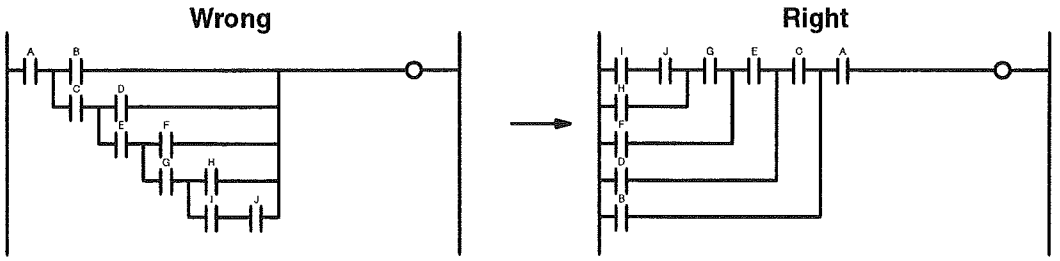
b) AND and OR instruction block inside OR instruction block. Move AND and OR to the bottom of the OR.



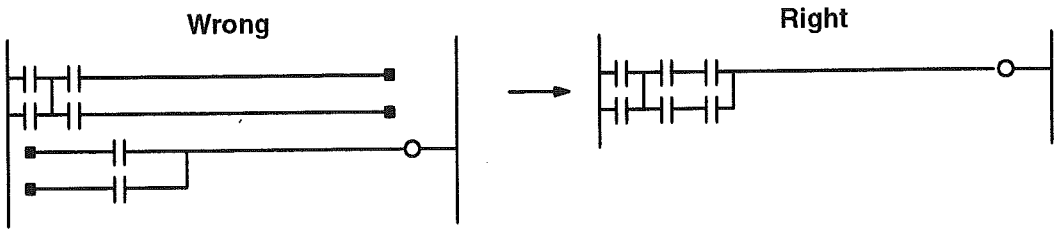
c) Horizontal line in front of OR instruction with no condition on the line. Conditions must be aligned on the left.



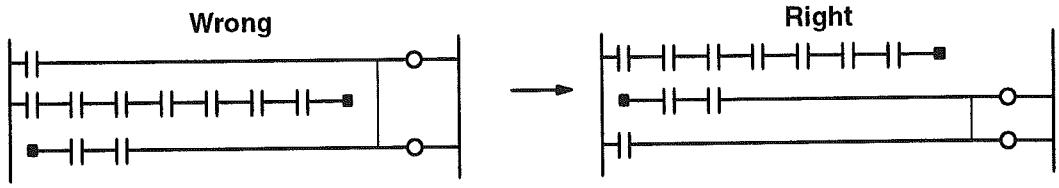
d) More than 8 LD instructions used (mnemonic display).



e) Multiple continue operations. Do not use continue operations in parallel.



f) Continue instruction sandwiched between right-hand instructions. Move the continuous line to the top.



Store/Store Insert Procedure

1, 2, 3...

1. In the Write or Insert mode, press the F3 Key for the "Store" operation or the Shift Key + the F3 Key for the "Store insert" operation.
2. Begin the "Store" or "Store insert" operation by pressing the Enter Key. Either "Store" or "Store insert" will flash at the upper right of the screen.
3. When the operation is complete, the Write or Insert mode will resume and the next program address will be displayed.

3-3-2 Checking the Program

The "P:Check program" operation is used to check whether the program in the system work area is correct. It can be used regardless of whether the program was written in ladder or mnemonic form.

Always use this operation to check a newly created or edited ladder program after storing the program in the system work area.

Any of the following check levels can be selected for checking the program.

Check level	Contents
A	Errors in program that prevent intended instructions from being executed.
B	Syntax errors that do not prevent intended instructions from being executed. (Alarms)
C	Errors such as omissions from the program or output timing errors that could prevent instructions from being executed properly.

Program instructions and operand values are checked according to the PC model specified in the System Setup.

The program is checked until the first END instruction is reached. To check the entire program, do not include any END instructions until the very end of the program.

The default setting is for programs to be check V2 CVM1 PCs. To check a program for a V1 or earlier PC models (e.g., CVM1-CPU11-E), change the mode by pressing the F10 Key so that new V2 instructions not supported by the previous PC models will be detected as illegal instructions.

Always store the program after input or modification, and then run the program check. (Storing the program is not required when the mnemonic code is input.)

If any errors are found during the program check, the error messages will be displayed when the check is complete. Check the contents of the error messages and correct them. Then execute the program check again.

The time required to check the program will depend on the size of the program.

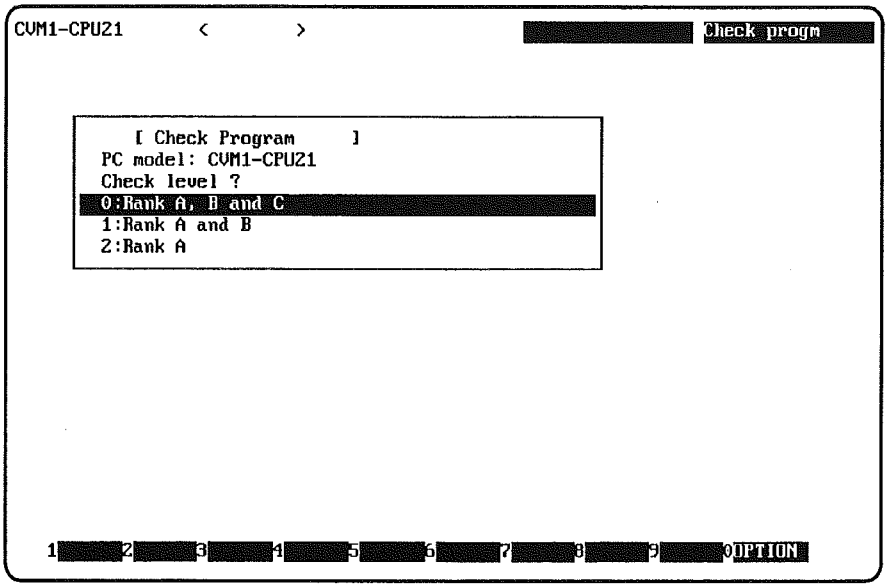
The program check will be carried out according to the maximum program capacity for that particular Programmable Controller model. If that capacity is exceeded, a "No END instruction" error message will be displayed. The maximum capacity for each model is shown in the following table.

Model	Maximum program capacity
CVM1-CPU01	30K words
CVM1-CPU11	30K words
CVM1-CPU21	62K words

Procedure

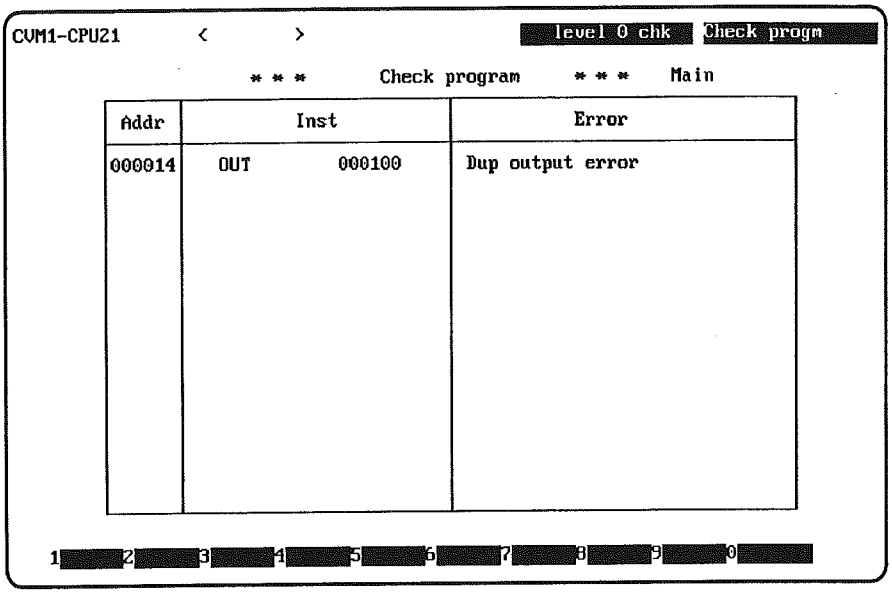
1, 2, 3...

1. Select "P:Check program" from the Programming Menu. The following screen will be displayed. If the F10 Key is pressed, the screen will change to indicate checking programs for V1 or earlier PC models.



2. Specify the level(s) to be checked. The program check will then begin when Enter is pressed and a message will flash on the display.

3. When the check is complete, the results will be displayed.



If there are no errors, a message will be displayed at the bottom of the screen indicating that the check was OK. If the errors cannot be displayed on a single page, use the PageDown and PageUp Keys to scroll the pages. If there are errors, correct them and run the program check again. If there are more than 255 errors (16 screens), the errors exceeding that amount will not be displayed.

4. To return to the Programming Menu, press the Escape Key.

Error Messages

Rank	Message	Description	Remedy
A	????	Program contents destroyed. Invalid instruction code.	Enter correct instructions at the ???? parts of the program.
	Ladder err	Syntax error in instruction block. Number of LD instructions disagrees with number of logic block instructions (OR LD, AND LD).	Check the program.
	Wrong data	Incorrect operand set for an instruction. EM set for a type of PC that cannot use EM.	Enter correct operand. Either reset the PC type or correct the program.
	Need an END	No END instruction in the program	Enter an END instruction at the end of the program.
	Data error	Instruction used in incorrect memory area	Check use of instruction and correct program
	Dup No. error	SBN, BPRG, or JME number used twice.	Check and correct program
	Wrong use of BPRG–BEND	BPRG, BEND not used in pairs	
	Wrong use of IF-IEND	IF-IEND used incorrectly.	
	Wrong use of LOOP-LEND	LOOP-LEND used incorrectly.	
	Need a JMP	No JME corresponding to JMP.	
	Need an SBN	No SBN corresponding to SBS.	
	STEP error	STEP, SNXT used incorrectly.	
B	IL-ILC error	IL, ILC not used in pairs.	Check and correct program
	Wrong use of SBN-RET	RET instruction or SBN-RET used incorrectly.	
	Wrong use of JMP–JME	JMP, JME not used in pairs.	
C	Dup output err	Same output bit specified for more than one instruction controlling its status.	Correct the bit addresses. This problem can cause racing.
	Need a JMP/CJP	No JMP/CJP address corresponding to JME/CJPN address.	Check and correct program
	Need a SBS/MCRO	No SBS address corresponding to SBN address.	

3-4 Saving and Retrieving Programs

3-4-1 Saving Programs

Once a program has been completed in the system work area, it can be saved to a data disk using the "S:Save program" operation. This operation cannot be selected if there is no program in the system work area.

Programs can be saved in DOS format. When "S:Save program" is selected from the Programming Menu, the two choices shown in the following table become available. By selecting one of them, either all or part of the program can be saved to the data disk.

Menu item	Function
Z:Save all	Saves the entire ladder or mnemonic program in the system work area to the data disk. (See note 1.)
B:Save part	Saves the specified range of the ladder program to the data disk. (See notes 1 and 2.)

Note 1. Only "Save all" is available in the mnemonic display mode, and it is not possible to use the "Save part" operation.

2. Once a file has been saved by the "Save part" operation, it can only be read by means of the "Add retrieve" operation.

The path name for the save destination that is set under "Data disk drive" in the System Setup will be displayed. It can be changed on the file name input screen. The data disk can be either a directory either on a floppy disk or on your hard disk drive.

If there is no program in the system work area, the "S:Save program" operation cannot be executed.

When the program is saved, all I/O comments and block comments will be saved at the same time. If "Save part" is selected, however, only those I/O comments within the specified range of addresses will be saved.

Use "Add retrieve" to retrieve file saved with "Save part."

⚠Caution Be careful not to overwrite the contents of a file by specifying the same file name inadvertently. Check all file names carefully. It is possible, however, to execute "Save program" and "Save part" using the same file name, because the file names are given different extensions when they are saved.

File Names, Directory Names, and Titles

When saving a file, input the file name and the title. File names and directory names will be automatically converted to capital letters even if small letters are input.

Up to eight characters can be used for a file name or a directory name, and up to 30 can be used for a title. A maximum of 78 characters can be used for the entire path and file name.

Floppy Disks

Floppy disks must be initialized before they can be used.

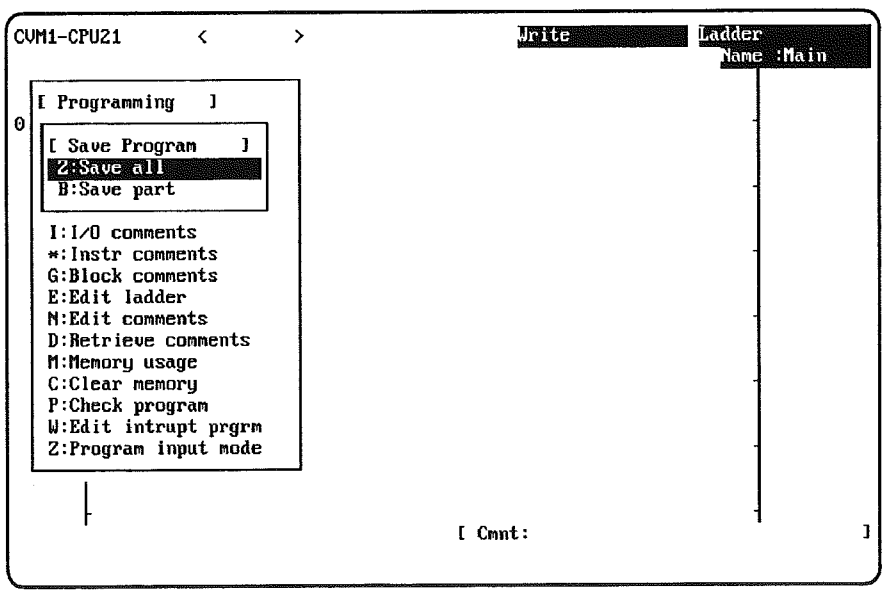
Make sure that the floppy disk is not write-protected.

Programs cannot be saved if they exceed the free space available on the data disk. Make sure a new disk is available when using floppy disks.

Procedure

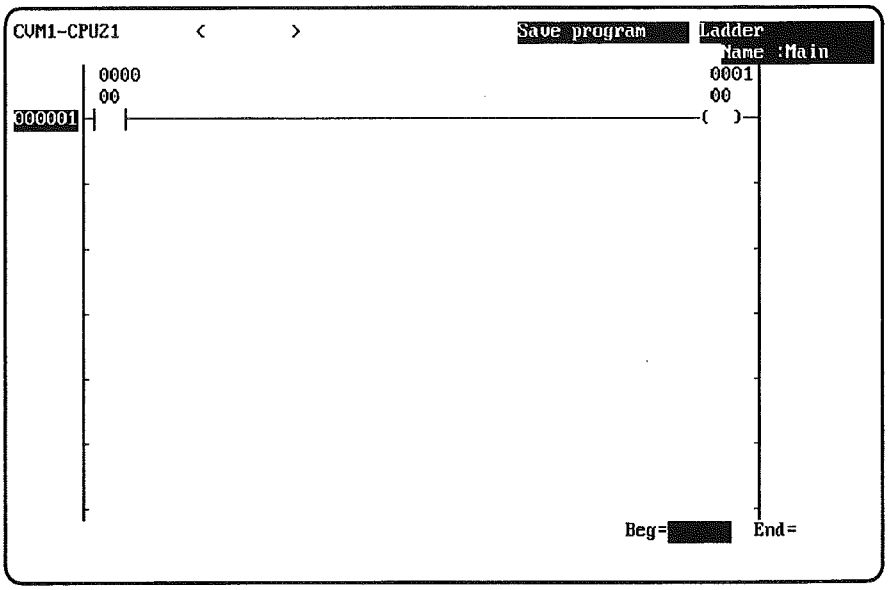
1, 2, 3...

1. Select "S:Save program" from the Programming Menu. The following menu will appear.



2. Select either "Z:Save all" or "B:Save part." (If the program is in mnemonic form, "Z:Save all will be selected automatically.) If "Z:Save all" is selected, a screen will appear for entering the file name. If "B:Save part" is selected, a screen will appear for specifying the range of the program that is to be saved. Specify the starting and ending program addresses.

   To specify the range, use the PageUp and PageDown Keys to display the required instruction block, and the Up and Down Cursor Keys to move the cursor to the desired starting and ending program addresses. Press the Enter Key for each.



   After the ending program address has been specified and the Enter Key has been pressed, the screen for entering the file name will appear.

3. Input the path name and the file name with any extension, and press the Enter Key. The extension ".SP1" will automatically be attached to the file name. (When "Save part" is executed, ".SL1" will be attached.) To overwrite a file name that has already been saved, press the End Key to display a list of programs. The file name can then be input from that list.
4. If the file name that is entered already exists, a message will ask if the existing file should be overwritten. To overwrite it, press "Y" followed by the Enter Key. To cancel the operation, press "N" and the Enter Key or just press the Enter Key.
5. Input the title and press the Enter Key. (The title can be omitted.)
6. When the Enter Key has been pressed, the save operation will begin and either "Save all" or "Save part" will flash. The time required to save the program will depend on the program size. When the operation is complete, the Programming screen will return.

3-4-2 Retrieving Programs

A program stored on a data disk can be retrieved to the system work area by using the "L:Retrieve Program" operation. When a program is retrieved, all I/O comments and block comments will be saved at the save time. Programs saved in DOS format can be read.

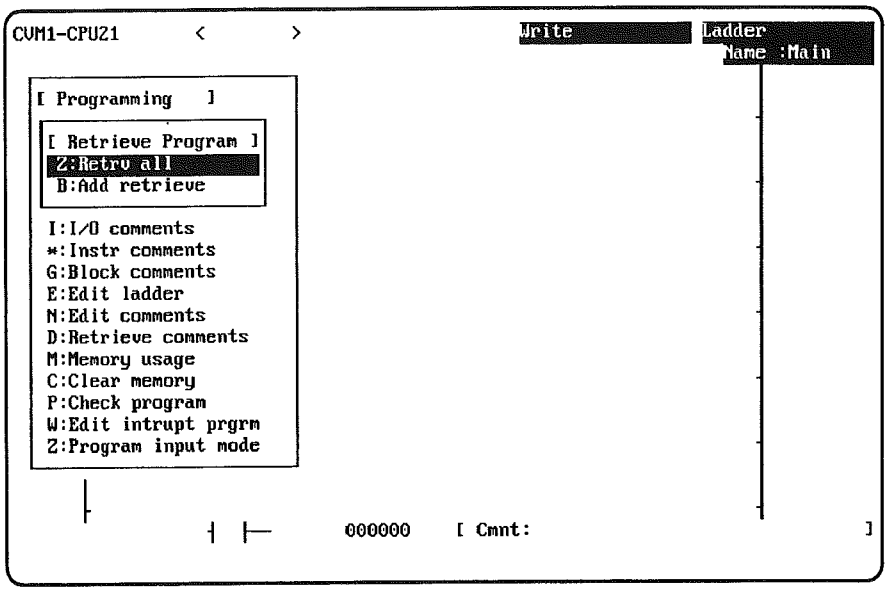
The "L:Retrieve Program" menu has two options: "Z:Retrieve all" and "B:Add retrieve." Use "Z:Retrieve all" to read the entire program to the system work area. Use "B:Add retrieve" to insert part of a program into a program that is being created.

Menu item	Function
Retrieve all	Retrieve the program with the specified file name in the data disk to the system work area. The program in the system work area is lost when a new program is retrieved. (See note.)
Add retrieve	Retrieve the program with the specified file name in the data disk to the system work area, from the specified address of the program already in the system work area. "Add retrieve" can retrieve only files saved with the "Save part" operation. It cannot be used during mnemonic displays.

Procedure

1, 2, 3...

1. First select "L:Retrieve program" from the Programming Menu. The following menu will appear. (If the program is in mnemonic form, the screen for inputting the file name for "Z:Retrieve all" will appear directly.)



2. If the program is in ladder diagram form, select either "Z:Retrieve all" or "B:Add retrieve." If "Z:Retrieve all" is selected, the screen for inputting the file name will appear. If "B:Add retrieve" is selected, the screen for specifying the program range will be displayed, with the beginning destination address displayed at the bottom of the screen. Specify the beginning destination address by using the PageUp and PageDown Keys to display the required instruction block, and the Up and Down Cursor Keys to move the cursor to the desired starting program addresses. Then press the Enter Key.

   To insert the partial program after the final program address (i.e., at the end of the existing program), move the cursor to the final program address and then press the PageDown Key so that a message on the screen indicates that the final page is displayed. Then press the Enter Key.

   It is also possible to search and read according to program addresses and instructions.

3. After the destination address has been specified and the Enter Key has been pressed, a screen will appear for entering the file name. Input the path name and the file name, and then press the Enter Key. Another way to enter the file name is to press the End Key to display a list of programs. The file name can then be selected from the list.

4. After the file name has been input, pressing the Enter Key will start the retrieve operation. Either "Save all" or "Save part" will flash on the screen. After the program has been retrieved, the programming screen will return.

3-4-3 Retrieving Comments

It is possible to retrieve only comments from a program that has been saved to a data disk.

When "D:Retrieve comments" is executed from the Programming Menu, I/O comments are read to the system work area. The newly retrieved comments are then displayed in the program. The original comments in the program are deleted, and they are replaced by the newly retrieved comments.

In order to retrieve comments in mnemonic form, it is first necessary to go into "Read" mode.

The data disk is used as a work area, so it must write-enabled.

Procedure

1, 2, 3...

1. If using a floppy disk, insert a write-enabled floppy disk into the data drive.
2. Select "D:Retrieve comments" from the Programming Menu.
3. Input the path name and the file name, and then press the Enter Key. Another way to enter the file name is to press the End Key to display a list of program files. The file name can then be selected and input from the list.

   The comments will then be retrieved. While they are being read, the "Retrieve comments" display will flash on the screen. When the operation is complete, the Programming Menu will return.

   If there are no I/O comments in the specified file when the "D:Retrieve comments" operation is executed, the I/O comments in the system work area will be preserved just as they are, without being deleted.

3-5 Searching Ladder Diagrams

This section explains how to search ladder programs for various items.

3-5-1 Searching and Reading Ladder Diagrams

A program in the system work area can be searched for specified contents, and those contents can be displayed on the screen. The following search operations can be carried out:

- Finding specified program addresses
- Finding input conditions and their operands
- Finding bit operands
- Finding reciprocal condition/output bits
- Finding character strings in string input mode
- Finding special instructions and their operands
- Finding I/O comments
- Finding block comments
- Online AI searches
- Online cross-reference searches

Read Mode Screen

Ladder diagram searching and reading is carried out in Read mode. To switch from Write mode to Read mode, store the program if you have not already done so and press the F1 Key. The editing mode display in the top right portion of the screen will indicate that the Read mode is in effect.

Scrolling

Use the PageUp and PageDown Keys to display the instruction blocks before and after the one that is currently displayed.

Key	Description
PageDown	Read the next instruction block.
PageUp	Read the previous instruction block.

If the instruction block that was found does not fit on a single screen, use the Up and Down Cursor Keys to move the cursor to display the rest.

Cursor key	Description
Down	Press the Down Cursor Key when the cursor is on the bottom line of the screen to display the next instruction line.
Up	Press the Up Cursor Key when the cursor is on the top line of the screen to display the previous instruction line.

The number of instruction lines that can be displayed at one time on a screen for each of the ladder display modes is shown in the following table.

Display mode	Number of instruction lines/screen
Ladder (no comments)	7
Ladder (2 comment rows)	4
Ladder (4 comment rows)	3

To display the instruction block that was found just prior to the one that is presently displayed on the screen, press the Tab Key.

If an instruction block consisting of more than 22 lines is read, the display mode will automatically switch to mnemonic. If that occurs, use "H:Change display" in the Programming Menu to switch the display mode back to a ladder mode when displaying the next instruction block.

The search will stop when an END instruction is reached even if the item being searched for exists after the END. To continue the search beyond the END, press the Enter Key.

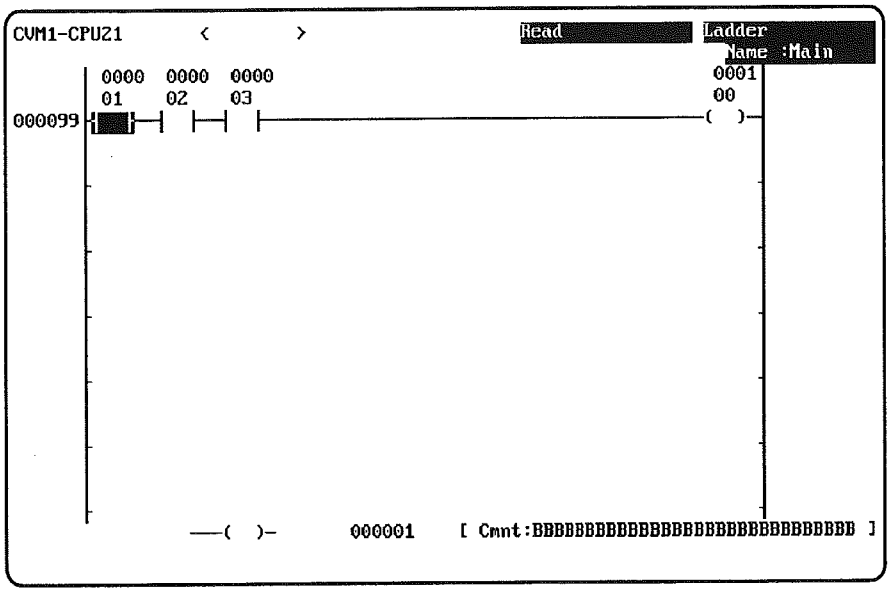
To abort a search operation before it is finished, press the Escape Key.

When the search is completed to the end of memory, a "No END instruction" message will be displayed. Press the Enter Key. A message will indicate when the final screen has been reached. To search again for the same item, again press the Enter Key. The search will begin from program address 00000. To search for a different item, repeat the procedure from the beginning.

Procedure 1: Searching for Program Addresses

1, 2, 3...

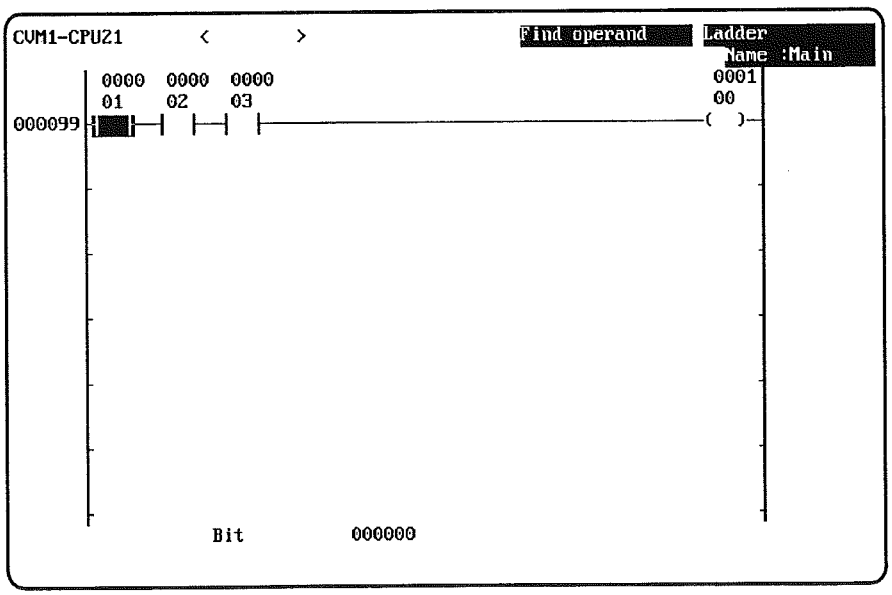
1. If not already in Read mode, press the F1 Key to go into Read mode.
2. Press the Escape Key, and input the program address that is to be found ("100" in this example). Then press the Enter Key. The instruction block that includes the specified program address will be displayed.



Procedure 2: Searching for Bit Addresses

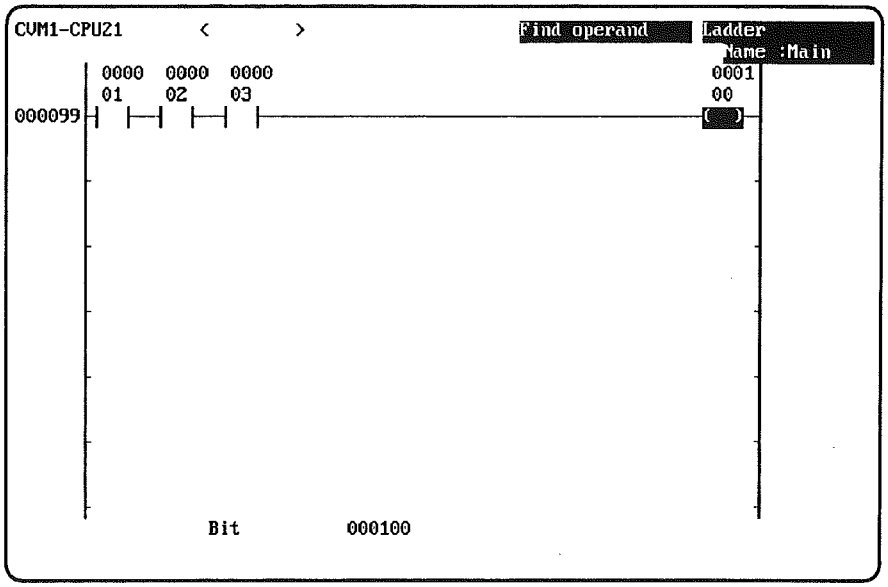
1, 2, 3...

1. If not already in Read mode, press the F1 Key to go into Read mode.
2. Press Control+F9 to specify that a bit address will be entered.



3. Input the bit address ("100" in this example), and then press the Enter Key.

4. The search will begin from program address 000000. While the search is in progress, a message will flash on the screen. The first instruction block that includes the specified bit address will then be displayed. Any instruction with that bit address as an operand will be found in the search.

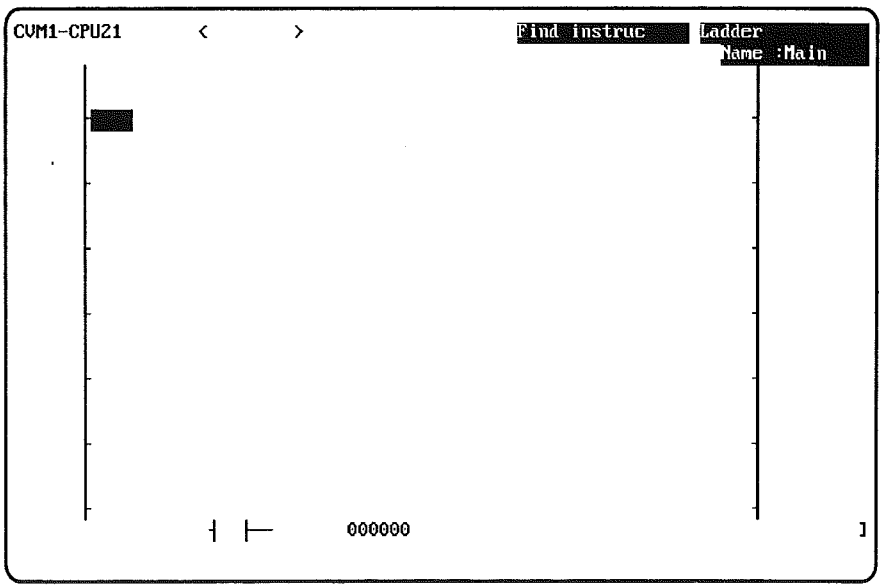


5. To continue searching the rest of the program for the same bit address, press the Enter Key.
6. Press the PageDown Key to display the next instruction block, and press the PageUp Key to display the previous one. The original instruction block will remain on the screen if space allows.

Procedure 3: Finding a Specified Basic Instruction

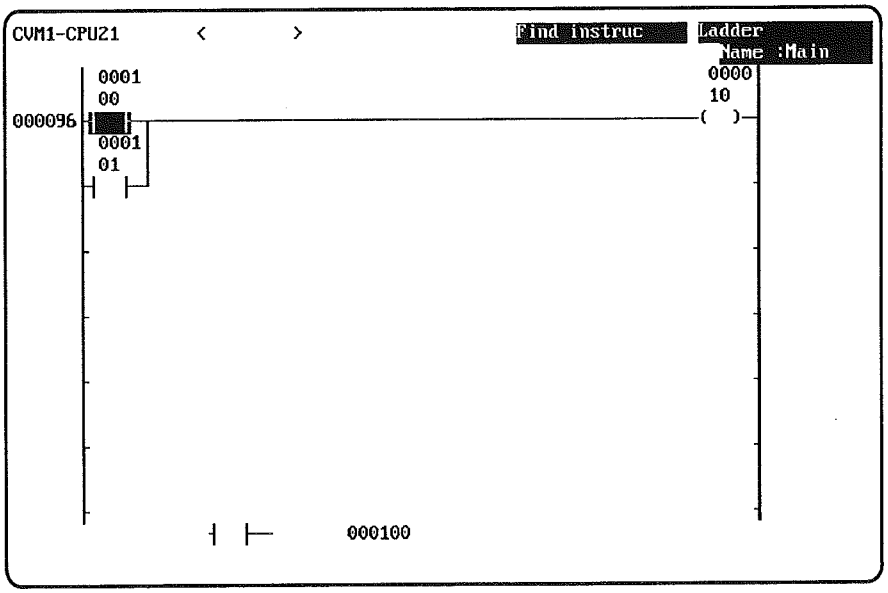
1, 2, 3...

1. Press either the F4 Key or the F7 Key to specify a symbol. In this example, press the F4 Key.



2. Input the bit address ("100" in this example), and then press the Enter Key.

3. The search will begin from program address 000000. While the search is in progress, a message will flash on the screen. The instruction and the instruction block that includes the specified bit address will be displayed. The following instructions are searched for when the output symbol (i.e., the F7 Key) is used: OUT, OUT NOT, KEEP, DIFU, DIFD, SET, RSET, STEP, SNXT.

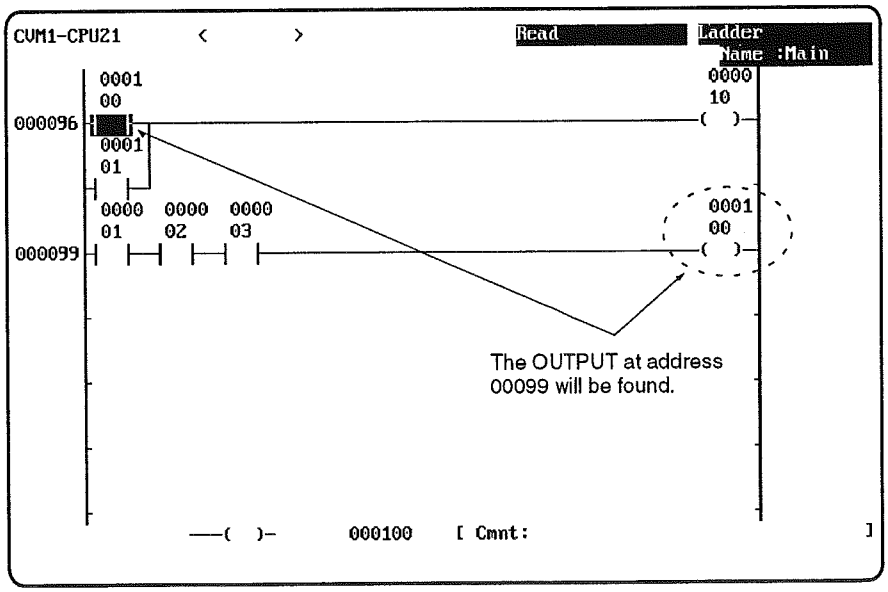


4. To continue searching the rest of the program for the same input condition or output, press the Enter Key.
5. Press the PageDown Key to display the next instruction block, and press the PageUp Key to display the previous one. The original instruction block will remain on the screen if space allows.

Procedure 4: Finding Reciprocal Inputs and Outputs

This procedure can be used to find input conditions and output instructions that have the same bit or address.

Move the cursor to the input bit and press the Enter Key. The corresponding output bit will be found. In this example, OUTPUT for CIO 00100 at address 00099 is found.



To reverse the procedure, move the cursor to the output bit and press Enter. The cursor will move to an input condition with the same bit address.

Procedure 5: Finding Character Strings

This operation can only be carried out in string input mode.

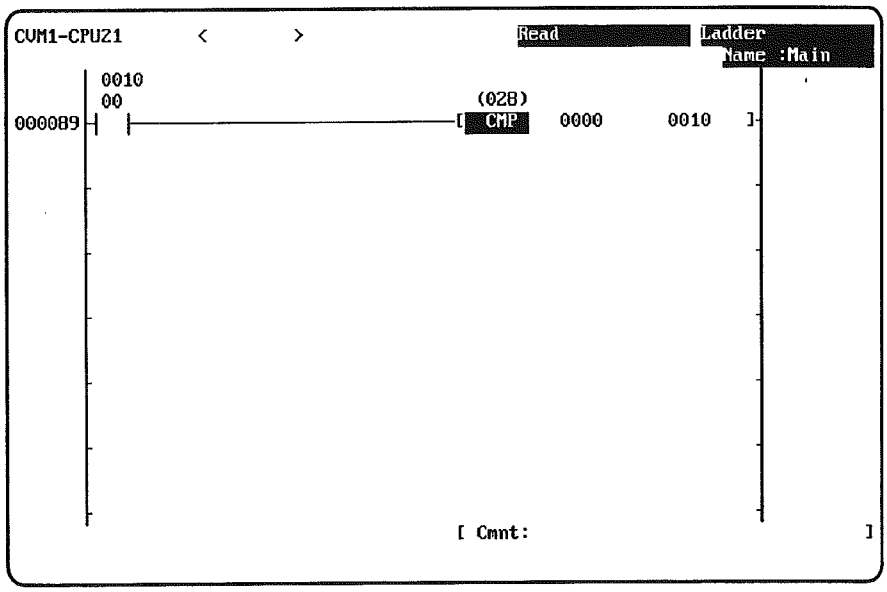
1, 2, 3...

1. Select "Z:Program input mode" from the Programming Menu.
2. Select "M:String input mode." The input mode indicator in the lower right-hand part of the screen will change to "String." (To go into the symbol input mode for just one operation and then return to the string input mode, press Control+Z and then press the Enter Key.)
3. Input the address of the bit operand or the special instruction (with or without operands). For example, input any of the following key sequence.

Bit address:	000001 **Enter**
Condition address:	T0001 **Enter**
Special instruction:	CMP **Enter**
	CMP 0000 **Enter**
	CMP ? 0010 **Enter** (See note.)
	CMP 0000 0010 **Enter**

Note A "wildcard" (?) can be input in place of an operand.

Any of the last four text strings will find the following special instruction (CMP).

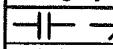
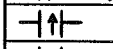
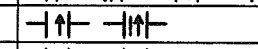
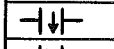
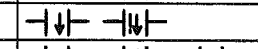
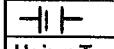
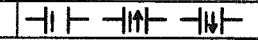


Searching Symbols vs Searching Text Strings

Searching for ladder diagram symbols does not always produce the same results as searching for text strings. The following tables illustrate the differences in the specific instructions that will be found for some typical examples.

Basic Instructions

The differences in searching for basic instructions can be illustrated using the LOAD instruction. As you can see, text string searches will find only literal equivalents, but symbol searches can be used to find various combinations of a specified element, somewhat like using wild cards.

Search specification	Items found
Using Symbols	
	
	
	
	
Using Text Strings	
LD	
LD NOT	
LD(Shift+F7)	
LD(Shift+F7)(Shift+F7)	
LD(Shift+F6)	

Special Instructions

The differences in searching for differentiated instructions can be illustrated using the MOVE instruction. Here too text strings find only literal equivalents.

Search specification	Items found
Using Symbols	
(F10)030	MOV or ↑MOV
(F10)030(Shift+F7)	↑MOV (but not MOV)
Using Text Strings	
MOV	MOV (but not ↑MOV)
MOV(Shift+F7)	↑MOV (but not MOV)

IF, WAIT, EXIT, and LEND

The differences in searching for instructions that can appear either with or without an operand can be illustrated using the IF instruction (others are WAIT, EXIT, and LEND). Here text string searches can be used to find all occurrences of the instruction regardless of whether or not an operand is included.

Search specification	Items found
Using Symbols	
(Shift+F10)002	IF (but not IF with an operand)
Using Text Strings	
IF	IF or IF with an operand

3-5-2 Finding I/O Comments and Block Comments

Programs can be searched for specified I/O or block comments.

When a search is carried out for a specified I/O comment, any instruction containing a bit address with an I/O comment that starts with the specified search string will be found and displayed.

When a search is carried out for a specified block comment, any block comment that contains the specified search string will be found and displayed.

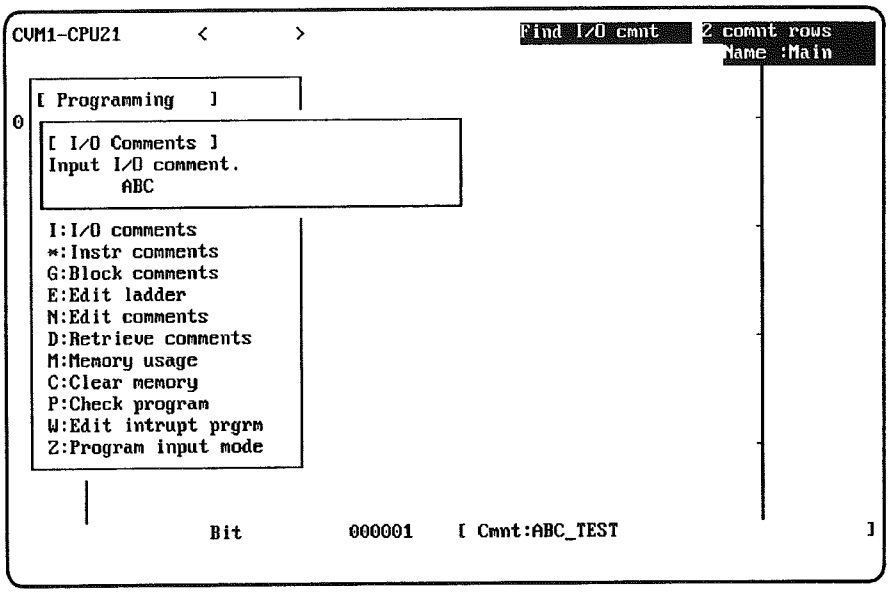
The searches for I/O or block comments cannot be carried out in the "Ladder (no comments)" display mode.

Searches will begin from program address 000000. Searches will end at the first END instruction in the program even if the search item exists after it. To continue the search after the END, press Enter. If the search is continued past the last END instruction, a "No END instruction" message will be displayed in the upper left corner of the screen. When the end of memory is reached, a message will be displayed indicating that the last page has been displayed.

Procedure 1: Finding I/O Comments

1, 2, 3...

1. Select "H:Change display" from the Programming Menu, and then specify the "C:Ladder (2 comment rows)" or "M:Ladder (4 comment rows)" display format.
2. Press the F1 Key to go into the Read mode.
3. Select "I:I/O comments" from the Programming Menu. An input area will appear.
4. Input the I/O comment that is to be found (or a text string at the beginning of the I/O comment), and press the Enter Key. (Example: Input "ABC" followed by the Enter Key.) The bit address to be found will be displayed on the screen along with the I/O comment. If there is no I/O comment that corresponds to the character string that has been input, a message will appear on the screen to inform the user of that.



5. If there is more than one I/O comment containing the search string, the user can select the desired one by pressing the F5 Key. The search can also be narrowed by pressing the F1 and F2 Keys to indicate either input conditions (F1: LD, LD NOT, AND, AND NOT, OR, OR NOT) or output conditions (F2: OUT, OUT NOT) for the search.
6. Press the Enter Key. The search will begin from program address 000000. When the specified bit address is found, the first instruction block containing that bit address will be displayed on the screen.
7. To continue the search through the rest of the program, press the Enter Key again.

   To return at any point to the previous instruction block that was displayed (i.e., the last one that was found), press the Tab Key. To display the instruction blocks just before and after the one that is currently being displayed, use the PageDown and PageUp Keys respectively.

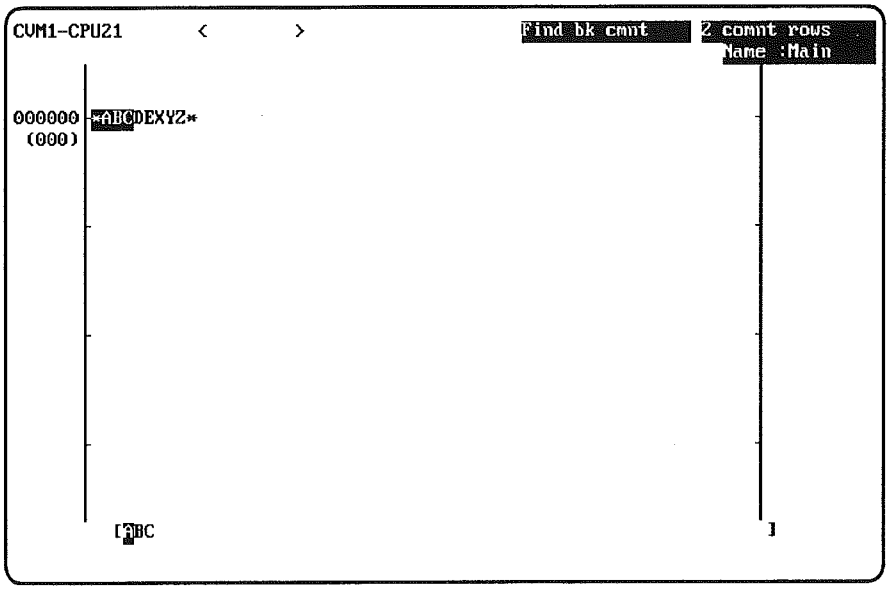
   To carry out another search starting from program address 000000, repeat the procedure from step 3. above.

Procedure 2: Finding Block Comments

1, 2, 3...

1. Press the F1 Key to go into the Read mode.
2. Select "G:Block comment" from the Programming Menu. An input area will appear.
3. Input the block comment that is to be found (or the character string from the block comment), and press the Enter Key. (Example: Input "ABC" followed by the Enter Key.)

4. Press the Enter Key. The search will begin from program address 000000. When the specified block comment is found, it will be displayed on the screen.



The block comment will be treated as a single instruction block, from the first line that is denoted with an asterisk (*) before it, in the program address position, to the next line marked by an asterisk.

5. To continue the search through the rest of the program, press the Enter Key again. If the Enter Key is pressed at the end of the program, a "No END instruction" message will be displayed. If the Enter Key is then pressed again, a "Last screen" message will be displayed.

   To return at any point to the previous instruction block that was displayed (i.e., the last one that was found), press the Tab Key. To display the instruction blocks just before and after the one that is currently being displayed, use the PageDown and PageUp Keys respectively.

   To continue the search from program address 000000, press the Enter Key again after the "Last screen" message is displayed.

3-5-3 Summary of Ladder Search/Read Operations

The following table summarizes the methods for searching and reading ladder programs.

Operation	Key sequence	Description
Reading a specified program address	**Esc** *Address* **Enter**	It is not necessary to input leading zeros, e.g., input address 00000 as 0. The instruction block containing the specified address will be displayed on the screen.
Finding a specified condition or output	Specifying an input condition: **F4** *Bit_address* **Enter** Specifying an output: **F7** *Bit_address* **Enter**	It is not necessary to input leading zeros. Specifying input conditions finds the following: LD, LD NOT, AND, AND NOT, OR, OR NOT. Specifying outputs find the following: OUT, OUT NOT, KEEP(011), DIFU(013), DIFD(014), SET(016), RSET(017), STEP(008), SNXT(009). For TIM/CNT, press Shift+F9 or Shift+F8 in place of the bit address, and then input the TIM/CNT number.

Operation	Key sequence	Description
Searching for a bit address	**Ctrl+F9** *Bit_address* **Enter**	Searches for all bit addresses, including the above input conditions and outputs. It is not necessary to input leading zeros. While the search is in progress, "000000" is displayed at the bottom of the screen.
Finding a reciprocal condition/output	Move cursor to desired condition/output **Enter**	Specify a condition or output with the cursor to find the corresponding output or condition. If LD, LD NOT, AND, AND NOT, OR, or OR NOT is specified, the OUT, OUT NOT, KEEP(011), DIFU(013), DIFD(014), SET(016), RSET(017), STEP(008), OR SNXT(009) with the same bit address will be found. If OUT or OUT NOT is specified, the LD, LD NOT, AND, AND NOT, OR, OR NOT with the same bit address will be found.
Finding a character string	Special instructions *Mnemonic* **Enter** *Mnemonic* + *Operand* (or ?) **Enter** *Operand* (or ?) **Enter** Illegal instructions ???? Illegal operands $$$$ Input/Outputs *Bit_address* **Enter** TIM/CNT T *Timer_number* C *Counter_number*	To find special instructions via character strings, input mnemonics in string input mode. Use the Space Key to separate mnemonics and operands, and operands from operands. Input a question mark as a wild card for operands. (Example: MOV ? 0) If the program has been converted using the C2000H→CVM1 operation, illegal instructions (mnemonic display only) or illegal operands may be displayed as "????" or "$$$$." These can be found in string input mode. Leading digits of bit addresses can be omitted.

3-6 Editing Ladder Programs

This section explains how use the "E:Edit ladder" operation to move, copy, and delete instruction blocks within ladder programs in the system work area. It also explains how to create interrupt programs.

3-6-1 Cut and Paste Operations

Instruction blocks can be moved, copied, or deleted using the Cut and Paste operation. This operation cannot be used when displaying the program in mnemonic form.

Block comments can be moved, copied, and deleted as individual instruction blocks. A block comment will be treated as a single instruction block, from the first line that is denoted with an asterisk (*) before it, in the program address position, to the next line marked by an asterisk. If there is no subsequent asterisk, the block comment will be treated as a single instruction all the way to the end.

I/O comments are moved, copied, and deleted together with instruction blocks. Even when an instruction block is deleted, however, the I/O comments will remain as data in the I/O comment area of the system work area.

Block and mnemonic programs within a ladder program are treated as a single block and must be moved as a single unit.

Programs in the system work area are edited directly, so there is no need to store them after editing.

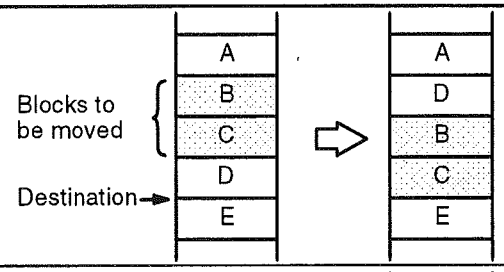
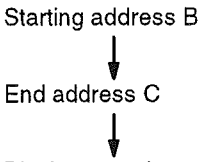
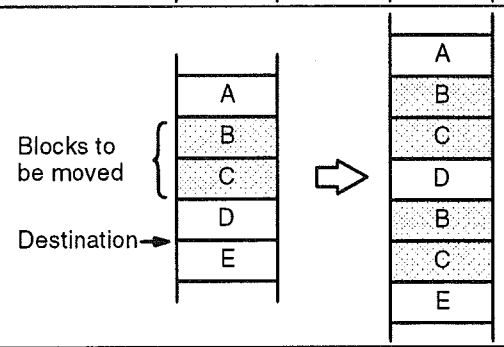
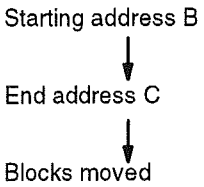
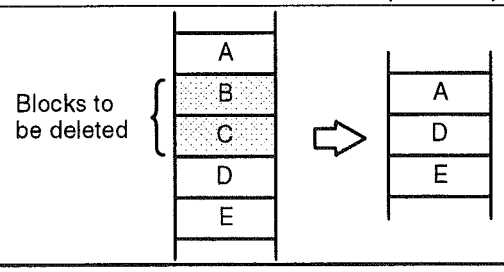
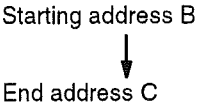
Specifying the Range to be Edited

The starting and end program addresses to be moved, deleted, or copied are specify and then the destination address is specified for moving or copying. When editing a program with the Cut and Paste operation, be careful regarding the following points.

- If the starting address is equal to the end address, only that one instruction block will be edited.
- The destination address for moving or copying cannot be between the starting address and the end address.
- When moving or copying a program section to the end of the program, press the PageDown Key until the final instruction block is displayed. Then press the PageDown Key again so that a message is displayed at the upper left of the screen indicating that it is the final page, and press the Enter Key.

Editing Operations

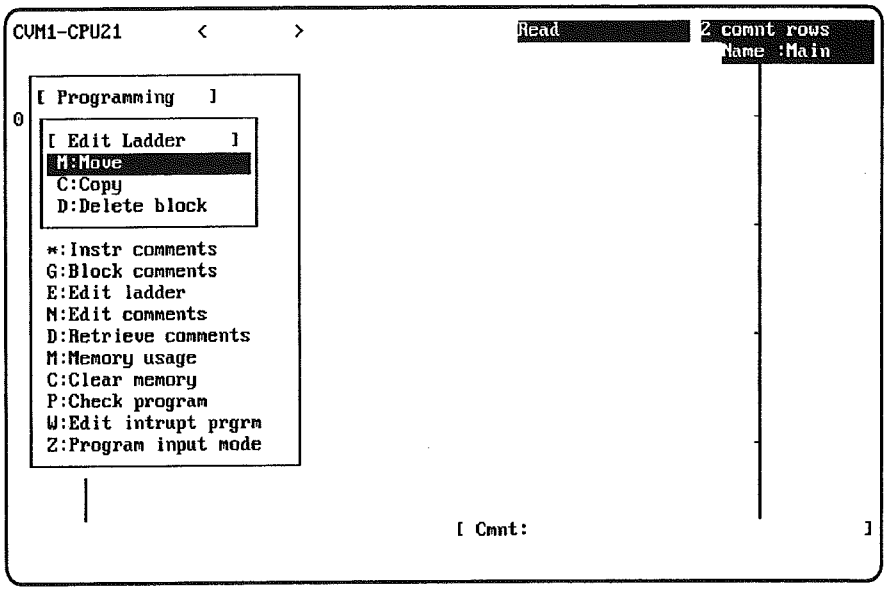
The following table shows the three editing operations that can be carried out using "E:Edit ladder," with an example of each operation.

Mode	Execution	Order
Move		
Copy		
Delete		

Reading and searching for program addresses or instructions can be useful when editing programs. For details, refer to *3-5 Searching Ladder Diagrams*.

Procedure

1, 2, 3... 1. Select "E:Edit ladder" from the Programming Menu.



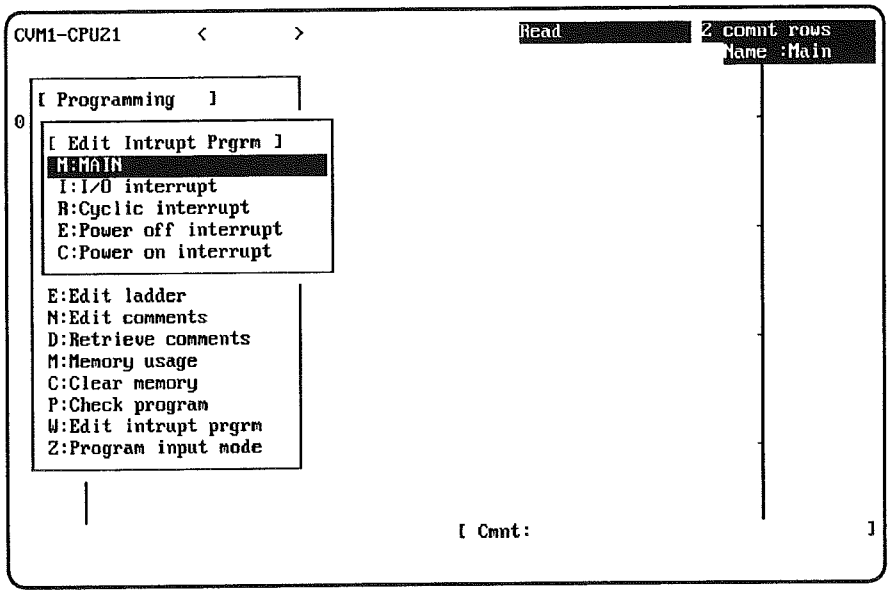
2. Select the operation that is to be executed. The area for setting the starting, end, and destination program addresses will be displayed in the lower right corner of the screen.
3. Move the cursor to the program address position and press the Enter Key to specify the required addresses. Use the PageUp and PageDown Keys to scroll the screen, and use the Up and Down Cursor Keys to move the cursor within a screen.
4. To move or copy a program section to the end of the program, press the Page-Down Key until the final instruction block is displayed. Then press the PageDown Key again so that a message is displayed at the upper left of the screen indicating that it is the final page. The move or copy operation can then be executed by pressing the Enter Key.

3-6-2 Creating Interrupt Programs

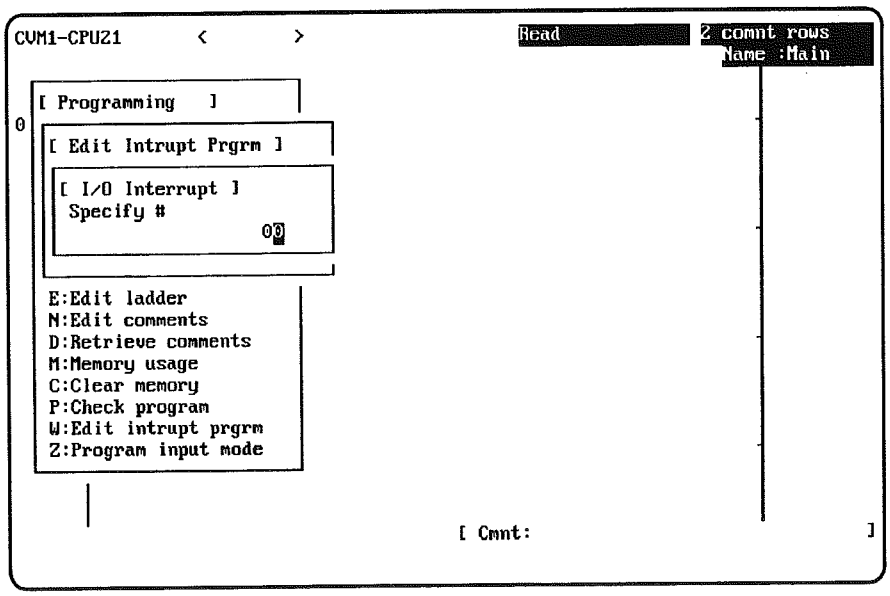
Ladder programs can be created for I/O interrupts, cyclic interrupts (i.e., scheduled interrupts), power off interrupts, and power on interrupts. The methods for creating these programs are the same as for ladder diagrams.

Procedure

1, 2, 3... 1. Select "W:Edit interrupt program" from the Programming Menu.



2. Select the program block that is to be created. If selecting I/O interrupt, proceed from step 3. If selecting cyclic interrupt, skip to step 4. If selecting the main program, power off interrupt, or power on interrupt, skip to step 5.
3. Select "I:I/O interrupt" and then input the interrupt number (0 to 31). After inputting the interrupt number, press the Enter Key and then skip to step 5.



4. Select "R:Cyclic interrupt" and then input the interrupt number (0 or 1). After inputting the interrupt number, press the Enter Key.
5. Create the program in ladder diagram format.

3-7 Editing I/O Comments

This section explains how to use the "N:Edit comments" operation. This operation edits I/O comments on the screen in all program formats and edit modes by finding and rewriting the specified comments. It does not, however, edit instruction or block comments.

3-7-1 Editing Operations

I/O comments are comments which are assigned to specific bit addresses. A list of I/O comments can be displayed on the screen for each data area. Once I/O comments have been written or edited, they are automatically written to the system work area, so there is no need to store them.

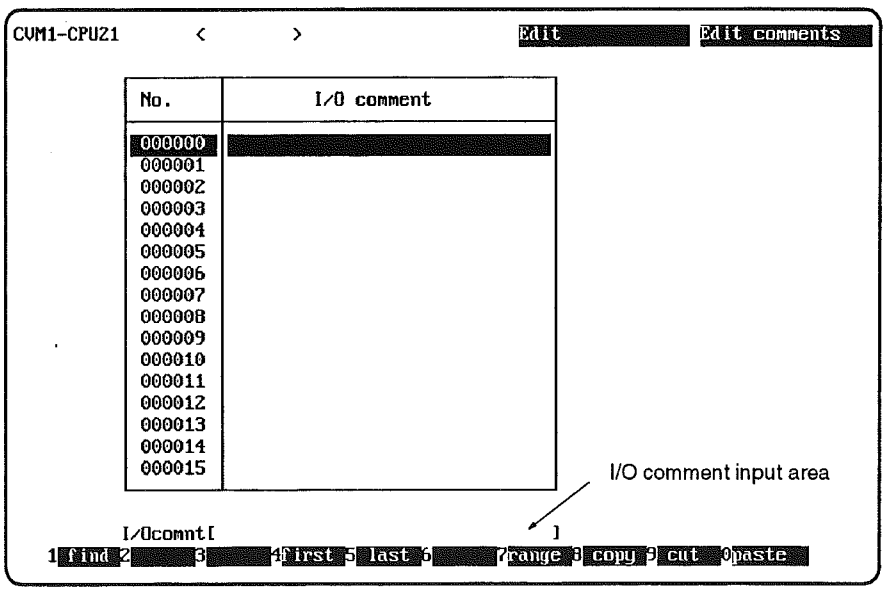
⚠Caution While I/O comments are being edited, do not turn the power supply off or press the computer's reset button. Doing so may damage the I/O comment area in the system work area.

Inputting I/O Comments

Up to 30 characters can be input for a single I/O comment. Any numbers or letters can be used.

Comment Editing Screen

To bring up the screen for editing I/O comments, select "N:Edit comments" from the Programming Menu. Then use either alphanumeric keys or the cursor to select the data area and word.

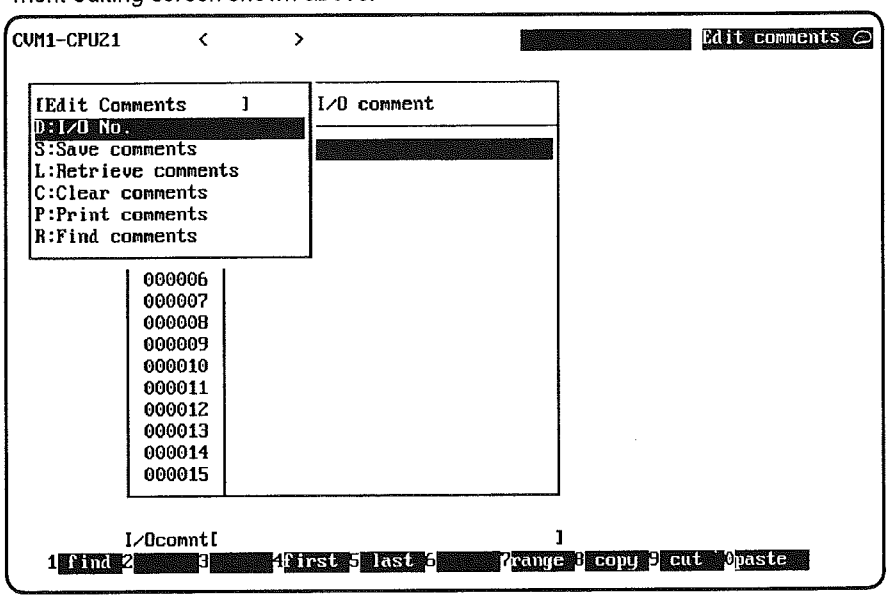


A maximum total of 10,000 I/O comments can be set, with up to 16 displayed on the screen at a time. Use the PageUp Key to display the previous screen, and the Page-Down Key to display the next screen. Use the Up and Down Cursor Keys to move the cursor to bit addresses, and the Right and Left Cursor Keys to move the flashing cursor inside of the I/O comment input area.

I/O comments edited here are displayed on both ladder and mnemonic screens.

Edit I/O Comments Menu

In addition to editing comments one by one, operations are also available from an Edit I/O Comments Menu. To access this menu, press the End Key while in the I/O comment editing screen shown above.



The following table gives a summary of the operations in the Edit Comment Menu.

Operation	Function
D:I/O No.	Used to read the bit area and address that is to be displayed on the screen.
S:Save comments	Saves I/O comments in the system work area to the data disk.
L:Retrieve comments	Reads I/O comments from the data disk to the system work area.
C:Clear comments	Clears all I/O comments in the system work area.
P:Print comments	Prints out all I/O comments in the system work area.
R:Find comments	Finds and displays all I/O comments.

3-7-2 Function Key Summary

The following tables summarize the function key operations available for the I/O number designation screen and the I/O comment editing screen.

Address Designation Screen

Operation	Explanation	Key
Word	Specifies input of a word address.	**F2**
Bit	Specifies input of a bit address.	**F3**

I/O Comment Editing Screen

Operation	Explanation	Key sequence
Search	Finds an I/O comment.	**F1**
First screen	Displays the first I/O comment screen.	**F4**
Last screen	Displays the last I/O comment screen.	**F5**
Copy	Copies a specified range of I/O comments to the bit addresses beginning with a specified address. (1) Move the cursor to the beginning bit address of the copy source and press F7. (2) Move the cursor to the final bit address of the copy source, and press F8. (3) Move the cursor to the beginning bit address of the copy destination, and press F10.	(Move cursor) **F7** (Move cursor) **F8** (See note.) (Move cursor) **F10**

Operation	Explanation	Key sequence
Cut	Cuts the specified range of I/O comments. (1) Move the cursor to the beginning bit address of the range that is to be cut, and press F7. (2) Move the cursor to the final bit address of the range that is to be cut, and press F9.	(Move cursor) **F7** (Range) (Move cursor) **F9** (See note.)
Move	Moves the specified range of I/O comments to the bit addresses beginning with the specified address. (1) Move the cursor to the beginning bit address of the range that is to be cut, and press F7. (2) Move the cursor to the final bit address of the range that is to be cut, and press F9. (3) Move the cursor to the beginning bit address of the destination, and press F10.	(Move cursor) **F7** (Range) (Move cursor) **F9** (See note.) (Move cursor) **F10**

Note The F8 (Copy) and F9 (Cut) Keys are only effective after the F7 (Range) Key has been pressed.

3-7-3 Editing Procedures

I/O comments are assigned to either bit or word addresses, and they can subsequently be edited, saved, and read. In order to edit I/O comments, it is first necessary to bring up the I/O comment editing screen by specifying the bit/word address.

Displaying the I/O Comment Editing Screen

1, 2, 3...

1. Select "N:Edit comments" from the Programming Menu.
2. If the I/O comment is assigned to a word address, press F2 (Word). If the I/O comment is assigned to a bit address, press F3 (Bit). The appropriate screen will then appear for inputting the address.
3. Input the data area and the bit or word address, and press the Enter Key. (If custom data areas have created, input the area prefix.) The I/O comment editing screen will then be displayed, with the specified bit or word address at the beginning.

Note If the I/O comment editing screen is already displayed, a different bit/word address can be specified by pressing the End Key and then selecting "D:I/O No." The subsequent operations are the same as above.

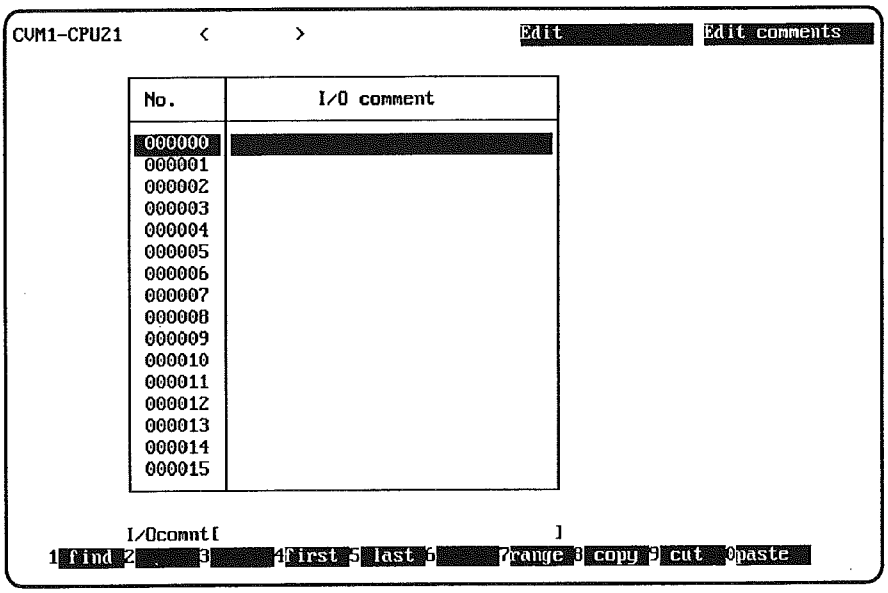
Writing and Modifying I/O Comments

Follow this procedure to write and modify I/O comments for particular bit/word addresses.

1, 2, 3...

1. Select "N:Edit comments" from the Programming Menu.
2. If the I/O comment is to be assigned to a word address, press F2 (Word). If the I/O comment is to be assigned to a bit address, press F3 (Bit). The appropriate screen will then appear for inputting the address.
3. Input the data area and the bit or word address, and press the Enter Key. For this example, first press the F3 Key and the Enter Key to display the I/O comment editing screen for bit addresses for the CIO Area (the default data area). The screen will then be displayed.

At the bottom of the screen, the cursor will flash in the area for inputting the I/O comment. If an I/O comment is already set for that address, it will be displayed.



4. Input a new I/O comment or change the existing one, and then press the Enter Key. The I/O comment will be written to the list.
5. Move the cursor to the next line. Follow the same procedure as before to input this and subsequent I/O comments.

3-7-4 Saving I/O Comments

1, 2, 3...

1. Select "N:Edit comments" from the Programming Menu.
2. Press either the F2 Key or the F3 Key, and then specify the data area and input the word or bit address. Then press the Enter Key. The I/O comment editing screen will be displayed.
3. Press the End Key. The Edit I/O Comments Menu will be displayed.
4. Select "S:Save comments" from the menu.
5. Input the path name and the file name, and then press the Enter Key. (Another way to enter the file name is to first press the End Key to display a list of files, and then to select the file name from the list.)
6. Input the title, and then press the Enter Key. If there is no title, then simply press the Enter Key. The extension ".CMT" will be added automatically, and the I/O comment will be saved to the data disk.

3-7-5 Reading I/O Comments

1, 2, 3...

1. Select "N:Edit comments" from the Programming Menu.
2. Press either the F2 Key or the F3 Key, and then specify the data area and input the word or bit address. Then press the Enter Key. The I/O comment editing screen will be displayed.
3. Press the End Key. The Edit I/O Comments Menu will be displayed.
4. Select "L:Retrieve comments" from the menu.
5. Input the path name and the file name, and then press the Enter Key. (Another way to enter the file name is to first press the End Key to display a list of files, and then to select the file name from the list.) The only files that can be retrieved in this operation are those with a ".CMT" extension.

3-7-6 Clearing I/O Comments

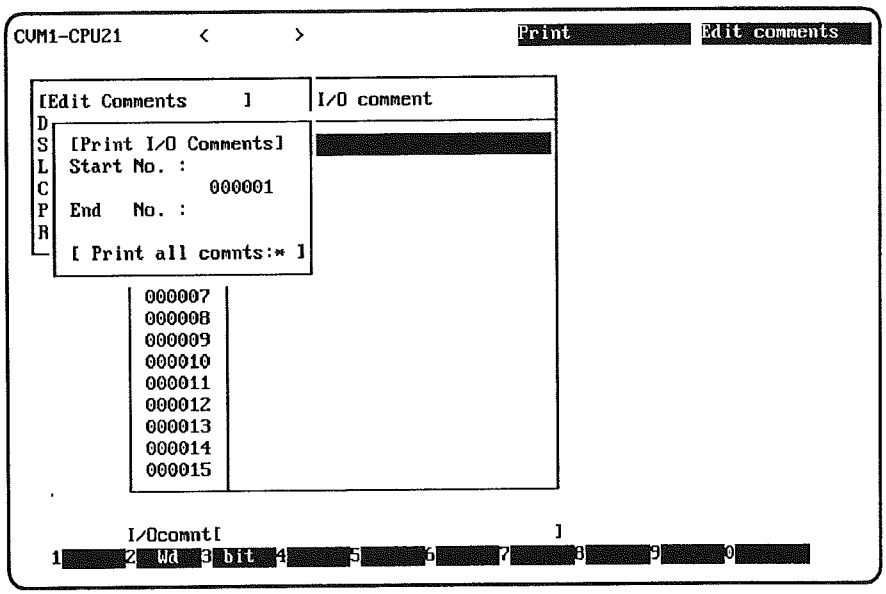
1, 2, 3...

1. Select "N:Edit comments" from the Programming Menu.
2. Press either the F2 Key or the F3 Key, and then specify the data area and input the word or bit address. Then press the Enter Key. The I/O comment editing screen will be displayed.
3. Press the End Key. The Edit I/O Comments Menu will be displayed.
4. Select "C:Clear comments" from the menu. A message will be displayed warning that all I/O comments will be cleared and asking for confirmation.
5. To clear the I/O comment data, input "Y" and press the Enter Key. To cancel the operation, input "N" and press the Enter Key.

3-7-7 Printing I/O Comments

1, 2, 3...

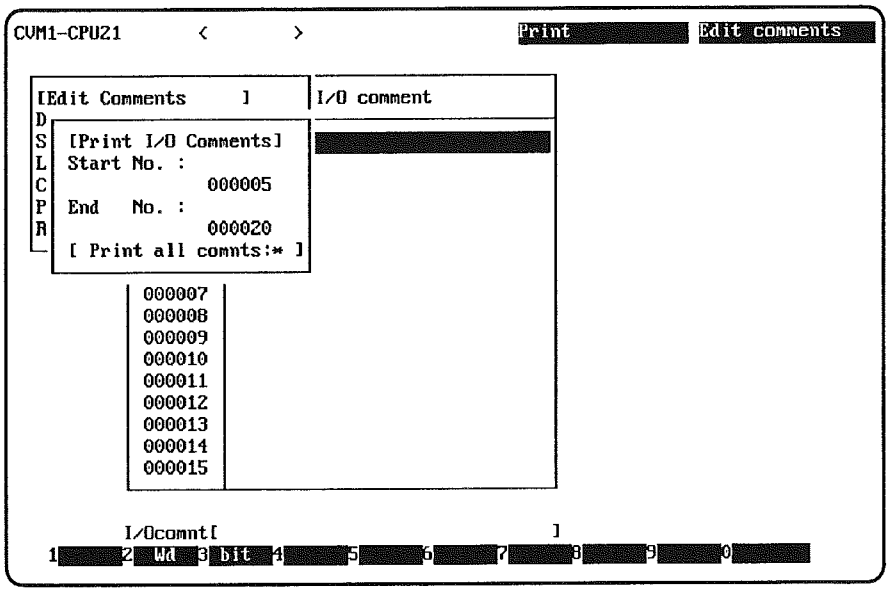
1. Connect the printer and turn it on.
2. Select "N:Edit comments" from the Programming Menu.
3. Press either the F2 Key or the F3 Key, and then specify the data area and input the word or bit address. Then press the Enter Key. The I/O comment editing screen will be displayed.
4. Press the End Key. The Edit I/O Comment Menu will be displayed.
5. Select "P:Print comments" from the menu.



6. Input the beginning word or bit address for the comments that are to be printed. If there is no need to move the cursor from the default address, just press the Enter Key. To change to another address, first press either the F2 or the F3 Key to specify a word or bit address, and then specify the data area and input the address. (For example, press F3 followed by 000005.) Then press the Enter Key.

   To print all comments, first use the Backspace Key to delete all entries in the display, and then press Shift+* followed by the Enter Key. In that case, printing will begin immediately, so refer to step 8 in this procedure.
7. Input the ending address for printing. The maximum values for the word or bit address for the specified area will be displayed as the default. If no change is required, just press the Enter Key. To make a change, first use the Backspace Key to delete all entries in the display, and then input the word or bit addresses

and press the Enter Key. Printing will then begin and a message will be displayed on the screen while the printing operation is in progress.



8. To abort the printing operation, press the Escape Key. Printing will stop as soon as all the data that has been sent to the printer has been printed out.

   An example of an I/O comment printout is shown below. Up to 150 I/O comments can be printed on one page. Addresses without I/O comments will not be printed.

I/O Comment List 06/12/94 PAGE = 001

No.	I/O comment	No.	I/O comment	No.	I/O comment
000000	load3				
000001	load2				
000002	water1				
000003	water2				
000004	gilding1				
000005	gilding2				
000006	gilding3				
000007	gilding4				
000008	gilding5				
000009	dry1				
000010	dry2				
000011	unload				
000012	unload				
000013	start1				
000014	start2				
000015	start3				
000100	over-run				
000101	over-run				
000102	stop1				
000103	stop2				
000104	stop3				
000105	stop4				
000106	crane				
000107	crane				
000108	drain				
000109	scrap1				
000110	scrap2				
000111	scrap3				
000112	scrap4				
000113	scrap5				
000114	scrap6				
000115	scrap7				

3-7-8 Finding I/O Comment Data

The "R:Find comments" operation can be used to find and display specified I/O comments. It is possible to search for an I/O comment by just specifying the initial letter or any part of the comment.

The I/O comment that is found will be displayed at the top of the list of comments.

1, 2, 3...

1. Select "N:Edit comments" from the Programming Menu.
2. Press either the F2 Key or the F3 Key, and then specify the data area and input the word or bit address. Then press the Enter Key. The I/O comment editing screen will be displayed.
3. Press the End Key. The Edit I/O Comments Menu will be displayed.
4. Select "R:Find comments" from the menu.
5. Input the string that is to be found, and press the Enter Key. If there is data that matches the comment or comment portion that was input, the cursor will move to that data. If there is no data that matches, a message will appear on the screen to indicate that nothing was found.
6. To continue the search, press the End Key and repeat the procedure from step 4.

3-8 Programming in the Mnemonic Display Mode

This section explains how to program in the mnemonic display mode.

3-8-1 Mnemonic Programming

Mnemonic programming allows ladder diagrams to be created in machine language. Block programs are input using mnemonic programming. Block programming instructions cannot be changed by the ladder diagram editor; they can be changed only using the mnemonic editor.

Ladder programs created in the mnemonic display mode and ladder programs created in the ladder programming modes are identical in the system work area, allowing programs to be created and read in either display mode. To switch between the ladder and mnemonic display modes, use the "H:Change display" command from the Programming Menu.

Programs created in the mnemonic display mode are automatically written to the system work area, so that it is not necessary to use the Store operations ("Store" and "Store insert").

Use the "N:Edit comments" operation to create I/O comments. Switch to either the "Ladder (2 comment rows)" display mode or the "Ladder (4 comment rows)" to create any required block comments comments. They cannot be created in the mnemonic display mode.

The first 32 characters of a block comment created and stored in the ladder display mode will be displayed on the screen in the mnemonic display mode.

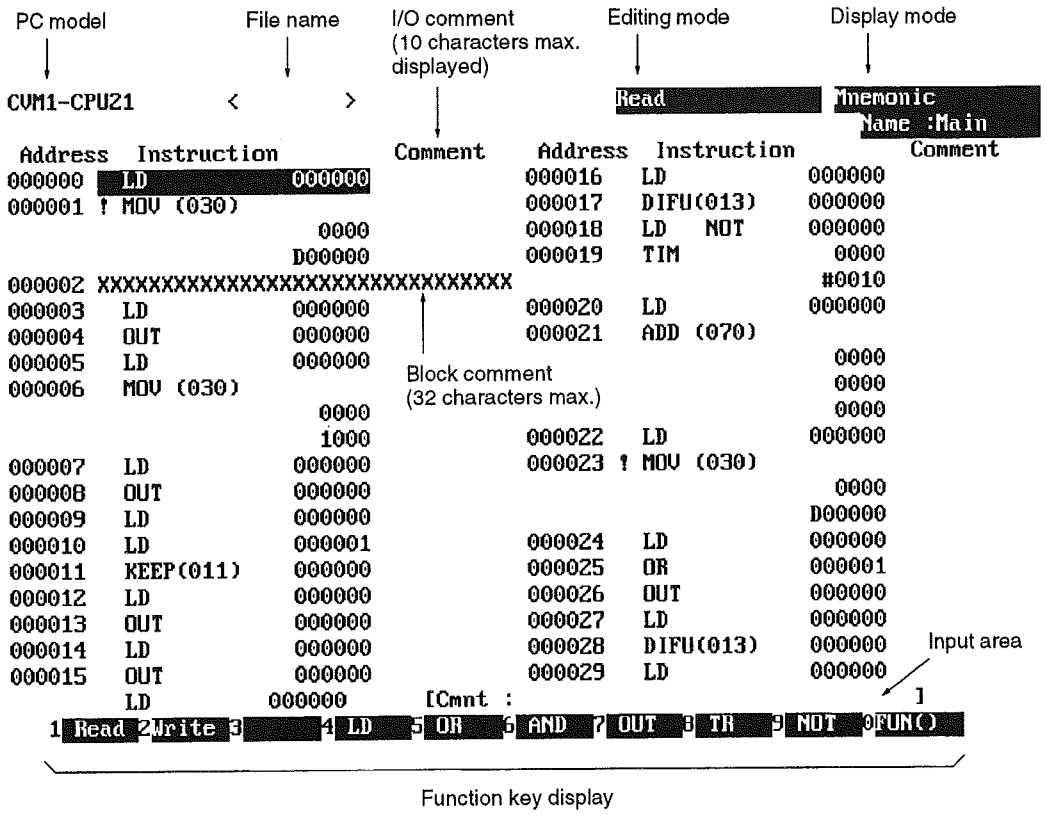
Preparations

The "PC model" setting in the System Setup must be set to the PC model for which the program is to be written. Check in advance to be sure that this setting is correct.

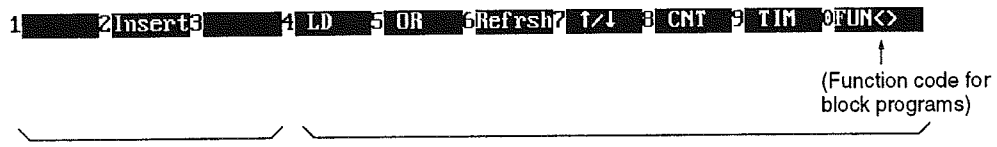
Use "C:Clear memory" to delete the contents of the memory before creating a new mnemonic program. Existing programs will be overwritten if not deleted before a new program is written.

3-8-2 Mnemonic Programming Screen

To access the mnemonic programming screen, select "N:Mnemonic" from the "H:Change display" menu. The following screen will appear, with the editing mode and the display mode displayed to the upper right.



Shift+Function Keys



The ten function keys at the bottom of the screen are changed when the Shift Key is pressed.

The editing mode (set by the function keys) will be displayed in the upper right part of the screen. The initial mode is the Read mode.

Up to 40 lines of read/write area can be displayed on a screen in mnemonic display. If the program exceeds 40 lines, it must go onto the next screen.

Moving the Cursor

Press the Up and Down Cursor Keys to move the cursor up and down the display. Press the PageUp and PageDown Keys to scroll to the previous page and the next page.

3-8-3 Entering Mnemonic Programs

Bit, timer, or counter addresses, and so on, are input after instructions.

Use the following procedure to input instructions with function codes. Mnemonic inputs can also be used.

1, 2, 3...

1. Press the F10 Key, or press the Shift Key and the F10 Key. Either FUN(???) or FUN<???> will be displayed.
2. Press the Enter Key or press Control+F. A list of instructions will be displayed.
3. Move the cursor to the instruction that is to be input, and press the Enter Key.
4. Input the required operands as described in this section.

⚠**Caution** Be sure to check any mnemonic program after storing it. Even if a mnemonic program is incorrect, no error will be generated and it will be stored as is.

Note For details regarding function codes, operands, and bit addresses, refer to the relevant CVM1-series manual.

Inputting Instructions in Mnemonic Form

The following table shows the key sequences for inputting instructions in mnemonic form, using either function keys or alphanumeric keys. All the instructions shown in the "Alphanumeric" column must be entered using alphanumeric keys. For example, "LD" must be entered using the "L" and "D" keys.

Instruction	Function keys	Alphanumeric
LD	**F4** *Bit_address* **Enter**	LD *Bit_address* **Enter**
OR	**F5** *Bit_address* **Enter**	OR *Bit_address* **Enter**
AND	**F6** *Bit_address* **Enter**	AND *Bit_address* **Enter**
LD NOT	**F4 F9** *Bit_address* **Enter**	LD NOT *Bit_address* **Enter**
OR NOT	**F5 F9** *Bit_address* **Enter**	OR NOT *Bit_address* **Enter**
AND NOT	**F6 F9** *Bit_address* **Enter**	AND NOT *Bit_address* **Enter**
OR LD	**F5 F4 Enter**	OR LD **Enter**
AND LD	**F6 F4 Enter**	AND LD **Enter**
OUT	**F7** *Bit_address* **Enter**	OUT *Bit_address* **Enter**
OUT NOT	**F7 F9** *Bit_address* **Enter**	OUT NOT *Bit_address* **Enter**
LD TR	**F4 F8** *Bit_address* **Enter**	LD TR *Bit address* **Enter**
OUT TR	**F7 F8** *Bit_address* **Enter**	OUT TR *Bit address* **Enter**
! LD	**F4 Shift+F6** *Bit_address* **Enter**	!LD *Bit address* **Enter**
! AND	**F6 Shift+F6** *Bit_address* **Enter**	!AND *Bit address* **Enter**
! OR	**F5 Shift+F6** *Bit_address* **Enter**	!OR *Bit address* **Enter**
! LD NOT	**F4 F9 Shift+F6** *Bit_address* **Enter**	!LD NOT *Bit address* **Enter**
! AND NOT	**F6 F9 Shift+F6** *Bit_address* **Enter**	!AND NOT *Bit address* **Enter**
LD ↑	**F4 Shift+F7** *Bit_address* **Enter**	LD **Shift+F7** *Bit address* **Enter**
AND ↑	**F6 Shift+F7** *Bit_address* **Enter**	AND **Shift+F7** *Bit address* **Enter**
OR ↑	**F5 Shift+F7** *Bit_address* **Enter**	OR **Shift+F7** *Bit address* **Enter**
LD ↓	**F4 Shift+F7 SHIFT+F7** *Bit_address* **Enter**	LD **Shift+F7 Shift+F7** *Bit address* **Enter**
AND ↓	**F6 Shift+F7 Shift+F7** *Bit_address* **Enter**	AND **Shift+F7 Shift+F7** *Bit address* **Enter**

Instruction	Function keys	Alphanumeric
OR ↓	**F5 Shift+F7 Shift+F7** *Bit_address* **Enter**	OR **Shift+F7 Shift+F7** *Bit address* **Enter**
!LD ↑	**F4 Shift+F6 Shift+F7** *Bit_address* **Enter**	!LD **Shift+F7** *Bit address* **Enter**
!AND ↑	**F6 Shift+F6 Shift+F7** *Bit_address* **Enter**	!AND **Shift+F7** *Bit address* **Enter**
!OR ↑	**F5 Shift+F6 Shift+F7** *Bit_address* **Enter**	!OR **Shift+F7** *Bit address* **Enter**
!LD ↓	**F4 Shift+F6 Shift+F7 Shift+F7** *Bit_address* **Enter**	!LD **Shift+F7 Shift+F7** *Bit address* **Enter**
!AND ↓	**F6 Shift+F6 Shift+F7 Shift+F7** *Bit_address* **Enter**	!AND **Shift+F7 Shift+F7** *Bit address* **Enter**
!OR ↓	**F5 Shift+F6 Shift+F7 Shift+F7** *Bit_address* **Enter**	!OR **Shift+F7 Shift+F7** *Bit address* **Enter**
!OUT	**F7 Shift+F6** *Bit_address* **Enter**	!OUT *Bit address* **Enter**
!OUT NOT	**F7 F9 Shift+F6** *Bit_address* **Enter**	!OUT NOT *Bit address* **Enter**
TIM (See note 1.)	**Shift+F9** *Timer_number* **Enter** *SV* **Enter**	TIM *Timer_number* # *SV* **Enter**
CNT (See note 1.)	**Shift+F8** *Counter_number* **Enter** *SV* **Enter**	CNT *Counter_number* # *SV* **Enter**
Instruction with function code (See note 2.)	**F10** *Function_code* **Enter** *(Operand)* **Enter**	*Mnemonic* (*Operand Operand Operand*) **Enter**
Differentiated up instruction (See note 2.)	**F10** *Function_code* **Shift+F7 Enter** *(Operand)* **Enter**	FUN **Shift+F7** *Operand* **Enter**
Differentiated down instruction (See note 2.)	**F10** *Function_code* **Shift+F7 Shift+F7** *(Operand)* **Enter**	FUN **Shift+F7 Shift+F7** *Operand* **Enter**
Immediate refresh instructions (See note 2.)	**F10** *Function_code* **Shift+F6** *(Operand)* **Enter**	!FUN *Operand* **Enter**
Block program instruction (with <>)	**Shift+F10** *Function_code* *(Operand)* **Enter**	*Mnemonic* (*Operand* **Enter** *Operand* **Enter** *Operand*) **Enter**

If the wrong function code is entered, press the F10 Key again and reenter the function code. When using the alphanumeric keys, input the instruction's operands all on one line. Use the Space Key to separate the mnemonic from operands, and operands from other operands.

Note

1. To input a set value (SV) from an external device, press Control+F7 to change to the word address input display and input the address of an input word for the SV.

2. Leading digits of function codes can be omitted. For all of the following instructions, input the operands before pressing the Enter Key:

   TIM, CNT, JMP, JME, FAL, FALS, SNXT, KEEP, CNTR, DIFU, DIFD, TIMH, SET, RSET, TTIM, TCNT, SBN, SBS, MSKS, CLI, MSKR, EMBC, MARK, MSG, SA, SP, SR, SF, SE, SOFF, MCRO, WDT, CJP, CJPN, BPRG, BPPS, BPRS, TIMW, CNTW, TMHW

Inputting Addresses and Data in Mnemonic Form

The following tables show how to input bit and word address and data in mnemonic form, using both function keys and alphanumeric keys. It is not necessary to input leading digits for addresses and numerals. If the wrong address is entered, press the Home Key and then reenter the address. Use these tables in conjunction with the preceding table.

Function Key Input

Data area	Bit address input	Word address input	Ladder diagram display
CIO	*Bit_address*	*Word_address*	I (Input) Q (Output) (See note 1.)
Auxiliary	**Ctrl+F1** *Bit_address*	**Ctrl+F1** *Word_address*	A
CPU Bus Link	**Ctrl+F2** *Bit_address*	**Ctrl+F2** *Word_address*	G
DM	—	**Ctrl+F4** *DM_address*	D
Indirect DM addresses	—	**Ctrl+F8** *DM_address*	*D
EM	—	**Shift+Ctrl+F4** *EM_address*	E
Indirect EM address	—	**Shift+Ctrl+F8** *EM_address*	*E
Timer	**Ctrl+F6** *Timer_number*	**Ctrl+F6** *Timer_number*	T
Counter	**Ctrl+F5** *Counter_number*	**Ctrl+F5** *Counter_number*	C
Constant (See note 2.)	—	**Ctrl+F10** *Value*	#

Alphanumeric Input

Data area	Bit address input	Word address input	Ladder diagram display
CIO	*Bit_address*	*Word_address*	—
Auxiliary	A *Bit_address*	A *Word_address*	A
CPU Bus Link	G *Bit_address*	G *Word_address*	G
DM	—	D *Word_address*	D
Indirect DM address	—	**Shift+*** D *Word_address*	*D
EM	—	E *EM_address*	E
Indirect EM	—	**Shift+*** *EM_address*	*E
Timer	T *Timer_number*	T *Timer_number*	T
Counter	C *Counter_number*	C *Counter_number*	C
Constant (See note 2.)	—	**Shift+#** *Value*	#
Data Register	—	DR *Value*	DR
Index Register	—	IR *Value*	IR

Note

1. Q is displayed after I/O table editing has been carried out.
2. For information on inputting BCD with and without a sign, refer to *3-2-4 Entering Bit/Word Address and Data.*

Examples: Inputting Instructions

Input instructions with the alphabet keys (A to Z) and numerical keys (0 to 9). Instructions are always displayed in all capital letters. Input instructions on a single line, including all operands. When inputting an instruction, use the Space Key to separate the mnemonic from operands and operands from operands.

LD 201 **Enter**	LD 000201
OR NOT T24 **Enter**	OR NOT T0024
TIM 1 **Shift+#** 100 **Enter**	TIM 001 #0100

MOV A1 5 **Enter**	MOV(030) A001 0005
MOV **Shift+F7** 10 6 **Enter**	↑MOV(030) 0010 0006
IF 1 **Enter**	IF<002> 000001

Correcting Inputs

Use the following keys to edit previously input characters.

Key	Function
Cursor	Move the cursor left and right along the input area.
Backspace	Deletes the character to the left of the cursor.
Delete	Deletes the character at the cursor position.
Insert	Inserts a space at the cursor position.
Home	Deletes all characters in the character input area.

3-8-4 Writing Mnemonic Programs

Programs can be input in mnemonic form either by using function keys or by using alphanumeric inputs.

When a program is written in mnemonic form, it is automatically written to the system work area. Be sure to execute "P:Check program" to check the program after it has been written, because no program errors will be detected while inputting if the mnemonic program is incorrect.

Procedure

1, 2, 3...

1. Select "H:Change display" from the Programming Menu.
2. Select "N:Mnemonic." "Mnemonic" will be displayed in the upper right part of the screen.
3. Press the F2 Key to go into the Write mode. "Write" will be displayed in the upper right part of the screen.
4. Move the cursor to the program address that is to be written.
5. Input the instruction using either function keys or alphanumeric keys, and the press the Enter Key.
6. The instruction that was input will be written at the cursor position, and the cursor will move to the next position.

3-8-5 Correcting Mnemonic Programs

There are basically two ways to edit a mnemonic program:

Changing instructions	Write mode
Inserting instructions	Insert mode

It is not necessary to store a program after it is edited in the mnemonic display mode. The edited program will be automatically stored in the system work area. Always use the "P:Check program" operation to avoid storing incorrect programs.

The following program editing operations can be carried out with ladder programming as well.

Adding or deleting NOT instructions.

Changing data areas

Changing bit addresses

Procedure

1, 2, 3...

1. Select "H:Change display" from the Programming Menu.
2. Select either "N:Mnemonic" from the "H:Change display" menu. "Mnemonic" will be displayed in the upper right part of the screen.
3. To change or delete instructions, press the F2 Key to go into the Write mode. To insert instructions, press Shift+F2 to go into the Insert mode. The mode will be displayed in the upper right part of the screen.

4. Move the cursor to the position of the instruction that is to be edited. Instructions cannot be inserted, deleted, or changed with the cursor positioned at an operand.
5. If changing or inserting the instruction, press the function key for the new instruction or input the instruction using the alphanumeric keys, and then press the Enter Key.

   If deleting the instruction, press the Space Key. To delete the character to the left of the cursor, press the Backspace Key.

   The instruction that has been input or changed will be written at the cursor position, and the cursor will move to the next position.

Inserting and Deleting Instructions

When an instruction is input, the previously existing instructions in the program will be moved down and the cursor will move to the original position.

Move the cursor to the instruction column to insert or delete an instruction. Instructions cannot be inserted or deleted when the cursor is at an operand.

There are instructions that cannot be used in block programming sections. For details, refer to the operation manual for the PC.

Correcting Operands

1, 2, 3...

1. Move the cursor to the position of the operand that is to be changed.
2. Input the new operand using either alphanumeric keys or function keys and alphanumeric keys.

   Alphanumeric keys (change to D00000): D00000 **Enter**
   Function keys + alphanumeric (change to D00000): **Ctrl+F4** 00000 **Enter**

3-8-6 Searching and Reading Mnemonic Programs

Specified contents of a mnemonic program in the system work area can be found and displayed on the screen. Most searching and reading operations for mnemonic programs can be carried out in the Read mode only. Searches for program addresses, however, are also possible in the Write and Insert modes.

The following items can be found and displayed on the screen:

- Program addresses
- Basic instructions
- Bit operands
- Instructions with function codes
- Instructions with specific operands (string searches)
- Operands
- Block comments

When a specified instruction is found, up to 40 lines can be displayed on the screen. Use the PageUp and PageDown Keys to scroll to the screens before and after the instruction that is found. To return to the last screen that was found, press the Tab Key.

If there is an END instruction in the program before the address that is the object of the search, the search will stop when that END instruction is reached. To continue the search, press the Enter Key.

When the search is completed, a "No END instruction" message will be displayed. Press the Enter Key. A message will indicate when the final page has been reached. To search again for the same item, again press the Enter Key. The search will begin from program address 000000. To search for a different item, repeat the procedure from the beginning.

The search operation can be aborted at any time by pressing the Escape Key.

Reading Mnemonic Programs

The following table summarizes the methods for searching and reading mnemonic programs. The specified instruction will be displayed at the top line of 40 lines of programming.

Operation	Key sequence	Description
Reading a specified program address	**Escape** *Address* **Enter**	The Escape Key clears the 23rd line of the display. It is not necessary to input leading zeros, e.g., input address 000000 as 0. In mnemonic input mode, specified addresses can be read even in write and insert modes.
Finding a basic instruction	**F4** to **F7** (**F9**) *Bit_address* **Enter** or Press **F4** or **F7**, followed by **F8 Enter**.	To input a TIM/CNT number, press Ctrl+F6 or Ctrl+F5 in place of the bit address. It is not necessary to input leading zeros for bit addresses.
Searching for bit operands	**Ctrl+F9** *Bit_address* **Enter**	Searches for all instructions using a specified bit address. It is not necessary to input leading zeros. While the search is in progress, "000000" is displayed at the bottom of the screen.
Finding an instruction from its function code	Instructions executed every cycle: **F10** *Function_code (operand)* **Enter** Differentiate up and down instructions and immediate refresh instructions **F10** *Function_code* (**Shift+F7** or **Shift+F7 Shift+F7** and/or **Shift+F6**) (*Operand*) **Enter** Block program instructions (with < >) **Shift+F10** *Function_code (Operand)* (F9) **Enter**	Leading zeros of function codes may be omitted. For the following instructions, input the operand(s) before pressing the Enter Key: TIM, CNT, JMP, JME, FAL, FALS, SNXT, KEEP, CNTR, DIFU, DIFD, TIMH, SET, RSET, TTIM, TCNT, SBN, SBS, MSKS, CLI, MSKR, EMBC, MARK, MSG, SA, SP, SR, SF, SE, SOFF, MCRO, WDT, CJP, CJPN, BPRG, BPPS, BPRS, TIMW, CNTW, TMHW. The following method can be used for non-differentiated instructions. While the prompt FUN(???) or FUN<???> is displayed, press the Enter Key or the Control+F Keys to display a table of instructions. Select the required instruction with the cursor and press the Enter Key. The selected instruction will be displayed at the bottom of the screen. Press the Enter Key to start the search.
Finding instructions containing operands	String searches: *Mnemonic Operand* **Enter** Search from menu: Input steps 1 through 3 in order. (1) **End** (2) **K** (3) *Mnemonic Operand* **Enter**	When executing a string search, use alphanumeric keys to input mnemonics and operands. Use the Space Key to separate mnemonics from operands, and operands from other operands. If omitting the operand, input a question mark in its place. (Example: MOV ? 0) When searching from the menu, input steps 1 through 3 in order, as shown on the left. The method for inputting step 3 is the same as for alphanumeric input.
Finding instructions by means of operands	*Operand* **Enter**	Bit or word addresses can be designated as operands. Leading zeros must be input for bit addresses. Only one operand can be specified.

Finding Block Comments The procedure for searching for block comments in a mnemonic program is the same as for a ladder program.

1, 2, 3...

1. Select "H:Change display" from the Programming Menu.
2. Select either "N:Mnemonic" from the "H:Change display" menu. "Mnemonic" will be displayed in the upper right part of the screen.

3. If not already in Read mode, press the F1 Key to go into Read mode. "Read" will then be displayed in the upper right part of the screen.
4. Input the contents of the search and then press the Enter Key. The search will begin from program address 000000, and the name of the item being searched for will flash while the search is in progress. When the object of the search is found, 40 lines of the program will be displayed beginning with item that was found.
5. To continue searching the program for the same item, press the Enter Key. If the same item is found again, it will be displayed. When the end of the program is reached, a message will be displayed indicating that that is the last page.

SECTION 4
Editing DM

This section explains the various commands within the DM Menu, which operate on both DM. These operations are used to enter data to the DM Area as 4-digit hexadecimal or ASCII, to save and retrieve the contents of the DM Area to and from a data disk, and to print a memory map of the DM contents.

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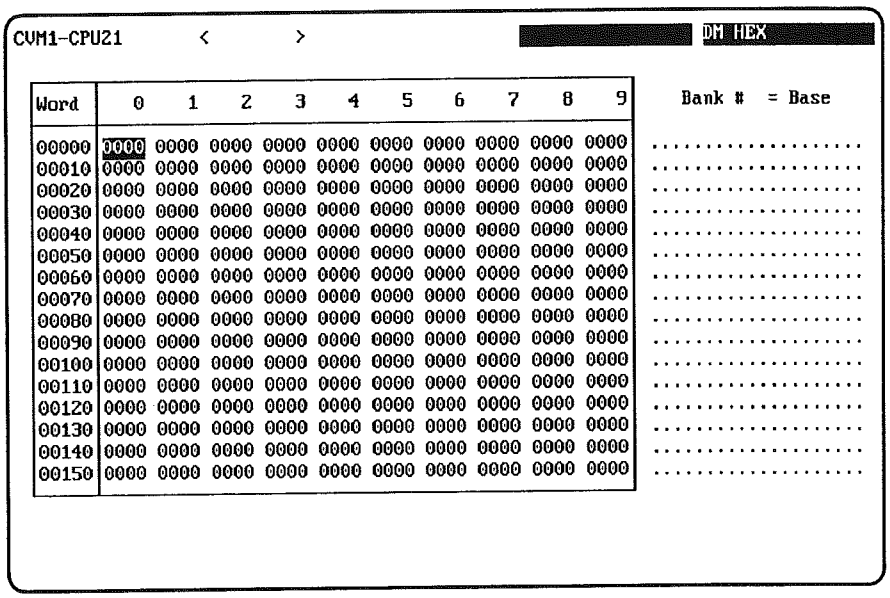
4-1 Introduction

The operations in the offline DM Menu operate on the contents of the DM Area.

DM Display

The DM display appears first when "DM" is selected from the top-level offline menu. This display shows the contents of the DM area in 160-word pages, as shown below. Data is displayed in both hexadecimal and ASCII form.

Use the PageUp and PageDown Keys to scroll through the DM and the Cursor Keys to move between words.



Note The effective DM area capacity on the system work area is 24,575 words for the DM Area and 32,765 words for each of the eight EM banks.

The EM Area is not available with the following PCs.

CVM1-CPU01-E, CVM1-CPU11-E

Edit each EM bank separately and save them to disk separately.

4-2 Reading/Writing DM Data

Reading Data

DM data is displayed in 160-word pages. Page 1 is displayed automatically when DM is selected from the top-level offline menu. A specific DM word can be displayed by selecting "D:Read DM addr" from the DM Menu. Refer to *4-3-3 Reading a DM Addresses* for details.

You can navigate through the pages of DM data by pressing the PageUp and PageDown Keys to display the previous and next pages of data. Press the Cursor Keys to move the cursor within a page.

Writing Data

Follow the procedure below to change DM data in the system work area. (Data is written to the system work area automatically. It isn't necessary to perform a Store operation.)

The default input mode is hexadecimal. You can switch to ASCII mode by pressing the End Key and selecting HEX ↔ ASCII from the DM Menu. In both modes, use the PageUp and PageDown Keys to go to the preceding or following page and use the Cursor Keys to go to specific words for writing and editing data.

1, 2, 3...

1. Use PageUp and PageDown to move the cursor to the desired DM word.

   It is also possible to display a specific word by pressing the End Key, selecting "D:Read DM addr" from the DM Menu, and inputting the DM address.

2. Input the data and press Enter. The data will be displayed in the selected word and the corresponding ASCII code will be simultaneously displayed in the ASCII display at the right of the screen.

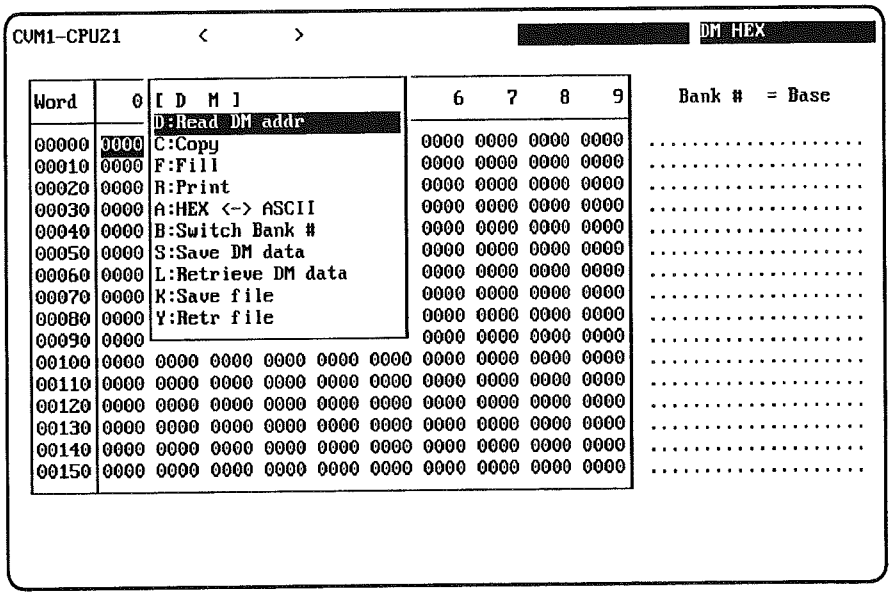
If a mistake is made while inputting, clear the input display by pressing Escape.

To change existing data, move the cursor to the desired word address, re-input and press Enter.

4-3 DM Menu Operations

4-3-1 DM Menu

Press the End Key to display the DM Menu, shown below.



The following table lists the operations that can be selected from the DM Menu. Select an operation by pressing its corresponding letter or moving the cursor to the operation and pressing Enter. These operations are described briefly in the following table and in more detail in later sections.

Operation	Function
D:Read DM addr	Displays the 160-word page of DM data that includes the specified DM address from the system work area.
C:Copy	Copies multiple, consecutive words of DM data to a specified destination DM address.
F:FILL	Places a specified value into multiple, consecutive words of the DM area. Filling with 0000 clears the DM words.
R:Print	Prints multiple, consecutive words of DM data.
A:HEX ↔ ASCII	Sets input to hexadecimal or ASCII. The mode set will be displayed in the top-right of the screen.
B:Switch Bank #	Switches editing between the standard DM and EM banks.
S:Save DM data	Saves the DM data from the system work area to the data disk.
L:Retrieve DM data	Retrieves the DM data on the data disk to the system work area.

Operation	Function
K:Save file	Saves the DM data from the system work area to the data disk as file data (with IOM suffix).
Y:Retr file	Retrieves the file data (with IOM suffix) on the data disk to the system work area. Retrieved file data can be edited in the same way as DM data. File data stored with the suffix IOM (data transferred to disk from a Memory Card or data saved with "K:Save file") can be retrieved.

4-3-2 HEX ↔ ASCII

This command switches the DM data input between hexadecimal and ASCII.

1, 2, 3...

1. Press the End Key while the DM display is on-screen.
2. Select "A:HEX ↔ ASCII" from the DM Menu to switch DM data input between hexadecimal and ASCII. The input mode changes each time this item is selected. The current input mode will be displayed at the top-right of the screen.

   Input 4-digit hexadecimal value when HEX is displayed.

   Input ASCII when ASCII is displayed.

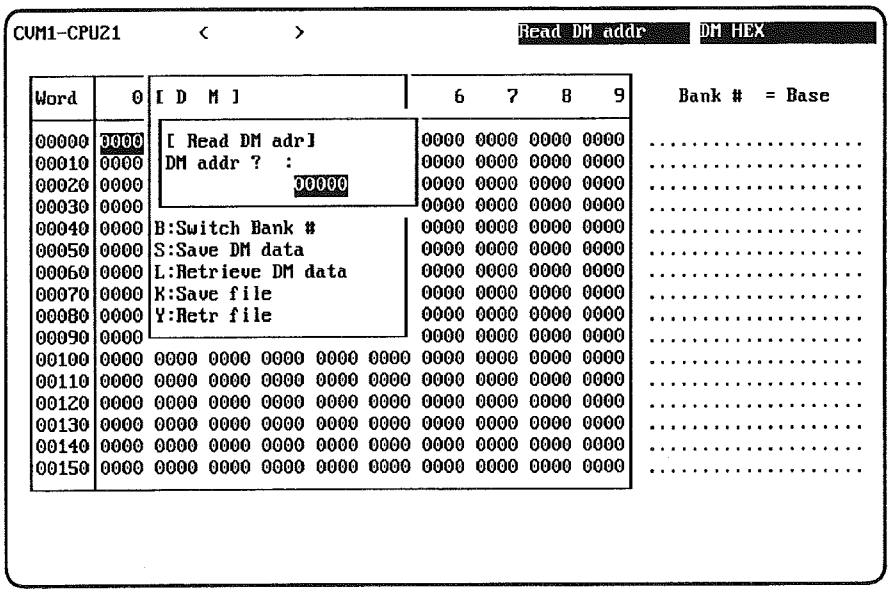
ASCII Table

Right digit	Left digit						
	2	3	4	5	6	7	0, 1, 8 to F
0	Space		@	P	‘	p	Not used.
1	!	1	A	Q	a	q	
2	”	2	B	R	b	r	
3	#	3	C	S	c	s	
4	$	4	D	T	d	t	
5	%	5	E	U	e	u	
6	&	6	F	V	f	v	
7	’	7	G	W	g	w	
8	(	8	H	X	h	x	
9	)	9	I	Y	i	y	
A	*	:	J	Z	j	z	
B	+	;	K	[	k	{	
C	,	<	L	\	l	|	
D	-	=	M	]	m	}	
E	.	>	N	^	n	~	
F	/	?	O	_	o		

4-3-3 Reading a DM Address

The "D:Read DM addr" operation displays the 160-word page of data that contains the specified address. Refer *4-2 Reading/Writing DM Data* for details on reading and writing DM data in the DM display.

1, 2, 3... 1. Select "D:Read DM addr" from the DM Menu.

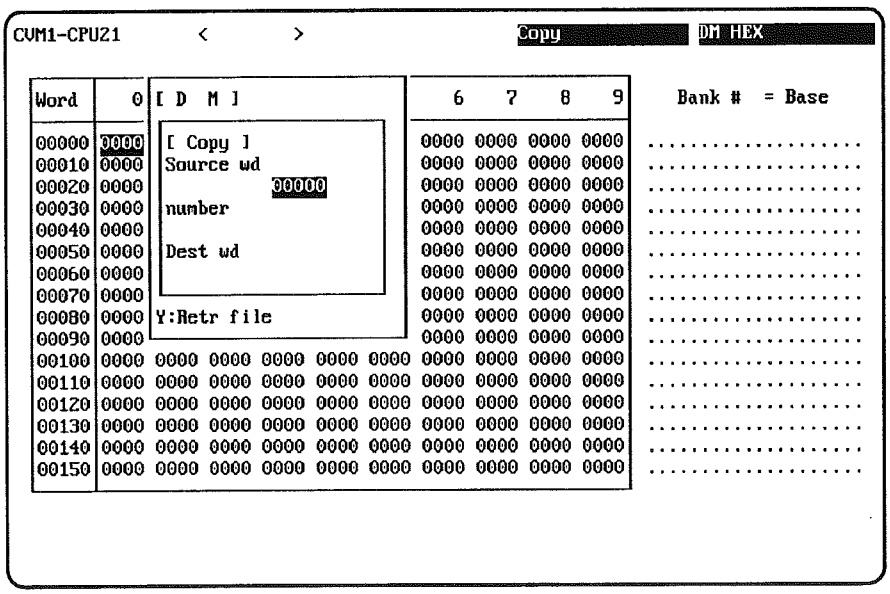


2. Input the desired DM address and press Enter. The DM display will show the 160 words of DM data beginning with the specified address.

4-3-4 Copying

This command copies data to and from specified words.

1, 2, 3... 1. Select "C:Copy" from the DM Menu.



2. Enter the starting source address, the number of words to copy, and starting destination address and press Enter.

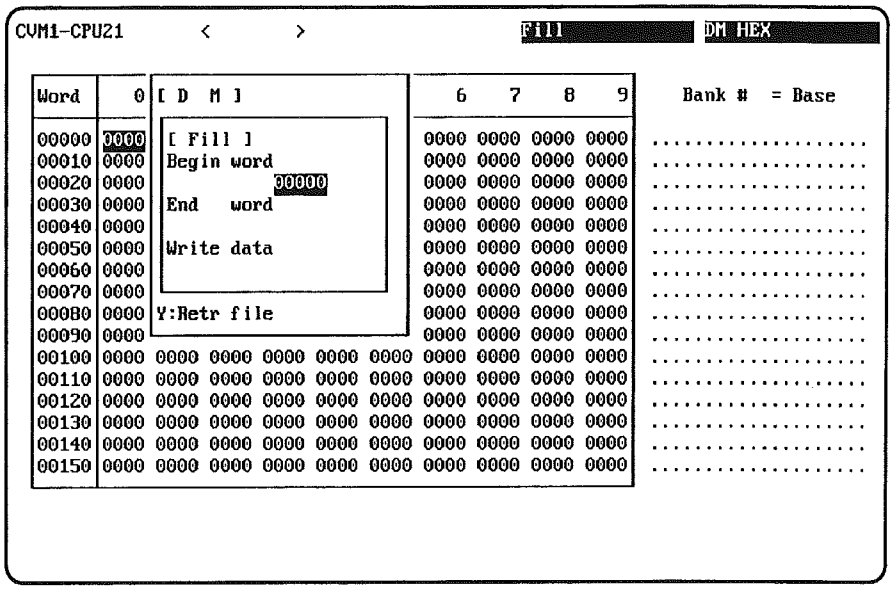
   The specified number of DM words from the starting source address will be copied to the words beginning with the starting destination address.

   Make sure that the source and destination words do not overlap.

4-3-5 FILL

This command writes the same data to a specified range of DM words.

1, 2, 3... 1. Select "F:Fill" from the DM Menu.



2. Enter the start address, the end address, and fill data and press the Enter Key. Input the fill data in hexadecimal. It is not necessary to input the leading zeros.

   The specified fill data will be copied to every word from the specified start address to the end address.

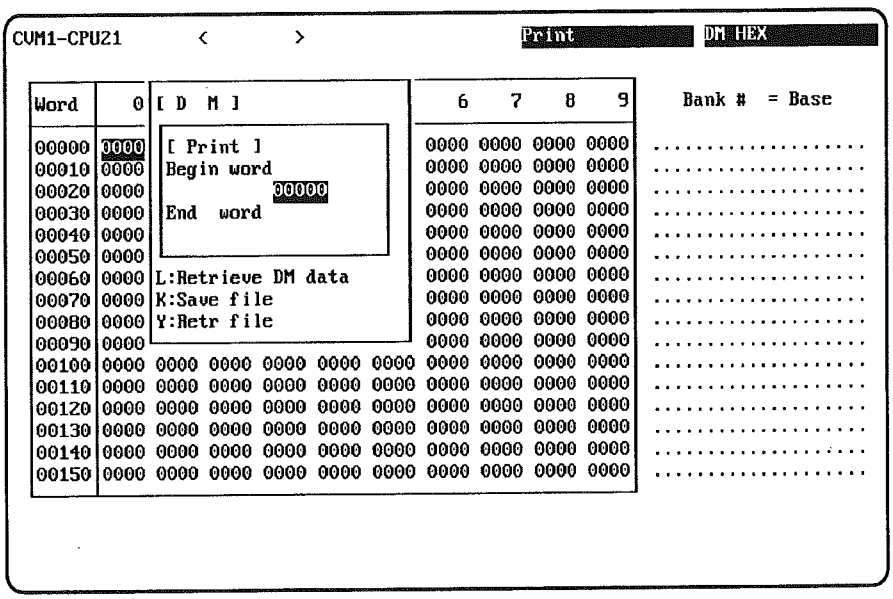
Clearing DM The initial values when "F:Fill" is selected are 00000 for the start address, 24575 for the end address (32765 when editing the EM Area), and 0000 for the fill data. Leave these settings unchanged and press Enter three times to clear the entire area.

4-3-6 Printing

This command prints the contents of a specified range of DM words.

1, 2, 3... 1. Verify that the computer is connected to a printer and the printer is on-line.

2. Select "R:Print" from the DM Menu.



3. Enter the starting address and the end address then press Enter.
4. Press Enter to start printing.

   The initial values are 00000 for the start address and 24575 for the end address (32765 when editing the EM Area). Leave these settings unchanged and press the Enter Key twice to print the entire contents of the area.

   A message will be displayed during the printing operation and will disappear when printing is complete.
5. Press the Escape Key to cancel printing and return to the main menu.

   All characters in the printer's buffer will be printed before printing stops.

Sample Print-out

< < < DM List > > > 05/12/94 PAGE = 001

Wd	0	1	2	3	4	5	6	7	8	9	ASCII Disp
00000	0765	0654	0543	0432	0321	1234	2345	3456	4567	5678	.e .T .C .2 .! .4 #E 4V Eg Vx
00010	6789	7890	8901	9012	9887	0005	0017	0118	0019	0010	g. x. .. ..
00020	0021	0022	0023	0034	0045	0056	0067	0078	0000	9098	.! ." .# .4 .E .V .g .x .. ..
00030	0006	000A	00AB	0E32	05E6	0000	006E	7896	0000	0067	.. .. .½ .2 .^ .. .n x. .. .g
00040	00E2	45A4	00E5	0045	045E	0000	0067	0005	0653	0007	.. Eñ .. .E .. .g .. .S ..
00050	6356	075E	0006	45A3	0056	000E	5478	000D	0006	0005	cV . ¯ .. Eú .V .. Tx .. .. ..
00060	0045	0006	0045	0056	4E5D	0005	6778	0869	0090	0000	.E .. .E .V N] .. gx .i .. ..
00070	000F	0045	2341	0A3E	A34E	0054	0006	0057	0007	0089	.. .E #A .> úN .T .. .W .. ..
00080	0000	0090	0000	0078	0667	004E	0005	0E34	0005	3A45	.. .. .. .x .g .N .. .4 .. :E
00090	0043	0000	0005	0054	0456	3373	5647	4679	0476	05E7	.C .. .. .T .V 3s VG Fy .v ..
00100	000A	000B	000C	000D	000E	000F	0000	0000	0000	0000	.. ..
00110	0011	0012	0023	0034	0045	0056	0067	0078	0089	0090	.. .. .# .4 .E .V .g .x .. ..
00120	0021	0032	0043	0054	0065	0076	0087	0098	0009	0123	.! .2 .C .T .e .v .. ..#
00130	0234	0345	0456	0567	0678	0789	0890	0098	0987	0876	.4 .E .V .g .x v
00140	0765	0654	0543	0432	0321	0210	0109	0001	ADE5	0036	.e .T .C .2 .! .. .. .. ¡. .6
00150	003E	0046	68ED	42CD	023A	245C	6745	021A	0000	000A	.> .F h. B= .: $\ gE .. .. ..

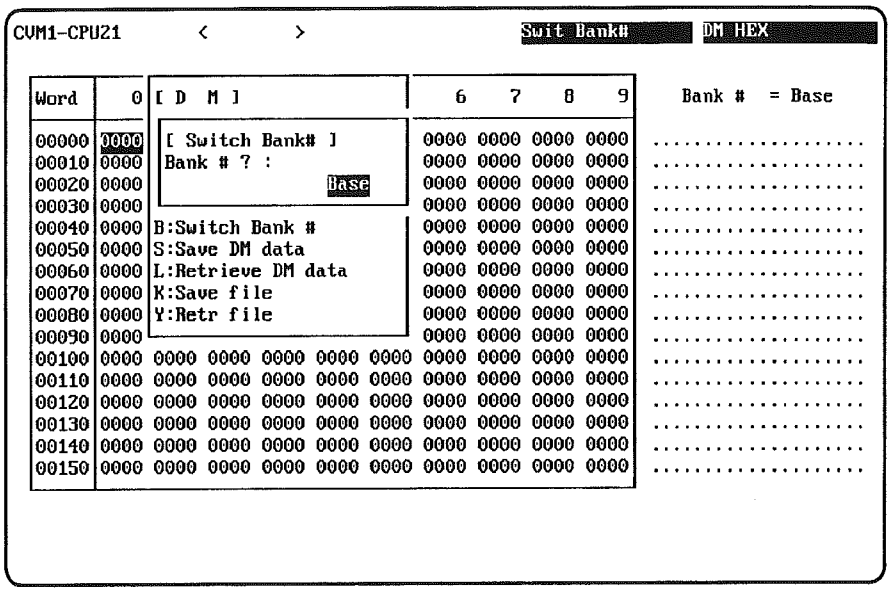
4-3-7 Switching Memory Banks

This operation selects the DM Area or an EM bank that will be displayed for editing. The DM Area will be displayed first. EM banks run from 0 to 7.

The EM Area is not available with the following PCs.

CVM1-CPU01-E, CVM1-CPU11-E

1, 2, 3... 1. Select "B:Switch Bank #" from the DM Menu.



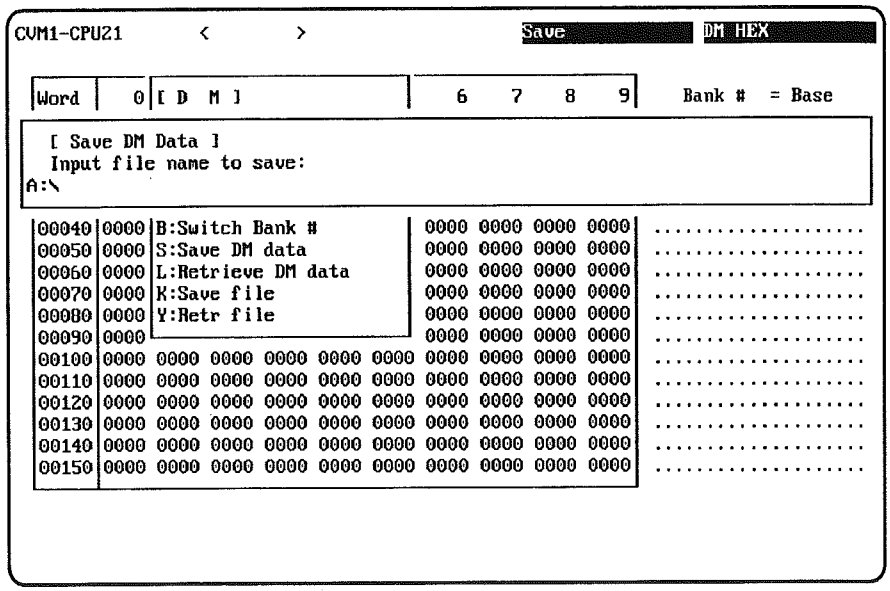
2. Enter the desired EM bank number (0 to 7) to select an EM bank. Enter "B" to select the DM Area. The selected bank number will be displayed in the upper-right corner of the display.

   Only a single EM bank can be edited at one time. To edit more than one bank, save each edited EM bank to a data disk before editing the next EM bank.

4-3-8 Saving DM Data

This command saves the DM data from the system work area to a data disk. Only one EM bank can be saved at a time.

1, 2, 3... 1. Select "S:Save DM data" from the DM Menu.



2. Enter the file name press the Enter Key.

   A directory of files on the disk can be displayed by pressing the End Key. To select a file from the directory, move the cursor to the desired file and press Enter.

3. A confirmation prompt will be displayed if the selected file already exists. Enter "Y" to overwrite the file, "N" to return to the file name input display.

   The title input area will appear when Enter is pressed.

4. Input the title and press the Enter Key.

   The title can be up to 30 characters long.

   Just press the Enter Key to skip the title input.

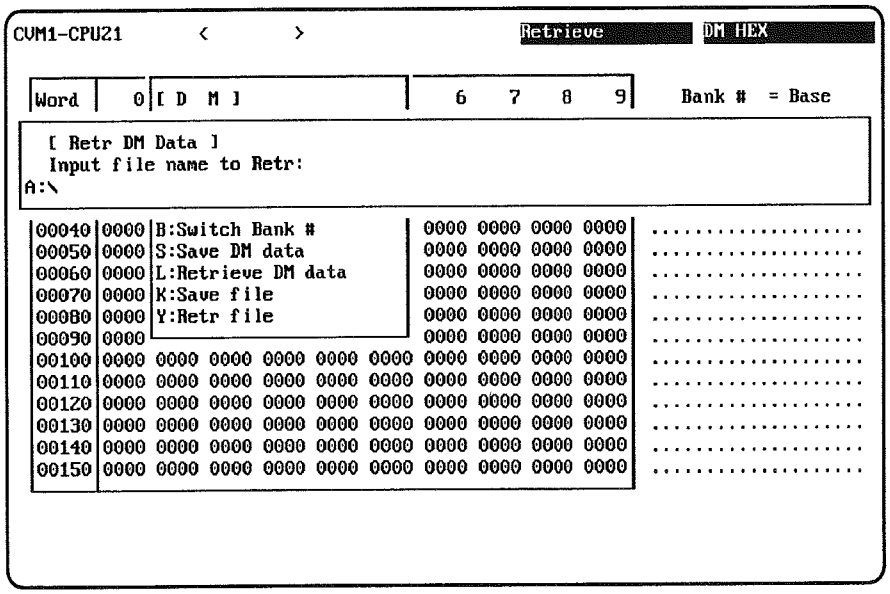
5. Press Enter to save the DM data. The DM screen will be displayed after the DM data is saved.

4-3-9 Retrieving DM Data

This command retrieves DM or EM data from a data disk to the system work area.

1, 2, 3...

1. When using a floppy disk, insert the disk containing the DM data in the drive.
2. Select "L:Retrieve DM data" from the DM Menu.



3. Press the End Key to display the directory of file names.
4. Select the desired file name with the cursor and press Enter.

   The file name will be displayed.

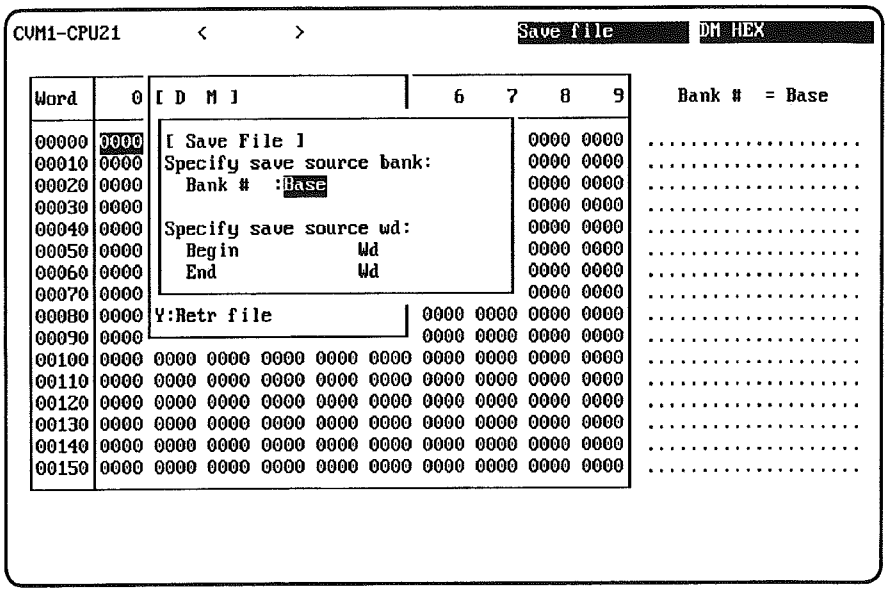
5. Press Enter to retrieve the DM data.

   The DM screen will be displayed after the DM data is retrieved.

4-3-10 Saving File Data

This command saves DM data as a DOS file (with a .IOM extension) to a data disk.

1, 2, 3... 1. Select "K:Save file" from the DM Menu. The following display will appear.



2. If you want to save DM Area data, just press Enter. If you want to save EM data, enter the desired bank number (0 to 7) and press Enter.
3. Enter the starting address and end address of the range of addresses you want to save and press Enter.
4. Enter the file name and press Enter.

   A directory of files on the disk can be displayed by pressing the End Key. To select a file from the directory, move the cursor to the desired file and press Enter.
5. A confirmation prompt will be displayed if the selected file already exists. Enter "Y" to overwrite the file, "N" to return to the file name input display.
6. Press Enter to save the file data.

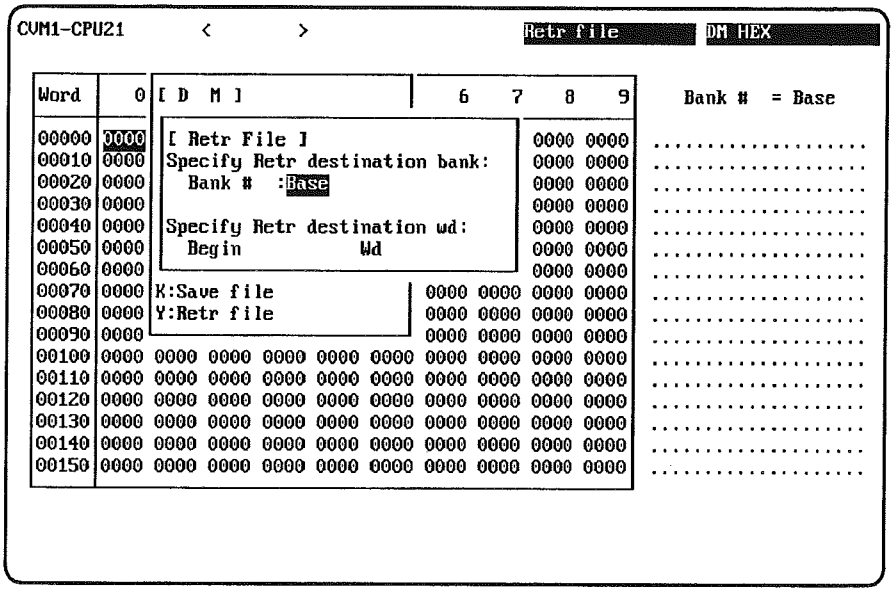
   The DM screen will be displayed after the DM data is saved.

4-3-11 Retrieving File Data

This command retrieves DM data from DOS files (with a .IOM extension) on a data disk.

1, 2, 3... 1. When using a floppy disk, insert the disk containing the saved file data in the drive.

2. Select "Y:Retr file" from the DM Menu. The following display will appear.



3. If you want to retrieve DM Area data, just press Enter. If you want to retrieve EM data, enter the desired bank number (0 to 7) and press Enter.
4. Enter the starting address of the data you want to retrieve and press Enter.
5. Enter the file name and press Enter.

   A directory of files on the disk can be displayed by pressing the End Key. To select a file from the directory, move the cursor to the desired file and press Enter.
6. A confirmation prompt will be displayed if the selected file already exists. Enter "Y" to overwrite the file, "N" to return to the file name input display.
7. Press Enter to retrieve the file data. An error message will be displayed if the file being read isn't within the starting and end addresses. The DM screen will be displayed after the DM data is retrieved.

SECTION 5
Editing I/O Tables

This section explains the various commands on the offline I/O Table Menu. These operations can be used to create and edit the I/O table at the computer and store it in the system work area, to check that the I/O table is correct, to save and retrieve the contents of the I/O table to and from a data disk, and to print the contents of the I/O table.

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5-1 Introduction

The I/O table lists the Units connected to the PC; the PC references the I/O table to allocate I/O words and control the Units during operation. The operations in the I/O Table Menu can be used to create and edit the I/O table at the computer and store it in the system work area, to check that the I/O table is correct, to save and retrieve the contents of the I/O table to and from a data disk, and to set the parameters in the PC Setup that relate to the I/O table.

If Units aren't mounted to the PC, use the offline "W:Write I/O table" operation to create the I/O table and transfer it online. Use the online "C:Create I/O Table" operation if the Units are mounted to the PC to automatically write the I/O table.

Up to eight C-series Special I/O Units can be mounted to each of the Basic Racks (the CPU Rack and Expansion I/O Racks) in a normal system. If a single Expansion Rack is connected directly to a CPU Rack, a total of eight C-series Special I/O Units can be mounted to both Racks.

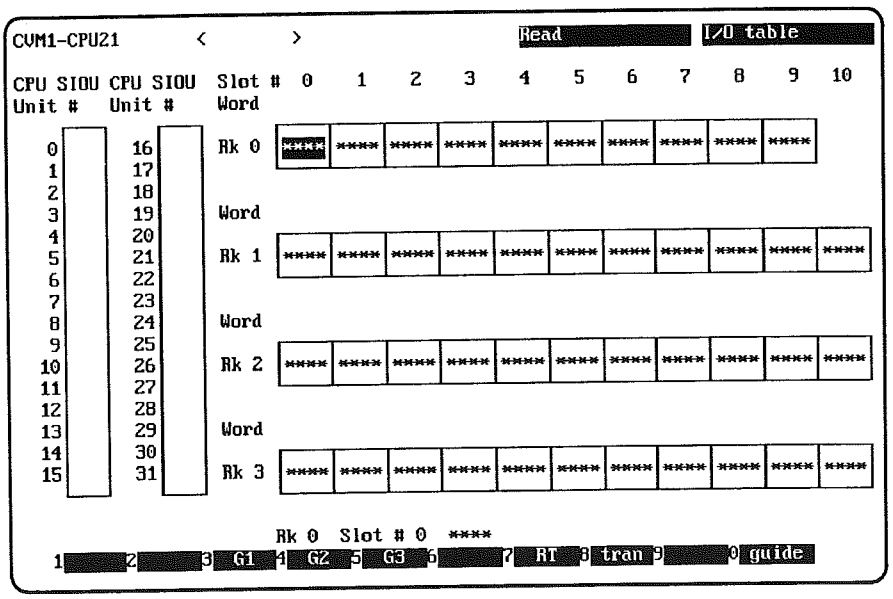
To delete I/O table data, move the cursor to the entry to be deleted and press the Home Key followed by the Enter Key.

⚠Caution When you have finished inputting or changing an I/O table, you must press Shift + F10 followed by Enter to save the changes. If you do not perform this operation (e.g., if you exit the operation using the Escape Key), none of the inputs or changes that have been made will be saved.

5-1-1 I/O Table Display

The I/O table display appears automatically when "I/O Table" is selected from the top-level offline menu; it shows the I/O table settings for the CPU Rack and Racks connected by I/O Interface Units. Rack 0 indicates the CPU Rack and Racks 1 through 7 indicate Expansion I/O Racks. (Rack numbers 1 through 7 are set on the Expansion I/O Rack's I/O Interface Unit.)

If a single Expansion I/O Rack is connected directly without an I/O Interface Unit, the CPU Rack is Rack #0 and the Expansion I/O Rack is Rack #1.



Use the Cursor Keys to move the cursor incrementally. Use the PageUp and PageDown Keys to page up and down through the I/O table display.

Press the Shift+Left Cursor Key to move from the Basic Racks section on the right side of the display to the CPU Bus Units section on the left side of the display. Press the Shift+Right Cursor Key to move back to the Basic Racks section.

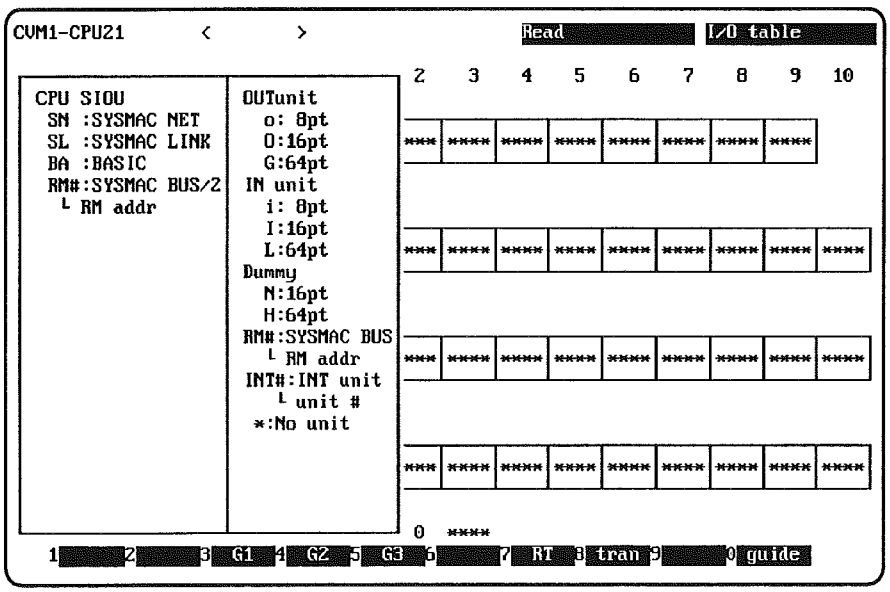
Master Units

When the cursor is moved to a slot containing a Master (RM), the I/O table data for each Slave connected to a Master can be edited by pressing the function key corresponding to the type of Slave connected to the Master. The following table shows the function of each function key when the cursor is at a Master slot.

Key	Display	Function
F3	G1	Displays group-1 Slaves connected to a SYSMAC BUS/2 Master.
F4	G2	Displays group-2 Slaves connected to a SYSMAC BUS/2 Master.
F5	G3	Displays group-3 Slaves (Slave Rack) connected to a SYSMAC BUS/2 Master.
F7	RT	Displays Slave Racks connected to a SYSMAC BUS Master
F8	tran	Displays the I/O Terminals, Optical I/O Units, and I/O Link Units connected to a SYSMAC BUS Master
F10	guide	Displays a key to the symbols used to display the I/O table.
Esc	Basic Racks	Press the Escape Key after any of the above function keys to return to the Basic Rack screen.

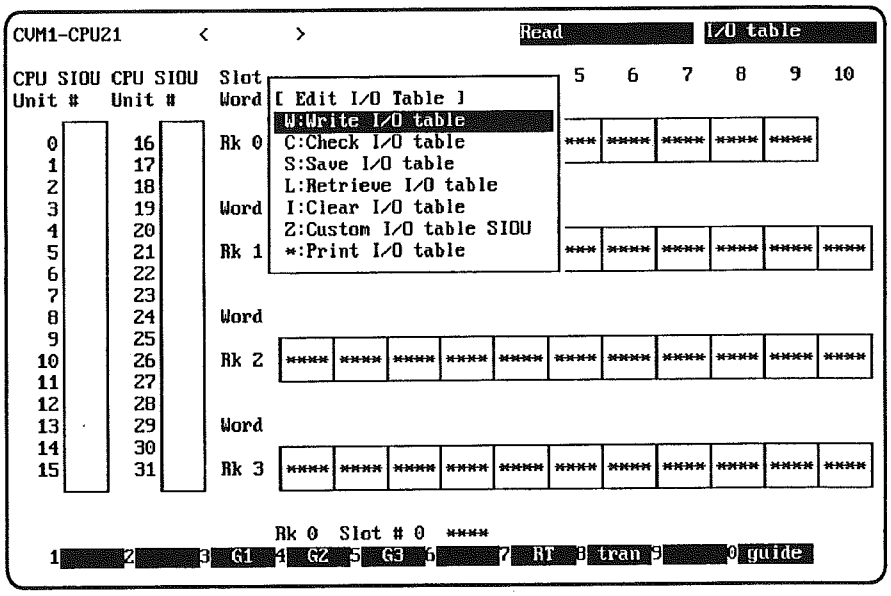
Help Displays

The F10 Key can be pressed to bring up a help display explaining the display codes for various Units. Press the Escape Key to clear the help display.



5-1-2 I/O Table Menu

When the I/O table display is on-screen, the I/O Table Menu can be displayed by pressing the End Key.



The following table lists the operations that can be selected from the I/O Table Menu. Select an operation by pressing its corresponding letter or moving the cursor to the operation and pressing Enter. These operations are described briefly in the following table and in more detail in later sections.

Operation	Function
W:Write I/O table	Used to write and edit the I/O table on the work disk.
C:Check I/O table	Checks the contents of the I/O table on the work disk and displays errors if detected.
S:Save I/O table	Saves the I/O table contents on the work disk and the first words set in the PC Setup to the data disk.
L:Retrieve I/O table	Retrieves the I/O table contents from the data disk to the work disk.
I:Clear I/O table	Clears the I/O table data from the work disk.
Z:Custom I/O table SIOU	Registers the types of CPU Bus Units.

5-2 I/O Table Errors

The contents of the I/O table is checked when the I/O table is written to the system work area or the "C:Check I/O table" command is executed. Any I/O errors detected in the checks will be listed on the screen. The errors are grouped according to Racks in the following order:

1, 2, 3...

1. CPU/Expansion I/O Racks
2. Slave Racks
3. I/O Terminals, Optical I/O Units, I/O Link Units
4. Group-1/2/3 Slaves
5. Masters
6. Special I/O Units

Use the PageUp and PageDown keys to scroll up and down through the list of errors. Press Escape to exit the list and return to the I/O table display. Be sure to correct any errors detected during the I/O table check.

Error message	Error description	Remedy
High total words	The total number of words exceeds the limit.	Change settings to bring the total number of words below the limit.
Excess Units	The total number of Units exceeds the prescribed limit.	Change settings to bring the total number of Units below the limit.
High address	An address is set out of range.	Change the settings to bring all addresses within the prescribed ranges.
# error	The total number of I/O points exceeds the limit.	Change settings to bring the total number of I/O points below the limit.
Dup unit #	Duplicate unit numbers for CPU Bus Units.	Change settings so that the same unit number is not used twice.
Dup word	Duplicate word allocations.	Change settings so that the same word is not allocated twice.
Intr unit posi err	An Interrupt Input Unit has been allocated to Rack other than the CPU Rack (rack #0) or Expansion CPU Rack (rack #1).	Move the Interrupt Input Unit to the CPU Rack or Expansion CPU Rack. Set the Expansion CPU Rack to rack #1.
Undefined RM	Master not recognized by the CPU.	Correct the I/O table.
IN/OUT mix	Both inputs and outputs used in the same word of a I/O Terminal, Optical I/O Unit, or I/O Link Unit.	Change the settings so that only inputs or only outputs are used in a single words.

5-3 Writing I/O Tables

The Write I/O Table operation is used to edit the I/O table stored in the system work area. Select "W:Write I/O table" from the I/O Table Menu and press Enter.

This command can be used to manually input the I/O table, but the online "C:Create I/O table" command is preferable if the Units are mounted to the PC because it writes the I/O table automatically. Refer to *12-4 Creating I/O Tables* for details.

5-3-1 Function Key Usage

The following table shows the functions performed by the function keys and the Home Key when writing I/O tables.

Key	Display	Table code	Function
F1	o	o	Enters an Output Unit. Each o indicates 8 outputs.
F2	O	O	Enters an Output Unit. Each O indicates 16 outputs. For I/O Terminals, Optical I/O Units or I/O Link Units, each O stands for 8 output points.
F3	G	G	Enters an Output Unit with 128 or more outputs. Each G indicates 64 outputs. Input two or more G's for each entry.
F5	N	N	Reserves a word. Each N represents 16 I/O.
F6	G1	---	Displays the I/O table for the group-1 Slaves connected to a SYSMAC BUS/2 Master. Move the cursor to the Master (RM) in the CPU Bus Unit display area and press the F6 Key.
F7	G2	---	Displays the I/O table for the group-2 Slaves connected to a SYSMAC BUS/2 Master. Move the cursor to the Master (RM) in the CPU Bus Unit display area and press the F7 Key.

Key	Display	Table code	Function
F8	G3	---	Displays the I/O table for the group-3 Slaves connected to a SYSMAC BUS/2 Master. Move the cursor to the Master (RM) in the CPU Bus Unit display area and press the F8 Key.
F9	SIOU	---	Enters CPU Bus Units in the CPU Bus Unit display area.
F10	Guide	---	Displays a key to the symbols used on the display. Press the Escape Key to clear the help screen.
Shift+F1	i	i	Enters an Input Unit. Each i indicates 8 inputs.
Shift+F2	I	I	Enters an Input Unit. Each I indicates 16 inputs. For I/O Terminals, Optical I/O Units or I/O Link Units, each I stands for 8 input points.
Shift+F3	L	L	Enters an Input Unit with 128 or more inputs. Each L indicates 64 inputs. Input two or more L's for each entry.
Shift+F5	H	H	Reserves 128 I/O. Each H represents 64 I/O. Input two or more H's for each entry.
Shift+F6	RT	---	Displays the I/O table for Slaves connected to a SYSMAC BUS Master. Move the cursor to the Master in the Basic Rack display area and press the Shift+F6 Keys.
Shift+F7	Tran	---	Displays the I/O table for I/O Terminals, Optical I/O Units, and I/O Link Units connected to a SYSMAC BUS Master. Move the cursor to the Master in the Basic Rack display area and press the Shift+F7 Keys.
Shift+F8	Intr	INT	Enters an Interrupt Input Unit. Only 4 Interrupt Input Units are supported per PC. Set the Interrupt Input Units on the CPU Rack (rack #0) or Expansion CPU Rack (rack #1). The unit numbers of the Interrupt Input Units are automatically allocated in the order the units are mounted.
Shift+F9	RM	RM	Enters a SYSMAC BUS Master. Up to 8 Masters can be used on the Basic Racks. The Master numbers are automatically determined in the order the units are attached.
Shift+F10	End	---	Press the Shift+F10 Keys from any other screen to return to the Basic Rack screen. Press the Shift+F10 Keys from the Basic Rack screen to check the input I/O table created on-screen and save it to the work disk if no errors are found. The I/O table will not be written to the work disk and an error message table will be displayed if errors are found. Press the Escape Key to return to the original screen. Correct the errors and press the Shift+F10 Keys again.
Home, Enter	——	****	Clears the allocation displayed at the cursor position.

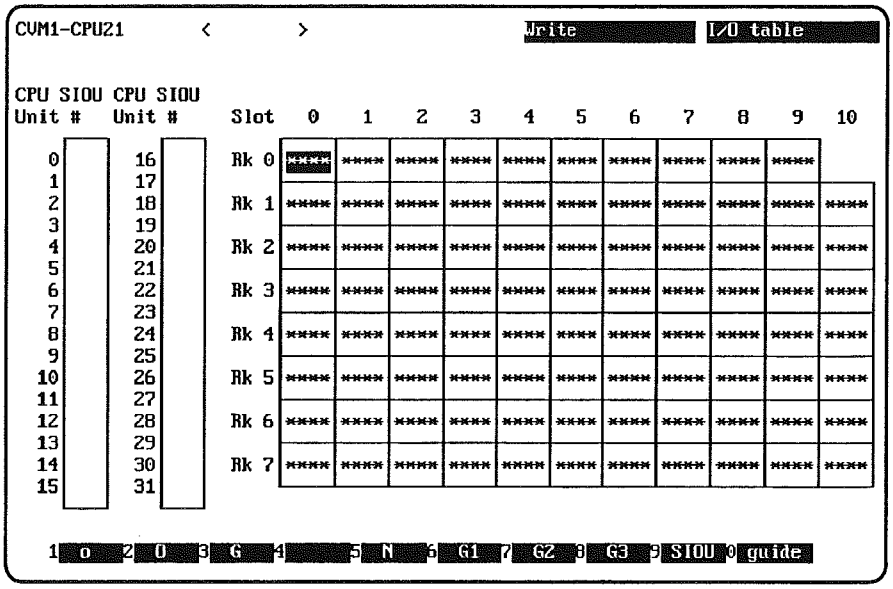
5-3-2 General Procedure

The general procedure for writing the I/O table is as follows:

1, 2, 3...

1. Select "W:Write I/O table" from the I/O Table Menu.

   The I/O table display will show the I/O table settings for the CPU Rack, Expansion CPU Rack, and Expansion I/O Racks on the right side of the display and settings for the CPU Bus Units on the left side of the display.



Note Rack numbers 1 through 7 are set on the Expansion I/O Rack's I/O Interface Unit.

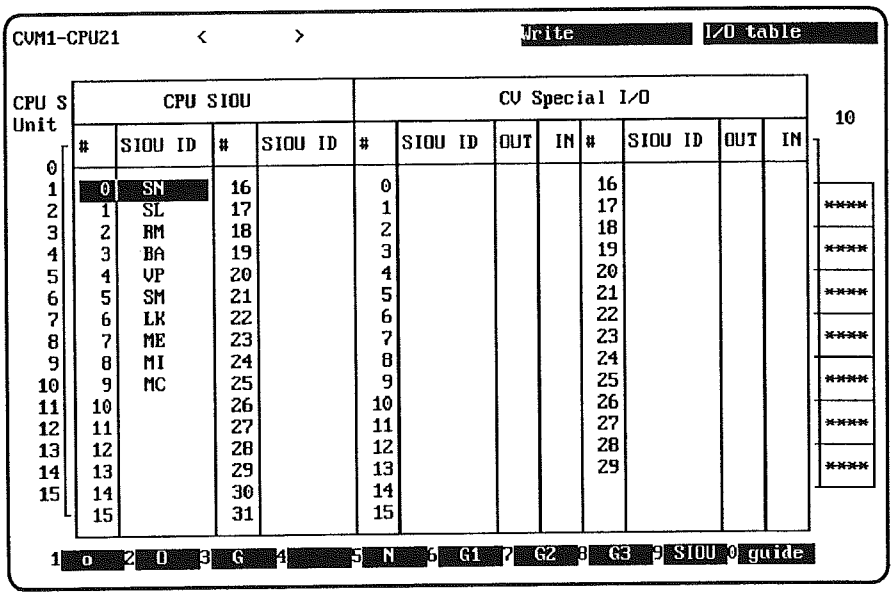
2. Use the function keys to write the I/O table data, pressing Enter after writing each slot.
3. When you are finished with the I/O table, press Shift+F10 to exit. A prompt will appear to confirm that you want to exit. Enter "Y" to exit or "N" to cancel.
4. An I/O table check is performed automatically when you exit. Any errors that are detected will be displayed. If no errors are found, the I/O table will be saved to the system work area automatically.

5-3-3 Entering CPU Bus Units

1, 2, 3...

1. Select "W:Write I/O table" from the I/O Table Menu.
2. Press the Shift+Left Cursor Keys to move the cursor to the CPU Bus Unit (CPU SIOU Unit) display area.
3. Move the cursor to the desired unit number in the CPU Bus Unit (CPU SIOU Unit) display area.

4. Press the F9 Key. The unit number that is displayed is set with the switch on the CPU Bus Unit.



Units in the display are identified with the following abbreviations.

SN: SYSMAC NET Link Unit
SL: SYSMAC LINK Unit
RM: SYSMAC BUS/2 Remote I/O Master Unit
BA: BASIC Unit
VP: Personal Computer Unit
LK: Host Link Unit
ME: ME-NET Interface Unit
MI: Module Interface Unit
MC: Position Control Unit

Note The CV-series Special I/O column on the right side of the display isn't used.

5. Move the cursor to the Unit to be set and press Enter.

   The Unit that is set will appear in the CPU Bus Unit display area.

   SYSMAC BUS/2 Masters are allocated Master numbers 0 to 3 sequentially from the Unit with the lowest unit number.

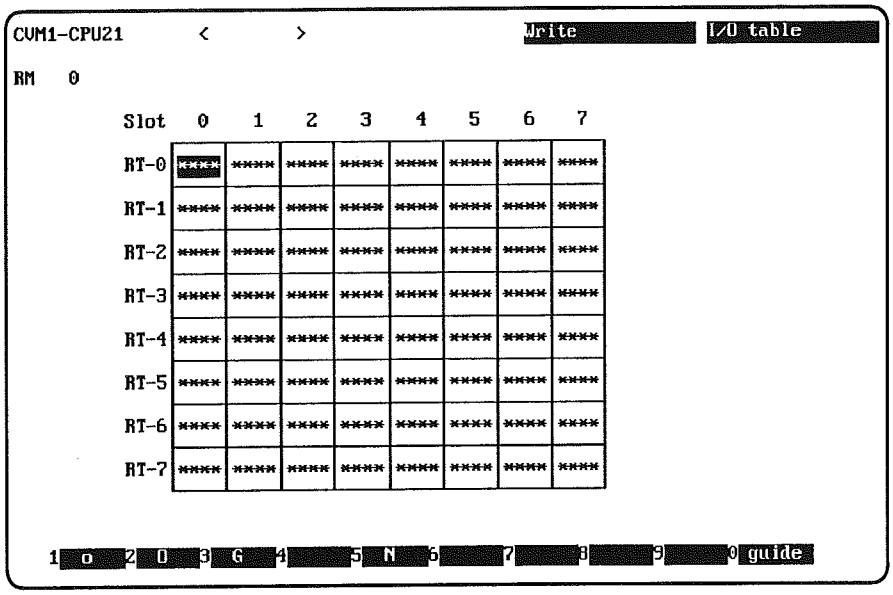
6. Press the Shift+F10 Keys from the Basic Rack screen to save the settings.

5-3-4 Entering SYSMAC BUS Slave Racks

1, 2, 3...

1. Select "W:Write I/O table" from the I/O Table Menu.
2. Move the cursor to the Master (RM0 to RM7) to which the Slave Rack is to be connected.

3. Press the F6 Key. The Slave Rack I/O table will be displayed.



4. Use the function keys to write the I/O table, pressing Enter after each slot. Set the slave number (RT0 to RT7) on the Remote I/O Slave Unit.
5. When all required data has been entered, press the Shift+F10 Keys to return to the Basic Rack screen then press the Shift+F10 and Enter Keys to check and save the settings.

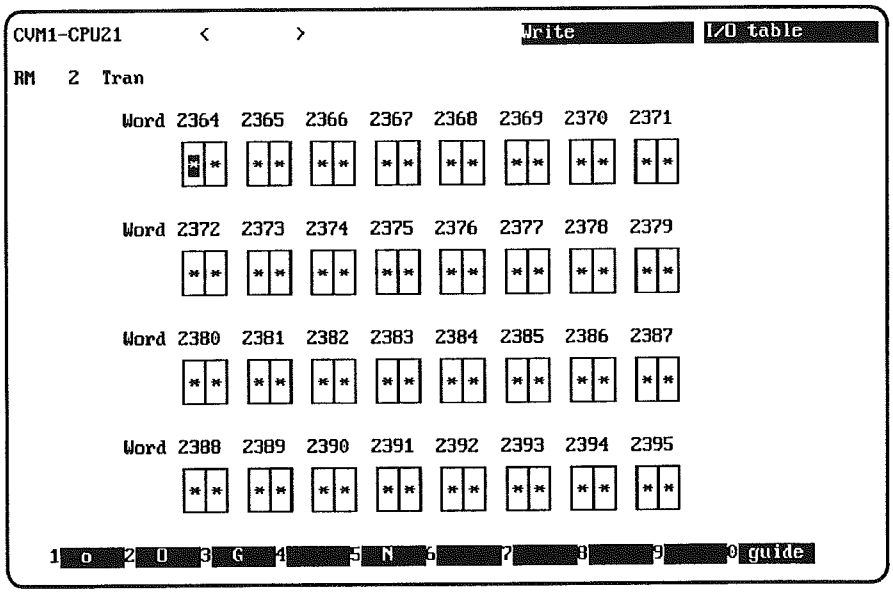
   An error message table will be displayed if any errors are discovered in the I/O table settings after the Shift+F10 and Enter Keys are pressed. The I/O table settings won't be saved if errors are detected.

5-3-5 Entering I/O Terminals, Optical I/O Units, and I/O Link Units

1, 2, 3...

1. Select "W:Write I/O table" from the I/O Table Menu.
2. Move the cursor to the Master (RM0 to RM7) to which the I/O Terminal, Optical I/O Unit, or I/O Link Unit is to be connected.

3. Press the Shift+F7 Keys. The I/O table section for I/O Terminals, Optical I/O Units, or I/O Link Units will be displayed.



4. Use the function keys to write the I/O table data, pressing Enter after each Unit. When writing I/O table data for an I/O Link Unit, enter the same I/O code in both bytes of a word.

   The "16-point input/16-point output" setting cannot be used when an I/O Link Unit is connected to a CVM1 PC, i.e., the lower words cannot be set for input.

5. When all required data has been entered, press the Shift+F10 Keys to return to the Basic Rack screen then press the Shift+F10 and Enter Keys to check and save the settings.

   An error message table will be displayed if any errors are discovered in the I/O table settings after the Shift+F10 and Enter Keys are pressed. The I/O table settings won't be saved if errors are detected.

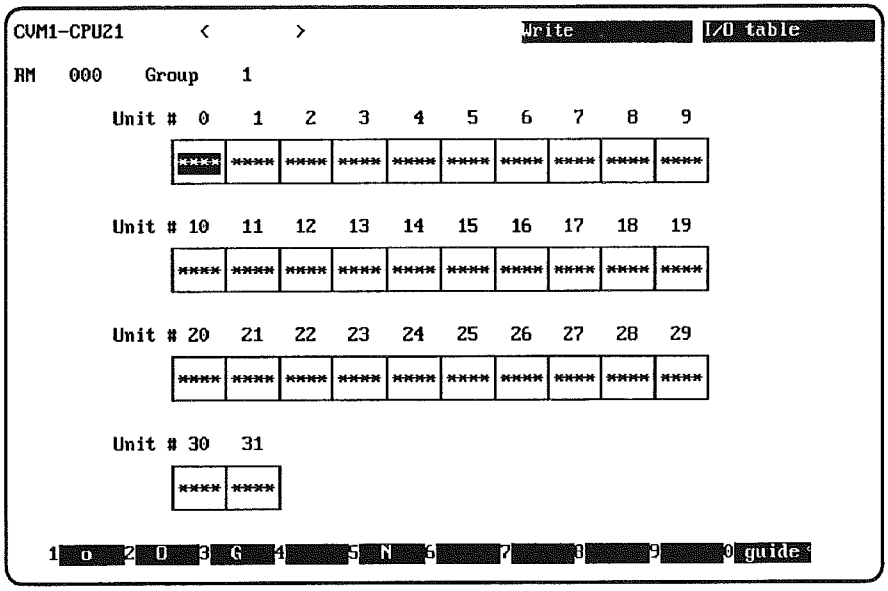
5-3-6 Entering SYSMAC BUS/2 Slaves

Use the following procedure to enter I/O table data for Group-1/2/3 SYSMAC BUS/2 Slaves.

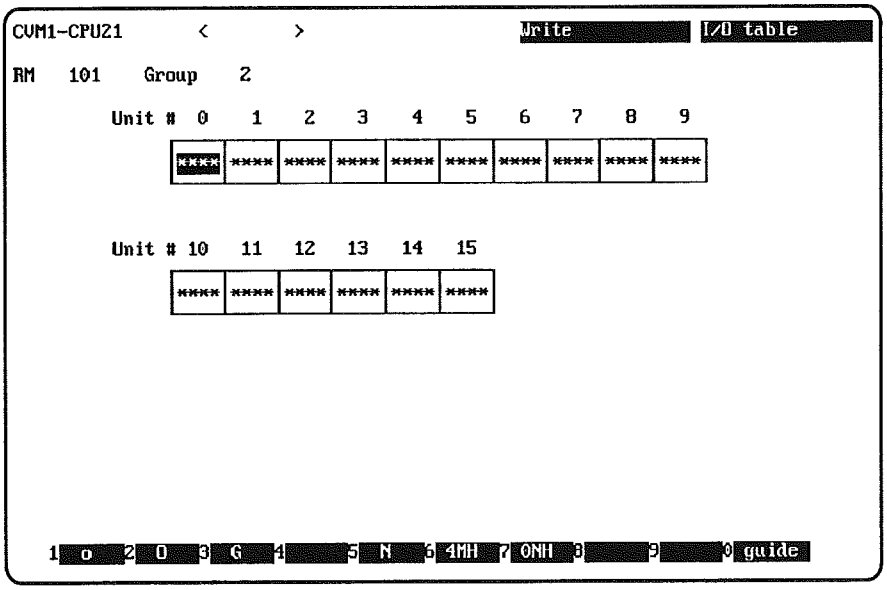
1, 2, 3...

1. Select "W:Write I/O table" from the I/O Table Menu.
2. Press the Shift+Left Cursor Keys to move the cursor to the CPU Bus Unit display area.
3. Move the cursor to the Master (RM0 to RM3) to which the Slave is to be connected.
4. Press the F6 if the Slave is a Group-1 Slave, F7 if it is a Group-2 Slave, or F8 if it is a Group-3 Slave. The corresponding I/O table will be displayed. The three I/O tables are shown in the following diagrams.

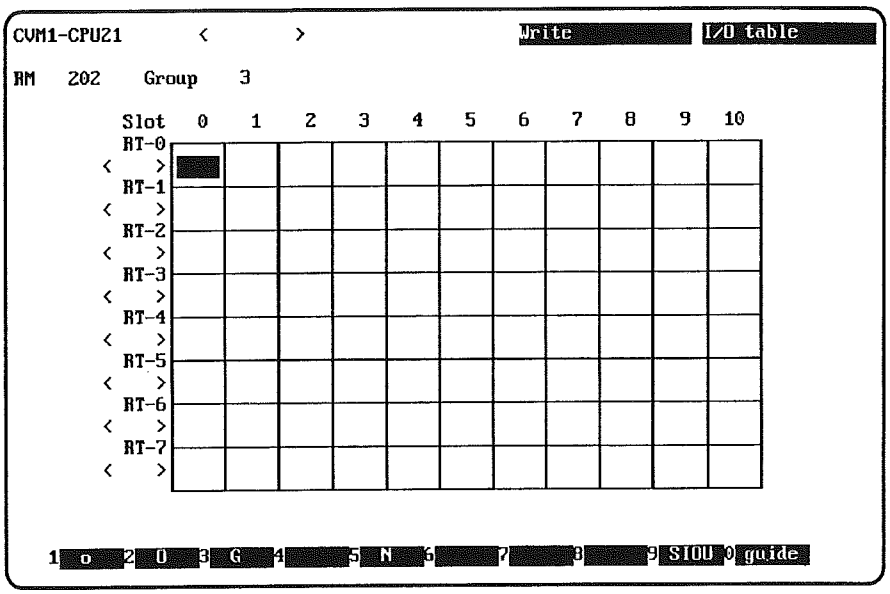
Group-1 Slaves



Group-2 Slaves



Group-3 Slaves



5. Use the function keys to write the I/O table and press Enter.

   For Group-2 Slaves, press F6 (4MH) or F7 (0NH) to indicate the Slave number and Slave type set on the switches on the Remote I/O Slave Unit.

   For Group-3 Slaves, press Shift+F7 (58M), Shift+F8 (122M), or Shift+F9 (54MH) to indicate the Slave number and Slave type set on the switches on the Remote I/O Slave Unit.

   The row of data currently selected by the cursor can be cleared by pressing Shift+F6.

6. When all required data have been entered, press the Shift+F10 Keys to return to the Basic Rack screen then press the Shift+F10 and Enter Keys to check and save the settings.

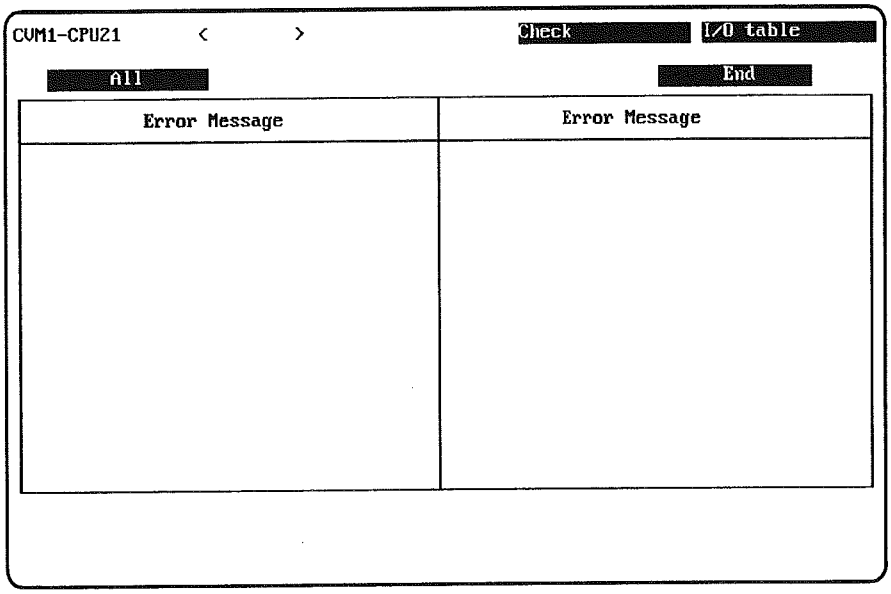
5-4 Checking I/O Tables

The following operation is used to check the I/O table in the system work area and display any errors found. Conduct this check before transferring an I/O table created on the PC to the computer.

This check is conducted automatically if the I/O table is written using the Write I/O Table operation.

1, 2, 3...

1. Select "C:Check I/O table" from the I/O Table Menu. The contents of the I/O table will be checked and a message will be displayed if an errors are detected. The errors are displayed on separate pages by group.



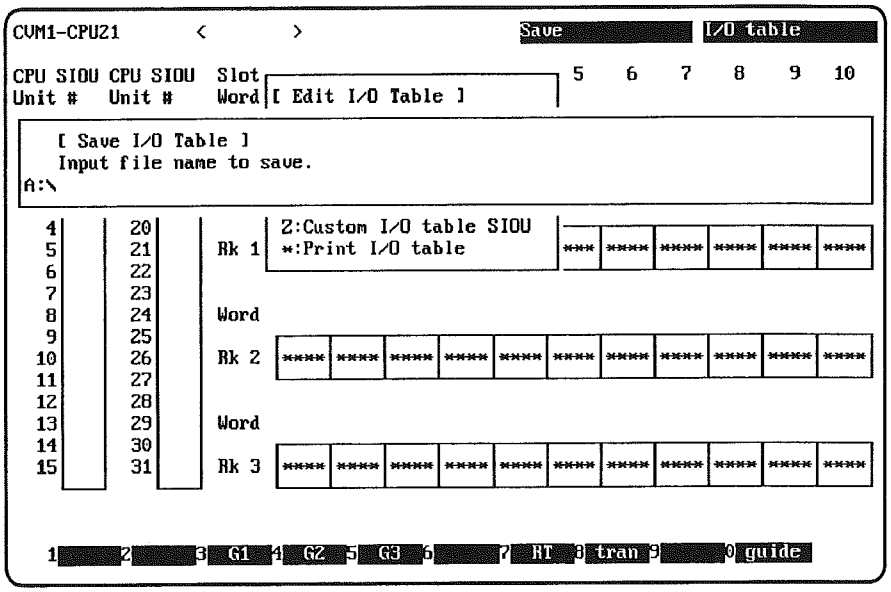
2. Press the PageDown to scroll down the pages of the error message table and the PageUp Key to return to the previous page. Refer to *5-2 I/O Table Errors* for information on the error messages.
3. Change the I/O table to match the actual units connected using the Create I/O Table operations.
4. Press the Escape Key when the I/O table check has been completed.

5-5 Saving/Retrieving I/O Tables

5-5-1 Saving I/O Tables

The Save I/O Table operation is used to copy the contents of the I/O table from the computer's system work area to a data disk. It is recommended that the user program and I/O table be written as a set to the same data disk and directory.

1, 2, 3... 1. Select "S:Save I/O table" from the I/O Table Menu.



2. Enter the path name and file name and press Enter.

   A directory of files on the disk can be displayed by pressing the End Key. To select a file from the directory, move the cursor to the desired file and press Enter.

3. A confirmation prompt will be displayed if the selected file already exists. Enter "Y" to overwrite the file, "N" to return to the file name input display.

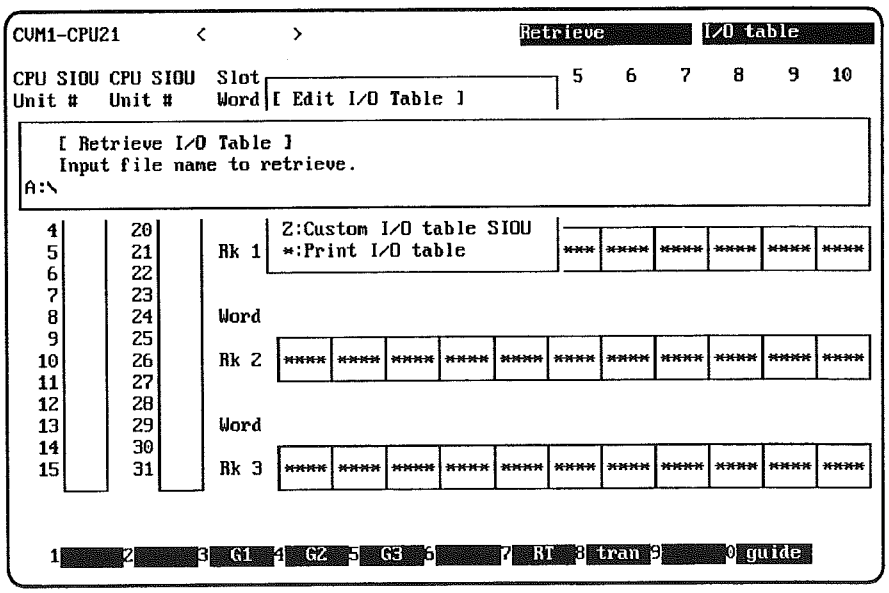
4. Input the title and press Enter. The title can be up to 30 characters long.

   Just press the Enter Key to skip the title input.

5-5-2 Retrieving I/O Tables

The Retrieve I/O Table operation is used to copy the contents of the I/O table from the data disk to the computer's system work area.

1, 2, 3... 1. Select "L:Retrieve I/O table" from the I/O Table Menu.



2. Enter the path name and file name and press Enter.

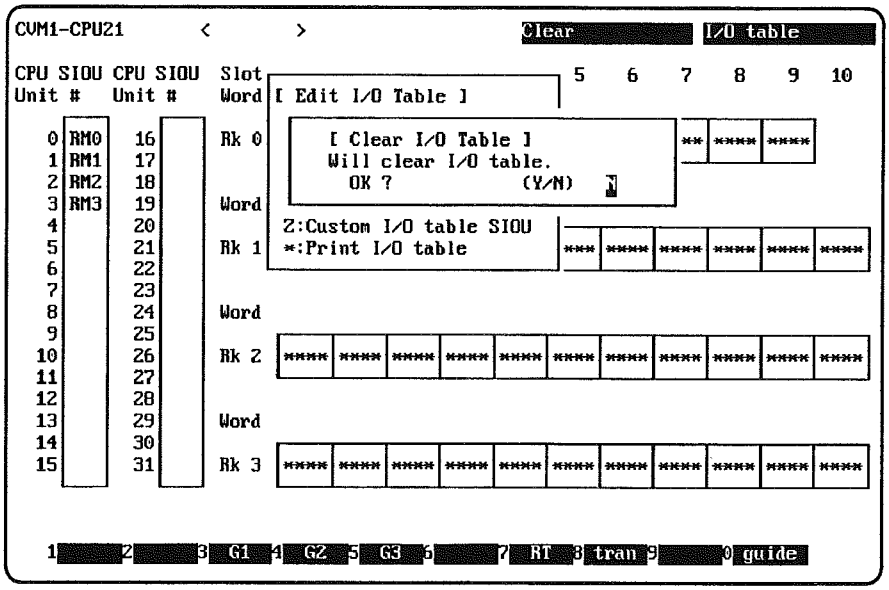
   A directory of files on the disk can be displayed by pressing the End Key. To select a file from the directory, move the cursor to the desired file and press Enter.

5-6 Clearing I/O Tables

The Clear I/O Table operation is used to clear the contents of the I/O table from the computer's system work area. Clear the I/O table data before writing a new I/O table.

1, 2, 3...

1. Select "C:Clear I/O table" from the I/O Table Menu. A confirmation prompt will be displayed.

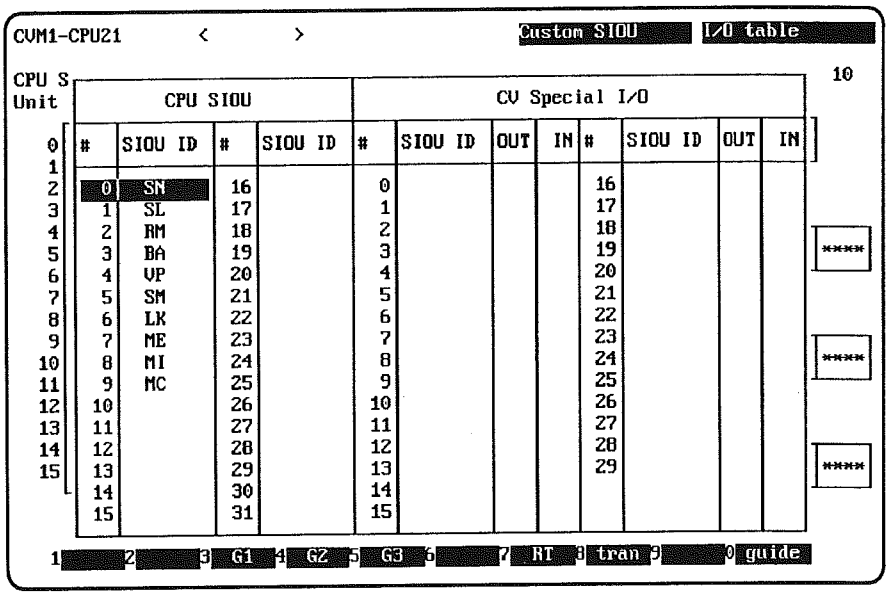


2. Enter "Y" to clear the I/O table data, "N" to cancel the operation.

5-7 Customizing CPU Bus Units

The Custom I/O Table SIOU operation is used to register CPU Bus Unit codes. The registered display codes be used when inputting CPU Bus Units with the Write I/O Table operation.

1, 2, 3... 1. Select "Z:Custom I/O table SIOU" from the I/O Table Menu.



2. Move the cursor to an empty space and press Enter.
3. Input the Unit display code that you want to register and press Enter.
4. Press Escape to return to the I/O table display.

5-8 I/O Allocations to Special I/O Units

The following table shows the I/O table display codes for Standard, Mixed, and Special I/O Units. Some Special I/O Units can be allocated 2 or 4 words (or). The Special I/O Instructions (READ(190) and WRIT(191)) cannot be used with these Units when they are allocated 4 words.

The C500-PID01, C500-NC103, and C500-NC121 require 2 slots. When installing one of these Units, input the display code from the table above for the left slot and don't input anything for the right slot.

Class	Name	Model number	Display code
Standard I/O Units	64-point Input Units	3G2A5-ID212, etc.	
	64-point Output Units	3G2A5-OD211, etc.	
Mixed I/O Units	16-point DC Input/16-point Transistor Output Unit	3G2A5-MD211CN	
Special I/O Units	Analog Input Units	3G2A5-AD001 to AD005	
		3G2A5-AD006/AD007	
		C500-AD101	or
	Analog Output Units	3G2A5-DA001 to DA005	
		C500-DA101	
	High-speed Counter Units	3G2A5-CT001	
		3G2A5-CT012 C500-CT041/021	
	Magnetic Card Reader	3G2A5-MGC01	
	PID Unit	3G2A5-PID01-E	
	Position Control Units	3G2A5-NC103-E 3G2A5-NC111-EV1 3G2A5-NC121	
		C500-NC222-E	
	Cam Positioner Unit	C500-CP131	or
	ASCII Unit	C500-ASC04	or
	ID Sensor Unit	C500-IDS01-V1/02/21/22	or
	Ladder Program I/O Unit	C500-LDP01-V1	

Slave Racks

There are some restrictions for Special I/O Units on Slave Racks. The following Units cannot be mounted on a SYSMAC BUS/2 Slave Rack: 3G2A5-MGC01, 3G2A5-PID01-E, 3G2A5-NC121/222-E, C500-CP131, and C500-FZ001.

The following Units cannot be mounted on a SYSMAC BUS Slave Rack: C500-NC222-E, 3G2A5-CT012, C500-CT041, C500-FZ001, C500-LDP01-V1.

The Special I/O Instructions (READ(190) and WRIT(191)) can be used with the following Units when they are mounted on a SYSMAC BUS/2 Slave Rack: C500-AD101, 3G2A5-CT012, C500-CT041, C500-ASC04, C500-IDS01-V1/02/21/22, C500-LDP01-V1, C500-NC222-E.

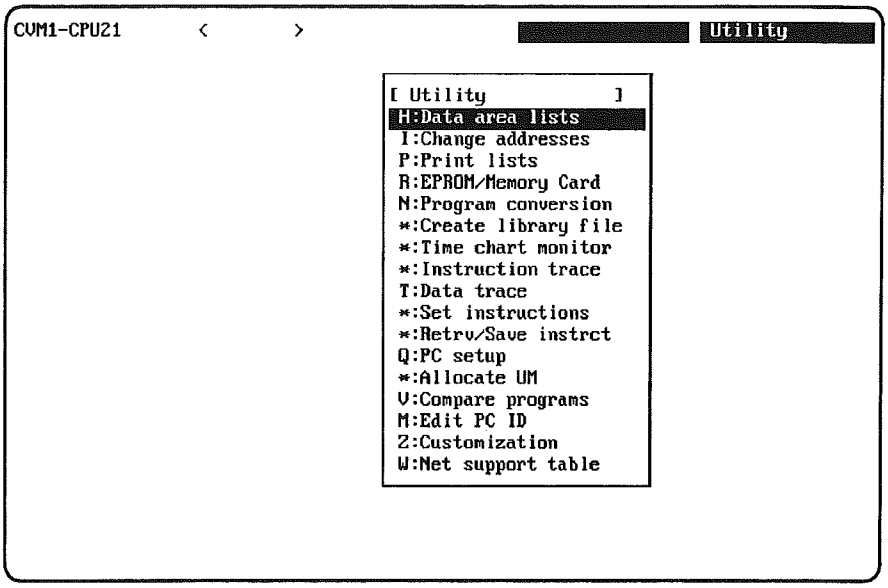
SECTION 6
Utility Operations

This section explains the various commands under the Utility Menu except the Network Support Table commands. Refer to *Part 4: Networks and CPU Bus Units* for details on the Network Support Table commands.

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6-1 The Utility Menu

The Utility Menu is displayed when "Utility" is selected from the top-level offline menu.



The following table lists the operations that can be selected from the Utility Menu. Select an operation by pressing its corresponding letter or moving the cursor to the operation and pressing Enter. These operations are described briefly in the following table and in more detail in later sections.

Operation	Function
H:Data area lists	Displays data area information (such as used areas and cross-references) for the program in the system work area.
I:Change addresses	Changes bit and word addresses in the program in the system work area.
P:Print lists	Prints lists of data and the program (ladder diagrams or mnemonics) using the program in the system work area.
R:EPROM/Memory Card	Performs a variety of Memory Card operations, such as transferring files between data disks and Memory Cards and initializing Memory Cards.
N:Program conversion	Converts the program format (C2000H→CVM1).
T:Data trace	Accesses the data trace displays that were produced online.
Q:PC setup	Sets the operating parameters contained in the PC Setup. The online PC Setup operations used to transfer the PC Setup to and from the PC are also provided for convenience.
V:Compare programs	Compares a program on data disk to the one in the system work area.
M:Edit PC ID	Creates, edits, searches for, and prints PC names.
Z:Customization	Changes function codes, bit/word prefixes, or memory area divisions.
W:Net support table	Edits data link tables and routing tables for SYSMAC NET Link and SYSMAC LINK Systems. Refer to *Part 4: Networks and CPU Bus Units* for details on this operation.

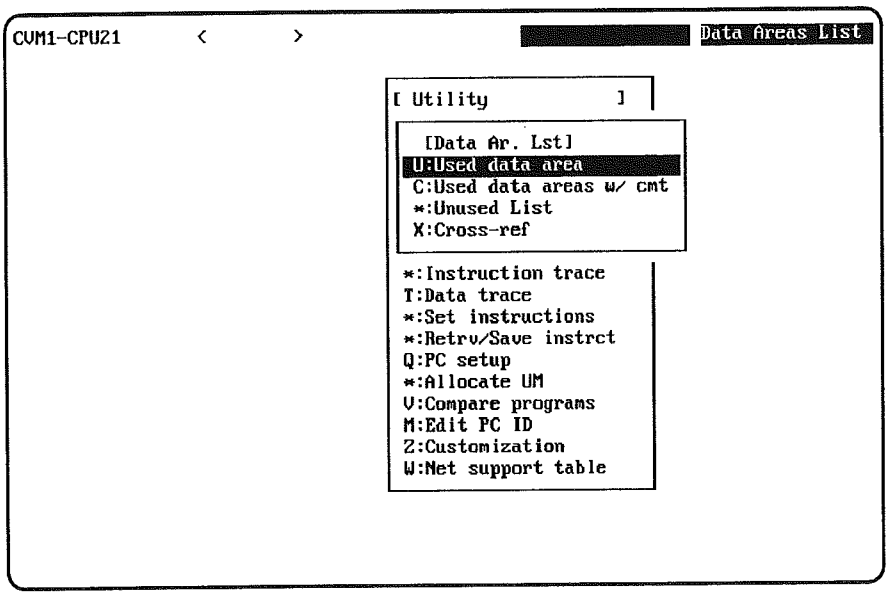
6-2 Displaying Data Lists

The "H:Data area lists" operations display information on how the specified data area's words and bits are used in the program in the computer's system work area. Information is displayed individually for standard or for custom data areas and cannot be displayed for all areas at once. Refer to *6-11 Customization* for details on creating custom data areas.

Data area information can be displayed in three ways.

Operation	Function
U:Used data area	Lists the data area words and bits that are used in the program and how they are used.
C:Used data areas w/cmt	Lists the data area words and bits that are used in the program along with their I/O comments.
X:Cross-references	Lists the addresses and instructions in the program that use the specified bits or words.

The following diagram shows the Data Area List Menu, which is displayed when "H:Data area lists" is selected from the Utility Menu.

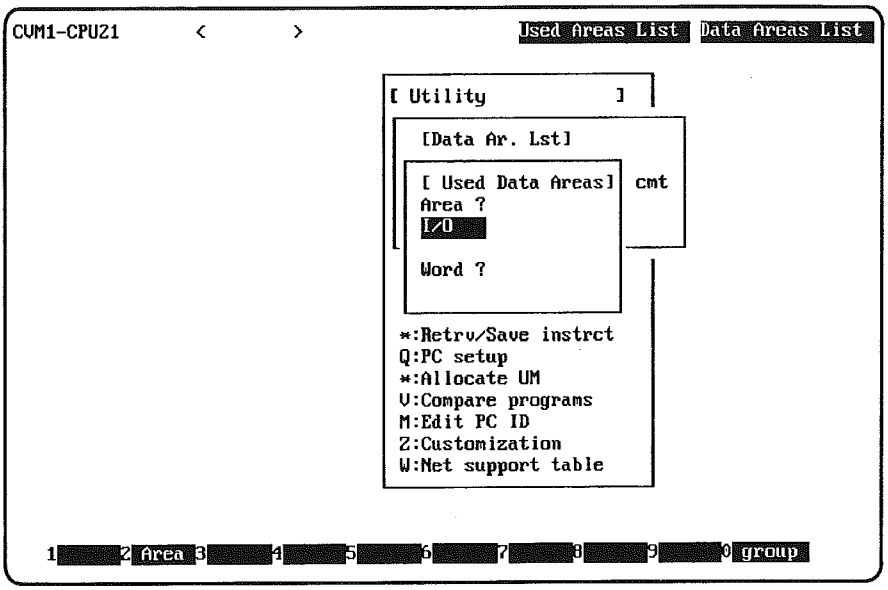


6-2-1 Used Data Areas

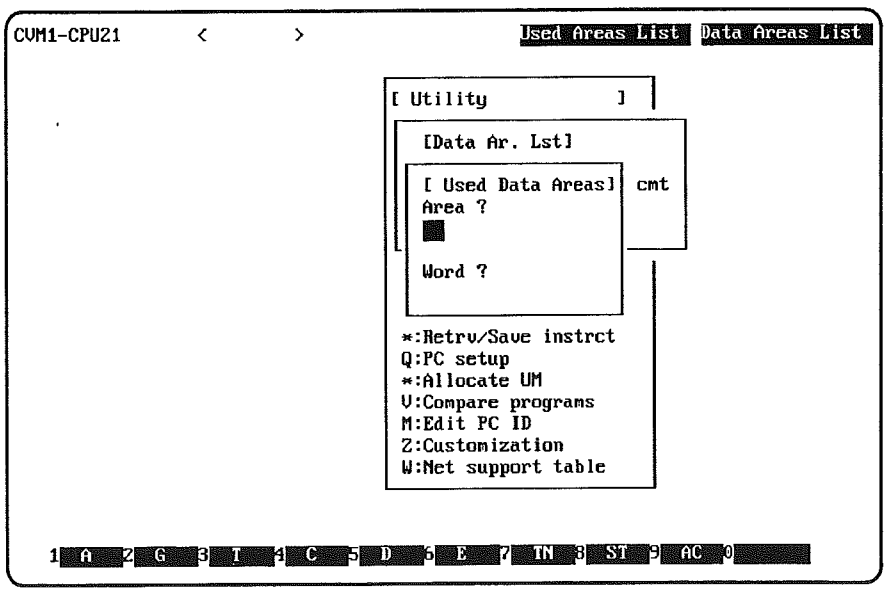
This list shows the words or bits used in a program. The procedure is as follows:

1, 2, 3...

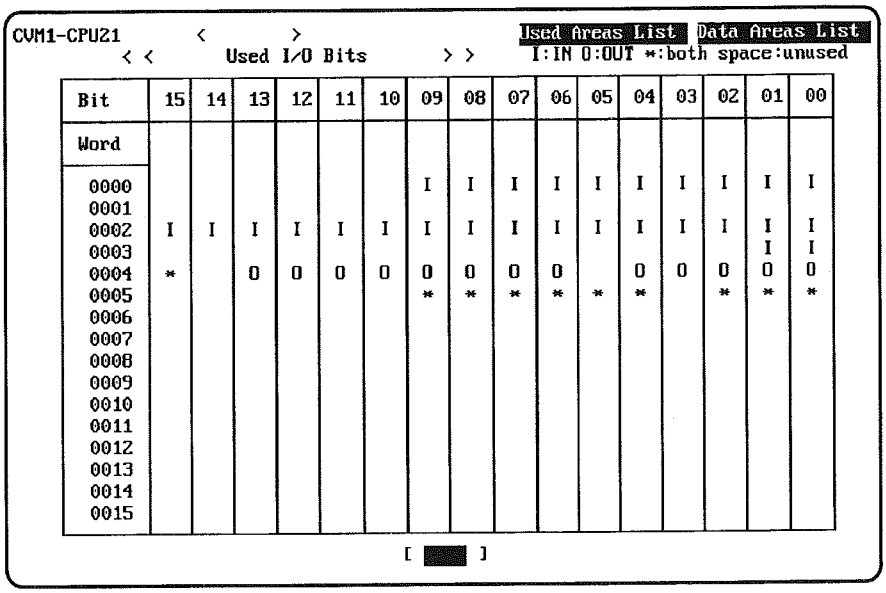
1. Select "U:Used data area" from the Data Area List Menu. The following menu will be displayed.



2. Select the desired data area. Press Enter to select the CIO Area, press F10 to specify a custom data area (group), or press F2 to specify another data area. The function keys will have the following functions if F2 is pressed.



3. Enter the desired address in the data area. The 16 words beginning with the desired address will be displayed. CIO 0000 was selected in this case.



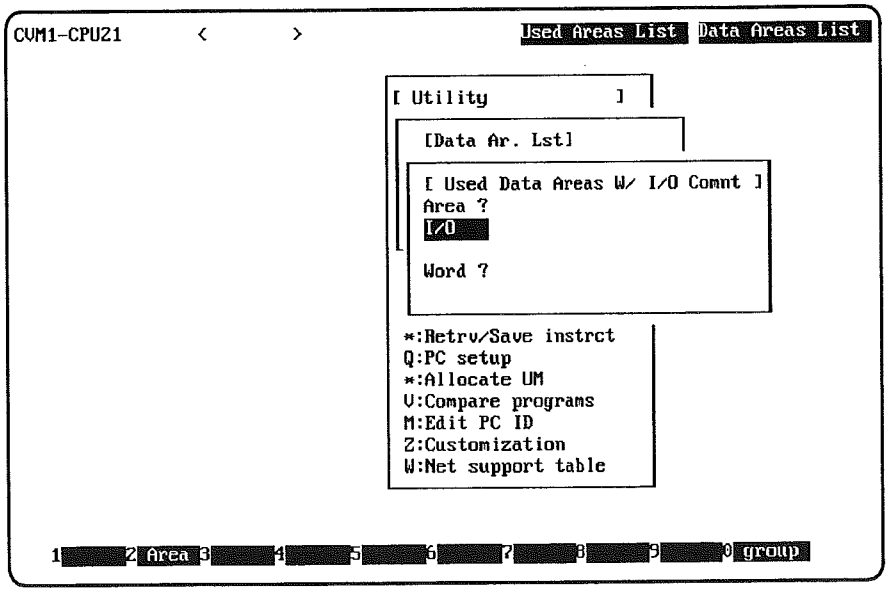
4. To view other addresses in the data area, press the PageUp and PageDown Keys to page through the data area list or input another address and press Enter.

6-2-2 Used Data Areas W/Cmt

This list shows used bits and words with their I/O comments.

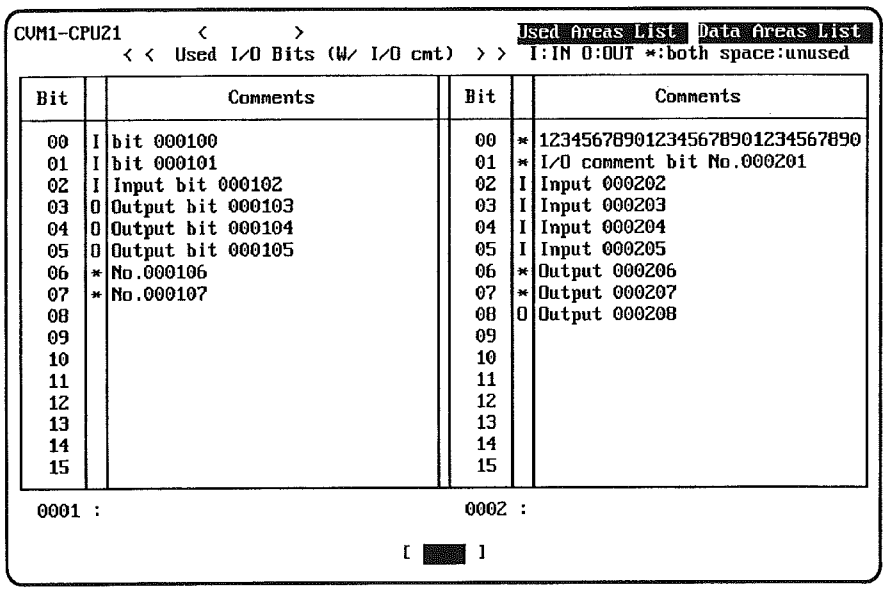
1, 2, 3...

1. Select "C:Used data areas w/cmt" from the Data Area List Menu. The following menu will be displayed.



2. Select the desired data area. Press Enter to select the CIO Area, press F10 to specify a custom data area (group), or press F2 to specify another data area.

3. Enter the desired word address in the data area. The usage of the specified word's 16 bits will be displayed. CIO 0001 was selected in this case.



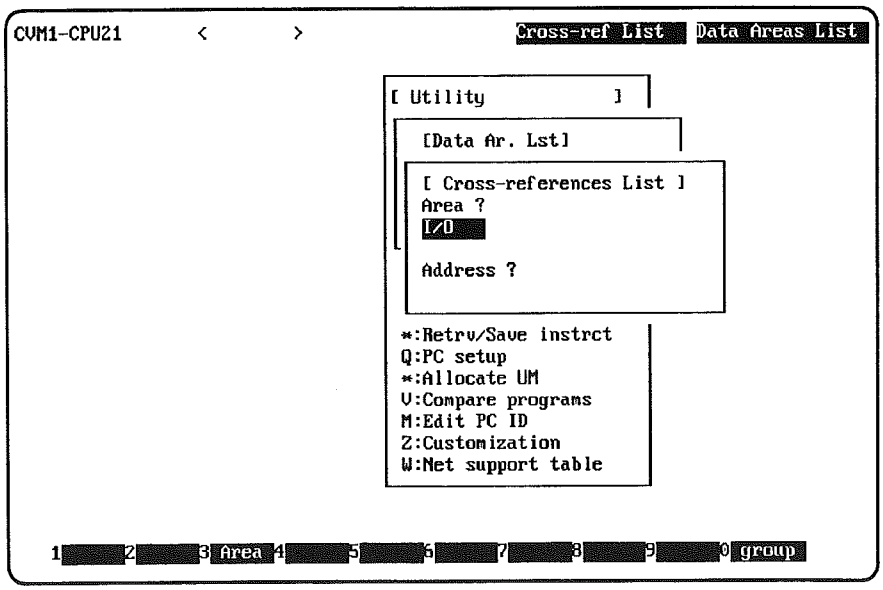
4. To view another word in the data area, press the PageUp and PageDown Keys to page through the data area list or input another word address and press Enter.

6-2-3 Cross-references

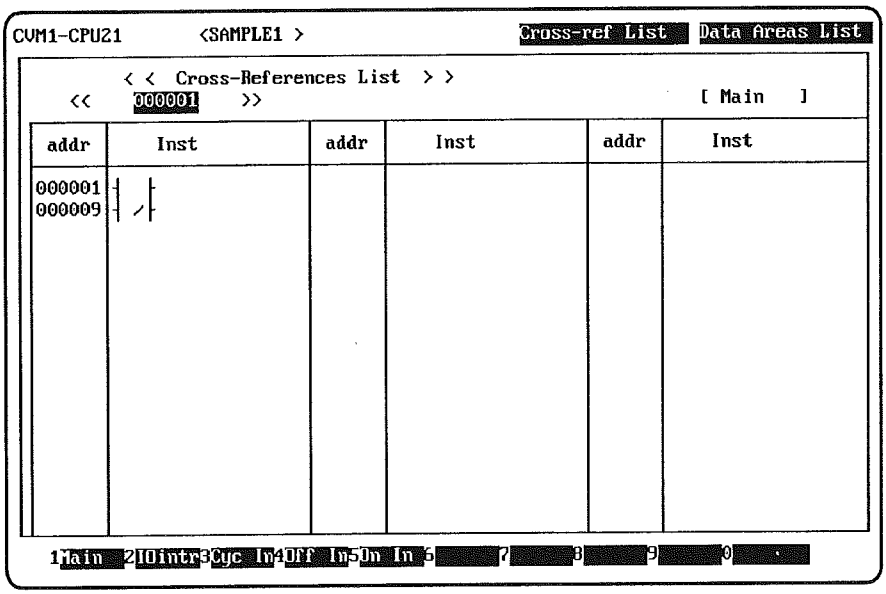
This list shows the program addresses and instructions in which the specified operands are used in the program. The procedure is as follows:

1, 2, 3...

1. Select "X:Cross-references" from the Data Area List Menu.
2. Select the desired data area. Press Enter to select the CIO Area, press F10 to specify a custom data area (group), or press F3 to specify another data area.



3. Enter the desired bit address in the data area. The display will show the program addresses and instructions where the bit is used. CIO 000001 was selected in this case.



4. Switch the program using F1 to F5 if necessary, e.g., press F2 and Enter for the I/O interrupt programs.
5. Press Enter. The cross-reference data will be displayed if the specified program number exists. If it doesn't exist a message will be displayed in the upper-left corner of the display.
6. Use PageDown and PageUp to scroll through the list.
7. Cross reference display can be accessed for the previous bit by pressing the Up Cursor Key; for the next bit by pressing the Down Cursor Key.

6-3 Changing Addresses

The following operations are used to globally change the bit or word addresses used in a program in the system work area. The operator can also specify whether the I/O comments are to be changed at the same time. These operations can save a great deal of time when changing the I/O configuration or modifying an existing program.

The Change Address operations can also be used when reusing programs from one PC to another, especially when program conversion is involved.

All programs in the system work area are affected by the Change Address operations, including all interrupt programs.

The following three change operations are available, each with different change capabilities.

(Yes: Can be changed, No: Cannot be changed)

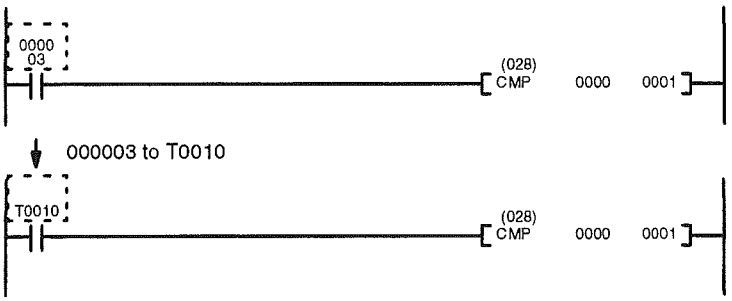
Operation	Operands changed					
	CIO, A, G		TIM, CNT		DM, EM	Range setting
	Bits	Words	Bits/ instructions	Word operands		
R:Bit adr, T/C no.	Yes	No	Yes	No	No	TIM, CNT
C:Wd adr, DM/EM adr	No	Yes	No	Yes	Yes	All
W:Wd adr (with bit adr)	Yes	Yes	No	No	No	All

Error messages will be display after the replacement process has been finished if any errors occur during the operation.

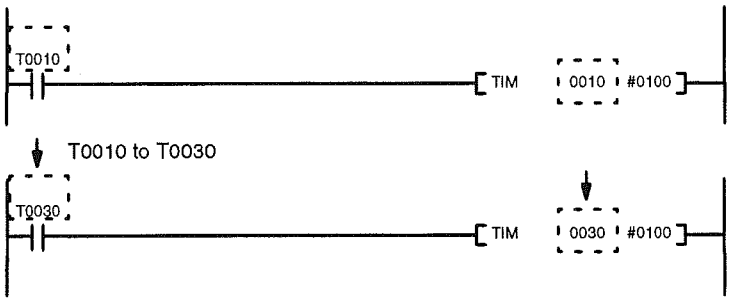
6-3-1 Changing Bit Addresses and TIM/CNT Numbers

With this operation, individual bits in the CIO, Auxiliary, and CPU Bus Link Areas can be changed or ranges of timer or counter numbers can be changed.

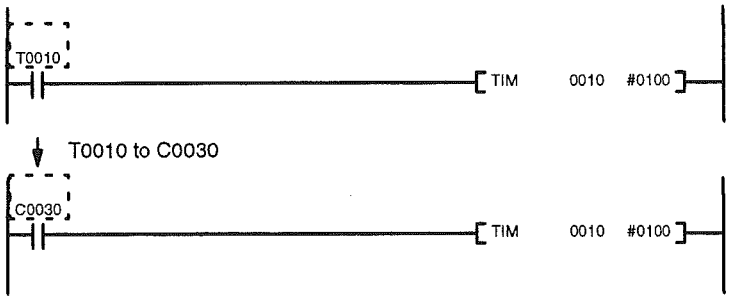
In the following example, bit CIO 000003 is changed to timer T0010.



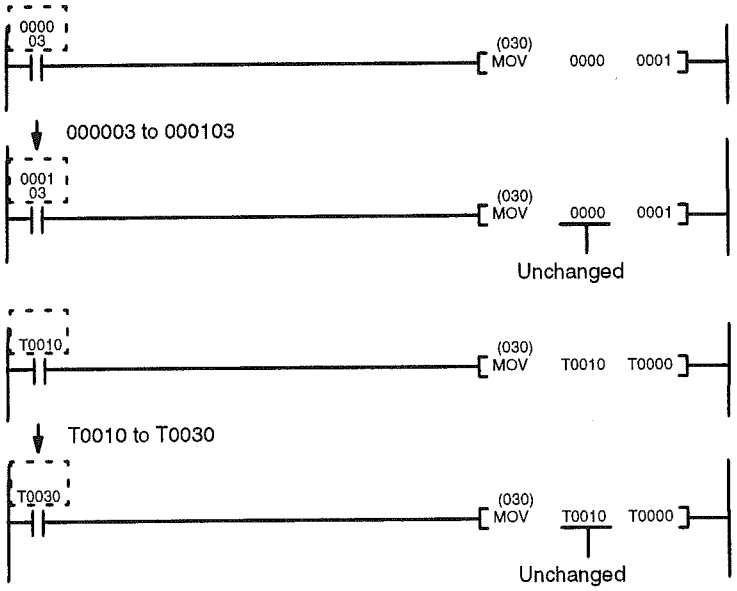
When one TIM or CNT number is changed to another, the timer/counter instruction will be changed at the same time as bit operands (i.e., the Completion Flag). In the following example, T0010 and all bit operands designated as T0010 are changed to T0030.



When a timer number is changed to a counter number or a counter number is changed to a timer number, only operands are changed. In the following example, timer T0010 is changed to C0030, but the TIM instruction remains unchanged.



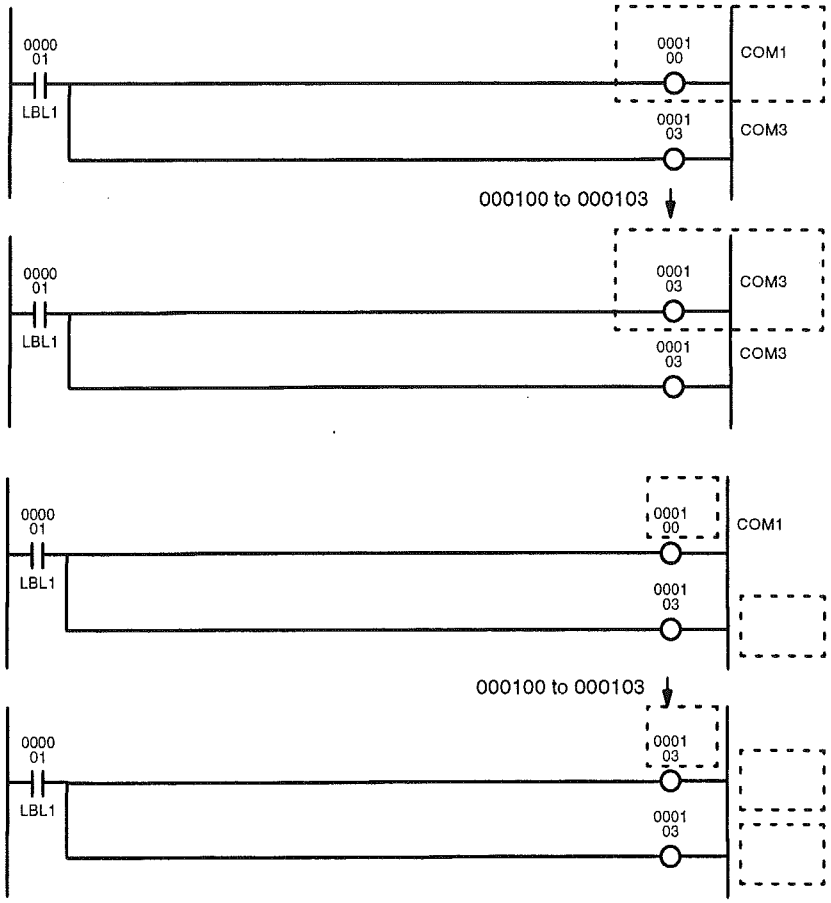
When bits or timer/counter numbers are changed, word operands (including timer/counter numbers accessing PV) are not changed.



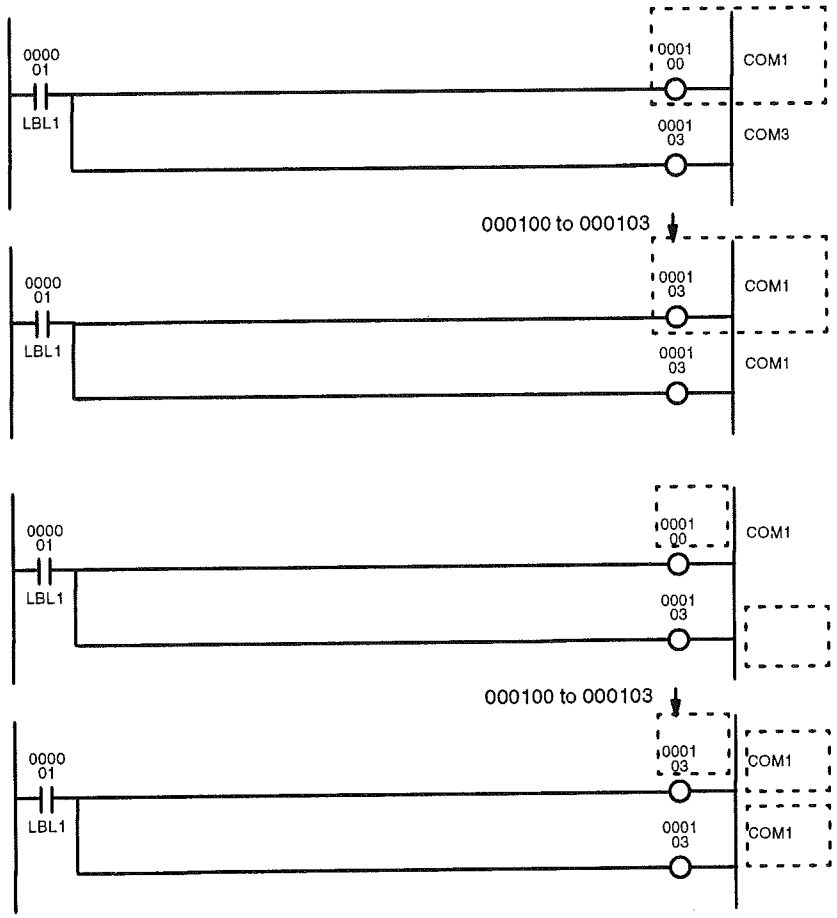
A message will be displayed in the upper-left corner of the screen if the specified address/number does not exist in the program.

Changing I/O Comments

You can specify whether or not I/O comments are to be changed for replacements. If "Change I/O comment" is set to "No" in the replacement prompt, the I/O comment for the new bit address will be used. If the changed bit address has no I/O comment, no I/O comment will be displayed.

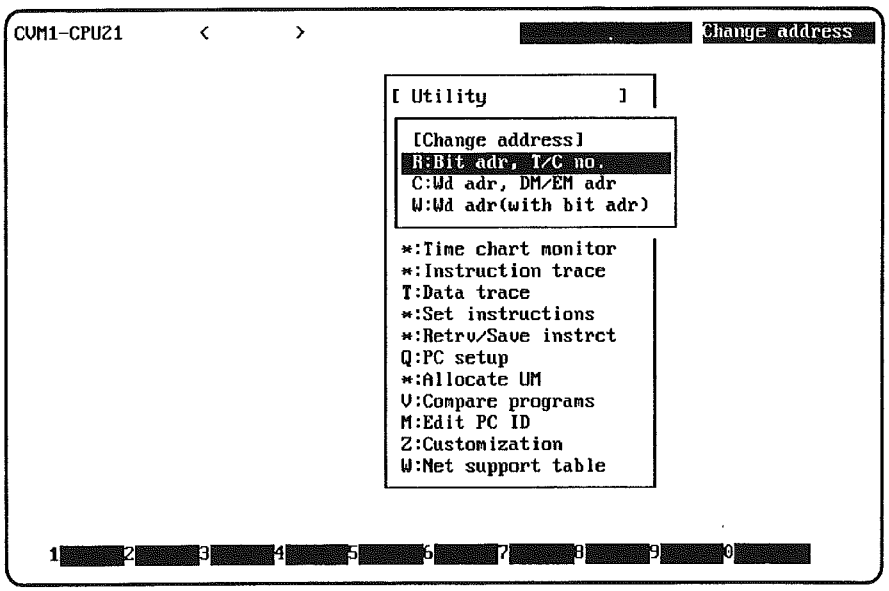


If "Change I/O comment" is set to "Yes" in the replacement menu, the I/O comment for the bit address before the change will remain if the new bit address has no I/O comment. If the I/O comments differ for the bit addresses before and after the change, the I/O comment for the old bit address will be used.

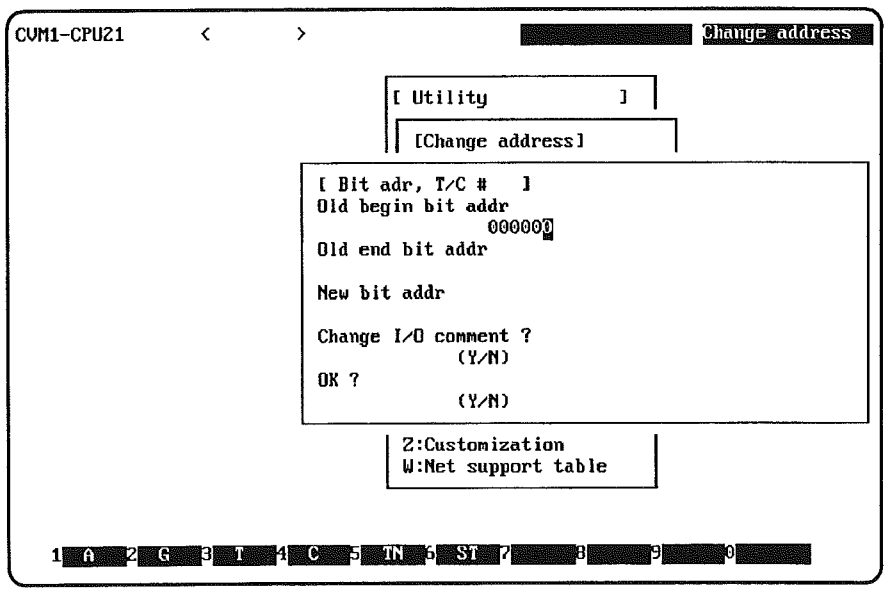


Procedure

1, 2, 3... 1. Select "I:Change addresses" from the Utility Menu.



2. Select "R:Bit adr, T/C no." from the menu.



3. Enter the first address to be changed and press Enter.
4. To change only one bit/number, press Enter.
5. Enter the new bit address/number.

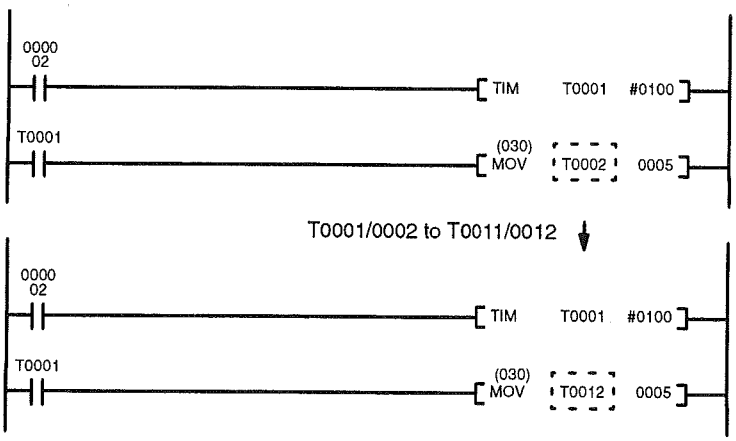
   When changing multiple TIM or CNT, enter the new number for the first address.
6. Set whether the I/O comments are to be changed.
7. Enter Y at "OK?" to execute the change, N to cancel the operation.

   A message will flash to indicate that the changes are being made and the program name will be displayed. The message and program name will be cleared from the screen when the changes are complete.

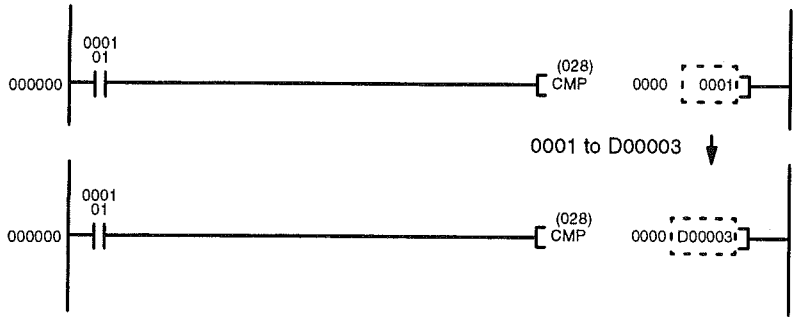
6-3-2 Changing Word Addresses

Word addresses can be changed in the CIO, Auxiliary, CPU Bus Link, Timer, Counter, DM, and EM Areas. Multiple, consecutive words can also be changed. Individual bits cannot be changed.

For timers and counters, only timer/counter numbers accessing the PV are changed (i.e., timer/counter numbers used as word operands. Timer/counter numbers used as bit operands and timer/counter instructions are not changed. In the following example, the only change is T0002 to T0012.



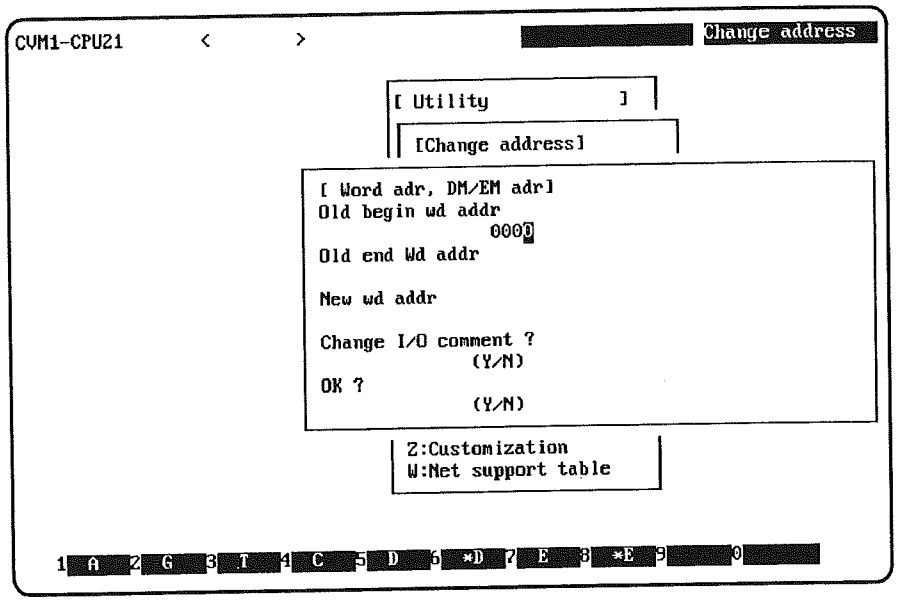
A word address can be changed to an address in another data area. In the following example, CIO 0001 is changed to D00003.



Procedure

1, 2, 3...

1. Select "I:Change addresses" from the Utility Menu.
2. Select "C:Wd adr, DM/EM adr" from the menu.



3. Enter the first address to be changed and press Enter.
4. To change only one word, press Enter.

or To change a range of words, enter the last address to be changed.

The start and end word address must be in the same data area.

5. Enter the new word address.

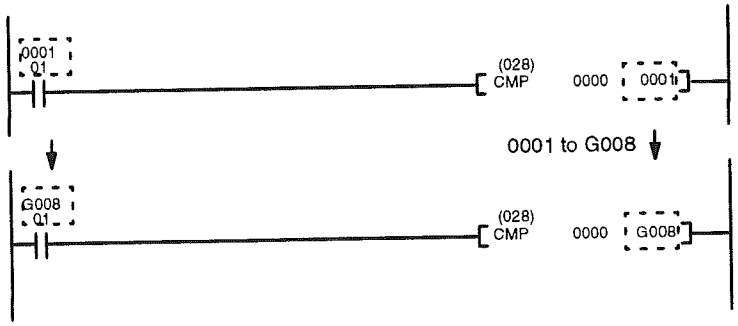
   When changing a range of words, enter the new address for the first address.
6. Set whether the I/O comments are to be changed.
7. Enter Y at "OK?" to execute the change, N to cancel the operation.

   A message will flash to indicate that the changes are being made and the program name will be displayed. The message and program name will be cleared from the screen when the changes are complete.

6-3-3 Changing Words and Bit Address Together

This operation can be used to change all word and bit addresses for specified words. Changes can be made in the CIO, Auxiliary, and CPU Bus Link Areas only.

In the following example, CIO 0001 is changed to G008, and as a result, CIO 000101 is also changed to G00801.

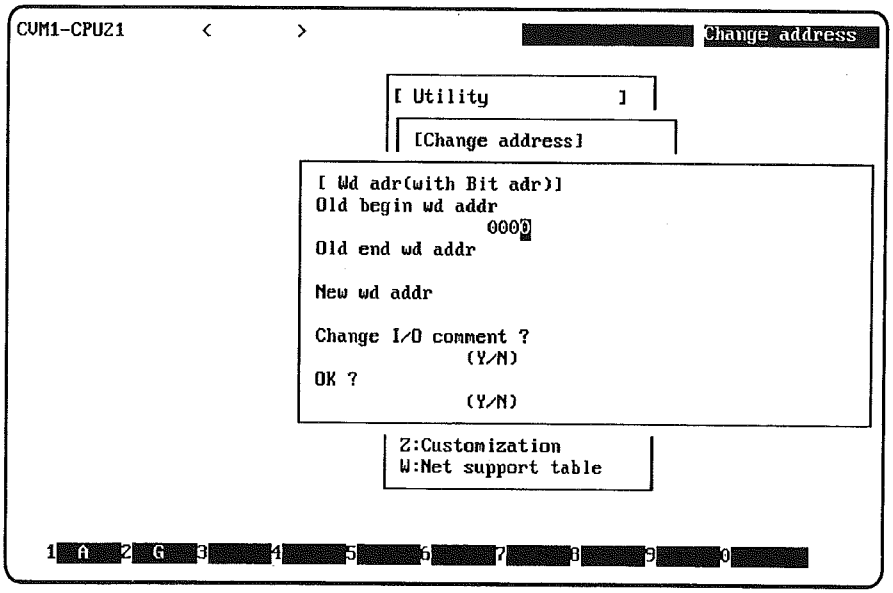


Ranges of words can be designated. I/O comments can be changed just like they are in "R:Bit adr, T/C no." Both word and bit addresses will be changed.

Procedure

1, 2, 3...

1. Select "I:Change addresses" from the Utility Menu.
2. Select "W:Wd adr(with bit adr)" from the menu.



3. Enter the first address to be changed and press Enter.
4. To change only one word, press Enter.

or To change a range of words, enter the last address to be changed.
The start and end word address must be in the same data area.

5. Enter the new word address.
When changing a range of words, enter the new address for the first address.
6. Set whether the I/O comments are to be changed.
7. Enter Y at "OK?" to execute the change, N to cancel the operation.
A message will flash to indicate that the changes are being made and the program name will be displayed. The Change Addresses Menu will be displayed when the changes are complete.

6-4 Printing Data Lists and Programs

These operations are used to print data lists based on the program stored in the system work area.

The following table shows the lists that can printed from the Print Lists Menu. Select an operation by pressing its corresponding letter or moving the cursor to the operation and pressing Enter. These operations are described briefly in the following table and in more detail in later sections.

Operation	Function
U:Used data areas	Prints a list of the bits and words used in the program.
C:Used areas w/cmnts	Prints a list of the bits and words used in the program with I/O comments.
X:Cross-references	Prints a list of all the places where the specified bit or word is used in the program.
I:Ladder diagram & I/O	Prints out the program as a ladder diagram. Letters X and Y show whether bits are allocated to Input or Output Units.
N:Mnemonic	Prints out the program in mnemonic code.

Before printing, verify that a printer is connected to the computer and that it is correctly set. An error message won't be displayed if a printer isn't connected to the host computer. A message will be displayed if a printer is connected but unable to print. In this case, press Escape, correct the problem, and try again.

The type of printer being used is set in the System Setup.

6-4-1 Printing Data Area Lists

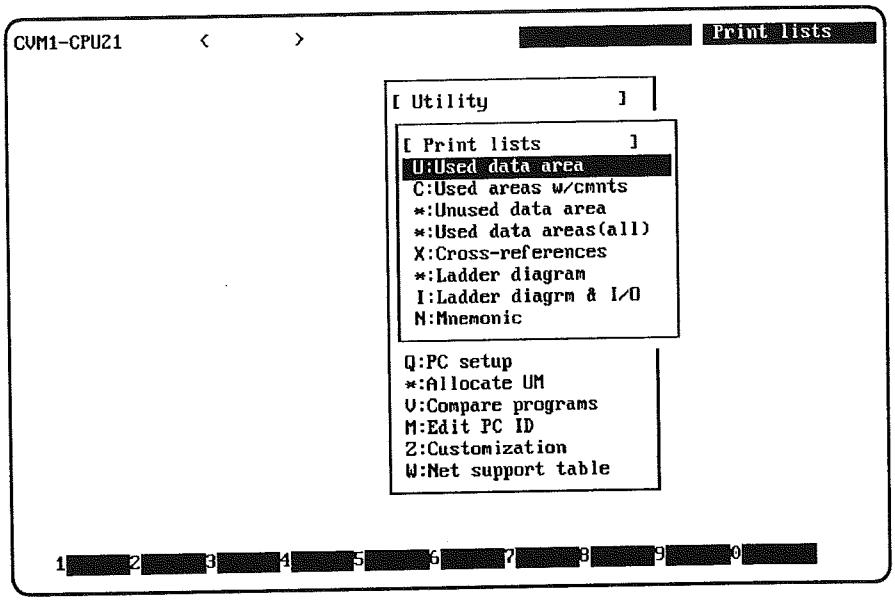
Follow this procedure to print the following data lists: used data areas, used areas with comments, and cross-references.

Separate areas must be printed separately. All areas cannot be printed at the same time. Cross references are searched for before printing and thus 10 minutes or more are required before printing.

As a rule, do not print words that are not being used. Printing large ranges of words will require extensive time.

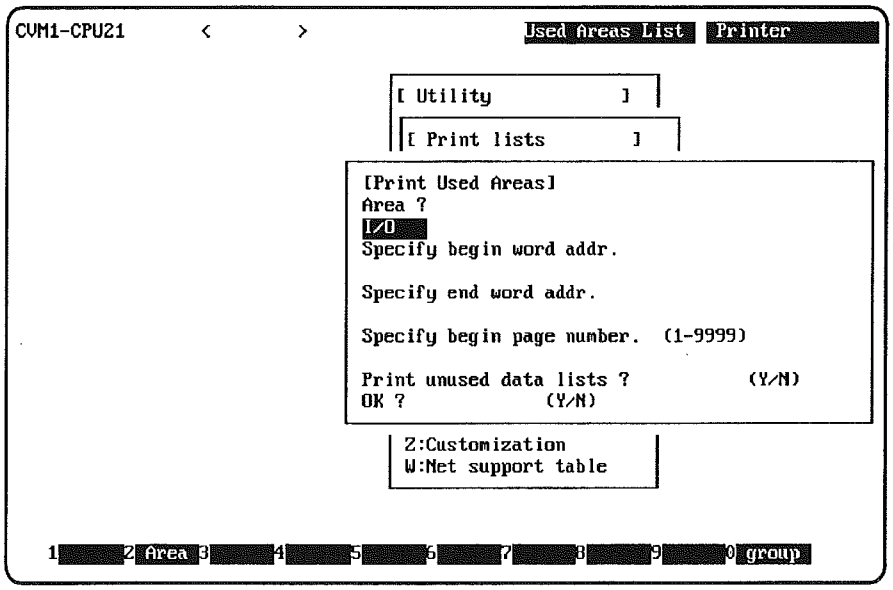
1, 2, 3...

1. Verify that the computer is connected to a printer and the printer is online.
2. Select "P:Print lists" from the Utility Menu and press Enter.



3. Select the desired list and press Enter.

In this example, Used Data Areas was selected, but the procedure is the same for Used Areas W/Cmnts and Cross-references.

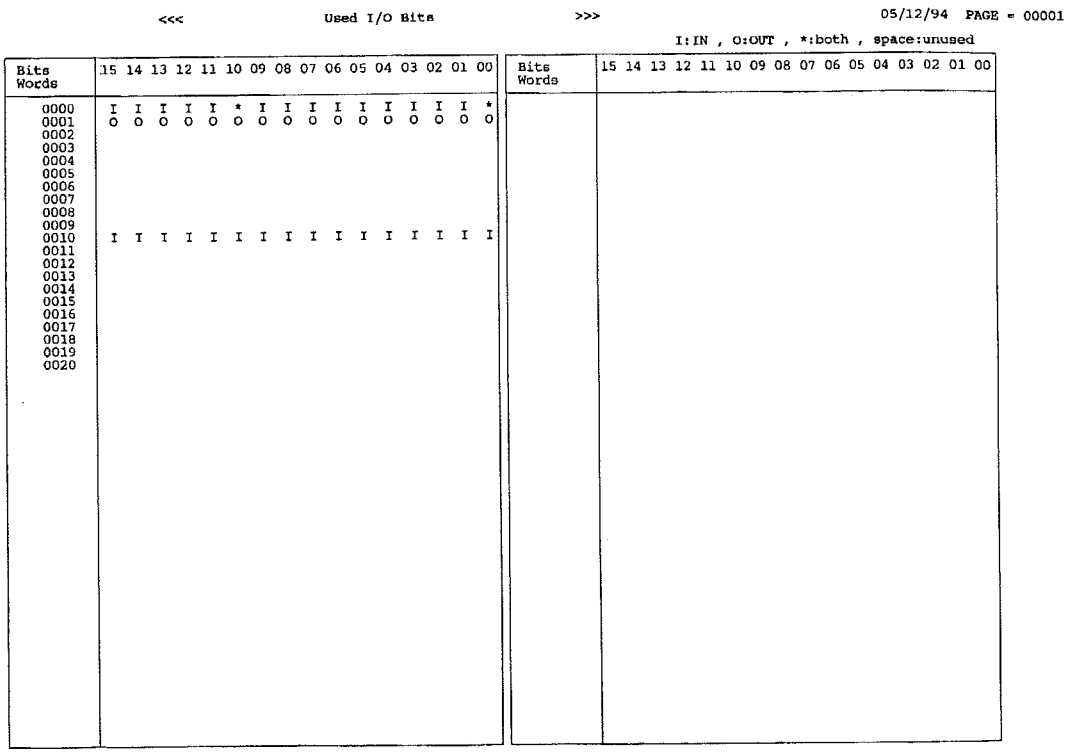


4. Select the desired data area. Press Enter to select the CIO Area, press F10 to specify a custom data area (group), or press F2 to specify another data area. If F2 is pressed, the function key display will change and F1 to F9 will correspond to the other data areas.
5. Enter the desired starting address, end address, and starting page number for printing.

   When printing a Cross-reference list, input "A:ALL" at the prompts for the beginning and end action and transition addresses.

   When printing a Used Data Areas or Used Areas W/Cmnts list, specify whether or not to print unused data lists.
6. Enter Y at "OK?" to execute the change, N to cancel the operation.

Press Escape at any time to interrupt printing. The printer will continue printing until its buffer is empty.



```
                <<<          Used I/O Bits          >>>          05/12/94  PAGE = 00001
                                                          I:IN , O:OUT , *:both , space:unused

Bits                                                      Bits
Words  15 14 13 12 11 10 09 08 07 06 05 04 03 02 01 00   Words  15 14 13 12 11 10 09 08 07 06 05 04 03 02 01 00
0000   I  I  I  I  I  *  I  I  I  I  I  I  I  I  I  *
0001   O  O  O  O  O  O  O  O  O  O  O  O  O  O  O  O
0002
0003
0004
0005
0006
0007
0008
0009
0010   I  I  I  I  I  I  I  I  I  I  I  I  I  I  I  I
0011
0012
0013
0014
0015
0016
0017
0018
0019
0020
```

6-4-2 Printer Settings for Program Printouts

Make the following printer settings before printing the program in ladder diagram or mnemonic format.

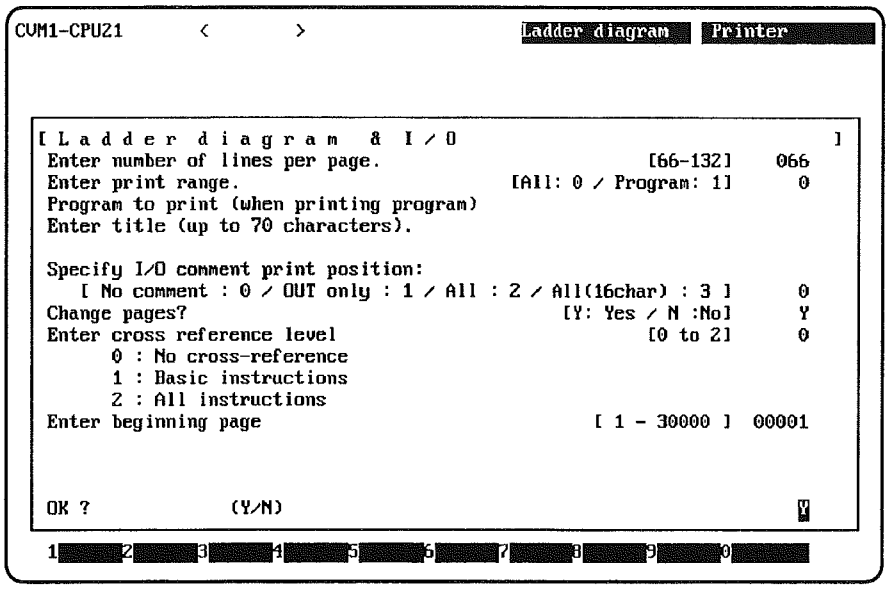
Item	Input	Description
Lines per page	66 to 132	Specifies the number of lines per page. Size A3 paper can be used if the number of lines is greater than 66.
Print range	0	The main program and all interrupt programs are printed out.
	1	Set the blocks to be printed. Also set the first and last addresses for the printing range.
Input title	Character input	Enter the title. This title will appear on the printout.
I/O comment	0	Do not print I/O comments.
	1	Print I/O comments for outputs only.
	2	Print I/O comments for all instructions.
	3	Print up to 16 characters of each I/O comment for all instructions
Change pages?	Y	Do not print over the perforations in the computer paper.
	N	Continuous printing, ignoring the perforations in the computer paper.
Cross-reference level	0	Do not print cross-references.
	1	Print cross-references only for instructions controlling program output status.
	2	Print cross-references for all instructions.
Start page	Numeric input	Enter the page number (1 to 30,000) of the first page to be printed.
OK?	Y	Start printing.
	N	Correct the settings.

6-4-3 Printing the Program in Ladder Diagram Format

Follow this procedure to print the program in the system work area in ladder diagram format.

1, 2, 3...

1. Verify that the computer is connected to a printer and the printer is online.
2. Select "P:Print lists" from the Utility Menu and press Enter.
3. Select "I:Ladder diagram & I/O" from the menu and press Enter. The ladder diagram settings will be displayed and the previous/default settings will appear on the right side of the display.



4. The cursor will appear at the "OK?" prompt at the bottom of the display. If no change is required, enter "Y" and go to step 6.

or If a change is required, enter "N," move the cursor to the setting that needs to be changed, and input the new setting.

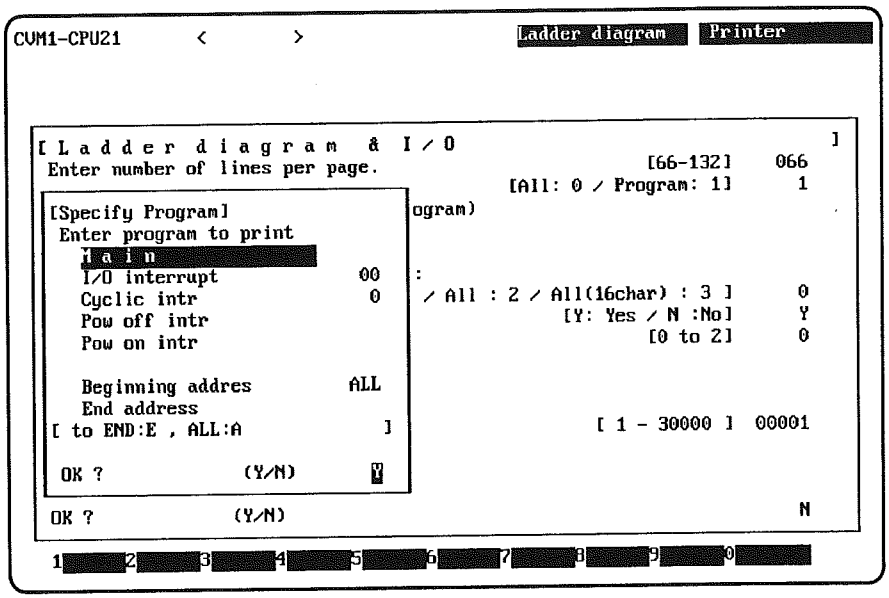
   Input a title (up to 70 characters) for the program and press Enter.

5. When all of the required changes have been made, move the cursor to the "OK?" prompt at the bottom of the display and enter "Y."
6. The message "Printing" will be displayed until printing is complete. The Print Lists Menu will be displayed when printing is complete.

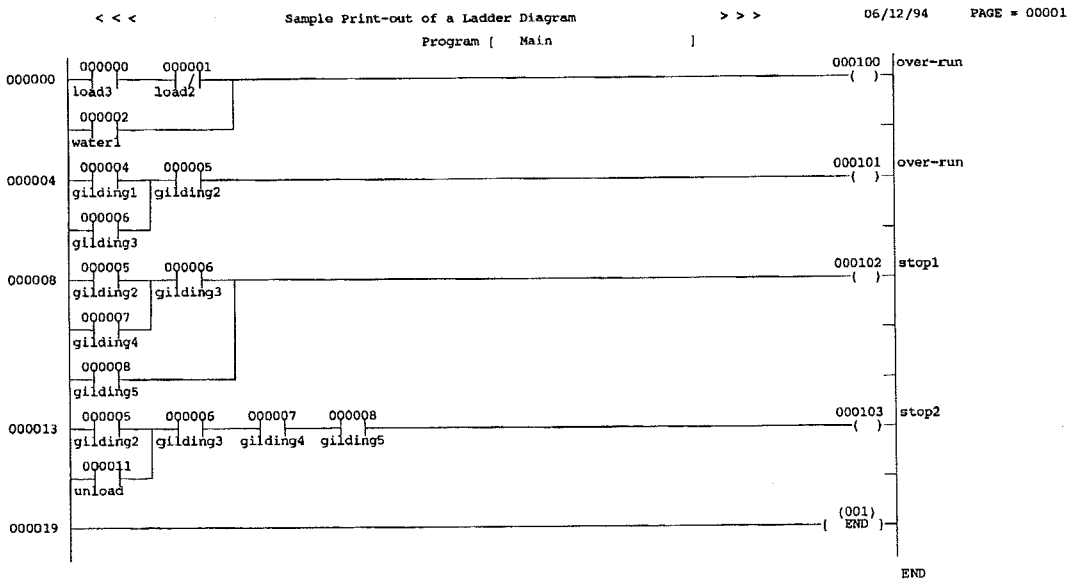
   Press Escape at any time to return to the Print Lists Menu. Printing will continue until all the data in the computer's printer buffer has been printed.

   There may be a delay of 10 minutes or more if the program is printed with cross-references, because the cross-reference search will be performed before the program is printed.

7. The following parameters must be set if printing a specific program is specified for the print range. The Print Lists Menu will be displayed after these parameters have been set and "Y" is entered at the confirmation prompt at the bottom of the display.



Example Ladder Diagram Printout

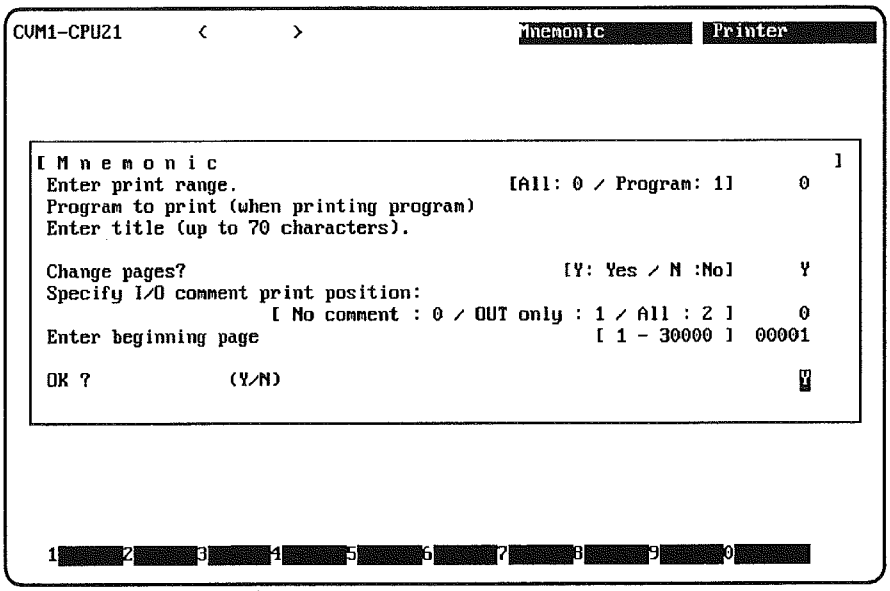


6-4-4 Printing the Program in Mnemonic Format

Follow this procedure to print the program in the system work area in mnemonic format.

1, 2, 3...

1. Verify that the computer is connected to a printer and the printer is online.
2. Select "P:Print lists" from the Utility Menu and press Enter.
3. Select "N:Mnemonic" from the menu and press Enter. The ladder diagram settings will be displayed and the previous/default settings will appear on the right side of the display.



4. The cursor will appear at the "OK?" prompt at the bottom of the display. If no change is required, enter "Y" and go to step 6.

or If a change is required, enter "N," move the cursor to the setting that needs to be changed, and input the new setting.

   Input a title (up to 70 characters) for the program and press Enter.

5. When all of the required changes have been made, move the cursor to the "OK?" prompt at the bottom of the display and enter "Y."
6. The message "Printing" will be displayed until printing is complete. The Print Lists Menu will be displayed when printing is complete.

   Press Escape at any time to return to the Print Lists Menu. Printing will continue until all the data in the computer's printer buffer has been printed.

   There may be a delay of 10 minutes or more if the program is printed with cross-references, because the cross-reference search will be performed before the program is printed.

Example Mnemonic List

```
< < <                          LADDER PRINT TEST                          > > >   05/12/94    PAGE = 0001
                                 Program [  Main                  ]

Address     Mnemonic     Operand      Comment

000000      LD             000001
000001      AND            000002
000002      AND            000003
000003      AND            000004
000004      AND            000005
000005      AND            000006
000006      AND            000007
000007      AND            000008
000008      AND            000009
000009      OUT            001000
000010      LD             000201
000011      AND            000202
000012      AND            000203
000013      AND            000204
000014      AND            000205
000015      AND            000206
000016      AND            000207
000017      AND            000208
000018      AND            000209
000019      OUT            002000
000020      LD             000301
000021      AND            000302
000022      AND            000303
000023      AND            000304
000024      AND            000305
000025      AND            000306
000026      AND            000307
000027      AND            000308
000028      AND            000309
000029      OUT            003000
000030      LD             000401
000031      AND            000402
000032      AND            000403
000033      AND            000404
000034      AND            000405
000035      AND            000406
000036      AND            000407
000037      AND            000408
000038      AND            000409
000039      OUT            004000
```

6-5 Memory Card Operations

When the PC model is set to CVM1, the following operations are used to manipulate files in the buffer RAM of the Memory Card Writer connected to the computer.

The operations from the computer affect only the Memory Card Writer buffer RAM. The operations do not affect the Memory Card directly. Refer to the Memory Card Writer operation manual for details on Memory Card Writer operations.

6-5-1 Preparation for Operation

A CV500-MCR01-E or other compatible Memory Card Writer must be connected in order to carry out the operations described in this section.

Memory Card Menu

Press the End Key to access the Memory Card Menu and select the required operation. These operations are outlined briefly in the following table.

Operation	Function and characteristics
M:Computer ↔ Memory Card	Transfers files between the Memory Card Writer buffer RAM and the data disk.
C:Copy file	Copies files in the Memory Card Writer buffer RAM.
N:Change file name	Renames files in the Memory Card Writer buffer RAM.
D:Delete file	Deletes files in the Memory Card Writer buffer RAM.
F:Initialize	Initializes the Memory Card Writer buffer RAM. Always use this operation to initialize new Memory Cards.
P:Print	Prints a list of the files in the Memory Card Writer buffer RAM.

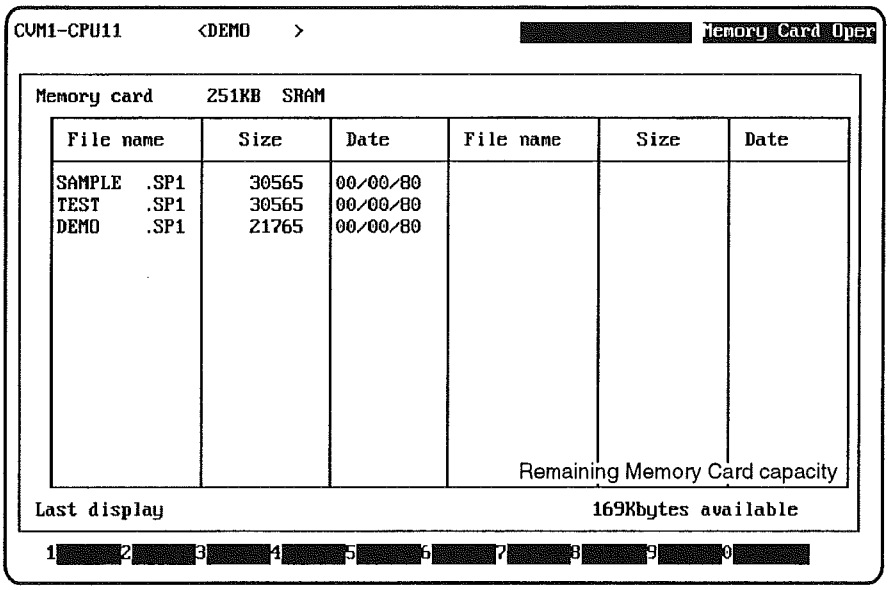
Preparations

The following procedure explains how to connect and prepare the Memory Card Writer.

1, 2, 3...

1. Connect the Memory Card Writer to the computer and turn on the power supply.
2. Press the Memory Card Writer's online switch and start switch to enable operation. The Memory Card Writer display should show the online code 0L and the green "ACCESS" indicator should be on.

3. Select "R:EPROM/Memory Card" from the Utility Menu. The files in the Memory Card Writer buffer RAM will be displayed.



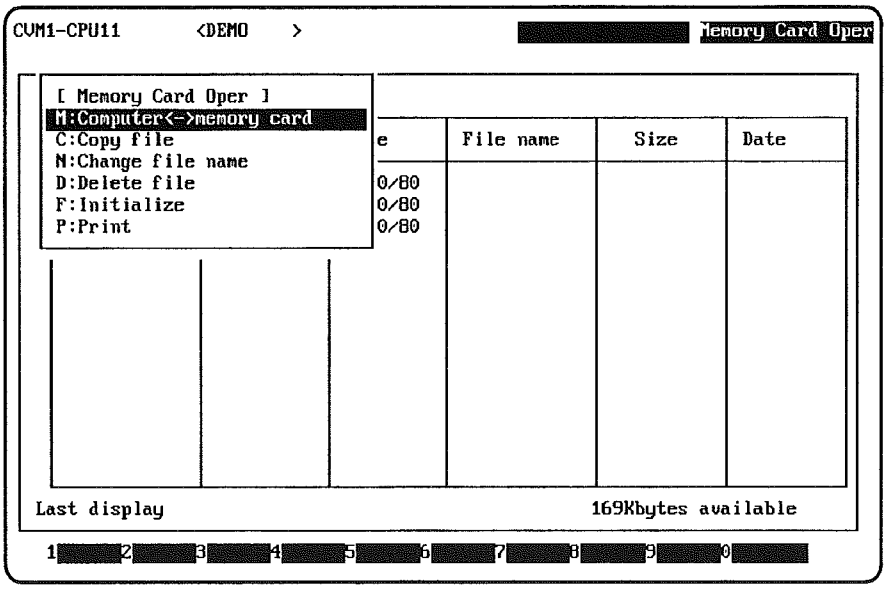
File name: The file name specified when the file was saved.

Size: The number of bytes the file occupies in memory.

Date: The date when the file was saved.

The date will be displayed as 80/00/00 for all files created on a Memory Card inserted in the Memory Card Writer. The date a file was saved will be displayed only for files created online for a Memory Card mounted in the CPU.

4. Up to 28 files can be displayed on a single page. Press the Space Bar to display more files.
5. Press the End Key to return to the Memory Card Menu.

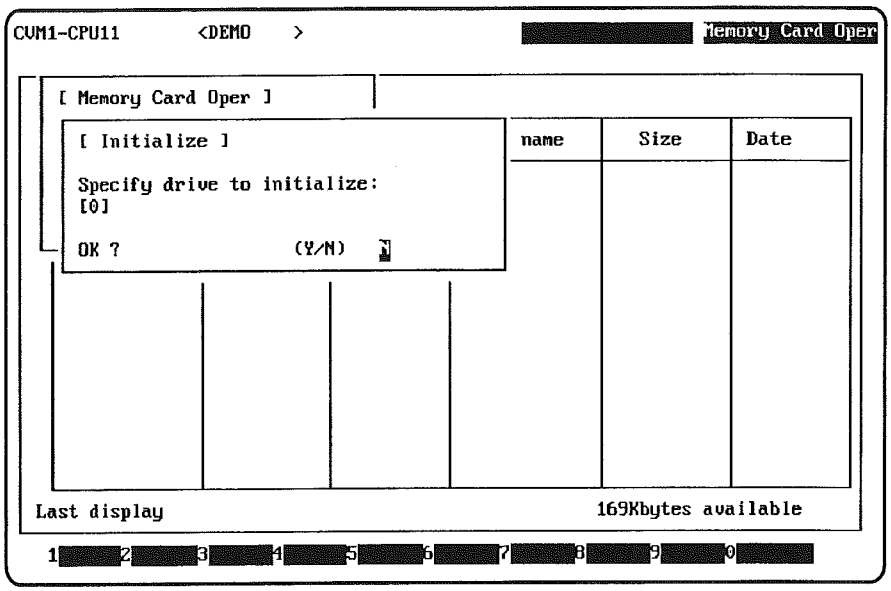


6-5-2 Initialization

This operation is used to initialize Memory Cards.

1, 2, 3... 1. Select "F:Initialize" from the Memory Card Menu.

The Memory Card drive is drive #0.



2. Press the Y and Enter Keys to initialize the Memory Card.
   The Memory Card Menu will be displayed when initialization is complete.

6-5-3 Automatic File Transfer

When the PC power is turned on, the user program and the PC Setup can be transferred from the Memory Card inserted in the CPU to the PC user program area. The files that can be transferred when the power is turned on are listed in the following table. To use this operation, save the files to be transferred to the Memory Card using the names shown in the table.

File type	File name
User program machine language file	AUTOEXEC.OBJ
PC Setup file	AUTOEXEC.STD

Turn ON pin #5 of the CPU's DIP switch to set the PC for automatic file transfer of both the user program file (AUTOEXEC.OBJ) and the PC Setup file (AUTOEXEC.STD).

The PC Setup can be set so that only the program file (AUTOEXEC.OBJ) will be transferred. Refer to *6-8 PC Setup* for details on changing the startup processing parameter in the PC Setup.

Preparations

Perform the following steps before transferring files from the PC to the Memory Card. Steps 1., 2., 9., and 10. must be performed, the other steps should be performed when necessary.

1, 2, 3...

1. Transfer the program.
2. Create the I/O table.
3. Transfer the data link tables.
4. Transfer the routing tables.
5. Set the Communications Units.
6. Set the System Setup for the BASIC Units.
7. Customize settings.
8. Set the PC Setup.
9. Set the PC Setup for no low battery detection.

10. Set the PC Setup for a startup mode of RUN or MONITOR.

EEPROM Memory Cards

It isn't possible to write files directly to EEPROM Memory Cards in PCs other than CVM1 PCs with version EV CPUs. Write the files to the Memory Card via a CV500-MCW01-E Memory Card Writer and then insert the Memory Card in the CVM1 PCs with version EV1 CPUs or later. The procedure is as follows:

1, 2, 3...

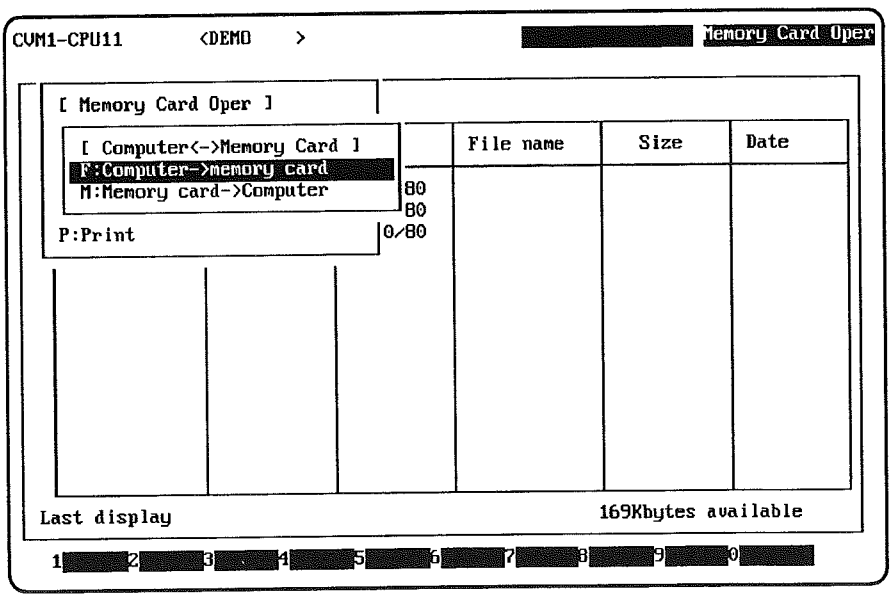
1. Go online with the PC.
2. Transfer the program and PC Setup information to the PC. Refer to *10-2-1 Transferring to the PC.*
3. Insert a RAM Memory Card into the PC.
4. Write the program, PC Setup, and System Setup information to the Memory Card. Refer to *13-2-1 Transferring from PC to Memory Card.*
5. Connect the Memory Card Writer and insert an EEPROM Memory Card.
6. Transfer the files from the RAM Memory Card in the PC. Refer to *13-2-2 Transferring from Memory Card to PC.*
7. Go offline.
8. Transfer files from the computer to the Memory Card in the Memory Card Writer. Refer to *6-5-4 Transferring from Computer to Memory Card.*
9. Turn off the PC and insert the EEPROM Memory Card.
10. Turn ON pin #5 of the CPU's DIP switch to set the PC for automatic file transfer.

6-5-4 Transferring from Computer to Memory Card

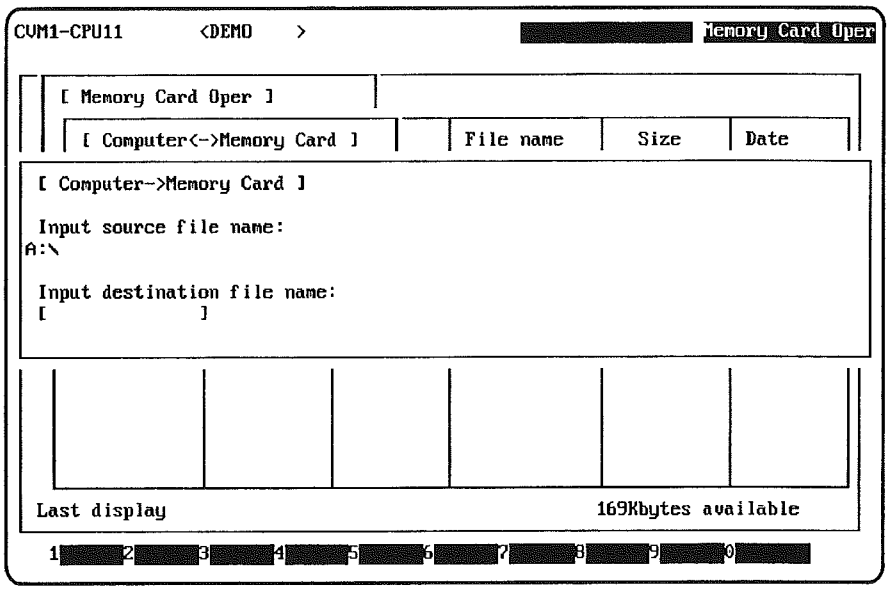
This operation is used to transfer files from the computer to a Memory Card in the Memory Card Writer.

1, 2, 3...

1. Select "M:Computer ↔ Memory Card" from the Memory Card Menu.



2. Select "F:Computer → Memory Card" from the menu. A file name input area will be displayed.



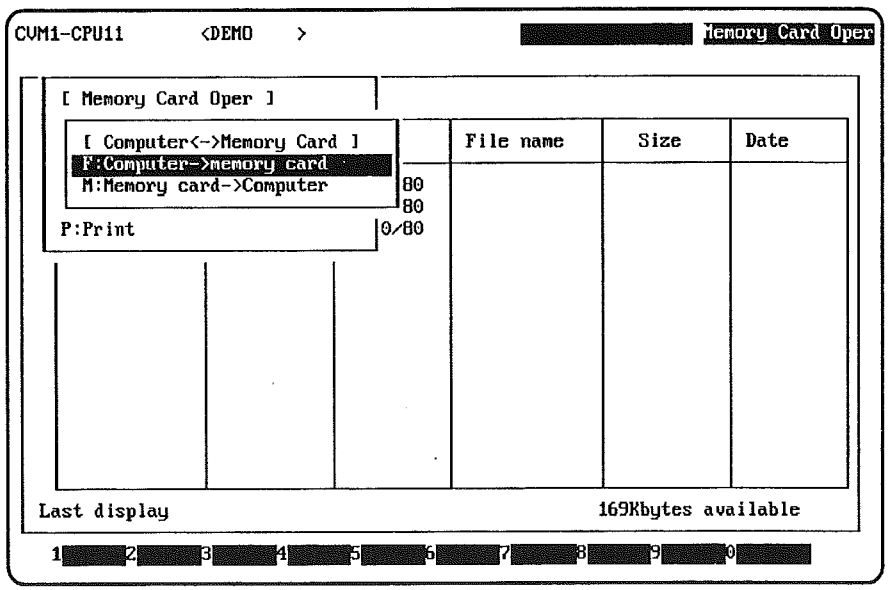
3. Check the source drive name, enter the file name of the file to be transferred to the Memory Card, and press Enter.
4. Check the destination drive name, enter the file name to be used in the Memory Card, and press Enter.

6-5-5 Transferring from Memory Card to Computer

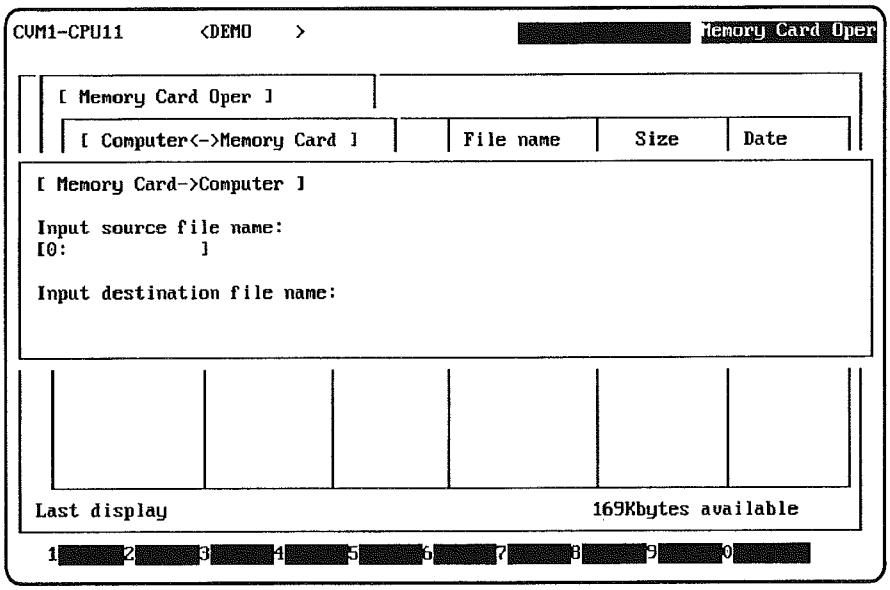
This operation is used to transfer files from a Memory Card in the Memory Card Writer to the computer.

1, 2, 3...

1. Select "M:Computer ↔ Memory Card" from the Memory Card Menu.



2. Select "M:Memory card → Computer" from the menu. A file name input area will be displayed.



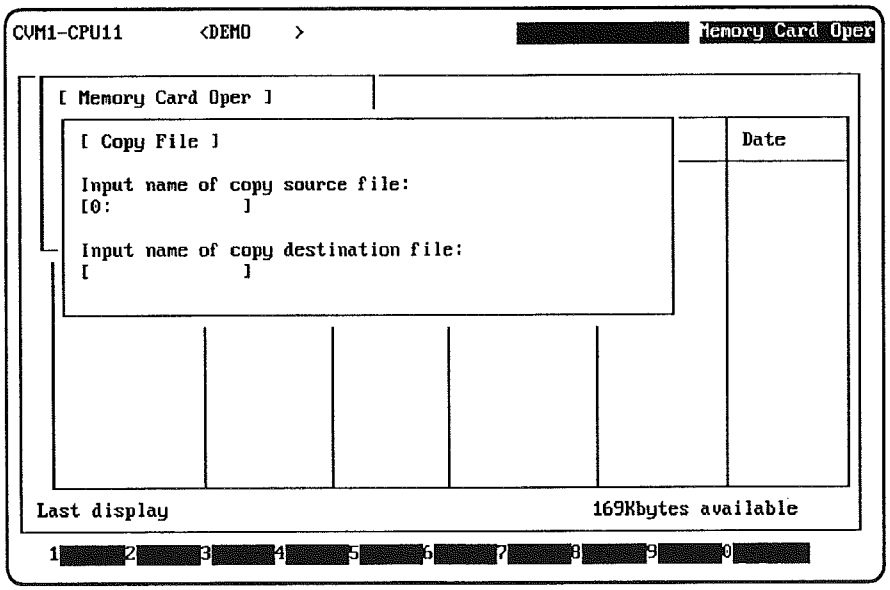
3. Check the source drive name, enter the file name of the file to be transferred from the Memory Card, and press Enter.
4. Check the destination drive name, enter the file name to be used in the computer, and press Enter.

6-5-6 Copying Files

This operation is used to copy files in the Memory Card Writer's buffer RAM.

1, 2, 3...

1. Select "C:Copy files" from the Memory Card Menu. A file name input area will be displayed.



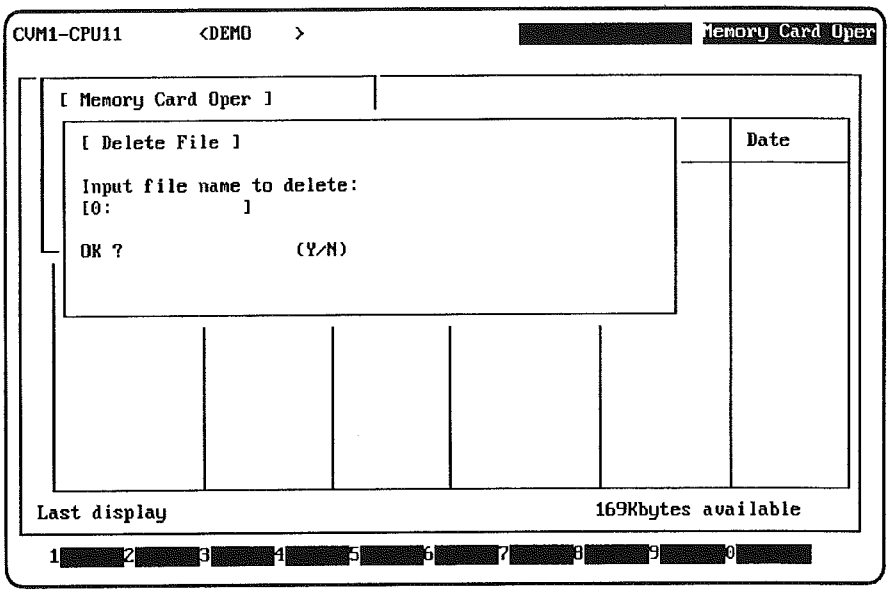
2. Enter the source file name and press Enter.
3. Enter the destination file name and press Enter.

6-5-7 Deleting Files

This operation is used to delete files from the Memory Card Writer's buffer RAM.

1, 2, 3...

1. Select "D:Delete file" from the Memory Card Menu. A file name input area will be displayed.



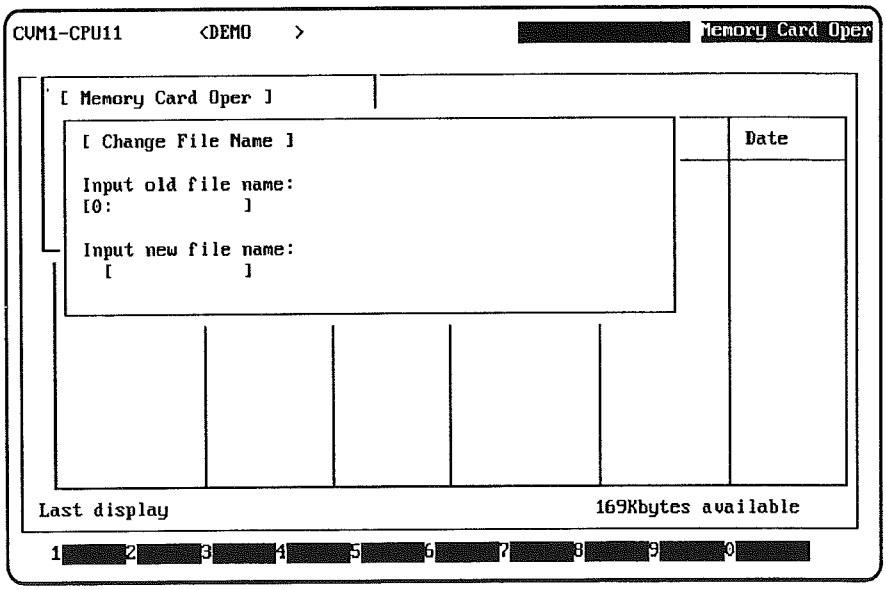
2. Enter the name of the file to be deleted and press Enter. A confirmation message will be displayed.
3. Enter "Y" delete the file, "N" to cancel the file delete operation.

6-5-8 Renaming Files

This operation is used to rename files in the Memory Card Writer's buffer RAM.

1, 2, 3...

1. Select "N:Change file name" from the Memory Card Menu. A file name input area will be displayed.



2. Enter the file name to be changed and press Enter.
3. Enter the new file name and press Enter.

6-5-9 Printing

This operation is used to print a list of files in the Memory Card Writer's buffer RAM.

1, 2, 3...

1. Verify that the computer is connected to a printer and the printer is online.
2. Select "P:Print" from the Memory Card Menu. A list of the files in the Memory Card Writer buffer RAM will be printed.

6-6 Program Conversion

The program conversion operations are used to convert C-series programs and DM data to the CV-series program format. Programs created for C500-family PCs must be converted to the C2000H-family format before conversion to the CV-series program format.

The C500 family includes the C20, C50, P-type, C120, and C500 PCs. The C2000H family includes the C200H, C1000H, C2000H, Mini H-type, K-type, CQM1, and C200HS PCs.

Some programs will not be entirely compatible after conversion. A list of the instructions and operands requiring modification will be displayed after conversion. This list can be printed or saved as a text file for reference during program editing. Refer to *6-6-3 Displaying/Printing Required Modifications* and to *Appendix J Correcting Converted Programs* for more details.

Program Conversion Operations

The following table briefly describes the operations that can be selected from the Program Conversion Menu. These operations are described in detail in later sections.

Operation	Function and characteristics
P:Program + I/O comments	Converts the program and I/O comments to the format usable by CVM1 PCs.
C:I/O comments	Converts I/O comments to the format usable by CVM1 PCs.
D:DM data	Writes DM data into the equivalent DM addresses in the CVM1 PC.
E:Fix list	Displays, prints, or files a list of items requiring modification after program conversion.

6-6-1 Program and I/O Comment Conversion

The "P:Program + I/O comments" operation converts both the program and I/O comments to the CVM1 format and the "C:I/O comments" operation converts only the I/O comments. Programs created for C500-family PCs must be converted to the C2000H-family format before conversion to the CV-series program format. Programs for PCs other than the C1000H/C2000H and C200HS might not convert normally.

The program conversion will proceed normally if the C-series instructions and IR area operands have CVM1 equivalents. Instructions that don't have CVM1 equivalents will be replaced by "????" and operands that don't have equivalents will be replaced by "$$$$." The number of incompatible instructions and operands will be counted during conversion.

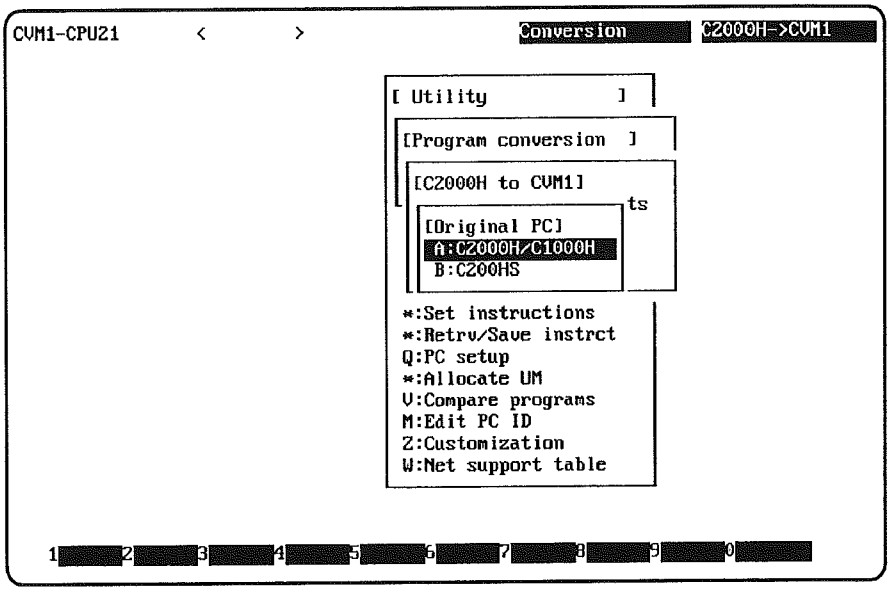
If the original C-series program data has been corrupted, the conversion will be completed and an error message will be displayed after completion.

I/O comments will be converted only when there is an equivalent CVM1 operand for the IR area operand. Block comments will be converted, but instructions comments will not be converted.

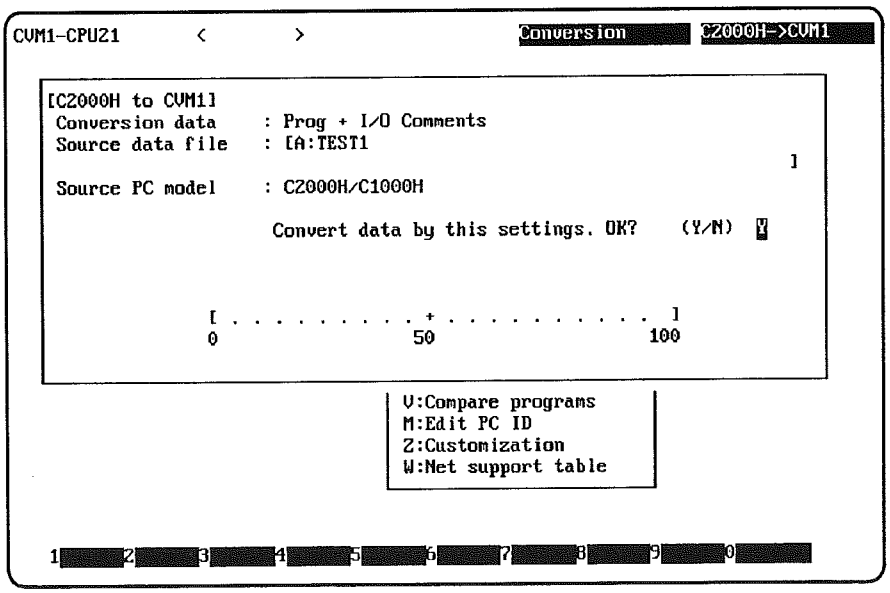
1, 2, 3...

1. Select "N:Program conversion" from the Utility Menu.

2. Select "V:C2000H → CVM1" from the Program Conversion Menu.
3. Select "P:Program + I/O comments" or "C:I/O comments" from the C2000H → CVM1 Menu.
4. If using a floppy disk, insert the disk containing the original C-series program into the disk drive.
5. Press F1 if you are inputting the file name of a program created with LSS. Proceed to step 8. if you are converting an DOS program.
6. Input the file name of the original program and press Enter. The following display will appear if the data disk is an LSS data disk.



7. Select the model of PC in which the program was used. The following display will appear when the program and I/O comments are being converted. The display for I/O comment conversion is similar.

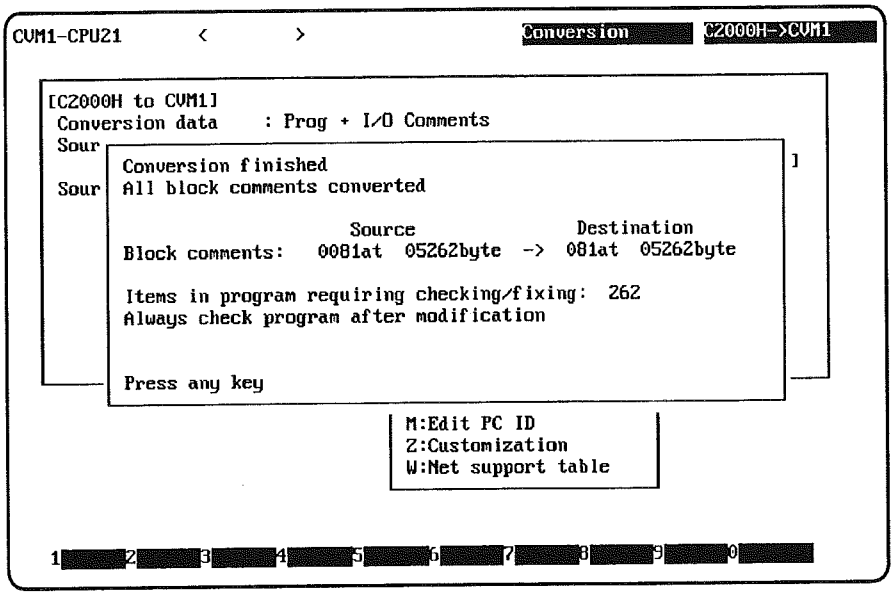


8. Press Enter. The display will indicate the progress of the conversion. The conversion can be interrupted by pressing Escape.

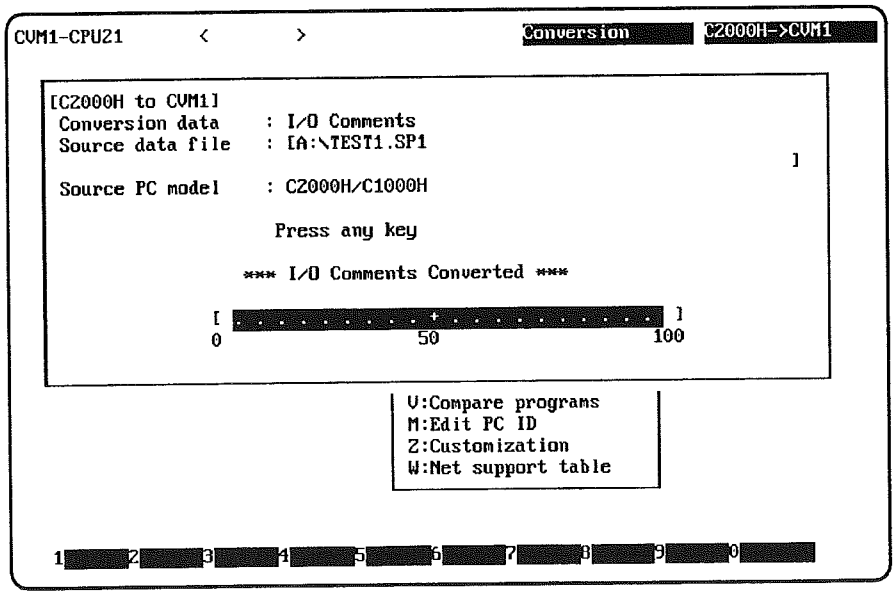
The I/O comments will be converted after the program if both the program and I/O comments are being converted.

9. When the conversion has been completed press any key to return to the C2000H → CVM1 Menu.

   If the program has been converted, the display will indicate the number of block comments, number of bytes, and number of instructions/operands which require modification. Be sure to list the items which require modification with the "E:Fix list" operation if there are items which require modification or a ladder diagram program has been converted.

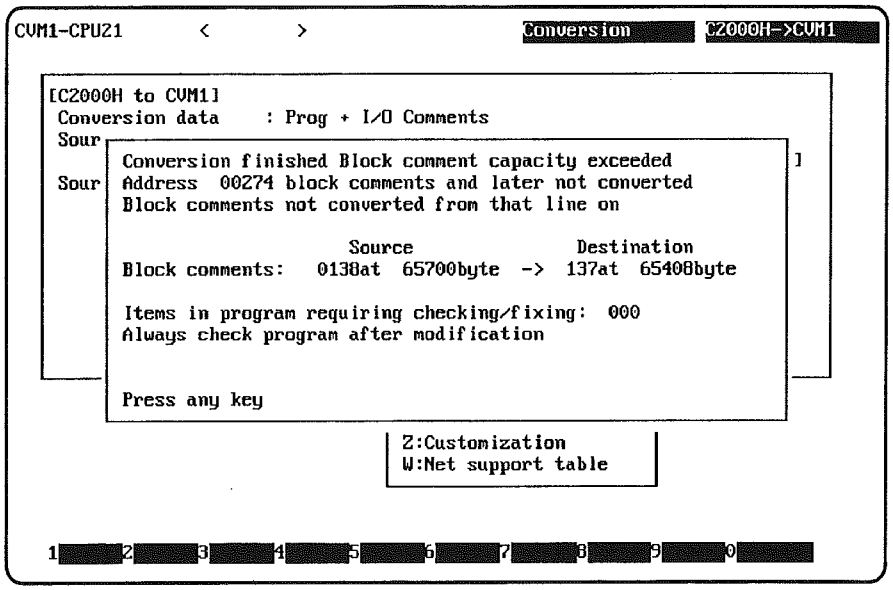


If just the I/O comments have been converted, the following display will appear.

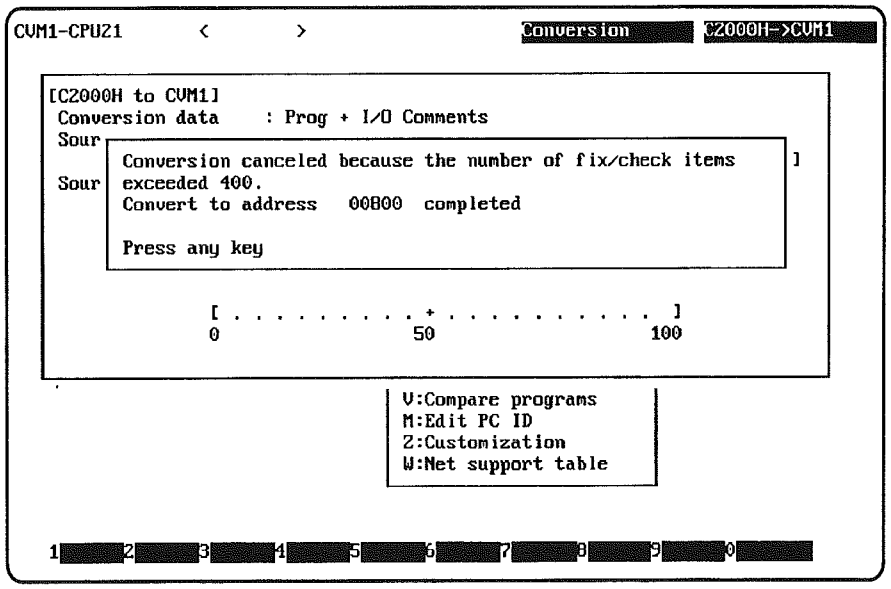


Errors

If the number of block comments or the number of characters exceeds the maximum number that can be converted, the remaining block comments won't be converted and the following display will appear. (The entire program will be converted.)



If more than 400 instructions/operands require modification, the remainder of the program won't be converted and the following display will appear.



Follow the procedure below to reduce the number of instructions/operands requiring modification.

1, 2, 3...

1. If a large number of errors are caused because a large number of communications-related flags and bits are being used as operands in the program, change the original operands to unused bits in the IR Area and try the program conversion again.
2. If there are other causes for the errors, break the original program into parts and then convert the parts one by one.

6-6-2 DM Data Conversion

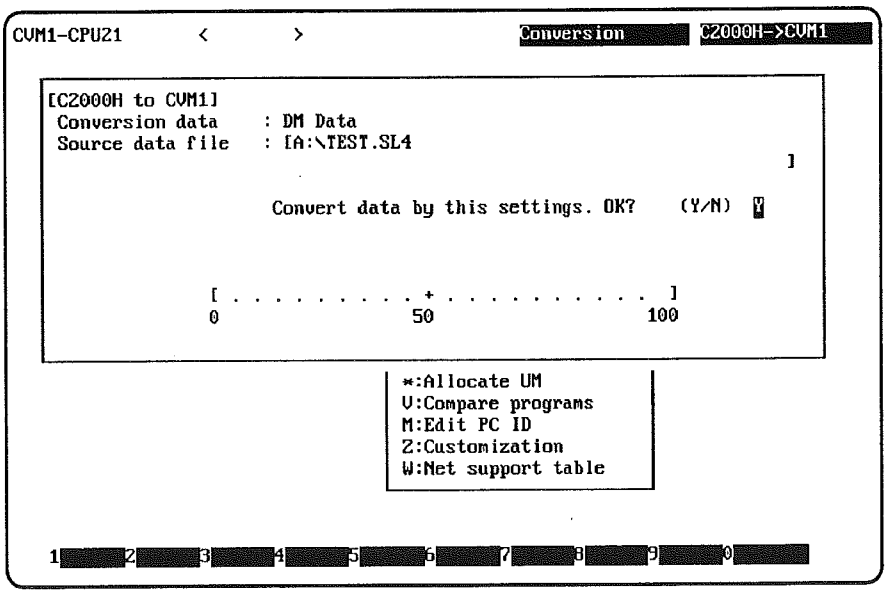
The "D:DM Data" operation converts DM data used in C-series PCs into DM data that can be used in CVM1 PCs. The operation copies the DM data from the original C-series PC to the equivalent addresses in the CVM1 PC. Only DM words that can be used as operands in the program are converted, as shown in the following table.

PC	Converted DM
C1000H	D0000 to D4095
C2000H	D0000 to D6655
C200HS	D0000 to D6655, D7000 to D9999

If there are more DM words in the CVM1 PC than the C-series PC, the extra words will be cleared to 0000.

1, 2, 3...

1. Select "N:Program conversion" from the Utility Menu.
2. Select "V:C2000H → CVM1" from the Program Conversion Menu.
3. Select "D:DM Data" from the C2000H → CVM1 Menu.
4. When using a floppy disk, insert the disk containing the original C-series DM data into the disk drive.
5. Press F1 if you are inputting the file name of DM file created with LSS. Proceed to step 7. if you are converting an DOS file.
6. Input the file name of the original DM file and press Enter. A confirmation prompt will be displayed.



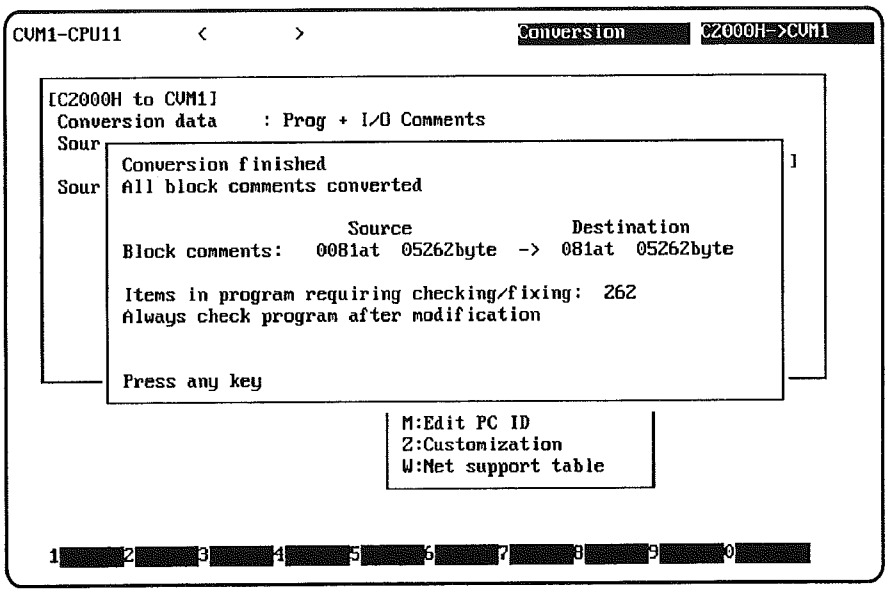
7. Press Enter. The display will indicate the progress of the conversion. The conversion can be interrupted by pressing Escape.
8. When the conversion has been completed press any key to return to the C2000H → CVM1 Menu.

6-6-3 Displaying/Printing Required Modifications

The "E:Fix list" operation is used to identify the instructions and operands that will require modification after program conversion. A list of the required program modifications can be displayed, printed, or saved as a text file after conversion. The user can then refer to the list of modifications while editing the program.

A list of modifications is produced only during program conversion, none is produced during I/O comment conversion or DM data conversion.

The following display will appear when program and I/O comment conversion is completed.



Be sure to execute the "E:Fix list" operation whenever there are required modifications and perform one or more of the following operations as necessary.

1, 2, 3...

1. Display the required program modifications after conversion.
2. Print the required program modifications after conversion. (It is very useful to have a list of the required modifications while editing the program.)
3. Save the required program modifications as a text file specified by the user. (Useful when saving records as DOS text files.)

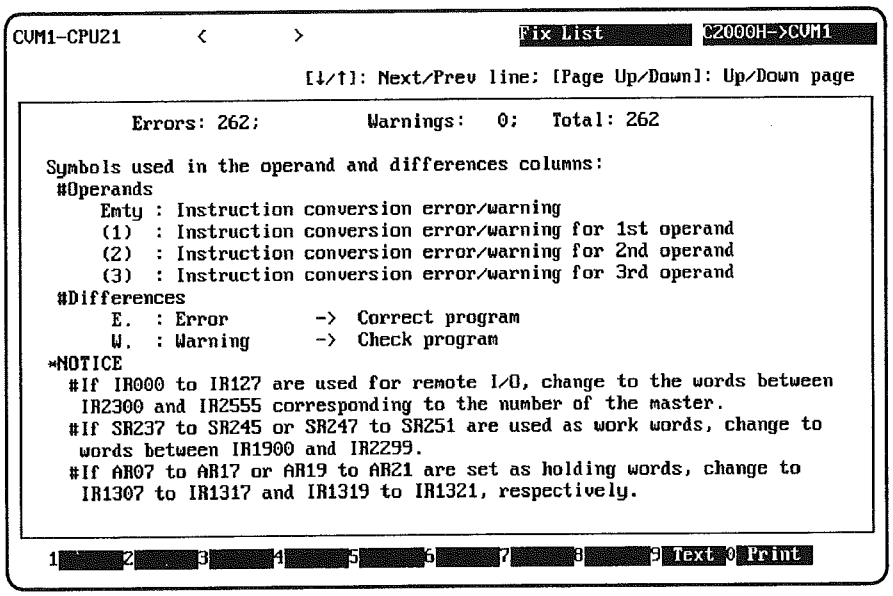
Displaying Modifications

Use this procedure to display the required program modifications after conversion. The displayed list will show only the differences in instructions and operands. Print out the required modification for a more detailed description of the required modifications.

1, 2, 3...

1. When program conversion is completed, check the display to see whether there are items requiring modification. Press any key to end the program conversion operation and return to the C2000H → CVM1 Menu.

2. Select "E:Fix list" from the C2000H → CVM1 Menu. The required modifications list will be displayed.



3. Use the Up and Down Cursor Keys and the PageUp and PageDown Keys to scroll through the list.
4. Press Escape to return to the C2000H → CVM1 Menu.

Printing Modifications

Use this procedure to print out a detailed description of the required modifications.

1, 2, 3...

1. When program conversion is completed, check the display to see whether there are items requiring modification. Press any key to end the program conversion operation and return to the C2000H → CVM1 Menu.
2. Select "E:Fix list" from the C2000H → CVM1 Menu. The required modifications list will be displayed.
3. Press F10 to print out the required modifications. The print operation can be interrupted by pressing Escape.

   The required modifications list will be displayed again when printing is completed.
4. Press Escape to return to the C2000H → CVM1 Menu.

Creating a Text File

Use this procedure to create an DOS text file containing a detailed description of the required modifications.

1, 2, 3...

1. When program conversion is completed, check the display to see whether there are items requiring modification. Press any key to end the program conversion operation and return to the C2000H → CVM1 Menu.
2. Select "E:Fix list" from the C2000H → CVM1 Menu. The required modifications list will be displayed.
3. Press F9 to create a text file. A file name input area will be displayed.
4. Input the path name and file name of the text file. The ".TXT" extension will be added to the file name.

   The required modifications list will be displayed again when printing is completed.
5. Press Escape to return to the C2000H → CVM1 Menu.

6-6-4 Required Modifications Table

The following table lists the required modifications that are counted as warnings.

Program differences	Required modification
Check PC Setup.	Check validity of multiple JMP00 instructions.
Instruction mnemonic changed.	Program execution will not be affected.
Check System Setup.	Check display message number to be sure it's "0."
Momentary stops also counted. (power interruptions)	Fix program if necessary for application.

The following table lists the required modifications that are counted as errors.

Program differences	Required modification
Wrong ladder form for inst	Check the structure of the instruction and modify the program.
Stack push will not work	Modify push operations to SSET and PUSH instructions.
Stack pop will not work	Modify pop operations to SSET, LIFO, and FIFO instructions.
#8000 processing differs	Check and modify processing of #8000 data.
#80000000 processing differs	Check and modify processing of #80000000 data.
PID parameter format differs	Check whether it is alright to use 39 words in the PID instruction's work area.
Range differs for interrupt	The interrupt program must be modified. (Refer to *Appendix J Correcting Converted Programs* and the Operation Manual.)
Interrupt prog range differs	The interrupt program must be modified. (Refer to *Appendix J Correcting Converted Programs* and the Operation Manual.)
Set unit for interrupt time	Check the PC Setup settings for scheduled interrupts.
Result output/content differ	Check the output and content and modify the program.
Byte comput. not possible	Modify the program to remove byte calculations.
Object released differs	Reset with FAL or MSG instructions.
No. of characters differs	Allocate memory for 32 characters rather than 16.
Cycle time unit differs	The cycle time monitoring time and WDT settings must be set.
Control data format differs	Refer to the Operation Manual and change the control data settings.
Different hardware used	Refer to the Operation Manual and modify program. (Memory cards are used in the CVM1.)
Instr not supported by CVM1	Check instruction and correct program.
Area not usable as source	An equivalent program cannot be created. Modify the program.
DM not usable as source	
No destination (system)	
No destination (spec flag)	
No destination (program)	
No destination (DM)	
Comm err flag differs	The program must be modified to agree with the flag's location.
SLK/SNT flag differs	
Tracing flags differ	
Error flag differs	
No destination (comm)	Check the Communication Unit's specifications and modify the program accordingly.
No destination (remote I/O)	Check the Remote I/O Unit's specifications and modify the program accordingly.
No destination (optical I/O)	Check the Optical I/O Unit's specifications and modify the program accordingly.
No destination (file memory)	File Memory Units cannot be used. Modify the program.
No destination (PC link)	The PC Link System cannot be used. Modify the program.

Program differences	Required modification
Only day flags processed	Modification required if an area other than day information is being used.
Only tracing flags processed	Modification required if bits other than the Trace Flag is being used.
Only math flags processed	Modification required if bits other than arithmetic flags is being used.
Destination range exceeded	Data is not within the data area's range.
Not usable as source flag	An equivalent program cannot be created. Modify the program.
No source flag (system)	
No source flag (SIOU)	
No source flag (memory)	
No source flag (program)	
No source flag (comm)	Check the communication unit's specifications and modify the program accordingly.
No source flag (remote I/O)	Check the Remote I/O Unit's specifications and modify the program accordingly.
No source flag (optical I/O)	Check the Optical I/O Unit's specifications and modify the program accordingly.
No source flag (PC link)	The PC Link System cannot be used. Modify the program.
No source flag (file memory)	File Memory Units cannot be used. Modify the program.
No destination operand	An equivalent program cannot be created. Modify the program.

6-7 Data Trace

The three Data Trace operations are used to display the data trace data located in the system work area, save data trace data to a data disk, and retrieve data trace data from a data disk. These operations are summarized in the following table.

Operation	Function
R:Read data trace	Displays the data trace data in the system work area.
L:Retrieve data trace	Retrieves data trace data from a data disk to the system work area.
S:Save data trace	Saves data trace data from the system work area to a data disk.

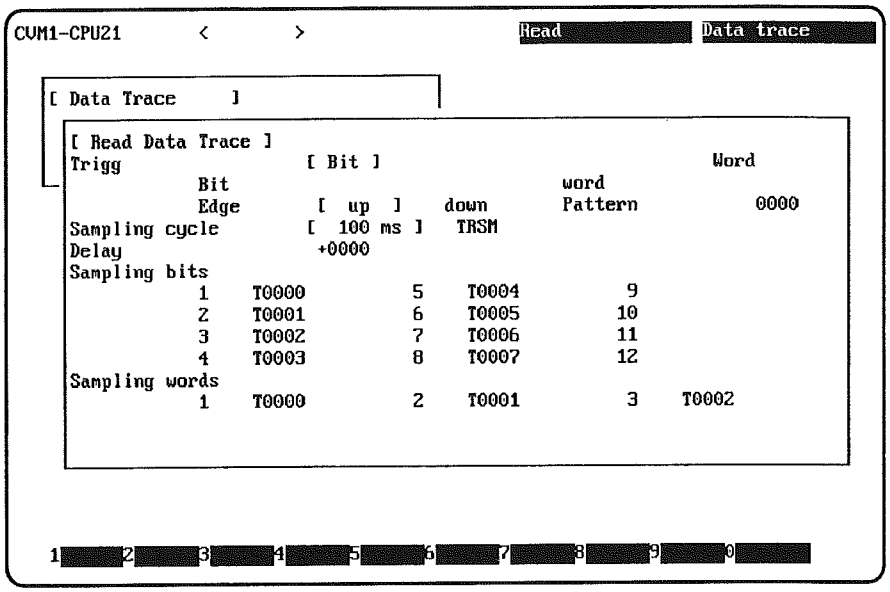
The data trace data in the system work area is generated using the online Execute Data Trace operation. Refer to *13-3 Data Tracing* for details.

6-7-1 Reading Data Trace Data

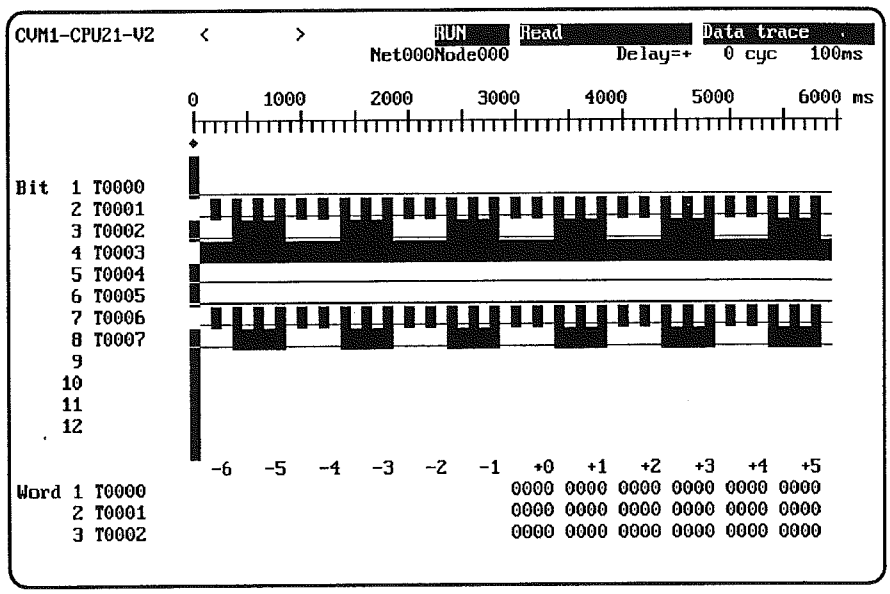
The Read Data Trace operation is used to display the data trace data located in the system work area.

1, 2, 3... 1. Select "R:Read data trace" from the Data Trace Menu.

The parameters set with the online Data Trace operation will be displayed.



2. Press Enter to display the data trace data.



3. Subsequent operations are identical to operations for the online Read Data Trace operation.

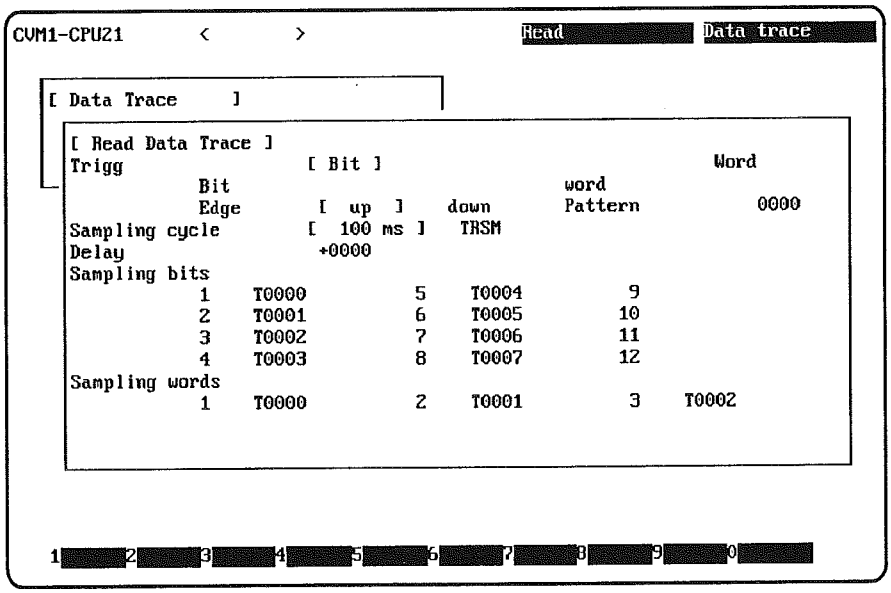
6-7-2 Retrieving Data Trace Data

The Retrieve Data Trace operation is used to retrieve data trace data from a data disk to the system work area.

1, 2, 3...

1. Select "L:Retrieve data trace" from the Data Trace Menu. A file name input area will be displayed.
2. Input the desired file's path name and file name and press Enter.

The data trace data will be retrieved when Enter is pressed. The retrieved data trace data will be displayed.



6-7-3 Saving Data Trace Data

The Save Data Trace operation is used to save data trace data from the system work area to a data disk.

1, 2, 3...

1. Select "S:Save data trace" from the Data Trace Menu. A file name input area will be displayed.
2. Input the desired path name and file name and press Enter.
3. If the input file name already exists, a confirmation prompt will be displayed. Enter "Y" to overwrite the existing file, "N" to cancel and input a new file name.
4. An input area for a header will be displayed. Input a header if desired and press Enter. The data trace data will be saved when Enter is pressed.

6-8 PC Setup

The PC Setup is used to specify operating parameters for the PC. The offline PC Setup operations affect the PC Setup in the computer's system work area. The PC Setup can be edited, saved to a data disk, or retrieved from a data disk.

The online PC Setup operations affect the PC Setup in the PC itself. The PC Setup in the PC can be edited directly or the PC Setup in the computer's system work area can be transferred to the PC. Refer to the online operations part of this manual for details.

The operations that can be selected from the offline PC Setup Menu are described briefly in the following table and in detail in later sections.

Menu item	Function
A:PC setup	Sets or changes the PC Setup in the system work area.
S:Save PC settings	Saves the PC system setup data in the system work area to a data disk.
L:Retrieve PC settings	Reads the PC Setup data from a data disk to the system work area.
C:Clear PC settings	Resets all parameters in the PC Setup in the system work area to their default values.

6-8-1 Default Values of PC Setup Parameters

The following table shows the PC Setup parameters and their default values.

Parameter		Default value
A:Hold areas	H:Hold areas	CIO 1200 to CIO 1499
	R:Hold bits	Nothing held.
B:Startup hold	K:Forced Status	Reset at startup.
	I:I/O bits	
	D:Power on flag	
C:Startup mode		PROGRAM
D:Startup processing		Don't transfer program.
E:I/O refresh		Cyclic refreshing
F:Execute control 1	B:Detect low battery	Detect
	S:Error on power off	Fatal
	T:CPU standby	CPU waits
	K:Measure CPU SIOU cycle	Don't measure cycle.
G:Execute control 2	C:Execute process	Asynchronous
	I:I/O interrupt	Nesting
	D:Power OFF interrupt	Disable
	A:Dup action process	Error
	T:Step timer	Set to 0.1 s
	J:Startup trace	Don't start trace.
	B:*DM BIN/BCD	BCD
	P:Multiple use of JMP000	Enabled
	E:Compare error process	Run after error
H:Host link	B:Baud rate	9600 bps
	S:Stop bit	2 bits
	P:Parity	Even
	D:Data bits	7 bits
	G:Unit #	Unit number 0
I:CPU bus link		Don't use CPU Bus Link.
J:Scheduled interrupt		10.0 ms
K:1st Rack addr (First words for local racks)		0 for CPU Rack
L:Group 1,2 1st addr (First words for SYSMAC BUS/2 Slaves)		RM0 RM1 RM2 RM3 Group 1: CIO 0200 CIO 0400 CIO 0600 CIO 0800 Group 2: CIO 0250 CIO 0450 CIO 0650 CIO 0850
M:Trans I/O addr (First words for I/O Terminals)		RM0 RM1 RM2 RM3 CIO 2300 CIO2332 CIO 2364 CIO2396 RM4 RM5 RM6 RM7 CIO 2428 CIO 2460 CIO 2492 CIO 2524
N:Group 3, RT 1st addr (First words for group-3 Slave Racks)		Group 3 (SYSMAC BUS/2): RM0 RM1 RM2 RM3 CIO 0300 CIO 0500 CIO 0700 CIO 0900 Words allocated to Units in order under each Master. RT (SYSMAC BUS): Defaults for SYSMAC BUS Slaves are the same as for I/O Terminals (see above). Words allocated to Units in order under each Master.
O:CV-SIOU 1st addr		Not used at present.
P:Power break (Momentary power interruption time)		0 ms
Q:Cycle time		Cycle variable

Parameter	Default value
R:Watch cycle time (Cycle time monitoring time)	1,000 ms
S:Error log	20 records in A100 through A199
T:IOIF, RT display (Slave display modes at startup)	Mode 1

6-8-2 Usage of PC Setup Parameters

The following table shows the function and normal application of PC Setup parameters.

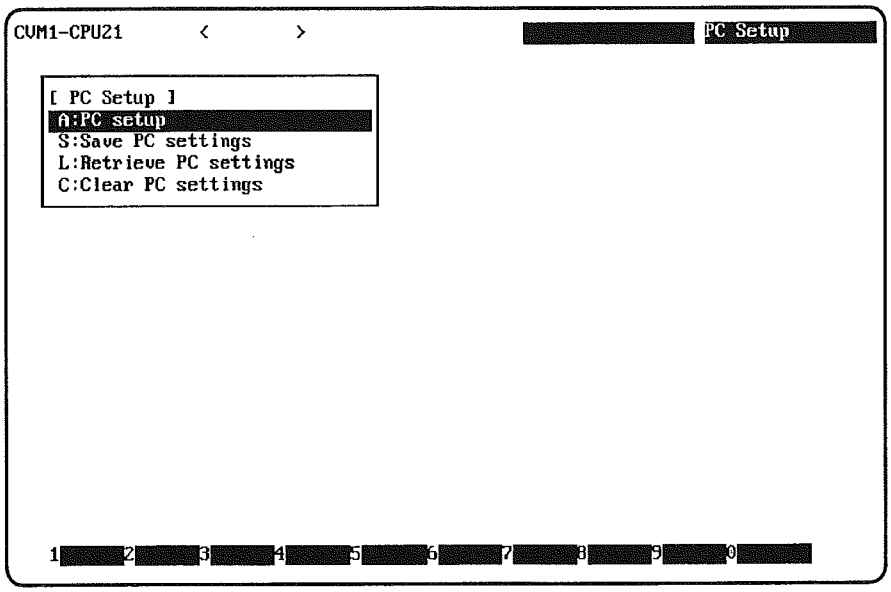
Parameter		Function	Normal application(s)
A:Hold areas	H:Hold areas	Specifies which bits are to maintain status when power is turned off.	To extend the Holding Area beyond CIO 300.
	R:Hold bits	Specifies Racks or Masters (Remote I/O Subsystems) that are to maintain status when operation is stopped or modes are changed.	To maintain output status for specific Racks or Remote I/O Subsystems.
B:Startup hold	K:Forced Status (A00013)	Maintains the status of the Forced Status Hold Bit when power is turned off and on.	To maintain the status of bits forced ON or OFF.
	I:I/O bits (A00012)	Maintains the status of the IOM Hold Bit when power is turned off and on.	To prevent I/O status from being cleared when power is turned on.
	D:Power on flag (A00011)	Maintains the status of the Restart Continuation Bit when power is turned off and on.	These parameters must be set to YES when using restart continuation.
C:Startup mode		Specifies the initial PC operating mode.	To automatically start the PC when power is turned ON. Set the mode to MONITOR or RUN when using restart continuation.
D:Startup processing		Specifies whether the user program is loaded from the Memory Card when power is turned on.	To enable using a ROM Memory Card without a backup battery.
E:I/O refresh		Sets the refresh method to cyclic, zero-cross, or scheduled.	To reduce the cycle time by using immediate refreshing or to reduce surge voltages for AC outputs.
F:Execute control 1	B:Detect low battery	Specifies detection of CPU battery errors.	To disable detection when batteries are not being used.
	S:Error on power off	Specifies if momentary power interruptions are to be treated as errors.	To generate an error for momentary power interrupts when they adversely affect system operation.
	T:CPU standby	Specifies whether the CPU is to go on standby or start operation while initializing the system or detecting terminators in SYSMAC BUS/2 Systems.	
	K:Measure CPU SIOU cycle	Specifies whether or not the CPU Bus Unit servicing cycle is to be measured.	

Parameter		Function	Normal application(s)
G:Execute control 2	C:Execute process	Specifies whether Peripheral Devices are to be serviced synchronously or asynchronously with program execution.	To increase processing capacity (speed) by using asynchronous processing.
	I:I/O interrupt	Specifies whether higher-priority I/O interrupts are to be executed before a current I/O interrupt.	
	D:Power OFF interrupt	Specifies whether a power off interrupt is to be executed.	To save system status when power turns off.
	A:Dup action process	Specifies whether an error is to be generated when the same action is executed simultaneously from two different locations in the program.	
	T:Step timer	Sets the units for the step timer to 0.1 or to 1 s.	
	J:Startup trace	Specifies whether a trace is to be automatically executed when power is turned on.	
	B:*DM BIN/BCD	Specifies whether indirect addresses are treated as binary (memory addresses) or BCD (data area addresses).	To enable indirectly addresses for the entire DM and EM areas by using binary addresses.
	P:Multiple use of JMP000	Specifies whether or not multiple JMP000 instructions can be programmed.	
	E:Comp error process	Specifies whether I/O verification errors are to be fatal or non-fatal.	
H:Host link		Sets communications parameters for the host link interface.	These settings must be made when using the host link interface.
I:CPU bus link		Specifies whether or not CPU bus links are to be created.	To enable linking of two or more BASIC Units.
J:Scheduled interrupt		Sets the unit for setting the scheduled interrupt to 10.0, 1.0, or 0.5 ms.	
K:1st Rack addr		Sets the first word for each of the CPU, Expansion CPU, and Expansion I/O Racks.	To simplify word allocations, to prevent changes in allocations, or to allow for expansion without changes in allocations.
L:Group 1,2 1st addr		Sets the first word for group-1 and group-2 Slaves for each Master.	To prevent overlapping of word allocations when group-1 and group-2 Slaves require more then 50 words per Master.
M:Trans I/O addr		Sets the first word for I/O Terminals for each Master.	To separate I/O Terminal allocations from those for other Slaves.
N:Group 3, RT 1st addr		Sets the first word for each Slave Rack.	To simplify word allocations, to prevent changes in allocations, or to allow for expansion without changes in allocations.
O:CV–SIOU 1st addr		Not used at present.	---
P:Power break		Sets the length of time to be treated as a momentary power interruption.	To enable ignoring short primary voltage drops for poor power supplies.
Q:Cycle time		Sets a minimum cycle time.	To eliminate irregular I/O delays.
R:Watch cycle time		Sets a maximum cycle time.	To stop operation when a specified cycle time is exceeded or to enable longer cycle times by setting a high maximum.
S:Error log		Sets the number of records recorded and the words in which they are recorded.	To increase the number or error records that are maintained.
T:IOIF, RT display		Sets the startup display mode for the 7-segment displays on I/O Control Units, I/O Interface Units, and SYSMAC BUS/2 Slave Racks.	

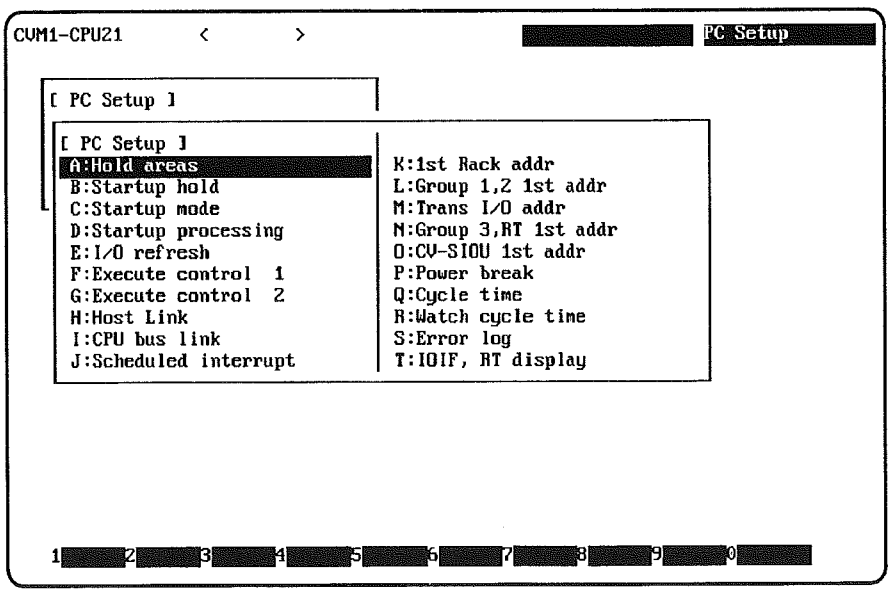
6-8-3 Editing the PC Setup

The PC Setup operation is used to change any of the parameters in the PC Setup in the system work area. The following procedure shows how to display the PC Setup Menu. The procedures for changing particular parameters are described in detail later in this section.

1, 2, 3... 1. Select "Q:PC setup" from the Utility Menu.



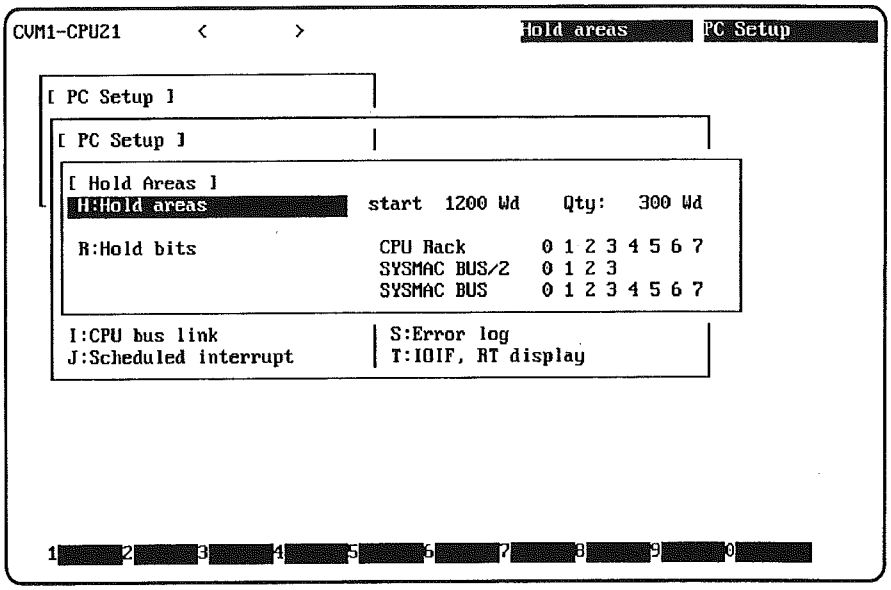
2. Select "A:PC setup" from the PC Setup Menu.



A:Hold areas

There are two settings for holding bits. The "Hold areas" parameter specifies a range of the CIO Area for which status is held. The "Hold bits" parameter specifies the Racks for which outputs are held.

The following display will appear when "A:Hold areas" is selected from the Setup Menu. The current settings will be displayed on the right.

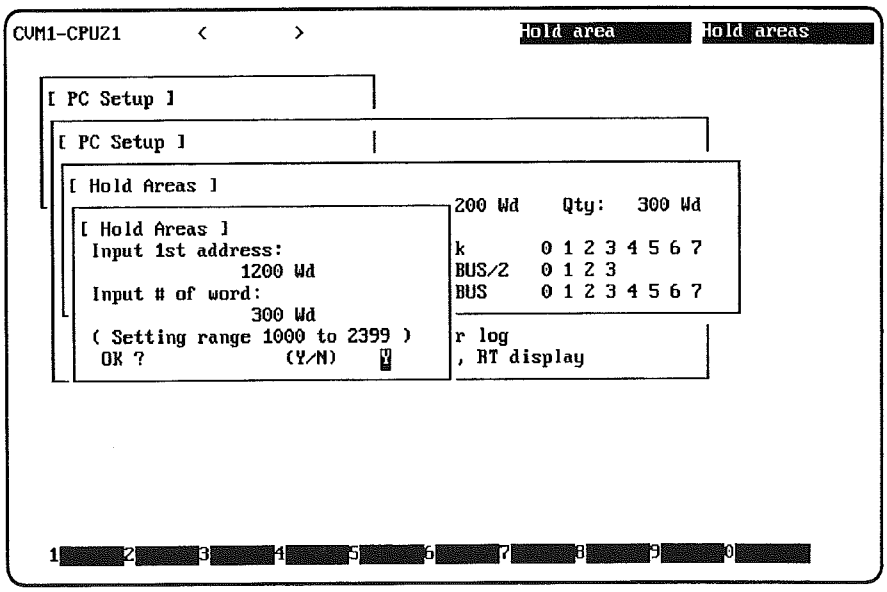


H:Hold Areas

Follow the procedure to specify a range of the CIO Area for which status is held.

1, 2, 3...

1. Select "H:Hold areas" from the menu.

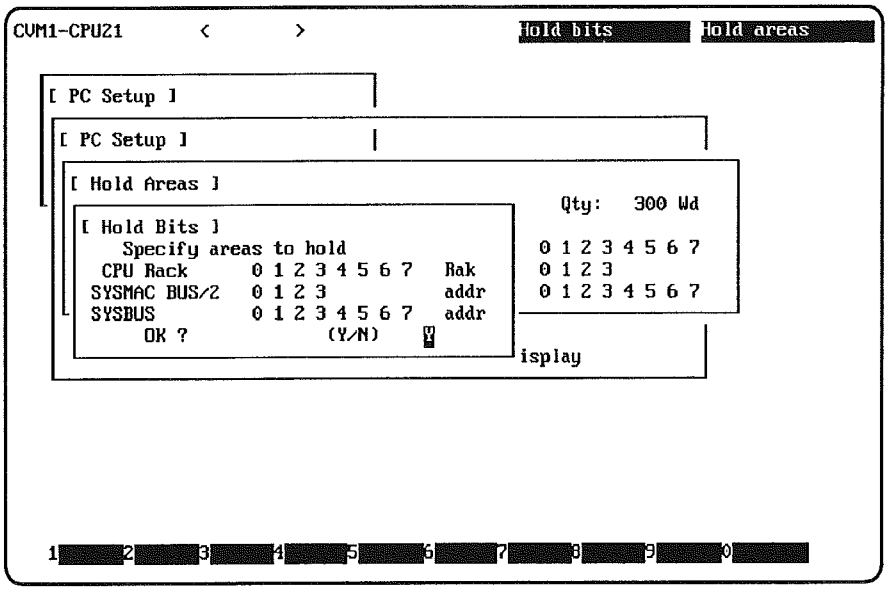


2. Specify the address of the first word in the CIO Area and the number of words that are to be held. CIO 1000 through CIO 2399 can be specified.

R:Hold Bits

Follow the procedure to specify the Racks for which status is held.

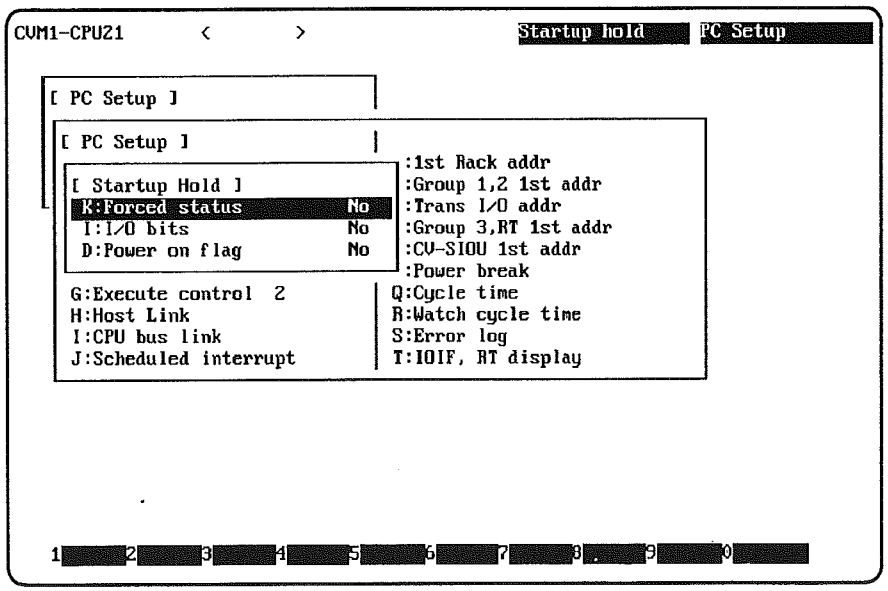
1, 2, 3... 1. Select "R:Hold bits" from the menu.



2. Move the cursor to the numbers of the Racks for which outputs are to be held and press Enter. Selected Racks will be displayed in reverse video.

B:Startup Hold

There are three bits in the Auxiliary Area that can be used to preserve status when power is turned off and on. These bits will themselves be reset and thus ineffective unless the following settings are used maintain status. To change a setting, select the item and select the desired treatment. The following display will appear when "B:Startup Hold" is selected from the Setup Menu.



K:Forced status

Set to Yes to maintain the Forced Status Hold Bit (A00013)

I:I/O bits
Set to Yes to maintain the IOM Hold Bit (A00012)

D:Power on flag
Set to Yes to maintain the Restart Continuation Bit (A00011)

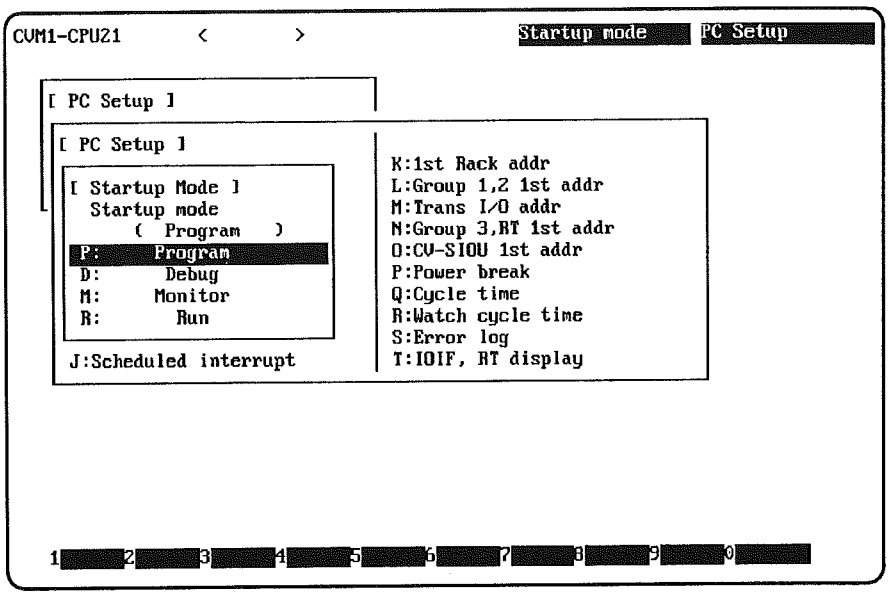
Refer to the *CV-series Operation Manual: Ladder Diagrams (W202)* for details.

C:Startup Mode

This parameter determines the mode that the PC will enter when power is turned ON or the PC is reset. This parameter should be set to RUN mode if the "D:Startup processing" parameter has been set to transfer the program from the Memory Card at startup.

1, 2, 3...

1. Select "C:Startup mode" from the Setup Menu. The current setting is shown in reverse video. The default setting is PROGRAM mode.

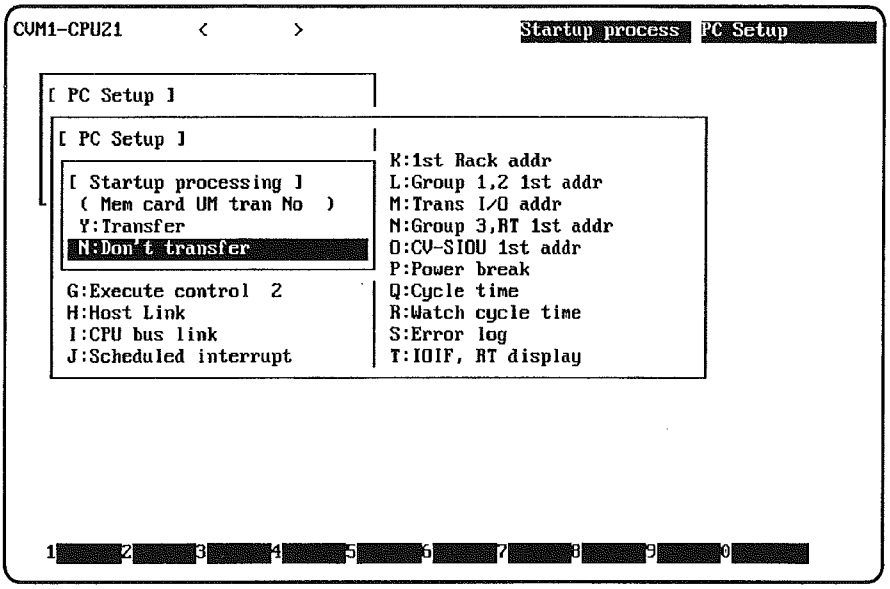


2. Move the cursor to the desired setting and press Enter.

D:Startup Processing

Specify whether the program (AUTOEXEC.OBJ) is to be transferred from the Memory Card when PC power is turned on. If you specify transfer from the Memory Card, set the "C:Startup mode" parameter to RUN mode.

1, 2, 3... 1. Select "D:Startup processing" from the Setup Menu. The current setting is shown in reverse video. The default setting is "Don't transfer."

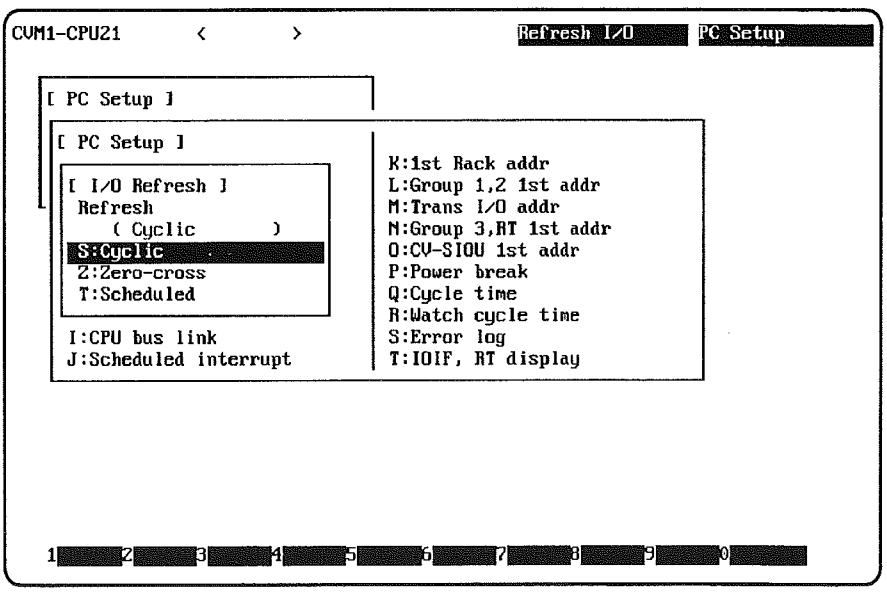


2. Move the cursor to the desired setting and press Enter.

E:I/O Refresh

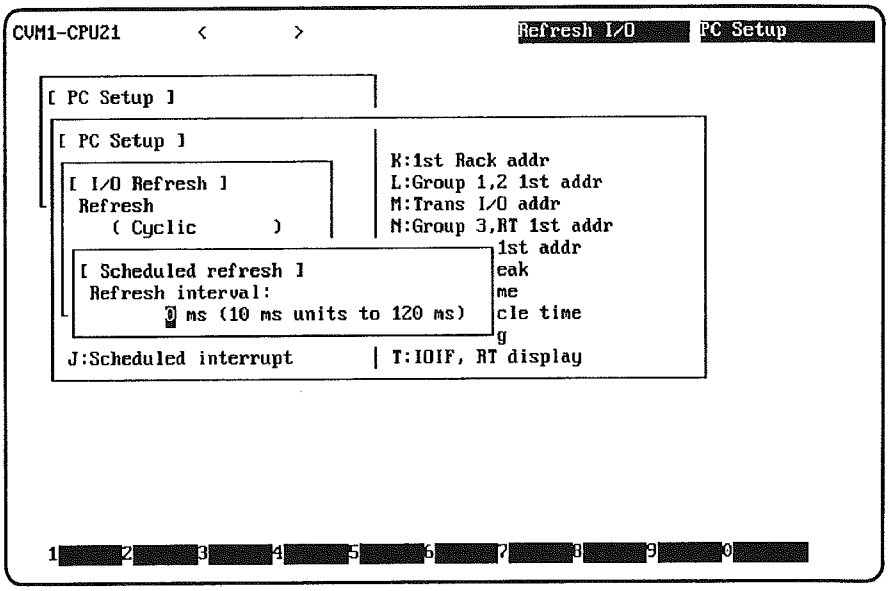
Specify whether cyclic, zero-cross, scheduled, or immediate I/O refreshing is to be used. The refresh interval for the scheduled refresh can be set in increments of 10 ms between 10 and 120 ms. Immediate refreshing is selected by setting the refresh interval to 00.

1, 2, 3... 1. Select "E:I/O Refresh" from the Setup Menu. The current setting is shown in reverse video. The default setting is "cyclic."



2. Move the cursor to the desired setting and press Enter.

The following input area will appear if scheduled refreshing is selected. Input the desired interval and press Enter.

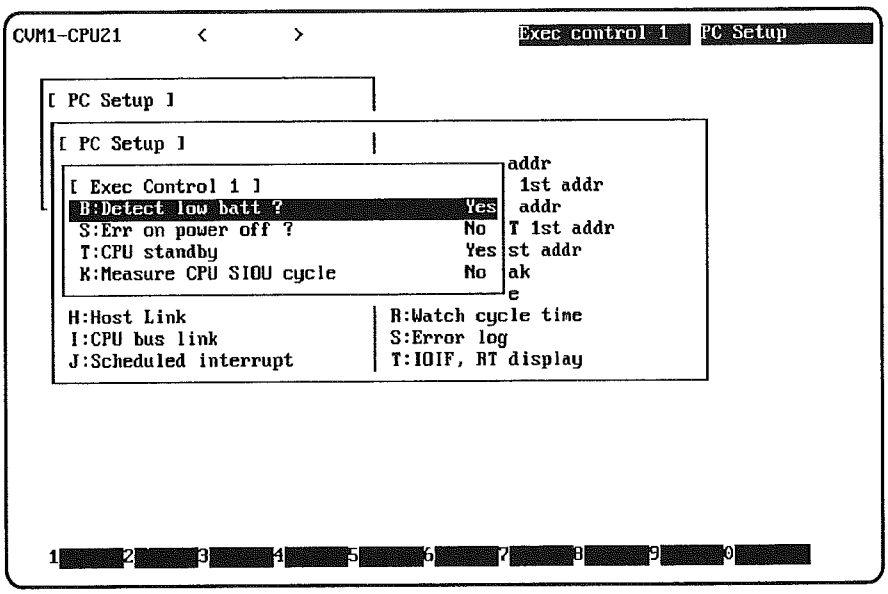


F:Execute Control 1

The four parameters that can be selected in the F:Execute Control 1 operation are listed below.

Parameter	Function
B:Detect low batt	Set to Yes to treat detection of a low CPU battery as an error.
S:Err on power off	Set to Yes to treat detection of a momentary power interruption as an error.
T:CPU standby	Set to Yes if you want the CPU to go on standby during system initialization.
K:Measure CPU SIOU cycle	Set to Yes if you want the CPU Bus Unit servicing cycle to be measured and stored in memory (A310 to A325).

1, 2, 3... 1. Select "F:Execute control 1" from the Setup Menu. The current settings will be displayed on the right.



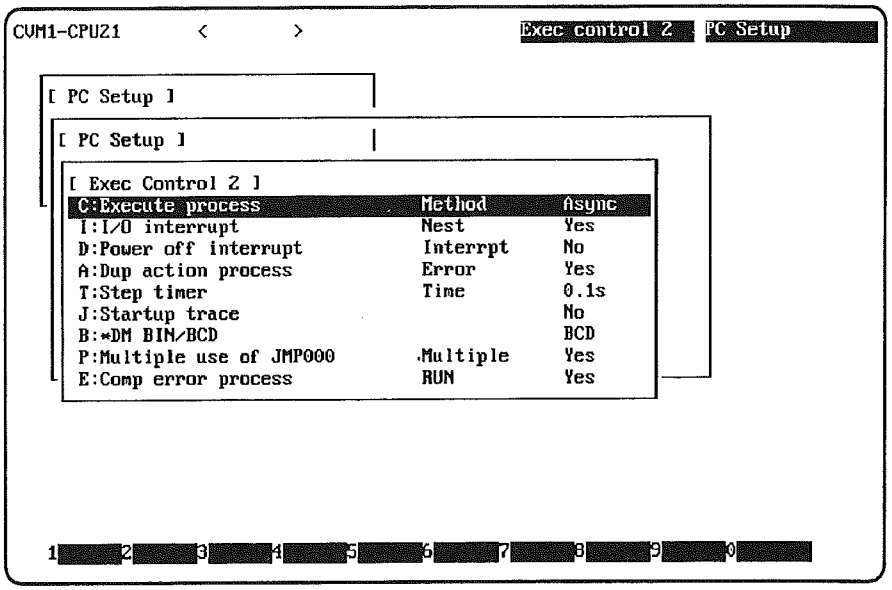
2. To select a parameter, move the cursor to the parameter and press Enter.
3. To change the setting, move the cursor to the desired setting and press Enter.

G:Execute Control 2

The eight parameters that can be selected in the G:Execute Control 2 operation are listed below.

Parameter	Function
C:Execute process	Specify whether Peripheral Device servicing is to be executed synchronously or asynchronously with program execution.
I:I/O interrupt	Specify whether I/O interrupts are to be interrupted to executed higher-priority I/O interrupts.
D:Power OFF interrupt	Specify whether the power off interrupt is to be executed.
A:Dup action process	Specify whether an error is to be generated if the same action is executed simultaneously from two locations in the program.
T:Step timer	Specify the unit for the step timer.
J:Startup trace	Specify whether a trace is to be automatically executed when PC power is turned on.
B:*DM BIN/BCD	Specify if indirect addresses are to be treated as binary or BCD.
P:Multiple use of JMP000	Enables or disables usage of multiple JMP000 instructions.
E:Comp error process	Specify if I/O verifications errors are to be fatal or non-fatal.

1, 2, 3... 1. Select "G:Execute control 2" from the Setup Menu. The current settings will be displayed on the right.

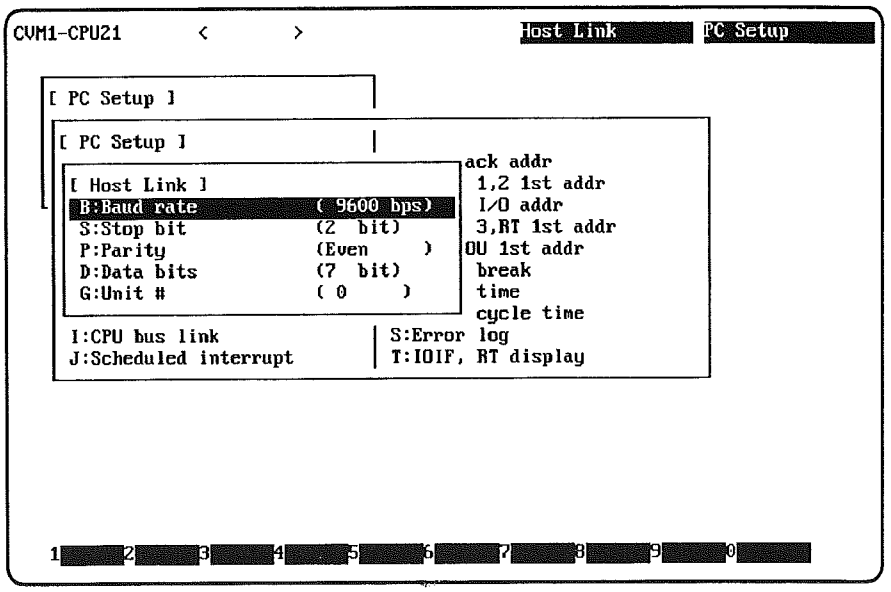


2. To select a parameter, move the cursor to the parameter and press Enter.
3. To change the setting, move the cursor to the desired setting and press Enter.

H:Host Link

This operation is used to set the communications parameters for the host interface.

1, 2, 3... 1. Select "H:Host Link" from the Setup Menu. The current settings will be displayed on the right.



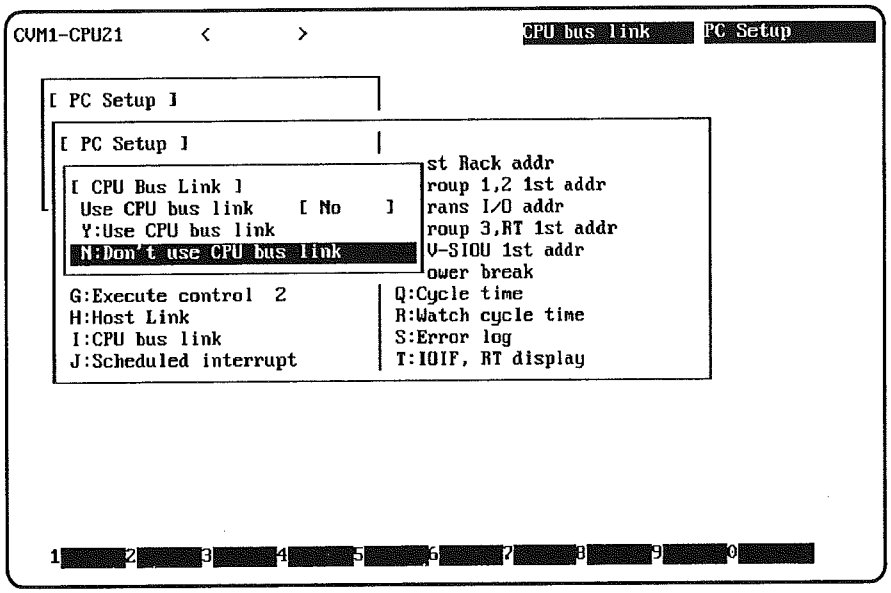
2. To select a parameter, move the cursor to the parameter and press Enter.
3. To change the setting, move the cursor to the desired setting and press Enter.

I:CPU Bus Link

This operation is used to specify whether CPU bus links are to be used between BASIC Units, Personal Computer Units, and other CPU Bus Units that use CPU bus links. If CPU bus links are used, the CPU but link servicing cycle will be set to 10 ms.

1, 2, 3...

1. Select "I:CPU bus link" from the Setup Menu. The current setting will be displayed in parentheses.



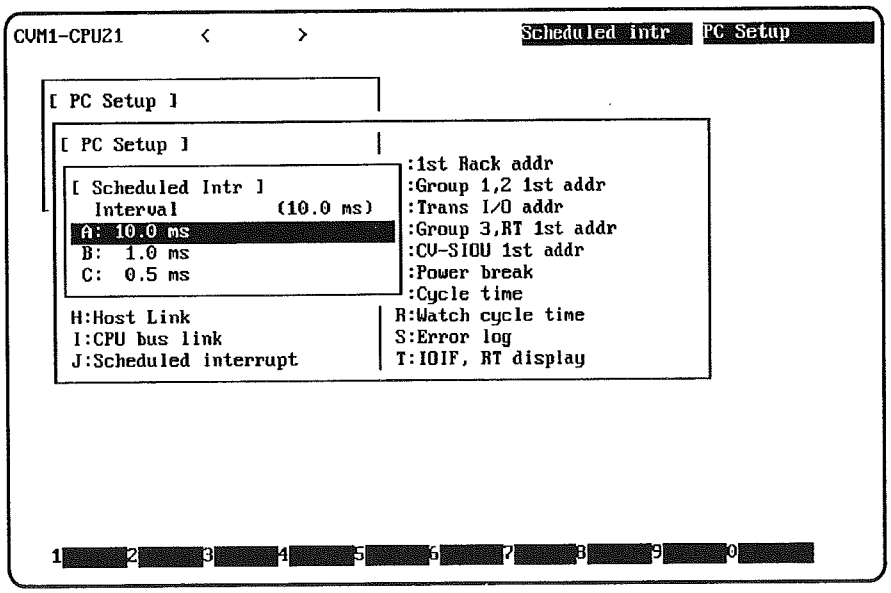
2. Enter "Y" to specify that CPU bus links are to be used, "N" to specify that they won't.

J:Scheduled Interrupt

This operation is used to specify the units used for the scheduled interrupt interval setting.

1, 2, 3...

1. Select "J:Scheduled interrupt" from the Setup Menu. The current setting will be displayed in parentheses. The default setting is 10 ms.



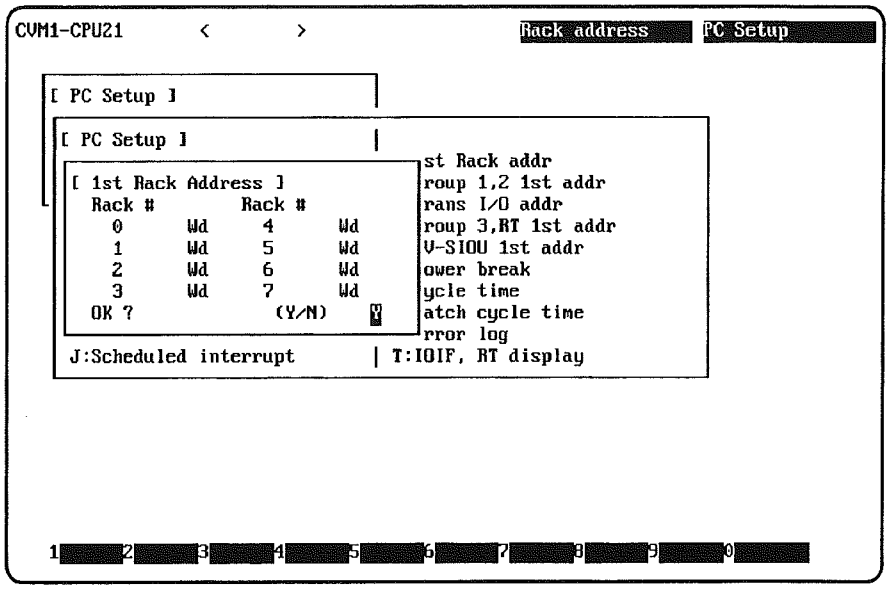
2. Enter "A," "B," or "C" to specify 10 ms, 1.0 ms, or 0.5 ms.

K:1st Rack addr

This operation is used to set the first word on each of the CPU, Expansion CPU, and Expansion CPU Racks. If these settings are not changed, words will be allocated automatically by rack number. First words can be specified between CIO 0000 and CIO 0511.

1, 2, 3...

1. Select "K:1st Rack addr" from the Setup Menu. The current settings will be displayed.



2. To set the first word for a rack, press "N" and Enter.
3. Move the cursor to the desired rack number and enter the first word. The Home Key can be pressed to clear the displayed word address.
4. When all the first words have been designated, move the cursor to "OK" at the bottom of the display and enter "Y."

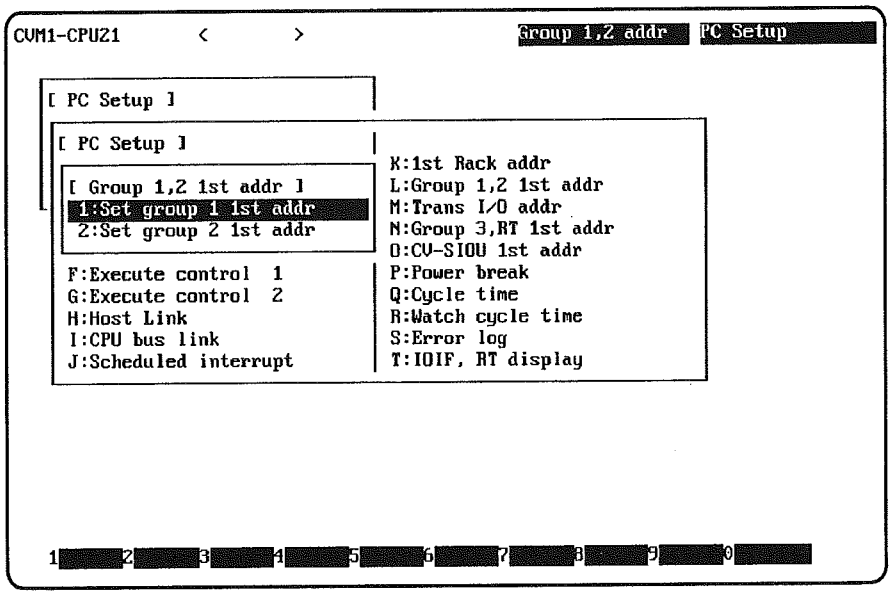
L:Group 1,2 1st addr

This operation is used to set the first words for SYSMAC BUS/2 group-1 or group-2 Masters. First words can be specified between CIO 0000 and CIO 0999. Be sure that the allocated words do not overlap the words allocated to another Master.

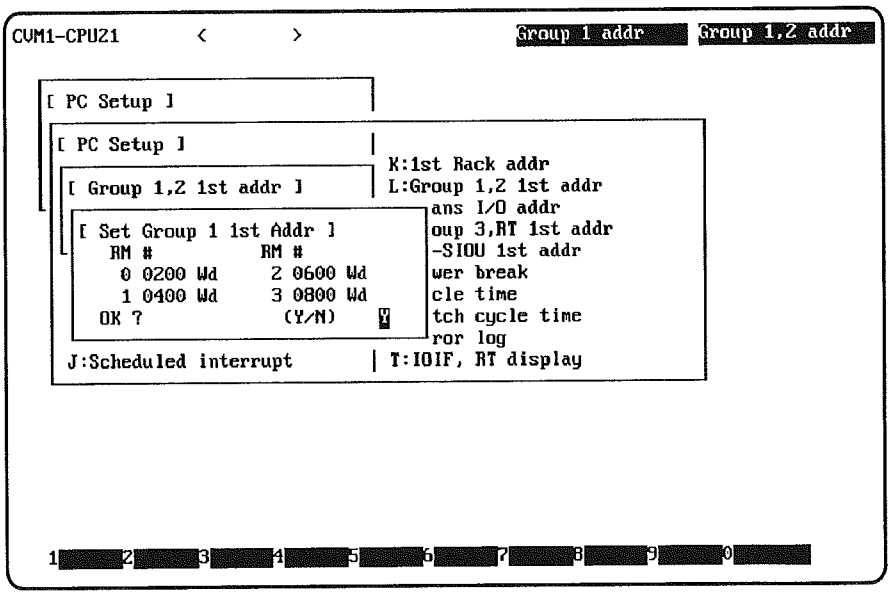
The following table shows the default word allocations for SYSMAC BUS/2.

Master #	Group-1 Slaves	Group-2 Slaves
0	CIO 0200 to CIO 0249	CIO 0250 to CIO 0299
1	CIO 0400 to CIO 0449	CIO 0450 to CIO 0499
2	CIO 0600 to CIO 0649	CIO 0650 to CIO 0699
3	CIO 0800 to CIO 0849	CIO 0850 to CIO 0899

1, 2, 3... 1. Select "L:Group 1,2 1st addr" from the Setup Menu.



2. Select group 1 or group 2. The current settings will be displayed.

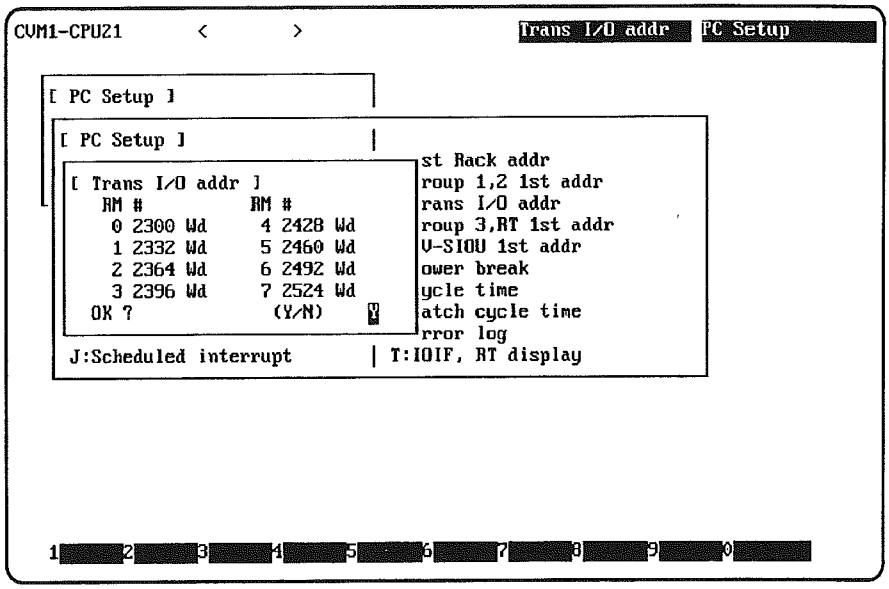


3. To set first words, press "N" and Enter.
4. Move the cursor to the desired location and enter the first word.
5. When all the first words have been designated, move the cursor to "OK" at the bottom of the display and enter "Y."

M:Trans I/O addr

This operation is used to set the first word the I/O Terminals under each SYSMAC BUS Remote I/O Master. First words can be specified between CIO 0000 and CIO 2555. Be sure that the allocated words do not overlap the words allocated to other Units.

1, 2, 3... 1. Select "M:Trans I/O addr" from the Setup Menu. The current settings will be displayed.

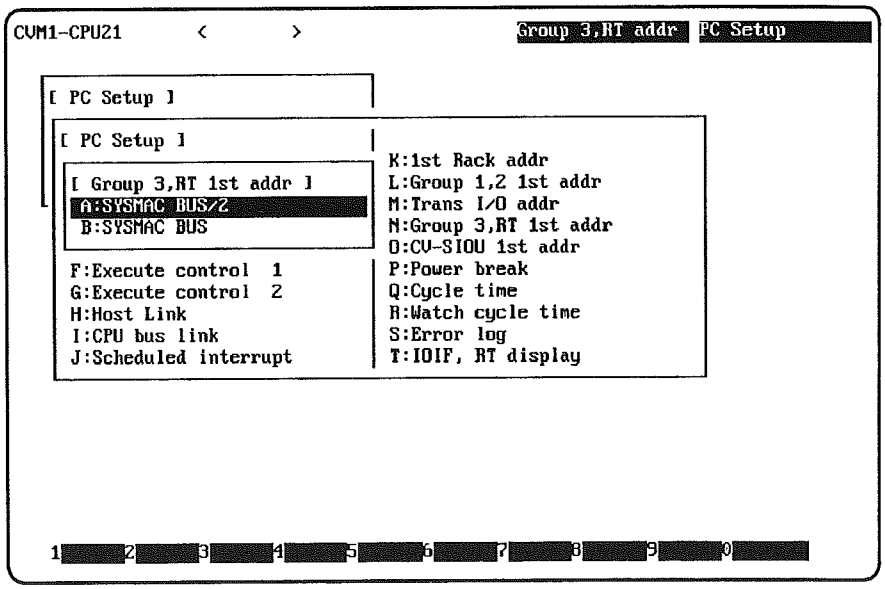


2. To set first words, press "N" and Enter.
3. Move the cursor to the desired location and enter the first word.
4. When all the first words have been designated, move the cursor to "OK" at the bottom of the display and enter "Y."

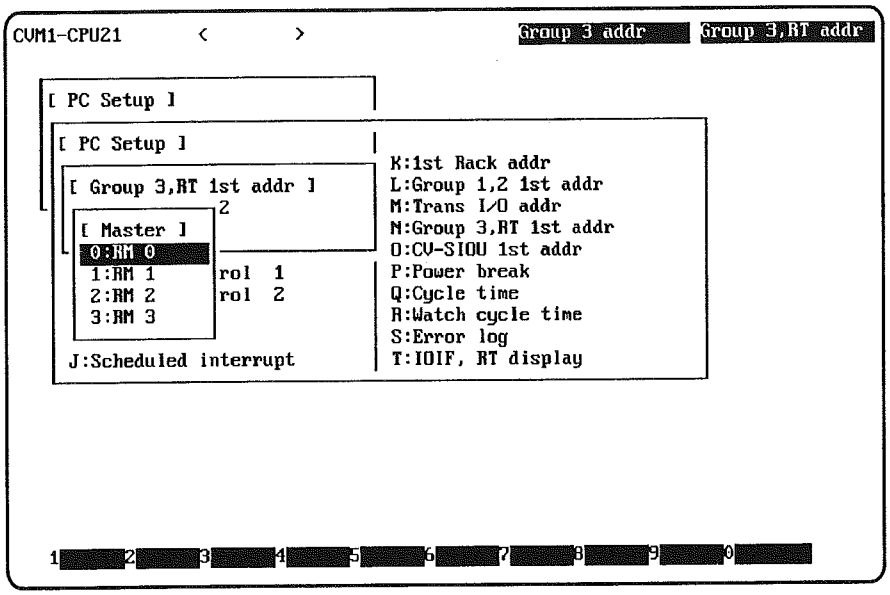
N:Group 3, RT 1st addr

This operation is used to set the first words for SYSMAC BUS/2 group-3 Slaves or SYSMAC BUS I/O Terminals. First words can be specified between CIO 0000 and CIO 0999 for the SYSMAC BUS/2 System, and between CIO 0000 and CIO 2555 for the SYSMAC BUS System. Be sure that the allocated words do not overlap the words allocated to other Units.

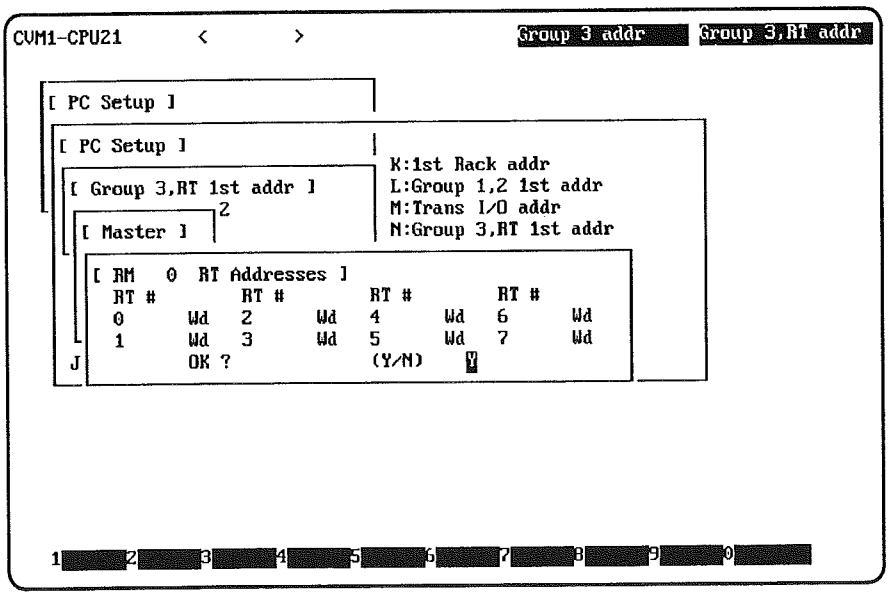
1, 2, 3... 1. Select "N:Group 3, RT 1st addr" from the Setup Menu.



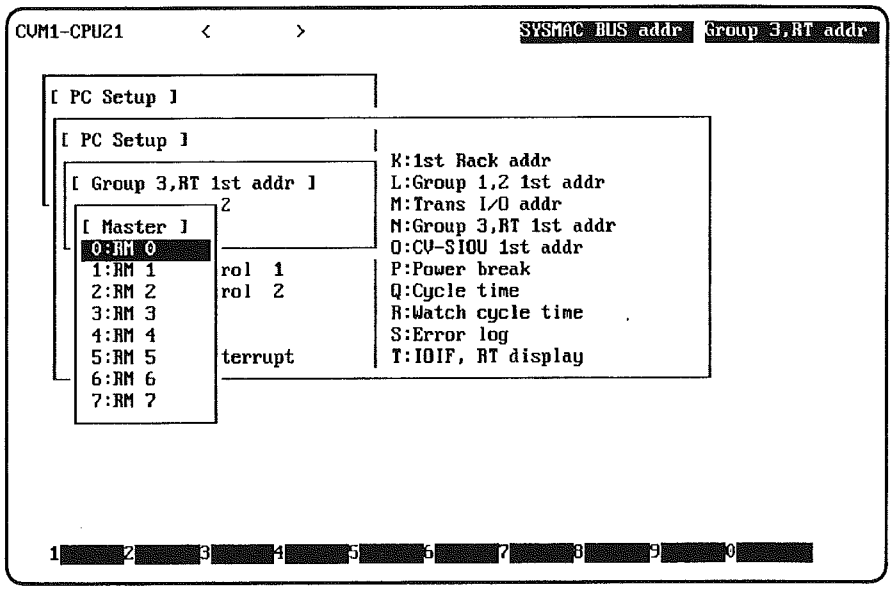
2. Select SYSMAC BUS/2 or SYSMAC BUS. The following display will appear if SYSMAC BUS/2 is selected.



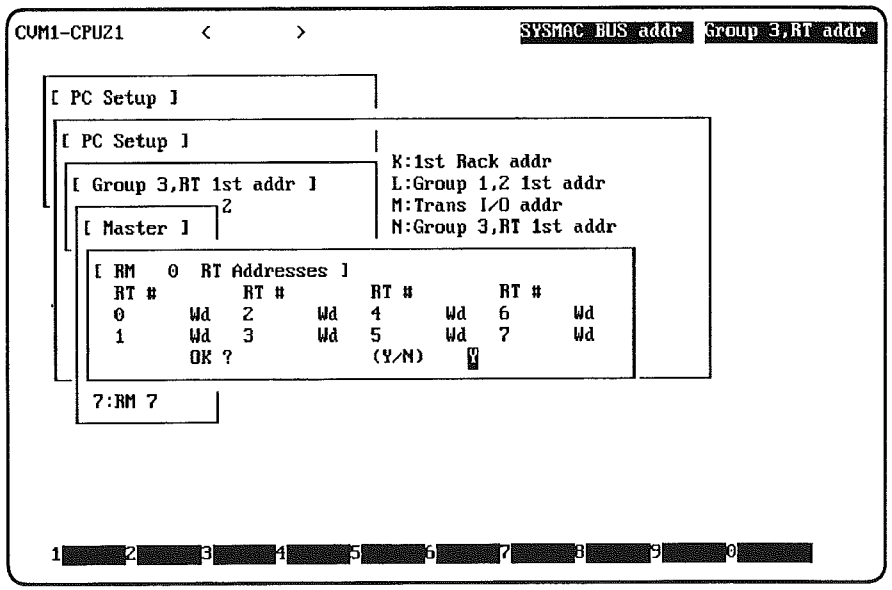
Select the desired SYSMAC BUS/2 Master. The current settings for the group-3 Slaves connected to the Master will be displayed.



The following display will appear if SYSMAC BUS is selected.



Select the desired SYSMAC BUS Master. The current settings for the I/O Terminals connected to the Master will be displayed.



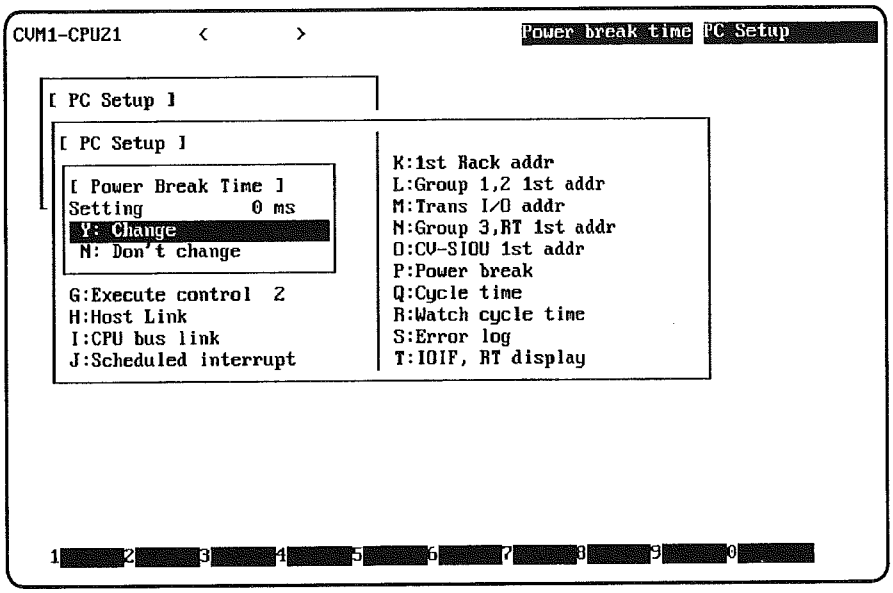
3. To set first words, press "N" and Enter.
4. Move the cursor to the desired location and enter the first word.
5. When all the first words have been designated, move the cursor to "OK" at the bottom of the display and enter "Y."

P:Power Break

This operation is used to set the length of time that constitutes a momentary power interruption. The setting can be between 0 and 10 ms.

1, 2, 3...

1. Select "P:Power break" from the Setup Menu. The current setting will be displayed.



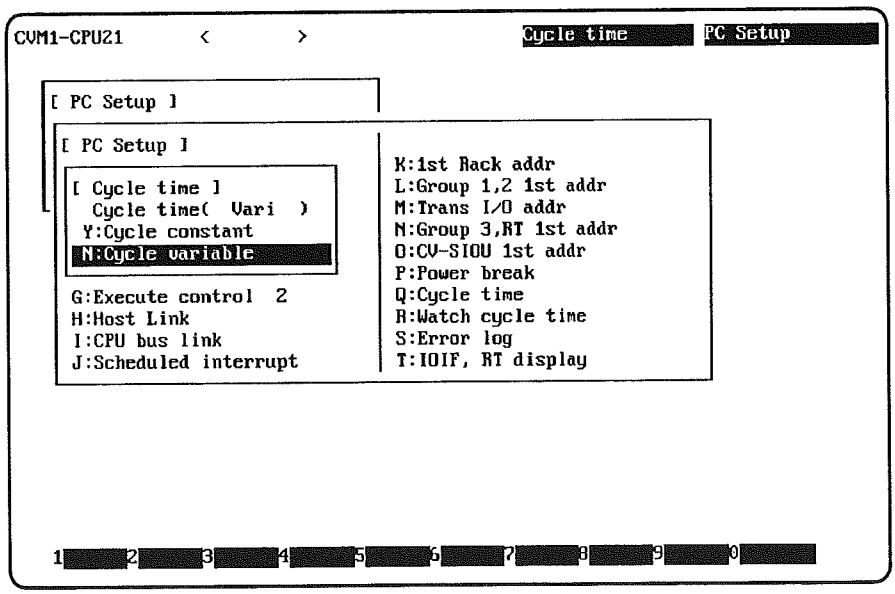
2. Select "Y:Change" to change the setting.
3. Input the new setting (0 to 10 ms).

Q:Cycle Time

This operation is used to specify whether the cycle time is to be maintained at a consistent minimum time or is to be allowed to vary. If you specify a constant cycle, specify the minimum cycle time between 1 and 32,000 ms.

1, 2, 3...

1. Select "Q:Cycle time" from the Setup Menu. The current setting will be displayed.



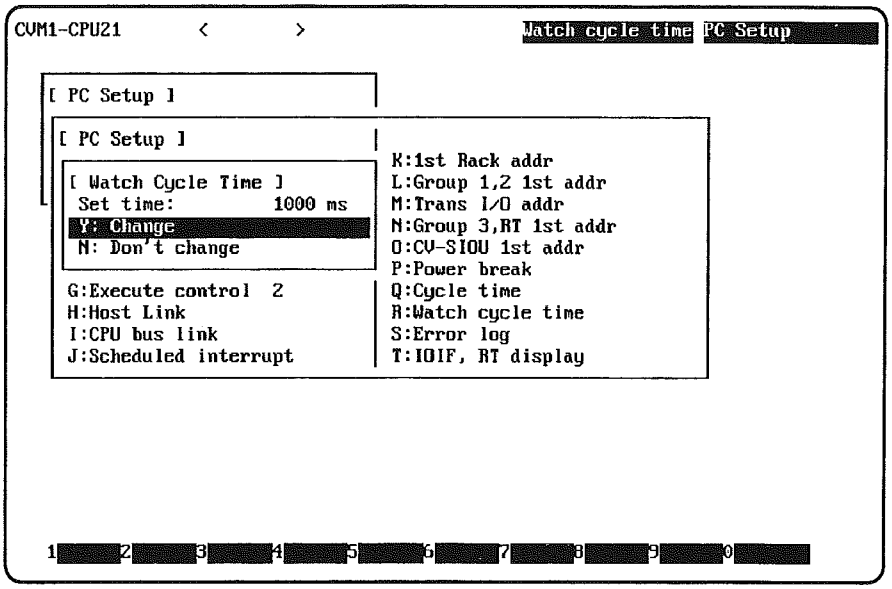
2. Select "Y:Cycle constant" to set a minimum cycle time.
3. Input the minimum cycle time (1 to 32,000 ms).

R:Watch cycle time

This operation is used to specify the maximum allowable cycle time between 10 and 40,000 ms. An error will be generated if the cycle time exceeds the value set here.

1, 2, 3...

1. Select "R:Watch cycle time" from the Setup Menu. The current setting will be displayed.



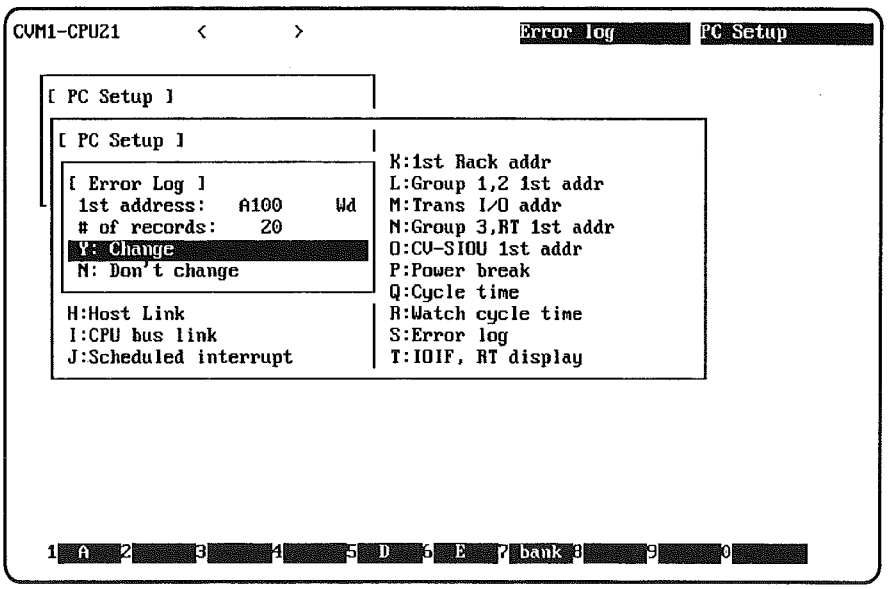
2. Select "Y:Change" to change the setting.
3. Input the new setting in 10-ms units.

S:Error Log

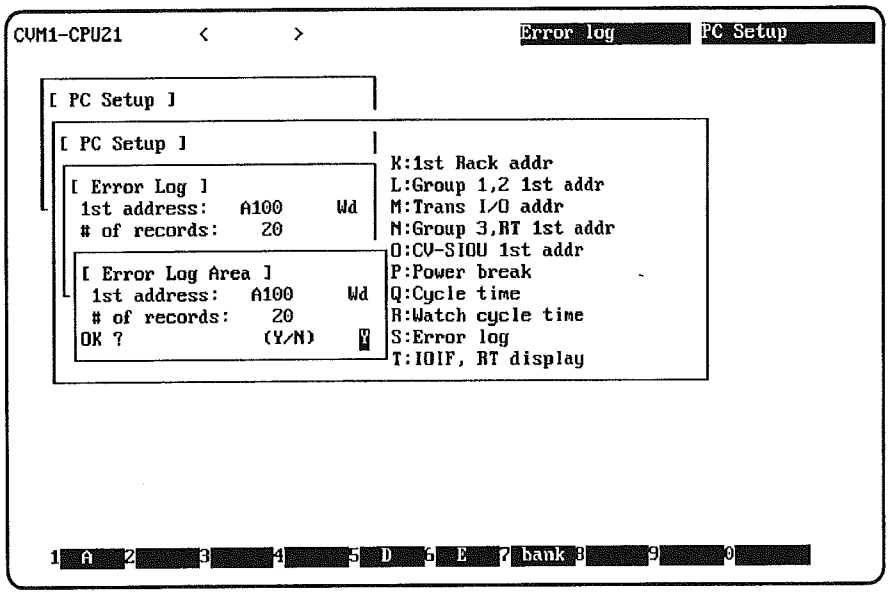
This operation is used to specify the number of records kept in the error log and the location that they are kept in memory.

1, 2, 3...

1. Select "S:Error log" from the Setup Menu. The current settings will be displayed.



2. Select "Y:Change" to change the settings or "N:Don't change" to leave the settings unchanged.



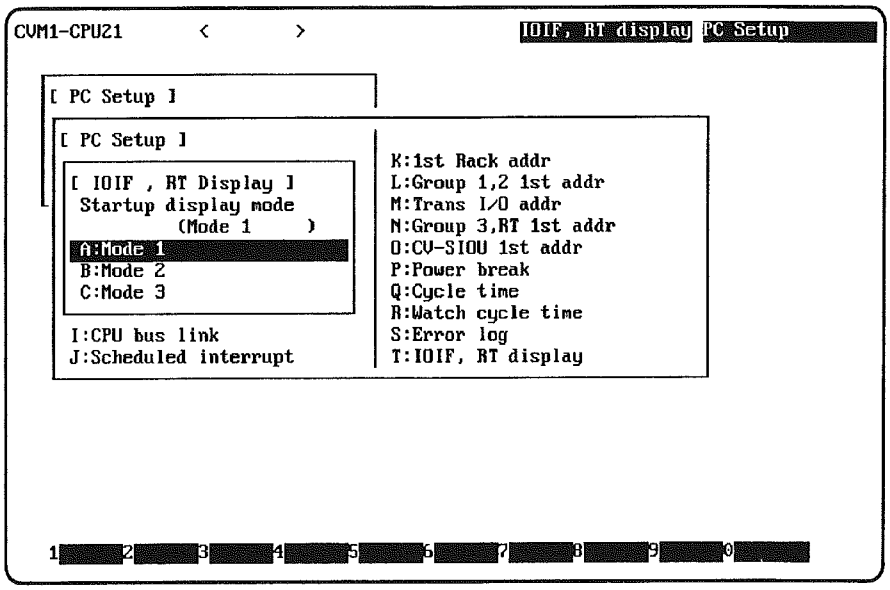
3. Move the cursor to the setting you wish to change and input the new setting. When inputting the first address, press F5 to specify the the DM Area or F6 to specify the EM Area. When specifying the EM Area, press F7 to input the EM bank number
4. When the settings are correct, move the cursor to "OK" at the bottom of the display and enter "Y."

T:IOIF, RT display

This operation is used to specify what information will be displayed on I/O Interface Units and SYSMAC BUS/2 Remote I/O Slave Units when power is turned on. The three available display modes are described in the following table.

Mode	Display
1	Displays the first word allocated to the Rack.
2	Shows various information depending on the Unit. Refer to the *CV500/CV1000 Installation Guide* or *SYSMAC BUS/2 Remote I/O System Manual* for details.
3	Shows displays generated from the PC program with the I/O DISPLAY instruction (IODP(189)).

1, 2, 3... 1. Select "T:IOIF, RT display" from the Setup Menu. The current display mode setting will be displayed in parentheses.



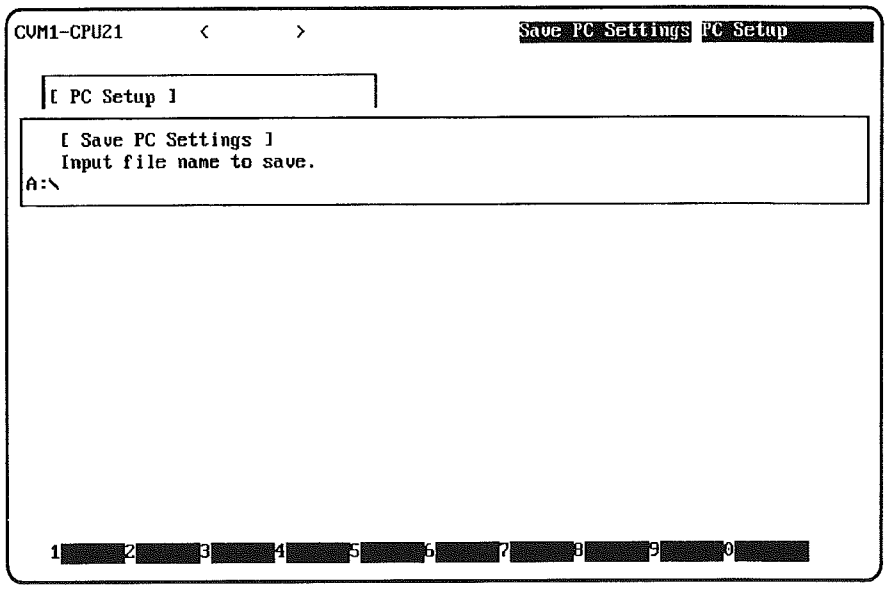
2. Select the desired display mode.

6-8-4 Saving the PC Setup

The following procedure can be used to save the PC Setup from the system work area to a data disk.

1, 2, 3... 1. Select "Q:PC setup" from the Utility Menu.

2. Select "S:Save PC settings" from the PC Setup Menu.



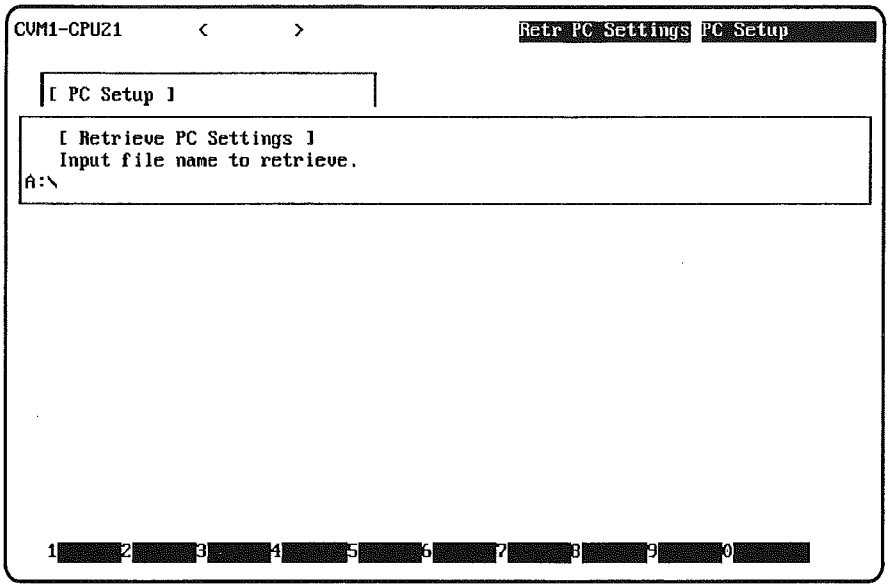
3. Input the desired path name and file name and press Enter.
4. If the input file name already exists, a confirmation prompt will be displayed. Enter "Y" to overwrite the existing file, "N" to cancel and input a new file name.
5. An input area for a header will be displayed. Input a header if desired and press Enter. The PC Setup data will be saved when Enter is pressed.
   The file extension is .CPU.

6-8-5 Retrieving the PC Setup

The following procedure can be used to retrieve the PC Setup from a data disk to the system work area.

1, 2, 3...

1. Select "Q:PC setup" from the Utility Menu.
2. Select "L:Retrieve PC settings" from the PC Setup Menu.



3. Make sure that the drive name is correct.
4. Input the name of the file to be retrieved and press Enter.
5. Press Enter again to start retrieving the PC Setup.

6-8-6 Clearing the PC Setup

The following procedure can be used to reset the PC Setup in the system work area to the its default values.

1, 2, 3...

1. Select "Q:PC setup" from the Utility Menu.
2. Select "C:Clear PC settings" from the PC Setup Menu. A confirmation prompt will be displayed.
3. Enter "Y" to reset the PC Setup, "N" to cancel the operation and return to the PC Setup Menu.

6-8-7 Details of PC Setup Parameter Settings

Name		Operation
A:Hold areas	Hold area	The status of bits specified here will be maintained when power is turned off and on. The holding bits can be set in any continuous range between CIO 1000 to CIO 2399. Be sure to perform the Create I/O Table operation or turn the power off and on after changing this parameter. Do not specify any bits allocated to I/O points on Remote I/O Units. Outputs on Remote I/O Units will remain on after program execution stops if they are in the hold area. (Default: CIO 1200 to CIO 1499)
	Hold bits	The I/O status on Racks specified here or in all Slaves connected to Masters specified here will be maintained when operation is stopped or when PC operating modes are changed. Status will not be maintained for these outputs when power is turned off. Be sure to perform the Create I/O Table operation or turn the power off and on after changing this parameter. (Default: nothing held)

Name		Operation
B:Startup hold	Forced Status Hold Bit status (A00013) (Forced status)	Specify whether the status of the Forced Status Hold Bit is to be maintained or reset to OFF when power is turned on. If A00013 is reset, the forced ON/OFF status of all force-set and force-reset bits will be cleared when power is turned on. Changes to this setting are effective the next time the power is turned ON. (Default: A00013 turned OFF)
	IOM Hold Bit status (A00012) (I/O bits)	Specify whether the status of the IOM Hold Bit is to be maintained or reset to OFF when power is turned on. If A00012 is reset, the CIO Area, Transition Flags, Timer Flags, Timer PVs, index registers, data register, and the Current EM bank number will be cleared when power is turned on. Changes to this setting are effective the next time the power is turned ON. (Default: A00012 turned OFF)
	Restart Continuation Bit status (A00011) (Power on flag)	Specify whether the status of the Restart Continuation Bit is to be maintained or reset to OFF when power is turned on. If A00011 is reset, restart continuation won't be performed when power is turned on. Changes to this setting are effective the next time the power is turned ON. (Default: A00011 turned OFF) The following settings are required to continue operation after a power interruption: Restart Continuation Bit (A00011): ON and maintained IOM Hold Bit (A00012): ON and maintained Startup mode: RUN or MONITOR Power OFF interrupt program: Exists
C:Startup mode		Designate the PC operating mode to be set when PC power is turned ON. Changes to this setting are valid the next time the power is turned ON. (Default: PROGRAM)
D:Startup processing		Designate whether the user program (AUTOEXEC.OBJ) is automatically transferred from the Memory Card to PC memory when the power is turned ON. If this parameter is set to transfer the program, the program will be transferred regardless of the PC's startup mode setting. Changes to this setting are effective the next time the power is turned ON. DIP switch pin #5 on the CPU can be turned ON to transfer both the user program (AUTOEXEC.OBJ) and the PC setup (AUTOEXEC.STD). Refer to information on the Memory Card for details. (Default: Don't transfer)
E:I/O refresh		Designate the I/O refresh method as cyclic, zero-cross, scheduled, or immediate. Cyclic refreshing occurs once each cycle at the end of program execution. Zero-cross refreshing occurs each time the AC power supply voltage crosses zero. Set this method to more accurately turn off output devices when using AC power supplies. Scheduled refreshing occurs at a specific timer interval. The scheduled refresh interval must also be set. Set the execution interval between 10 and 120 ms. Scheduled refreshing cannot be used if the PC is set for synchronous operation. Immediate refreshing occurs when certain instructions are set to interrupt for refreshing from the user program. To set immediate refreshing, specify scheduled refreshing with a refresh interval of 00 ms. If this is done, I/O status will be refreshed only when instructions in the user program call for it. Changes to this setting are effective immediately. (Default: Cyclic)

Name		Operation
F:Execute control 1	Detect low battery	Designate whether battery errors are detected. Changes to this setting are effective immediately. (Default: Detect) The following bits will be turned ON when a battery error is detected. A40204 Battery Low Flag (PC or Memory Card) A42614 Memory Card Battery Low Flag A42615 PC Battery Low Flag
	Error on power off	Designate whether a momentary power interruption is ignored or treated as a non-fatal error. If momentary power interrupts are treated as errors, they will be recorded in the error log (see setting F). Changes to this setting are effective immediately. (Default: Not an error)
	CPU standby	Designate whether PC operation will begin or the CPU will standby during initialization and until SYSMAC BUS/2 terminators are properly detected. If this parameter is set for operation, PC operation will continue even if SYSMAC BUS/2 terminators aren't detected. Changes to this setting are effective immediately. (Default: CPU standby)
	Measure CPU-bus Unit (CPU SIOU) cycle	Designate whether or not the time between CPU-bus Unit services is to be measured. If measured, the cycle is stored starting at A310. Changes to this setting are effective immediately. (Default: Don't measure cycle)
G:Execute control 2	Execute process	Designate whether instruction execution and Peripheral Device servicing are to be carried out synchronously or asynchronously. If synchronous execution is used, Peripheral Device access to IOM can be disabled during user program execution. Changes to this setting are effective the next time the power is turned ON. (Default: Asynchronous)
	I/O interrupts	Designate whether or not I/O interrupt program execution is interrupted for higher-priority I/O interrupts. The I/O interrupt program with the lowest input number has highest priority. Power OFF interrupts, power ON interrupts, and scheduled interrupts take priority over I/O interrupts regardless of this setting. Changes to this setting are effective immediately. (Default: Do not interrupt lower-priority I/O interrupts.)
	Power OFF interrupt	Designate whether or not power OFF interrupts are generated. If an interrupt is generated, the power OFF interrupt program will be executed. Changes to this setting are effective immediately. (Default: No power OFF interrupt)
	Dup action process	Not used.
	Step timer	Designate whether the step timer is set in increments of 0.1 s or 1.0 s. Changes to this setting are effective immediately. (Default: 0.1 s)
	Startup trace	Designate whether a trace is executed automatically according to the preset conditions when the power is turned on or the operating mode is changed. Changes to this setting are effective the next time power is turned on. (Default: Don't start trace.)
	Indirect DM binary/BCD (DM BIN/BCD)	Designate whether indirect DM and EM addresses are binary (PC memory addresses) or BCD (DM and EM area addresses). Changes to this setting are effective immediately. (Default: BCD)
	Multiple use of JMP000	Specify whether multiple JMP000 instructions can be programmed. Changes to this setting are effective immediately. (Default: Multiple use of JMP000 enabled)
	Comparison error process	Designate whether or not to start operation even though an I/O verification error has occurred. This setting affects only the start of PC operation. The I/O verification error is non-fatal, so PC operation will continue if an I/O verification error occurs. Changes to this setting are effective immediately. (Default: Run after error)

Name		Operation
H:Host link	Baud rate	Designate 1200, 2400, 4800, 9600, or 19200 bps. (Default: 9600 bps)
	Stop bits	Designate either 1 stop bit or 2 stop bits. (Default: 2 stop bits)
	Parity	Designate even, odd, or no parity. (Default: Even parity)
	Data length (Data bits)	Designate either 7-bit or 8-bit data. (Default: 7-bit data)
	Unit number	Designate the unit number between 00 and 31. The unit number must not be the same as the unit number of another node in an RS-422 host link. Changes to this setting are effective immediately. (Default: 00)
I:CPU bus link		Designate whether or not CPU bus links are used. CPU bus links are used between BASIC Units only. The CPU bus link service interval is 10 ms. Changes to this setting are effective immediately. (Default: Don't use CPU bus link)
J:Scheduled interrupt interval		Designate whether the scheduled interrupt time is set in increments of 10.0 ms, 1.0 ms, or 0.5 ms. Changes to this setting are effective the next time the power is turned ON. (Default: 10 ms)
K:1st Rack addr		Designate the first CIO words allocated to the CPU, Expansion CPU, and Expansion I/O Rack. The first word can be set between 0 and 511. Do not allow word allocations to overlap. Racks without a designated first word will be allocated words automatically beginning from CIO 0000. Perform the Create I/O Table or Change I/O Table operation or turn the power off and on after changing this setting. (Default: Automatic allocation by rack number beginning from CIO 0000)
L:Group 1,2 1st addr		Designate the first words between CIO 0000 and CIO 0999 for each SYSMAC BUS/2 group-1 and group-2 Masters. The default first word will be used for Masters without a designated first word. Perform the Create I/O Table or Change I/O Table operation or turn the power off and on after changing this setting. (Default: See the table on page 184 for details.)
M:Trans I/O addr		Designate the first word between CIO 0000 and CIO 2555 for each Master for SYSMAC BUS I/O Terminals. Do not designate any bits that are in the hold area. Outputs on I/O Terminals will remain on after program execution stops if they are in the hold area. The default first word will be used for Masters without a designated first word. This setting does not change the Slave address. Perform the Create I/O Table or Change I/O Table operation or turn the power off and on after changing this setting. (Default: 32 words per I/O Terminal starting from CIO 2300)
N:Group 3, RT 1st addr		Designate the first word for each SYSMAC BUS/2 group-3 Slave between CIO 0000 and CIO 0999 and for each SYSMAC BUS Slave Rack between CIO 0000 and CIO 2555. Do not designate any bits that are in the hold area. Outputs on Slaves will remain on after program execution stops if they are in the hold area. The default first word will be used for Slaves without a designated first word. Perform the Create I/O Table or Change I/O Table operation or turn the power off and on after changing this setting. (Default: See the table on page 184 for details.)
O:CV-SIOU 1st addr		Not used.

Name	Operation
P:Power break	Designate the momentary power interruption time between 0 and 9 ms. Operation will continue for momentary power interruptions if the power supply is restored within this time after a power interruption. If the momentary power interruption time is greater than 0 ms, Peripheral Device and Host Link communications may be disrupted and may go on standby for momentary power interruptions. This setting will be ignored and the default value will be used if a C500 Expansion I/O Rack is connected to the System. Changes to this setting are effective immediately. (Default: 0 ms)
Q:Cycle time	Set the minimum cycle time to between 0 and 32,000 ms. If the actual cycle time is less than the set cycle time, execution will be halted until the set cycle time elapses before the next cycle is executed. If the actual cycle time exceeds the set cycle time, the setting is ignored and the next cycle is executed when the current cycle is complete. Changes to this setting are effective immediately. The actual cycle time might vary 3 to 4 ms from the set cycle time. If an interrupt program is executed, the actual cycle time might be extended by the additional time it takes to execute the interrupt program. (Default: Variable cycle)
R:Watch cycle time	Designate the maximum cycle time between 10 and 40,000 ms. If the cycle time exceeds the designated value, a fatal error will occur and A40108 will be turned ON (Cycle Time Too Long Flag). The actual maximum cycle time might vary about 5 ms from the designated value. Changes to this setting are effective immediately. (Default: 1,000 ms)
S:Error log	Designate the size and range of the error log area. When a error occurs, information about the error is saved in this memory area together with the time that the error occurred. The error log can be allocated in the DM or EM Area. Up to 2,047 errors can be recorded. Changes to this setting are effective the next time the power is turned ON. (Default: 20 records of 5 words each in A100 to A199)
T:IOIF, RT display	Designate the display mode to be used for the 7-segment displays on I/O Interface Units, the I/O Control Unit, and SYSMAC BUS/2 Remote I/O Slave Units when the power is turned ON. Changes to this setting are effective the next time the power is turned ON. (Default: Mode 1)

6-8-8 Online PC Setup Operations

This section provides a brief summary of the online PC Setup operations. Refer to *6-8 PC Setup* for more details.

The online PC Setup operations affect the PC Setup in the PC itself. These operations are listed in the following table.

Operation	Function
A:PC setup	Edits the PC Setup in the PC.
S:Save PC settings	Saves the PC Setup in the PC to a data disk.
L:Retrieve PC settings	Retrieves the PC Setup from a data disk to the PC.
T:Transfer PC settings	Transfers the PC Setup between the PC and system work area.

The following table show the PC modes in which each operation can be used.

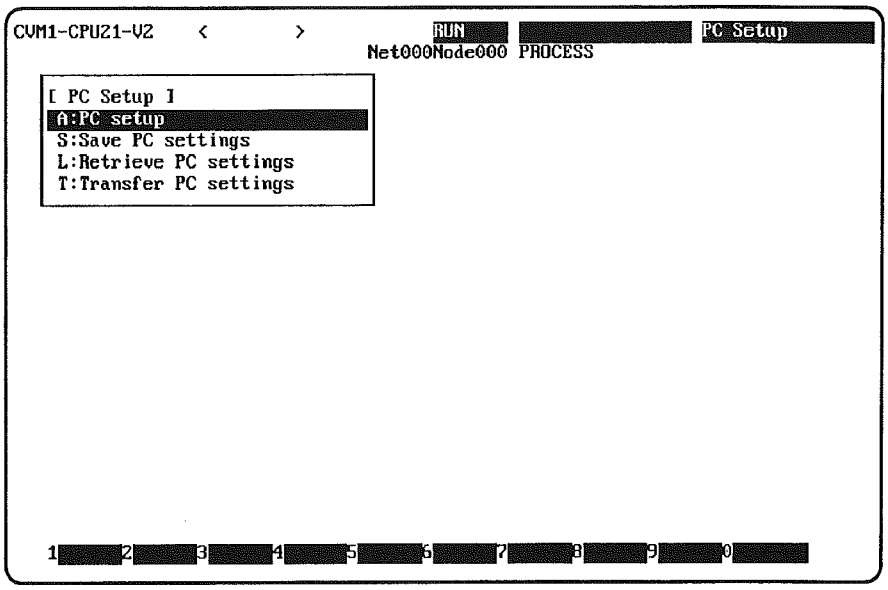
Operation		RUN	MONITOR	DEBUG	PROGRAM
PC setup		No	OK	OK	OK
Save PC settings		OK	OK	OK	OK
Retrieve PC settings		No	No	No	OK
Transfer PC settings	PC → Computer	OK	OK	OK	OK
	Computer → PC	No	No	No	OK

Procedure

Use the following procedure to execute an online PC Setup operation.

1, 2, 3...

1. Select "Q:PC setup" from the online Utility Menu. The PC Setup Menu will be displayed.



2. Select the desired operation.

Save PC Settings

The online Save PC Settings operation is used to save the PC's PC Setup information to a data disk in the computer.

1, 2, 3...

1. Select "Q:PC setup" from the online Utility Menu.
2. Select "S:Save PC settings" from the PC Setup Menu.

Retrieve PC Settings

The online Retrieve PC Settings operation is used to retrieve PC Setup information from a data disk in the computer and write it to the PC.

1, 2, 3...

1. Select "Q:PC setup" from the Utility Menu.
2. Select "L:Retrieve PC settings" from the PC Setup Menu.

Transfer PC Settings

The online Transfer PC Settings operation is used to transfer the PC Setup information between the PC and the computer's system work area. The following procedure transfers the PC Setup from the PC to the computer.

1, 2, 3...

1. Select "Q:PC setup" from the online Utility Menu.
2. Select "T:Transfer PC settings" from the PC Setup Menu.
3. Select "P:PC → Computer" from the menu.

The following procedure transfers the PC Setup from the computer to the PC.

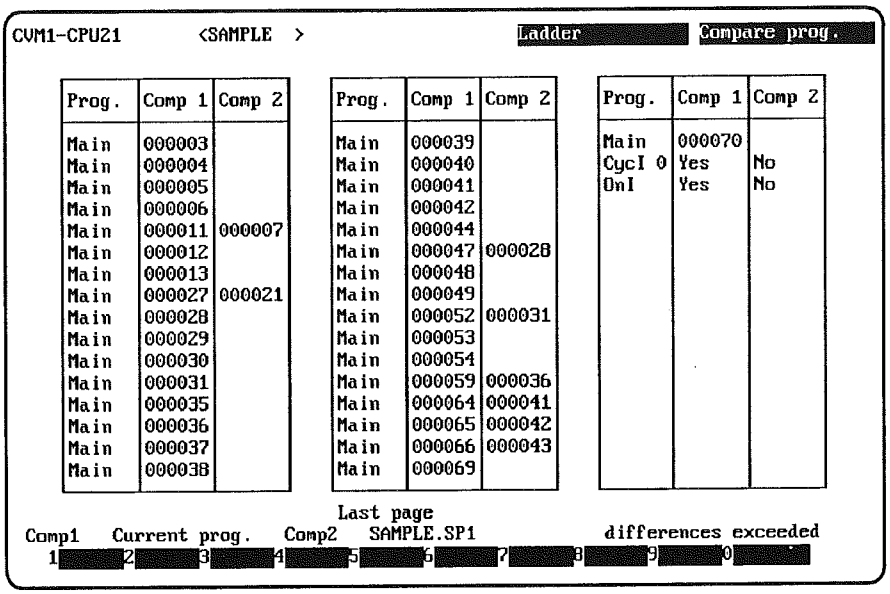
1, 2, 3...

1. Select "Q:PC setup" from the online Utility Menu.
2. Select "T:Transfer PC settings" from the PC Setup Menu.
3. Select "F:Computer → PC" from the menu.

6-9 Comparing Programs

The Compare Programs operation is used to compare a program file on a data disk to the programs held in the computer's system work area and display any differences in a list. The program file being compared must have a ".SP1" or ".COD" extension.

The following diagram shows an example of a list of program differences.



6-9-1 Procedure

1, 2, 3...

1. Select "V:Compare programs" from the Utility Menu.
2. Input the name of the program file to be compared and press Enter.
3. A message will appear indicating that the comparison is being made.

   When the comparison is finished, a list of the differences, if any, will be displayed. If the list is too long to fit on one display, use the PageUp and PageDown Keys to scroll the display.

   If there are no differences, "Data same" will be displayed.
4. Press Escape to return to step 1, above.

6-9-2 Program Comparison Messages

The following messages are displayed for differences found in the programs.

	Yes
	No
(See note 1)	* 200*
(See note 2)	*1000*

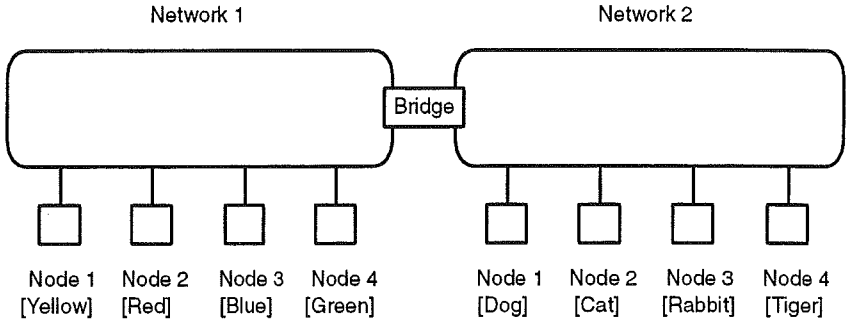
Note

1. The number of differences exceeds 200.
2. The total exceeds 1,000.

6-10 Editing PC IDs

A PC ID is a name assigned to each node of a SYSMAC NET or SYSMAC LINK network. For example, the name RED could be assigned to node 2 on network 1. Once set, the assigned name can be specified instead of the network and node addresses.

The diagram below shows an example of PC IDs in SYSMAC NET networks.



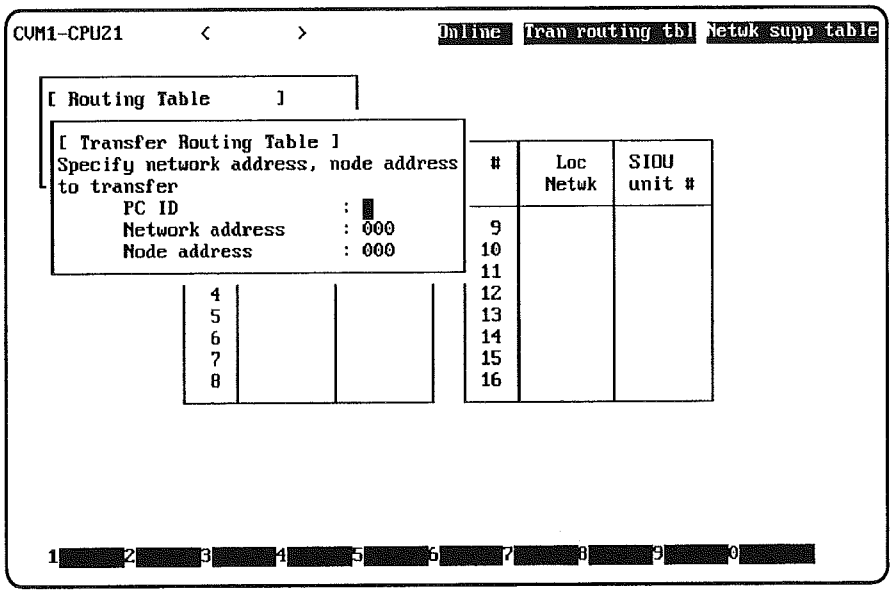
The PC IDs for the networks in the diagram are listed in the following table.

Row	Network	Node	PC ID
001	001	001	YELLOW
002	001	002	RED
003	001	003	BLUE
004	001	004	GREEN
005	002	001	DOG
006	002	002	CAT
007	002	003	RABBIT
008	002	004	TIGER

The PC ID editing operations handle the PC IDs in the format shown in the table. A maximum of 500 PC IDs can be registered with up to 8 characters per name. The input is case-sensitive: upper-case and lower-case letters are treated as different characters. More than one PC ID cannot be assigned to a single node and the same PC ID cannot be assigned to more than one node.

6-10-1 Using PC IDs

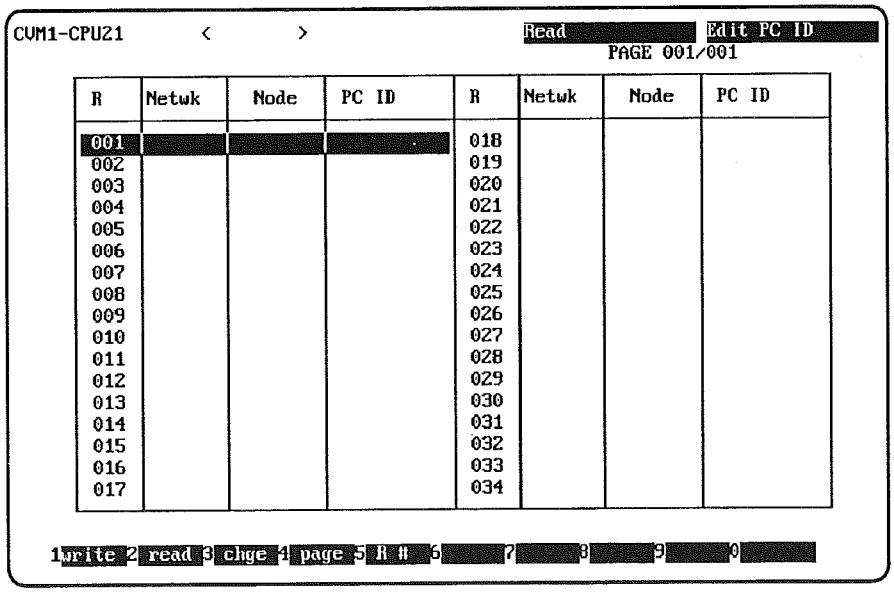
To specify a node using its PC ID, enter the PC ID at the PC ID input area and press Enter. The PC's network and node address will be displayed when its PC ID is entered.



With some functions it is possible to select a PC from a list of PC IDs rather than entering the PC ID. In this case, move the cursor to the PC ID input area, press the End Key to display a list of PC IDs, and select the desired node.

6-10-2 The PC ID Editing Display

Select "M:Edit PC ID" from the Utility Menu to bring up the editing display. The display will be in read mode. There are three editing modes: read, write, and change.



Function Key Operations

Function key	Name	Function
F1	write	Switches to write mode.
F2	read	Switches to read mode. Displays the first page if pressed in the read or change mode.
F3	chge	Switches to change mode.
F4	page	Displays a specified page. Only enabled in the read and change modes. Input the F4 Key, *page_number*, and Enter.
F5	R #	Displays a specified row. Only enabled in the read and change modes. Input the F5 Key, *row_number*, and Enter.

6-10-3 Writing PC IDs

Use the procedure below to write new PC IDs. The editing display can contain up to 500 PC IDs and it will revert to read mode automatically when the 500th PC ID has been entered. The cursor cannot be moved in write mode; it is moved to the first blank row automatically.

1, 2, 3...

1. Select "M:Edit PC ID" from the Utility Menu.
2. Press F1 to switch to write mode. The cursor will move to the first blank row and a PC ID input area will be displayed at the bottom of the screen.

   If necessary, press the Escape Key to move back to the previous input area.
3. Enter the network address (0 to 127) and press Enter.
4. Enter the node address (0 to 126) and press Enter.

   The node address can be set to 0 only if the network address has been set to 0.
5. Enter the PC ID and press Enter.

   The entered data will appear in the blank row at the cursor and the cursor will move down to the next row.

6-10-4 Changing PC IDs

Use the procedure below to change existing PC IDs.

1, 2, 3...

1. Press the F3 Key from the PC editing display to switch to the change mode.
2. Move the cursor to the desired PC ID and press Enter. Press the Shift+Escape Keys to return to the first page.
3. Input the new PC ID. Refer to *6-10-3 Writing PC IDs* for details on inputting PC IDs.

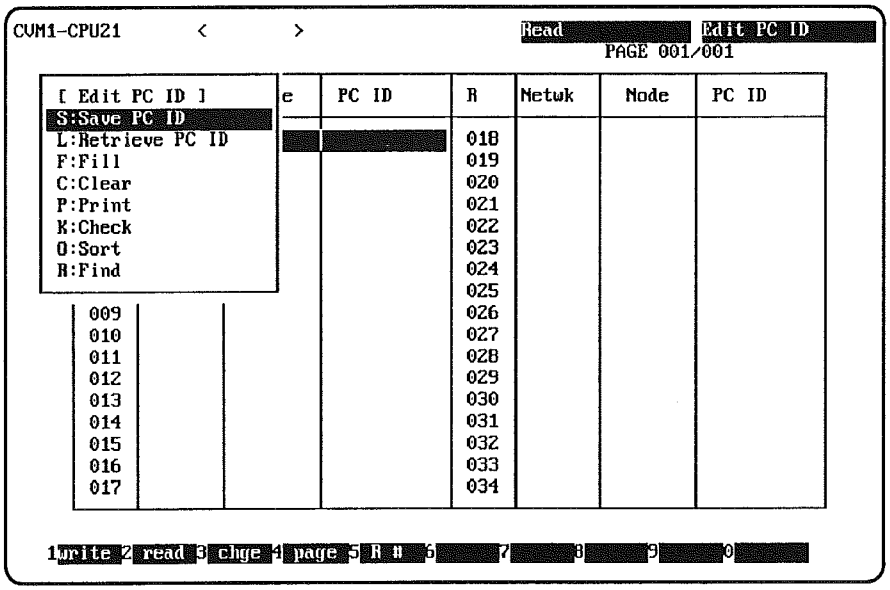
6-10-5 The Edit PC ID Menu

The following table shows the operations that can be selected from the Edit PC ID Menu. These operations are described in more detail in later sections.

Operation	Function
S:Save PC ID	Saves the PC ID data in the system work area to a data disk.
L:Retrieve PC ID	Retrieves the PC ID data from a data disk to the system work area.
F:FILL	Writes the same specified network address, node address, or PC ID data to consecutive rows.
C:Clear	Clears data from all rows in a specified range.
P:Print	Prints the PC ID data.
K:Check	Checks the edited PC ID and displays any errors found.
O:Sort	Sorts PC IDs in numerical and alphabetical order.
R:Find	Finds a specified item in PC ID data.

Use the following procedure to display the Edit PC ID Menu and execute an operation.

1, 2, 3... 1. Press the End Key in read mode to display the Edit PC ID Menu.

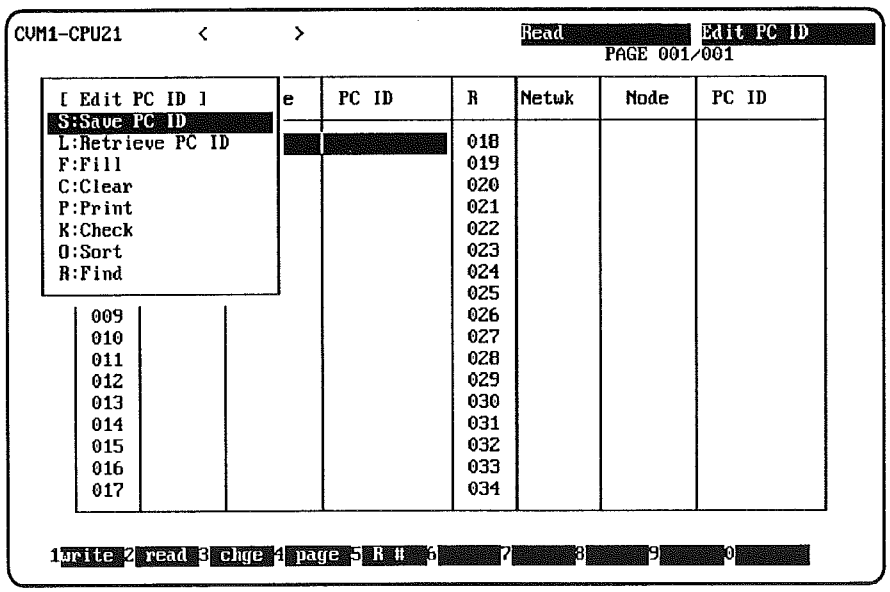


2. Select the desired operation.

6-10-6 Saving PC IDs

This operation is used to save PC ID data from the system work area to a data disk.

1, 2, 3... 1. Select "S:Save PC ID" from the Edit PC ID Menu. A file name input area will be displayed.



2. Enter the path and file name of the desired file and press Enter.
   The title input area will appear when Enter is pressed.
3. Input the title and press Enter. The title can be up to 30 characters long.

6-10-7 Retrieving PC IDs

This operation is used to retrieve PC ID data from a data disk to the system work area. The PC ID data in the system work area will be erased when this operation is executed.

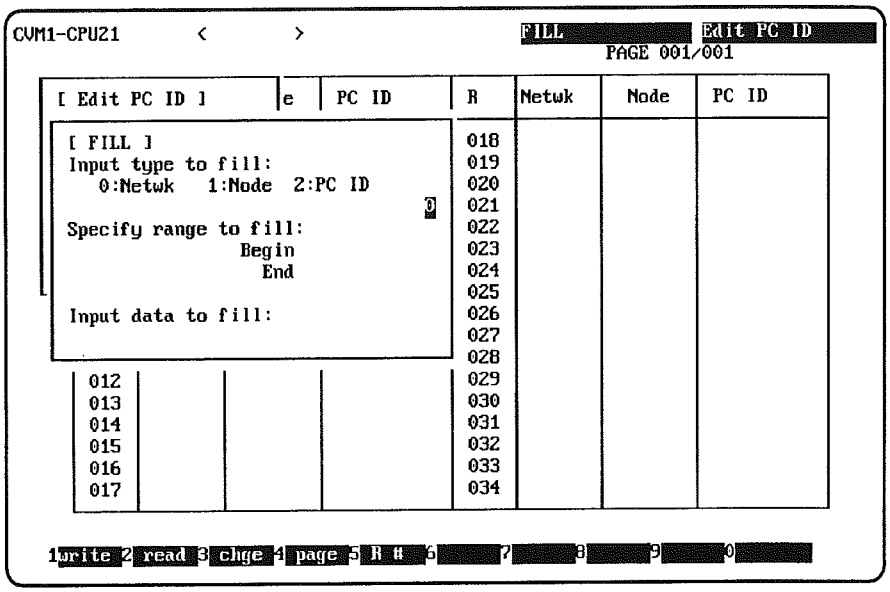
1, 2, 3...

1. Select "L:Retrieve PC ID" from the Edit PC ID Menu. A file name input area will be displayed.
2. Enter the path and file name of the desired file and press Enter.

6-10-8 FILL

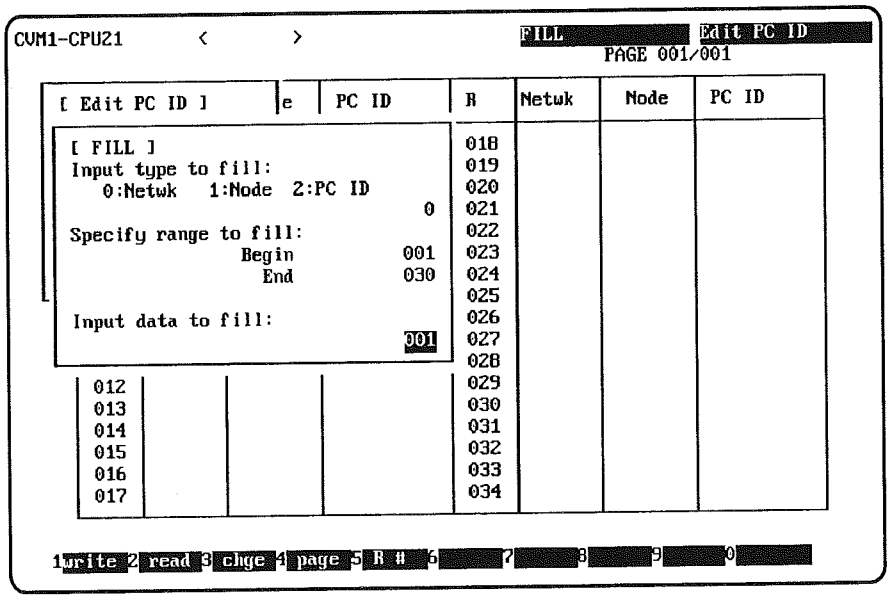
This operation is used to write the specified network address, node address, or PC ID in the specified range of rows.

1. Select "F:FILL" from the Edit PC ID Menu.



2. Specify in which column the data is to be entered, the range of rows, and the data.
3. Press Enter. The specified data will be written in the PC ID table.

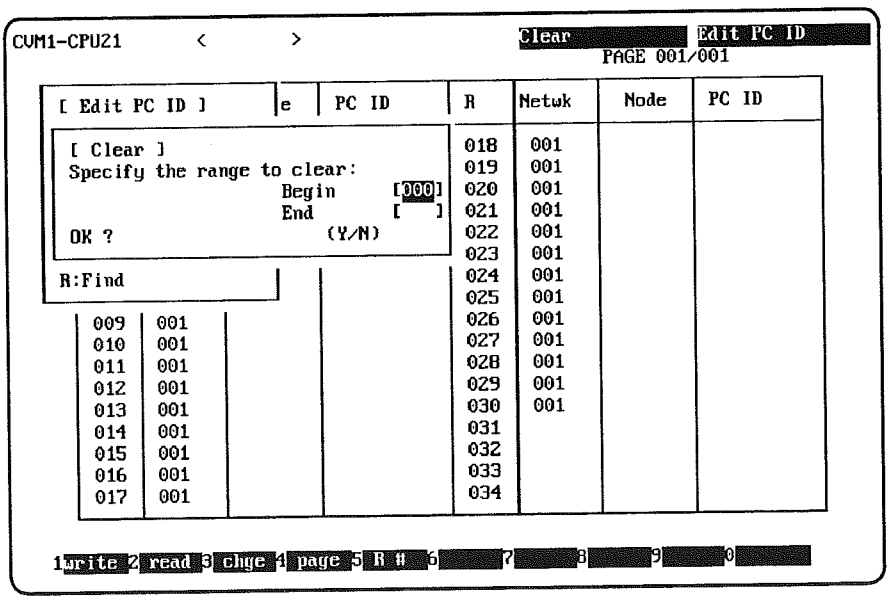
Example This example shows the FILL operation being used to write network address 001 in rows 1 to 30.



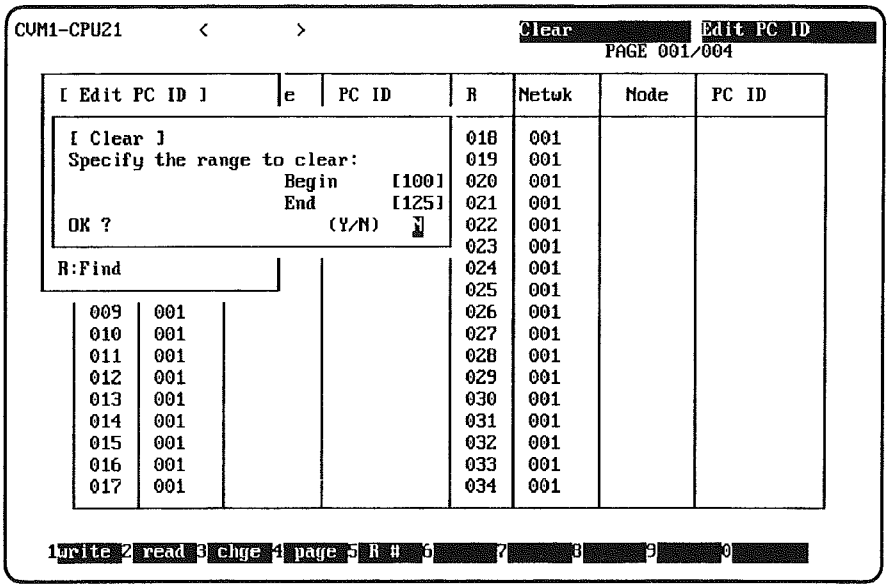
6-10-9 Clearing PC IDs

This operation is used to clear PC ID data from the specified range of rows.

1, 2, 3... 1. Select "C:Clear" from the Edit PC ID Menu.



2. Specify the range of rows to clear. A confirmation prompt will be displayed.



3. Enter "Y" to clear the data, "N" to cancel the clear operation.

6-10-10 Printing PC IDs

This operation is used to print the PC ID data in the system work area.

1, 2, 3...

1. Check that the printer is connected and online.
2. Select "P:Print" from the Edit PC ID Menu to start printing. A message will be displayed to indicate that the PC ID data is being sent to the printer.
3. Press the Escape Key to cancel printing and return to the main menu. All data in the printer's memory buffer will be printed before printing stops.

Sample Print-out

PC ID Dir

06/12/94 PAGE = 001

R	Netwk	Node	PC ID	R	Netwk	Node	PC ID	R	Netwk	Node	PC ID
001	001	001	blue								
002	001	002	red								
003	001	003	yellow								
004	001	004	green								
005	002	001	white								
006	002	002	black								
007	003	001	grey								
008	003	002	pink								
009	004	001	orange								

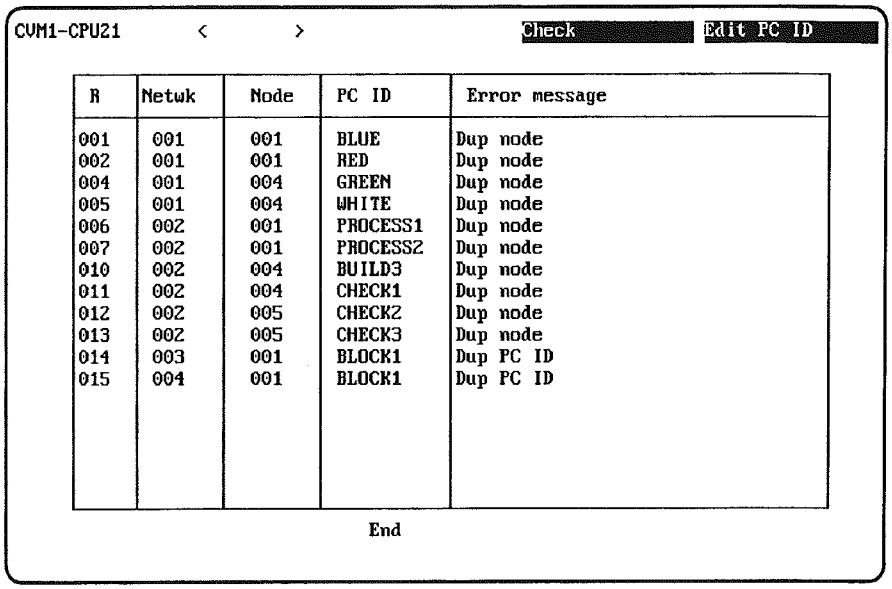
6-10-11 Checking PC IDs

This operation is used to check the PC ID data in the system work area. An error message will be displayed if a PC ID or node appears in the table more than once.

1, 2, 3...

1. Select "K:Check" from the Edit PC ID Menu. A message will be displayed to indicate that the PC ID data is being checked.

A message will indicate if no errors were found. If any errors are found, they will be displayed as in the following diagram.



2. If the errors can't be displayed on one page, press the PageUp and PageDown Keys to scroll through the data.
3. To correct any errors, switch to change mode, correct the PC ID data, and run the check again.

6-10-12 Sorting PC IDs

This operation is used to sort the PC ID data in the system work area.

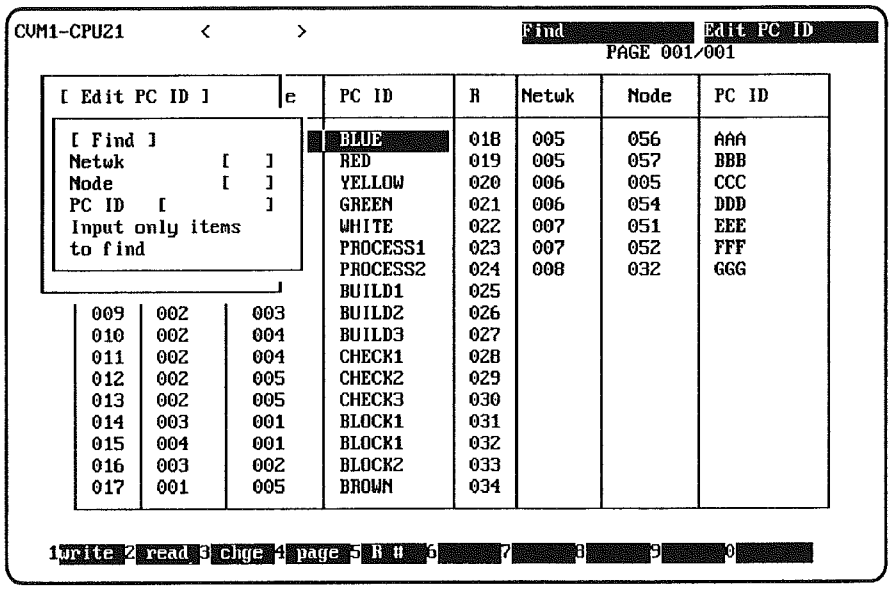
Select "O:Sort" from the Edit PC ID Menu to sort the data.

The data will be sorted in the following order: network, node, PC IDs. PC IDs will be sorted in numerical and alphabetical order.

6-10-13 Searching for PC ID Data

This operation is used to search through the PC ID data in the system work area. It is possible to search for any network address, node address, or PC ID.

1, 2, 3... 1. Select "R:Find" from the Edit PC ID Menu.



2. Enter the the network, node, or PC ID data to be found and press Enter. (Enter only the data that you want to find.)

   If the specified data is found, the cursor will move to that row. Press Enter to continue the search.

   If the specified data is not found, a message to that effect will be displayed in the upper-left corner of the screen and the display will be switched to read mode.

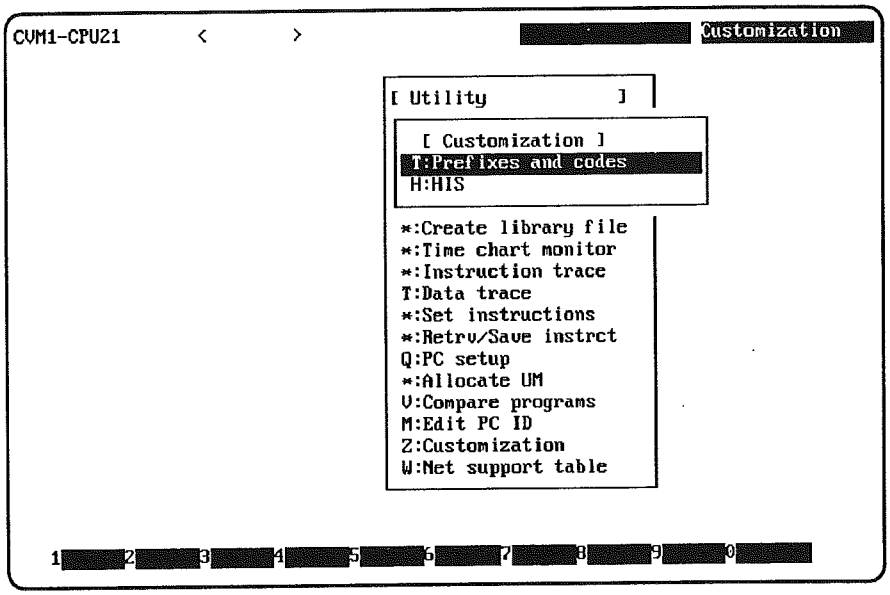
6-11 Customization

The Customization Menu can be used to change the abbreviations (prefixes) used for data areas, divide the CIO Area into custom data areas, or record or delete HIS programs.

The customized settings will not be effective until they are transferred to the PC using the online Customize Data operation.

Customization Menu

The following menu will appear when "Z:Customization" is selected from the offline Utility Menu.



Select "T:Prefixes and codes" to access the operations used to change data area prefixes and divide the CIO Area into custom data areas. Refer to *6-11-1 Prefixes and Codes* for details.

Select "H:HIS" to access the operations used to record or delete HIS programs. Refer to *6-11-2 HIS Programs* for details.

6-11-1 Prefixes and Codes

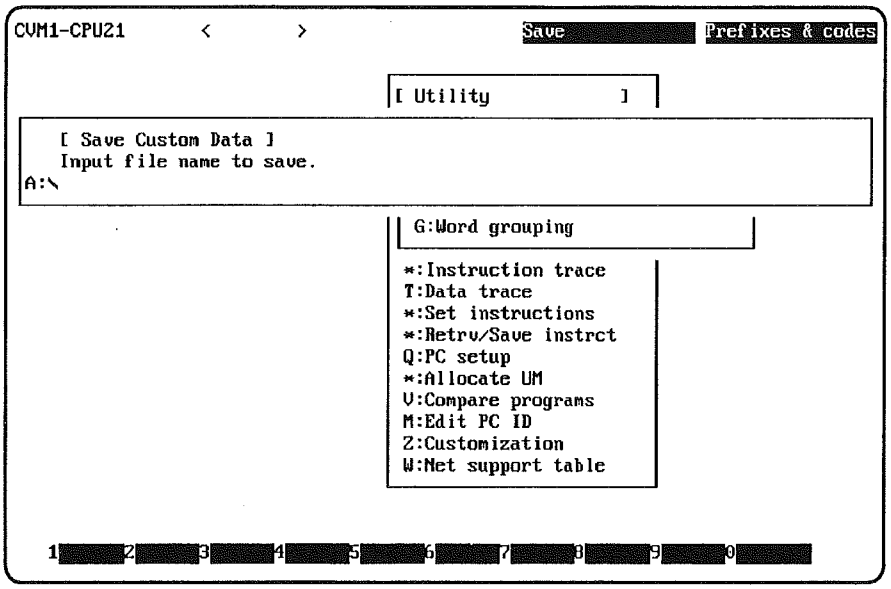
The operations under the "T:Prefixes and codes" command are used to change the data area prefixes or divide the CIO Area into smaller areas. The following table lists the operations that can be selected from the Prefixes and Codes Menu.

Operation	Application
S:Save custom data	Saves the customized settings from the system work area to a data disk.
L:Retrieve custom data	Retrieves the customized settings from a data disk to the system work area.
E:Chge data area abbr	Changes the prefixes for data areas.
G:Word grouping	Breaks the CIO Area into custom data areas with area prefixes.

Saving Customized Settings

The following procedure saves the customized settings from the system work area to a data disk.

1, 2, 3... 1. Select "S:Save custom data" from the Prefixes and Codes Menu.

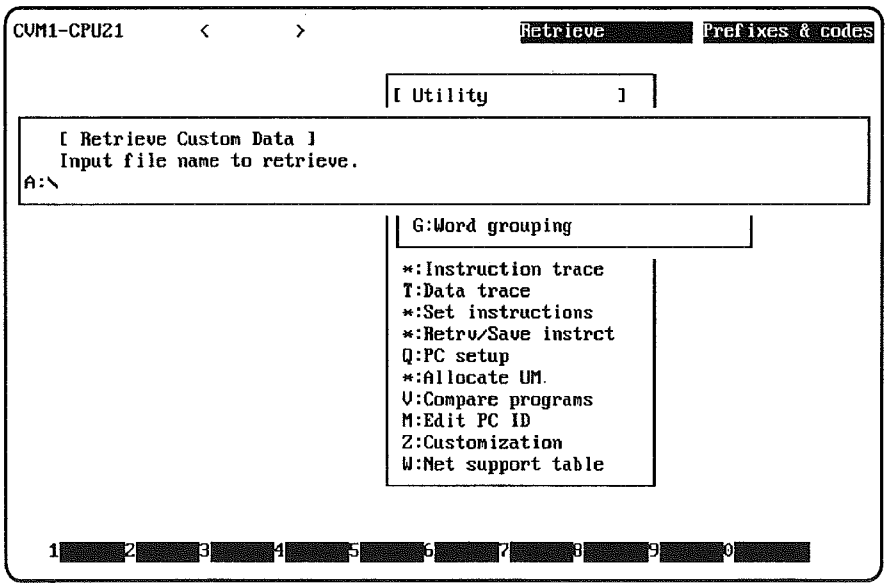


2. Input the drive, path, and file name into which to save the customized settings. The End Key can be pressed to select the file name from a list of files.
3. Input a heading for the file if desired. The heading can be up to 30 characters long. the data will be saved when Enter is pressed.

Retrieving Customized Settings

The following procedure retrieves the customized settings from a data disk to the system work area.

1, 2, 3... 1. Select "L:Retrieve custom data" from the Prefixes and Codes Menu.



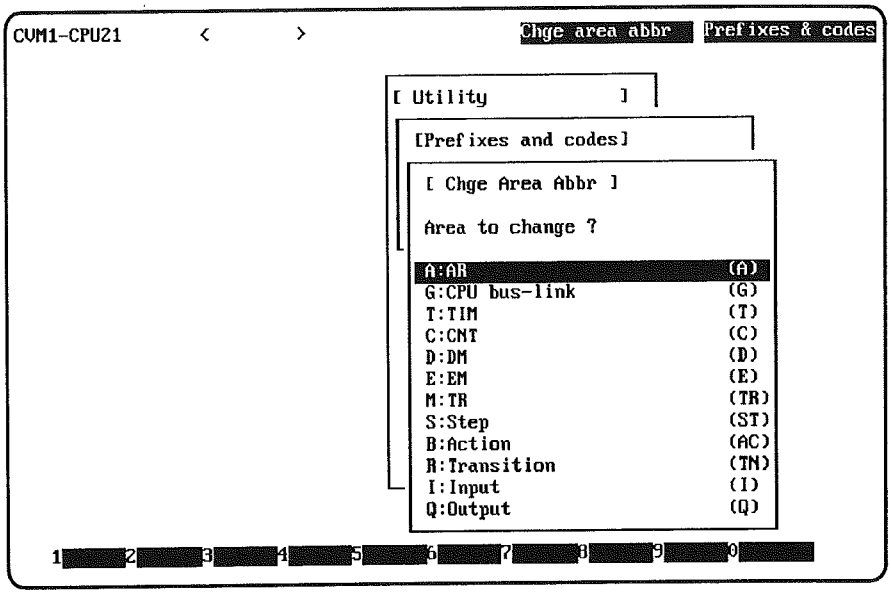
2. Input the drive and the name of the file to be retrieved. The End Key can be pressed to select the file name from a list of files on the specified disk.

Changing Data Area Prefixes

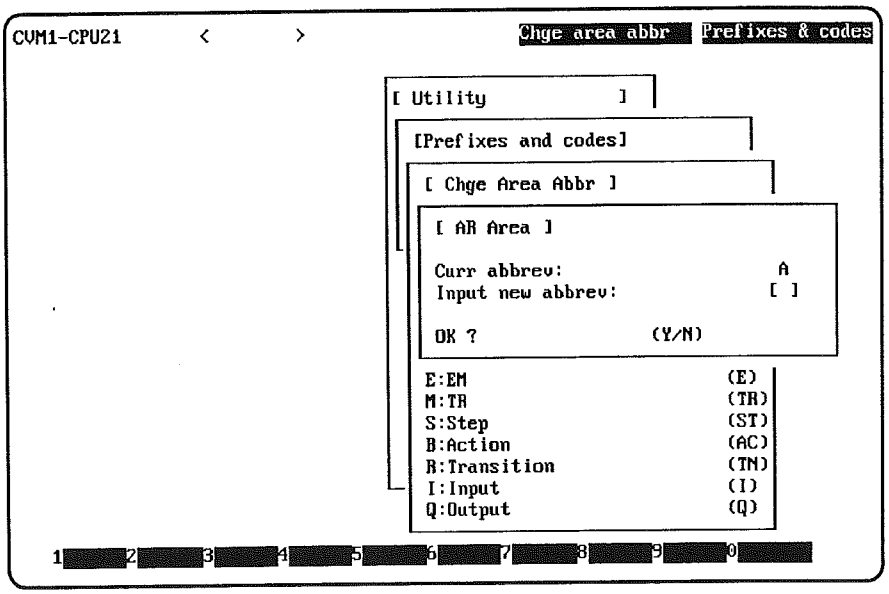
The following procedure changes the prefixes used to identify data areas.

1, 2, 3...

1. Select "E:Chge data area abbr" from the Prefixes and Codes Menu. The following display will appear showing the current prefixes.



2. Enter the prefix that you want to change an press Enter.



3. Input the new prefix for the data area. The prefix for the TR Area is two characters long and all other prefixes are one character long. (The prefixes for the Step Area, Transition Area, and Action Area cannot be changed.)
4. Enter "Y" to change the prefix, "N" to cancel the operation. If the same prefix is used for more than one area, an error message will appear and you will have to change the prefix again.

Word Grouping

The following procedure divides the CIO Area into separate data areas. The CIO Area from CIO 0000 to CIO 2555 can be broken up into up to 18 custom data areas with area prefixes. Any letters that aren't already used for other data areas (such as A, C, D, E, G, I, T, and Q) can be used for the new data areas.

Note Once custom data areas have been set, the words and bits in them must always be addressed using the assigned prefixes.

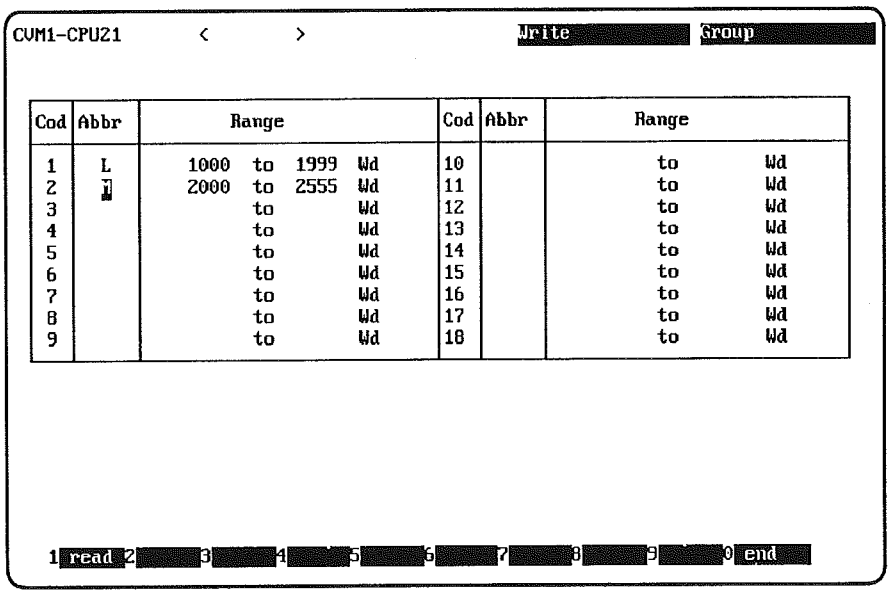
1, 2, 3...

1. Select "G:Word grouping" from the Prefixes and Codes Menu. A list of the current word groupings will be displayed.
2. Press the F2 Key to switch to write mode.
3. Specify the abbreviation (prefix) and word range for each custom data area. The prefixes can be only one character and cannot be the same as prefixes used for other data areas. Press the Down Cursor Key to move to the next row.

   Custom areas must be set so that words do not overlap between the areas. The smaller address in each range must be specified first.

   In the following example, the prefix "L" was assigned to words CIO 1000 to CIO 1999 and the prefix "M" was assigned to words CIO 2000 to CIO 2555 by pressing:

   L, Enter, 1000, Enter, 1999, Enter, and the Down Cursor Key
   M, Enter, 2000, Enter, 2555, and Enter.



The new data areas in this example would be L0000 to L0999 and M0000 to M0555.

4. The Insert Key can be pressed to insert a new row at the current cursor position. The Delete Key can be pressed to delete the data at the current cursor position.
5. When you have finished setting data areas and prefixes, press the F10 Key.
6. Enter "Y" to confirm the changes, "N" to cancel the operation.

7. If the changes are confirmed, the settings will be checked for errors. If no errors are detected, press Enter to return to the Customization Menu.
If an error message appears, press Enter to return to the input display and correct the mistake. Possible errors are shown in the following table.

Error	Meaning	Correction
Dup range err	The same words have been placed in two different groups.	Change the group ranges so that no words overlap.
Range error	The upper limit of the range is specified first.	Specify the smaller address first.
Dup abbrev err	The same prefix has been used for more than one group or is the the same as a prefix for the normal data areas.	Change the prefixes so that each is used only once.

6-11-2 HIS Programs

The HIS operations are used to register or delete HIS programs developed by the user. HIS instructions can be used in the PC program if an HIS program has been registered.

The following table lists the operations that can be selected from the HIS Menu.

Operation	Application
R:Record program	Registers an HIS program.
D:Delete program	Deletes the registered HIS program. (The HIS program is stored in a file with the filename extension ".HIS.")

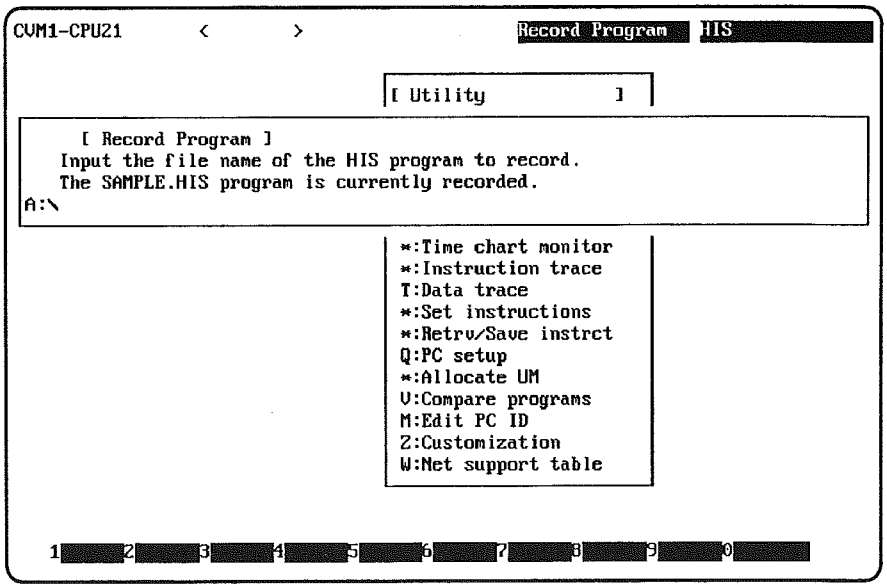
The customized settings will not be effective until they are transferred to the PC using the online Customize Data operation.

Recording HIS Programs

This operation registers an HIS program so that HIS instructions can be used in the user programs.

1, 2, 3...

1. Select "R:Record program" from the HIS Menu. A file input area will be displayed. If a HIS program is currently recorded, the name will appear as the default.



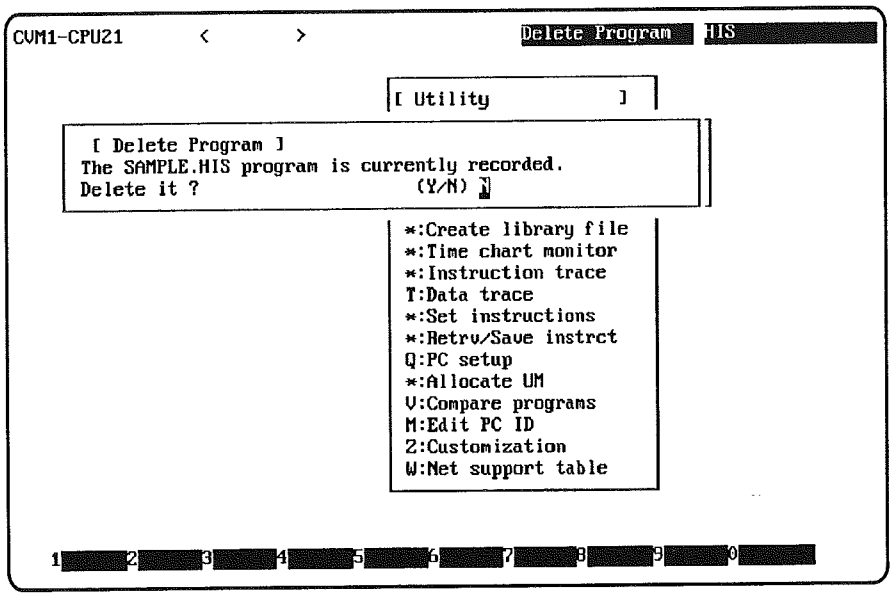
2. Input the path and name of the file containing the HIS program and press Enter. The End Key can be pressed to display a directory of files and the desired file can be selected from this list.

Deleting HIS Programs

This operation deletes the HIS program currently registered for use with HIS instructions.

1, 2, 3...

1. Select "D:Delete program" from the HIS Menu. The name of the currently recorded program and a confirmation prompt will be displayed. If a HIS program name is not displayed, there is not HIS program currently recorded.



2. Enter "Y" to delete the current HIS program, "N" to cancel the operation.

SECTION 7
System Setup

This section describes the various parameters that are set to control SSS operation and communications with the PCs.

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7-2 System Setup Parameters 219
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7-2-2 PC Interface 219
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7-1 Overview

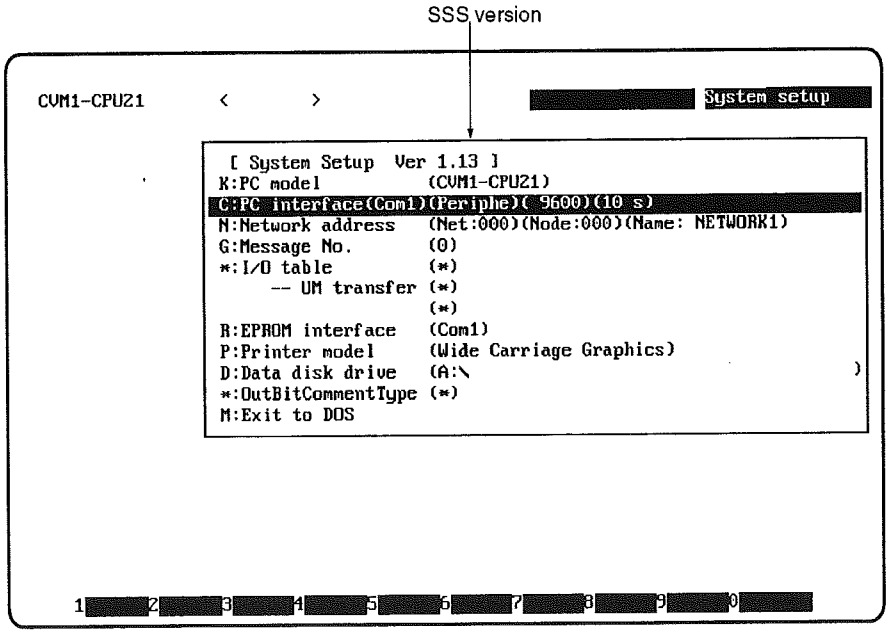
The System Setup menu contains operations used to set parameters for communication between the computer and the PC, and other devices such as printers. The System Setup menu and current settings are displayed when System Setup is selected from the main offline menu.

The following table lists the operations that can be selected from the System Setup menu. Select an operation by pressing its corresponding letter or moving the cursor to the operation and pressing Enter. These operations are described briefly in the following table and in more detail in later sections.

Operation	Function
K:PC model	Specifies the model of PC that is to be used. This settings affects peripheral devices, program checks, and communications.
C:PC interface	Specifies the interface for Programmable Controller communications (Peripheral or Host Link).
N:Network address	Specifies the node address and network address for the destination PC when communications are carried out.
G:Message No.	Specifies the MSG(195) message number to be displayed by the SSS.
R:EPROM interface	Specifies the communications protocol between the PROM Writer and computer.
P:Printer model	Specifies the model of printer connected.
D:Data disk drive	Specifies the data disk drive for saving and retrieving data.
M:Exit to DOS	Terminates SSS operation and returns to DOS.

When the System Setup Menu is selected, the following screen will be displayed with the current settings shown on the right side of the screen. To change a setting, select the particular item and then make the change.

During online operation, only the message number setting can be changed.



7-2 System Setup Parameters

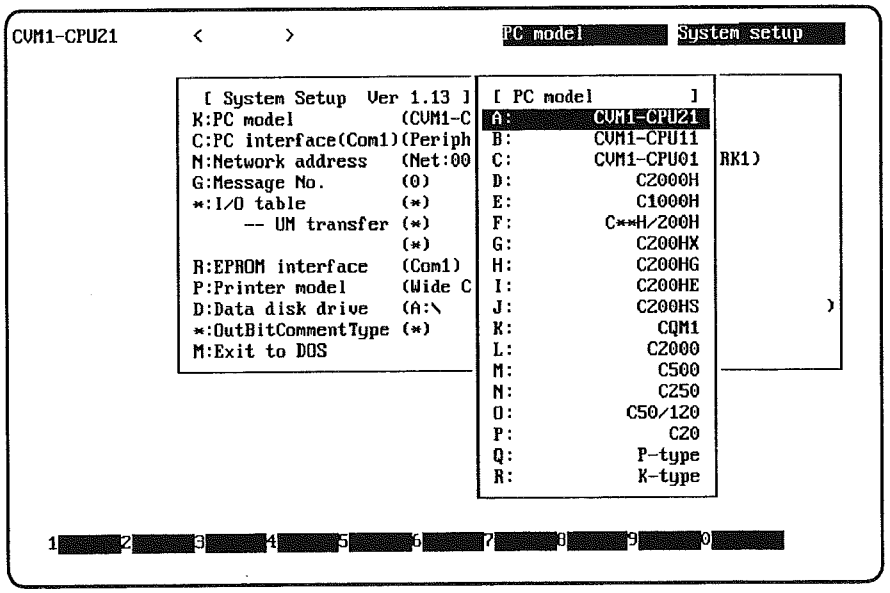
7-2-1 Setting the PC Model

Use this parameter to indicate which model of PC will be used with the SSS. The PC Interface parameter will be initialized when the PC model is changed and, if the PC model is changed between any of the PC families in the following table, the current ladder program, block comments, instruction trace data, time chart data, and data trace data in the computer will be cleared. A confirmation message will appear before the data is actually cleared so that you can cancel the operation if necessary.

Family	PCs
C2000H	C200H, C1000H, C2000H, Mini H-type PCs, K-type PCs, CQM1, C200HS, and C200HX/C200HG/C200HE
C500	C20, C50, P-type PCs, C120, and C500
CVM1	All CVM1 PCs

The procedure for changing the PC model is as follows:

1, 2, 3... 1. Select "K:PC model" from the System Setup Menu.



2. Select the desired PC model from the menu.

   If P-type is selected, "C20P" will be displayed as the current setting in the System Setup menu. If C200H/C**H is selected, "C200H" will be displayed.

3. A confirmation prompt will be displayed. Enter "Y" and press the Enter Key to change the PC model and erase the current ladder program in the computer. Enter "N" (i.e., just press the Enter Key) to cancel the operation.

7-2-2 PC Interface

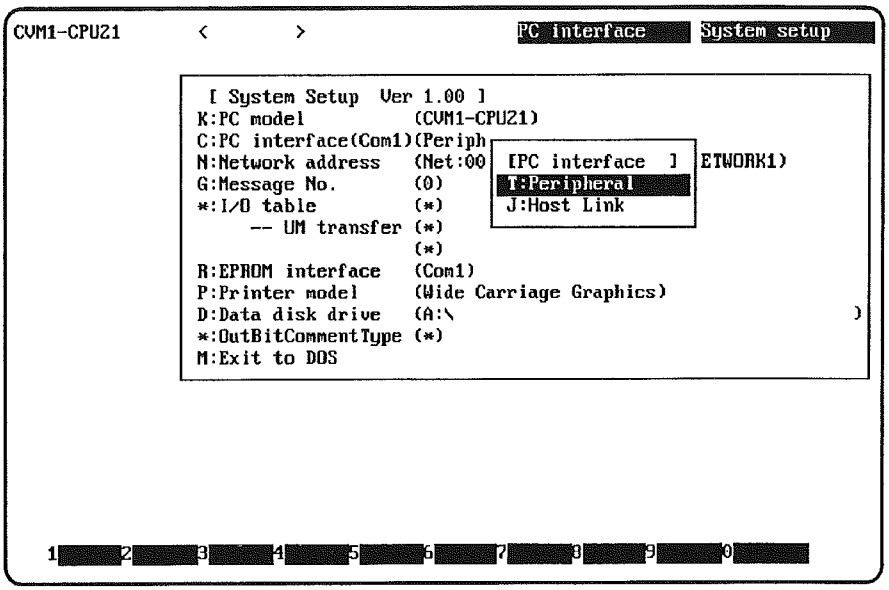
Use the "C:PC interface" operation to indicate whether a Peripheral or Host Link interface is to be used for communications between the computer and PC.

Be sure to check the specifications of the personal computer that is to be used. Some personal computers may not be able to communicate at a baud rate of 19,200 bps.

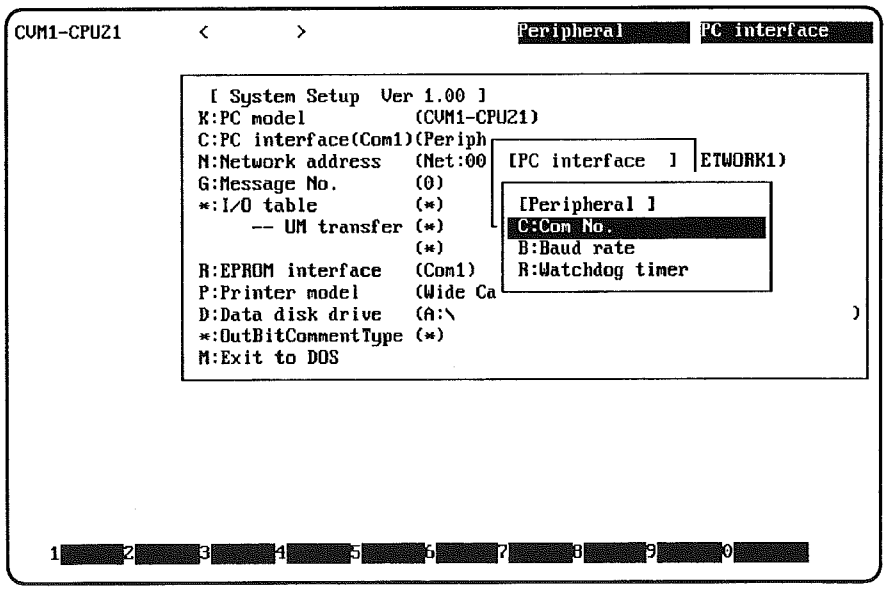
Peripheral Interface

1, 2, 3...

1. Set the baud rate at the PC's DIP switch to match the PC interface setting (which will be set later in this procedure).
2. Select "C:PC interface" from the System Setup Menu.



3. Select "T:Peripheral" from the menu. The following screen will appear.



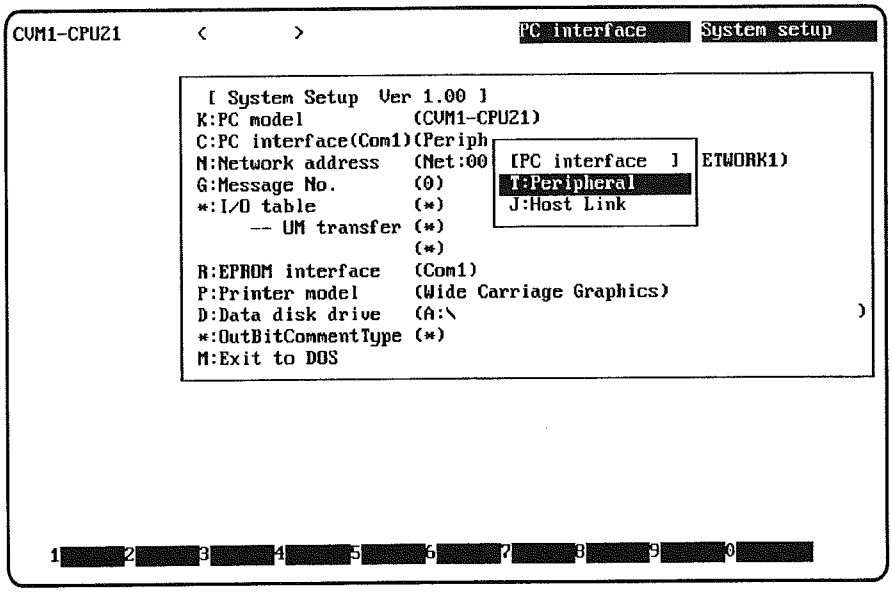
4. Use the Up and Down Cursor Keys to select the item that is to be changed, and then press the Enter Key.

Host Link Interface

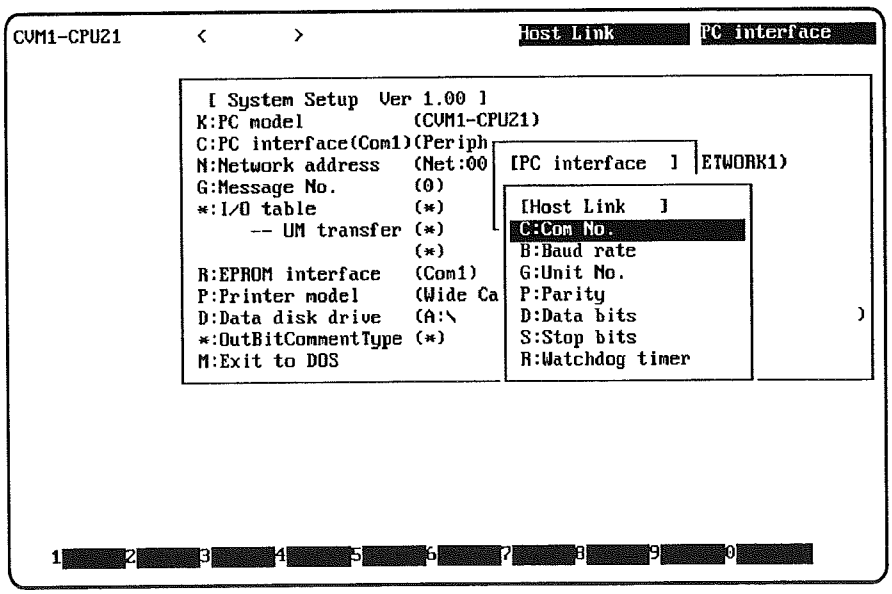
1, 2, 3...

1. Set the communications parameters on PC or the Host Link Unit. Refer to the *CV-series PC Operation Manual: Host Link System* for details on settings.
2. Connect a Programming Device (e.g., the SSS) to the PC's peripheral connecter.
3. Change to online operation.
4. Set the PC's communications parameters for host link communications in the PC Setup. These settings must match those of the SSS.

   The PC Setup can also be changed offline and then transferred to the PC.
5. Next, connect the SSS to the PC's Host Link interface connector, and set the PC's RS-232C/RS-422 switch to RS-232C.
6. Select "C:PC interface" from the System Setup menu.



7. Select "J:Host Link" and set the communications parameters to the same values used for the PC. The watchdog timer and communications port can also be set.



7-2-3 Setting the Network Address

The Destination Network Address setting is used to specify the network and node addresses for the destination PC when communicating with PCs connected by SYSMAC NET or SYSMAC LINK. The PC names (IDs) set using the Edit PC IDs offline utility operation can be used to specify network and node addresses.

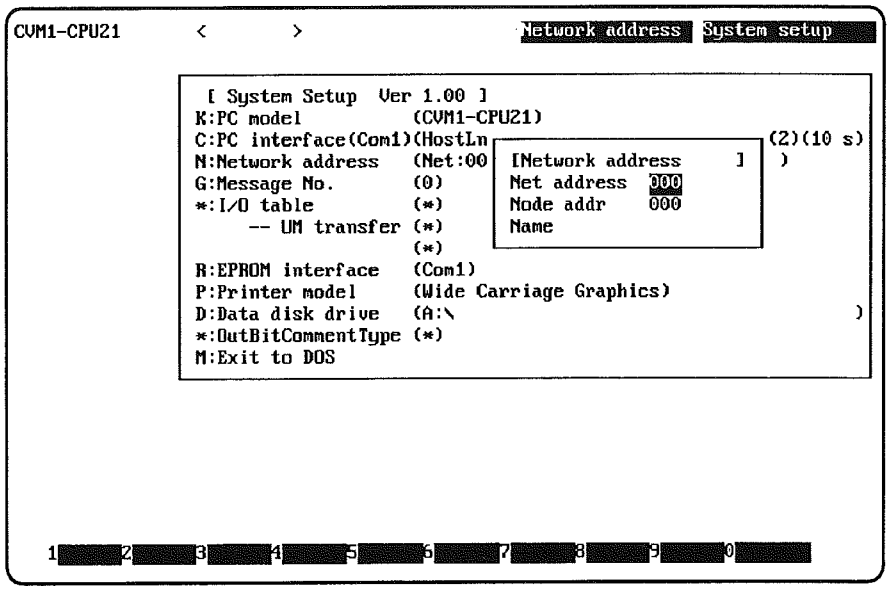
If the programming device and the PC are directly connected, set both the network address and the node address to "000." If the programming device and the PC are on the same network, set the network address to "000."

In order to communicate with a PC in another network, it is necessary to create a routing table. For details, refer to *Part 4: Networks and CPU Bus Units*.

Procedure

1, 2, 3...

1. Select "N:Network address" from the System Setup Menu.



2. Use the Up and Down Cursor Keys to select the item that is to be set. Make the setting and press the Enter Key.

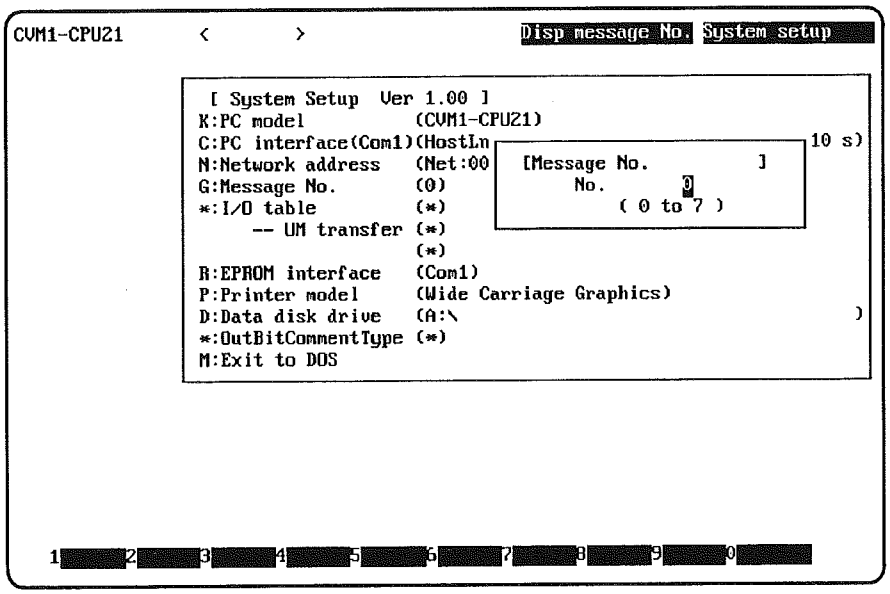
Item		Address range
Network address		000 to 127
Node address	SYSMAC NET	001 to 126
	SYSMAC LINK	001 to 062

7-2-4 Setting the Display Message Number

The Message Number setting specifies the MSG(195) message number to be displayed by the SSS.

Procedure

1, 2, 3... 1. Select "G:Message No." from the System Setup Menu.



2. Specify a number from 0 to 7 and then press the Enter Key.

7-2-5 EPROM Interface

Select "R:EPROM Interface" from the System Setup menu and specify the Memory Card Writer and the computer's communications port.

7-2-6 Setting the Printer Model

Select "P:Printer model" from the System Setup menu and specify the type of printer connected to the computer.

Any of the following printers can be used depending on the specification.

Specification	Manufacturer	Model
Wide carriage graphics	IBM	4202-001
		4208-002
80-column graphics	IBM	4201-002
		4201-003
	Epson	FX-800
HP LaserJet II	HP	HP33471A

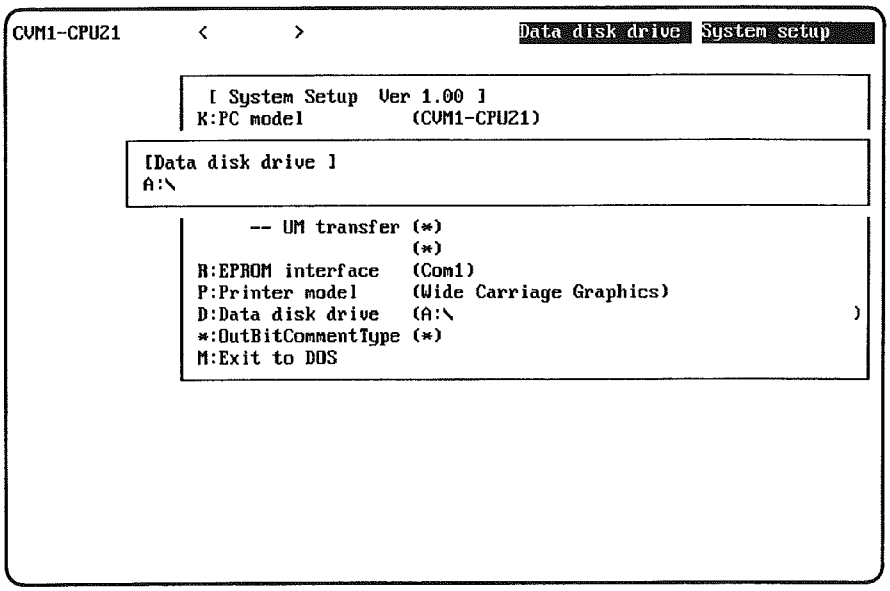
Note Set the job size and paper size with the control panel if the LaserJet II is to be used.

7-2-7 Setting the Path for Saving Data

The Data Disk Drive setting specifies the name of the disk drive and /or directory for saving data when a personal computer is used. The path can be for a directory on a hard disk, for a floppy disk drive, or for other drives supported by your computer.

1, 2, 3...

1. Select "D:Data disk drive" from the System Setup Menu. The default setting will be displayed.



2. Specify the data disk drive and the path name, and press the Enter Key. Up to 66 characters can be used for the path name (including the drive designation).

7-2-8 Exiting to DOS

The Exit to DOS operation exits the SSS and returns to DOS. Before exiting the SSS, check whether there is any data that needs to be saved.

1, 2, 3...

1. Select "M:Exit to DOS" from the System Setup Menu. A confirmation message will be displayed.
2. To exit to DOS, input "Y" and press the Enter Key. To remain in the SSS, just press the Enter Key to select "N."

SECTION 8
File Management

This section explains how to manage files on the data disk.

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8-1 File Management Operations

The operations described in this section can be used to display, copy, rename, and delete files stored on data disks and to create and delete directories. File management operations cannot be used during online operation; to carry out file management operations one must first return to the offline mode.

Summary of Operations

Both DOS and LSS-format files can be managed. The menu to handle LSS-format files is a submenu of the File Management (DOS) Menu. The operations available on the DOS File Management and LSS File Management menus are explained in the following tables.

For detailed explanations of the operations accessed through these menus, refer to *8-2 DOS File Operations* and *8-3 LSS File Operations*.

DOS File Management Menu

Operation	Function
I:Directory	Displays directories for programs, I/O tables, etc., on the screen. File directories can be displayed individually by type.
C:Copy file	Copies files.
N:Change file name	Renames files.
D:Delete file	Deletes files.
R:Create/Delete directory	Creates or deletes subdirectories under the current directory.
L:LSS file management	Access the LSS File Management menu (see next table)

LSS File Management Menu

LSS file management is used to create and handle LSS-compatible files. It is not required unless LSS-files are to be used on the SSS or unless SSS files are later to be used on the LSS.

Operation	Function
I:Directory	Displays directories for programs, data memory, I/O tables, etc., on the screen. File directories can be displayed individually by type.
C:Copy file	Copies files.
N:Change file name	Renames files.
D:Delete file	Deletes files.

Press the Escape Key to return to DOS file management.

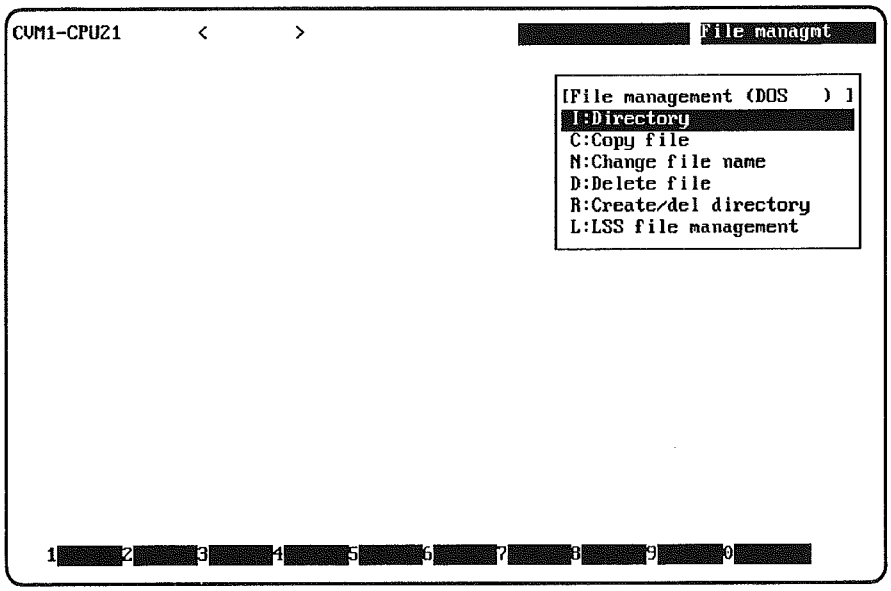
8-2 DOS File Operations

This section explains operations involving DOS file management.

8-2-1 Displaying the DOS File Management Menu

As explained in the following procedure, the menu that first appears when File Management is selected is the DOS File Management Menu. In order to access the LSS File Management Menu, it is necessary to select "L:LSS file management" from the DOS File Management Menu. Then, to return to the DOS File Management Menu, select the Escape Key.

1, 2, 3... 1. Select file management from the top-level offline menu. The DOS File Management Menu will be displayed.



2. Select the operation that is to be carried out. Each of these menu operations is explained in detail beginning with *8-2-2 Displaying Directories*. To display the LSS File Management Menu, select "L:LSS file management."

8-2-2 Displaying Directories

The "I:Directory" operation can be used to display directories of programs, DM files, I/O table, and so on, on the screen. When this operation is executed, the files with be displayed for the drive and path name set as the data disk drive in the System Setup. For each file listed in a directory, the file name, size, and date will be displayed.

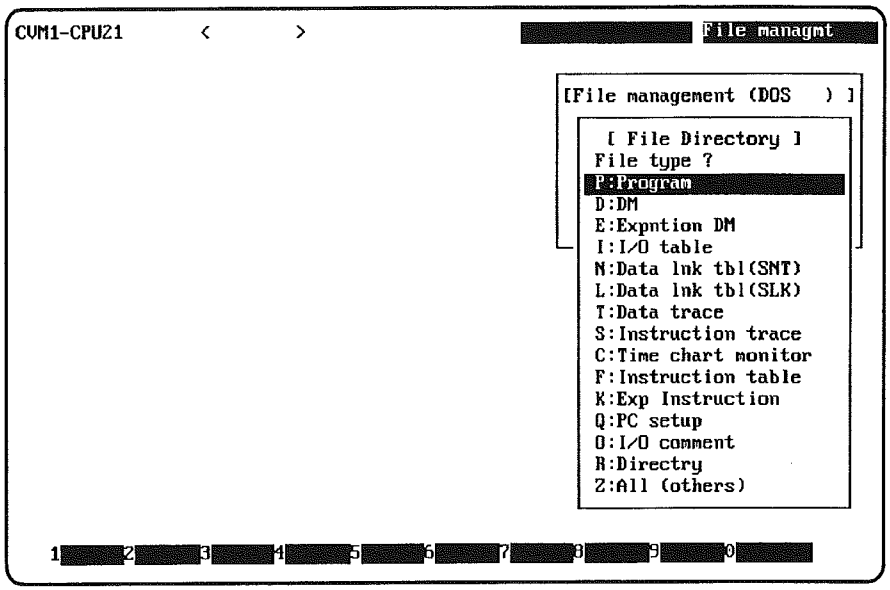
- **File name:** The file name and type specified when the file was saved.
- **Size:** The number of bytes the file occupies in memory. If <DIR> is displayed in the size frame, the name is a directory name.
- **Date:** Shows the date when the file was saved. Automatically appended when the file is saved.

Note

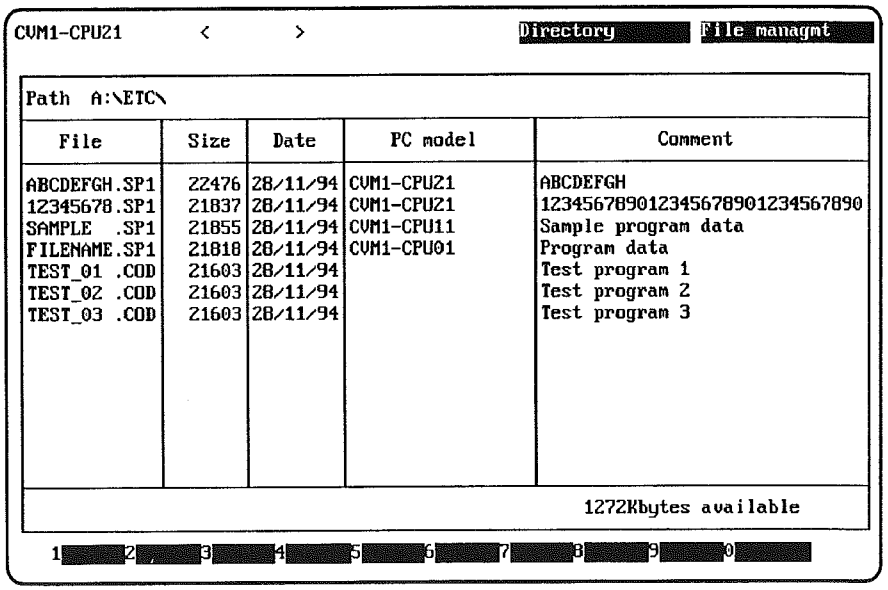
1. Path name is set for the data disk drive in the System Setup. If another drive is to be used, the path must be changed.
2. Programs saved with "Save part" will be displayed only when "Z:All (others)" is selected.

Procedure

1, 2, 3... 1. Select "1:Directory" from the DOS File Management Menu.



2. Select the type of file for which the directory is to be displayed. After the selection has been made, the directory will be displayed. If that type of file does not exist, a message will indicate that fact.



3. If there is information on the next page, a message in the lower left corner of the screen will indicate that fact. Press the PageDown Key to scroll to the next page.

File Types The meanings of the file name extensions are shown in the following table. When a file type is selected, the file is displayed with the appropriate extension.

File type	Created by SSS	Created by LSS	Created by CVSS
Program	SP1, COD	—	COD
DM	SL4, DMD	—	DMD
Expansion DM	EDM	—	EDM
I/O table	SP5, IOT	—	IOT
Data link table (SNT)	SN2, SNT	—	SNT
Data link table (SLK)	SLK	SLK	SLK
Data trace	SD1, DTR	—	DTR
Instruction trace	SD2	—	—
Time chart monitor	SD3	—	—
Instruction table	SP3	—	—
Expansion instructions	SE1	—	—
PC Setup	SP7, CPU	—	CPU
I/O comment	CMT	—	CMT
Directory	Directory display	—	Directory display
All types	All files	—	All files

8-2-3 Copying Files

The "C:Copy file" operation can be used to copy files.

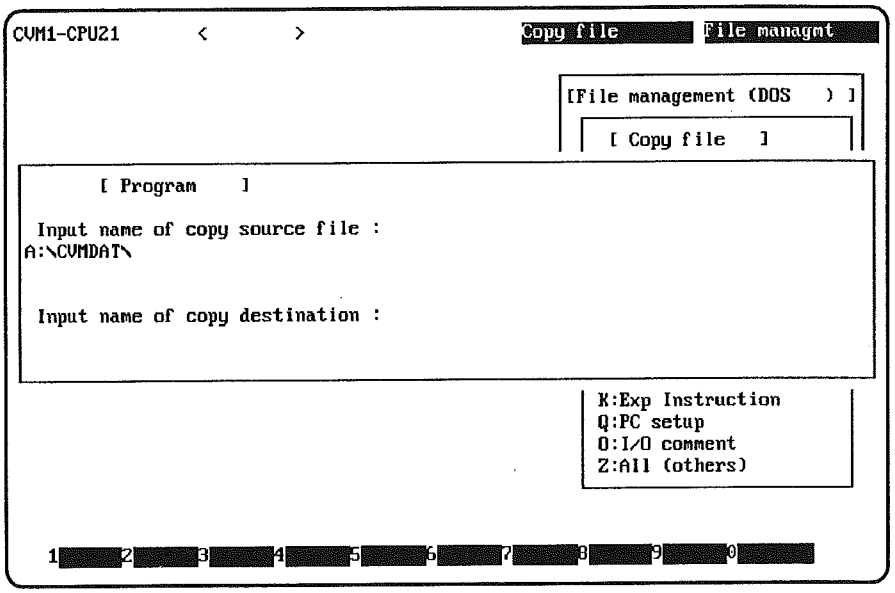
⚠ **Caution** When copying a file to a directory in another drive, check to be sure that there is no existing file with the same file name. If there is a file with the same name, it will be overwritten and the data will be lost. No warning message will be displayed, so be careful not to overwrite any existing files.

To execute "C:Copy file," follow the procedure outlined below.

1, 2, 3...

1. Select "C:Copy file" from the DOS File Management Menu. The screen for selecting the file type will be displayed just as in the procedure for displaying directories. (See *8-2-2 Displaying Directories.*)

2. Select the type of file that is to be copied. In this example, "P:Program" is selected.



3. Check the path name and change it if necessary.
4. Input the name of the source file (i.e., the file that is to be copied), and press the Enter Key.
5. Input the destination file name and press the Enter Key. (The End Key cannot be used.)
6. To begin the copy operation, press the Enter Key again.

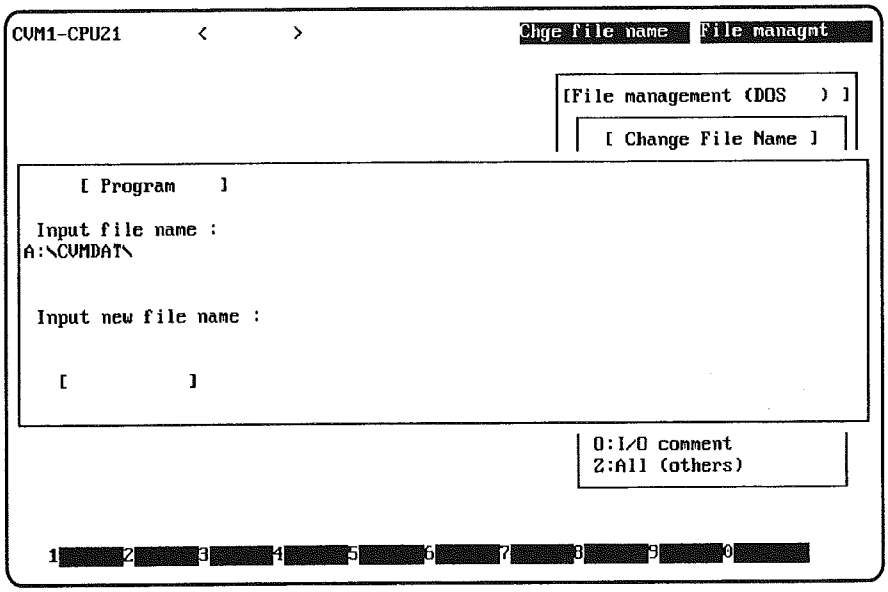
8-2-4 Changing File Names

The "N:Change file name" operation can be used to change the names of files on the data disk in the data drive.

1, 2, 3...

1. Select "N:Change file name" from the DOS File Management Menu. The screen for selecting the file type will be displayed just as in the procedure for displaying directories. (See *8-2-2 Displaying Directories.*)

2. Select the type of file that is to be copied. In this example, "P:Program" is selected.



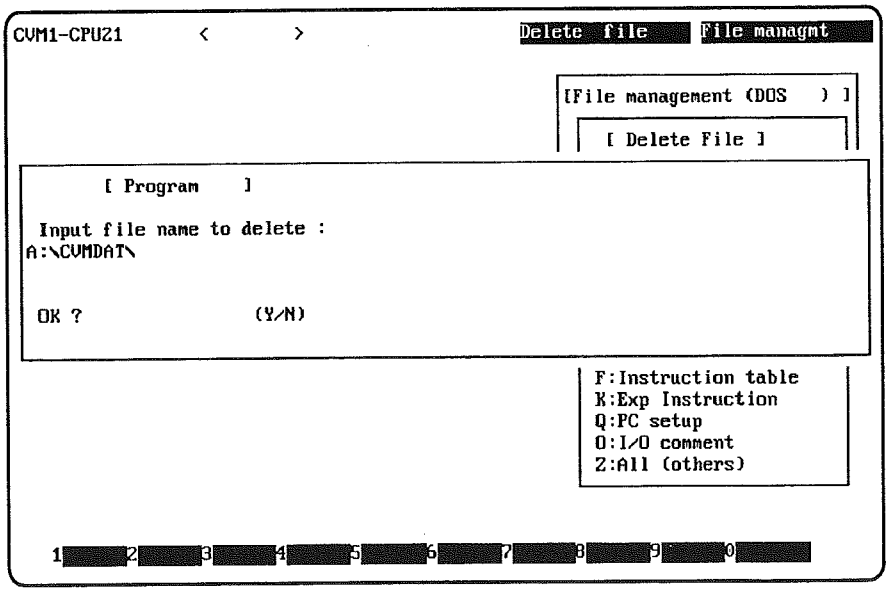
3. Check the path name and change it if necessary.
4. Input the file name that is to be changed, and press the Enter Key.
5. Input the new file name and press the Enter Key. The file name will then be changed to the new name.

8-2-5 Deleting Files

The "D:Delete file" can be used to delete files from the data disk in the data drive.

1, 2, 3...

1. Select "D:Delete file" from the DOS File Management Menu. The screen for selecting the file type will be displayed just as in the procedure for displaying directories. (See *8-2-2 Displaying Directories*.)
2. Select the type of file that is to be deleted. In this example, "P:Program" is selected.



3. Check the path name and change it if necessary.
4. Input the name of the file that is to be deleted, and press the Enter Key. A message will ask for confirmation.
5. To delete the file, input "Y" and press the Enter Key. To cancel the operation, press either the Enter Key or the Escape Key.

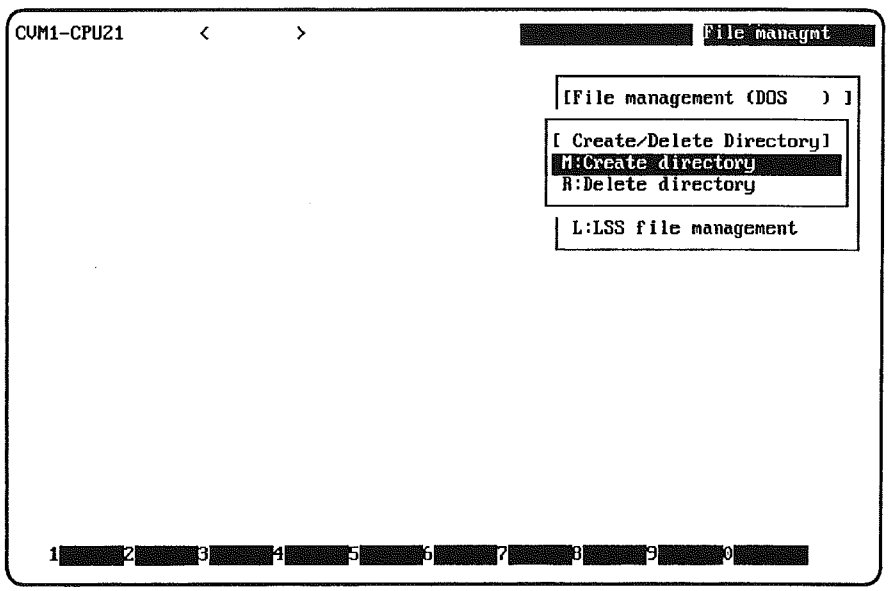
8-2-6 Creating Directories

The Create Directory operation can be used to create subdirectories under the current directory. Up to eight characters can be used in a file name.

To change the current directory, change the data disk drive setting in the System Setup.

1, 2, 3...

1. Select "R:Create/Delete directory" from DOS File Management Menu.



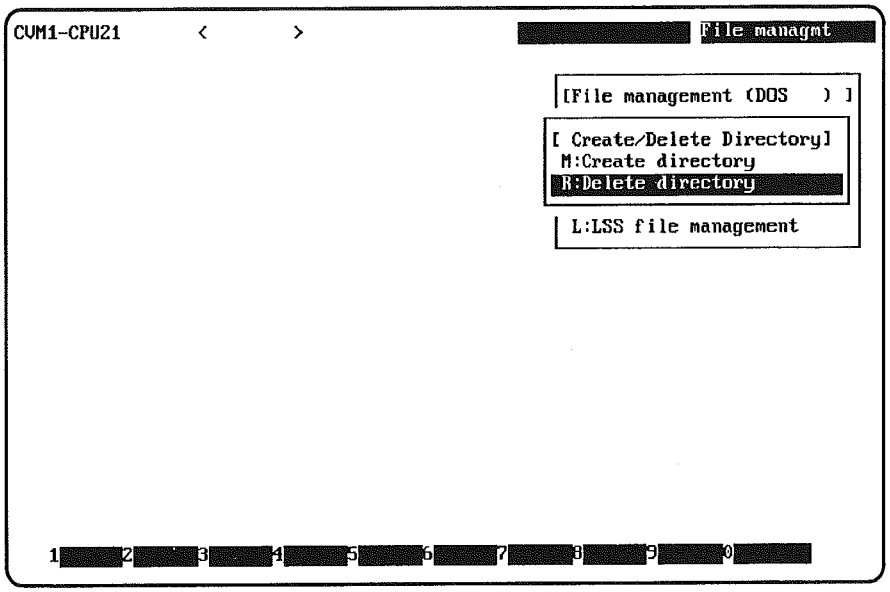
2. Select "M:Create directory" from the Create/Delete Directory Menu, and press the Enter Key. The current directory will be displayed.
3. Input the name of the subdirectory that is to be newly created, and press the Enter Key. The new subdirectory will then be created under the current directory, with the name that was input.

8-2-7 Deleting Directories

The Delete Directory operation can be used to delete specified subdirectories under the current directory. No subdirectory can be deleted if it contains files or other subdirectories.

To change the current directory, change the data disk drive setting in the System Setup.

1, 2, 3... 1. Select "R:Create/Delete directory" from DOS File Management Menu.



2. Select "R:Delete directory" from the Create/Delete Directory Menu, and press the Enter Key. The current directory will be displayed.
3. Input the name of the subdirectory that is to be deleted, and press the Enter Key. A message will ask for confirmation.
4. To delete the subdirectory, input "Y" and press the Enter Key. To cancel the operation, press either the Enter Key or the Escape Key.

8-3 LSS File Operations

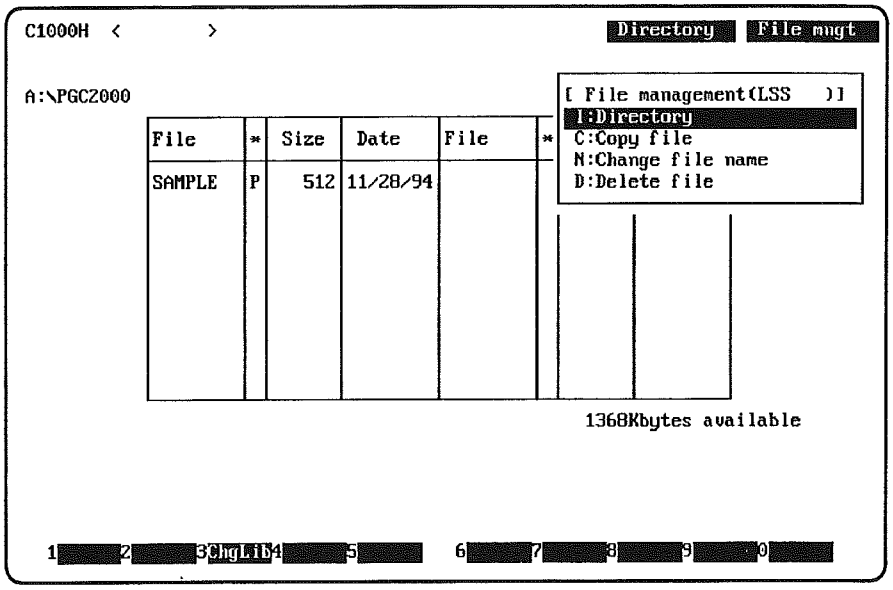
This section explains operations involving LSS file management.

8-3-1 Displaying the LSS File Management Menu

1, 2, 3...

1. If using a floppy disk, insert in into the drive.
2. Change the data disk drive setting in the System Setup if it is not set for the drive/directory containing the LSS library.
3. Select file management from the top-level offline menu. The DOS File Management Menu will be displayed.
4. Select "L:LSS file management" from the DOS File Management Menu. A list of files will be displayed.

5. Press the End Key. The LSS File Management Menu will be displayed.



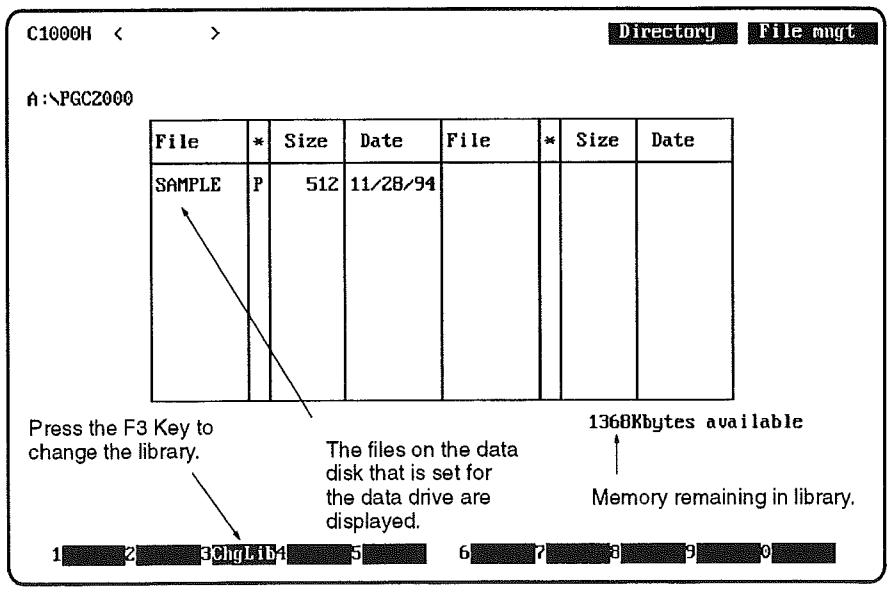
6. Select the operation that is to be carried out. Each of these menu operations is explained in detail beginning with *8-3-2 Displaying Directories.* To display the DOS File Management Menu, press the Escape Key.

8-3-2 Displaying Directories

The "1:Directory" operation can be used to display directories of programs, DM files, I/O table, and so on, on the screen. When this operation is executed, the files with be displayed for the drive and path name set as the data disk drive in the System Setup. For each file listed in a directory, the file name, size, and date will be displayed. If there are no files stored on the data disk, a message at the bottom of the screen will indicate that fact.

File List

The screen for displaying the list of files in a directory appears as follows:



- **File name:** The file name and type specified when the file was saved.
- **File type:** The file type is indicated by a letter of the alphabet, as shown in the following table.

P	Program file	S	Instruction trace file
D	DM file	C	Time chart monitor file
I	I/O table file	F	Instructions table file
L	Data link table file	K	Expansion instructions file
T	Data trace file	Q	PC Setup file

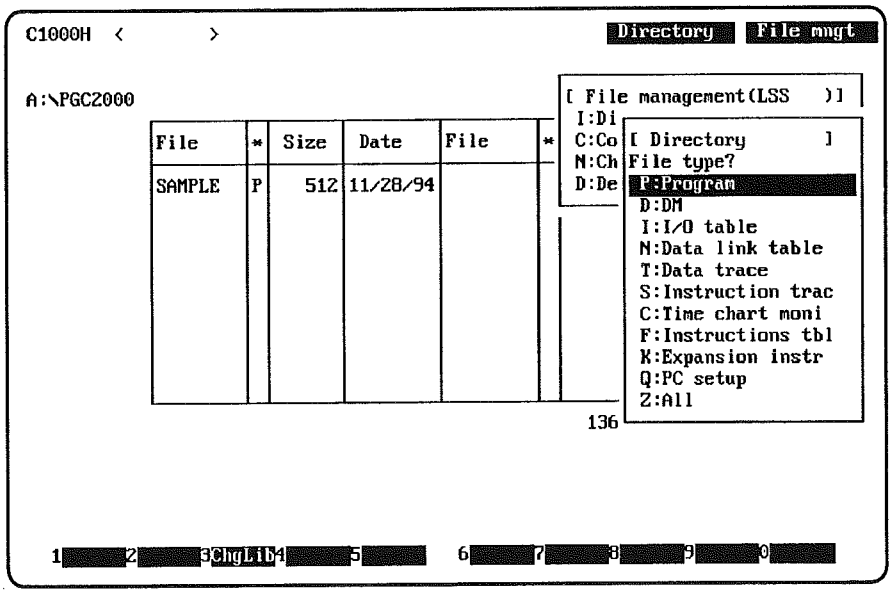
- **Size:** The number of bytes the file occupies in memory.
- **Date:** Shows the date when the file was saved. Automatically appended when the file is saved.

A maximum of 255 files can be stored in one LSS library. If all of the file names cannot be displayed on a single screen, a message will be displayed indicating that there are more pages. Use the PageDown and PageUp Keys to scroll between pages.

- **Function Keys:** The library can be changed between C2000H-family PC libraries and C500-family PC libraries by pressing the F3 Key. If use by both families was specified when the library was created, pressing the F3 Key will switch the display between the directories for these two PC families.

Procedure In this example, a list of DM files is displayed.

1, 2, 3... 1. Select "I:Directory" from the LSS File Management Menu.



2. Select "D:DM." A list of DM files will be displayed.

8-3-3 Copying Files

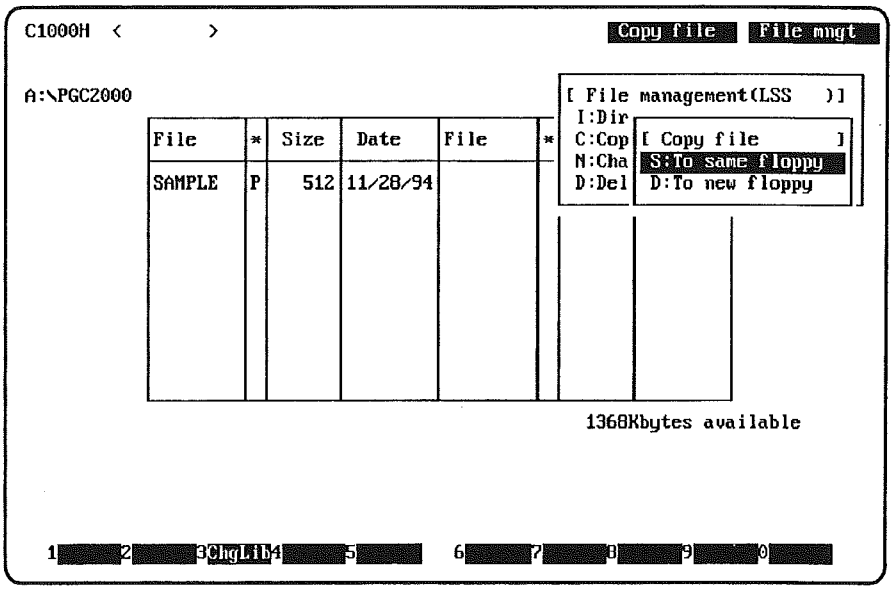
The "C:Copy file" operation can be used to copy files within the same data disk or to a different data disk.

It is not possible to copy a file to a data disk set for a different library than that set under "Create library file."

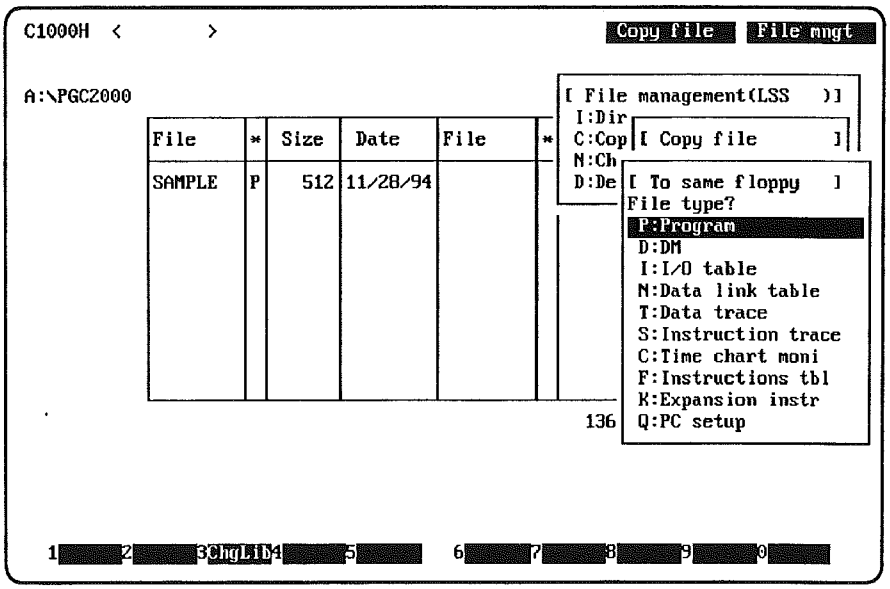
Note The hard disk can also be used.

Procedure 1: Copying a File within the Same Data Disk

1, 2, 3... 1. Select "C:Copy file" from the LSS File Management Menu.



2. Select "S:To same floppy" The following menu will be displayed.

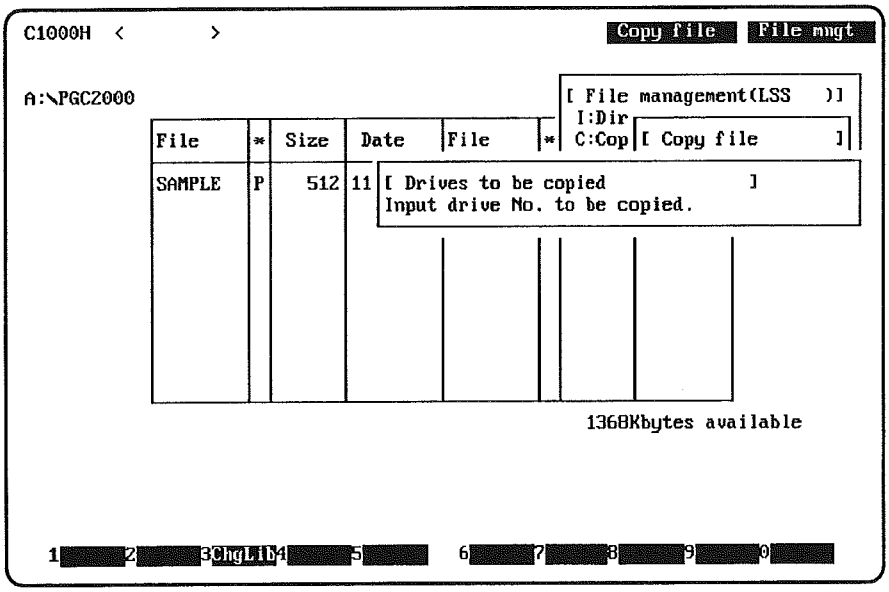


3. Select the type of file that is to be copied.
4. Input the name of the source file (i.e., the file that is to be copied), and press the Enter Key. To select from a list of files, press the End Key.
5. Input the destination file name and press the Enter Key. The copy operation will begin. If there is already a file with the same name, a message will be displayed asking for confirmation. To proceed with the copy operation and overwrite the existing file, input "Y" and press the Enter Key.
6. After the file has been copied, a list of files including the newly copied file will be displayed.

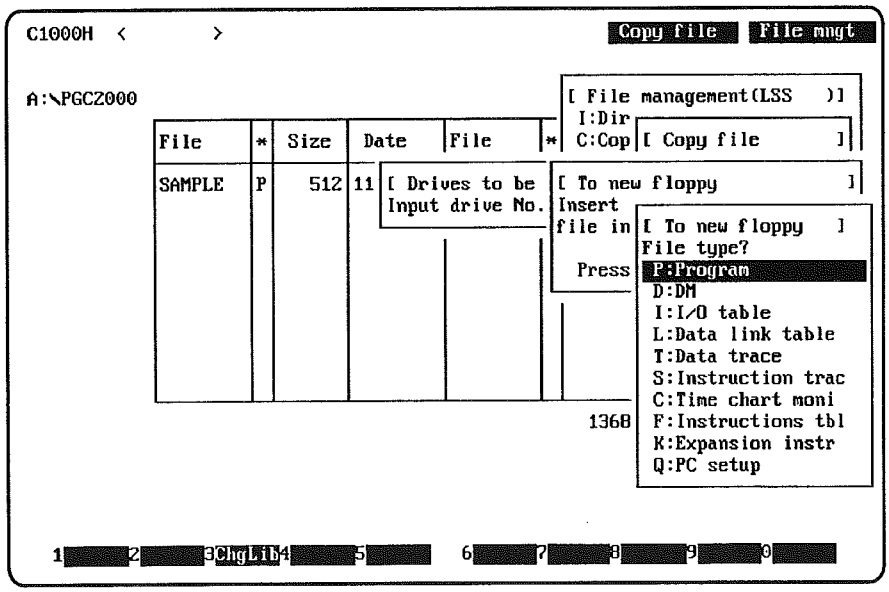
Procedure 2: Copying a File to a Different Data Disk

1, 2, 3...

1. Select "C:Copy file" from the LSS File Management Menu.
2. Select "D:To new floppy" The following screen will be displayed.



3. Select the data disk drive of the copy source file, and press the Enter Key.
4. Confirm that the data disk is inserted in the designated drive, and press the Enter Key. In this example, "P:Program" is set.



5. Input the name of the source file (i.e., the file that is to be copied), and press the Enter Key. To select from a list of files, press the End Key.
6. Input the destination file name and press the Enter Key. To select from a list of files, press the End Key.
7. Remove the data disk and insert the copy destination data disk, and then press the Enter Key. If there is already a file with the same name, a message will be displayed asking for confirmation. To proceed with the copy operation and overwrite the existing file, input "Y" and press the Enter Key.

8-3-4 Changing File Names

The Change File Name operation can be used to change the names of files on the data disk in the data drive.

1, 2, 3...

1. Select "N:Change file name" from the LSS File Management Menu. The screen for selecting the file type will be displayed.
2. Select the type of file for which the name is to be changed. In this example, "P:Program" is selected.
3. Select the file name that is to be changed. (To select from a list of files, press the End Key.)
4. Input the new file name and press the Enter Key. The file name will be changed and a list of files, including the newly named file, will be displayed.

8-3-5 Deleting Files

The Delete File operation can be used to delete files from the data disk in the data drive.

1, 2, 3...

1. Select "D:Delete file" from the LSS File Management Menu. The screen for selecting the file type will be displayed.
2. Select the type of file that is to be deleted. In this example, "P:Program" is selected.
3. Input the name of the file that is to be deleted, and press the Enter Key. (To select from a list of files, press the End Key.) A message will ask for confirmation.
4. To delete the file, input "Y" and press the Enter Key. To cancel the operation, press either the Enter Key or the Escape Key.

   After the file has been deleted, a list of remaining files will be displayed.

SECTION 9
Option Menu

This section describes the Option Menu. Registered utility programs can be started from the Option Menu.

9-1 Introduction 240
9-2 Registering a Utility 240
9-3 Deleting a Utility 242
9-4 Changing a Registered Utility 243
9-5 Starting a Utility 244

9-1 Introduction

Registered utilities or MS-DOS can be started from the Option Menu. To return to SSS from MS-DOS, input EXIT at the MS-DOS prompt.

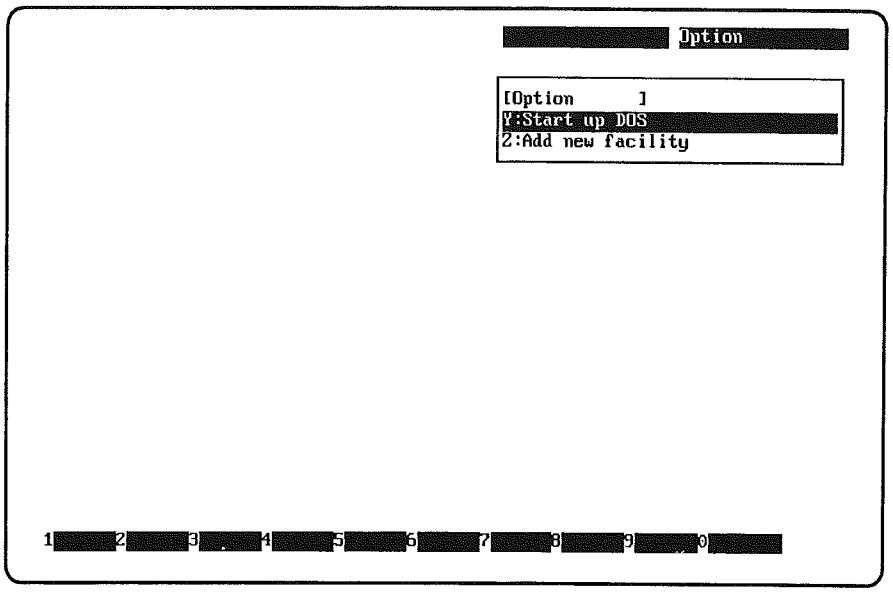
Up to 16 utility programs can be registered using the Option Menu. Once a utility has been registered it can be started directly from the Option Menu, which is convenient when the utility is related to SSS operation.

The SSS environment (such as modified programs or settings) is retained when a utility has been started from the Option Menu

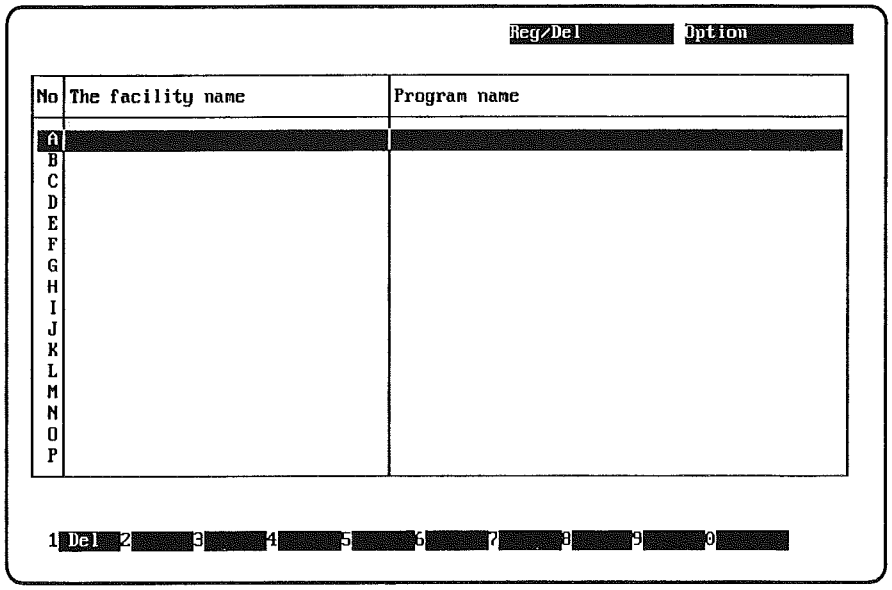
9-2 Registering a Utility

Use the following procedure to register a utility program in the Option Menu.

1, 2, 3... 1. Select the Option Menu.

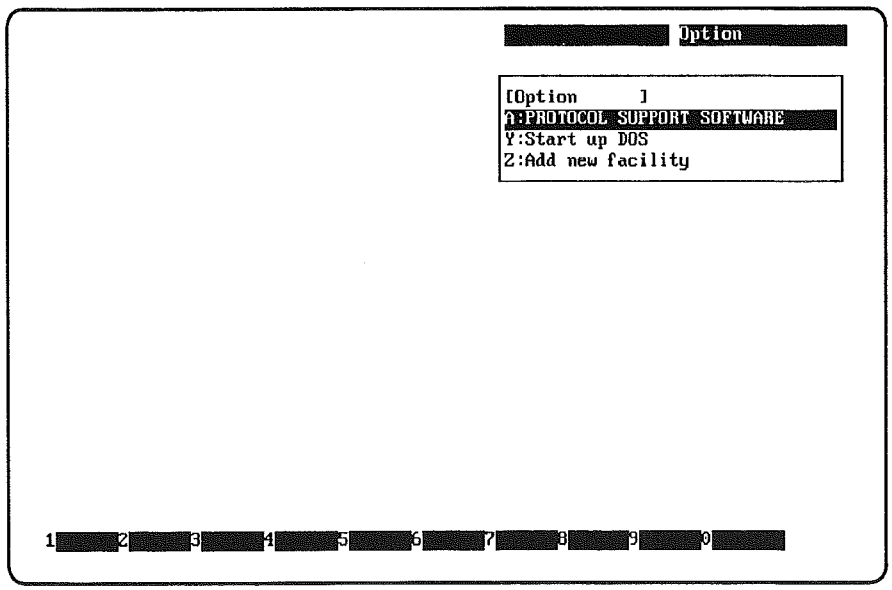


2. Select "Z:Add new facility" from the Option Menu. The utility registration display will appear.



3. Move the cursor to the letter where the utility will be registered and press the Enter Key. Input areas for the utility name and command line will appear.
4. Input the name of the utility in the first input area and the command line of the executable program in the second input area. The utility name can be up to 30 characters long and the command line for the program can be up to 120 characters long. The utility registration can be cancelled by pressing the Escape Key.

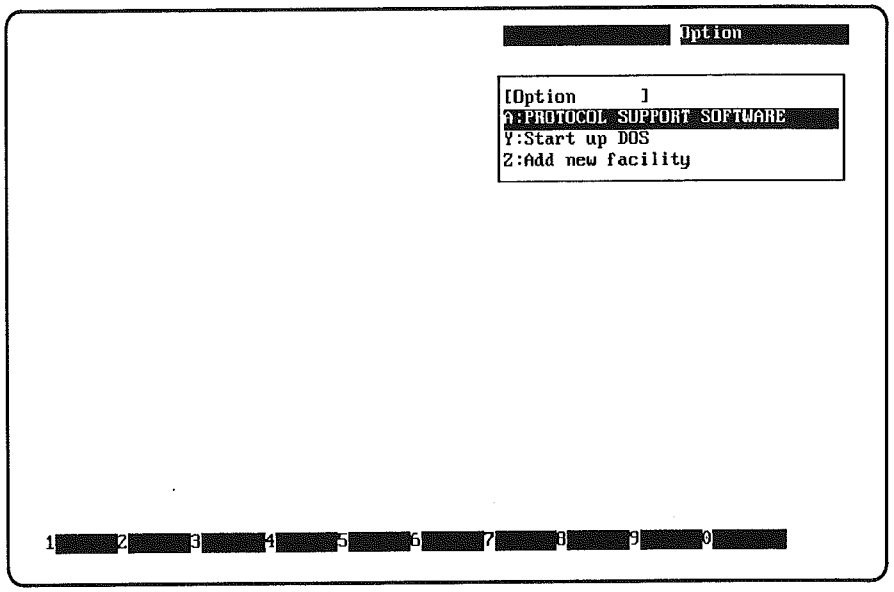
   For example, if the Protocol Support Software were installed in directory C:\PSS, you could input "Protocol Support Software" for the utility name. The command line would be "C:\PSS\PSS.BAT". The newly registered utility will appear in the Option Menu as shown in the following diagram.



9-3 Deleting a Utility

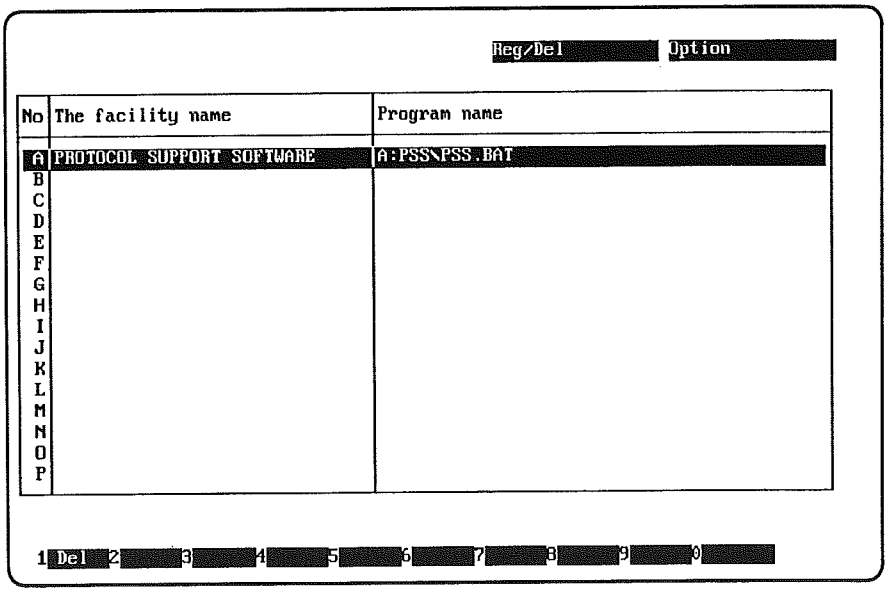
Use the following procedure to delete a utility program from the Option Menu.

1, 2, 3... 1. Select the Option Menu.



In this case, the utility program "A:Protocol Support Software" will be deleted.

2. Select "Z:Add new facility" from the Option Menu. The utility registration display will appear.

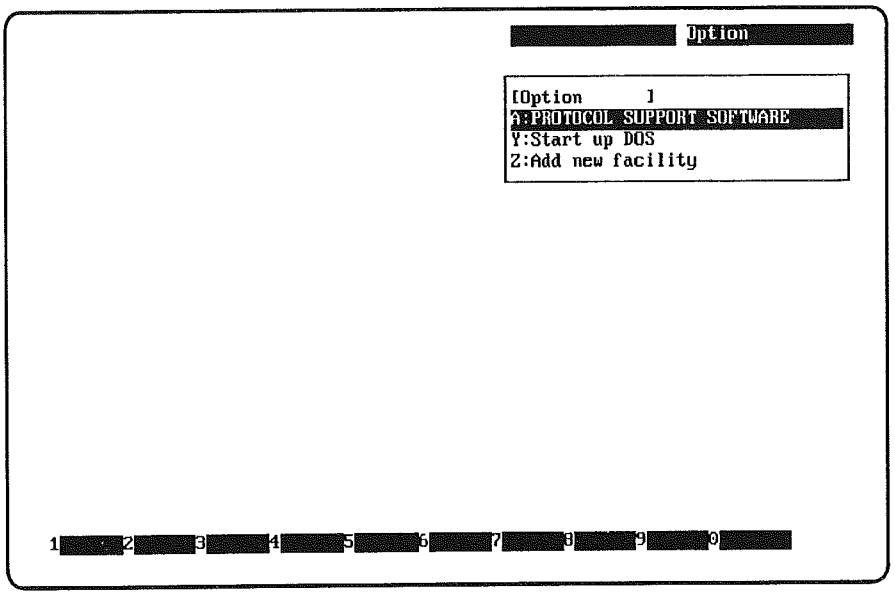


3. Move the cursor to the utility that will be deleted and press the F1 Key. A confirmation prompt will be displayed.
4. Press the Enter Key to delete the utility from the Option Menu. Enter "N" and press the Enter Key to cancel the operation.

9-4 Changing a Registered Utility

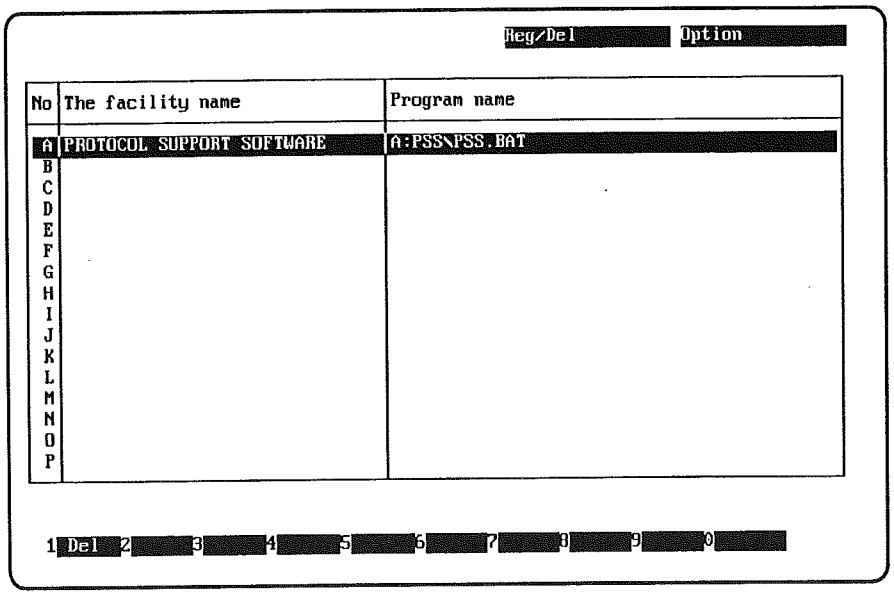
Use the following procedure to change the information for a utility program has been registered in the Option Menu.

1, 2, 3... 1. Select the Option Menu.



In this case, the information for the utility program "A:Protocol Support Software" will be changed.

2. Select "Z:Add new facility" from the Option Menu. The utility registration display will appear.

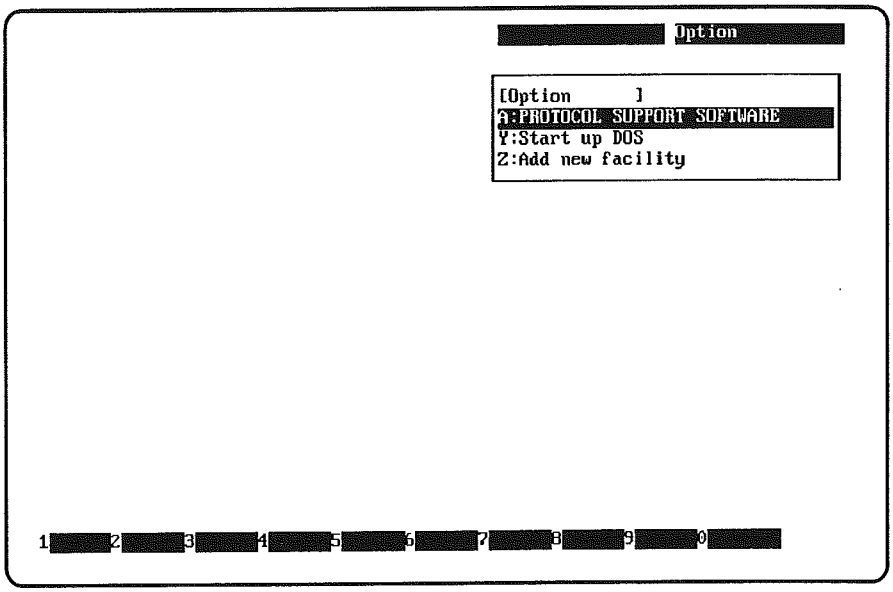


3. Move the cursor to the utility that will be changed and press the Enter Key. The input areas for the utility name and command line will appear.
4. Use the Up and Down Arrow Keys to move between the utility name and command line input areas. After changing the information in the input area, press the Enter Key to input the changes.

9-5 Starting a Utility

Use the following procedure to start a utility program that has been registered in the Option Menu.

1, 2, 3... 1. Select the Option Menu.



In this case, the utility program "A:Protocol Support Software" is selected.

2. Select the utility to be started.

Part 3
Online Operations

This part of the manual covers procedures for operations performed online, including monitoring, program and data editing, program control, and debugging.

SECTION 10
Monitoring

This section describes the operations used to monitor PC operation and transfer the program between the computer and PC.

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10-1 Introduction

Online monitoring allows the user to inspect the program during operation and force bits on and off to simulate conditions that will exist in the actual system, reducing the time required for program development.

In the event of an emergency, online editing can be used to make minor changes to the PC's program during operation.

Various functions are supported to search the program.

⚠ **Caution** Never use an incorrect program. Never change to a different program without first confirming operation and safety. Depending on the controlled system, an incorrect or inappropriate program can have serious and unexpected results.

10-1-1 Going Online

1, 2, 3...

1. Press Control+O and then F1 to go online.

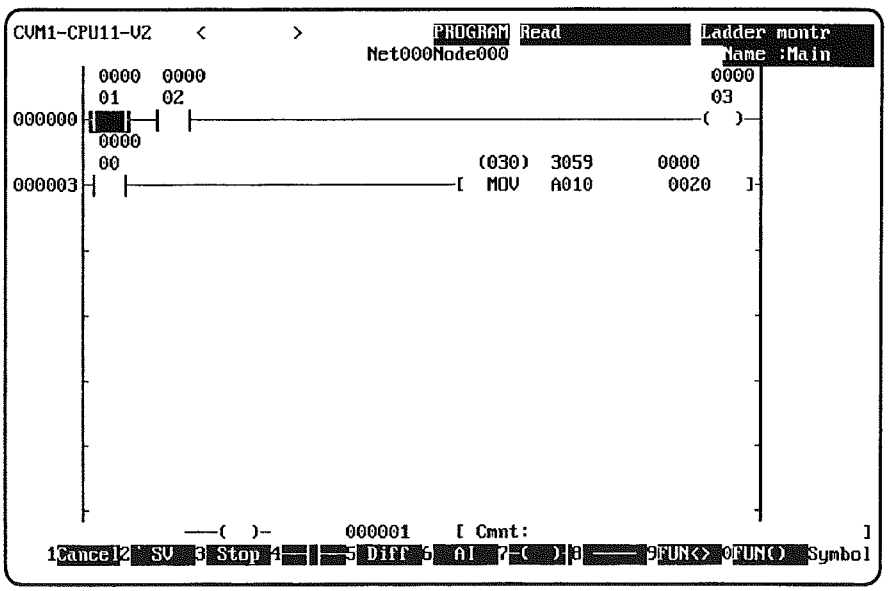
   You cannot switch between online and offline operation while the file management or system setup menus are being displayed.

2. Select "Monitor" from the top-level online menu. The basic monitoring display will appear showing the program in the system work area.

   Note The program in the computer's system work area must be identical to the program in the PC in order to monitor program execution. If the programs aren't identical, transfer the program from the PC to the computer or from the computer to the PC.

10-1-2 Basic Monitoring Display

The following display will appear when Monitor is selected from the top-level online menu.



The basic monitoring display shows the program in the computer's system work area. Bits which are ON are displayed in reverse video and the content of words in special instructions is displayed above the word address. The content of two consecutive words will be displayed for special instructions that perform calculations on 2-word (4-byte) units. The status of bits and words being monitored will change in accordance with the operating status of the PC.

The destination network address and node address, which are displayed at the top of the display, are set in the System Setup. The unit number will be displayed when the computer and PC are connected by a Host Link System.

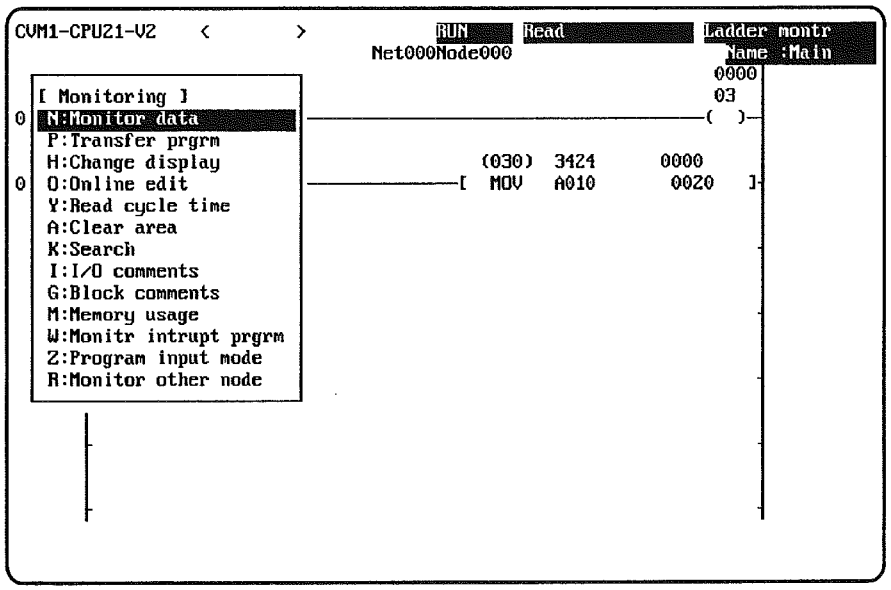
Changing the PC Mode The PC's mode can be changed between RUN, MONITOR, PROGRAM, and DEBUG modes by pressing Control+O followed by F2 (RUN), F3 (MON), F4 (PRG), or F5 (DBG).

⚠ Caution Never change the PC's operating mode without first confirming that no problems will result in the controlled system. Depending on the controlled system, changes to the PC's operating mode can have serious and unexpected results.

A confirmation prompt will be displayed if the PC is switched to PROGRAM or DEBUG mode. The PC mode will be changed and PC operation will stop if "Y" is entered at the prompt.

10-1-3 Monitor Menu

Press the End Key from the basic monitoring display to access the Monitor Menu.

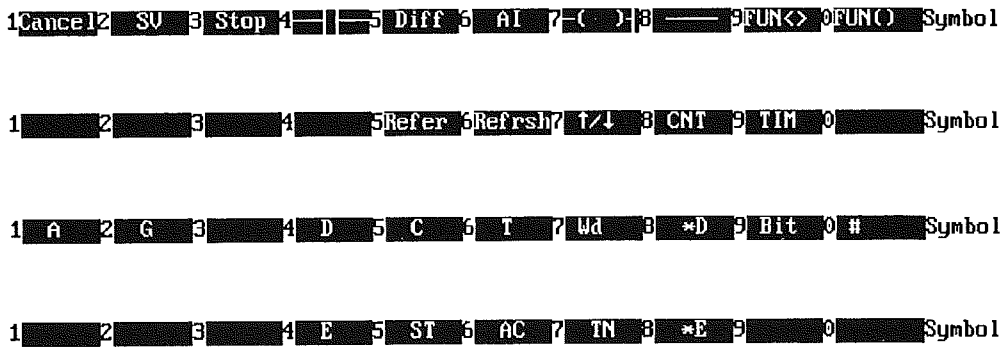


Valid PC Modes The following table shows the PC modes in which each operation can be executed.

Operation		RUN	MONITOR	PROGRAM	DEBUG
N:Monitor data		OK	OK	OK	OK
P:Transfer program	R:PC → Computer	OK	OK	OK	OK
	W:Computer → PC	No	No	OK	No
	V:Compare	OK	OK	OK	OK
H:Change display	L:Ladder (no comments)	OK	OK	OK	OK
	C:Ladder (2 comment rows)	OK	OK	OK	OK
	M:Ladder (4 comment rows	OK	OK	OK	OK
O:Online edit		No	OK	OK	OK
Y:Read cycle time		OK	OK	No	No
A:Clear area		No	No	OK	OK
K:Search		OK	OK	OK	OK
I:I/O comments		OK	OK	OK	OK
G:Block comments		OK	OK	OK	OK
M:Memory usage		OK	OK	OK	OK
W:Monitor interrupt program		OK	OK	OK	OK
Z:Program input mode		OK	OK	OK	OK
R:Monitor other node		OK	OK	OK	OK

10-1-4 Function Key Operations

The PC's mode can be changed between RUN, MONITOR, PROGRAM, and DEBUG modes by pressing Control+O followed by F2 (RUN), F3 (MON), F4 (PRGM), or F5 (DEBUG). Other function key operations from the basic monitoring display are described below.



The following table shows the operations assigned to the function keys in the basic monitoring display.

Key(s)	Operation	Description
F1	Cancel	Clears errors from the PC. Refer to *10-11 Clearing Errors* for details.
F2	SV	Changes set values (SVs) for timers and counters used in a program. The changed settings are overwritten in the computer's system work area and the PC's user memory. Refer to *10-7 Changing Set Values* for details.
F3	Stop (Pause monitoring)	Freezes the PC monitoring display. PC operation continues unchanged. Refer to *10-8 Pausing Displays* for details.

Key(s)	Operation	Description
F4	LOAD	Search for I/O bits used in LD, LD NOT, AND, AND NOT, OR, and OR NOT instructions.
F5	Diff (Differentiate monitor)	Monitors the specified bit and displays it in reverse video when the bit goes from OFF to ON or from ON to OFF. Refer *10-9 Differentiation Monitoring* for details.
F6	AI (AI searches)	AI search finds the condition that is the most likely cause of an output not turning on. Refer to *10-5 AI Searches* for details.
F7	OUTPUT	Searches for I/O bits used in OUT and OUT NOT instructions.
F9	FUN<>	Searches for block instructions through their function codes.
F10	FUN()	Searches for instructions through their function codes.
Shift+F5	Refer (Cross-reference)	Finds a specified input, word, or register in the program.
Shift+F6	Refrsh (Immediate refresh)	Searches for specified immediate refresh instructions.
Shift+F7	↑/↓	Searches for specified differentiated instructions.
Shift+F8	CNT	Searches for counter instructions.
Shift+F9	TIM	Searches for timer instructions.
Control + function keys	Used to specify data areas and constants.	

Valid PC Modes The following table shows the PC modes in which function key operations can be used.

Operation	RUN	MONITOR	PROGRAM	DEBUG
F1: Cancel	OK	OK	OK	OK
F2: SV	No	OK	OK	OK
F3: Stop (Pause monitoring)	OK	OK	OK	OK
F5: Diff (Differential monitoring)	OK	OK	OK	OK
F6: AI (AI searches)	OK	OK	OK	OK
Shift+F5: Refer (Cross-referencing)	OK	OK	OK	OK

Note
1. The program in the PC must be the same as the one in the SSS.
2. Comments are not displayed in the Ladder (No Comments) mode.

10-2 Transferring Programs

The Transfer program operations can be used to transfer or compare programs between the computer and the PC. These operations are described briefly in the following table and in detail later in this section.

⚠ **WARNING** Never transfer programs to other nodes, change I/O memory at other nodes, or perform any other operations at other nodes without first confirming that the results of the action will not create a dangerous situation. Depending on the controlled system, changes to programs or data can result in serious injury or death.

Operation	Function
R:PC → Computer	Transfers the main program and HIS program from the PC to the system work area of the computer.
W:Computer → PC	Transfers the main program and HIS program from the system work area of the computer to the PC.
V:Compare	Compares the main program and HIS program in the PC to those in the system work area of the computer.

The program in the computer is handled in intermediate code and the PC's program is handled in machine language, so one or the other must be converted for data transfer or comparison. A message will flash on the display while this conversion is being performed.

Program transfer or comparison can be interrupted by pressing the Escape Key. The operation will be aborted after the block being processed is completed.

The HIS program will be transferred or compared only when an HIS program has been registered using the offline Customization operation. Refer to *6-11 Customization* for details on registering and deleting HIS programs.

10-2-1 Transferring to the PC

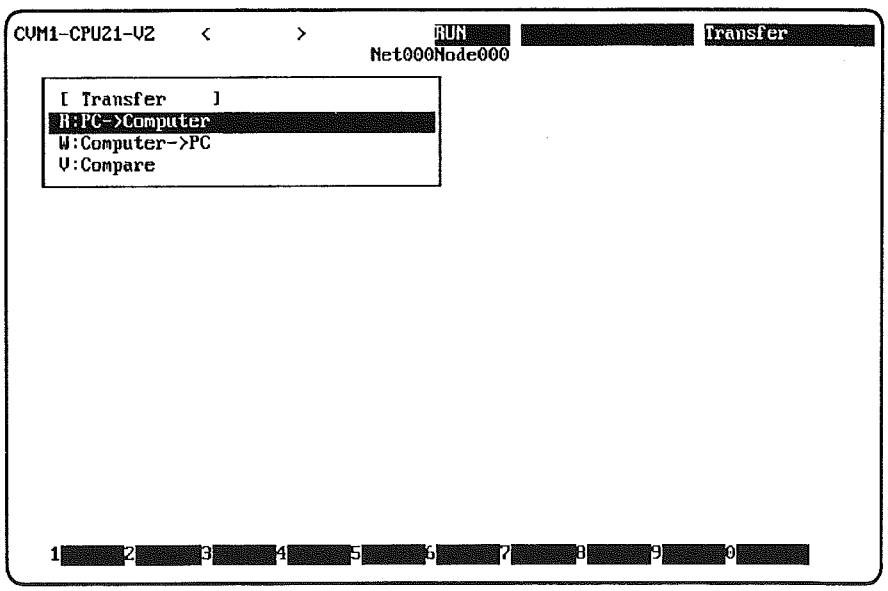
This operation can be used to transfer the main and HIS programs from the computer's system work area to the PC. This operation is possible only when the PC is in PROGRAM mode.

⚠WARNING Never transfer programs to other nodes, change I/O memory at other nodes, or perform any other operations at other nodes without first confirming that the results of the action will not create a dangerous situation. Depending on the controlled system, changes to programs or data can result in serious injury or death.

A program check is performed when the program is transferred. If the program check detects any instructions that cause an operand error or contain "????," an error message "Ladder Conversion Error" will be displayed and the transfer will not be possible.

Procedure Use the following procedure to transfer the main and HIS programs from the computer to the PC.

1, 2, 3... 1. Select "P:Transfer program" from the Monitor Menu.



2. Select "W:Computer → PC" from the Transfer Program Menu.
3. Press Enter if no protection is required. The program transfer will begin when Enter is pressed.

or If protection is required, press "N" once and Enter twice. Make the required settings and press Enter. A confirmation prompt will be displayed.
Enter "Y" to accept the settings and begin program transfer, "N" to cancel and return to step 2.

10-2-2 Transferring to the Computer

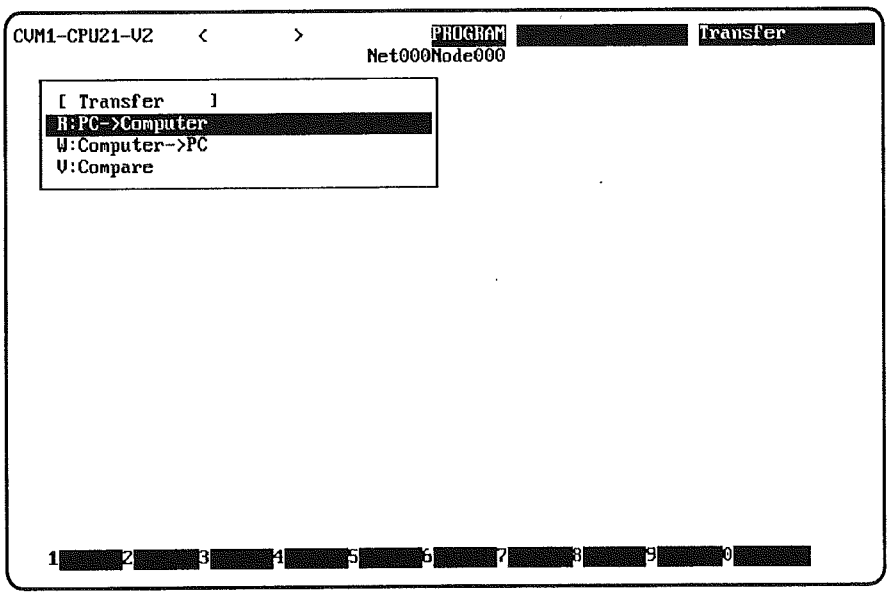
This operation can be used to transfer the main and HIS programs from the PC to the computer's system work area.

Transferring the Program

Use the following procedure to transfer the main and HIS programs from the PC to the computer.

1, 2, 3...

1. Select "P:Transfer program" from the Monitor Menu.



2. Select "R:PC → Computer" from the Transfer Program Menu.
3. Enter "Y" to begin program transfer, "N" to cancel the operation.

10-2-3 Comparing Programs

The Compare operation can be used to compare the main and HIS programs in the PC to those in the computer's system work area.

If the programs are identical, the message "Same" will be displayed. If differences are found, the instruction block where they occur will be displayed.

Procedure

Use the following procedure to compare the programs in the PC and computer.

1, 2, 3...

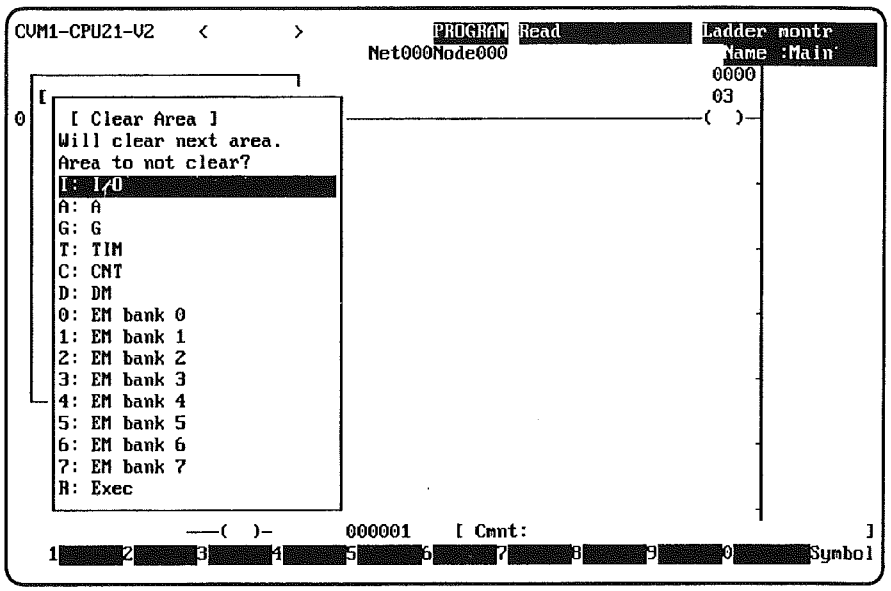
1. Select "P:Transfer program" from the Monitor Menu.
2. Select "V:Compare" from the Transfer Program Menu.
3. Enter "Y" to begin program comparison, "N" to cancel the operation.

10-3 Clearing Data Areas

The "A:Clear area" operation can be used to clear data areas in the PC. The CIO, Auxiliary, CPU Bus Link, Timer, Counter, DM, and EM data areas can be cleared. Data in the computer's system work area will not be affected. This operation is possible only when the PC is in PROGRAM or DEBUG mode.

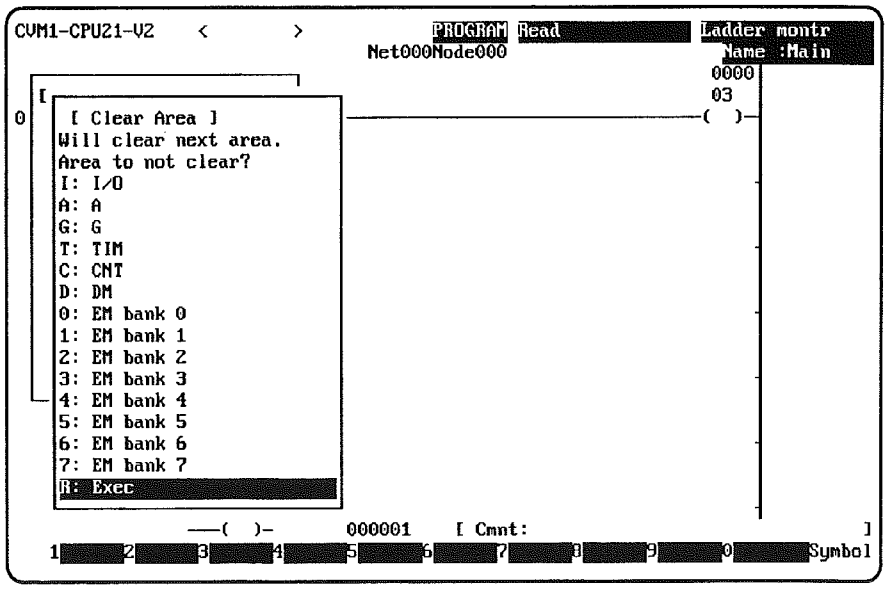
1, 2, 3...

1. Select "A:Clear area" from the Monitor Menu. The following display will appear.



2. Remove any data areas from the display that you do not want to clear by selecting them and pressing Enter. The data areas that are left on-screen will be cleared when the operation is executed.

   In the following example, all data areas except the CNT Area and EM bank #1 will be cleared.



3. When the data areas that won't be cleared have been removed, move the cursor to "R:Exec" and press Enter to start clearing data areas.

10-4 Searching in Ladder Diagrams

The search operations can be used to find particular instructions and comments in a PC program that is being monitored.

Before searching for an instruction or comment, monitor the PC program. The procedure for reading programs is the same as in offline mode.

Move to the previous or next instruction block using the PageUp and PageDown Keys. If an instruction block is too large to fit on-screen, scroll through the block using the Up Cursor and Down Cursor Keys.

Block Programs The ON/OFF status of program blocks will be displayed.

Instruction Search Select the "K:Search" operation from the Monitor Menu when searching for special instructions that include operands.

I/O and Block Comments Select the "I:I/O comments" operation to search for I/O comments in the PC's program. Select the "G:Block comments" operation to search for block comments.

Before selecting one of these operations, set the display mode to the Ladder (2 comment rows) or Ladder (4 comment rows) format. Refer to *10-6 Changing the Display Mode* for details.

Program Input Mode The input mode can be set to either symbol or string input mode with the "Z:Program input mode" operation in the Monitor Menu. Use symbol input mode when searches are usually performed by symbols, and use string input mode when searches are usually performed by strings.

Online String Input Mode If "CMP' or "CMPL" is input when connected to a V2 CPU, CMP(028) and CMPL(029) will be found. If "CMP' or "CMPL" is input when connected to a V1 or earlier CPU, CMP(020) and CMPL(021) will be found. (Symbol inputs for these instructions are the same as in offline procedures.) Refer to *3-2-6 Inputting Basic Comparison Instructions.*

10-5 AI Searches

The AI Search operation is used to determine which execution condition is preventing an output from going ON. The cursor is automatically moved to the execution condition that is most likely to be the cause.

The AI search will use either OUT or OUT NOT instructions as a trigger and search the following instructions as the cause of the problem: LD, LD NOT, AND, AND NOT, OR, and OR NOT. The search might fail if the output bit being searched is in an interlocked (IL/ILC) or jumped (JMP/JME) program section and the program section is not being executed.

Procedure Use the following procedure to perform an AI search.

1, 2, 3...

1. Press F6 from the basic monitor display. The message "AI Monitor" will be displayed in the upper-right corner of the display.
2. Press F7 to display "–( )–" in the input area. (It isn't necessary to press F7 if "–( )–" is already displayed in the input area.)
3. Press Control+F9, input the bit address of the output that you want to check, and press Enter.

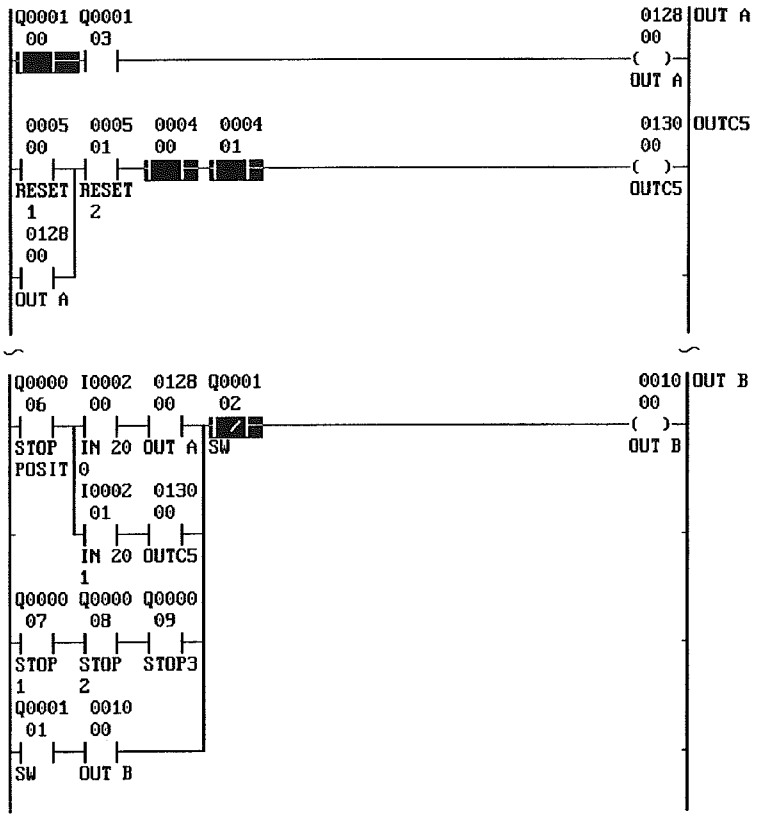
   If the desired output bit is found, the cursor will be moved automatically to the execution condition that is most likely to be preventing activation.
4. Press Enter again if you want to continue searching for the output bit.

If the execution condition identified by AI search isn't the cause of the problem, move the cursor to another condition in the program step. If the suspected condition isn't displayed on-screen, use the PageUp and PageDown Keys to display it.

The Tab Key can be pressed to display the last program step that was found by the AI search. Using the Tab Key can speed-up the debugging process.

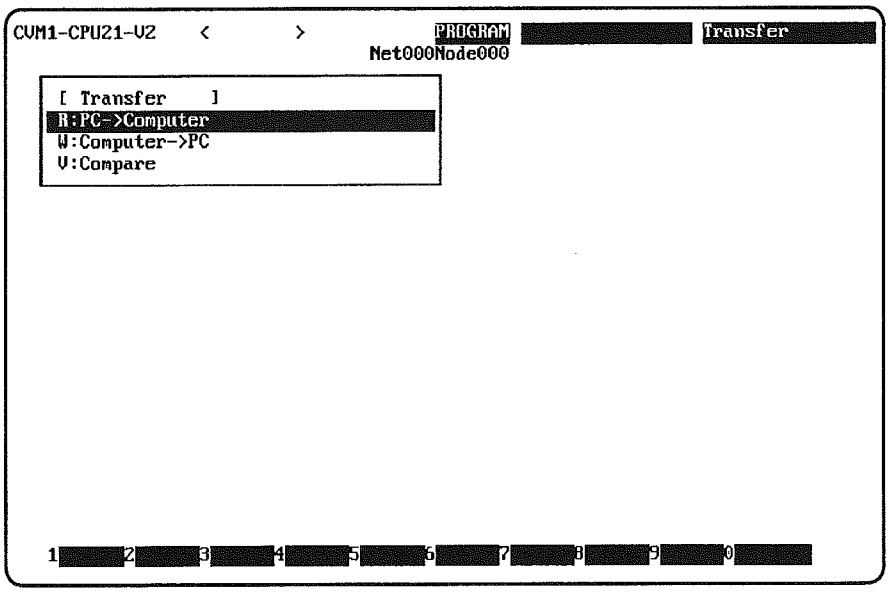
When using the Tab Key you can only return to the actual input bit that was specified. The Tab Key can then be used to return in order to the instructions already displayed.

Example The following example shows AI search used to find the execution condition preventing the output for CIO 001000 from turning ON in the following program.



1, 2, 3...

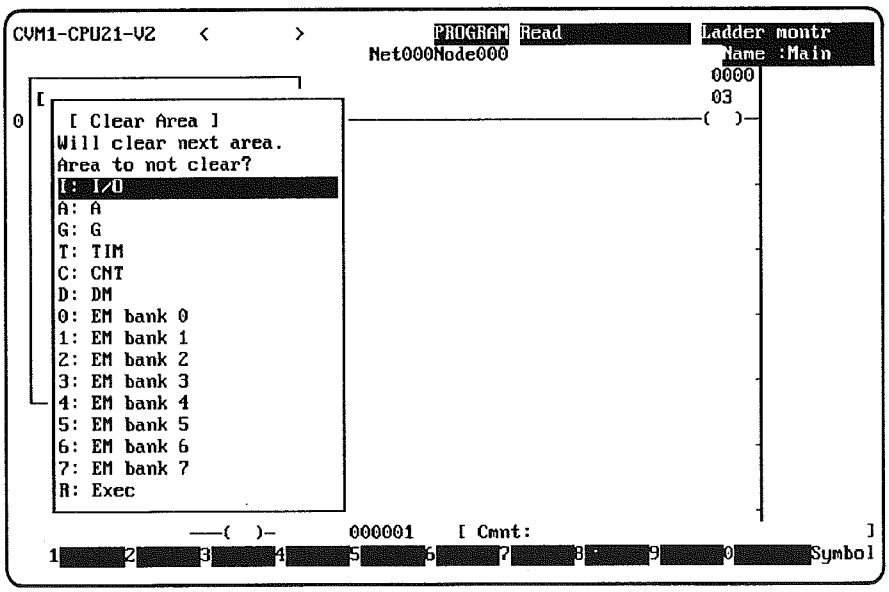
1. Enter CIO 001000 by pressing F7, 1000, and Enter. The instruction block containing the output CIO 001000 will be displayed and the cursor will move to CIO 013000, the suspected cause of the problem.



In this example, the cause of the problem could be CIO 013000, CIO 012800, or CIO 000007. Bit CIO 013000 was judged to be the most likely cause, so the cursor was moved to this position.

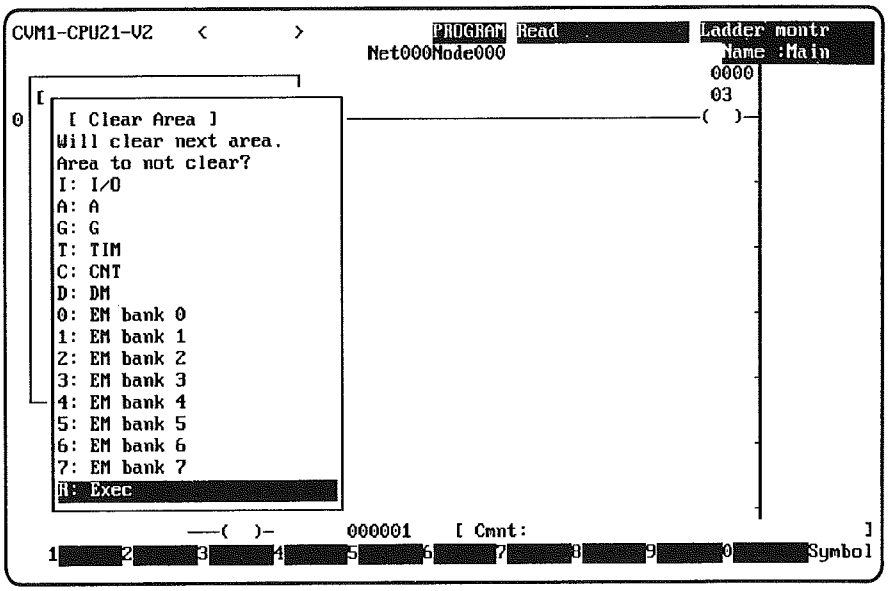
The use of CIO 001000 as a self-maintaining bit is not in the scope of the AI search.

2. If the execution condition at the cursor is the cause of the problem, press Enter again. The next instruction block will be searched and the cursor will be moved to the execution condition that seems to be preventing the output from going ON. In this case the cursor is moved to CIO 012800.



3. Press return again if the execution condition at the cursor is the cause of the problem. The next instruction block will be searched and the cursor will be moved

to the execution condition that seems to be preventing the output from going ON. In this case the cursor is moved to CIO 000103.



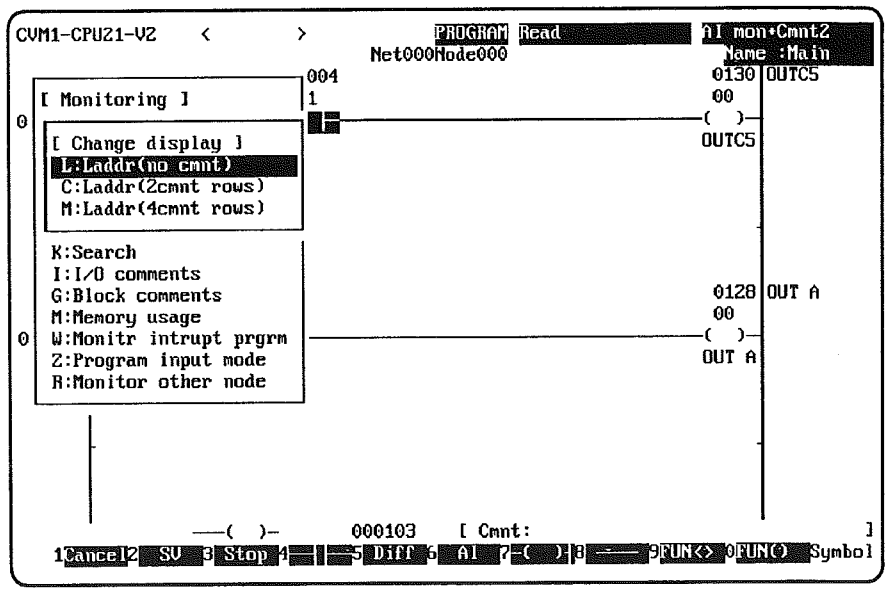
4. Continue searching if necessary. A message will be displayed when there aren't any more execution conditions that could prevent activation of the specified output.

10-6 Changing the Display Mode

The ladder diagram can be displayed with or without I/O comments. The ladder with comments format should be used when writing or editing I/O comments. The normal ladder format can be used when it isn't necessary to display the comments. Refer to *3-2 Programming in Ladder Form* for examples of ladder diagrams and comments.

Procedure Use the following procedure to change the display mode.

1, 2, 3... 1. Select "H:Change display" from the Monitor Menu.



2. Select the desired display mode. The ladder diagram will be displayed in the selected display mode.

10-7 Changing Set Values

The F2 Key can be used to change the set values of PC timers and counters while the PC is in MONITOR or PROGRAM mode. This operation is not possible when the PC is in RUN mode.

⚠ Caution Never change the set value of a timer or counter without first confirming that no problems will result in the controlled system. Depending on the controlled system, changes to the set value of a timer or counter can have serious and unexpected results.

The set values of following timer and counter instructions can be accessed and changed with this operation: CNT, CNTR, CNTW, TCNT, TIM, TIMH, TIML, TIMW, TMHW, and TTIM. The set values can be incremented, decremented, or changed to a constant value or word address.

Timer and counter present values can also be changed while monitoring data online. See *10-12-9 Changing Present Values* for details.

Procedure Use the following procedure to change the set value of a timer or counter.

1, 2, 3...

1. Monitor the timer or counter instruction whose set value you want to change and press F2.

   Note The Escape Key can be pressed to return to the basic monitoring display. No changes will be made if the Escape Key is pressed before entering a new SV.

2. Enter the key sequence for the timer/counter instruction. The instruction and the set value will be displayed at the bottom of the screen. The following table shows the possible key sequences.

Instruction	Key sequence
CNT	F3, *counter_number*, Enter
TIM	F4, *timer_number*, Enter
CNTR(012)	F1, 12, *counter_number*, Enter
TIMH(015)	F1, 15, *timer_number*, Enter
TTIM(120)	F1, 120, *timer_number*, Enter
TIML(121)	F1, 121, *timer_number*, Enter
TCNT(123)	F1, 123, *counter_number*, Enter
TIMW<13>	F2, 13, *timer_number*, Enter
CNTW<14>	F2, 14, *counter_number*, Enter
TMHW<15>	F2, 15, *timer_number*, Enter

3. The set value can be changed in three ways:

   a) To increment or decrement a constant SV, press F9 (Tune). Press the Up Arrow Key to increment the SV and press the Down Arrow Key to decrement the SV. Press Enter to register the change.

   b) To change the SV to a constant, press F10 (Change), input a new SV, and press Enter.

c) To change the SV to a word address, press F10, input the word address, and press Enter. The following table shows the key sequences for word addresses.

Data area	Prefix	Key sequence
CIO	None	Control+F7, *word_address*, Enter
Auxiliary	A	Control+F1, *word_address*, Enter
CPU Bus Link	G	Control+F2, *word_address*, Enter
Counter	C	Control+F5, *word_address*, Enter
Timer	T	Control+F6, *word_address*, Enter
DM	D	Control+F4, *word_address*, Enter
*DM	*D	Control+F8, *word_address*, Enter
EM	E	Shift+Control+F4, *word_address*, Enter
*EM	*E	Shift+Control+F8, *word_address*, Enter

Note The input area can be cleared by pressing Shift+Home. The input area can be reset to constant SV input by pressing Control+F10.

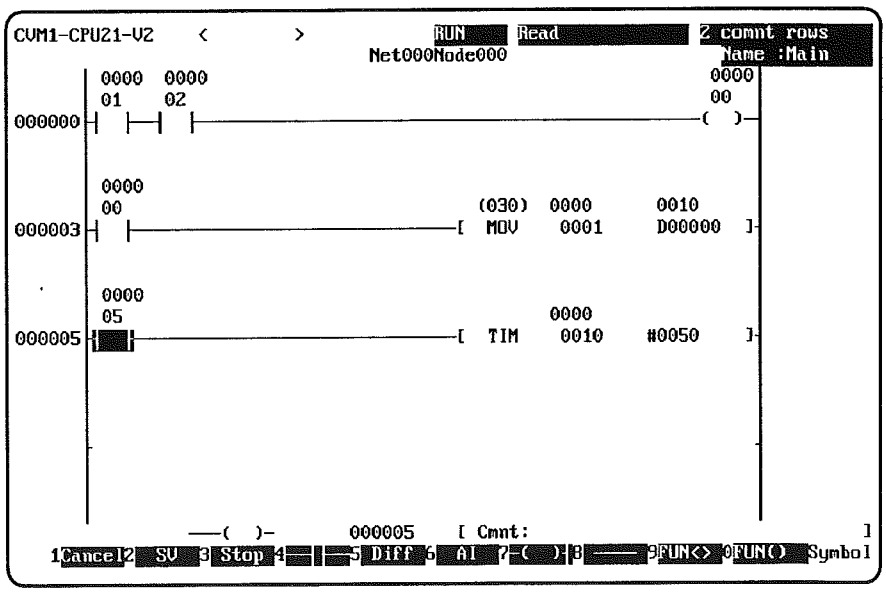
4. Press Escape to return to the basic monitoring display.

Incrementing a Timer SV

The following example shows how to increment the set value of timer T0010.

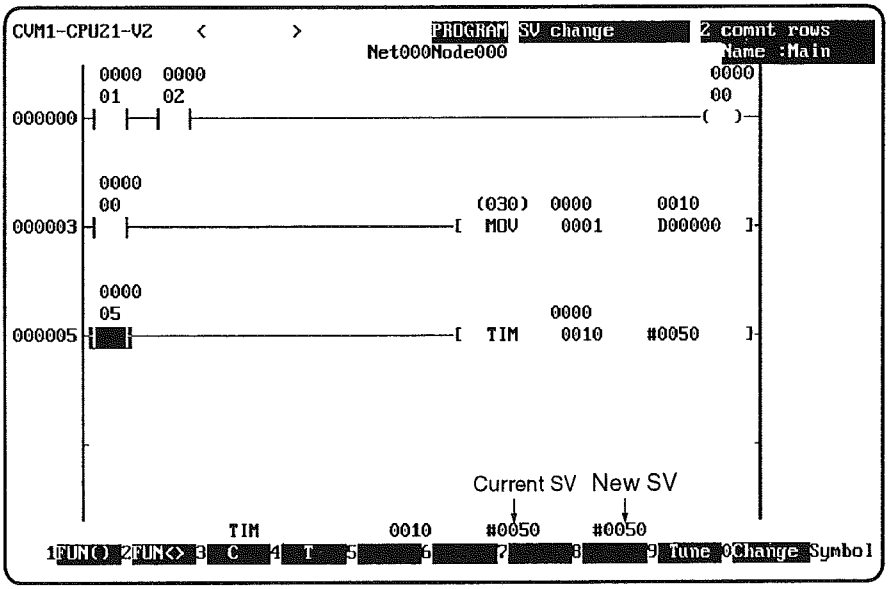
1, 2, 3...

1. Monitor the program step that contains timer T0010. (It isn't necessary to have the timer/counter instruction on-screen, but this allows the SV to be monitored.)

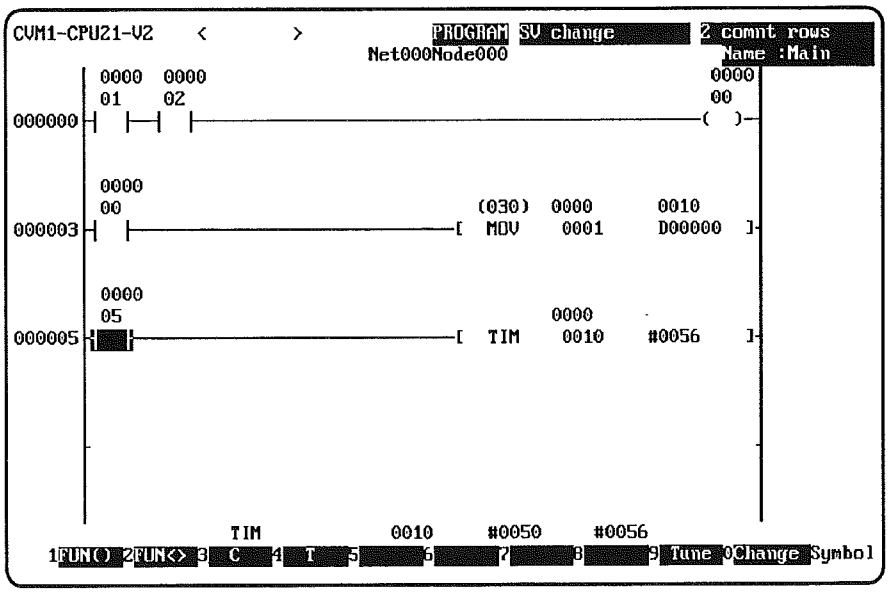


2. Press F2. (The function key display at the bottom of the screen will change.)
3. Enter the key sequence for T0010 by pressing F4, 10, and Enter. The set value will be displayed at the bottom of the screen.

4. Press F9 to enable incrementing/decrementing. In this case the SV is #0050.



5. Press the Up Cursor Key 6 times to increment the SV by 6.



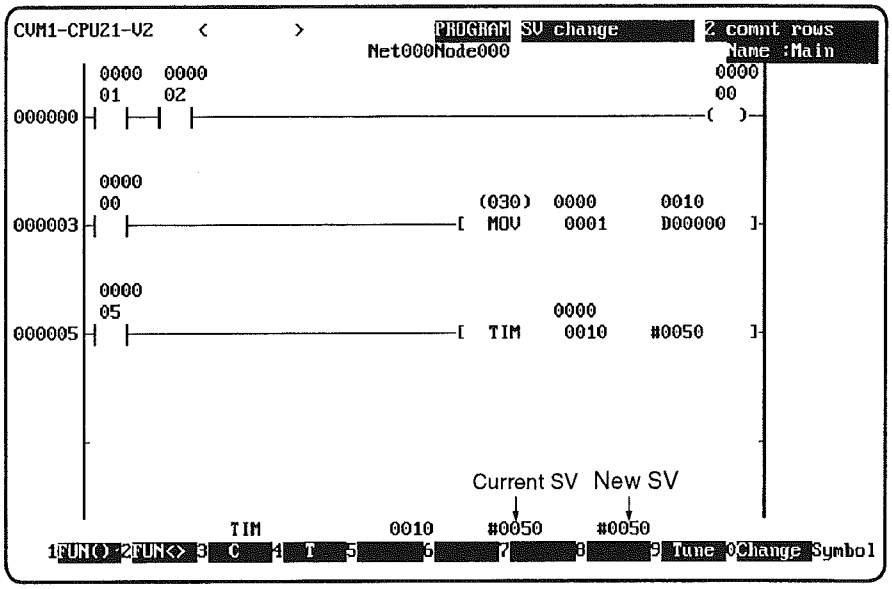
Changing a Timer SV

The following example shows how to change the set value of timer T0010 from a constant (#0050) to a word address (CIO 0200).

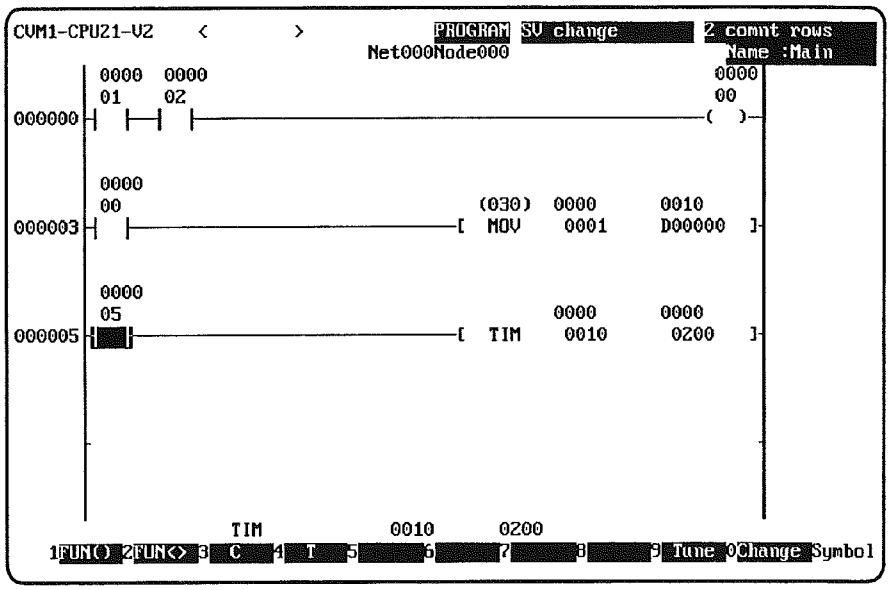
1, 2, 3...

1. Monitor the program step that contains timer T0010. (It isn't necessary to have the timer/counter instruction on-screen, but this allows the SV to be monitored.)
2. Press F2.
3. Enter the key sequence for T0010 by pressing F4, 10, and Enter. The set value will be displayed at the bottom of the screen.

4. Press F10 to display an input area for the new SV.



5. Enter the word address for CIO 0200 by pressing Control+F7, 200, and Enter.



Note Although the change can be made without displaying the instruction for TIM10, you will not be able to monitor the operation unless the instruction is displayed.

10-8 Pausing Displays

The F3 Key can be used to pause the monitoring display based on a specified condition or unconditionally. The monitoring display will be stopped, but PC operation will continue. This operation is useful in determining the program's status when the specified condition is fulfilled.

The menu and ladder diagrams cannot be displayed in the pause monitor mode.

The following conditions can be set:

- Stop monitoring when the content of the specified word equals the specified value.

- Stop monitoring on the rising edge (OFF to ON) or falling edge (ON to OFF) of a specified bit.
- Stop monitoring on the rising edge of A00814 (Trace Trigger Flag).

Note

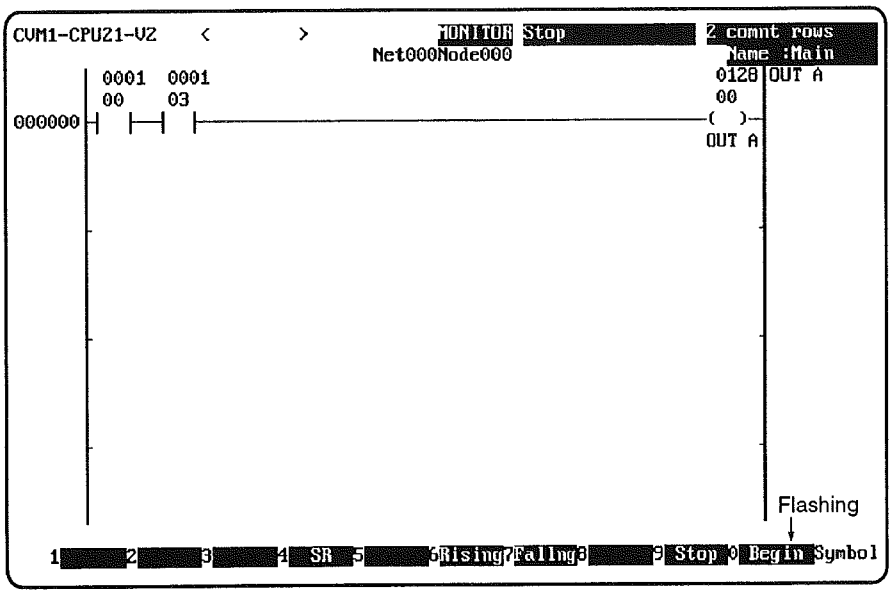
1. The pause monitor will stop when the first pause condition is met. The data at the time of the first I/O refresh after the condition is met will be displayed. Consequently, the displayed data may differ from the data when the conditions were met.
2. Do not specify bits that do not change. For example, monitoring will never be paused if the Always ON or Always OFF Flags are specified, because these flags never go OFF to ON or ON to OFF.

Unconditional Pause

Use the following procedure to pause the monitoring display unconditionally.

1, 2, 3...

1. Press F3 while monitoring. The function key functions will change and F10 will start to flash.

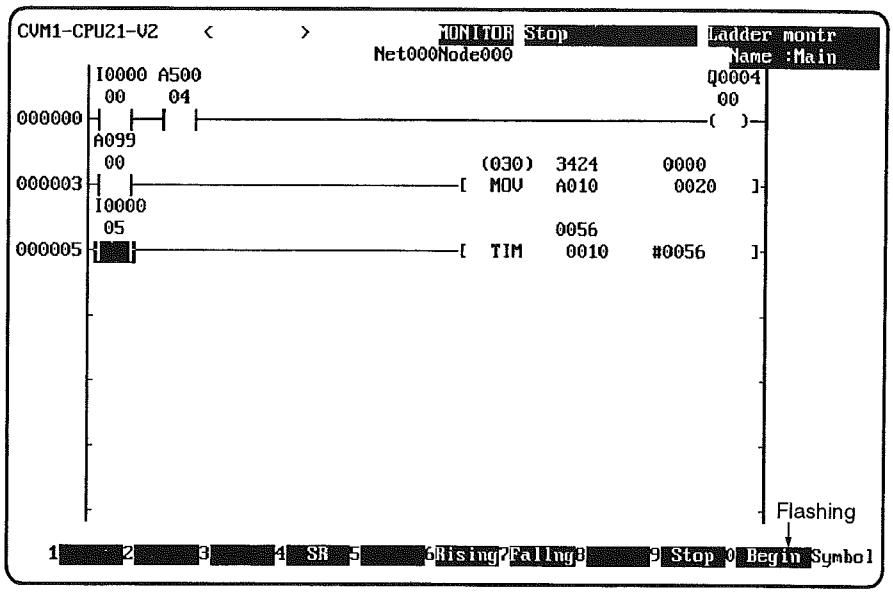


2. Press the F9 Key to freeze monitoring unconditionally.
3. Press the F10 Key to restart the monitoring display.

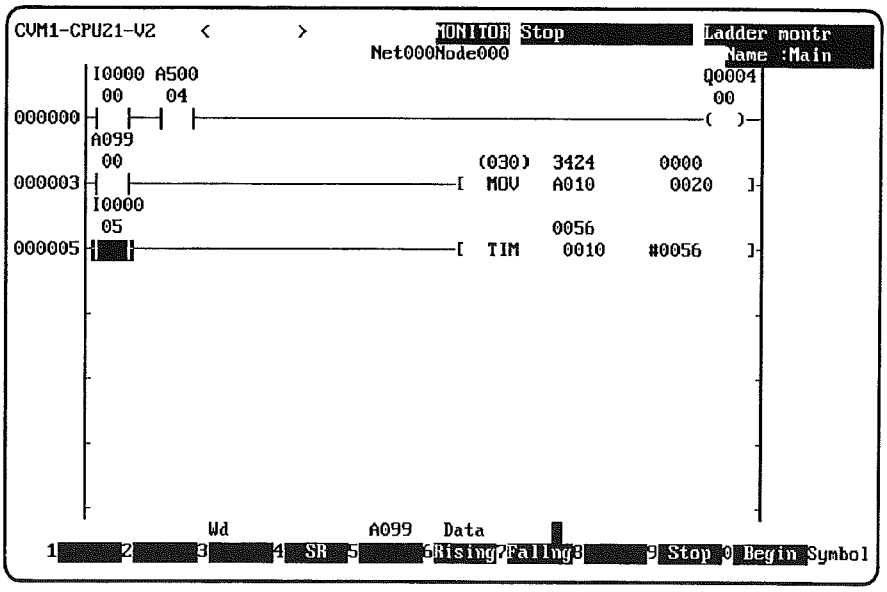
or Press the Escape Key to return to the basic monitoring display.

Word Condition The following example shows how to pause the monitoring display when a word (A099) reaches a specified value (#0033).

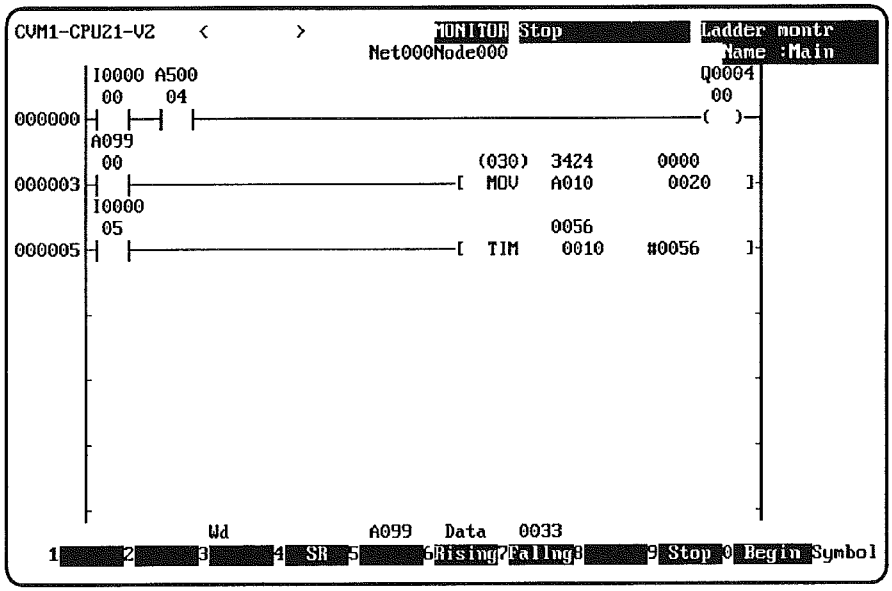
1, 2, 3... 1. Press F3 while monitoring. The function key functions will change and F10 will start to flash.



2. Press Control+F7 to indicate a word condition and enter the desired word. In this case press A99 and Enter.



3. Enter the set value for the specified word. In this case, press 33 and Enter.



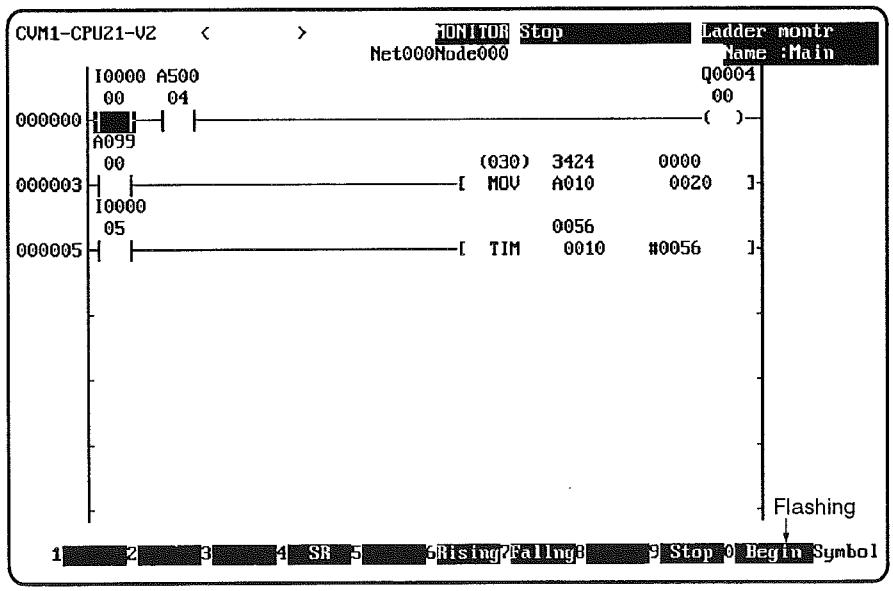
The monitoring display will be stopped and F9 will start to flash when A099 reaches #0033.

4. Press the F10 Key to restart the monitoring display with the same condition.

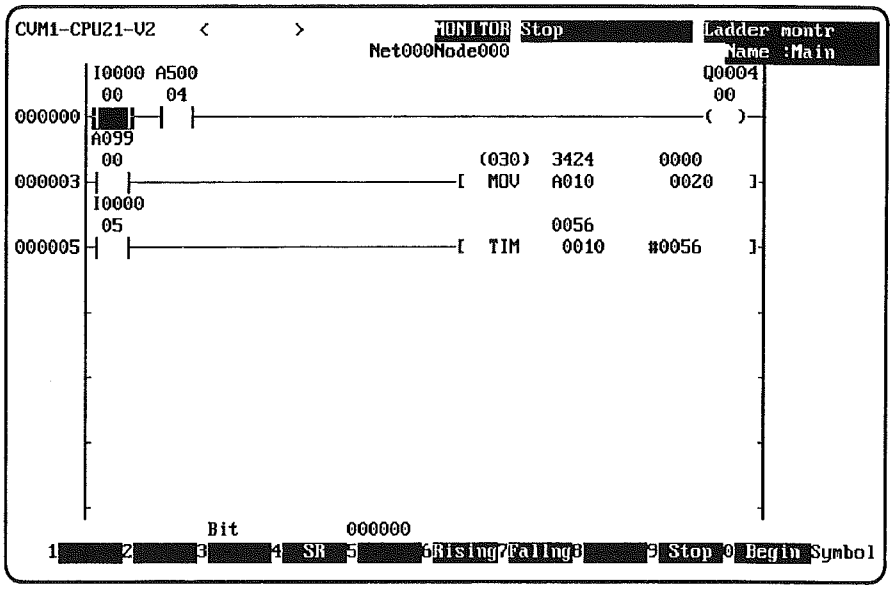
or Press the Escape Key to return to the basic monitoring display.

Bit Condition The following example shows how to pause the monitoring display when CIO 000000 goes from OFF to ON.

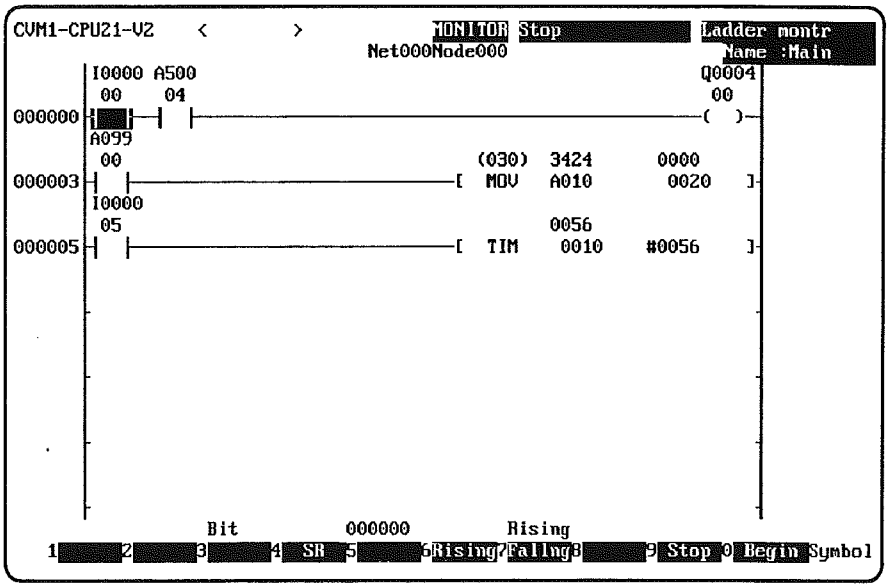
1, 2, 3... 1. Press F3 while monitoring. The function key functions will change and F10 will start to flash.



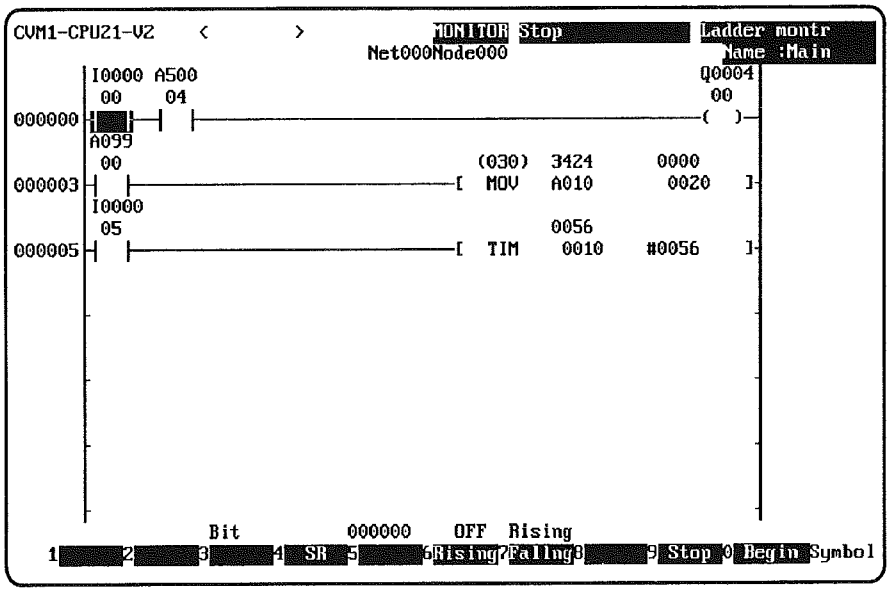
2. Press Control+F9 to indicate a bit condition.



3. Enter the bit address of the desired bit. In this case, press 0 and Enter to specify CIO 000000.



4. Press F6 to specify up-differentiation (OFF to ON). (Down-differentiation is specified by pressing F7.)



The monitoring display will be stopped and F9 will start to flash when CIO 000000 goes from OFF to ON.

5. Press the F10 Key to restart the monitoring display with the same condition.

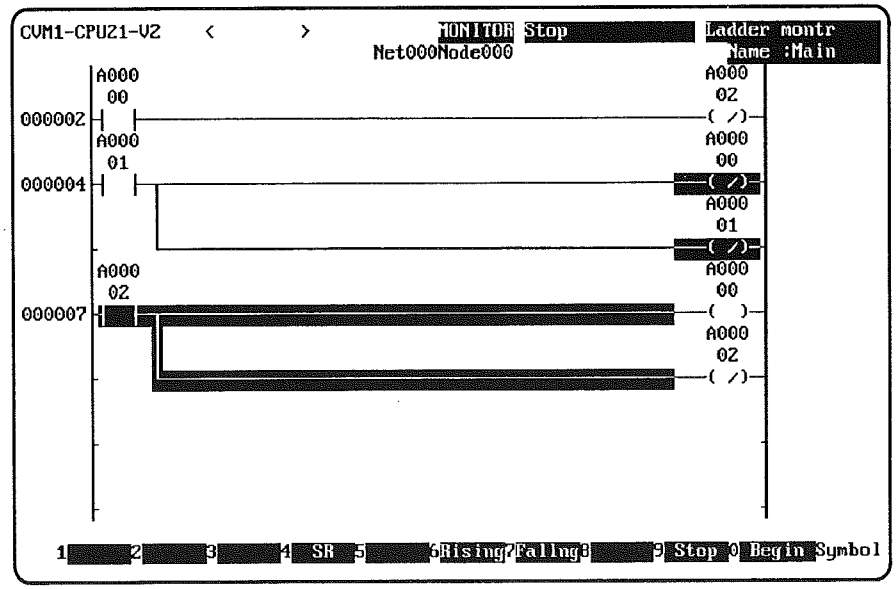
or Press the Escape Key to return to the basic monitoring display.

Trace Trigger Flag (A00814)

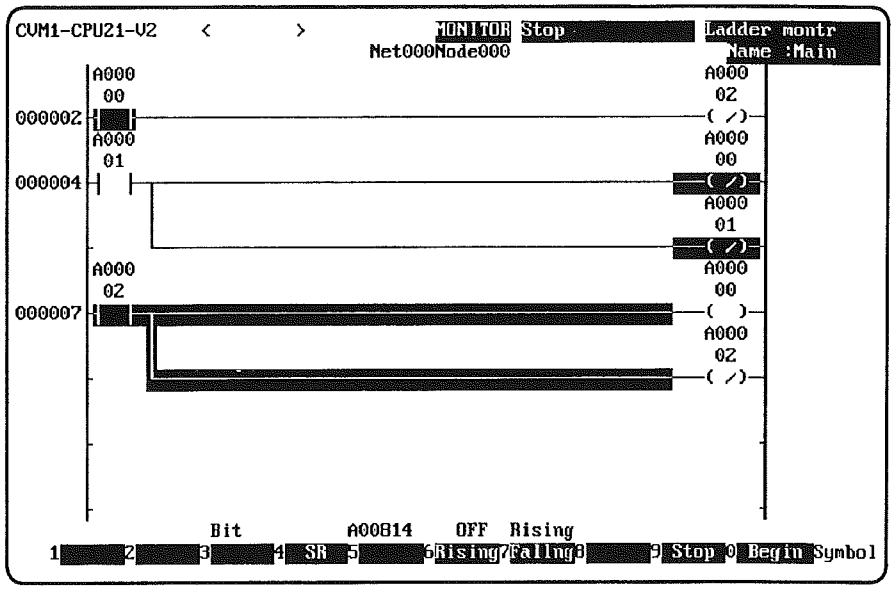
The following procedure shows how to pause the monitoring display when the Trace Trigger Flag goes ON.

1, 2, 3...

1. Press F3 while monitoring.



2. Press F4 to begin monitoring the Trace Trigger Flag.



The monitoring display will be stopped and F9 will start to flash when A00814 goes from OFF to ON.

3. Press the F10 Key to restart the monitoring display with the same condition.

or Press the Escape Key to return to the basic monitoring display.

10-9 Differentiation Monitoring

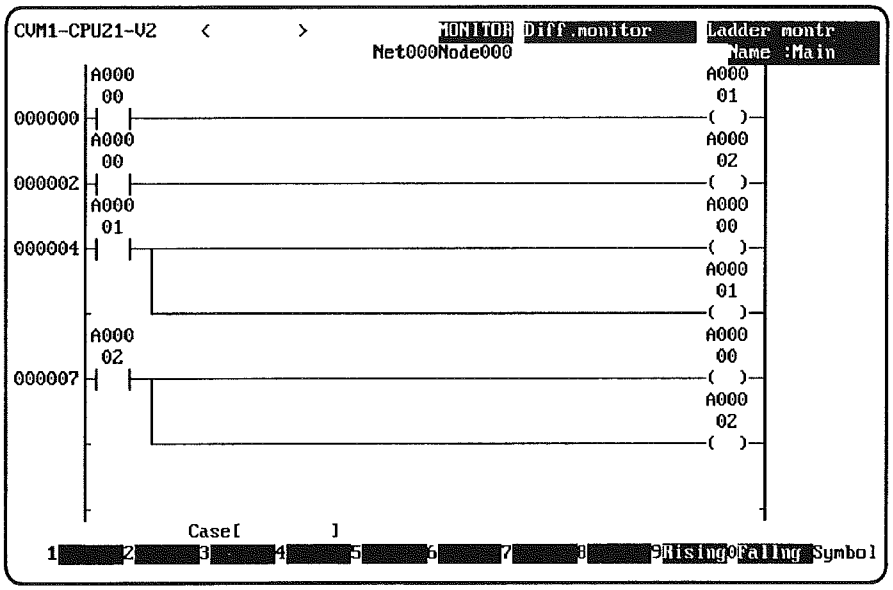
This operation detects the rising edge (OFF to ON) or falling edge (ON to OFF) of a specified bit and displays the bit in reverse video when its status changes. The buzzer will sound when the differentiated condition is detected, but PC operation will continue and the monitor display will not be frozen. This operation is possible in any PC mode.

Other operations, such as displaying the menu and ladder diagrams, are not possible in the differentiation monitor mode. To execute another operation, press the Escape Key to return to the basic monitoring display and then execute the operation.

Procedure Use the following procedure for differentiation monitoring.

1, 2, 3...

1. Press F5 while monitoring the ladder program. The function key assignments will change, as shown in the following diagram.

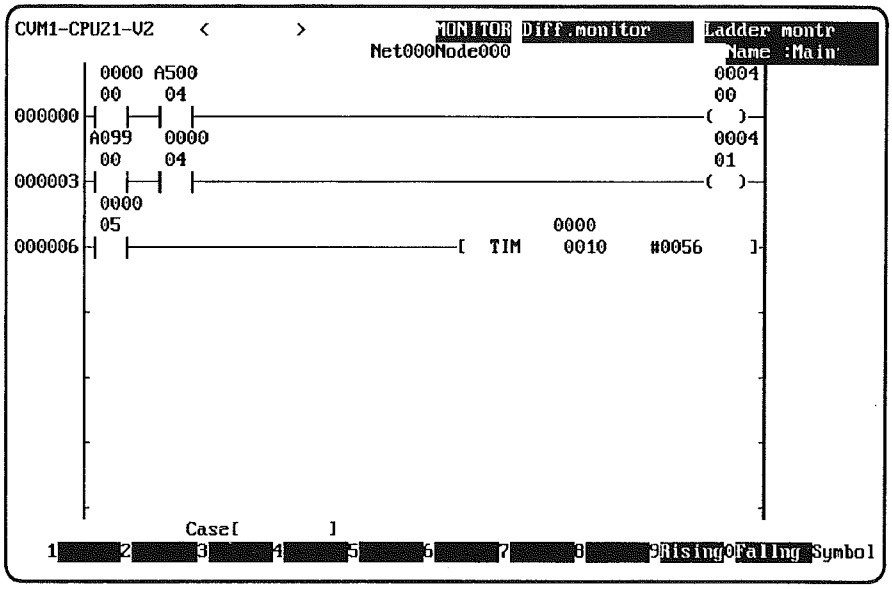


2. Move the cursor to the condition or output bit that is to be monitored and press Enter.
3. Press F9 to detect an OFF-to-ON transition in the specified bit or press F10 to detect an ON-to-OFF transition, and then press Enter.

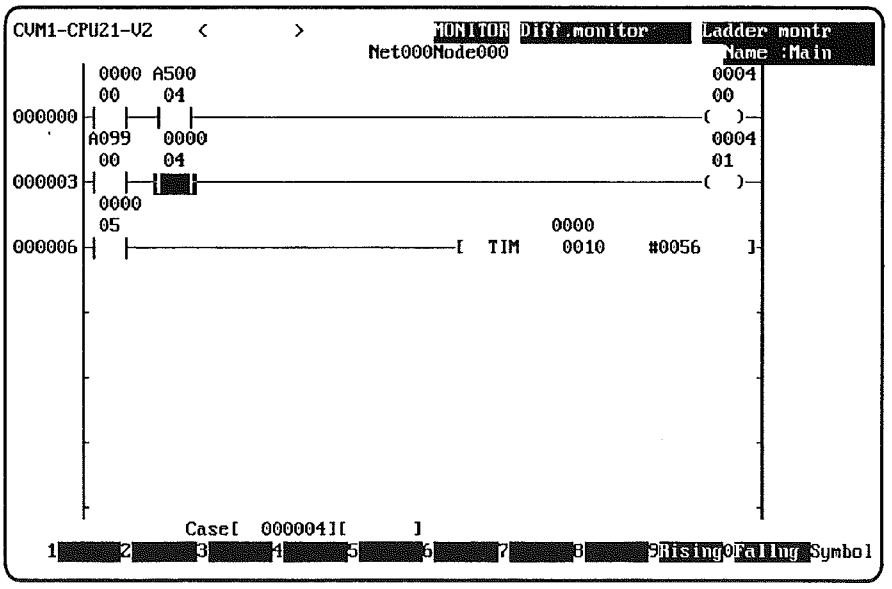
   When the transition occurs, the specified bit will be displayed in reverse video and the monitoring operation will continue.
4. Press the Escape Key to return to the basic monitoring display.

Example The following example shows differentiation monitoring used to detect up-differentiation (OFF→ ON changes) of CIO 000004.

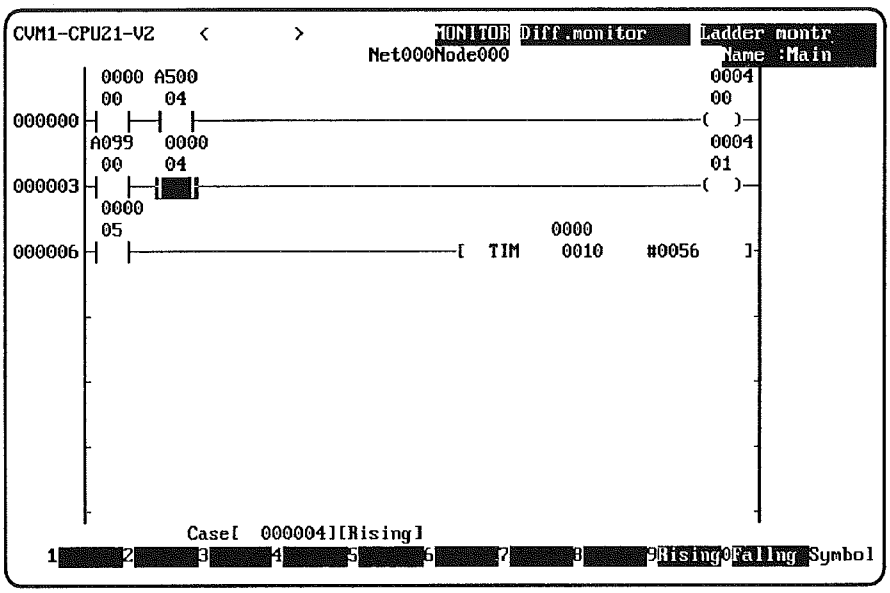
1, 2, 3... 1. Press F5. The function key assignments will change.



2. Move the cursor to CIO 000004 and press Enter.



3. Press F9 to indicate up-differentiation and then press Enter.



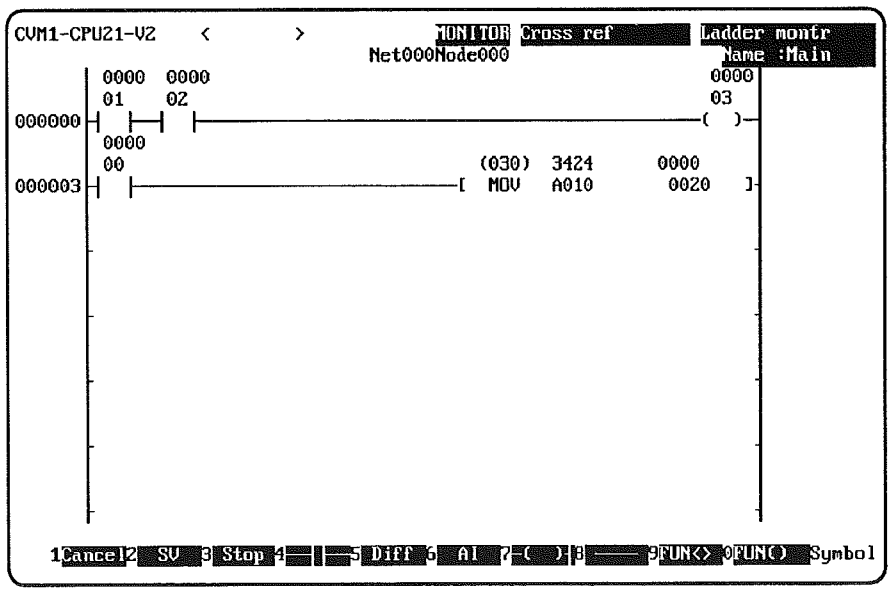
10-10 Cross-referencing

The Cross-reference operation is used to search the program for specified words, bits, or registers. The search is performed in the main program and all interrupt programs. If the specified item is found, the cursor will be moved to that location in the program and the program block, program address, and instruction in which the item is used will be displayed at the bottom of the screen.

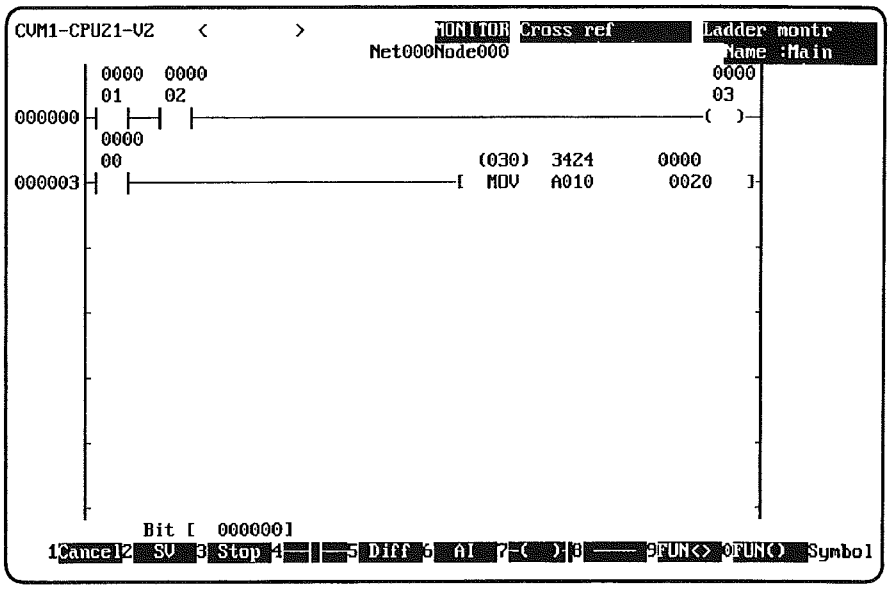
Other operations, such as displaying the menu and ladder diagrams, are not possible in the cross-reference mode. To execute another operation, press the Escape Key to return to the basic monitoring display and then execute the operation.

Procedure Use the following procedure to perform a cross-reference search for CIO 000007.

1, 2, 3... 1. While monitoring, press Shift+F5 to start the cross-reference operation.

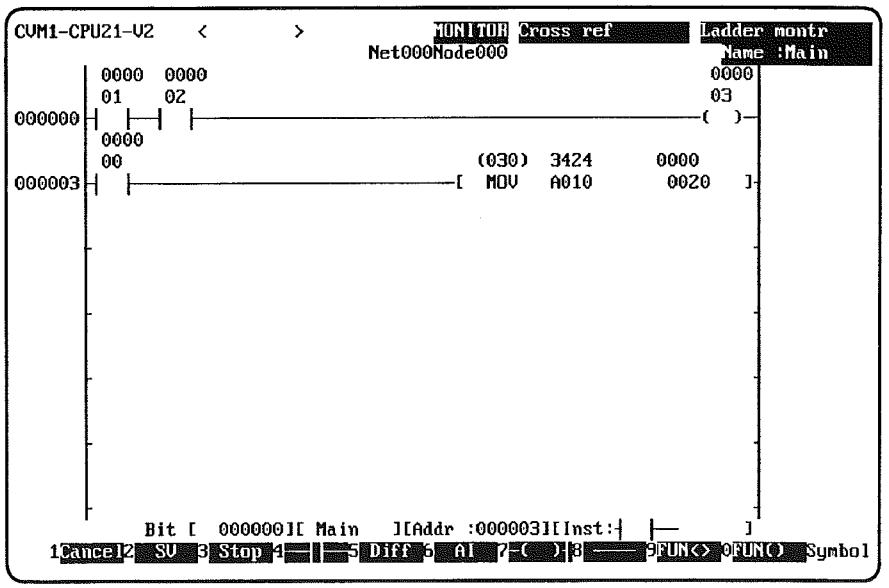


2. Press Control+F9 to specify a bit address.



3. Input the bit address of the bit that you want to check, and press Enter. In this case press 7 and Enter.

   When the specified bit is found, the program address and instruction in which it is used will be displayed at the bottom of the screen.



Specify Cross-reference Addresses

Use the following key sequences to specify the address for cross-reference searches. Input Shift+F5 first, followed by the key sequences given in the table.

Item	Area	Key sequence
Bits	CIO	**Ctrl+F9**, *Bit_address*, **Enter**
	Auxiliary	**Ctrl+F9**, **Ctrl+F1**, *Bit_address*, **Enter**
	CPU Bus Link	**Ctrl+F9**, **Ctrl+F2**, *Bit_address*, **Enter**
Words	CIO	**Ctrl+F7**, *Word_address*, **Enter**
	Auxiliary	**Ctrl+F7**, **Ctrl+F1**, *Word_address*, **Enter**
	CPU Bus Link	**Ctrl+F7**, **Ctrl+F2**, *Word_address*, **Enter**
	DM	**Ctrl+F7**, **Ctrl+F4**, *Word_address*, **Enter**
	*DM	**Ctrl+F7**, **Ctrl+F8**, *Word_address*, **Enter**
	EM	**Ctrl+F7**, **Shift+Ctrl+F4**, *Word_address*, **Enter**
	*EM	**Ctrl+F7**, **Shift+Ctrl+F8**, *Word_address*, **Enter**
	Timer	**Ctrl+F6**, *Timer_number*, **Enter**
	Counter	**Ctrl+F6**, *Counter_number*, **Enter**

10-11 Clearing Errors

The F1 Key can be pressed to clear errors from PC memory. Error messages are displayed at the top-left of the screen and should be cleared after taking appropriate measures to remove the cause of the error. The error message cannot be cleared if its cause isn't removed. If there is more than one error, the next message will be displayed after the preceding message is cleared.

Procedure

The following procedure shows how to clear errors.

1, 2, 3...

1. Error messages are displayed at the top-left of the screen.
2. Eliminate the cause of the error and press F1. Another error message will be displayed if there is another error.
3. Continue displaying error messages, eliminate their causes, and clearing the errors by pressing F1 until all the errors are cleared.

10-12 Monitoring Data

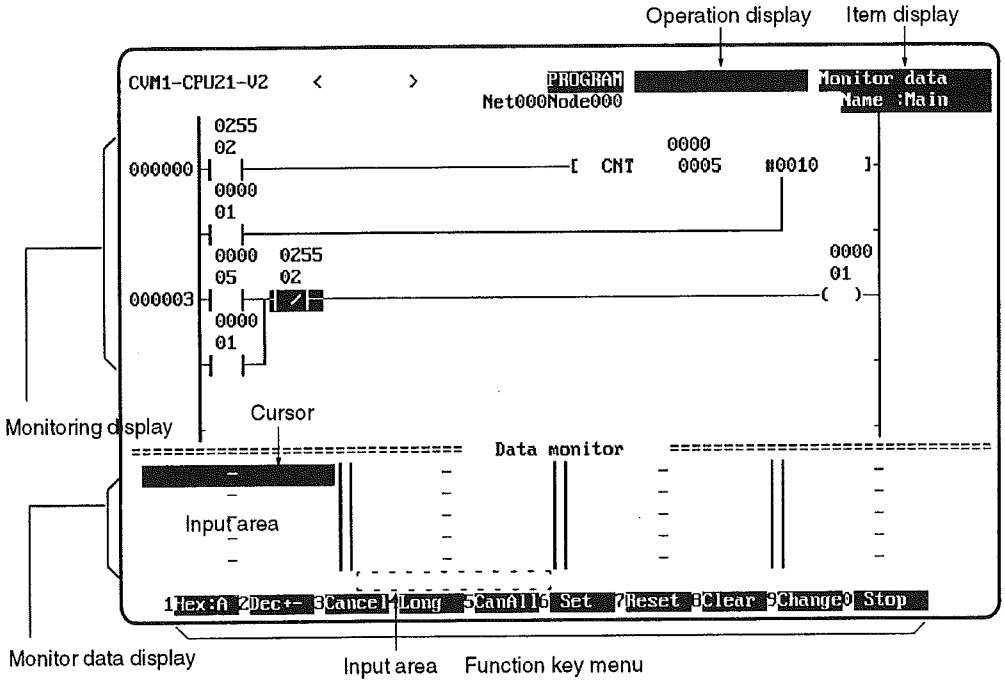
The Monitor Data operation uses the lower third of the screen to display the changing status of up to 20 bits or words. This operation can be used to monitor and change the status or contents of timers, counters, bits, and words in memory.

Word data can be displayed in hexadecimal, signed or unsigned decimal, signed or unsigned long (2-word decimal), and ASCII formats.

This operation is especially useful during debugging, since the status of monitored bits and timer/counter flags can be forced-set or forced-reset to simulate actual operating conditions.

The monitoring display will continue to operate while using the Monitor Data operation, but other operations, such as displaying the menu and ladder diagrams, are not possible.

Monitor Data Display The Monitor Data display will appear in the bottom 1/3 of the screen when "N:Monitor data" is selected from the Monitor Menu.



10-12-1 Function Key Operations

The following table shows the operations assigned to the function keys while using the Monitor Data operation. The function keys are also used to specify words and bits for monitoring. See *10-12-2 Specifying Words and Bits* for details.

Key(s)	Name	Function
F1	Hex:A	Toggles between hexadecimal and ASCII formats.
F2	Dec+/–	Toggles between signed and unsigned decimal formats.
F3	Cancel	Releases the forced-set or forced-reset status of the bit at the cursor. See *10-12-8 Releasing Force-set/Force-reset Bits* for details.
F4	Long	Toggle between standard (1-word) and long (2-word) decimal formats. (The long format is applicable to signed/unsigned decimal only.)
F5	CanAll	Releases the forced-set or forced-reset status of all bits. See *10-12-8 Releasing Force-set/Force-reset Bits* for details.
F6	Set	Used to force-set the bit at the cursor. See *10-12-7 Force-setting/Force-resetting Bits* for details.
F7	Reset	Used to force-reset the bit at the cursor. See 10-12-7 *Force-setting/Force-resetting Bits* for details.
F8	Clear	Clears all items displayed from the Monitor Data display. See *10-12-6 Clearing the Monitor Data Display* for details.
F9	Change	Changes the present value of the timer, counter, or content of the word where the cursor is located. See *10-12-9 Changing Present Values* for details.
F10	Stop	Freezes the Monitor Data display. The PC continues operating. See *10-12-10 Pausing Display* for details.
Ctrl/Shift + function keys	Used to specify data area addresses.	

Valid PC Modes The following table shows the PC modes in which each operation can be executed.

Operation	RUN	MONITOR	PROGRAM	DEBUG
F1: Hex:A	OK	OK	OK	OK
F3: Cancel	No	OK	OK	OK
F5: CanAll	No	OK	OK	OK
F6: Set	No	OK	OK	OK
F7: Reset	No	OK	OK	OK
F8: Clear	OK	OK	OK	OK
F9: Change	No	OK	OK	OK
F10: Stop	OK	OK	OK	OK

10-12-2 Specifying Words and Bits

To designate items to be monitored, move the cursor to a cell in the Monitor Data display and enter the appropriate key sequence.

Specifying Bits To designate a bit, press Control+F9, followed by the data area prefix and address. (Data area prefixes are not required for the CIO Area.)

Data area	Key sequence
CIO	**Ctrl+F9,** *Bit_address* **Enter**
A	**Ctrl+F9, Ctrl+F1** *Bit_address* **Enter**
G	**Ctrl+F9, Ctrl+F2** *Bit_address* **Enter**

Specifying Words To designate a word, press Control+F7, followed by the data area prefix and address. (Data area prefixes are not required for the CIO Area.)

Data area	Key sequence
CIO	**Ctrl+F7,** *Word_address* **Enter**
A	**Ctrl+F7, Ctrl+F1** *Word_address* **Enter**
G	**Ctrl+F7, Ctrl+F2** *Word_address* **Enter**

Specifying DM and EM Use the following key sequences to designate DM and EM words.

Data area	Key sequence
DM	**Ctrl+F7, Ctrl+F4** *DM_address* **Enter**
EM	**Ctrl+F7, Shift+Ctrl+F4** *DM_address* **Enter**
EM bank number	**E** *bank_number _ EM_address*

Specifying TIM/CNT Use the following key sequences to designate timer and counter PVs and completion flags.

Data area	Key sequence
Counter flag	**Ctrl+F9, Ctrl+F5** *CNT_number* **Enter**
Timer flag	**Ctrl+F9, Ctrl+F6** *TIM_number* **Enter**
Counter PV	**Ctrl+F7, Ctrl+F5** *CNT_number* **Enter**
Timer PV	**Ctrl+F7, Ctrl+F6** *TIM_number* **Enter**

Specifying IR/DR Use the following key sequences to designate Index and Data Registers.

Data area	Key sequence
IR	**Ctrl+F7, IR** *IR_number* **Enter**
DR	**Ctrl+F7, DR** *DR_number* **Enter**

10-12-3 Changing Data Formats

Word data can be displayed in hexadecimal, signed or unsigned decimal, signed or unsigned long (2-word decimal), and ASCII formats. To change the data format, move the cursor to the desired word and press the desired function key.

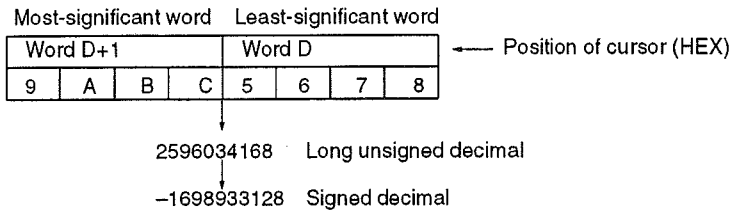
When changing the content of a word, the data input format can be switched among hexadecimal, ASCII, and the four decimal formats by pressing F9.

F1: Hex:A Press the F1 Key to toggle between hexadecimal and ASCII formats. See *10-12-5 Changing to ASCII Format* for details.

F2: Dec+/– Press the F2 Key to toggle between signed and unsigned decimal formats. If F1 is pressed while data is displayed in decimal format, the display will switch back to hexadecimal or ASCII format.

F4: Long Press the F4 Key to toggle between standard (1-word) and long (2-word) decimal formats. The long format is applicable to signed/unsigned decimal only. The words used for long data are the word at the cursor location and the next word. Long data will be displayed at the bottom of the screen.

Example In the following example, the hexadecimal content of word D is 5678 and that of D+1 is 9ABC. The cursor is positioned at word D.



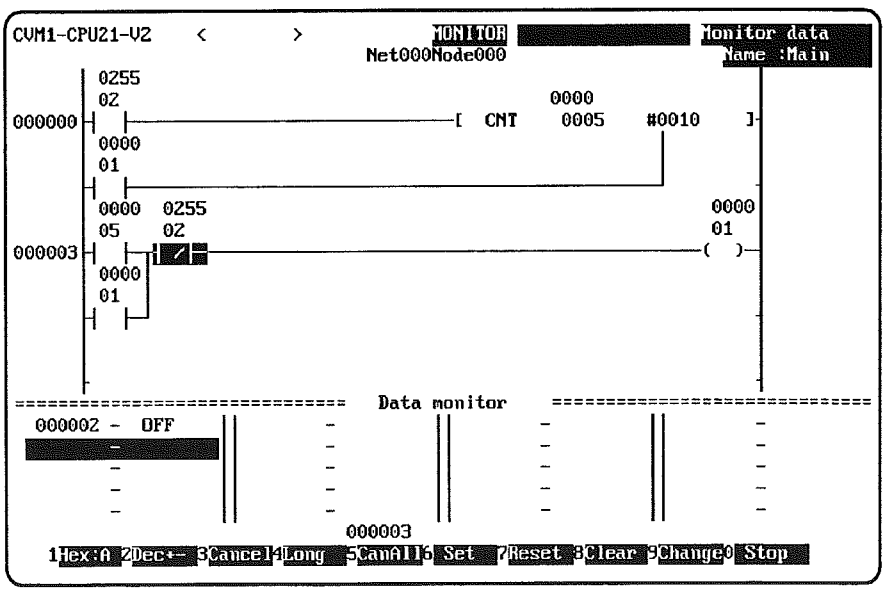
The F9 key can be used to change between all of these input modes.

10-12-4 Monitoring Example

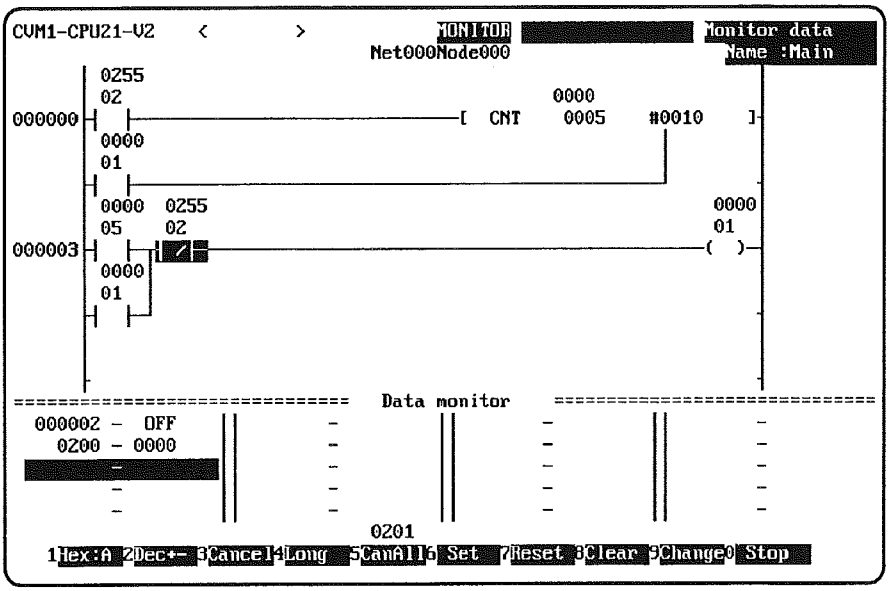
The following example shows how to monitor the status of CIO 000002, the content of CIO 0200 and D00001, and the present value and status of T0005.

1, 2, 3...

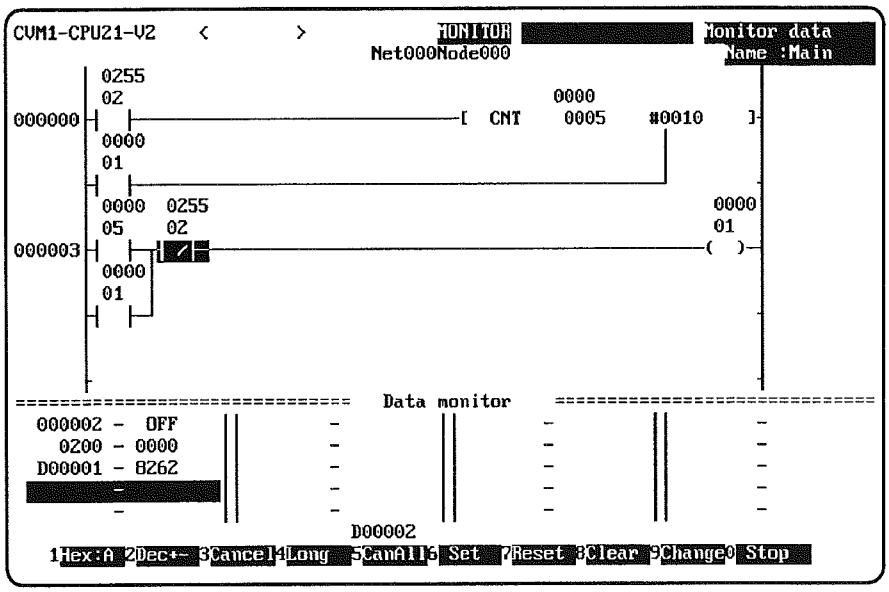
1. Select "N:Monitor data" from the Monitor Menu.
2. Input CIO 000002 by pressing Control+F9, 2, and Enter. The next bit address (CIO 000003) will be displayed in the input area.



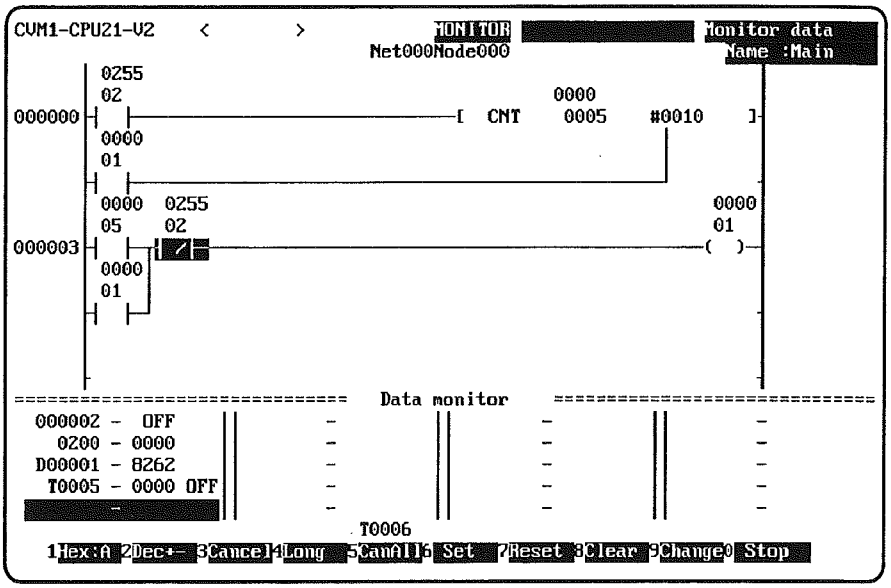
3. Input CIO 0200 by pressing Control+F7, 200, and Enter.



4. Input DM00001 by pressing Control+F7, Control+F4, 1, and Enter.



5. Input T0005 by pressing Control+F7, Control+F6, 5, and Enter.

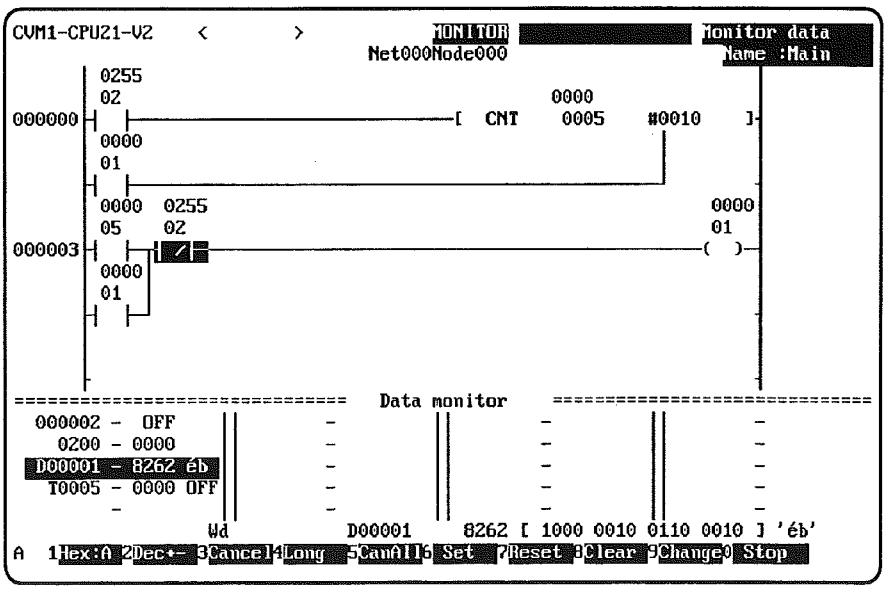


10-12-5 Changing to ASCII Format

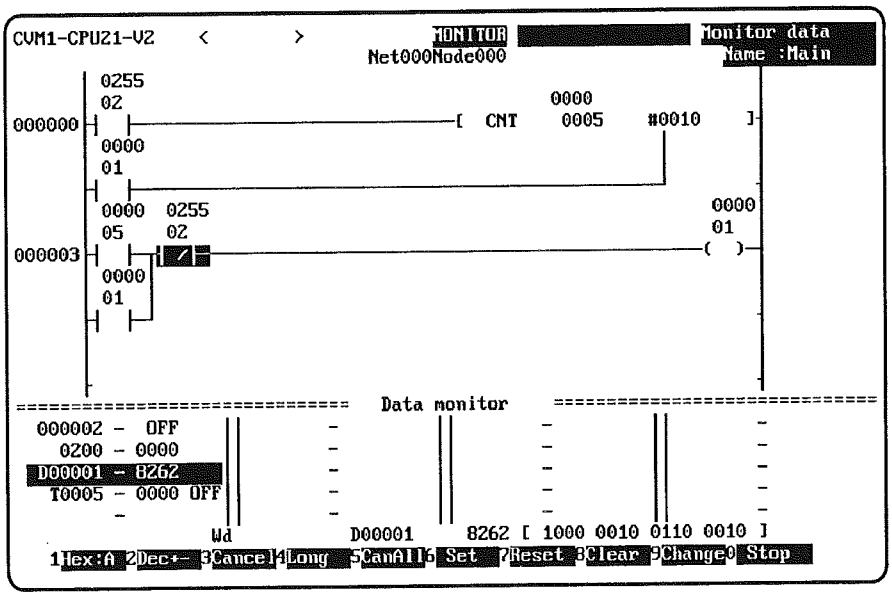
The following example shows how to change the data display to ASCII format. This function can be used to read ASCII messages, such as those written to DM.

1, 2, 3...

1. Display the desired data in the Monitor Data display.
2. Press F1 to display the data in ASCII. An "A" will be displayed in the lower-left corner of the screen to indicate ASCII format.



3. Press F1 again to return to normal hexadecimal format.

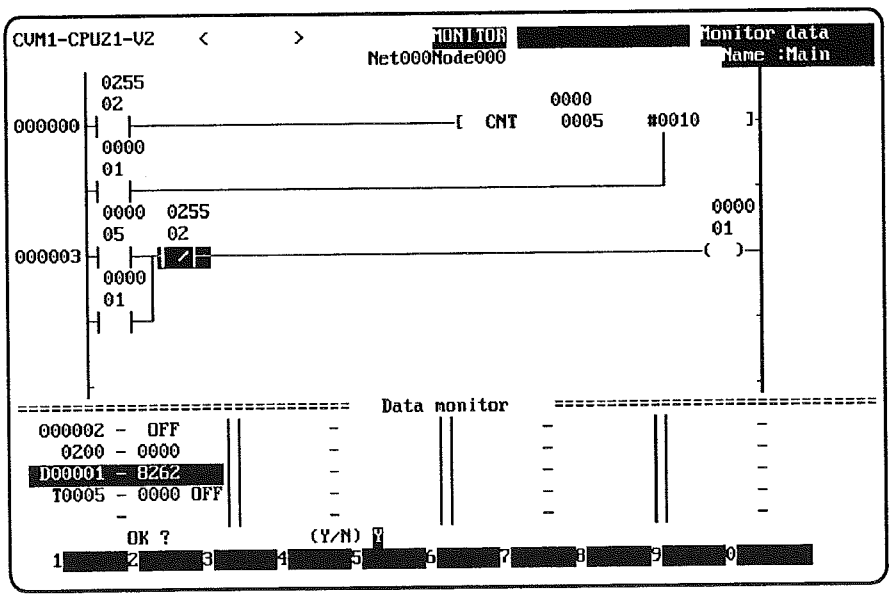


10-12-6 Clearing the Monitor Data Display

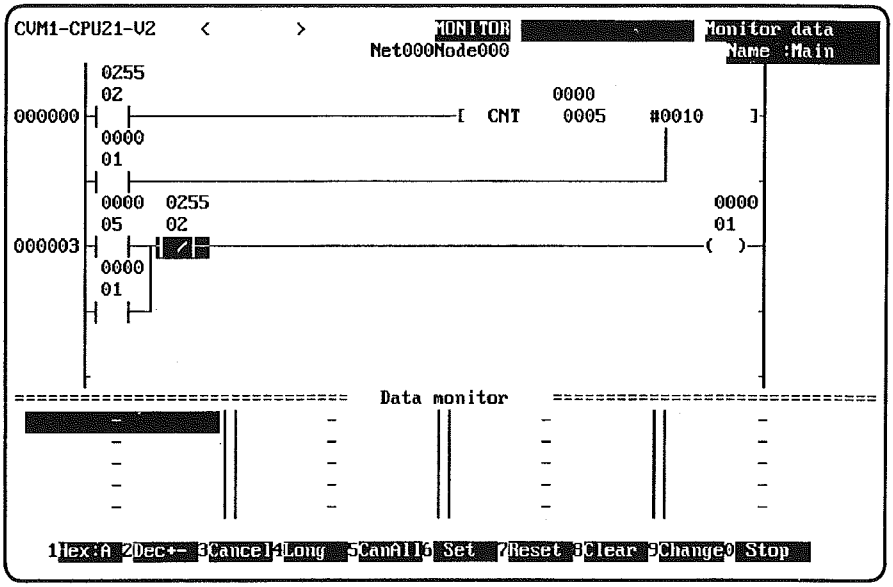
The following example shows how to clear the Monitor Data display.

1, 2, 3...

1. Press F8 to clear the Monitor Data display. A confirmation prompt will be displayed.



2. Enter "Y" to clear the display, "N" to cancel the operation.



10-12-7 Force-setting/Force-resetting Bits

Bits displayed on the Monitor Data display can be force-set (turned on) and force-reset (turned off). These operations are possible in any PC mode except RUN mode. If an output bit is force-set/force-reset in MONITOR mode, its corresponding output point will be turned ON/OFF.

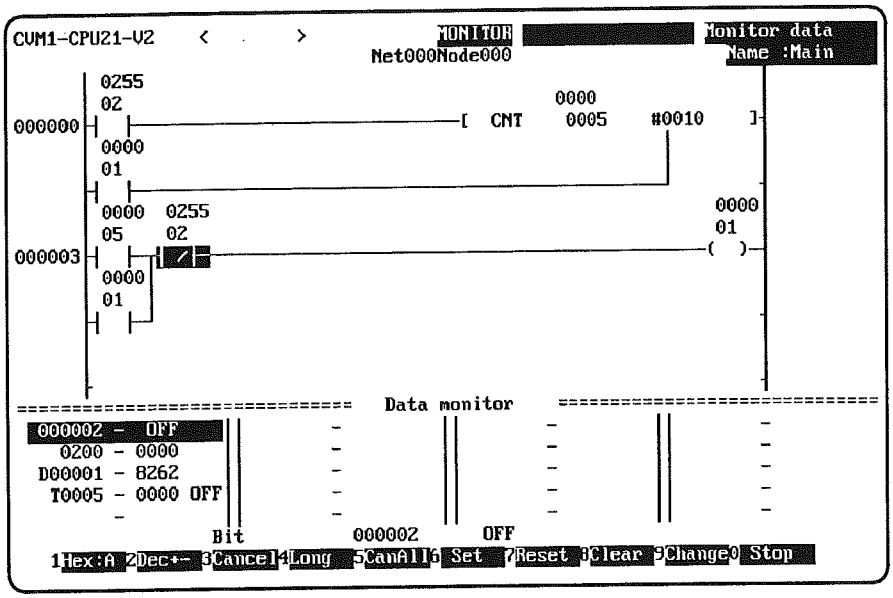
⚠ **Caution** Never force-set or force-reset bits in memory without first confirming that no problems will result in the controlled system. Depending on the controlled system, force-setting or force-resetting bits in memory can have serious and unexpected results.

Press F6 to force-set a bit; this bit status is indicated by an "S." Press F7 to force-reset a bit; this status is indicated by an "R." The ladder diagram will also reflect the status of force-set/force-reset bits; force-set bits will be displayed in reverse video.

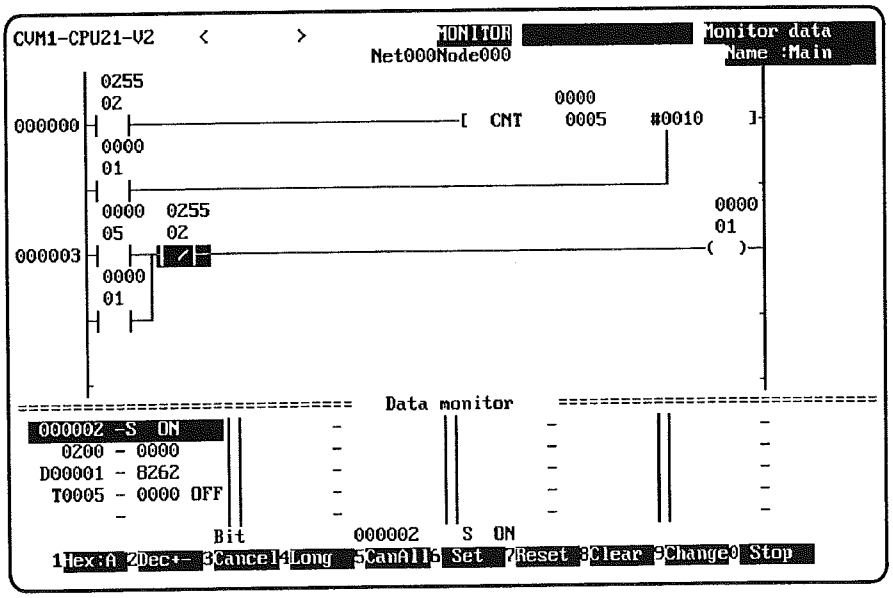
Refer to *10-12-8 Releasing Force-set/Force-reset Bits* for details on releasing forced status.

Example The following example shows how to force-set and force-reset CIO 000002.

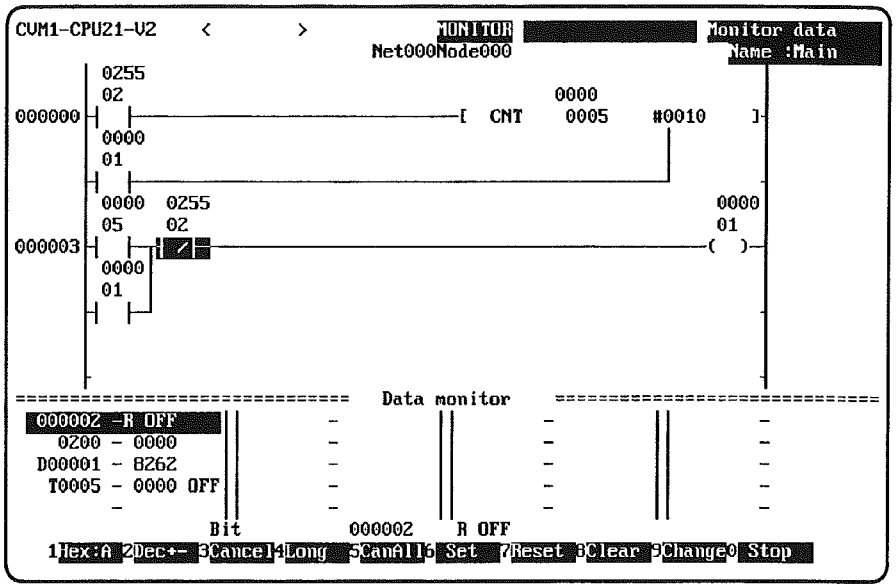
1, 2, 3... 1. Move the cursor to CIO 000002.



2. Press F6 to force-set CIO 000002. An "S" will appear next to the bit address.



3. Press F7 to force-reset CIO 000002. An "R" will appear next to the bit address.



10-12-8 Releasing Force-set/Force-reset Bits

The following examples show how to release the force-set or force-reset bit status. When the forced status is released, the bit or bits will return to their original status and the "S" or "R" that indicated forced status will be cleared from the display.

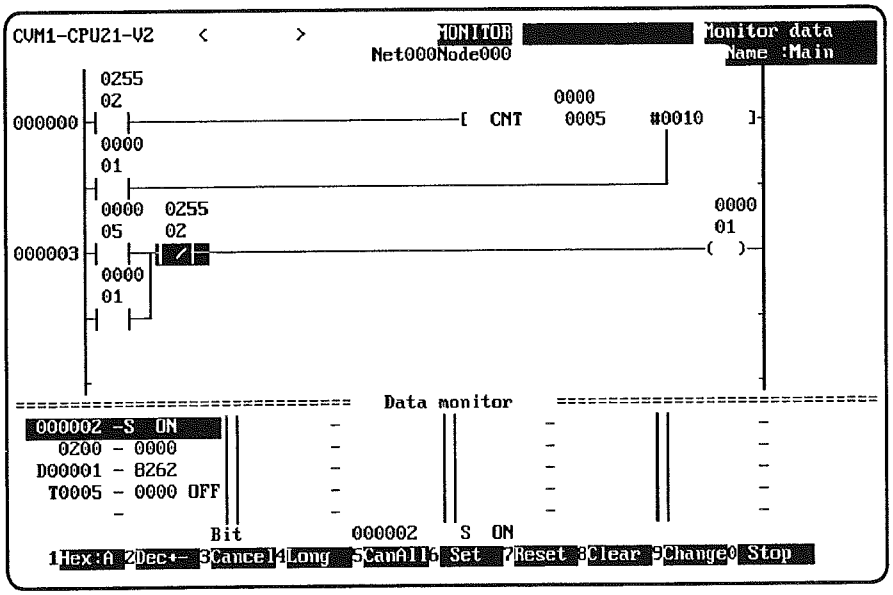
⚠ Caution Never force-set or force-reset bits in memory without first confirming that no problems will result in the controlled system. Depending on the controlled system, force-setting or force-resetting bits in memory can have serious and unexpected results.

Press F3 to release the forced status of the bit at the cursor. Press F5 to release the forced status of all bits that have been force-set or force-reset.

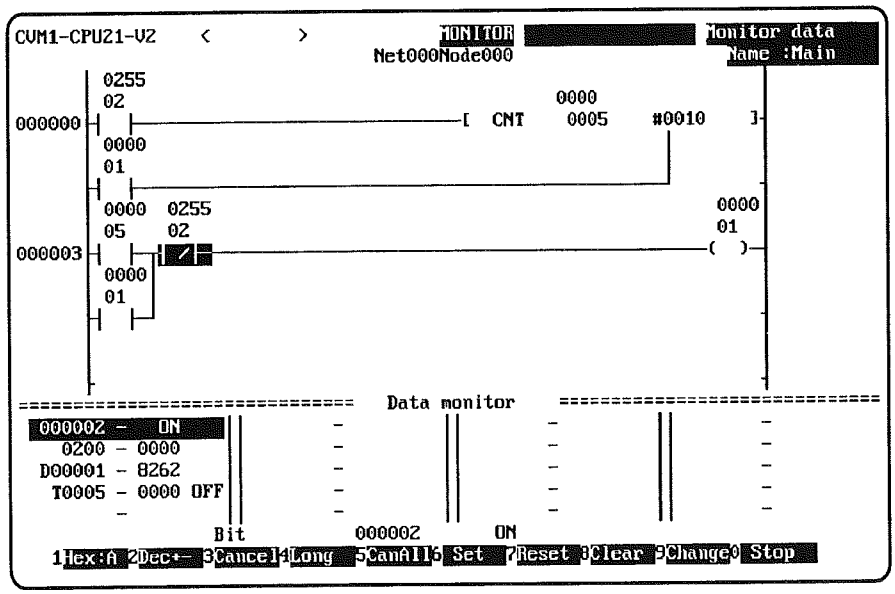
Press Escape to quit the Monitor Data operation.

Release One Bit The following example shows how to release the forced status of just one bit.

1, 2, 3... 1. Move the cursor to CIO 000002.



2. Press F3 to release the force-set status of CIO 000002.



Release All Bits The following example shows how to release the forced status of all bits.

1, 2, 3... 1. Press F5. A confirmation prompt will be displayed.

2. Enter "Y" to clear the forced status of all bits, "N" to cancel the operation.

10-12-9 Changing Present Values

The present value of a timer or counter or the content of a word displayed on the Monitor Data display can be changed. This operation is not possible with the PC in RUN mode.

Timer and counter PVs must be changed in decimal (0000 to 9999), but new word data can be entered in hexadecimal, binary, or ASCII. After pressing F9, press the Tab

Key once to input data in binary, twice to input data in ASCII. Press the F1 Key to display the data in ASCII before inputting ASCII data.

Timer and counter SVs cannot be changed with this operation, they must be changed from the monitoring display. See *10-7 Changing Set Values* for details.

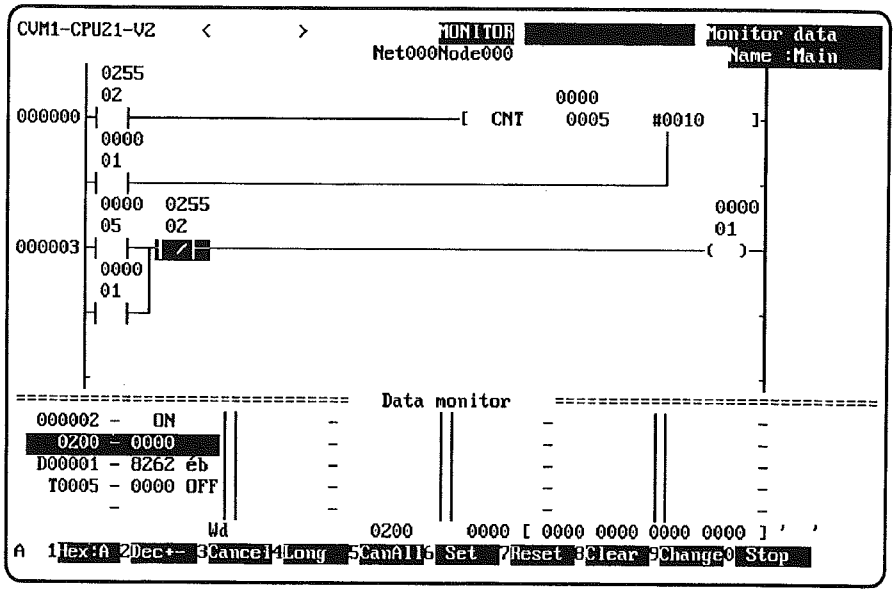
The DM data in the system work area won't be affected even if the content of a DM word is changed on screen.

Hexadecimal Data Input

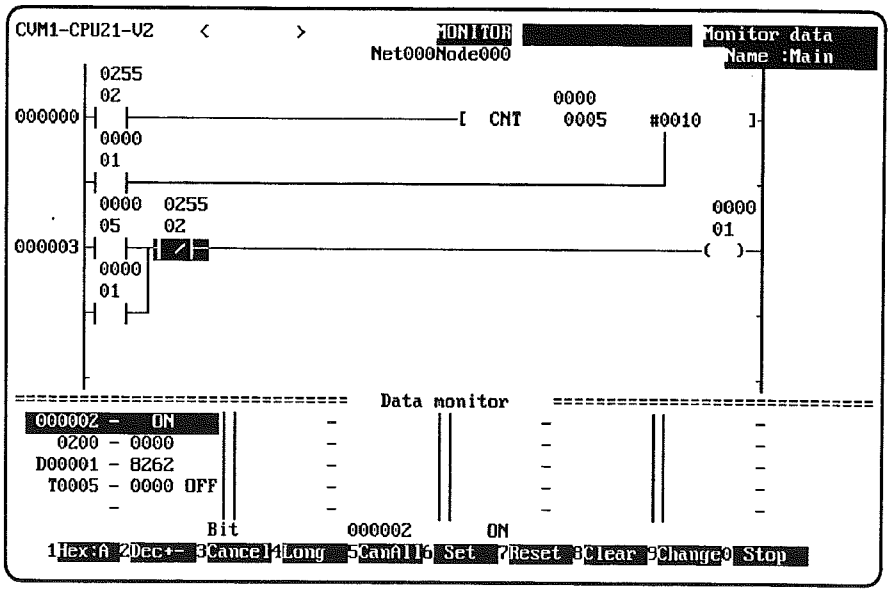
In the following example, the hexadecimal content of CIO 0200 is changed to 123F.

1, 2, 3...

1. Move the cursor to CIO 0200 and press F9.



2. Input the new value for CIO 0200 by pressing 123F and Enter.



Binary Data Input

In the following example, the binary content of CIO 0200 is changed to 0001001000111111.

1, 2, 3...

1. Move the cursor to CIO 0200 and press F9.

2. Press the Tab Key once to switch to binary input.
3. Input the new value for CIO 0200 by pressing 0001001000111111 and Enter.

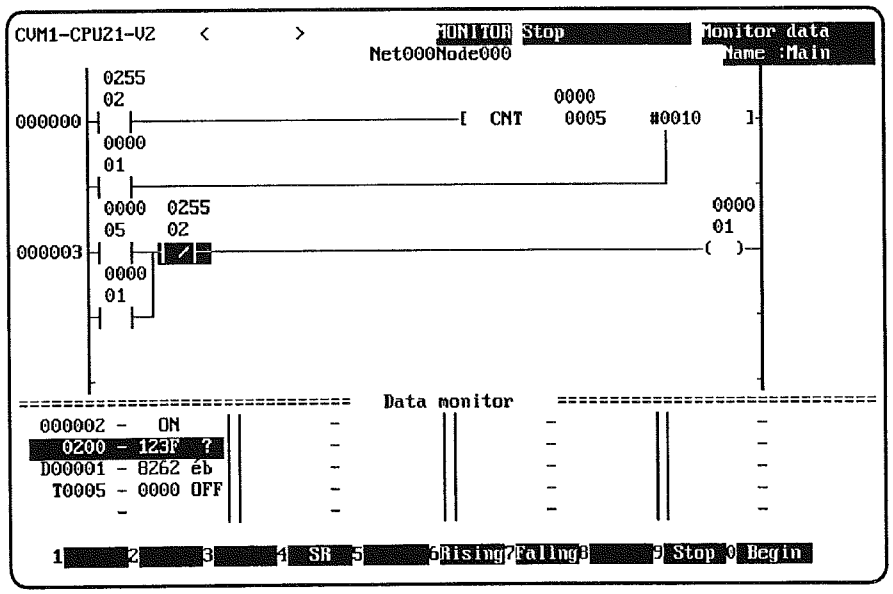
10-12-10 Pausing Displays

The F10 Key can be used to pause the Monitor Data display based on a specified condition or unconditionally.

The following conditions can be set:

- Stop monitoring when the content of the specified word equals the specified value.
- Stop monitoring on the rising edge or falling edge of a specified bit.
- Stop monitoring on the rising edge of A00814 (Trace Trigger Flag).

The following diagram shows the function key assignments when the F10 Key is pressed.



The operation of the Monitor Data pause function is identical to the pause function for the basic monitoring display. Refer to *10-8 Pausing Displays* for details.

10-13 Online Editing

The Online Edit operation is used to make simple changes to the PC's program without interrupting its operation in MONITOR mode. This operation is useful for editing I/O comments and block comments.

⚠ Caution Never edit a program or other data online without first confirming that no problems will result even if the cycle time is extended. Online editing can cause the cycle time to increase, possibly causing input signals to be read late or not at all. Depending on the controlled system, changes to cycle time can have serious and unexpected results.

The programs in the PC and the computer are edited simultaneously when the Store operation (F3) is performed. The programs in the PC and the computer must be identical. A "UM differs" error will occur if the programs are different.

Major editing operations such as large scale editing, moving instruction blocks, copying, inserting block programs, and deleting should be done to the program off-line and then transferred to the PC.

Only one instruction block can be edited at a time. The desired instruction block must be monitored before executing the Online Edit operation. A different instruction block cannot be displayed after the Online Edit operation is being used.

Only bit addresses and data areas can be changed in block programs. It is also possible to convert a bit control instruction to its opposite, i.e., AND can be converted to AND NOT and vice versa.

New instruction blocks can be added after the edited blocks, but the largest program section that can be saved with Store or Store Insert is 256 words. An error will occur if an attempt is made to save a larger program section.

Online String Input Mode

If "CMP' or "CMPL" is input when connected to a V2 CPU, CMP(028) and CMPL(029) will be found. If "CMP' or "CMPL" is input when connected to a V1 or earlier CPU, CMP(020) and CMPL(021) will be found. (Symbol inputs for these instructions are the same as in offline procedures.) Refer to *3-2-6 Inputting Basic Comparison Instructions.*

Errors

The following errors might occur during online editing:

1, 2, 3...

1. A "Cycle time over" error will be generated if instruction block additions or editing cause the PC's cycle time to exceed the maximum cycle time (watch cycle time) set in the PC Setup. This is a fatal error which will stop program execution.

   If a "Cycle time over" error occurs, clear the error, switch to PROGRAM mode and then back to MONITOR mode to restart PC operation. If the error cannot be cleared, modify the program to reduce the cycle time or increase the watch cycle time in the PC Setup and then clear the error.

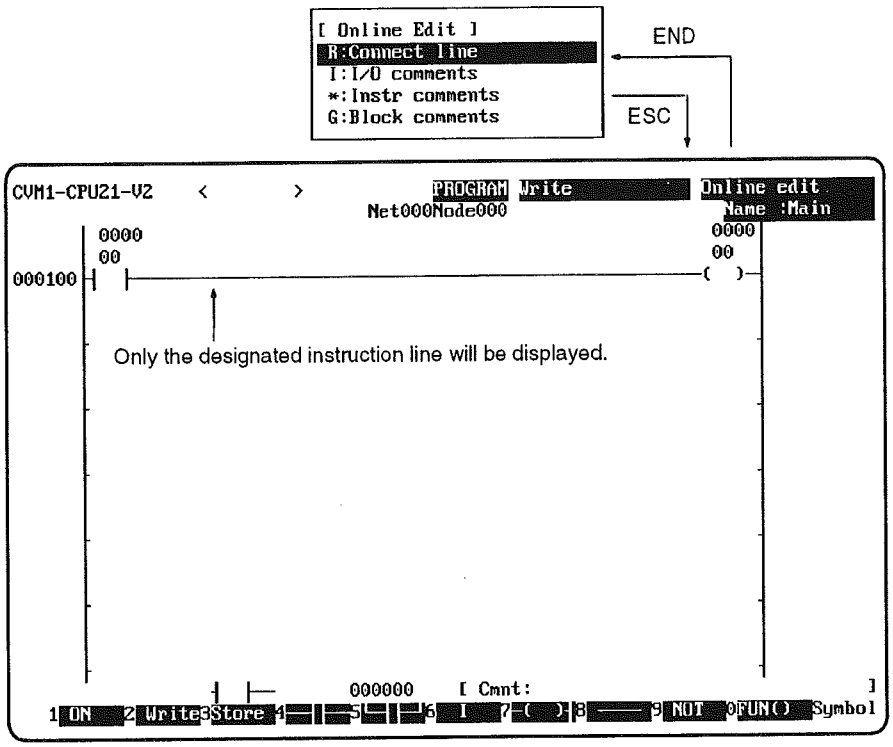
2. Insertion of a JME instruction can stop PC operation for as much as 2 seconds in CVM1-V1 PCs and as much as 0.8 seconds in CVM1-V2 PCs. Insertion of other instructions such as JMP, SBN, BPRG, BEND, and END cause little delay in PC operation. The actual time delay that occurs depends not only on the instruction that is inserted, but on the position in the program where it is being inserted.

10-13-1 Online Editing Procedure

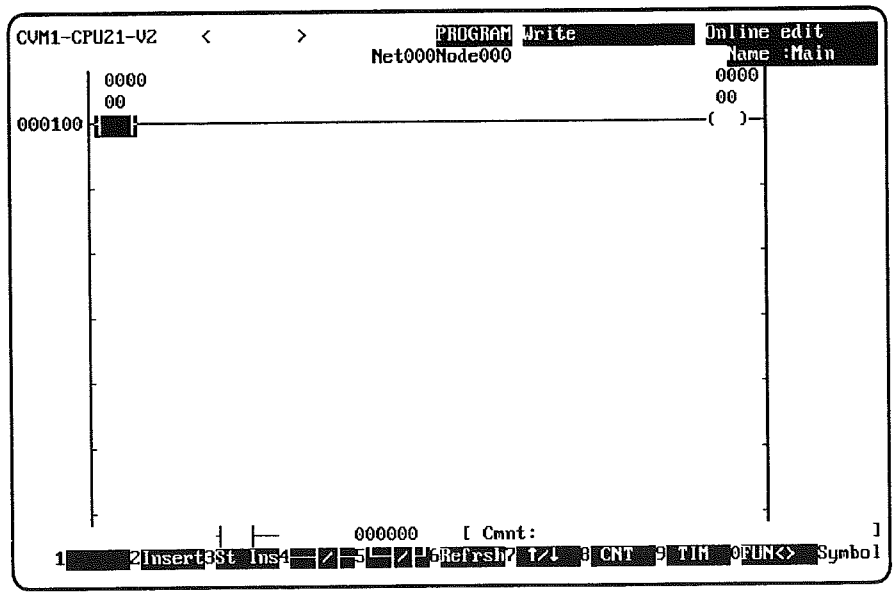
1, 2, 3...

1. Display the desired instruction block on the lowest part of the screen using the PageUp or PageDown Keys.
2. Press the End Key to display the Monitor Menu and select "O:Online edit."

3. Move the cursor to the desired instruction block and select it by pressing Enter. The online editing display will appear. Press the End Key to display the Online Edit Menu and press the Escape Key to return to the online editing display.



4. Another set of function-key assignments can be accessed with the Shift Key. Editing of programs is accomplished in the same manner as in offline editing.

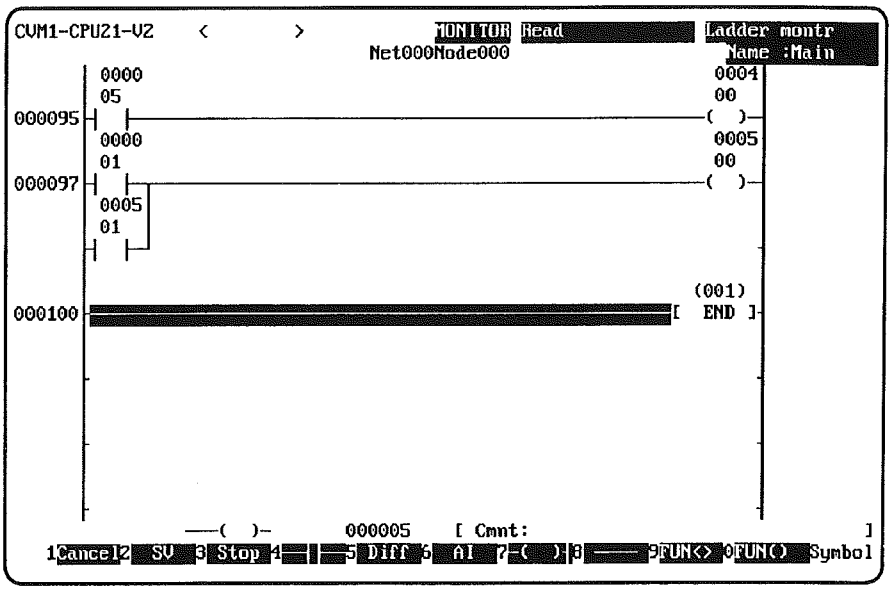


5. Save the modified instruction block by pressing F3 (Store) and Enter. Data will be written to both the computer's system work area and to the PC's program memory.

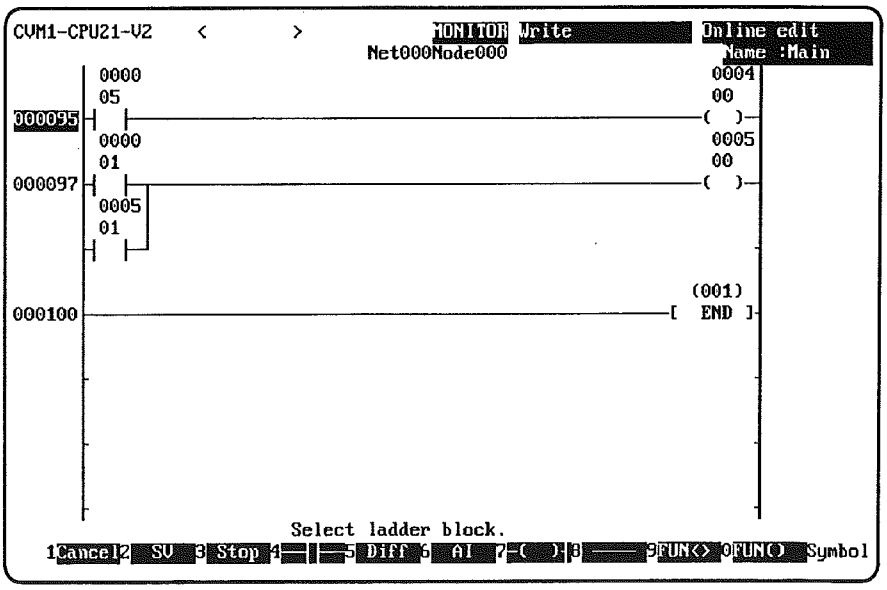
10-13-2 Online Editing Example

In the following example, online editing is used to add an execution condition and change the bit operand in an output instruction from CIO 000500 to CIO 000501.

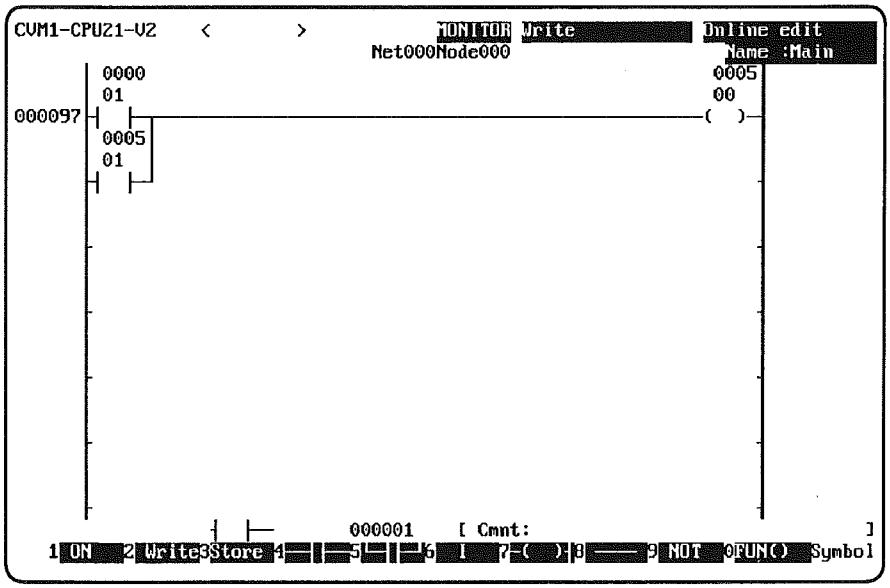
1, 2, 3... 1. Display the desired instruction block on the monitoring screen.



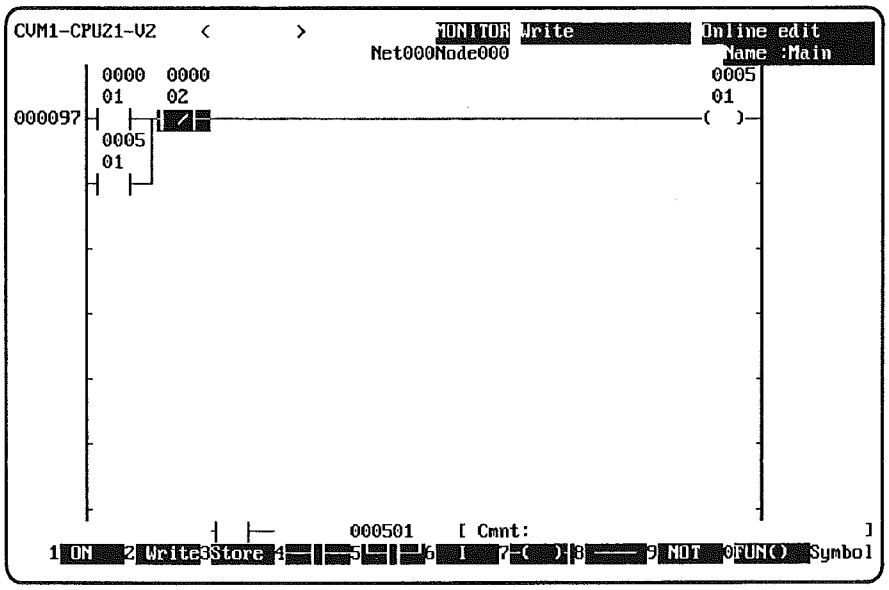
2. Select "O:Online edit" from the Monitor Menu.



3. Move the cursor to the program address of the instruction block you want to edit and press Enter. In this case, the Down Cursor Key and Enter were pressed.



4. Edit the instruction block. Press the Right Cursor Key, Shift+F4, 2, and Enter to add the normally closed condition. Press the Left Arrow Key 3 times, 501, and Enter to change the bit address of the output.



5. Save the modified instruction block by pressing F3 (Store) and Enter.

10-14 Monitoring Interrupt Programs

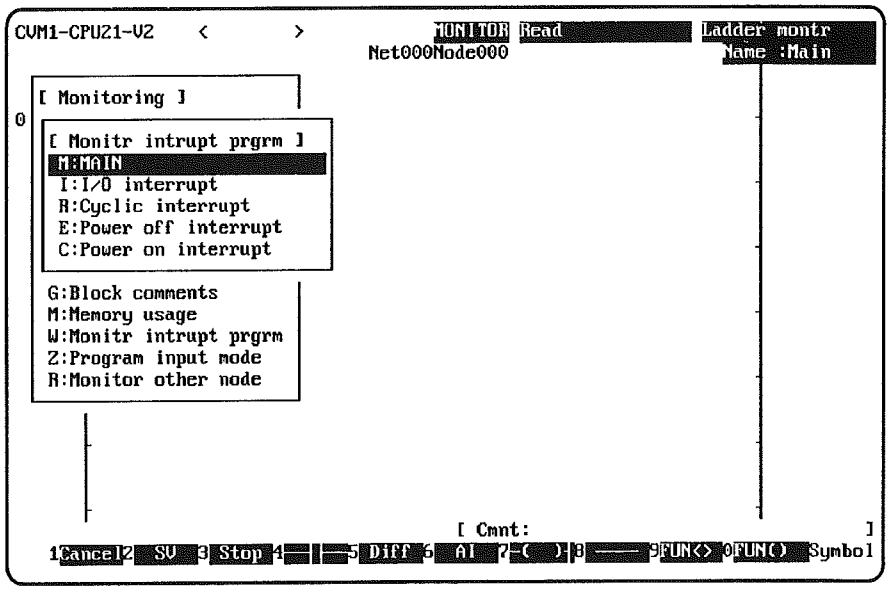
This operation is used to monitor interrupt programs, such as I/O interrupt or scheduled interrupt programs. This operation is possible in any PC mode.

There can be 32 I/O interrupts with I/O interrupt numbers 0 to 31. There can be 2 scheduled interrupts with interrupt numbers 0 or 1, except in the CVM1-CPU01 which can have only one scheduled interrupt with interrupt number 0.

The method of monitoring the programs is identical to monitoring other ladder diagrams.

1, 2, 3...

1. Select "W:Monitor intrupt progrm" from the Monitoring Menu. The following menu will appear.



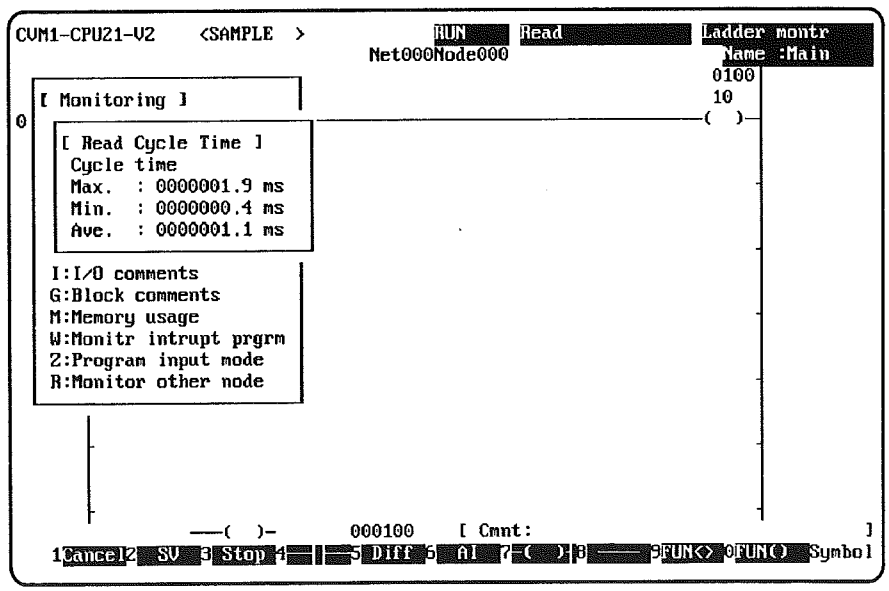
2. Select the type of program to be monitored.
3. A number input area will be displayed if an I/O interrupt program or a scheduled interrupt program is selected.
   Input the desired interrupt number and press Enter.
4. Monitor the selected interrupt program using the normal monitoring procedure.

10-15 Reading the Cycle Time

This operation is used to measure the cycle time of the program and display the maximum, minimum, and mean values. This operation is possible only in RUN and MONITOR modes.

1, 2, 3...

1. Select "Y:Read cycle time" from the menu.
2. The maximum, minimum, and mean cycle times will be displayed.



10-16 Checking Memory Usage

The Memory Usage operation shows the amount of user memory used in the PC and computer. The amount of memory used for the PC Setup and program and the amount of available user memory is taken from the PC. The amount of memory used for I/O comments and block comments is taken from the computer.

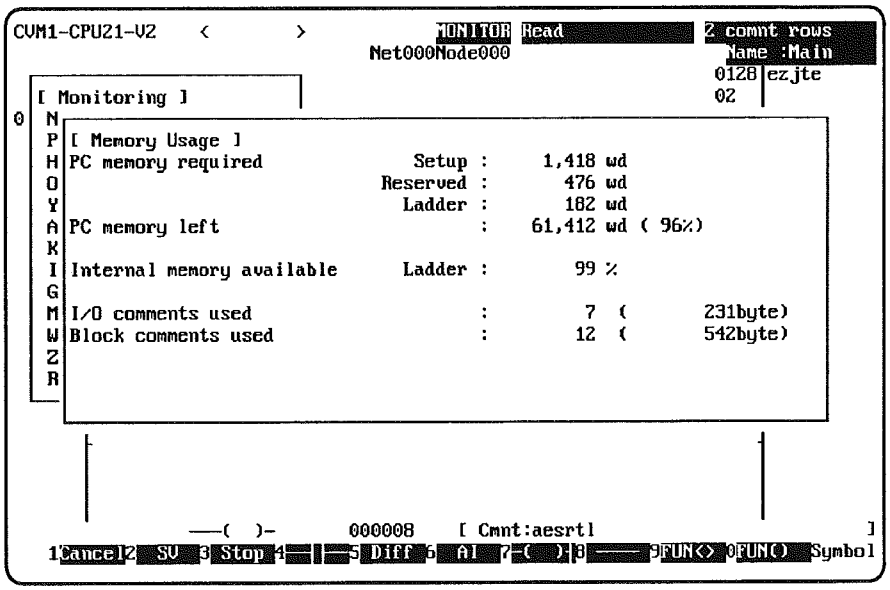
Data from the PC

Item		Description
PC memory required	Setup	Displays the entire amount of memory not used for the program.
	Reserved	Reserved memory
	Ladder	Displays the amount of PC memory occupied by ladder and mnemonic programs.
PC memory left		Shows the amount of free memory remaining in the PC as a percentage of the total.
Internal memory available		Shows the amount of free memory remaining in the user program area as a percentage.

Data from the Computer

Item	Description
I/O comments used	Displays the number of I/O comments in the computer and the memory they use.
Block comments used	Displays the number of block comments in the computer and the memory they use.

Procedure To check the memory usage, select "M:Memory usage" from the Monitor Menu. The following display shows a typical result:

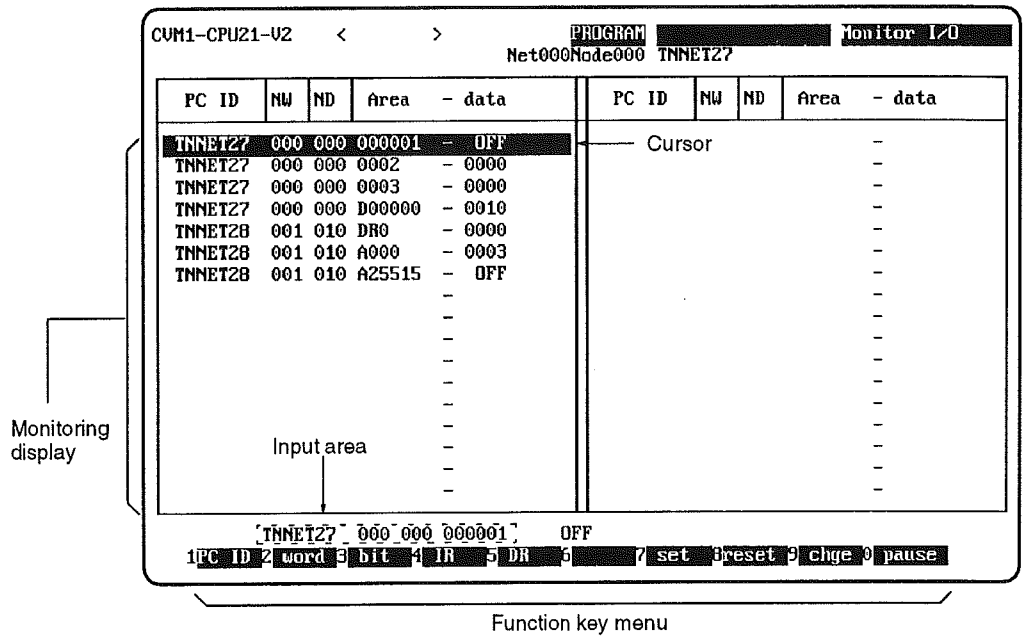


10-17 Monitoring Other Nodes

The Monitor Other Node operation can be used to monitor the status of bits and words in other nodes. This operation is useful when data must be simultaneously monitored in the local node and other nodes in the network.

10-17-1 Monitor Data Display

The Monitor I/O display will appear when "R:Monitor other node" is selected from the Monitor Menu.



The following information is shown in the Monitor I/O display area.

No.	Item	Description
1	PC ID	Indicates a PC ID set with the offline *Edit PC ID* operation.
2	NW	Indicates the network address of the PC being monitored. The default is 000 (the PC directly connected to the computer).
3	ND	Indicates the node address of the PC being monitored. The default is 000 (the PC directly connected to the computer).
4	Area (see note)	Indicates the bit or word address in CIO (CIO 0000 to 2555), CPU Bus Link, Auxiliary, Timer, Counter, DM, EM, Data Register, or Index Register Area being monitored. In the EM area, the bank number is displayed after E (for EM), followed by the word address.
5	Data	Indicates the ON/OFF status of the monitored inputs. The status of words monitored is displayed as a 4-digit hexadecimal value. Timer or counter values are displayed when a timer or counter is monitored with the monitor data. If a timer or counter has been force-set/reset, an "S" (for set) or an "R" (for reset) and the ON/OFF status will be displayed. The ON (active) or OFF (inactive) status is displayed for steps, transitions, and actions. If a bit has been force-set/reset, an "S" (for set) or an "R" (for reset) will be displayed after a dash "–."

10-17-2 Function Key Operations

The following table describes the operations assigned to function keys in the "R:Monitor other node" operation.

Key(s)	Operation	Description
F1	PC ID	Used to input the PC ID.
F2	Word[1]	Used to input word addresses.
F3	Bit[1]	Used to input bit addresses.
F4	IR[1]	Used to input an index register.
F5	DR[1]	Used to input a data register.
F7	Set	Force-sets a bit.
F8	Reset	Force-resets a bit.
F9	Chge	Changes present values (PVs). Results of this operation are displayed on the screen.
F10	Pause[2]	Freezes the monitoring display. PC operation will continue uninterrupted.
Shift+F1	Netwk	Used to input the PC network and node addresses.
Shift+F2	HEX:AS	Displays the content of a word or register in ASCII.
Shift+F3	CanAll	Clears all forced sets and resets for all inputs in the same network and node.
Shift+F4	Canc	Clears the forced set or reset for the bit at the cursor.
Shift+F5	Clear	Clears the entire monitor data display area.
Shift+F6	C-series	Selects C or CV-series PCs. When a C-series PC is selected, a "C" is displayed to the left of the PC ID area.

Note

1. The monitor area will be cleared if the a specified data area doesn't exist in the PC being monitored, for example, if the EM Area is specified for a CVM1-CPU01.
2. Do not set pause conditions which are established only for a short time, such as those that will be ON for one cycle only. Also, the pause condition may not be recognized if the PC's communication cycle is too long.

SECTION 11
DM Editing

This section explains the various operations accessed through the online DM Menu. These operations are used to edit and transfer DM/EM Area data.

11-1 The DM Menu 296
11-2 Saving DM/EM Data 298
11-3 Retrieving DM/EM Data 299
11-4 Transferring DM/EM Data 300
11-5 Comparing DM/EM Data 302

11-1 The DM Menu

Data can be written to the PC's DM/EM Area and displayed in either hexadecimal or ASCII code. The contents of the DM/EM Area can be saved to data disks, read from data disks, and printed. DM/EM data can also be transferred between the PC and the personal computer running SSS.

The following table lists the operations that can be selected from the online DM Menu. Select an operation by pressing its corresponding letter or moving the cursor to the operation and pressing the Enter Key. These operations are described briefly in the following table and some (saving, retrieving, transferring, and comparing DM/EM data) are explained in more detail later in this section. The rest of the operations are the save as for offline mode, so refer to *Section 4 Editing DM* for more details.

Operation	Function
D:Read DM addr	Reads the data for a specified address from the DM/EM Area of the PC. Up to 160 words can be displayed on a single screen.
C:Copy	Copies multiple, consecutive words of DM/EM data to a specified destination address.
F:Fill	Places a specified value into multiple, consecutive words of the DM/EM Area. Filling with 0000 clears the words.
R:Print	Prints multiple, consecutive words of DM/EM data.
A:HEX ↔ ASCII	Sets input to hexadecimal or ASCII. The mode set will be displayed in the top-right of the screen.
B:Switch Bank #	Switches editing between the standard DM and EM banks.
S:Save DM data	Saves the DM/EM data from the system work area to the data disk.
L:Retrieve DM data	Retrieves the DM/EM data on the data disk DM/EM Area to the system work area.
T:Trans DM	Transfers DM/EM data between the PC and computer and compares the data.

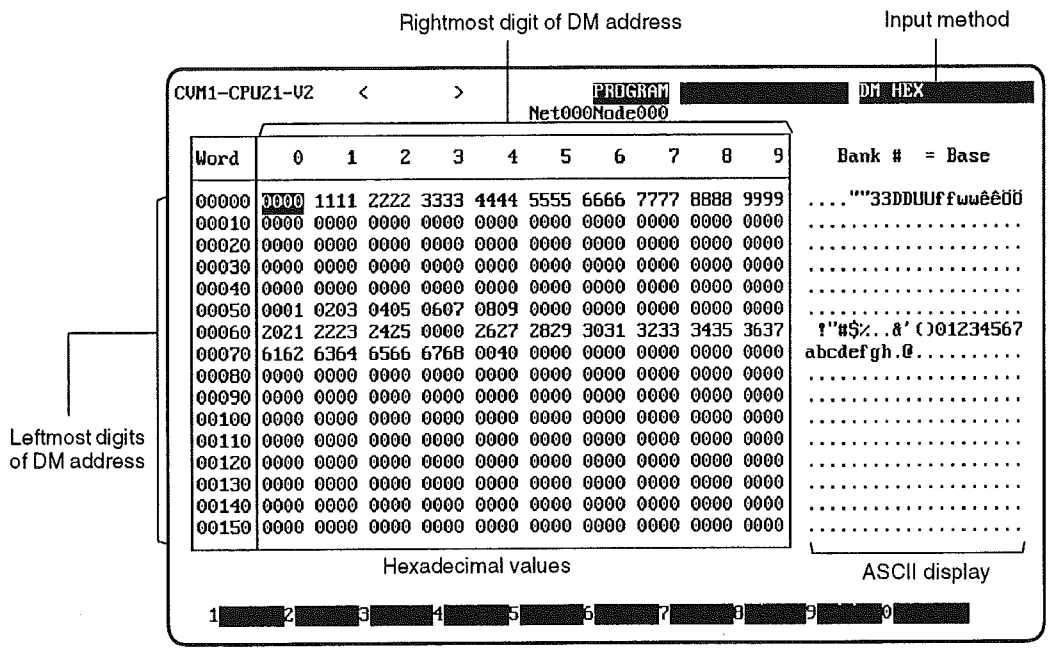
The following table shows which DM Menu operations can be used in each of the PC modes.

Operation		RUN	MONITOR	DEBUG	PROGRAM
D:Read DM addr		Yes	Yes	Yes	Yes
C:Copy		No	Yes	Yes	Yes
F:Fill		No	Yes	Yes	Yes
R:Print		Yes	Yes	Yes	Yes
A:HEX → ASCII		Yes	Yes	Yes	Yes
B:Switch Bank #		Yes	Yes	Yes	Yes
S:Save DM data		Yes	Yes	Yes	Yes
L:Retrieve DM data		No	Yes	Yes	Yes
T:Trans DM	R:PC → Computer	Yes	Yes	Yes	Yes
	W:Computer → PC	No	Yes	Yes	Yes
	V:Verify	Yes	Yes	Yes	Yes
DM data write		No	Yes	Yes	Yes

Displaying the Initial DM Screen

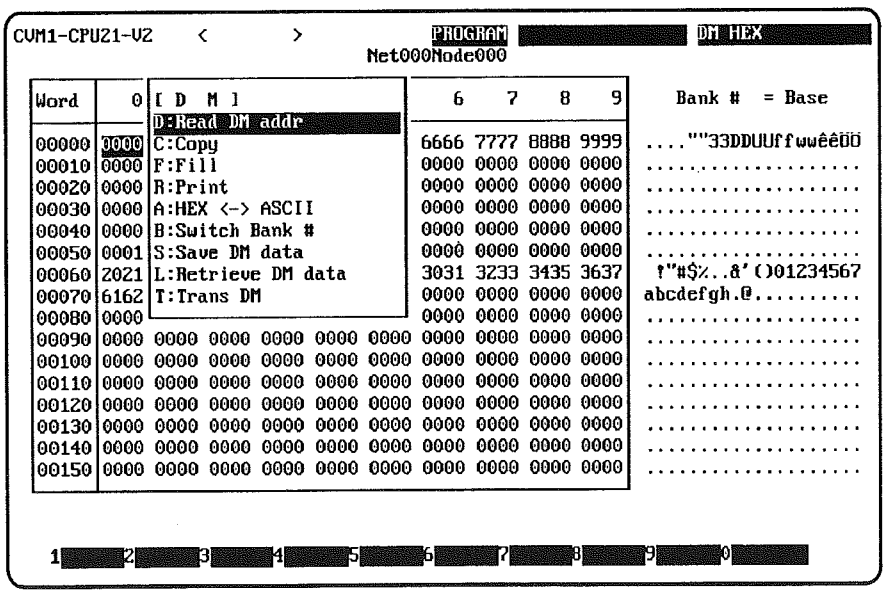
To display the initial DM screen, select "DM" from the top-level menu. The following screen will then be displayed.

Basic operations are the same for offline except that the DM/EM data in the PC is affected.



Displaying the DM Menu

To display the DM Menu, press the End Key while at the initial DM screen. The following menu will be displayed. All operations are the same as for offline operation, except that "T:Trans DM" can only be executed in the online mode.



DM/EM Capacity

DM and EM (Expansion DM) Area capacities vary according to the PC model, as shown in the following table. (The CVM1-CPU01-E and CVM1-CPU11-E have no EM Area.)

PC	DM	EM
CVM1-CPU01-E	8,192	---
CVM1-CPU11-E	24,576	---
CVM1-CPU21-E	24,576	32,768

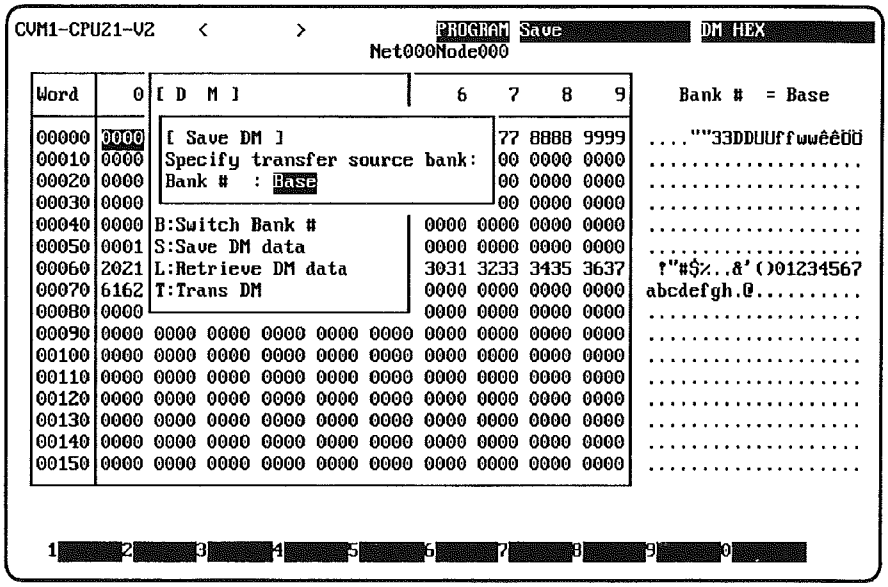
11-2 Saving DM/EM Data

The Save DM Data operation saves the DM or EM data from the system work area to the data disk. It is not possible, however, to save only a specified series of addresses (D0300 to D0800, for example), and then retrieve them to a specified DM location (D0500 onwards, for example).

Procedure

1, 2, 3...

1. Select "S:Save DM Data" from the DM Menu.

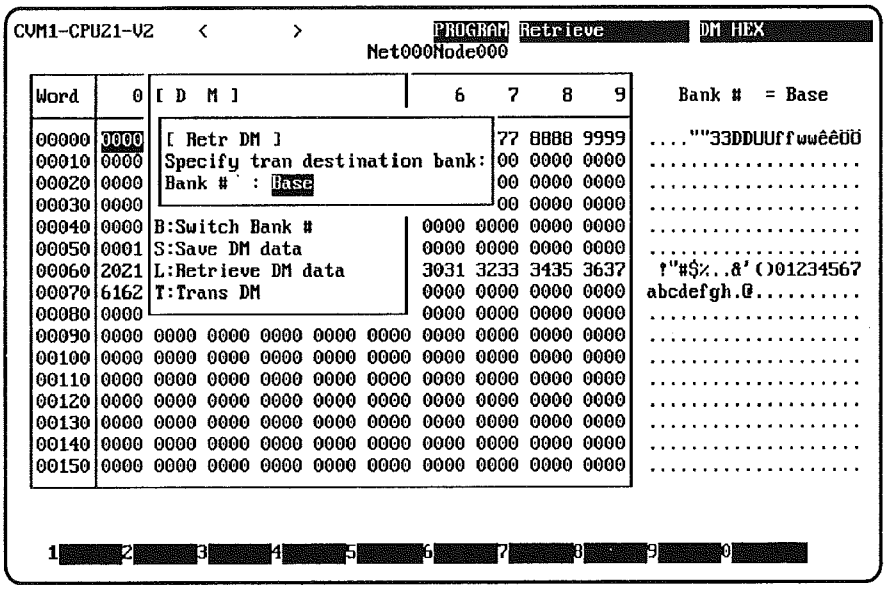


2. To save the DM data, simply press the Enter Key. To save EM, input the bank number from the PC that is the transfer source, and the press the Enter Key. Input "B" and press the Enter Key to return the bank number display to "Base" (i.e., the DM Area).
3. From this point on, the operations are the same as for offline mode. (Refer to *4-3-8 Saving DM Data*.

11-3 Retrieving DM/EM Data

The Retrieve DM Data operation reads DM/EM data from a data disk to the DM Area or a specified EM bank in the PC.

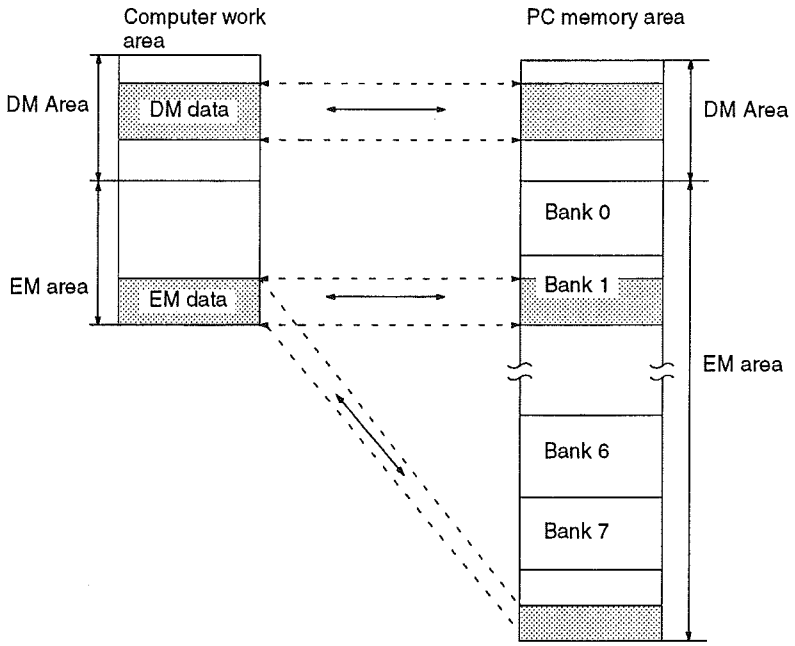
1, 2, 3... 1. Select "L:Retrieve DM data" from the DM Menu.



2. To retrieve DM data, simply press the Enter Key. To retrieve EM data, input the bank number from the PC that is the transfer destination, and the press the Enter Key. Input "B" and press the Enter Key to return the bank number display to "Base" (i.e., the DM Area).
3. From this point on, the operations are the same as for offline mode. (Refer to *4-3-9 Retrieving DM Data.*

11-4 Transferring DM/EM Data

The Transfer DM operation transfers DM/EM data between the memory areas shown in the following illustration. Data can be transferred in either direction and compared while the PC is in any mode but RUN. While the PC is in RUN mode, data can be transferred from the PC to the computer and compared, but data cannot be transferred from the computer to the PC.



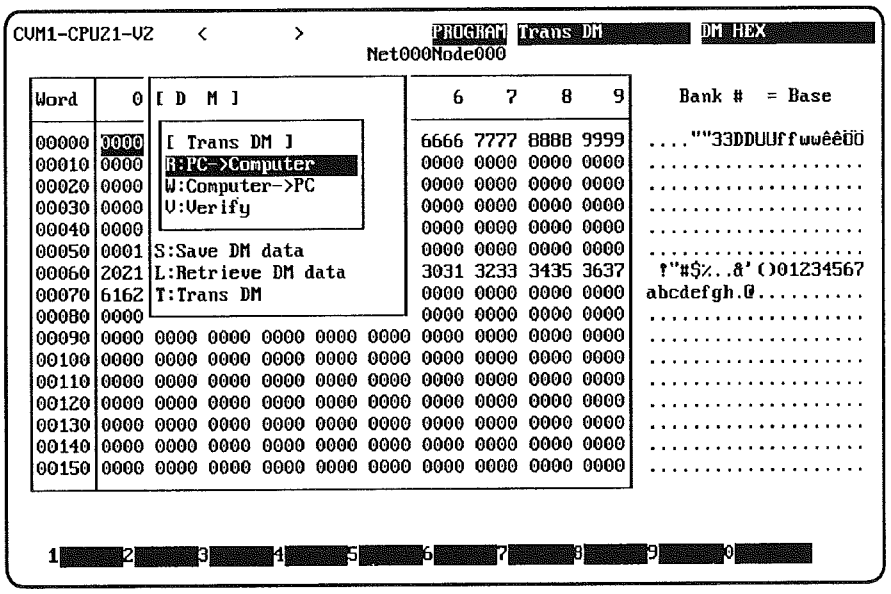
As indicated in the diagram, the system work area at the computer has only one bank for the EM Area, but PCs with EM can have seven banks.

New EM data created on the RAM disk or edited data previously read from the PC can be transferred to any bank 0 to 7 of the EM Area in the PC.

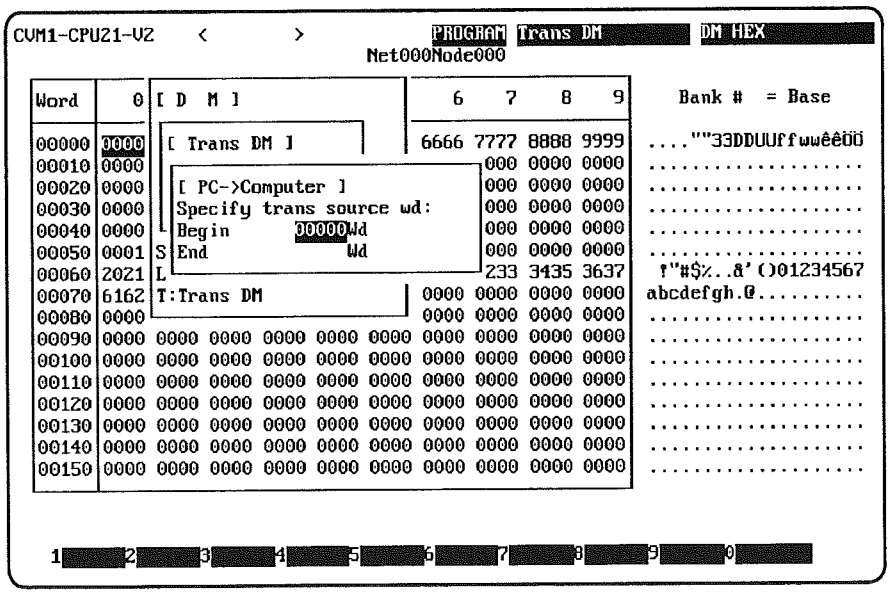
Data can be transferred and compared between any specified words. However, transfer and comparison are not possible between the DM Area and an EM bank.

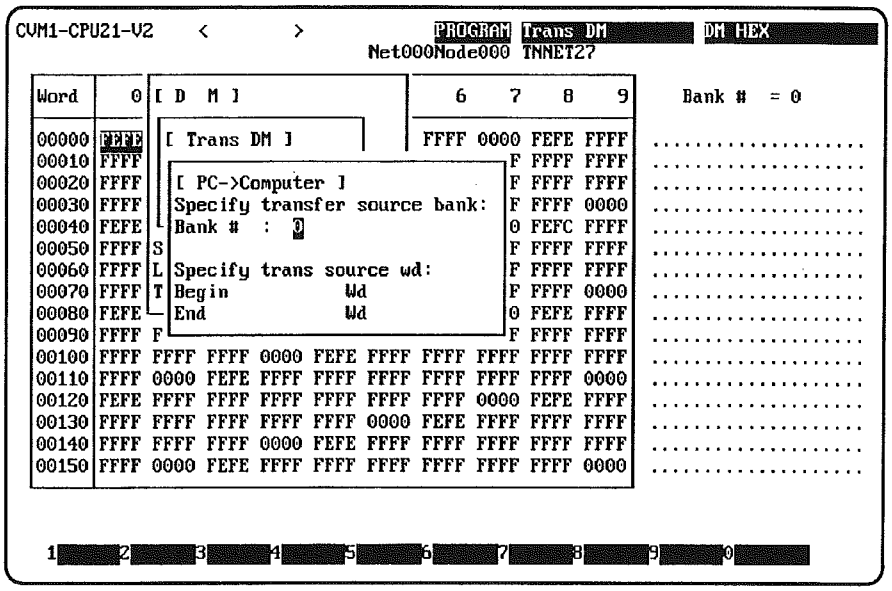
Procedure

1, 2, 3... 1. Select "T:Trans DM" from the DM Menu.



2. To transfer data from the computer to the PC, select "R:PC → computer." To transfer data from the PC to the computer, select "W:Computer → PC." The screen for entering the beginning and ending word addresses will be displayed. (The screens shown in the example here are for transferring data from the PC to the computer.)





3. For EM, enter the bank number (0 to 7).
4. Enter the beginning and ending word addresses, and press the Enter Key. While the data is being transferred, a screen display will show the percentage of data transferred so far.

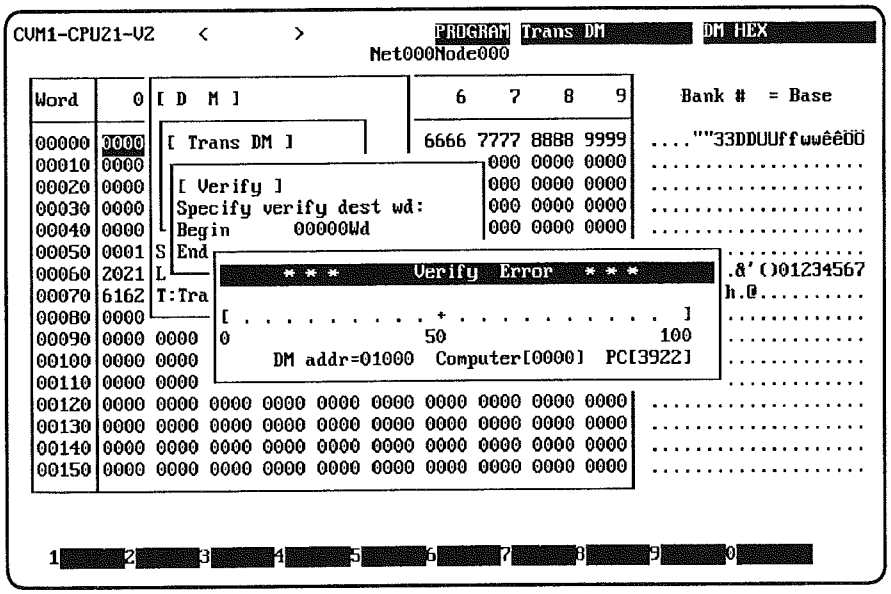
11-5 Comparing DM/EM Data

The Verify operation compares DM/EM data from the PC and the computer.

1, 2, 3...

1. Select "T:Trans DM" from the DM Menu.
2. Select "V:Verify." The screen for entering the beginning and ending word addresses for the comparison will be displayed.
3. For EM, enter the bank number (0 to 7).

4. Enter the beginning and ending word addresses, and press the Enter Key. While the data is being compared, a screen display will show the percentage of data compared so far. If there is a difference in the DM/EM data, the following screen will be displayed and the comparison will stop.



The address where the difference was found will be displayed at the bottom of the screen. To resume the comparison, press any key. To return to the DM editing screen, press the Escape Key.

SECTION 12
Editing I/O Tables

This section explains the various commands within the I/O Table Menu. These operations can be used to create, edit, and transfer the PC's I/O table from the computer.

Refer to *Part 2: Offline Operation* for commands that operate on the computer's I/O table.

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12-1-1 I/O Table Menu 306
12-1-2 Displaying the PC's I/O Table 307
12-2 Transferring/Comparing I/O Tables 309
12-2-1 Uploading the I/O Table 309
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12-3-2 SYSMAC BUS Slaves 312
12-3-3 Help Screens 313
12-4 Creating I/O Tables 314
12-5 Changing I/O Tables 314
12-6 Verifying I/O Tables 316

12-1 Introduction

An I/O table lists the Units that make up the PC; the PC references the I/O table to allocate I/O words and control the Units during operation. The online I/O table operations are used perform the following operations on the I/O table registered in the PC:

- Display and edit the I/O table.
- Transfer I/O tables between the PC and computer.
- Compare the PC's I/O table with the one in the computer.
- Register the actual Units mounted to the PC in the I/O table.
- Compare the actual Units mounted to the PC and the I/O table in the PC.

The following table lists the operations that can be selected from the I/O Table Menu.

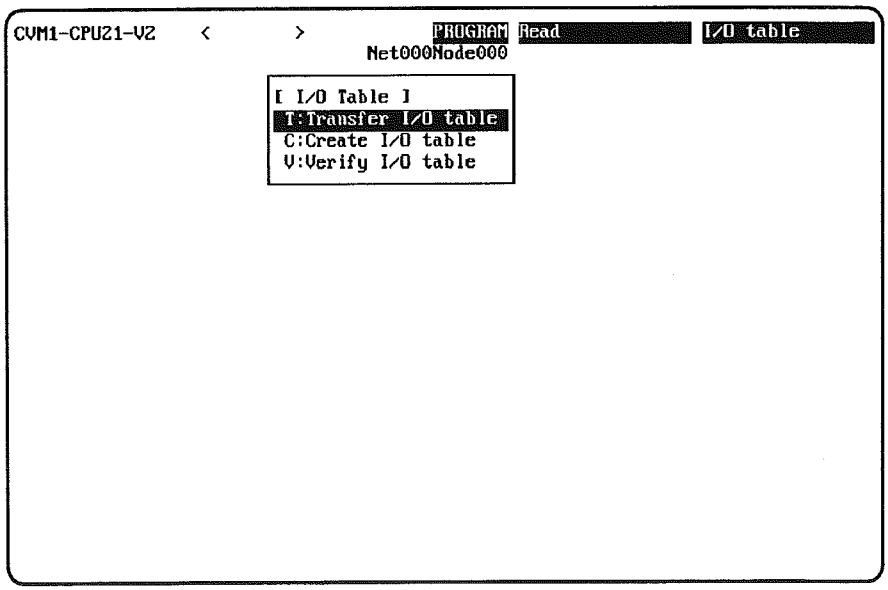
Operation	Function
T:Transfer I/O table	Writes the I/O table from the PC to the system work area. Writes the I/O table data from the system work area to the PC. Compares the I/O tables in the system work area and the PC. An error table will show any errors discovered during comparison.
C:Create I/O table	Registers the actual Units mounted to the PC to the I/O table.
V:Verify I/O table	Compares the contents of the I/O table in the PC and the actual Units mounted to the PC and displays any errors found.

When displaying the I/O table edit display, first transfer the I/O table from the PC to the computer with the Transfer I/O Table operation.

⚠ Caution The registered I/O table will not necessarily agree with the Units actually mounted to the PC unless the Create I/O Table operation is executed or unless the Verify I/O Table shows that the registered I/O table agrees with the actual Units. The display at the SSS always shows the registered I/O table.

12-1-1 I/O Table Menu

The I/O Table Menu is displayed when "I/O Table" is selected from the top-level online menu.



Valid PC Modes The following table shows the PC modes in which each operation can be executed.

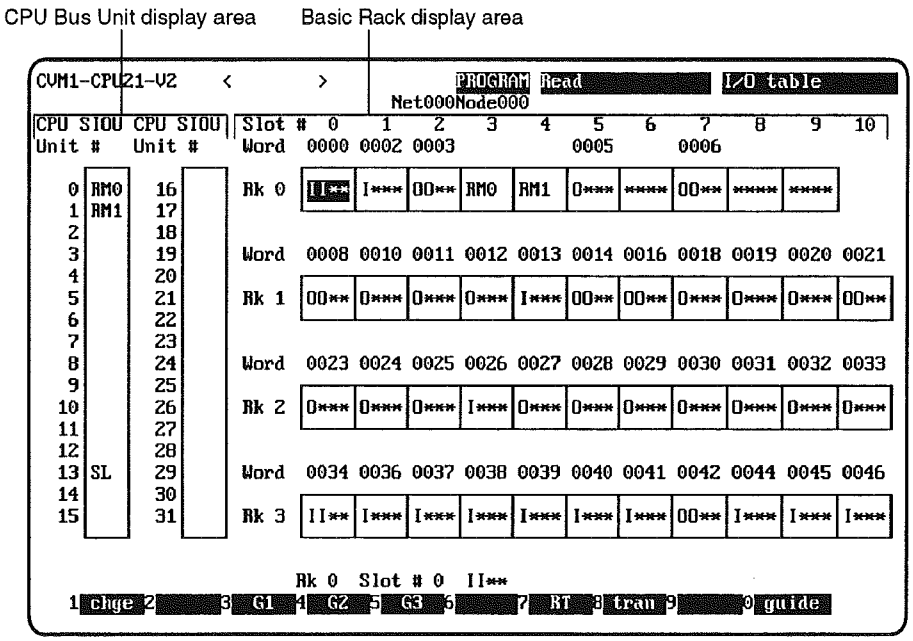
Operation		RUN	MONITOR	DEBUG	PROGRAM
T:Transfer I/O table	R:PC → Computer	OK	OK	OK	OK
	W:Computer → PC	No	No	No	OK
	V:Compare I/O table	OK	OK	OK	OK
C:Create I/O table		No	No	No	OK
V:Verify I/O table		OK	OK	OK	OK

When a change has been made to the Units mounted to the PC, use the Create I/O Table operation to register a new I/O table in the PC.

Any changes made to the I/O table in the SSS offline will be deleted when the Create I/O Table operation is performed.

12-1-2 Displaying the PC's I/O Table

The PC's I/O table is displayed automatically when the I/O table is transferred to the computer using the Transfer I/O Table operation. Refer to *12-2-1 Uploading the I/O Table* for details on this operation.



The PageUp/PageDown Keys can be used to display the previous/next page of the I/O table, and the Cursor Keys can be used to move the cursor within the page.

Press the Shift+Left Cursor Keys to move the cursor from the right side of the display (rack display) to the left side of the display (CPU Bus Unit display), and press the Shift+Right Cursor Keys to move the cursor back to the right side of the display.

Display Codes

I/O Units

The following table shows the I/O table display codes for I/O Units.

Code	Unit	Code	Unit	Code	Unit
	No unit 8-pt Output 8-pt Input 16-pt Output 16-pt Input 16-pt Dummy 32-pt Output 32-pt Input		32-pt I/O 32-pt Dummy 64-pt Output 64-pt Input 64-pt I/O 64-pt Dummy 128-pt Output 128-pt Input		128-pt I/O 128-pt Dummy 256-pt Output 256-pt Input 256-pt I/O 256-pt Dummy

SYSMAC BUS Masters
The display code is RM#, where # is master number (0 to 7).

Interrupt Units
The display code is INT#, where # is Interrupt Unit number (0 to 3).

Optical I/O Units and I/O Terminals

Display code	Unit
O	8-pt Output
I	8-pt Input
W	Duplicated unit

Units with Group-2 Events

Display code	Unit
4MH	32-pt I/O
0NH	No I/O

CPU Bus Unit Display Codes
SYSMAC BUS/2 Masters: RM#, where # is master number (0 to 3).
SYSMAC LINK Units: SL
SYSMAC NET Link Units: SN
Basic Units: BA
Personal Computer Units: VP
Host Link Units: LK
ME-NET Interface Unit ME
Module Interface Unit MI
Position Control Unit: MC

The unit number will appear to the left of the display code in the CPU Bus Unit display area. It is not necessary to input the master number. The unit numbers are automatically assigned and displayed in ascending order.

Function Keys

The following table describes the functions performed by function keys when the I/O table is being displayed.

Key	Name	Description
F1	Chge	Changes or registers I/O Units in the PC's I/O table. Use this operation to reserve I/O words for I/O Units that will be added later or to prevent word allocation to unused I/O Units
F3	G1	Displays the I/O table for Group-1 Slaves connected to SYSMAC BUS/2. (See note 1.)
F4	G2	Displays the I/O table for Group-2 Slaves connected to SYSMAC BUS/2. (See note 1.)
F5	G3	Displays the I/O table for Group-3 Slaves (Slave Racks) connected to SYSMAC BUS/2. (See note 1.)
F7	RT	Displays the I/O table for Slaves connected to a SYSMAC BUS Master. (See note 2.)
F8	Tran	Display the I/O table for Optical I/O Units, I/O Terminals, or I/O Link Units connected to a SYSMAC BUS Master. (See note 2.)
F10	Guide	Displays a help screen explaining the Unit display codes.

Note

1. Move the cursor to the unit number of the desired Master in the CPU Bus Unit area and then press the appropriate function key.
2. Move the cursor to the desired Master on the basic Rack and then press the appropriate function key.
3. The following table shows the PC modes in which each function key operation can be executed.

Operation	RUN	MONITOR	DEBUG	PROGRAM
F1: Chge	No	No	No	OK
F3, F4, F5, F7, and F8: G1, G2, G3, RT, and Tran	OK	OK	OK	OK

12-2 Transferring/Comparing I/O Tables

The three operations in the Transfer I/O Table Menu are used to transfer I/O tables between the computer and PC and to compare the I/O table in the computer's system work area with the I/O table in the PC.

12-2-1 Uploading the I/O Table

This operation copies the PC's I/O table to the computer's system work area; it is possible in any PC mode.

1, 2, 3...

1. Select "T:Transfer I/O table" from the I/O Table Menu.
2. Select "R:PC → Computer." A confirmation prompt will be displayed.
3. Enter "Y" to transfer the I/O table, "N" to cancel the transfer.

12-2-2 Downloading the I/O Table

This operation copies the I/O table in the computer's system work area to the PC; it is possible only when the PC is in PROGRAM mode.

⚠ **Caution** Turn the PC off and then on again after transferring the I/O table to the PC.

1, 2, 3...

1. Select "T:Transfer I/O table" from the I/O Table Menu.
2. Select "W:Computer → PC." A confirmation prompt will be displayed.
3. Enter "Y" to transfer the I/O table, "N" to cancel the transfer.

12-2-3 Comparing I/O Tables

This operation compares the I/O table in the computer's system work area to the I/O table in the PC. This operation is useful when comparing the PC's I/O table to an I/O table created offline in the computer.

Note To compare the I/O table in the PC with the actual Units mounted to the PC, use the Verify I/O Table operation on the main I/O Table Menu. See page 316 for details.

Comparison errors are displayed on separate pages for different Racks or groups of Units.

Error messages are the same as when comparing the I/O table in the PC to the actual Units mounted to the PC. Refer to *12-6 Verifying I/O Tables* for details on the displays and error messages.

1, 2, 3...

1. Select "T:Transfer I/O table" from the I/O Table Menu.
2. Select "C:Compare I/O table." The comparison results will be displayed on-screen.

12-3 Displaying I/O Tables

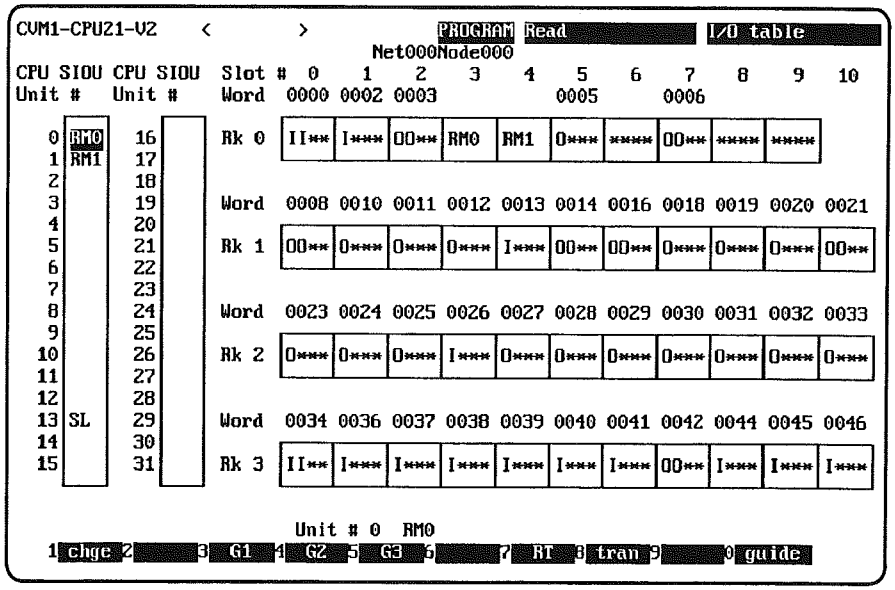
This section shows how to display the I/O tables for SYSMAC BUS/2 Slaves, SYSMAC BUS Slave Racks, and Optical I/O Units or I/O Terminals.

12-3-1 SYSMAC BUS/2 Slaves

Use the following procedure to display the I/O tables for Group-1, -2, or -3 Slaves connected to SYSMAC BUS/2 Masters.

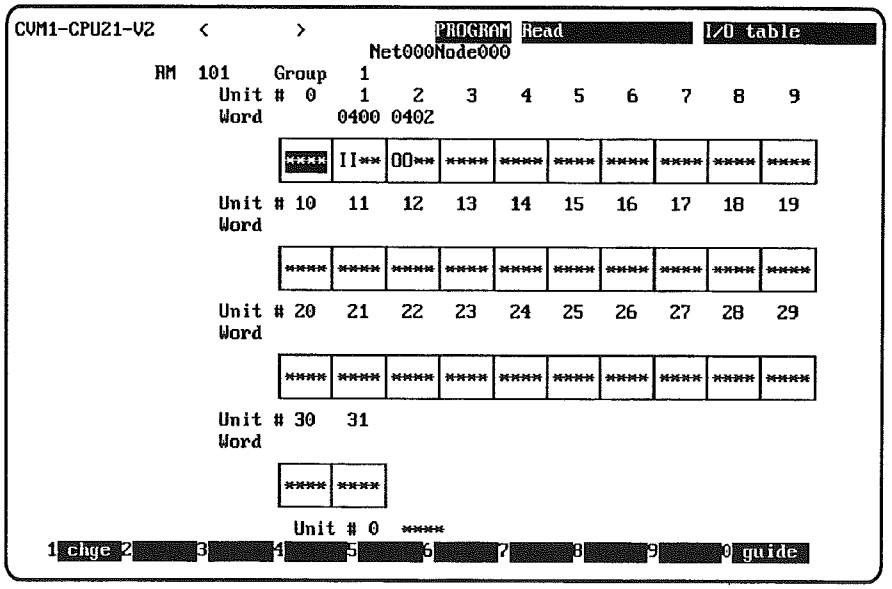
1, 2, 3...

1. While the I/O table editing display is on-screen, press the Shift+Left Cursor Keys to move the cursor to the CPU Bus Unit area.

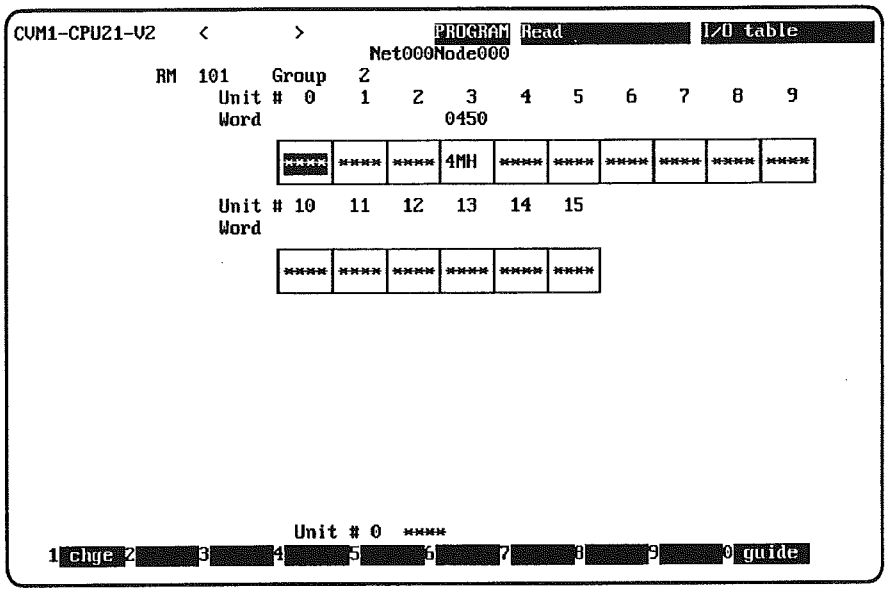


2. Move the cursor to RM0.
3. Press the F3, F4, or F5 Key to display the I/O tables for Group-1, -2, or -3 Slaves connected to the Master. Examples are shown below.

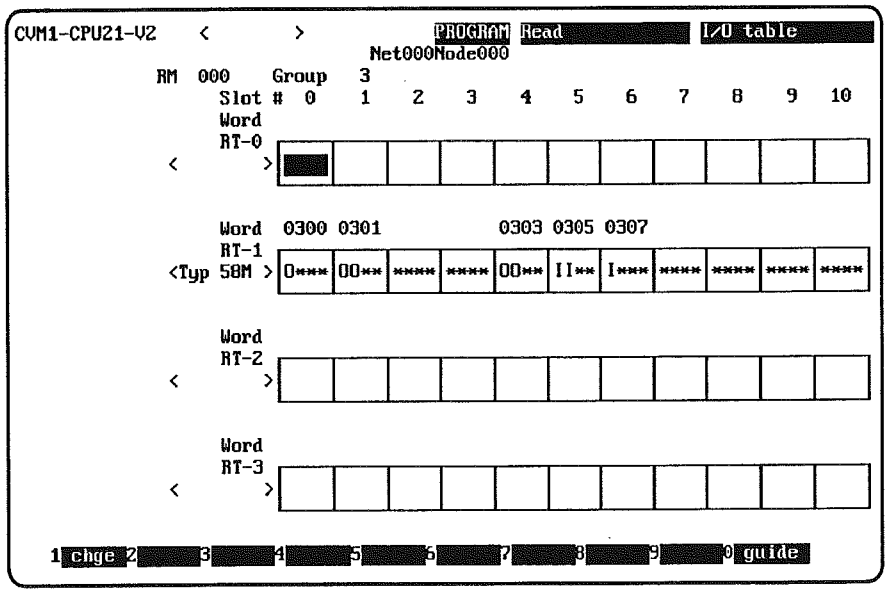
   Press F3 to display the I/O tables for Group-1 Slaves.



or Press F4 to display the I/O tables for Group-2 Slaves.



or Press F5 to display the I/O tables for Group-3 Slaves.

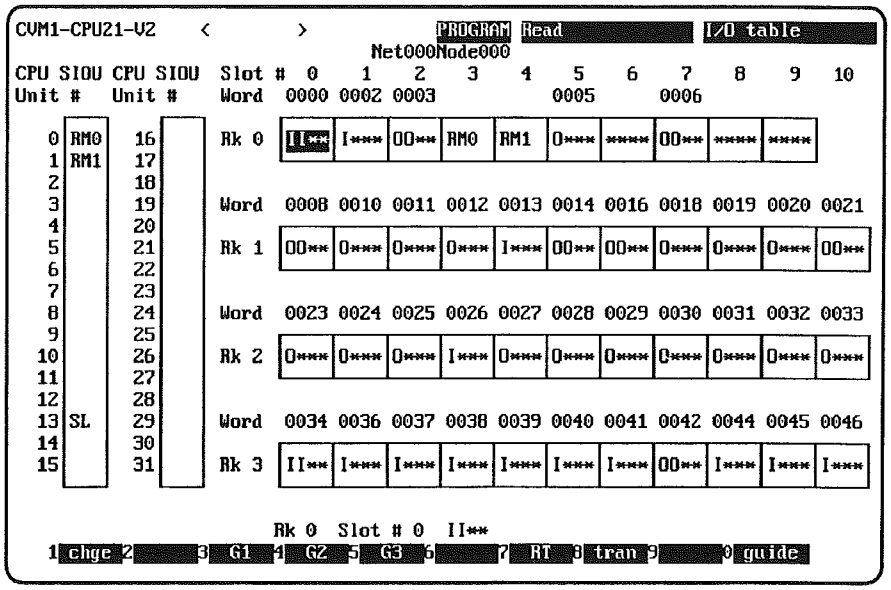


12-3-2 SYSMAC BUS Slaves

Use the following procedure to display the I/O tables for Slave Racks and Optical I/O Units or I/O Terminals connected to SYSMAC BUS Masters.

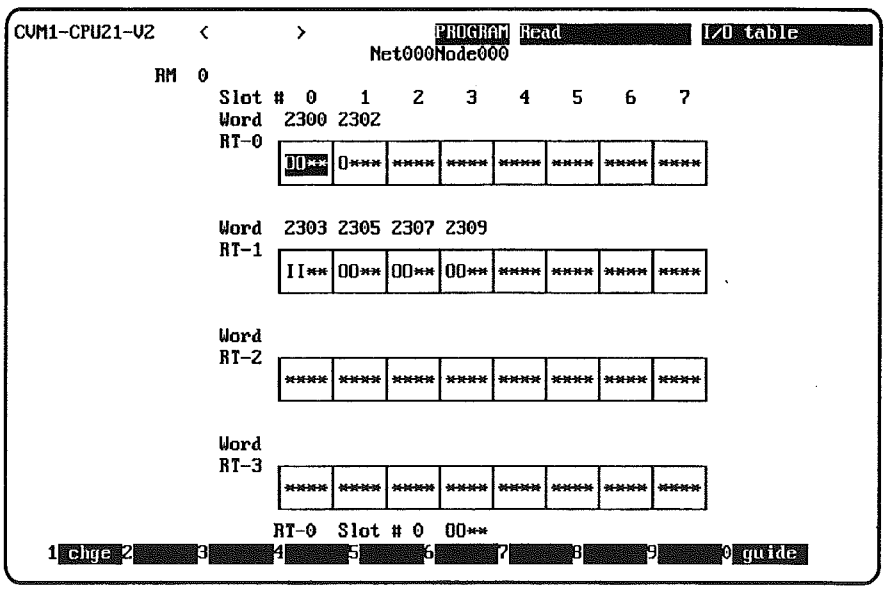
1, 2, 3...

1. While the I/O table editing display is on-screen, press the Shift+Right Cursor Keys to move the cursor to the Basic Rack area.

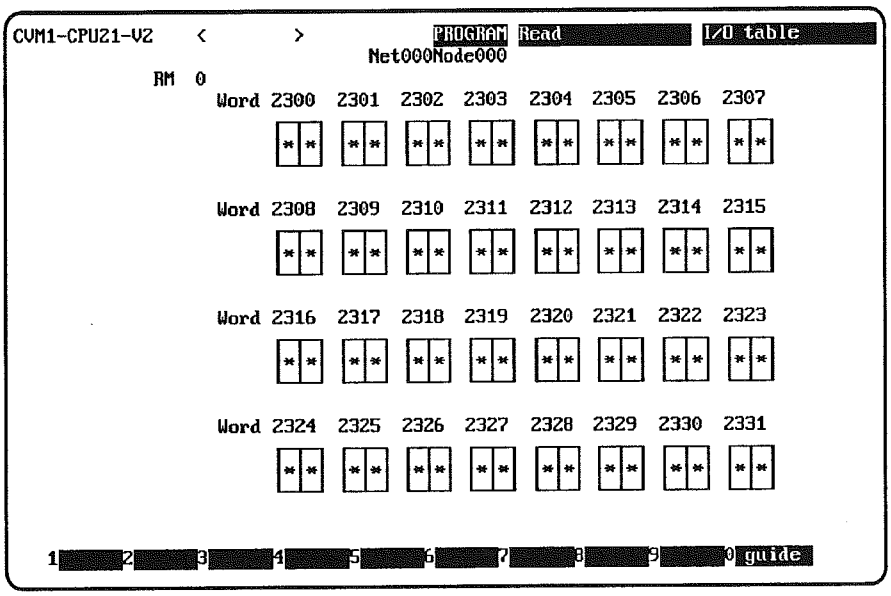


2. Move the cursor to RM0.
3. Press the F7 or F8 Key to display the Slave Racks, Optical I/O Units, or I/O Terminals connected to the Master.

   Press F7 to display the I/O tables for Slave Racks.



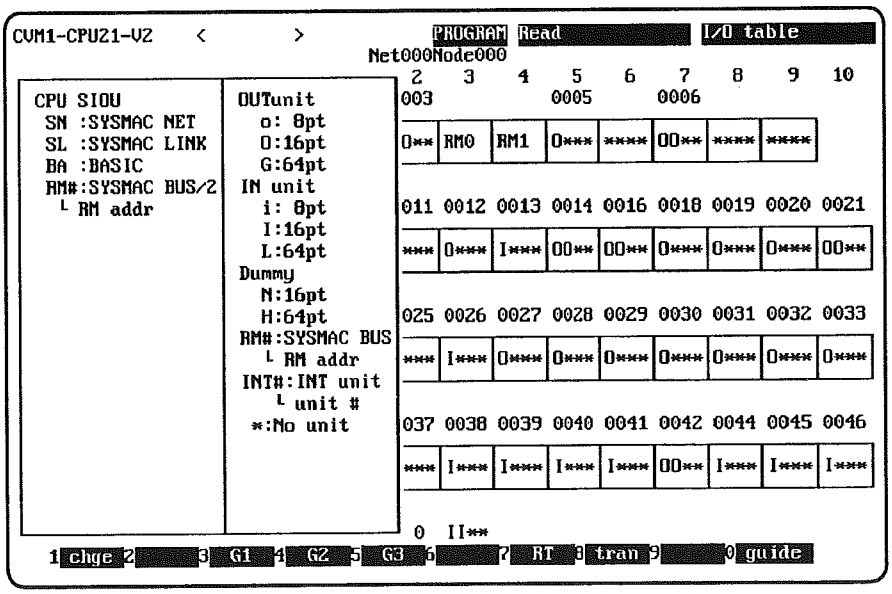
or Press F8 to display the I/O tables for Optical I/O Units or I/O Terminals.



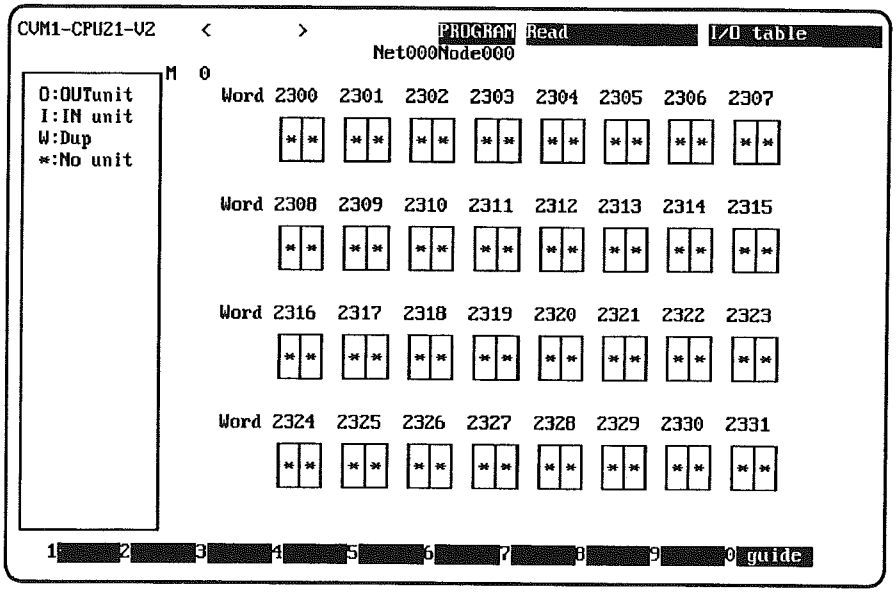
12-3-3 Help Screens

The F10 Key can be pressed to display a help screen that explains the I/O table display codes.

1, 2, 3... 1. Press F10 while the I/O table is on-screen. The help screen will be displayed.



2. If the F10 Key is pressed while the I/O table for an I/O Terminal is on-screen, the following type of help screen will be displayed.



12-4 Creating I/O Tables

The Create I/O Table operation is used to create an I/O table in the PC based on the Units actually connected to the PC; it should be executed when a Unit has been removed from or added to the PC. The I/O table will be retained once it is registered. This operation is possible only when the PC is in PROGRAM mode.

The Create I/O Table operation can't be executed from a computer that is connected to the PC via a SYSMAC BUS/2 Remote I/O Slave Unit.

Procedure The procedure for creating the I/O table is as follows:

1, 2, 3...

1. Select "C:Create I/O table" from the I/O Table Menu. A confirmation prompt will be displayed.
2. Enter "Y" to clear the settings for unused CPU Bus Units, "N" to retain these settings.

12-5 Changing I/O Tables

This operation changes the I/O table in the computer's system work area; it is possible only when the PC is in PROGRAM mode.

Changes can be made to the I/O tables for Basic Racks, SYSMAC BUS Slave Racks, and SYSMAC BUS/2 Slaves.

It is not possible to change the I/O table allocation if the slot is allocated to one of the following Units: a CPU Bus Unit, SYSMAC BUS Master, Optical I/O Unit, I/O Terminal, or Interrupt Input Unit.

Changes can't be made to the I/O table from a computer that is connected to the PC via a SYSMAC BUS/2 Remote I/O Slave Unit.

Error Messages An error will occur if the modified I/O table doesn't match the Units actually mounted to the PC. The non-fatal I/O table verification error (I/O comp err) occurs when an I/O Unit is placed in an empty I/O table slot. The PC's ALARM LED will light, but the PC will continue operating.

The fatal input/output I/O table error (I/O setting err) can occur when a Unit in the I/O table is changed or replaced. The PC's ALARM LED will light and the PC will stop operating.

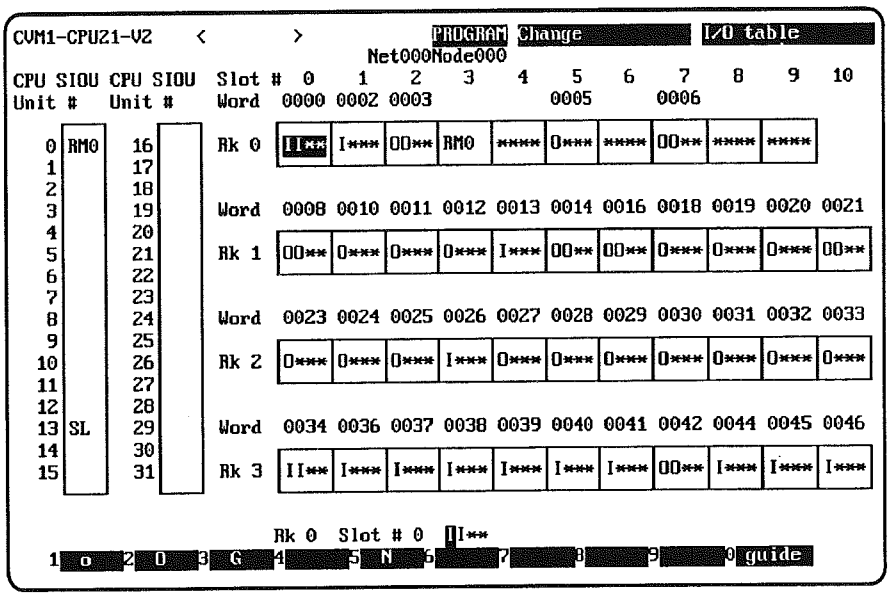
Function Keys The following table describes the functions of the function keys and the Home Key after F1 (Chge) has been pressed.

Key(s)	Display	Function
F1 (o)	o	Allocates an 8-pt Output Unit.
F2 (O)	O	Allocates an 16-pt Output Unit.
F3 (G)	G	Allocates an 64-pt Output Unit.
F5 (N)	N	Allocates a 16-pt Dummy I/O Unit.
Shift+F1 (i)	i	Allocates an 8-pt Input Unit.
Shift+F2 (I)	I	Allocates an 16-pt Input Unit.
Shift+F3 (L)	L	Allocates an 64-pt Input Unit.
Shift+F5 (H)	H	Allocates a 64-pt Dummy I/O Unit.
Home	****	Deletes the allocation at the cursor position.

Example In the following example, a 64-point High-density I/O Unit (OOIl) is added to word CIO 0031.

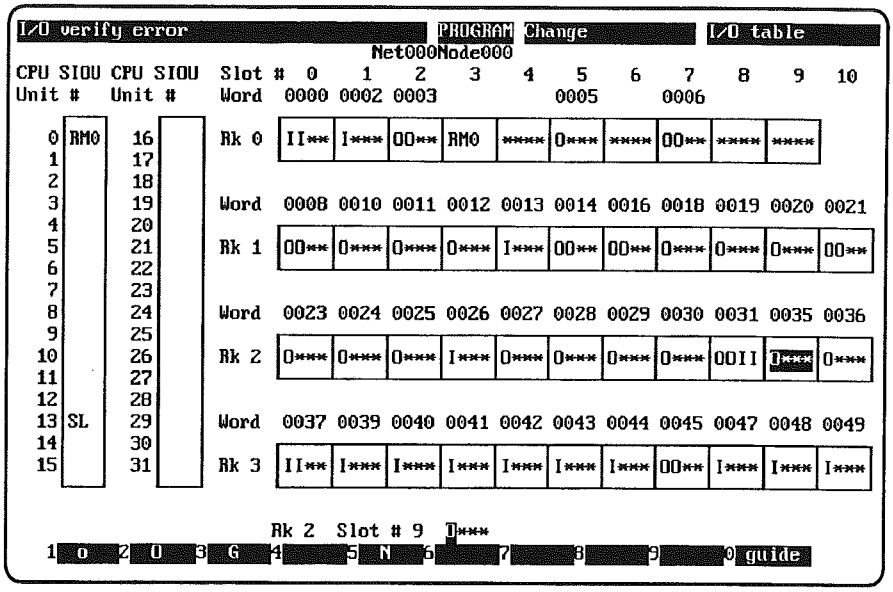
1, 2, 3...

1. Display the Rack for which allocations are to be changed.
2. Press the F1 Key.



3. Move the cursor to "0031" on Rack 1.
4. Press F2 twice.
5. Press Shift+F2 twice.

6. Press Enter.



12-6 Verifying I/O Tables

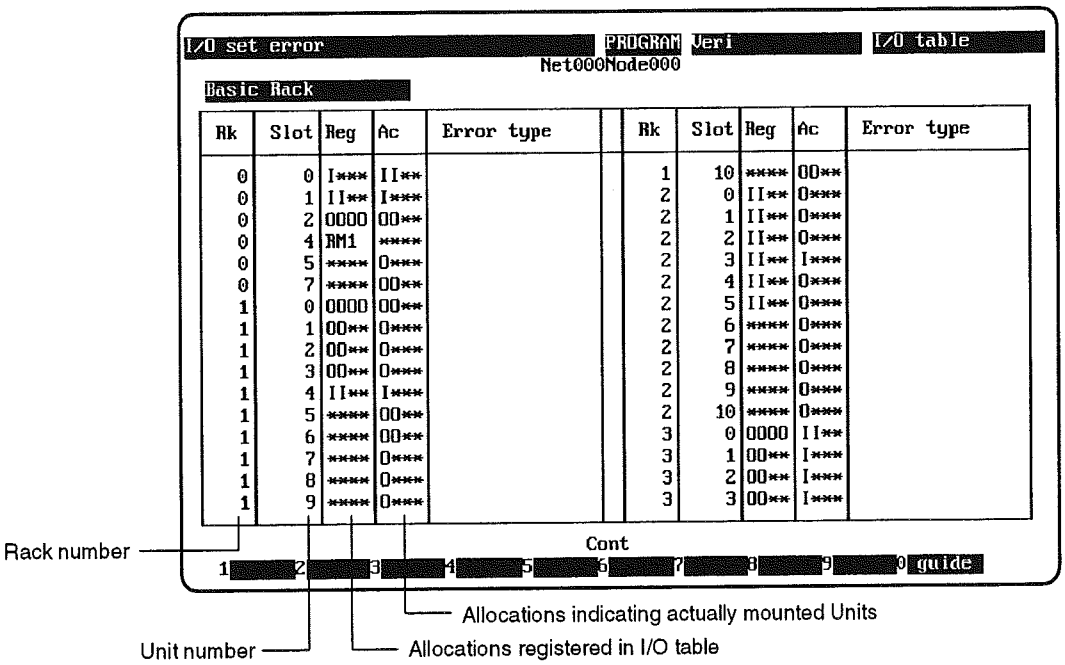
The Verify I/O Table operation compares the contents of the PC's I/O table with the actual Units mounted to the PC.

Note To compare the I/O table in the computer's system work area to the I/O table in the PC, use the Compare I/O Table operation on the Transfer I/O Table Menu. See page 309 for details.

Comparison errors are displayed on separate pages for each Rack or group of Units. Errors are displayed in the following order: Basic Racks, CPU Bus Units, Group-3 Slaves, Group-1 Slaves, Group-2 Slaves, SYSMAC BUS Slave Racks, and Optical I/O Units and I/O Terminals.

1, 2, 3... 1. Select "V:Verify I/O table" from the I/O Table Menu.

If differences are found between the PC's I/O table and the actual Units mounted, those differences will be displayed as shown in the following diagram.



2. The message "Continue" will appear at the bottom of the screen if differences are found in Racks other than the basic Racks.

   Press the PageDown Key to display the next Rack. Press the PageUp Key to display the previous Rack in the sequence.

3. If an error is displayed, take the steps outlined in the following table.

Error	Meaning	Remedy
RT status error	Incorrect Slave designation (58M/122M/54MH) for a SYSMAC BUS/2 Group-3 Slave.	Correct the Slave type.
Data error	I/O table data is corrupted	Create or transfer I/O table.

SECTION 13
Utility Operations

This section explains the various commands within the Utility Menu. The Utility Menu contains a variety of useful operations.

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13-2-2 Transferring from Memory Card to PC 327
13-2-3 Transfer between Computer and Memory Card 329
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13-7-1 Protecting the UM 344
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13-7-3 Clearing Partial Protection 346

13-1 The Utility Menu

The Utility Menu is displayed when Utility is selected from the top-level online menu. The following table lists the operations that can be selected from the Utility Menu. Select an operation by pressing its corresponding letter or moving the cursor to the operation and pressing Enter. These operations are described briefly in the following table and in more detail in later sections.

Operation	Function
F:FileMemory/Mem Card	Manages files in a Memory Card installed in a CVM1 PC.
T:Data trace	Samples the status of specified bits and words at fixed intervals and stores the data in the PC's trace memory.
K:Display/set clock	Displays or sets the PC's system clock.
Z:Custom data	Transfers and compares the customized settings that were set with the offline *Customization* operations.
X:CPU Bus unit setup	Sets parameters for CPU Bus Units. Refer to *Part 4: Networks and CPU Bus Units* for details.
Q:PC setup	Sets or transfers the PC Setup parameters. Refer to *6-8 PC Setup* for details.
B:SYSMAC BUS/2	Sets parameters for SYSMAC BUS/2 Remote I/O Systems. Refer to *Part 4: Networks and CPU Bus Units* for details.
V:Read error log	Displays and clears errors which have occurred in the PC, displays and clears the error history, and clears the right to access PC memory.
U:Protect UM	Sets or cancels total or partial protection for the PC user program memory (UM).
W:Net support table	Transfers the SYSMAC NET Link or SYSMAC LINK data link tables. Starts/stops the data link. Refer to *Part 4: Networks and CPU Bus Units* for details.
N:Net diagnosis	

13-2 Memory Card Operations

This section describes how to display the file names in the Memory Card inserted in the PC and manage these files. The online Memory Card operations cannot be used with Memory Cards in a Memory Card Writer connected to the computer; they act on the Memory Card installed in the Memory Card drive in the PC.

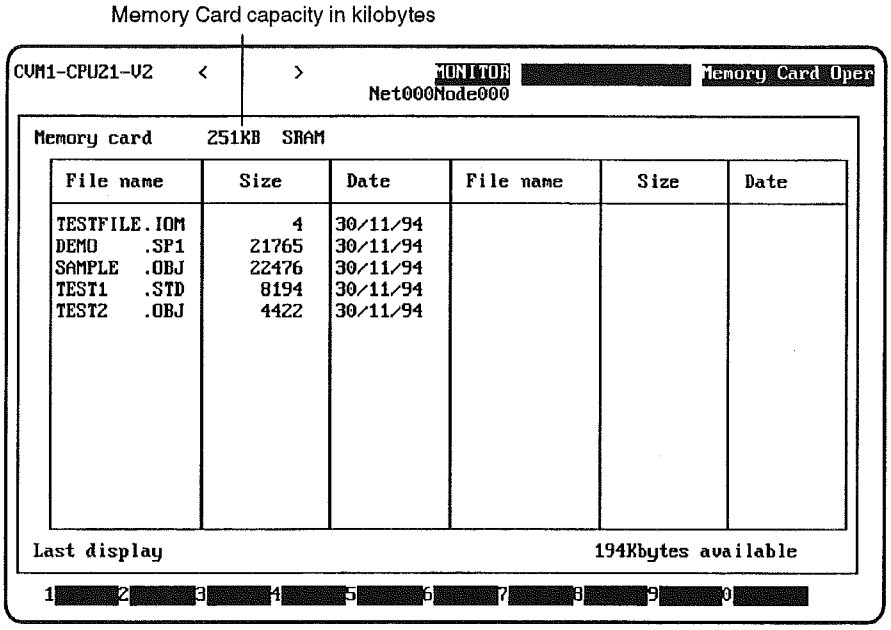
The PC ↔ Memory Card operation can be used transfer the program, data area data, and Special I/O Unit settings between the PC and Memory Card.

The Computer ↔ Memory Card operation can be used transfer files between a data disk and the Memory Card. Other Memory Card operations can initialize the Memory Card or copy, change, or delete Memory Card files.

EEPROM and EPROM Memory Cards are read-only when installed in the PC.

Memory Card File Directory

The following diagram shows the Memory Card file directory, which will appear when "F:FileMemory/Mem Card" is selected from the Utility Menu. The total Memory Card capacity will be displayed at the top of the directory and the free space on the Memory Card will be displayed in the lower-right corner.

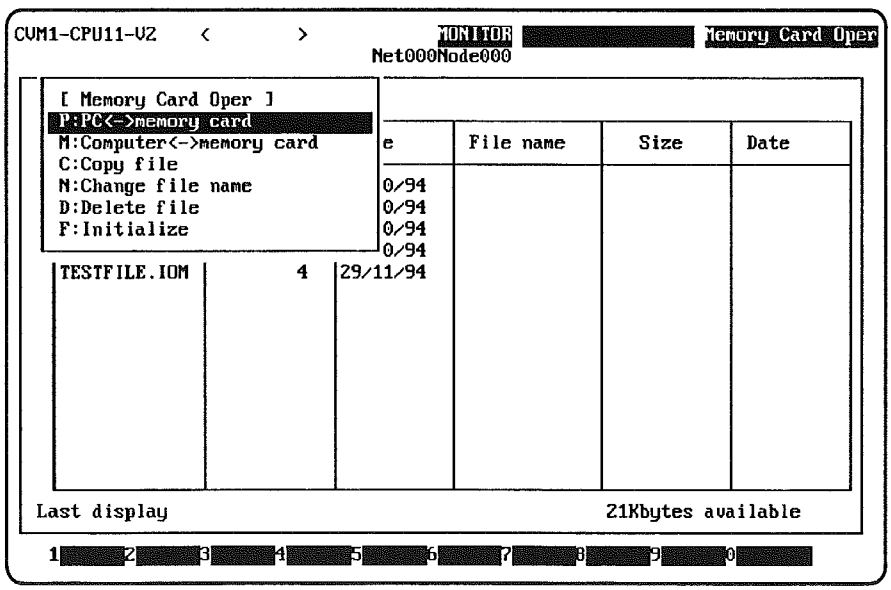


The "File name" is the file name specified when the file was saved, "Size" indicates the number of bytes the file occupies in memory, and "Date" indicates the date when the file was saved.

Up to 28 files can be displayed on a single page. If there are more than 28 files, press the Page Down Key to display the next page.

Memory Card Menu

The following diagram shows the Memory Card Menu. To access the Memory Card Menu, press the End Key while the Memory Card file directory is on-screen.



The following table briefly describes the Memory Card operations. The data transfer operations are described in detail later in this section. The Memory Card operations used to initialize the Memory Card or copy, change, or delete Memory Card files are essentially the same as those described in *6-5 Memory Card Operations*.

Operation		Function
P:PC ↔ Memory card	A:All programs	Transfers all programs between the PC and the Memory Card in the PC.
	L:Ladder	Transfers the ladder program from the PC to the Memory Card in the PC.
	I:IOM	Transfers a consecutive block of IOM words (CIO, G, A, D, E) between the PC and the Memory Card inserted in the PC.
	S:PC Setup, SIOU settings	Transfers the Extended PC Setup between the PC and the Memory Card in the PC. This data includes the PC Setup, customize settings, I/O table, data link tables, routing tables, Communications Unit settings, and BASIC Unit settings.
M:Computer ↔ Memory card		Transfers files between a data disk and the Memory Card in the PC.
C:Copy file		Copies files in the Memory Card in the PC. Refer to *6-5-6 Copying Files* for details.
N:Change file name		Renames files in the Memory Card in the PC. Refer to *6-5-8 Renaming Files* for details.
D:Delete file		Deletes files from the Memory Card in the PC. Refer to *6-5-7 Deleting Files* for details.
F:Initialize		Initializes the Memory Card in the PC. Always use this operation to initialize new Memory Cards. Refer to *6-5-2 Initialization* for details.

Note The CIO Area ranges from the I/O Area to the SYSMAC BUS Area (CIO 0000 to CIO 2555).

Valid PC Modes The following table shows the PC modes in which each operation can be used.

Menu	Sub-menu		RUN	MON.	DEBUG	PROG.
PC ↔ Memory Card	PC → Memory Card	Program	OK	OK	OK	OK
		IOM	OK	OK	OK	OK
		PC, SIOU	OK	OK	OK	OK
	Memory card → PC	All programs	No	No	No	OK
		IOM	No	OK	No	OK
		PC, SIOU	No	No	No	OK
Computer ↔ Memory Card			OK	OK	OK	OK
Copy file			OK	OK	OK	OK
Change file name			OK	OK	OK	OK
Delete file			OK	OK	OK	OK
Initialize			OK	OK	OK	OK

File Types and Extensions

The Computer ↔ Memory Card operation can transfer any file on the data disk. Always add the extension to a file name when using the Computer ↔ Memory Card, Copy file, Change file name, or Delete file operation. Input just the file name for the PC ↔ Memory Card operations.

File types and their extensions are shown in the following table.

File type	Extension
All programs	.OBJ
SFC programs	.SFC
Ladder programs	.LDP
IOM file data	.IOM
Extended PC setup	.STD

Memory Cards can be written to under the following conditions.

CPU	Memory Card		
	SRAM	EEPROM	EPROM
CVM1-CPU□□-E	Yes	No	No
CVM1-CPU□□-EV1 or later	Yes	Yes	No

13-2-1 Transferring from PC to Memory Card

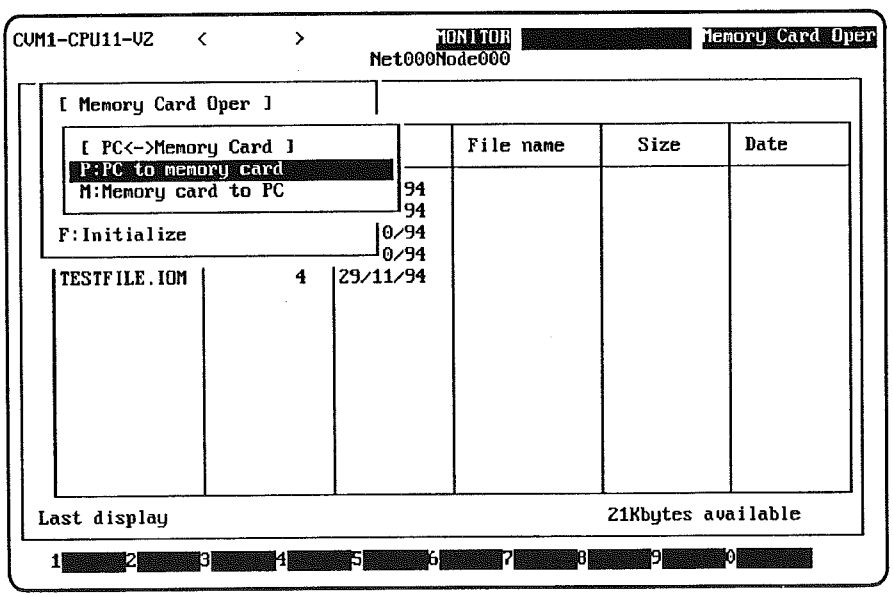
The operations described in this section are used to transfer data from the PC itself to the Memory Card in the PC. The following data can be transferred: all programs, ladder program, IOM file data, or the Extended PC Setup. File extensions are not required and should not be input for these operations.

All Programs

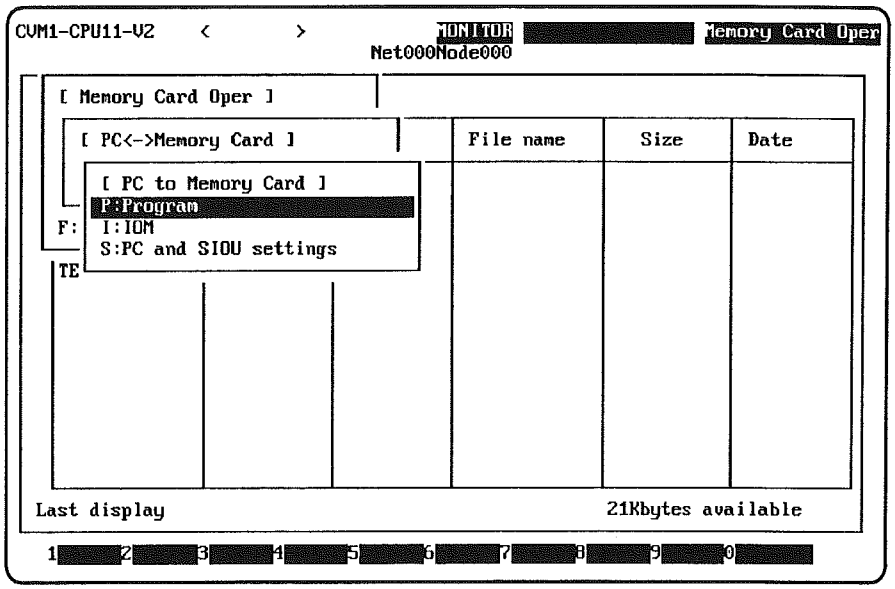
Use the following procedure to transfer all programs from the PC to the Memory Card.

1, 2, 3...

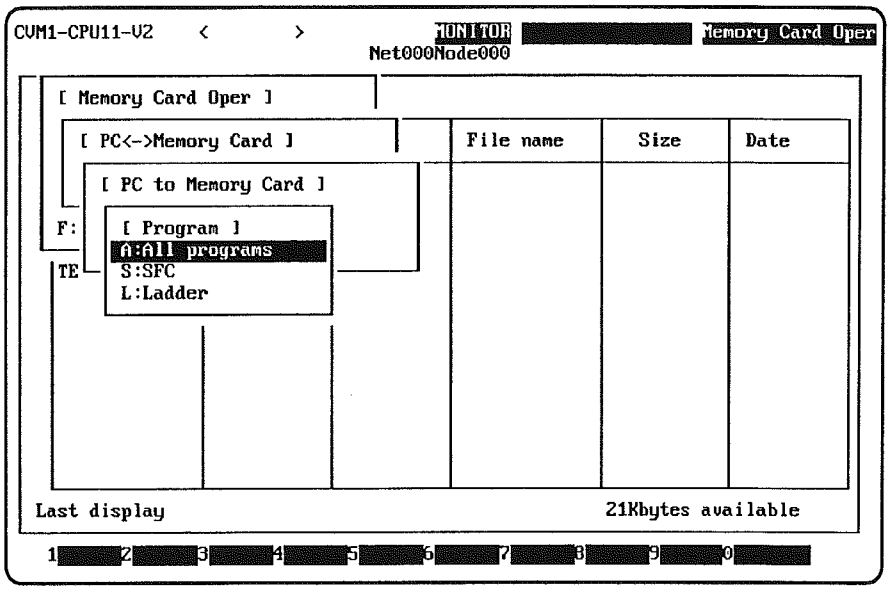
1. Select "P:PC ↔ Memory Card" from the Memory Card Menu.



2. Select "P:PC → Memory Card."



3. Select "P:Program."



4. Select "A:All programs" from the Program Menu. A file input area will be displayed to input the file name to be transferred.
5. Enter the desired file name and press Enter.
6. If the file already exists, a message will ask if the file can be overwritten. Enter "Y" to overwrite the file, "N" to cancel and input a new file name.

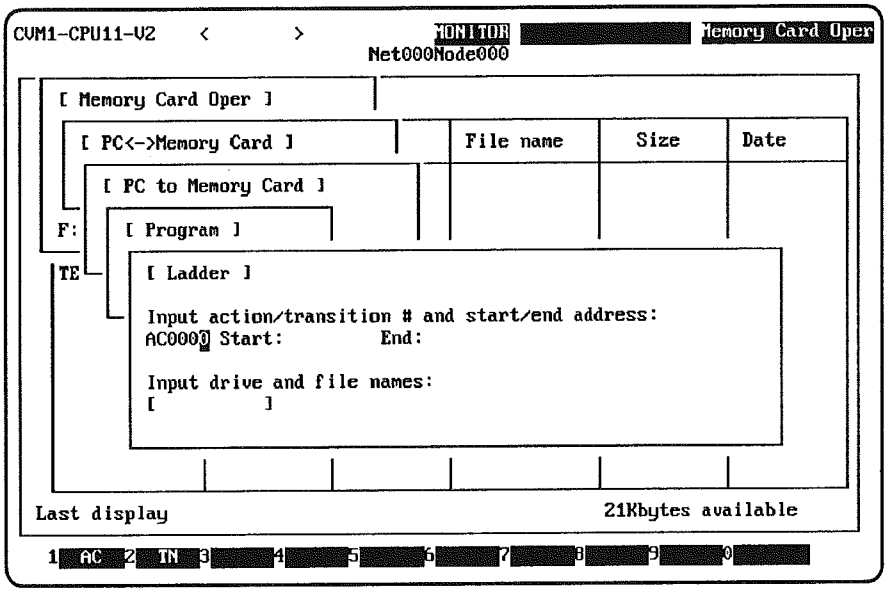
Ladder Programs

Use the following procedure to transfer an action program or transition program from the PC to the Memory Card in the PC.

1, 2, 3...

1. Select "P:PC ↔ Memory Card" from the Memory Card Menu.
2. Select "P:PC → Memory Card."
3. Select "P:Program."

4. Select "L:Ladder" from the Program Menu. A input area will be displayed to input the desired action/transition number and file name.



5. The default value is AC0000. To input an action number, enter the desired number and press Enter.

or To input a transition number, press the F2 Key, input the desired transition number, and press Enter.

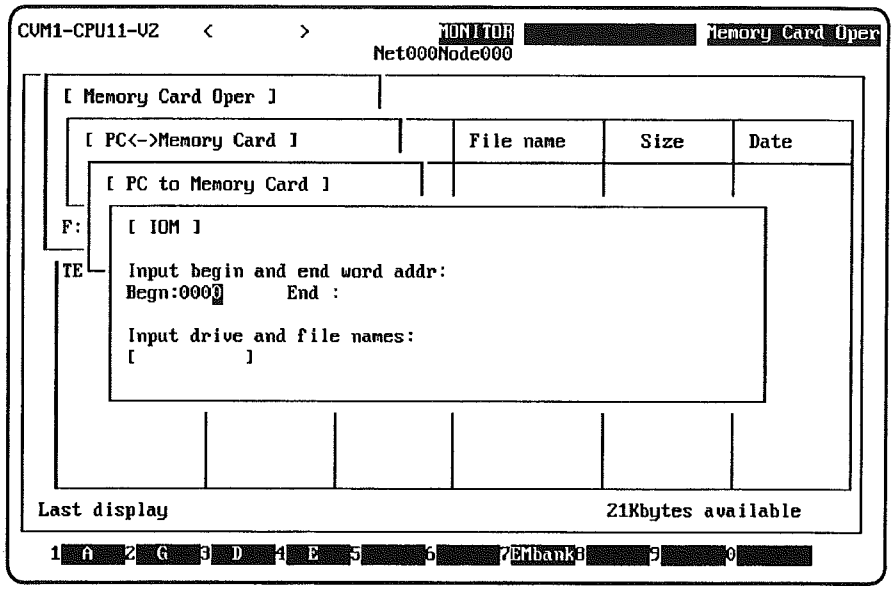
6. Enter the first program address to be transferred and press Enter.
7. Enter the last program address to be transferred and press Enter.
8. Input the file name of the ladder program and press Enter.
9. If the file already exists, a message will ask if the file can be overwritten. Enter "Y" to overwrite the file, "N" to cancel and input a new file name.

IOM

Use the following procedure to transfer a range of IOM words (CIO, G, A, D, E) from the PC to the Memory Card in the PC.

1, 2, 3...

1. Select "P:PC ↔ Memory Card" from the Memory Card Menu.
2. Select "P:PC → Memory Card."
3. Select "I:IOM."



4. Enter the first word of the IOM range to be transferred and press Enter.

   Press the F1 to F4 Key or the F7 Key to specify the memory area, enter the word address, and press Enter. For the CIO Area, just enter the word address (0000 to 2555) and press Enter.
5. Enter the last word to be transferred and press Enter.
6. Input the desired file name for the IOM file and press Enter.
7. If the file already exists, a message will ask if the file can be overwritten. Enter "Y" to overwrite the file, "N" to cancel and input a new file name.

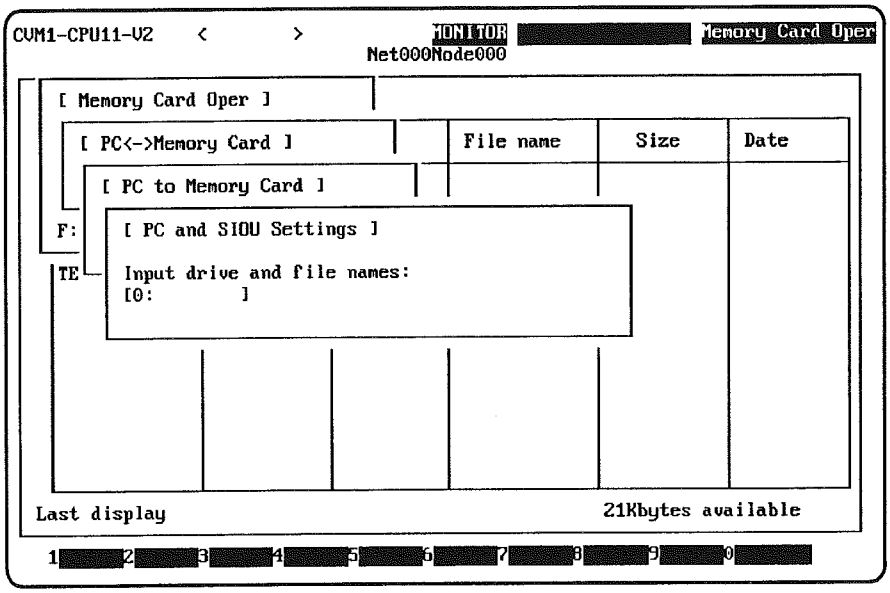
Extended PC Setup

Use the following procedure to transfer the PC Setup and Special I/O Unit settings from the PC to the Memory Card in the PC.

1, 2, 3...

1. Select "P:PC ↔ Memory Card" from the Memory Card Menu.
2. Select "P:PC → Memory Card."

3. Select "S:PC and SIOU settings."



4. Input the desired file name for the extended PC setup file and press Enter.
5. If the file already exists, a message will ask if the file can be overwritten. Enter "Y" to overwrite the file, "N" to cancel and input a new file name.

13-2-2 Transferring from Memory Card to PC

The operations described in this section are used to transfer data from the Memory Card in the PC to the PC itself. The following data can be transferred: all programs, IOM file data, or the Extended PC Setup.

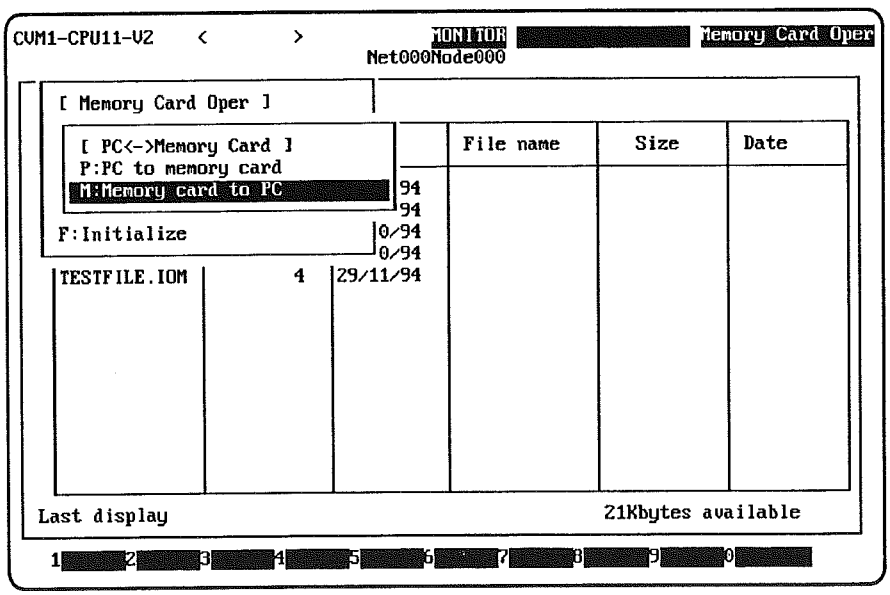
File extensions are not required and should not be input for these operations.

All Programs

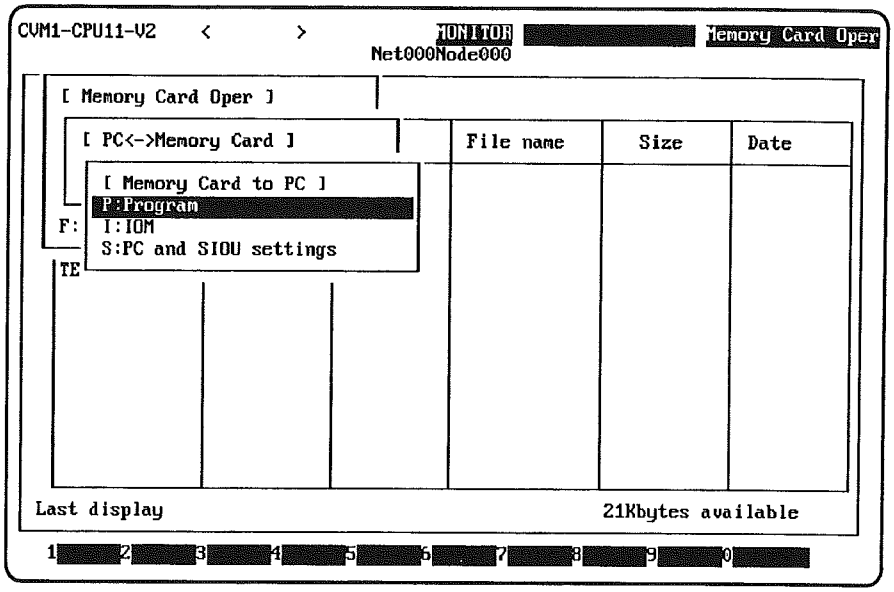
Use the following procedure to transfer all programs from the Memory Card to the PC.

1, 2, 3...

1. Select "P:PC ↔ Memory Card" from the Memory Card Menu.



2. Select "M:Memory card → PC."



3. Select "P:Programs." A file input area will be displayed.
4. Enter the file name and press Enter. A message will be displayed in the upper-left corner of the screen if the specified file name does not exist.

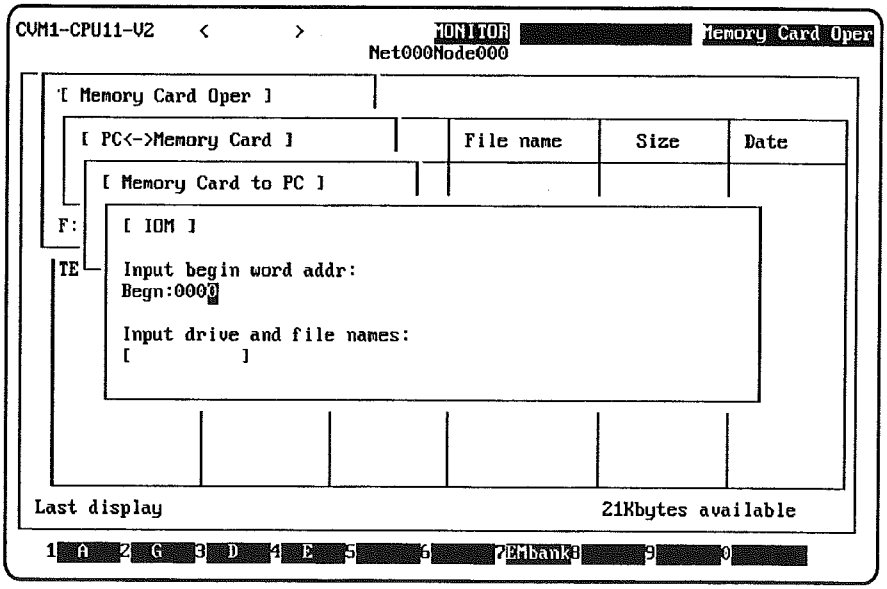
IOM

Use the following procedure to transfer IOM word data (CIO, G, A, D, E) from the Memory Card in the PC to the PC itself. Data will be transferred from the specified start word to the end of the file.

⚠ Caution If data is being transferred to the Core I/O Area (CIO) or CPU Bus Link Area (G), any data exceeding the upper limit for those areas (CIO 2555 or G255) will overwrite the data in subsequent data areas.

1, 2, 3...

1. Select "P:PC ↔ Memory Card" from the Memory Card Menu.
2. Select "M:Memory card → PC."
3. Select "I:IOM." A input area will be displayed to input the start word and file name.



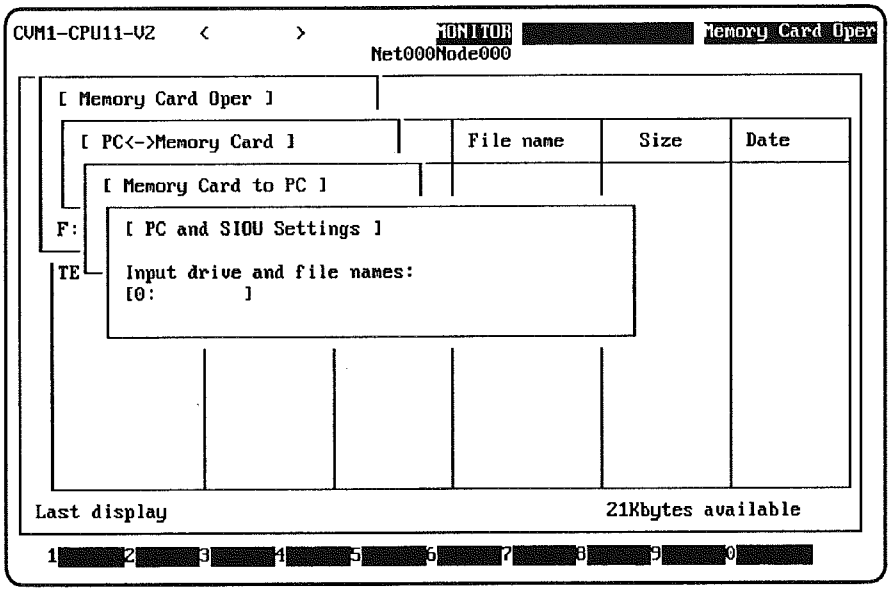
4. Enter the start word in the PC where data is to be transferred and press Enter. Press the F1 to F4 Key or the F7 Key to specify the memory area, enter the word address, and press Enter. For the CIO Area, just enter the word address (0000 to 2555) and press Enter.
5. Enter the file name and press Enter. A message will be displayed if the specified file name does not exist.

Extended PC Setup

Use the following procedure to transfer the PC Setup and Special I/O Unit settings from the Memory Card in the PC to the PC itself.

1, 2, 3...

1. Select "P:PC ↔ Memory Card" from the Memory Card Menu.
2. Select "M:Memory Card → PC."
3. Select "S:PC and SIOU settings." A file input area will be displayed.



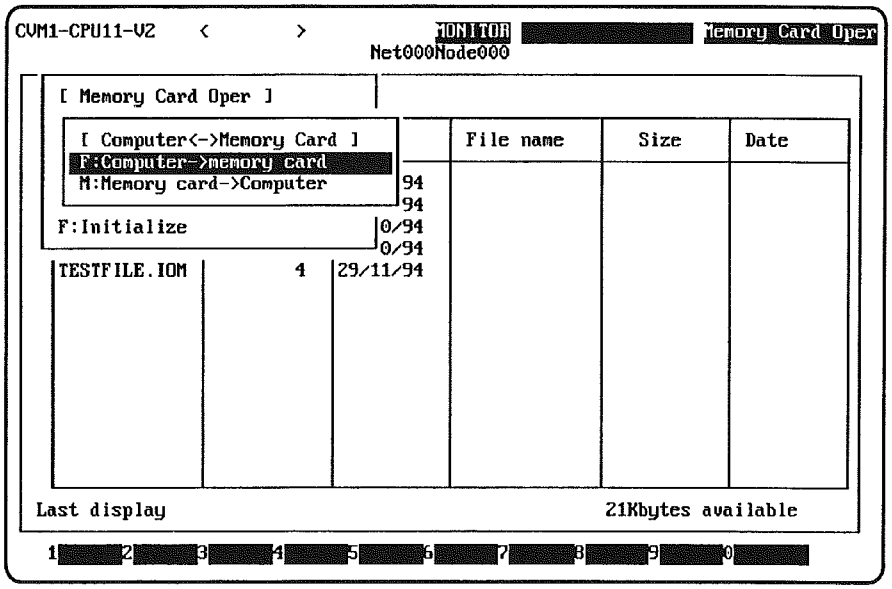
4. Enter the file name and press Enter. A message will be displayed if the specified file name does not exist.

13-2-3 Transfer between Computer and Memory Card

The operations described in this section are used to transfer files and data between the computer and the Memory Card in the PC.

Transfer from Computer to Memory Card

1, 2, 3... 1. Select "M:Computer ↔ Memory Card" from the Memory Card Menu.



2. Select "F:Computer → Memory Card." A file name input area will be displayed.
3. Check the source drive name, input the name of the file to be transferred to the Memory Card, and press Enter.
4. Check the destination drive name, input the file name to be used in the Memory Card, and press Enter.

Transfer from Memory Card to Computer

1, 2, 3... 1. Select "M:Computer ↔ Memory Card" from the Memory Card Menu.
2. Select "M:Memory card → Computer." A file name input area will be displayed.
3. Check the source drive name, input the name of the file to be transferred, and press Enter.
4. Check the destination drive name, input the file name to be used in the computer, and press Enter.

13-3 Data Tracing

This section describes the Data Trace operations. These operations are used to sample the status of specified bits or the content of specified words and store the result in the PC's trace memory. The stored data can be displayed on the computer screen.

13-3-1 Introduction

Description Data tracing begins when a trigger condition is fulfilled or the Trace Start Bit (A00814) is turned on. There are two ways to control data sampling. Data can be sampled at 5-ms intervals or whenever TRSM(170) is executed in the program.

After data has been sampled, it can be transferred from the PC's trace memory and displayed on the computer screen in time-chart format. The CVM1-CPU21-E and CVM1-CPU11-E have a 2K-word trace memory, and the CVM1-CPU01-E has a 1K-word trace memory.

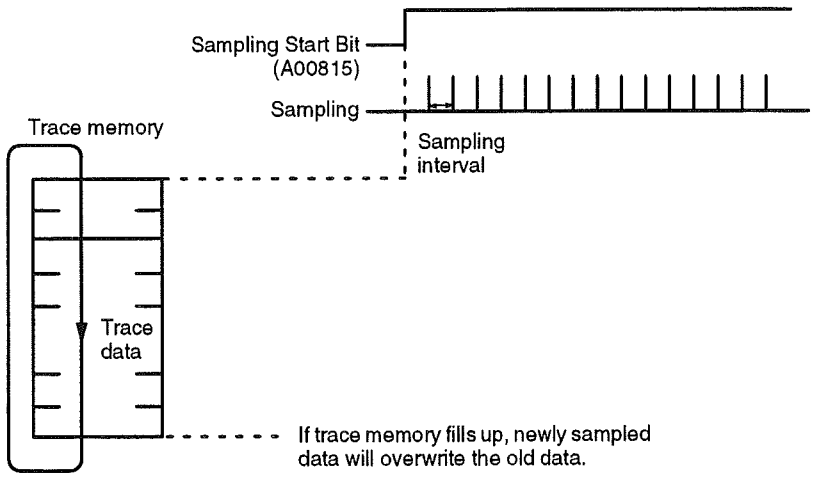
Control Bits and Flags

The following control bits and flags are used during data tracing.

Flag	Function
A00811	Trace Trigger Monitor Flag
A00812	Trace Completed Flag (ON when trace completed)
A00813	Trace Busy Flag (ON during execution)
A00814	Trace Start Bit
A00815	Sampling Start Bit

Sampling Start Bit (A00815)

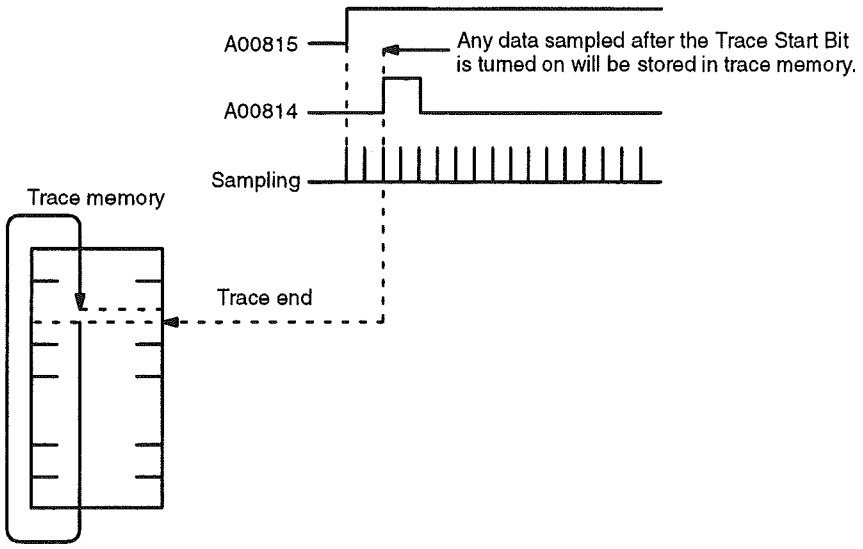
The Trace Start Bit (A00814) and Sampling Start Bit (A00815) are meant to be controlled by the user. Turn the Sampling Start Bit on to start sampling data and writing it to the PC's trace memory. The following diagram shows how the Sampling Start Bit controls data sampling.



As shown in the diagram above, the data will be overwritten if the sampled data exceeds the capacity of the trace memory. If data at the beginning of the trace memory is overwritten, it isn't possible to tell where the trace data begins and ends. Use the Trace Start Bit (A00814) to prevent data from being overwritten.

Trace Start Bit (A00814)

If the Trace Start Bit (A00814) is turned on while the data trace is operating, the data sampled after A00814 is turned on will be valid. The data trace will end automatically when the trace memory fills up. The following diagram shows how the Trace Start Bit controls data sampling.



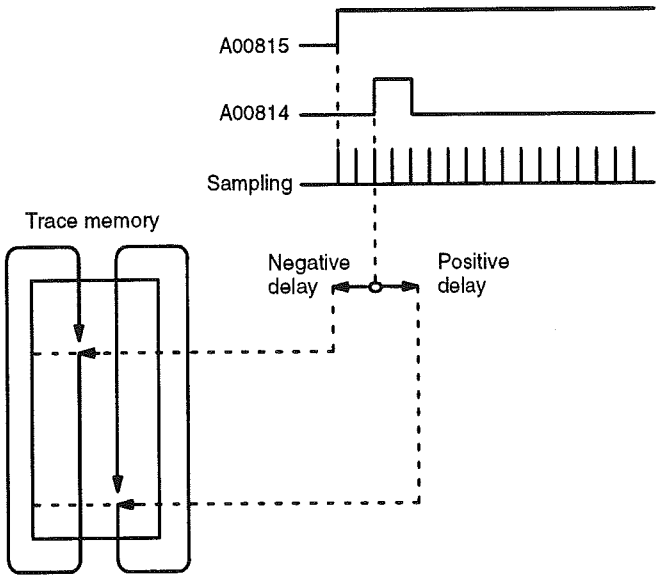
The Trace Start Bit doesn't have to be A00814. The user can designate another bit (or word) as the Trace Start Bit. If another bit (or word) is designated, data tracing will begin when the designated bit goes ON.

Refer to the *CV-series Operation Manual: Ladder Diagrams (W202)* for details on other flags and control bits.

Delay Setting

A positive or negative delay can be set to alter the actual point from which tracing will begin. The delay is set by specifying the number of data samples to add or subtract.

When the Trace Start Bit is received, the CPU looks at the delay and marks the trace memory accordingly. This can mean that some of the samples already made will be recorded as the trace memory (negative delay), or that more samples will be made before they are recorded (positive delay). The following diagram shows how the delay affects data sampling.



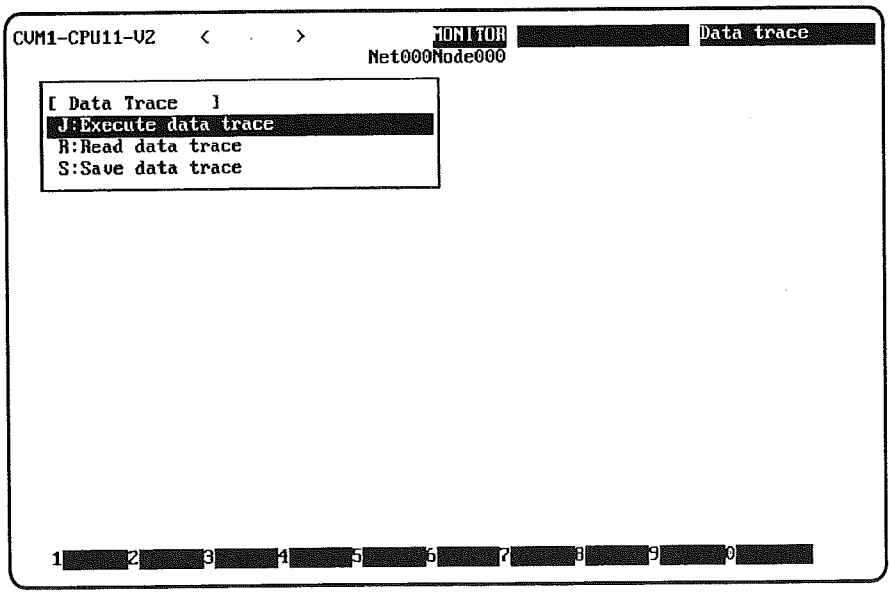
The delay is based on the sampling cycle, with the cycle taken as 1 unit. For example, a delay setting of –30 will produce a delay of 300 ms if the cycle is set to 10 ms.

Reading Data Trace Data

The data trace data can be uploaded to the computer after the Trace Start Bit has been turned on and sampling has been completed.

13-3-2 Data Trace Menu

The Data Trace Menu will be displayed when "T:Data trace" is selected from the Utility Menu.



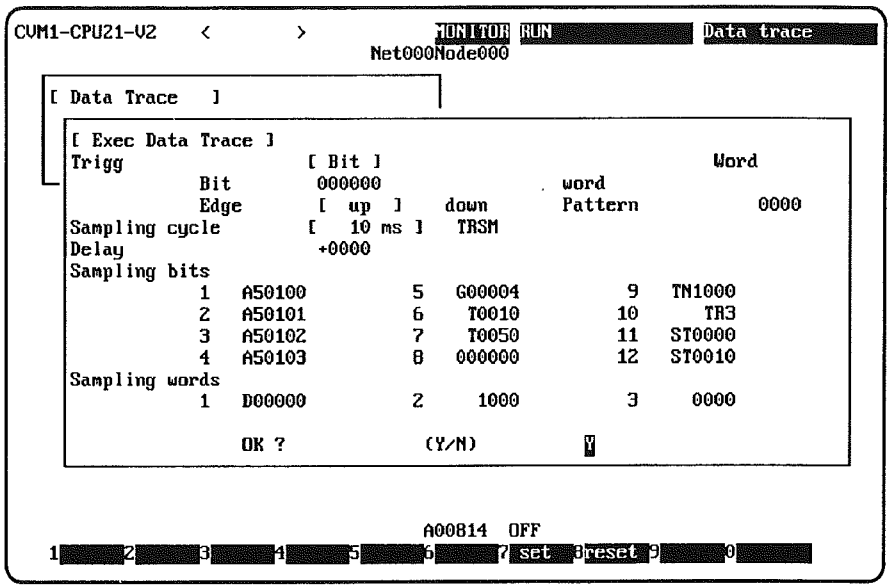
The data trace operations are as follows.

Item	Operation
J:Execute data trace	Sends the data trace parameters and execute instruction to the PC. Execute "R:Read data trace" when the trace is complete.
R:Read data trace	Displays the trace data. This operation will interrupt the data trace if the data trace is in progress.
S:Save data trace	Saves the trace data to a data disk.

Note All online data trace operations act on the PC. Consequently, it is not possible to read or save data trace data in the system work area.

13-3-3 Setting Data Trace Parameters

The Execute data trace operation is used to set data trace parameters and execute the data trace. The Parameter Setting Menu will be displayed when "J:Execute data trace" is selected from the Data Trace Menu. The parameters set previously will be displayed as defaults.



Trace Trigger Parameters

The data trace can be started by the Trace Start Bit (A00814) or a bit or word specified by the user. If a bit is used, specify whether to start the data trace on the bit's rising edge (up-differentiation) or falling edge (down-differentiation).

If the Trace Start Bit (A00814) is used, leave the trigger bit and trigger word parameters blank by pressing the Home Key to skip these spaces. The following table describes the trace trigger parameters.

Parameter	Function	Keys Used
Trigg	If using a trigger other than the Trace Start Bit (A00814), specify if this trigger is a bit or a word.	**Enter**
(Trigger) Bit	Specifies the bit address of the trigger bit if the trigger parameter is set to Bit. (Leave this setting blank if A00814 is the trigger.)	**F1** to **F6** (Data area) **0** to **9** (Address)
(Trigger bit) Edge	Specifies whether to use the rising edge or falling edge of the trigger bit as the trigger condition if the trigger parameter is set to Bit. Only the rising edge (up) setting is valid when A00814 is set as the trigger.	**Enter**

Parameter	Function	Keys Used
(Trigger) Word	Specifies the word address of the trigger word if the trigger parameter is set to Word. (Leave this setting blank if A00814 is the trigger.)	**F1** to **F6** (Data area) **0** to **9** (Address)
(Trigger word) Pattern	Specifies the target content of the trigger word in 4-digit hexadecimal if the trigger parameter is set to Word.	**0** to **9**, **A** to **F**

Other Parameters

The following table describes the other data trace parameters.

When the cursor is at the OK? (Y/N) position at the bottom of the screen, the ON/OFF status of the Trace Start Bit (A00814) will also be displayed. Press the F7 Key to turn the Trigger Flag ON or press the F8 Key to turn the trigger OFF. The trigger set/reset operation is valid only for bit A00814. The trigger cannot be set or reset when the PC is in RUN mode.

Press the Enter Key if the displayed parameters are acceptable. If the parameters must be changed, press the N and Enter Keys to permit parameters to be input.

A bit or word other than bit A00814 can be specified as the trigger. In this case, the save operation is started when one of the trigger conditions is met. To set bit A00814 as the only trigger, use the Home Key to clear the Bit and Word settings for the trigger parameter on the menu.

If "E:Execute data trace" is selected from the menu during PC trace execution, a message will indicate that the data trace is executing after the Parameter Setting Menu is displayed and the system will wait for the data trace to end.

The parameters and the valid keys are shown in the following table. Parameter settings are cleared when you return to the top-level online menu.

Parameter	Function	Keys Used
Sampling cycle	Select a sampling interval or the TRACE MEMORY instruction (TRSM(170)). If sampling interval is selected, set the time from 5 to 2550 ms in 5 ms increments. Data will be sampled every cycle if the time is set to zero.	**0** to **9** **Enter**
Delay[1]	Set the delay as a number of samples offset from the trigger condition. A positive (+) value indicates after the trigger condition is met, a negative (–) value indicates before the trigger condition is met.	**+**, **–** **0** to **9**
Sampling bits[2]	Specify the bit addresses of the bits to be sampled. Up to 12 bits can be specified. The ON/OFF status the bits will be displayed in a time chart.	**F1** to **F6** and **F8** (data area) **0** to **9** (Address)
Sampling words[2]	Specify the word addresses of the words to be sampled. Up to 3 words can be specified. The content of each word will be displayed in hexadecimal.	**F1** to **F6** (data area) **0** to **9** (Address)

Note

1. The delay value won't be displayed when the data trace data is read if the delay is negative and exceeds the number of samples stored since the trigger condition was met.

The possible delay settings depends on the PC and number of sampling words.

PC	Sampling words	Range
CVM1-CPU21-E CVM1-CPU11-E	0	–1999 to 2000
	1	–999 to 1000
	2	–665 to 666
	3	–499 to 500
CVM1-CPU01-E	0	–999 to 1000
	1	–499 to 500
	2	–332 to 333
	3	–249 to 250

2. The DM and EM Areas can't be accessed by bit, and the IR and DR registers cannot be used as triggers or sampled.

Item	Trigger/Sampling	
	Bit	Word
CIO Area	OK	OK
Timer and Counter Areas	OK	OK
DM Area	No	OK
EM Area (Bank 0 to Bank 7)	No	OK
Registers	No	No

Inputting Parameters

The newly set parameters will be erased if the parameter input is cancelled before the new settings have been accepted.

1, 2, 3...

1. Use the Cursor Keys to move the cursor to the parameter to be changed.
2. Input the parameter. Some parameters are selected, while others require alphanumeric input.

   To set a parameter which is selected, move the cursor to the required setting on the display and press Enter. Square brackets [ ] will be displayed around the selected item. To set a parameter requiring alphanumeric input, move the cursor to the required position and press the appropriate keys.

   Note The sampling cycle is set in 5 ms increments between 5 and 2550 ms. The square brackets [ ] won't be displayed around an incorrect setting and the incorrect setting won't be accepted even if Enter is pressed.

Resetting Parameters

When setting the trigger bit or word address or the sampling bit or word address, press the Home Key to reset the input to zero. If the Home Key to pressed when an item is non-zero, the item will be reset to zero. If the Home Key to pressed when an item is already zero, a space will be created at the cursor position. It is not possible to clear the setting for the trigger word pattern, sampling cycle, or delay.

13-3-4 Executing Data Traces

The Execute Data Trace operation is used to set data trace parameters and execute the data trace. This section explains how to execute the data trace after setting the parameters. Refer to *13-3-3 Setting Data Trace Parameters* for details on setting the parameters.

Executing the data trace starts data sampling and storage in trace memory according the data trace parameters. The trace data will be transferred to the computer and displayed on-screen automatically when the data trace is completed.

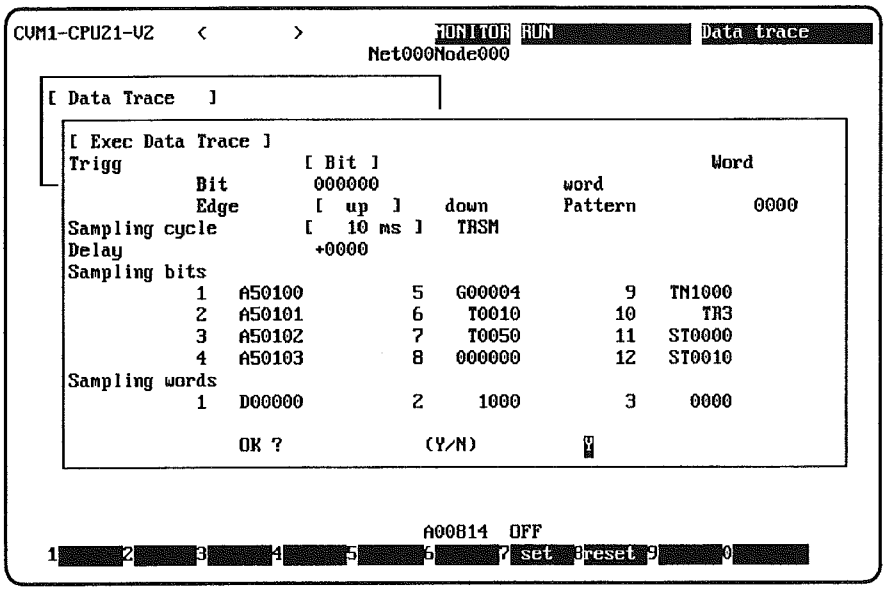
The Trace Start Bit (A00814) can be force-set/reset using the F7 (SET) or F8 (RESET) Keys. Force-setting and resetting of the trigger is valid with the Trace Start Bit only. The Trace Start Bit can't be force-set/reset if the PC is in RUN mode.

If the data trace is already in progress when the Execute Data Trace operation is performed, a message will be displayed after the Parameter Setting Menu indicating that the data trace is in progress.

Procedure Use the following procedure to execute the data trace.

1, 2, 3...

1. Select "J:Execute data trace" from the Data Trace Menu. The Parameter Setting Menu will be displayed with the previous parameter settings. The ON/OFF status of the Trace Start Bit (A00814) will be displayed at the bottom of the screen.



2. Enter "Y" to accept the parameter settings, "N" to make changes.
3. The data trace will be executed when the parameters are accepted and the data trace results will be displayed automatically when the trace is completed.

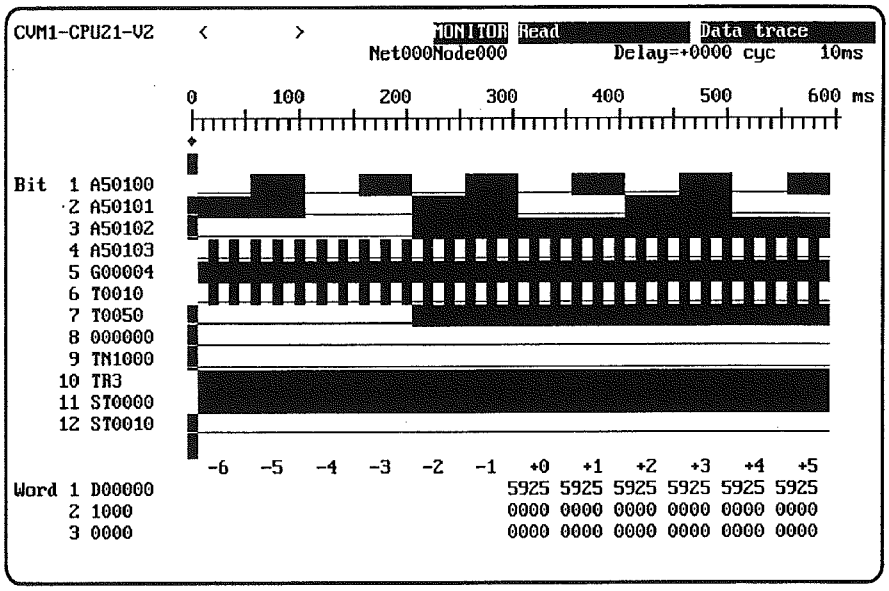
13-3-5 Reading the Data Trace

The Read Trace Data operation transfers trace data from the PC's trace memory to the computer and displays it on-screen in time-chart format. The time-chart display is the same as the one that is displayed automatically when the data trace is completed or interrupted.

1, 2, 3...

1. Select "R:Read data trace" from the Data Trace Menu. The Parameter Setting Menu will be displayed.

2. Press Enter. The Parameter Setting Menu will be replaced by the time-chart display.



Use the Left and Right Cursor Keys to move the cursor horizontally. The cursor will continuously if the key is held down. The display will shift right or left to display trace data that is off-screen.

A total of twelve words of data can be displayed: six before and after the cursor position. "0" corresponds to the cursor position.

13-3-6 Interrupting the Data Trace

The Read Data Trace operation can be used to interrupt data trace execution.

1, 2, 3...

1. Press Shift+Escape or Escape while the data trace is in progress.
2. Select "R:Read data trace" from the Data Trace Menu. A confirmation prompt will be displayed at the bottom of the screen.
3. Enter "Y" to interrupt the data trace, "N" to continue data tracing.

   When the data trace is interrupted, the data trace results up to that point will be displayed automatically.

13-3-7 Saving the Data Trace Results

The Save Data Trace operation saves data trace results to a data disk.

1, 2, 3...

1. Select "S:Save data trace" from the Data Trace Menu. A file name input area will be displayed.
2. Input the path and file name of the file in which you want to save the data trace results. Alternatively, press the End Key to display a directory of files and select a file from the directory.

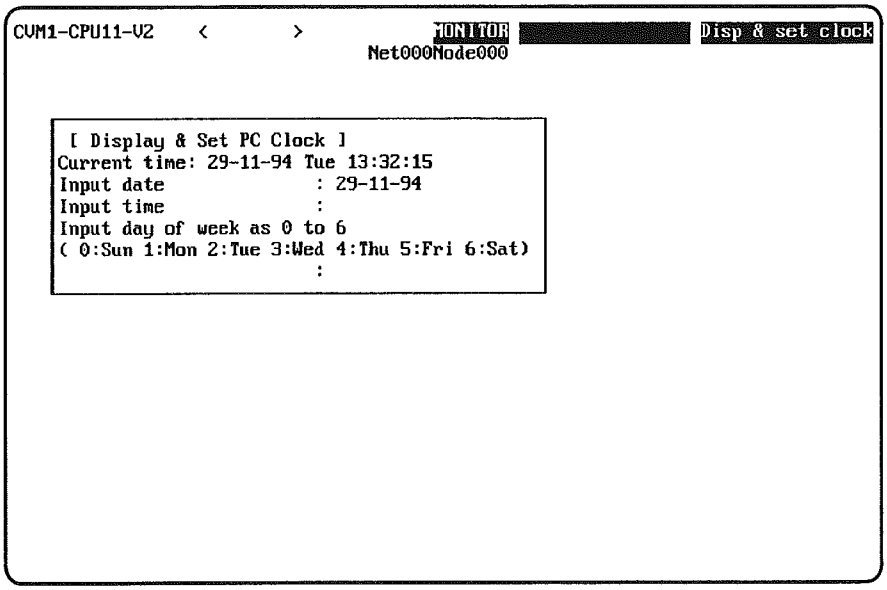
   A confirmation prompt will be displayed if the specified file already exists. Enter "Y" to overwrite the existing file, "N" to cancel and input another file name.
3. Enter a title if one is desired. (Just press Enter to continue without entering a title.)

13-4 Displaying and Setting the Clock

The Display/Set Clock operation is used to read and set the PC's system clock. The date, time, and day of the week displayed on the screen will be changed if a new value is entered. The settings won't be changed if the Escape Key is pressed while changing the settings.

1, 2, 3...

1. Select "K:Display/set clock" from the Utility Menu. The current settings for the date, time, and day of the week will be displayed.



2. Press Enter if the current date setting is correct.

or To change the date, move the cursor to the date, input the year, month, and day, and press Enter.

3. Press Enter if the current time setting is correct.

or To change the time, move the cursor to the time, input the new time, and press Enter.

4. Press Enter if the current day of the week setting is correct.

or To change the day of the week, move the cursor to the day, input the new setting (0 to 6: Sunday to Saturday), and press Enter.

13-5 Customization

The online Custom Data operations are used to transfer and compare custom settings between the computer and PC.

Custom settings are made with the offline Customization operation and then transfer the settings to the PC with the online Custom Data operation. If the settings aren't transferred to the PC, the changes won't be reflected in the computer's display during online operations. Refer to *6-11 Customization* for more details on customized settings and the offline Customization operations.

The following table lists the operations in the Customize Menu, which is displayed when "Z:Custom data" is selected from the Utility Menu.

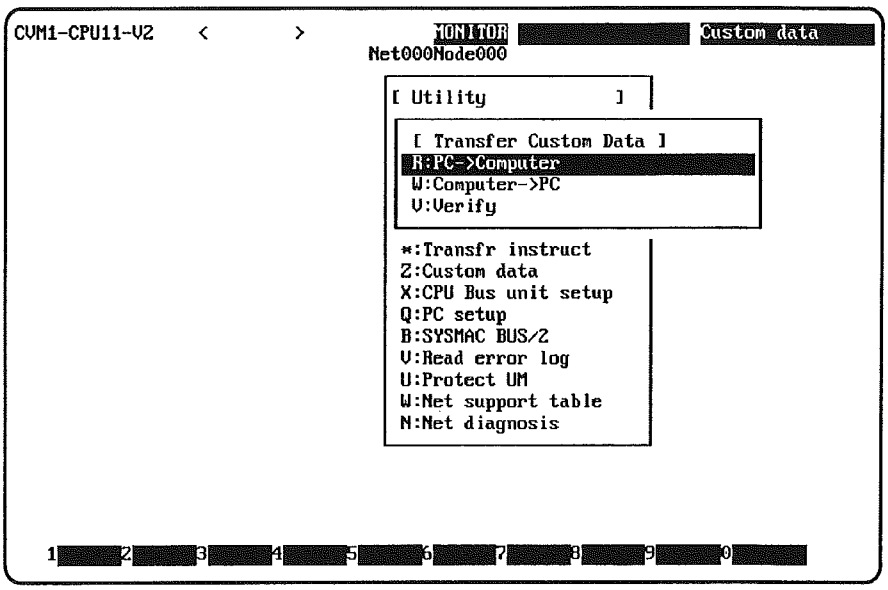
Operation	Function
R:PC → computer	Transfers customized settings from the PC to the computer.
W:Computer → PC	Transfers customized settings from the computer to the PC.
V:Verify	Compares the customized settings between the PC and computer.

13-5-1 Uploading Customized Settings

The PC → Computer operation transfers the customized settings from the PC to the computer's system work area.

1, 2, 3...

1. Select "Z:Custom data" from the Utility Menu.



2. Select "R:PC → Computer." A display will indicate the percentage of the customized settings that have been transferred.

13-5-2 Downloading Customized Settings

The Computer → PC operation transfers the customized settings from the computer's system work area to the PC.

1, 2, 3...

1. Select "Z:Custom data" from the Utility Menu.
2. Select "W:Computer → PC." A display will indicate the percentage of the customized settings that have been transferred.

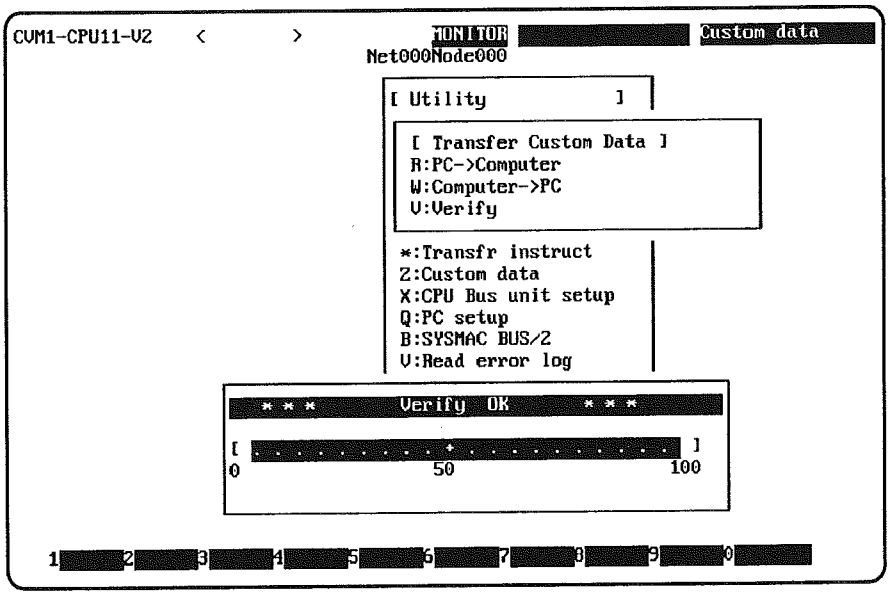
13-5-3 Verifying Customized Settings

The Computer → PC operation compares the customized settings in the computer's system work area to the settings in the PC. A message will indicate whether the settings are identical or not

1, 2, 3...

1. Select "Z:Custom data" from the Utility Menu.

2. Select "V:Verify." A display will indicate the percentage of the customized settings that have been compared.
   When the comparison is completed, a message will indicate the result.



13-6 Displaying Errors

The Display error operations are used to display and clear errors which have occurred in the PC, display and clear the error history, and manage the right to access PC memory.

The following table lists the operations in the Read Errors Menu, which is displayed when "V:Read error log" is selected from the Utility Menu.

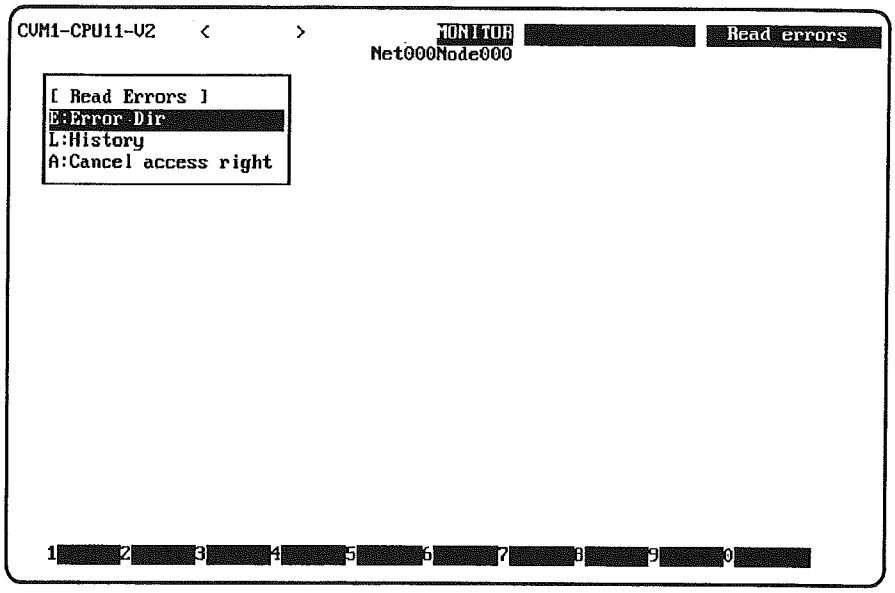
Function	Operation
E:Error Dir	Used to display the current PC error directory and to clear specified errors.
L:History	Used to display the PC error history with dates and times the errors occurred and to clear the error history.
A:Cancel access right	Used to release the access right. Use this operation during online operations when a message on the screen indicates that you do not have the access right.

13-6-1 Current Error Directory

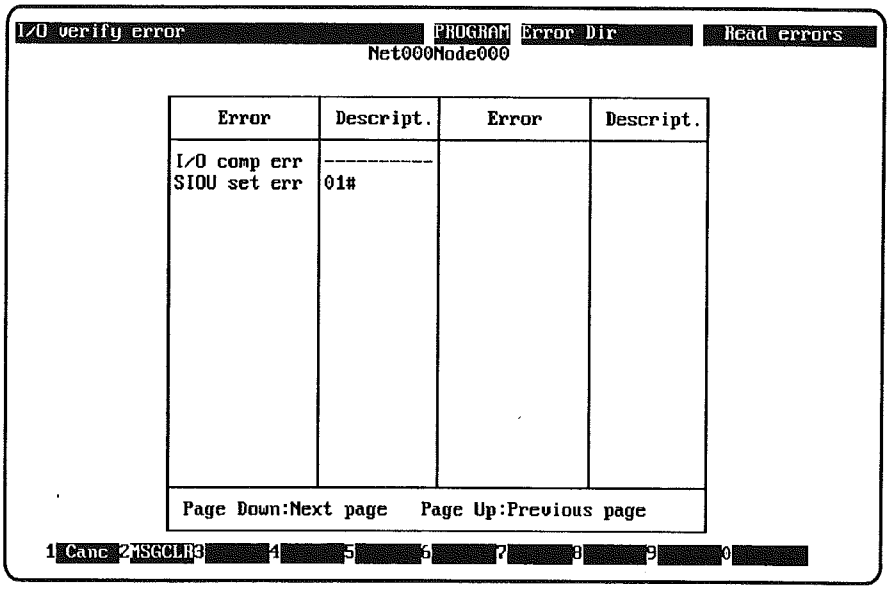
The Error Directory operation is used to display and clear errors which have occurred in the PC. If the errors can't be displayed in one page, use the PageDown/PageUp Keys to display the next/previous pages.

Errors can be cleared by pressing the F1 Key and messages generated by MESSAGE instructions can be cleared by pressing the F2 Key. Messages generated by MESSAGE instructions are displayed just below error messages in the upper-left corner of the screen.

1, 2, 3... 1. Select "V:Read error log" from the Utility Menu.



2. Select "E:Error Dir." The current error directory will be displayed.



3. Use the following procedure to clear errors.
   a) Press the F1 Key.
   b) Use the Up and Down Cursor Keys to select the error to be deleted.
   c) Press Enter to delete the error.

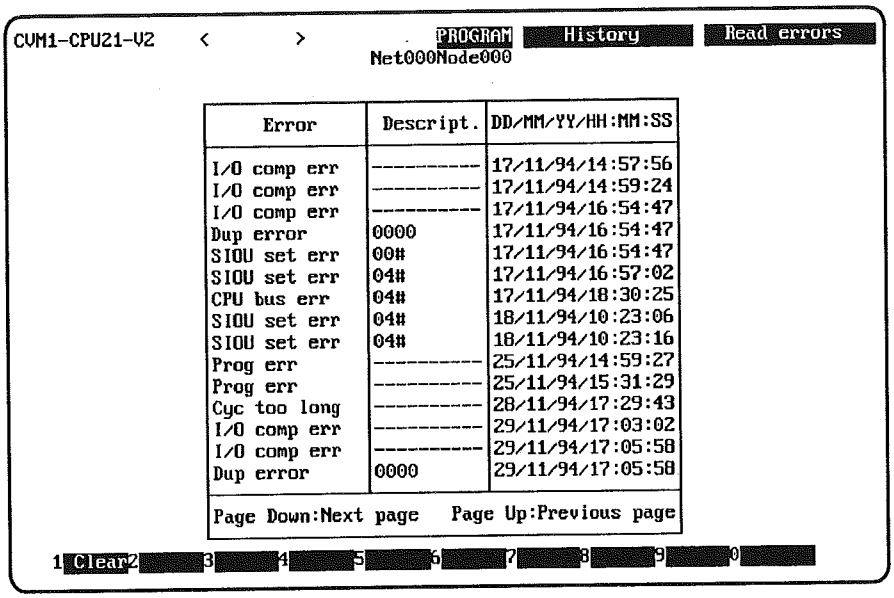
13-6-2 Error History

The History operation is used to display and clear the PC's error history. If the error history can't be displayed on one page, use the PageDown/PageUp Keys to display the next/previous pages.

The error history can be cleared by pressing the F1 Key.

1, 2, 3... 1. Select "V:Read error log" from the Utility Menu.

2. Select "L:History." The error history screen will be displayed.



3. Press the F1 Key to clear the error history. A confirmation prompt will appear.
4. Enter "Y" to clear the error history, "N" to return to the error history screen.

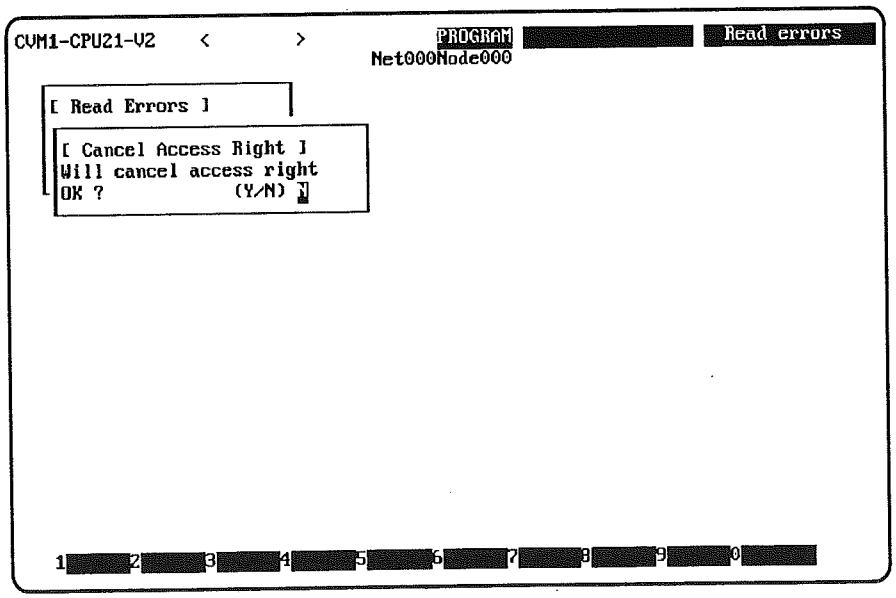
13-6-3 Releasing the Access Right

The Cancel Access Right operation is used to release the access right to PC memory. Use this operation during online operations when a message on the screen indicates that you do not have the access right.

Note A message will also be displayed indicating that you do not have access right when another node is communicating with the PC. Do not use the Cancel Access Right operation in this situation. Refer to the *CV-series PC Operation Manual: Host Interface* for details about access rights.

1, 2, 3...

1. Select "V:Read error log" from the Utility Menu.
2. Select "A:Cancel access right." A confirmation prompt will be displayed.



3. Enter "Y" to release the access right, "N" to cancel the operation.

13-7 Protecting UM

The Protect UM operations can be used to set or cancel total or partial protection for the PC user program memory (UM).

UM Protection

Setting UM protection will protect programs in the PC's user program memory. A password is input (up to 8-digit hexadecimal) to protect the entire program or up to 3 specified parts of the program.

The following programs can be specified for protection: the main program, an I/O interrupt program (0 to 31), a scheduled interrupt program (0 or 1), a power OFF interrupt, or a power ON interrupt.

The Delete Total Protection and Delete Part Protection operations are used to clear all or part of the UM protection.

Protect UM Menu

The following table lists the operations in the Protect UM Menu, which is displayed when "U:Protect UM" is selected from the Utility Menu.

Function	Operation
P:Protect	Used to protect all or part of the user program in the PC.
A:Del total protect	Used to clear all program protection.
B:Del part protect	Used to clear part of the program protection.

Specifying Programs

Function Keys F1 through F6 are used to specify the programs that are to be protected, as shown in the following table.

Key	Program	Function
F1	Main	Used to select the main program for protection.
F2	I/O Interrupt	Used to select an I/O Interrupt program for protection. Input the interrupt number (0 to 31) after pressing F2.
F3	Scheduled Interrupt	Used to select a scheduled Interrupt program for protection. Input the interrupt number (0 or 1) after pressing F3.
F4	Power OFF Interrupt	Used to select the power OFF Interrupt program for protection.
F5	Power ON Interrupt	Used to select the power ON Interrupt program for protection.
F6	None	When just one program is being protected, press F6 for the other parts.

13-7-1 Protecting the UM

This operation is used to set total or partial protection for the PC user program memory (UM).

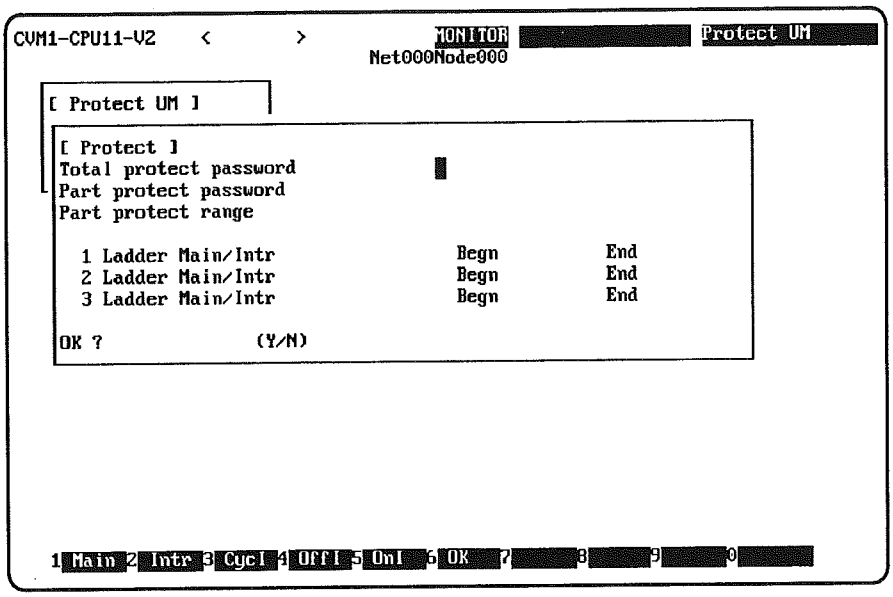
Total Protection

The following example demonstrates how to protect all programs in the PC UM with the password "12345678."

1, 2, 3...

1. Select "U:Protect UM" from the Utility Menu.

2. Select "P:Protect." The protect UM display will appear.



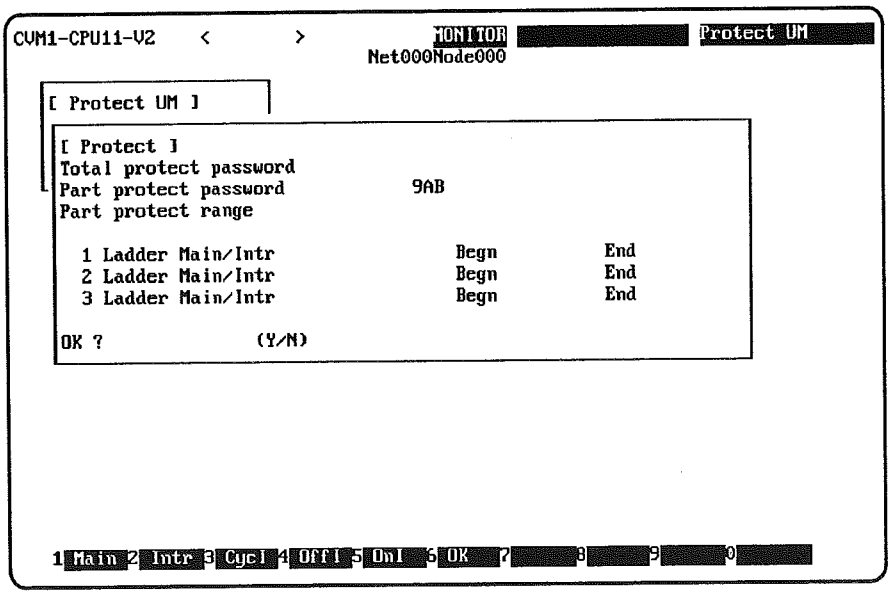
3. Input 12345678 and press Enter to enter the password.
4. Press Enter again. The cursor will move to the last line on the screen.
5. Enter "Y" to set the UM protection, "N" to cancel the operation.
   If "Y" is entered, a message will appear in the upper-left corner of the screen indicating that the UM is protected.

Partial Protection

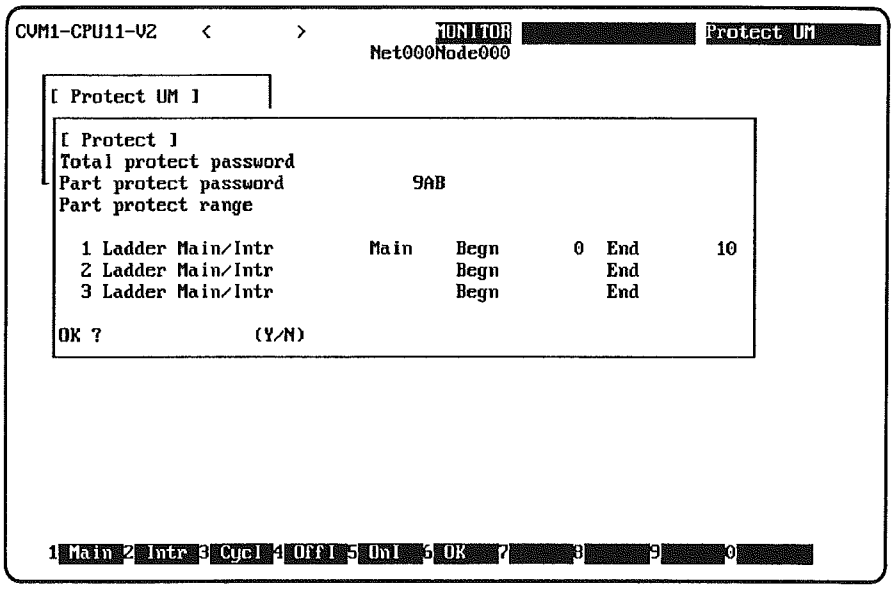
The following example demonstrates how to protect program addresses 0 through 10 of the main program with the password "9AB."

1, 2, 3...

1. Select "U:Protect UM" from the Utility Menu.
2. Select "P:Protect." The protect UM display will appear.
3. Press Enter again to skip to the partial protection password input.
4. Input 9AB and press Enter to enter the password.



5. Press F1.
6. Press 0 and Enter to enter the beginning address of the protected range.
7. Press 10 and Enter to enter the end address of the protected range.



8. Press F6 twice to skip to the last line on the screen.
9. Enter "Y" to set the UM protection, "N" to cancel the operation.

13-7-2 Clearing Total Protection

1, 2, 3...

1. Select "U:Protect UM" from the Utility Menu.
2. Select "A:Del total protect" from the Protect UM Menu.
3. Enter the password and press Enter. A confirmation prompt will be displayed.
4. Enter "Y" to clear the protection, "N" to cancel the operation.

13-7-3 Clearing Partial Protection

1, 2, 3...

1. Select "U:Protect UM" from the Utility Menu.
2. Select "B:Del part protect" from the Protect UM Menu.
3. Enter the password and press Enter. A confirmation prompt will be displayed.
4. Enter "Y" to clear the protection, "N" to cancel the operation.

Part 4
Networks and CPU Bus Units

This part of the manual covers operations required to set up, diagnose, and control networks. These include SYSMAC NET, SYSMAC LINK, and SYSMAC BUS/2 Systems. Also included are operations to set up and control CPU Bus Units. An overview of these operations is provided in the first section of this part.

SECTION 14
Network-related Operations

This section provides an overview of the operations required to set up, diagnose, and control networks. These include SYSMAC NET, SYSMAC LINK, and SYSMAC BUS/2 Systems. Also included is an overview of the operations to set up and control CPU Bus Units.

14-1 Network Support Tables 350
14-2 Data Links 350
14-3 Routing Tables 350
14-4 Support for CPU Bus Units 350
14-5 Network Diagnosis 350
14-6 Support for SYSMAC BUS/2 351

14-1 Network Support Tables

The Network Support Table Menu on the Utility Menus provide operations to set up data links in SYSMAC NET and SYSMAC LINK systems. Operations are also provided to set up and transfer routing tables to enable internetwork communications. Refer to following sections of this part for details on the specific operations that are possible. Refer to the manuals for individual systems for details on data link tables, data link areas, and other operational details.

14-2 Data Links

This section provides an overview of the data link feature of SYSMAC NET and SYSMAC LINK Systems. Refer to the operation manuals for the SYSMAC NET Link Unit, SYSMAC LINK Unit, and other network products for details.

Data links can be established between PCs and computers on a SYSMAC NET or SYSMAC LINK System network to automatically exchange data. To achieve automatic data exchange, data link tables are established at each node to specify the words that are to be exchanged. The results is that the nodes share data in what are called common data areas, i.e., the data areas linked at each of the nodes is exactly the same as the corresponding areas at the other nodes. Each node thus has certain words to which it writes data called write words and words written by other nodes called read words (i.e., the local node can only read words written by other nodes).

Data Link Tables The data link tables contain parameters necessary to automatically transfer data between the nodes in the data link. These data link tables must be established before any data link communications are possible.

There are two ways to establish data link tables: automatically and manually. The operations described in this manual to create and edit data link tables are not necessary if the System is set up to automatically generate data link tables from the LR Areas of the PCs.

Manually establishing data link tables involves inputting data link tables on the SSS or host computers and transferring them to the PCs and other participating nodes. The operations required to input and transfer the data link tables using the SSS are described in the rest of this section.

14-3 Routing Tables

Routing tables are required to communicate with remote networks and are not necessary if communications are only going to be conducted within one network. Routing tables are data files that tell the nodes that communications must be sent through in order to reach a particular remote node.

Routing tables are input in offline operation and then transferred to nodes in online operation. Routing tables are explained in more detail in *Section 17 Routing Tables.*

14-4 Support for CPU Bus Units

The online Utility Menu provides an item call "Communication Setup" that lets you set parameters for CPU Bus Units, including parameters and software switches for Communications Units (SYSMAC NET, SYSMAC LINK, and SYSMAC BUS/2) and parameters and software switches for CPU Bus Units

14-5 Network Diagnosis

Network Diagnosis operations are available on the online Utility Menu to diagnose SYSMAC NET and SYSMAC LINK Systems. These operations let you read network status, run communications tests, and read error histories.

14-6 Support for SYSMAC BUS/2

The BUS/2 Support item on the online Utility Menu provides the following operations for SYSMAC BUS/2 Systems.

- Status displays for transmission line status and terminator information.
- Communications tests.
- Cycle time readouts.
- Slave connection status readouts.
- Line mode switching for Optical Systems.

SECTION 15
Support for SYSMAC NET Data Links

This section describes the operations required to set up, check, and transfer data link tables, to save and retrieve data link tables, and to start and stop data links for SYSMAC NET Systems.

15-1 Overall Procedure 354
15-2 Offline Data Link Table Menu 354
15-2-1 Editing Data Link Tables 356
15-2-2 Checking Data Link Tables 357
15-2-3 Clearing Data Link Tables 358
15-2-4 Retrieving Data Link Tables 358
15-2-5 Saving Data Link Tables 358
15-2-6 Printing Data Link Tables 359
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15-3-2 Transferring the Data Link Table 361
15-3-3 Starting and Stopping Data Links 365

15-1 Overall Procedure

The following procedure is used when creating data link tables. Be sure to read the rest of this section before attempting to carry out this procedure. The last three of these steps are performed online.

This procedure is required only when the Communications Units are set up for manual setting of the data link tables.

1, 2, 3...

1. Set the number of nodes in the data link.
2. Input the data link table.
3. Check the data link table.
4. Save the data link table to disk.
5. Switch to online operation.
6. Retrieve the data link table from disk.
7. Transfer the data link tables to the PCs.
8. Start and stop the data links as required by the application.

15-2 Offline Data Link Table Menu

The following table describes the operations found in the SYSMAC NET Data Link Table Menu. These operations are described individually next in the manual

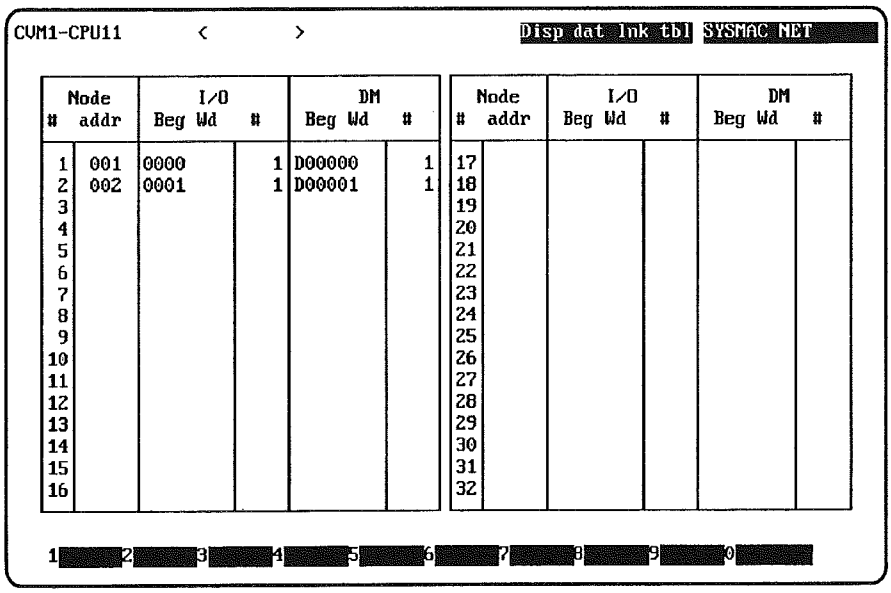
Operation	Function
E:Edit data link table	Used to create and edit data link tables.
K:Check data link table	Checks the data link table in memory and displays any error found.
C:Clear data link table	Clears all data link table data from the system work area.
L:Retrieve data link table	Retrieves the data link table data from the data disk to the system work area.
S:Save data link table	Saves the data link table data in the system work area to the data disk.
P:Print data link table	Prints the data link table data in the system work area.

The offline SYSMAC NET Data Link Table Menu can be accessed using the following procedure.

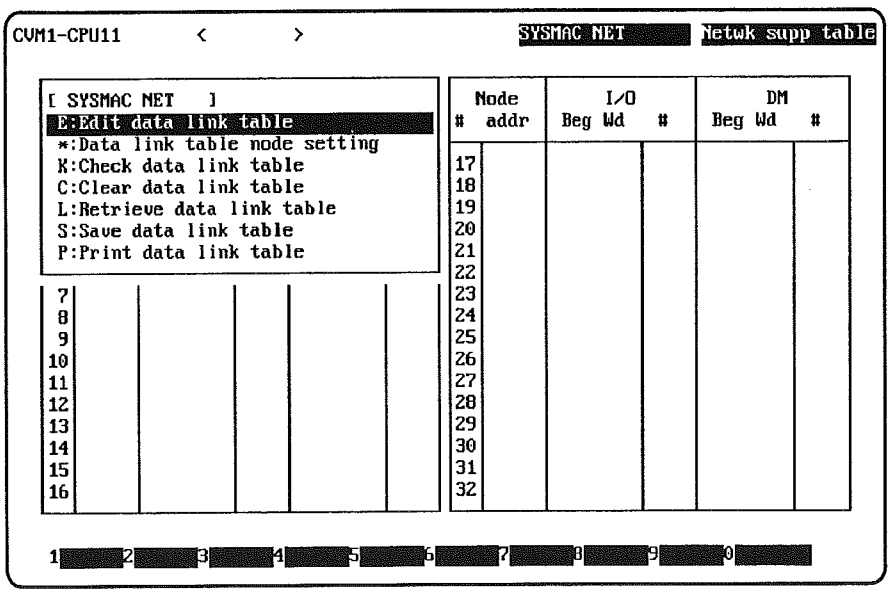
1, 2, 3...

1. Select "W"Net support table" from the offline Utility Menu. The Network Support Table Menu will appear.

2. Select "N:Data link table (SYSMAC NET)." The Data Link Table display will appear as shown below.



3. Press the End Key. The SYSMAC NET Data Link Table will appear. This menu can also be accessed by pressing the End Key during most data link table operations.



15-2-1 Editing Data Link Tables

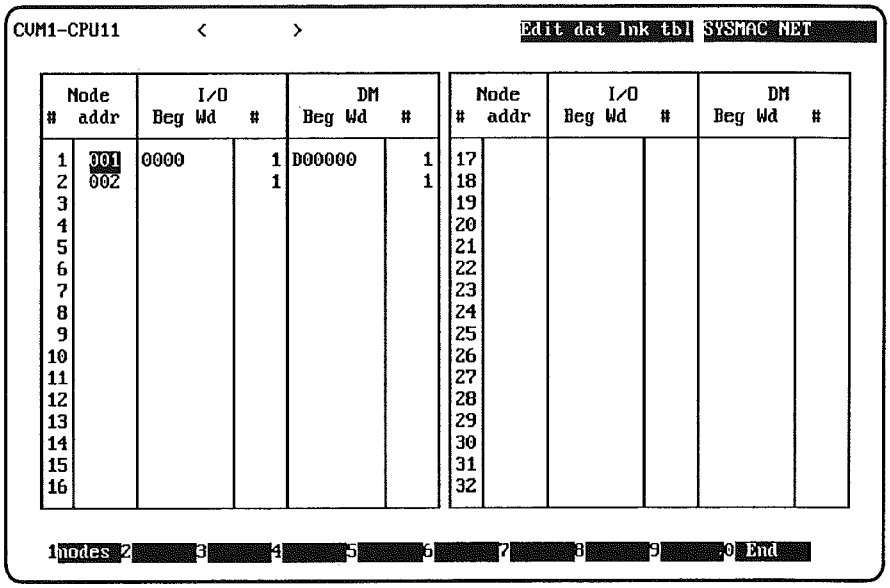
The Edit Data Link Table operation is used to input and correct data link tables. The following parameters must be designated.

Parameter	Meaning
Number of nodes	The number of nodes in the data link.
Node address	The node address (number) of a node in the data link.
I/O beginning word	The first CIO word in the data link.
I/O number	The number of CIO words in the data link.
DM beginning word	The first DM word in the data link.
Number of DM words	The number of DM words in the data link.

1, 2, 3...

1. Select "E:Edit data link table" from the SYSMAC NET menu.

   A message at the top-right of the screen will indicate that the data link table is being edited.



2. Follow the sequence below to set the number of nodes in the data link. The number of node must be between 2 and 32.

   F1 Key, *number_of_link_nodes*, Enter

3. Move the cursor to the position where data is to be input and enter the data. Input the node address, I/O beginning word, number of I/O words, DM beginning word, and number of DM words. These inputs are described in the following table.

Node address	Set the node address in the range 1 to 126. Make sure that the same address is not input twice. Press the Insert Key to insert a node address or the Delete Key to delete a node address.
I/O and DM beginning words, number of words	Set the I/O and DM beginning words for the first node only. The I/O and DM start words for the subsequent nodes will be automatically set. Input Enter, *word_address*, Enter to input the beginning word. Set the number of I/O and DM words in the range 1 to 127. Set the I/O beginning and the number of words so that the last word does not exceed CIO 2555. Set the DM beginning and number of words so that the last word does not exceed the following limits: CVM1-CPU01-E: D8191 CVM1-CPU11-E: D24575 CVM1-CPU21-E: D24575 Restrict the total number of I/O and DM words to 3,584 words or less.

4. When all data is input, press the F10 Key to save the data.

Note When the F10 Key is input, the data link table is saved to memory only. Be sure to save the data link table to disk when you have finished creating it.

15-2-2 Checking Data Link Tables

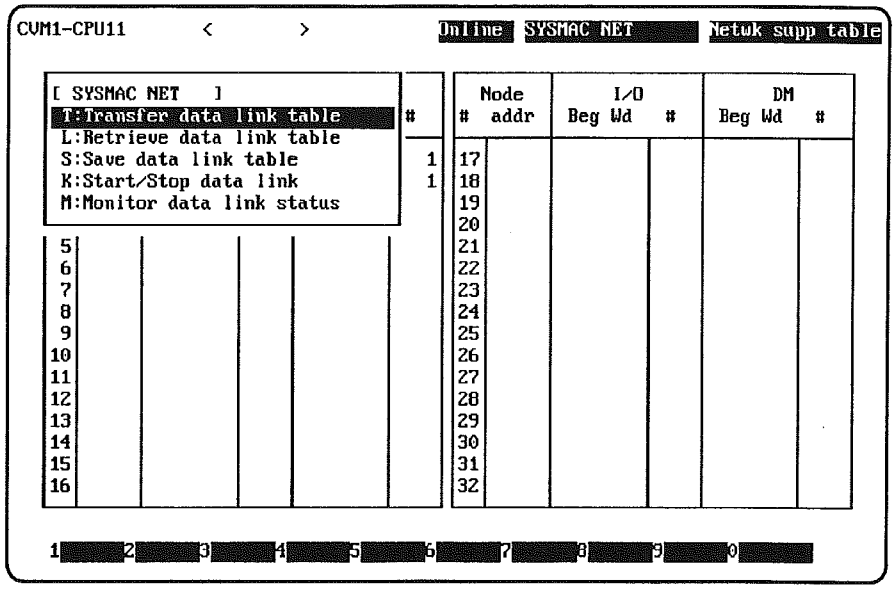
This Check Data Link Table operation checks the on-screen data link table for setting errors. Use the following operation.

⚠ **Caution** Always check any data link table that has been newly input or modified. If any errors are found in the table, correct them using the Edit Data Link Table operation and then check the table again.

1, 2, 3...

1. Display the data link table to be checked either by inputting it or by reading it from the disk.

2. Select "K:Check data link table" from the SYSMAC NET Data Link Table Menu. The check will start immediately and any errors that are discovered will be displayed as shown in the following illustration.



If no error exists in the data link table, no error messages will be displayed and the message "Check OK" will be displayed at the bottom center of the table.

If errors have been detected, the relevant error messages will be displayed. If too many errors have occurred to be displayed on a single screen, the message "Continued" will be displayed at the bottom center of the screen. Use PageUp and PageDown Keys to display these errors.

15-2-3 Clearing Data Link Tables

This Clear Data Link Table operation clears the data link table to the default table (i.e., one for two nodes).

The procedure is as follows:

1, 2, 3...

1. Select "C:Clear data link table" from the SYSMAC NET Data Link Table Menu. A confirmation display will appear.
2. Press Y and Enter to clear the table. The default data link table will appear.

15-2-4 Retrieving Data Link Tables

The Retrieve Data Link Table operation retrieves a data link table from a disk to the computer's system work area. The data link table currently being displayed will be lost.

The procedure is as follows:

1, 2, 3...

1. Select "L:Retrieve data link table" from the SYSMAC NET Data Link Table Menu.
2. Input the name of the file to be retrieved and press Enter. The data link table under the input name will be retrieved to the system work area.

   Files can also be specified by pressing End while the file name input area is displayed, selecting the file name and pressing Enter.

15-2-5 Saving Data Link Tables

The Save operation saves a data link table from the computer's system work area to a disk.

The procedure is as follows:

1, 2, 3...

1. Select "S:Save data link table" from the SYSMAC NET Data Link Table Menu.

2. Input the name of the file to be saved and press Enter.

   Files can also be specified by pressing End while the file name input area is displayed, selecting the file name and pressing Enter.

3. Input a title for the file if desired and press Enter. The data link table under the input name will be saved from the system work area to the data disk.

15-2-6 Printing Data Link Tables

The Print Data Link Table operation prints the data link table shown on the display. The printout will be in a form similar to the form in which tables are displayed on-screen.

1, 2, 3...

1. Select "P:Print data link table" from the SYSMAC NET Data Link Table Menu. Printing will be started.

   The *Printing* message will disappear when printing is complete.

2. Press Escape to cancel printing. All characters in the print buffer will be printed before printing stops.

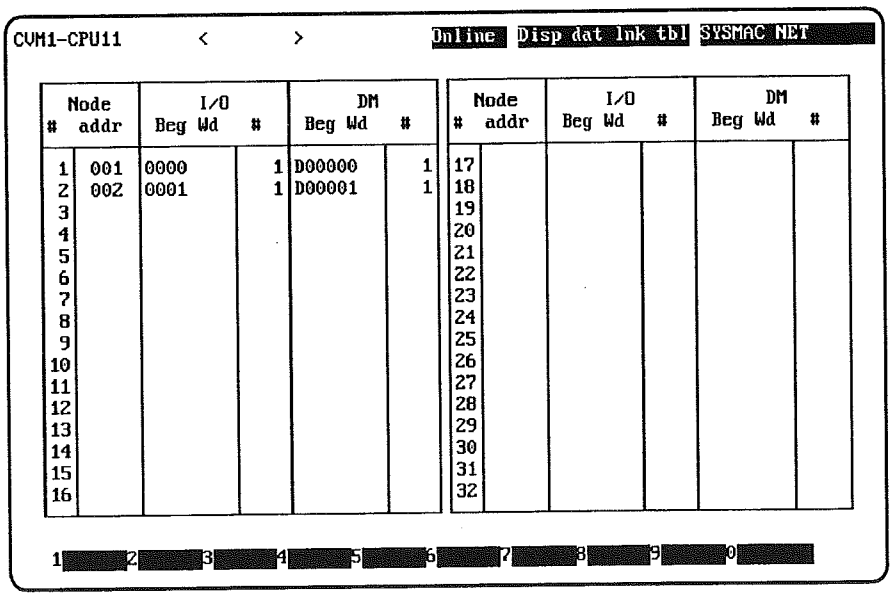
15-3 Online Data Link Table Menu

The online SYSMAC NET Data Link Table Menu provides the following operations to support SYSMAC NET data links.

Operation	Function
T:Transfer data link table	Used to transfer and compare the data link table between the SYSMAC NET Link Unit and computer system work area.
L:Retrieve data link table	Used to read the data link table from the data disk to the computer system work area.
S:Save data link table	Used to write the data link table from the computer system work area to the data disk.
K:Start/Stop data link	Used to start or stop the data link with the specified SYSMAC NET Link Unit.
M:Monitor data link status	Used to display the operating status of each node belonging to the data link.

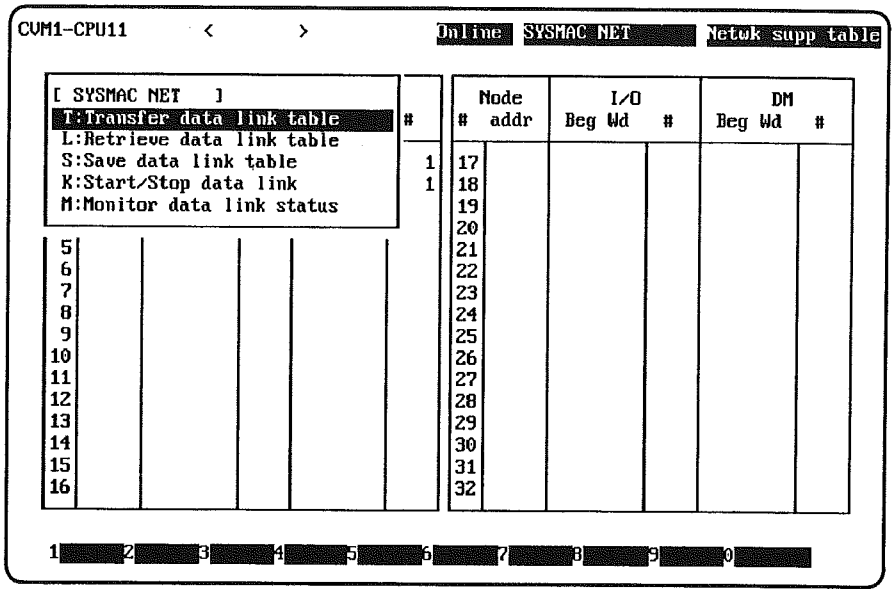
1, 2, 3...

1. Select "N:Data link table (SYSMAC NET)" from the Network Support Table Menu. The default data link table will be display



Note Default values will be shown in the data link table when it is first displayed. A specific table can be display by transferring one from a PC using the Transfer Data Link Table operation or by retrieving one from disk using the Retrieve Data Link Table operation.

2. Press the End Key from the data link table to access the SYSMAC NET menu and select the required item from the menu.



15-3-1 Retrieving a Data Link Table

The Retrieve Data Link Table operation retrieves a data link table from a disk to the computer's system work area. The data link table currently being displayed will be lost.

The procedure is as follows:

1, 2, 3...

1. Select "L:Retrieve data link table" from the SYSMAC NET Data Link Table Menu.
2. Input the name of the file to be retrieved and press Enter. The data link table under the input name will be retrieved to the system work area.

   Files can also be specified by pressing End while the file name input area is displayed, selecting the file name and pressing Enter.

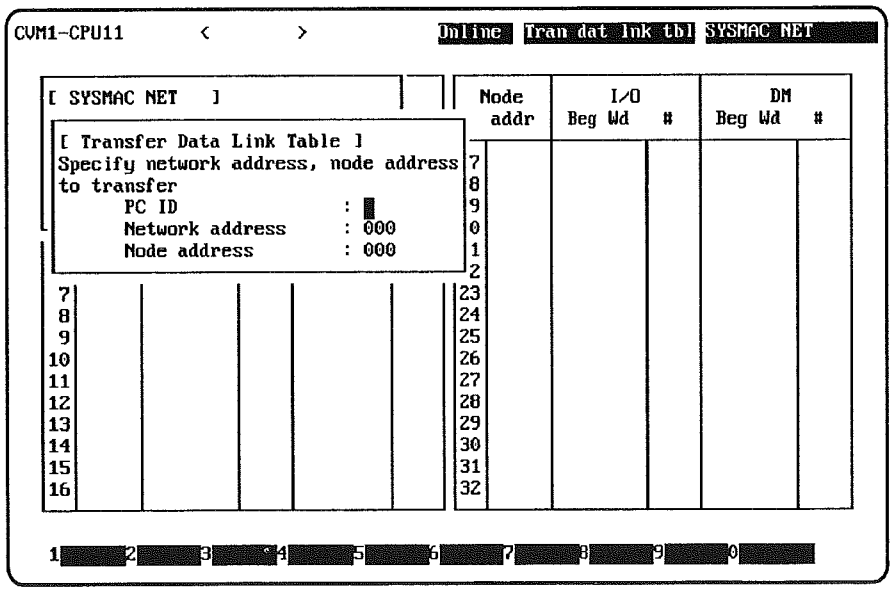
15-3-2 Transferring the Data Link Table

The following table shows transfer operations available and the valid data link statuses for each operation.

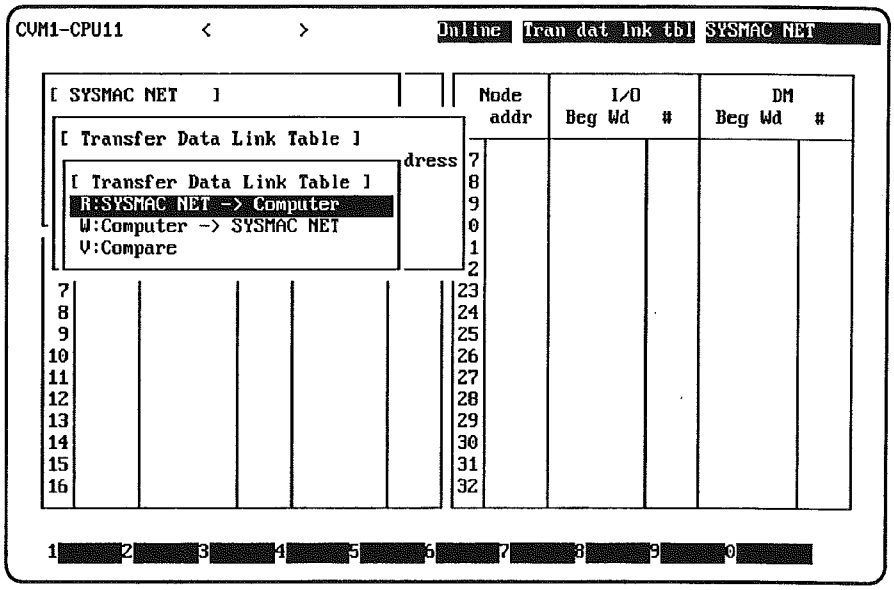
Operation	Valid data link status		Function
	Stopped	Running	
SYSMAC NET Computer	OK	OK	Uploads the contents of the data link table in the SYSMAC NET Link Unit to the computer system work area. The data link table already existing in the computer system work area will be overwritten.
Computer SYSMAC NET	OK	No	Downloads the contents of the data link table in the computer system work area to the data link table area for the SYSMAC NET Link Unit. The data link table already existing in the SYSMAC NET Link Unit will be overwritten.
Compare	OK	OK	Compares the data link table in the computer system work area with the data link table area in the SYSMAC NET Link Unit.

Note It is necessary to transfer the data link table only to and from the PC which contains the SYSMAC NET Link Unit specified as the Master of the data link.

1, 2, 3... 1. Select "T:Transfer data link table" from the SYSMAC NET Data Link Table Menu to access the following display.



2. Press the Up and Down Keys to move the cursor and input the network address and node address. The network address and node address can also be specified using PC names (IDs). Press the End Key to access the PC name table and select the required PC name with the cursor. The network address and node address will be displayed automatically when the Enter Key is pressed. The following menu will appear after the network address and node address are displayed.



3. Continue as described next for individual operations.

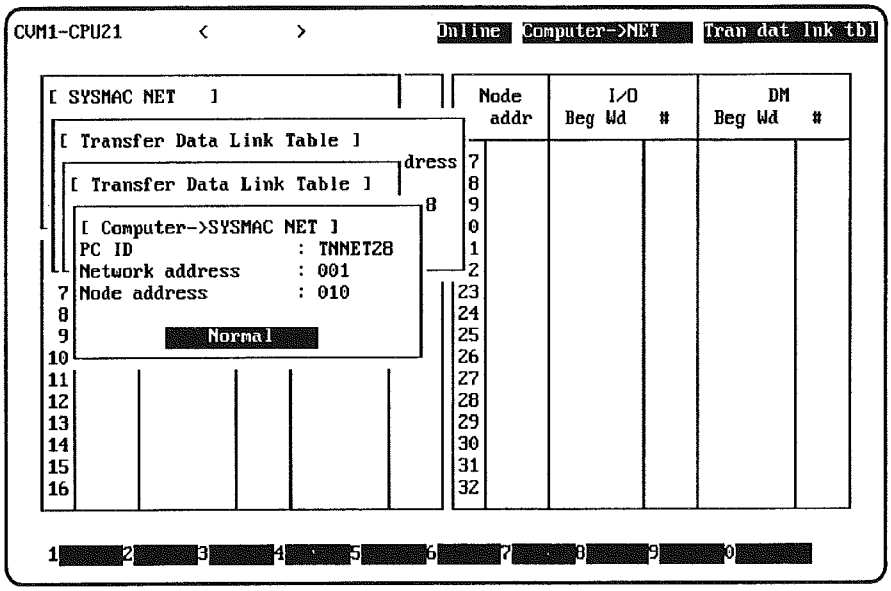
Uploading Data Link Tables

The SYSMAC NET Computer operation uploads the contents of the data link table in the SYSMAC NET Link Unit to the computer system work area. The data link table already existing in the computer system work area will be overwritten.

This operation can be used to modify the data link tables in a system by first uploading the existing table, modifying it using the Edit Data Link Table operation, and then transferring the modified table back to the Unit.

1, 2, 3...

1. Select "R:SYSMAC NET Computer" from the Transfer Data Link Table Menu to start uploading the data link table. A message will flash during the transfer. The following display will appear when the transfer is complete.



2. Press Escape to return to the Transfer Data Link Table Menu.

Downloading Data Link Tables

The Computer SYSMAC NET operation downloads the contents of the data link table in the computer system work area to the data link table area for the SYSMAC NET Link Unit. The data link table already existing in the SYSMAC NET Link Unit will be overwritten.

Before using this operation, display the desired data link table using the Retrieve data link table operation.

1, 2, 3...

1. Select "W:Computer SYSMAC NET" from the Transfer Data Link Table Menu to start downloading the data link table. A message will flash during the transfer and another one will appear when the transfer is complete.
2. Press Escape to return to the Transfer Data Link Table menu after the transfer is complete.

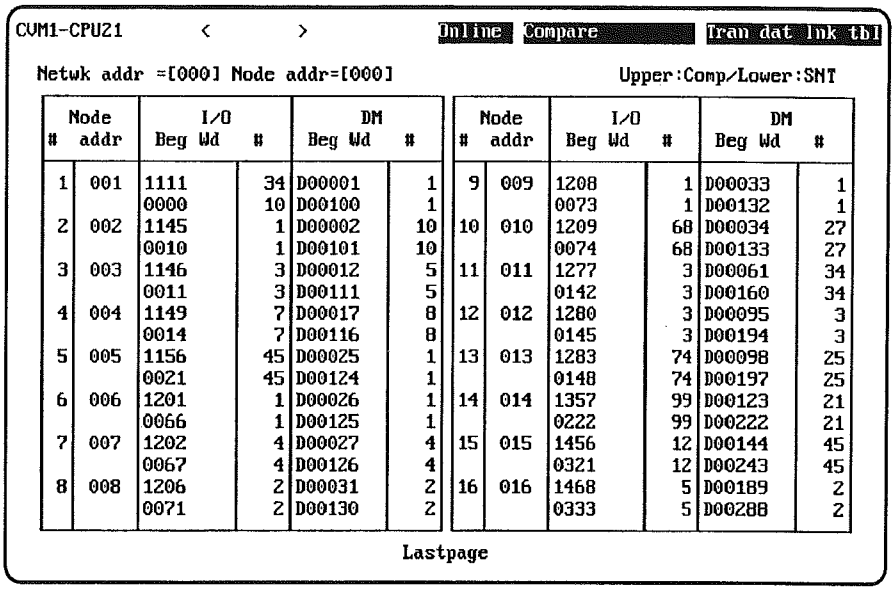
Compare

The Compare operation compares the data link table in the computer system work area with the data link table area in the SYSMAC NET Link Unit.

Use the Compare operation after using the SYSMAC NET Computer *or* Computer SYSMAC NET operation to confirm that the tables agree. If the tables are not the same, repeat the transfer operation.

1, 2, 3...

1. Select "V:Compare" from the Transfer Data Link Table menu to start comparing the data link tables. A message will flash during the comparison and the following display will appear when the comparison is complete. Unmatching data items will be displayed with the data in the computer on top and the data in the SYSMAC NET Link Unit underneath.



CVM1-CPU21 < > Online Compare Tran dat link tbl

Netwk addr =[000] Node addr=[000] Upper:Comp/Lower:SNT

Node #	Node addr	I/O Beg Wd	I/O #	DM Beg Wd	DM #	Node #	Node addr	I/O Beg Wd	I/O #	DM Beg Wd	DM #
1	001	1111	34	D00001	1	9	009	1208	1	D00033	1
		0000	10	D00100	1			0073	1	D00132	1
2	002	1145	1	D00002	10	10	010	1209	68	D00034	27
		0010	1	D00101	10			0074	68	D00133	27
3	003	1146	3	D00012	5	11	011	1277	3	D00061	34
		0011	3	D00111	5			0142	3	D00160	34
4	004	1149	7	D00017	8	12	012	1280	3	D00095	3
		0014	7	D00116	8			0145	3	D00194	3
5	005	1156	45	D00025	1	13	013	1283	74	D00098	25
		0021	45	D00124	1			0148	74	D00197	25
6	006	1201	1	D00026	1	14	014	1357	99	D00123	21
		0066	1	D00125	1			0222	99	D00222	21
7	007	1202	4	D00027	4	15	015	1456	12	D00144	45
		0067	4	D00126	4			0321	12	D00243	45
8	008	1206	2	D00031	2	16	016	1468	5	D00189	2
		0071	2	D00130	2			0333	5	D00288	2

Lastpage

2. Press the PageDown Key to display the next page if the message "Continue" appears on the screen. If the comparison discovers no differences between the data link tables in the computer and the SYSMAC NET Link Unit, a message will indicate that the comparison was OK. A message will also indicate if the number of nodes did not agree.
3. Press Escape to return to the Transfer Data Link Table Menu
4. If the contents did not agree, repeat the data link table transfer operation and then compare the resulting table again.

Saving Data Link Tables

The Save operation saves a data link table from the computer's system work area to a disk.

The procedure is as follows:

1, 2, 3...

1. Select "S:Save data link table" from the SYSMAC NET Data Link Table Menu.
2. Input the name of the file to be saved and press Enter.

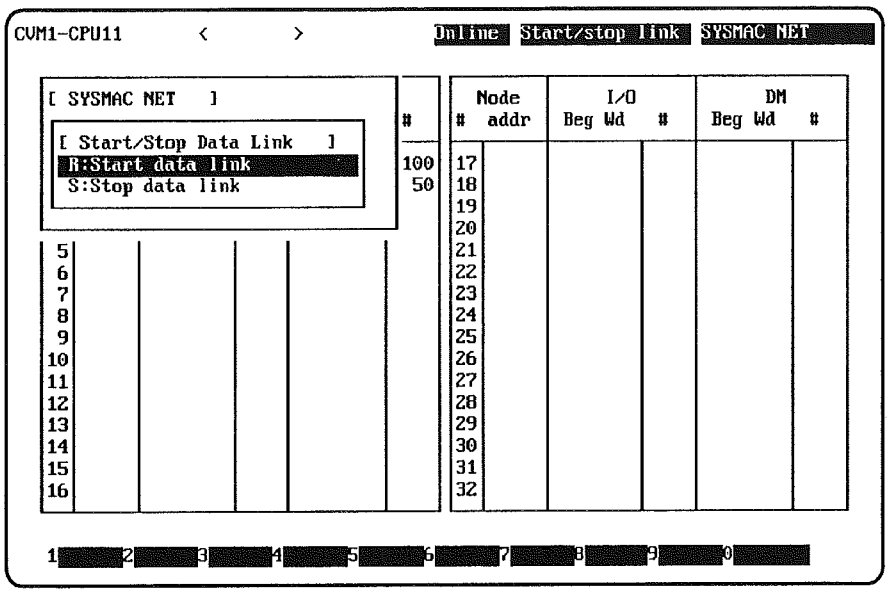
   Files can also be specified by pressing End while the file name input area is displayed, selecting the file name and pressing Enter.
3. Input a title for the file if desired and press Enter. The data link table under the input name will be saved from the system work area to the data disk.

15-3-3 Starting and Stopping Data Links

The Start/Stop Data Link operation is used to start or stop data links under a specified master.

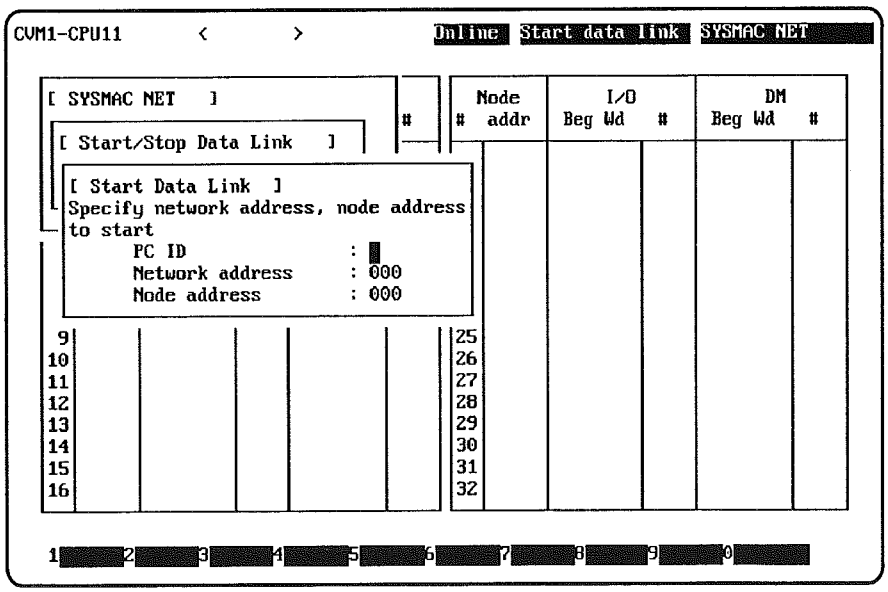
1, 2, 3...

1. Select "K:Start/Stop data link" from the SYSMAC NET Data Link Table Menu to access the following menu.



2. Select the required item from the Start/Stop Data Link Menu to start or stop the data link.

   The following displayed when stopping a data link has been selected. The display for stopping data links is similar.



3. Input the network address and node address of the SYSMAC NET Link Unit specified as the master of the data link.

The network address and node address can be specified using PC names (IDs). Press the End Key to display the PC name table and select the required PC name with the cursor. The network address and node address will be displayed automatically when the Enter Key is pressed.

4. Press the Enter Key. The data link will start or stop, as specified and the display will return to the Start/Stop Data Link menu.

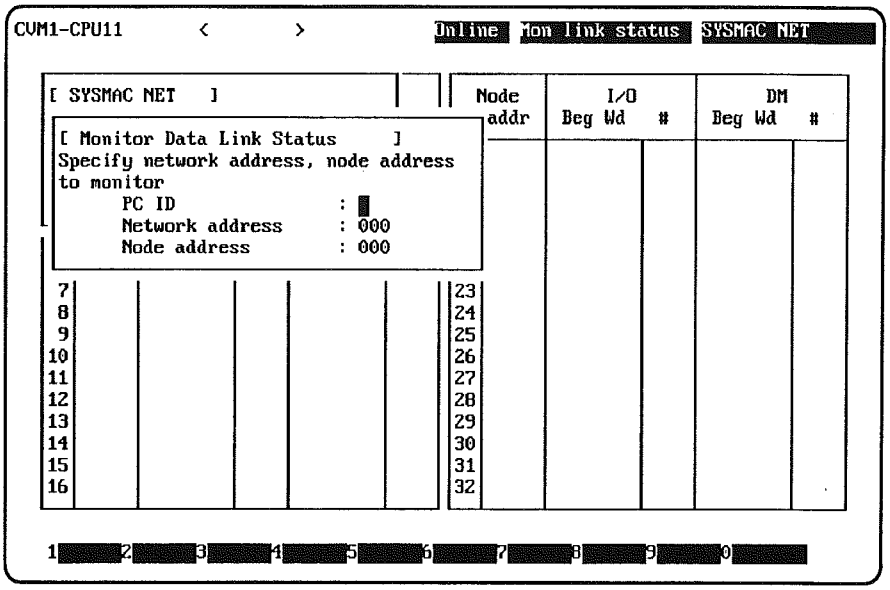
Monitoring Data Link Status

The Monitor Data Link Status operation is used to display the operating status of each node belonging to a data link.

This operation is possible only when the Data Link is actually running.

1, 2, 3...

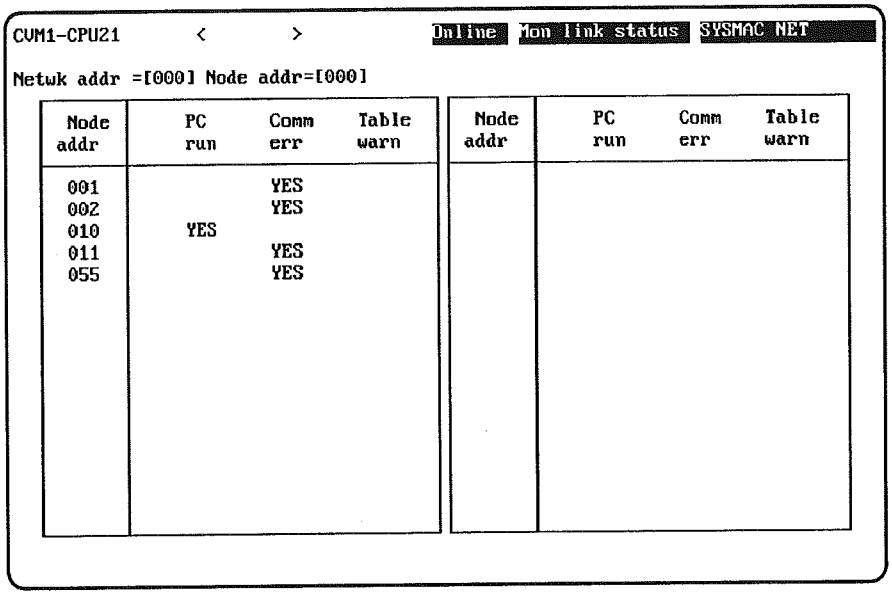
1. Select "M:Monitor data link status" from the SYSMAC NET Data Link Menu to access the following display.



2. Press the Up and Down Keys to move the cursor and input the network address and node address. Specify the node address of a node belonging to a data link.

   The network address and node address can be specified using PC names. Press the End Key to display the PC name table and select the required PC name with the cursor. The network address and node address will be displayed automatically when the Enter Key is pressed.

3. Press the Enter Key. The data link status will appear for each node.



"YES" in the table will indicate the status of each node for the following items.

Item	Status
PC running	The PC is in RUN or MONITOR mode.
Communications error	A data link error has occurred and the Unit is not currently participating in the data link.
Table error	A data link table setting error was discovered.

Note If automatically generated data link tables are being used, "Yes" will be displayed indicating communications errors for all nodes that are not communicating, including nodes that do not actually exist.

4. Press Escape to end monitoring.

SECTION 16
Support for SYSMAC LINK Data Links

This section describes the operations required to set up, check, and transfer data link tables, to save and retrieve data link tables, and to start and stop data links for SYSMAC LINK Systems.

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16-1 Overall Procedure

The following procedure is used when creating data link tables. Be sure to read the rest of this section before attempting to carry out this procedure. The last three of these steps are performed online.

This procedure is required only when the Communications Units are set up for manual setting of the data link tables.

1, 2, 3...

1. Input the data link table.
2. Check the data link table.
3. Save the data link table to disk.
4. Switch to online operation.
5. Retrieve the data link table from disk.
6. Transfer the data link tables to the PCs.
7. Start and stop the data links as required by the application.

16-2 Offline Data Link Table Menu

The offline Data Link Table Menu provides operations to create and maintain data links when manual setting has been designated in online Communications Unit Settings. For SYSMAC LINK Systems two types of data link table are required: the common link parameter table and the refresh parameter table.

Note Always save data link tables to disk. Data link tables created on-screen will be lost if power is turned off, if the computer is reset, or if you return to the top-level menu.

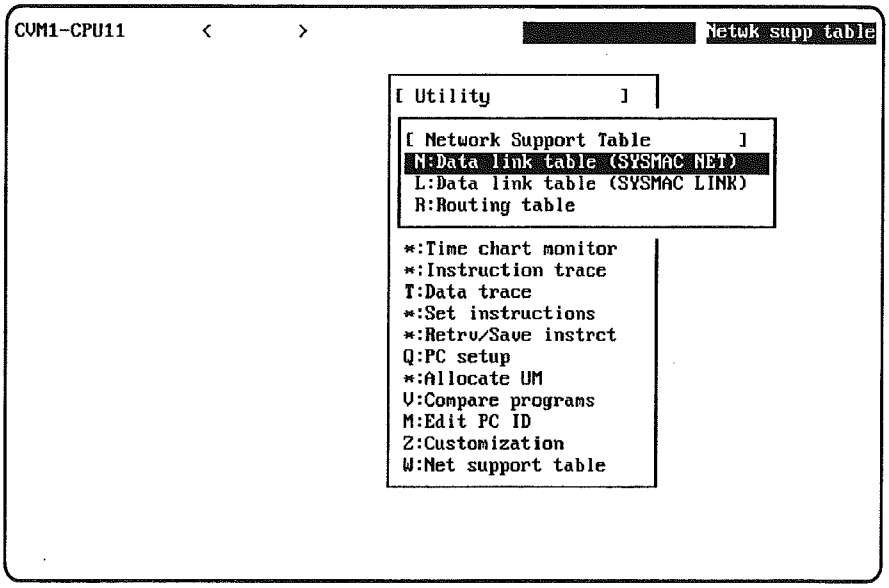
The offline Data Link Table Menu provides the following operations.

Operation	Function
E:Edit data link table	Used to create and edit data link tables.
K:Check data link table	Checks the data link table in memory and displays any errors found.
Y:Copy data link table	Copies refresh parameters from a specified node to one or more other nodes.
C:Clear data link table	Clears all data link data from the system work area.
L:Retrieve data link table	Retrieves the data link table data from the data disk to the system work area.
S:Save data link table	Saves the data link table data in the system work area to the data disk.
P:Print data link table	Prints the data link table data in the system work area.

Use the following procedure to access the SYSMAC LINK Network Support Table Menu.

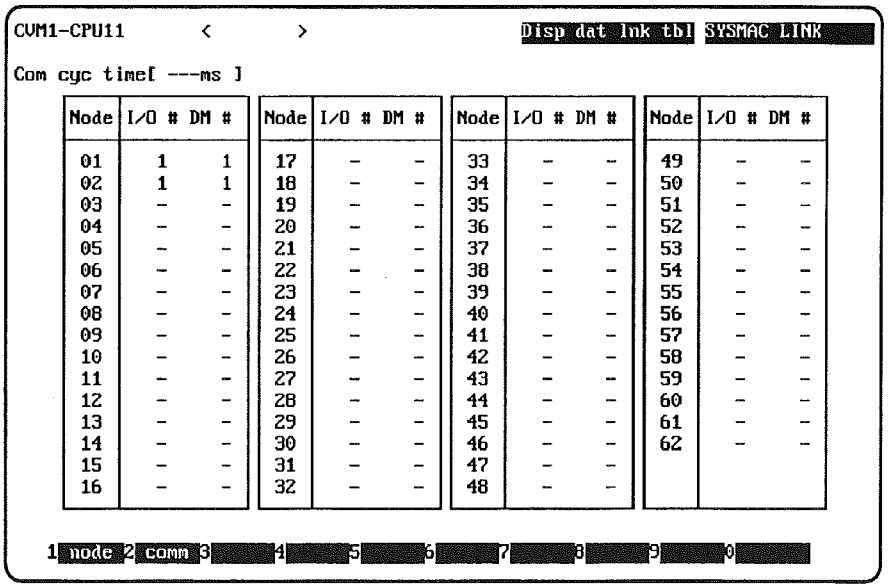
1, 2, 3...

1. Select W":Net support table" from the offline Utility Menu. The following display will appear.



2. Select "L:Data link table (SYSMAC LINk). The default common link parameter table will be displayed.

Common Link Parameter Display

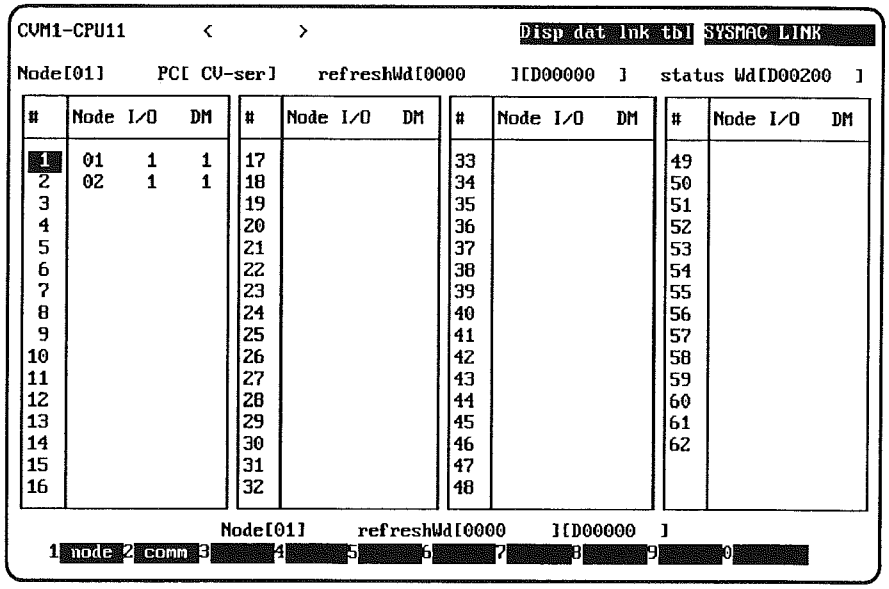


Node	I/O #	DM #	Node	I/O #	DM #	Node	I/O #	DM #	Node	I/O #	DM #
01	1	1	17	-	-	33	-	-	49	-	-
02	1	1	18	-	-	34	-	-	50	-	-
03	-	-	19	-	-	35	-	-	51	-	-
04	-	-	20	-	-	36	-	-	52	-	-
05	-	-	21	-	-	37	-	-	53	-	-
06	-	-	22	-	-	38	-	-	54	-	-
07	-	-	23	-	-	39	-	-	55	-	-
08	-	-	24	-	-	40	-	-	56	-	-
09	-	-	25	-	-	41	-	-	57	-	-
10	-	-	26	-	-	42	-	-	58	-	-
11	-	-	27	-	-	43	-	-	59	-	-
12	-	-	28	-	-	44	-	-	60	-	-
13	-	-	29	-	-	45	-	-	61	-	-
14	-	-	30	-	-	46	-	-	62	-	-
15	-	-	31	-	-	47	-	-			
16	-	-	32	-	-	48	-	-			

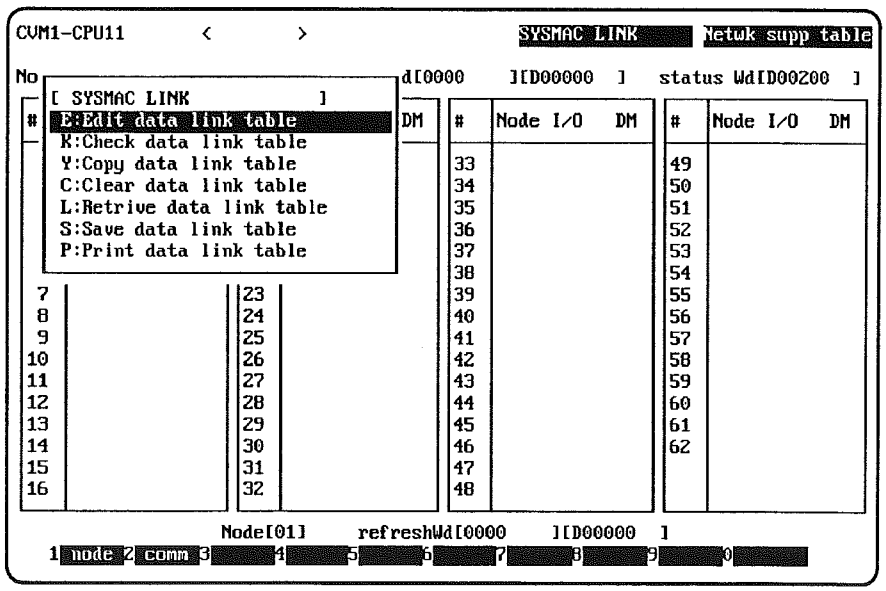
3. To display a specific table, retrieve it from disk.
4. Press the PageDown and PageUp Keys to display any refresh parameter screens that have been set for nodes 1 to 62.

or The required refresh parameter screen can also be displayed by pressing the F1, *node address*, Enter Keys.

Node Refresh Parameter Display



5. Press the F2 Key to revert to the common link parameter screen.
6. Press the End Key from the Data Link Table display to access the SYSMAC LINK Data Link Table Menu.



6-2-1 Editing Data Link Tables

The Edit Data Link Table operation is used to create and edit common link parameter and node refresh parameter tables.

The following parameters are input on the common link parameter display.

Parameter	Setting method
Communicatio ns cycle time	This is the time taken for the token to pass all the nodes in the data link. Initially dashes (-) will be displayed to indicate that the cycle times is set automatically. This is the normal setting. Set the cycle time to a constant value if the cycle time fluctuates too much due to noise or other causes. Input a value in the range 5 to 255 ms that is large than the maximum cycle time and press the Enter Key. The data link may malfunction if the cycle time setting is too short.
I/O #	Set the number of I/O (CIO Area) words used in the data link by each node.
DM #	Set the number of DM words used in the data link by each node.

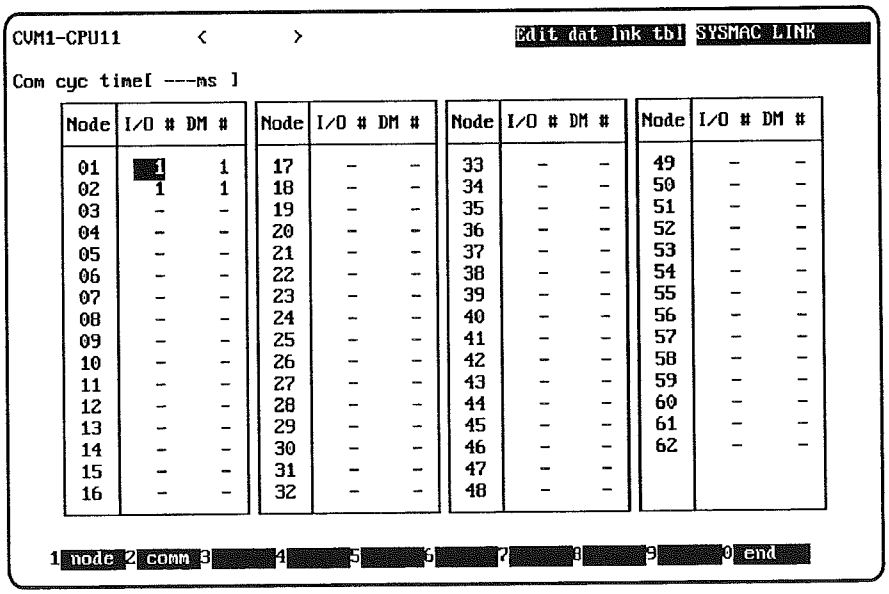
The following parameters are input on the node refresh parameter display.

Item	Setting method
PC	Set the PC series of the node to either CV Series or "Other." CVM1 PCs are part of the CV Series of PCs.
Beginning refresh word	Set the first data link word for the displayed node in the CIO (IR) and DM Area.
Status wd	This setting is not required for CV-series PCs. Words are allocated starting from CIO 1500. For C-series PCs, set the first word of the data link status area.
Node	The node displayed at the top is the node for which the data link is being set. Be sure you are setting data for the correct node.

Use the following procedure for setting the data link tables.

1, 2, 3...

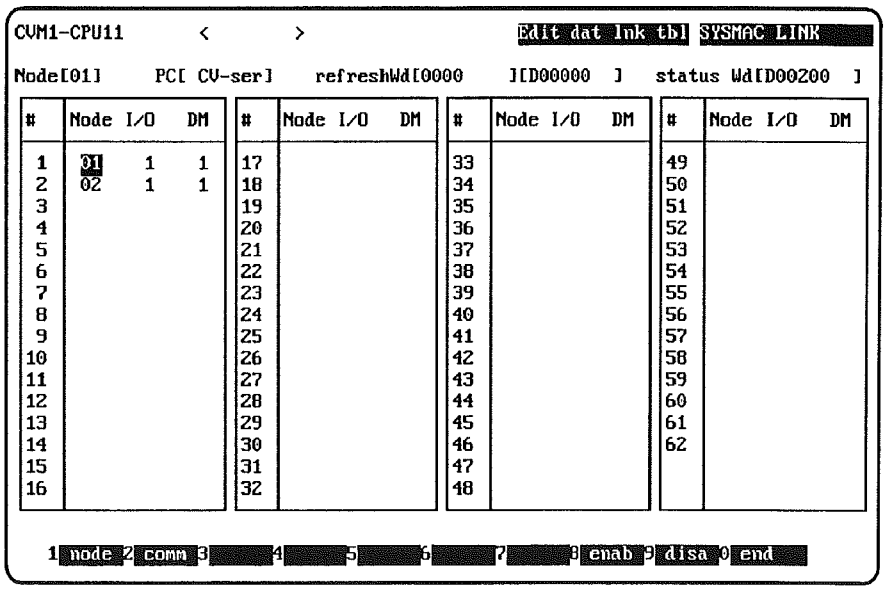
1. Select "E:Edit data link table" from the SYSMAC LINK Data Link Table Menu. The common data link table will appear and a message at the top-right of the screen will indicate that the data link table is being edited.



2. Input the communications cycle time, and input the number of I/O and DM words for the data link to each node. These are described in more detail in the following table. Use the Up, Down, Left, Right Keys to move the cursor to the required position on the screen.

Parameter	Setting method
Com cyc time	Initially dashes (-) will be displayed to indicate that the cycle times is set automatically. This is the normal setting. To set a cycle time, input a value in the range 5 to 255 ms. To return to automatic cycle times once a value has been input, move the cursor to the communications cycle time input area and press the Home Key twice.
I/O # and DM #	Set the number of I/O (CIO Area) words and DM words used in the data link by each node. Initially dashes (-) are displayed to indicate that there are no I/O or DM words in the data link. If the numbers of words is set to zero for a node, that node will not transmit data into the data link but can access data transmitted by other node and data link status will be refreshed. Press the dash (-) Key to revert a set value back to the initial dash (-). Set the numbers of I/O and DM words in the ranges specified below. **Only CVM1 PCs in data link:** I/O words 0 to 254 DM words 0 to 254 **Other PCs in data link:** I/O words 0 to 64 DM words 0 to 254 Restrict the total number of I/O and DM words to 2,966 words or less.

3. Use one of the following methods to display a refresh parameter screen.
   Press the PageDown and PageUp Keys to scroll through the screens or press F1, input the node address, and press Enter.
   Refresh parameters will not be displayed for disabled nodes.



   The data link table will not be displayed for a disabled node.
4. To enable a node, press F8, input the desired total number of nodes, and press Enter.
5. To disable a node, press F9. The contents of the table will remain unchanged but the data link will be disabled.

6. Input the parameters as described in the following table for each enabled node. Use the Up, Down, Left, Right Keys to move the cursor to the required position on the screen.

Item	Setting method
PC	Set the PC series of the node. Set the CV Series for CVM1 PCs. Press the 1 Key for CV-series PC and the 2 Key for other PC and then press the Enter Key.
Refresh wd	Set the first data link word for the displayed node in the CIO (IR) or DM Area. Input the Enter Key, *word_address*, Enter Key.
Status wd	This setting is not required for CVM1 PCs. For C-series PCs, set the first word of the data link status area. Input the Enter Key, *word_address*, Enter Key. Four bits are required for each node.
Node	The node displayed at the top is the node for which the data link is being set. Be sure you are setting data for the correct node. To change the node, press F1, input the node number, and press Enter. Set only nodes previously set in the common link parameters. You must make a setting for the current node for it to participate in the data link. Words set for the current node (i.e., the node displayed at the top) are written by the current node and are transferred to the other nodes. Words set for other nodes are written by the other nodes and received by the current node. The data link area will be allocated from the first refresh words set in the table in order of the numbers at the left of the table. Press the Insert Key to insert a node or the Delete Key to delete a node.
I/O and DM	The values input on the common link parameter display will be automatically displayed in these columns.

Parameter Ranges

Parameter	PC		
	CVM1-CPU01-E	CVM1-CPU11/21-E	Other
I/O (CIO) link words	0 to 254		0 to 64
DM link words	0 to 254		0 to 254
I/O (CIO) start and end words	0000 to 2555		1000 to 1063
DM start and end words	D00000 to D08191	D00000 to D24575	D00000 to D04095
Status start and end words	---		0000 to 0252 1000 to 1191 D00000 to D04095

7. When finished inputting parameters, press F10 to access the menu and save the data link table to disk.

16-2-2 Checking Data Link Tables

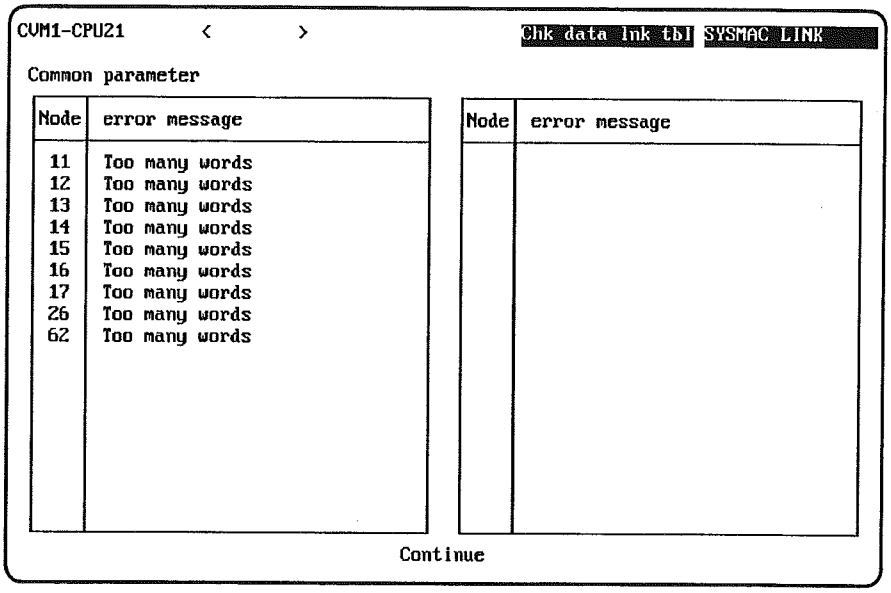
The following operation is used to check manually created data link tables displayed on-screen. If the desired tables are not currently display, retrieve them from disk to transfer them from a PC.

1, 2, 3...

1. Select "K:Check data link table" from the SYSMAC LINK Data Link Table Menu to start the check.

   A message will indicate if no errors were detected.

An error message table will be displayed if errors are found.



2. If "Continue" is displayed at the bottom of the screen, press the PageDown Key to display the next page of error messages.
3. If errors are detected, correct the data link table and run the check again.

Error Message Table

Common Link Parameter Error Messages

Error message	Error description	Remedy
Comm cycle time range err	The transfer cycle time is not set to automatic or 5 to 255.	Press the Home Key to set automatic calculation or set a value in the range 5 to 255.
Too many DM words	The number of DM words exceeds 254.	Set the number of DM words to below 254.
Too many I/O words	The number of I/O words exceeds the prescribed range.	Change settings to bring the number of words inside the prescribed range.
Too many words	The total number of I/O and DM words exceeds the prescribed range.	Change settings to bring the total number of I/O and DM words to below 2,966 words.

Refresh Parameter Error Messages

Error message	Error description	Remedy
Begin I/O Wd range err	The first I/O word lies outside the prescribed range.	Change settings to bring the first I/O word inside the prescribed range.
Begin I/O Wd set err	The data link exceeds the permissible area range.	Lower the first I/O word to bring the entire link area within the prescribed range.
Begin DM Wd range err	The first DM word lies outside the prescribed range.	Change settings to bring the first DM word inside the prescribed range.
Begin DM Wd set err	The data link exceeds the permissible link area range.	Lower the first DM word to bring the entire link area within the prescribed range.
Begin status Wd range err	The first status word lies outside the prescribed range.	Change settings to bring the first status word inside the prescribed range.
Begin status Wd set err	The status area is too small.	Lower the status start word to bring the entire status area within the prescribed range.
Dup node address	A node address is duplicated.	Do not set the same node address twice.
Node addr range err	The node address is set outside the range 1 to 62.	Set the node address in the range 1 to 62.
Node addr set err	The set node address is not set in the common link parameters.	Only set nodes previously set in the common link parameters.
No send area	Link area does not exist for the node.	Set the data link words for the current node.
Refresh node range err	Number of refresh nodes lies outside the range 2 to 62.	Check the contents of the data link table.

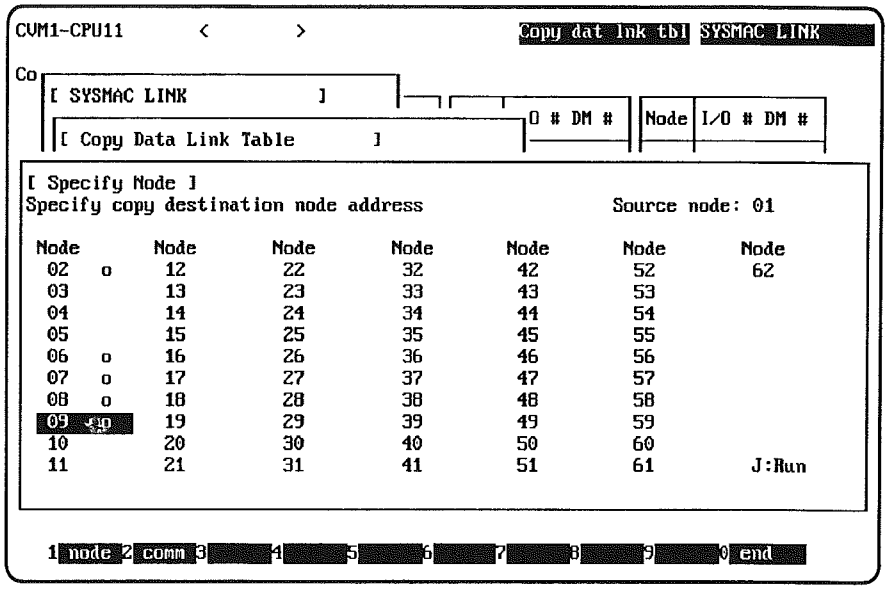
16-2-3 Copying Data Link Tables

The Copy Data Link Table operation copies refresh parameters from a specified node to one or more other nodes. An refresh parameters at the destination nodes will be overwritten.

1, 2, 3...

1. Select "Y:Copy data link table" from the SYSMAC LINK Data Link Table Menu.
2. Enter the copy source node address and press the Enter Key. Nodes that are disabled cannot be set.

3. Press the Enter Key to display the screen to set the copy destination.



4. Move the cursor to the copy destination nodes and press the Enter Key.
   "o" will be displayed to indicate nodes that have been set as a copy destinations. Multiple nodes can be set.
   To deselect a node as a copy destination, move the cursor to the node and press the Enter Key again.
5. Select "J :Run."
   The copy source node will be copied to the destination nodes, and all previous data will be cleared from the copy destination nodes.
   Disabled copy destination nodes will be enabled after the copy is complete.
   The common link parameter screen will be displayed when the copy is complete.

16-2-4 Clearing Data Link Tables

The Clear Data Link Table operation returns the data link table in the system work area to its default settings. Nodes 1 and 2 are enabled in the default table; all other nodes are disabled.

1, 2, 3...

1. Select "C:Clear data link table" from the SYSMAC LINK Data Link Table Menu.
2. Press the Y and Enter Keys to clear the contents of the data link table.

16-2-5 Saving Data Link Tables

The Save Data Link Table operation saves the data link table data in the system work area to the data disk.

When using a floppy disk, be sure the data disk has been formatted and is not write-protected. Data link table data cannot be saved if it exceeds the free space available on the data disk.

1, 2, 3...

1. Select "S:Save data link table" from the SYSMAC LINK Data Link Table Menu. A file name input area will be displayed.
2. Enter the file name and press the Enter Key.
   To enter an existing file name, press the End Key to display the current file names, select the required file name with the cursor, and press the Enter Key.
3. If the input file name already exists, a message will ask if the file should be over-written.Press the Y and Enter Keys to overwrite the file. Press the Enter Key to cancel and input a new file name.

The title input area will appear when the Enter Key is pressed.

4. Input the title and press the Enter Key. The title can be up to 30 characters long.

   A message will flash while the table is being saved. The data link table will be displayed after the data is saved.

16-2-6 Retrieving Data Link Tables

The Retrieve Data Link Table operation retrieves the data link table data from the data disk to the system work area. The data link table that was previously in the system work area will be overwritten.

1, 2, 3...

1. Select "L:Retrieve data link table" from the SYSMAC LINK Data Link Table Menu. A file name input area will be displayed.
2. Enter the file name and press the Enter Key. Press the End Key to display the file names, select the required file name with the cursor, and press the Enter Key to input the file name.
3. Press the Enter Key to retrieve the data link table.

   A message will flash while the table is being retrieved. The data link table will be displayed after the data is retrieved.

16-2-7 Printing Data Link Tables

The Print Data Link Table operation prints the data link table data in the system work area.

1, 2, 3...

1. Select "P:Print data link table" from the SYSMAC LINK Data Link Table Menu. Printing will be started.

   The *Printing* message will disappear when printing is complete.
2. Press Escape to cancel printing. All characters in the print buffer will be printed before printing stops.

Sample Print-out

< < < SYSMAC LINK Data Link Table Directory > > > 05/12/94 PAGE = 0001

[Common Parameters]

Comm cycle time = [--- ms]

Node	I/O	DM
01	1	2
02	2	3
03	5	0
04	-	-
05	-	-
06	-	-
07	-	-
08	10	0
09	-	-
10	-	-
11	-	-
12	5	0
13	-	-
14	-	-
15	-	-
16	-	-

Node	I/O	DM
17	-	-
18	-	-
19	-	-
20	-	-
21	-	-
22	-	-
23	-	-
24	-	-
25	-	-
26	-	-
27	-	-
28	-	-
29	-	-
30	-	-
31	-	-
32	-	-

Node	I/O	DM
33	-	-
34	-	-
35	-	-
36	-	-
37	-	-
38	-	-
39	-	-
40	-	-
41	-	-
42	-	-
43	-	-
44	-	-
45	-	-
46	-	-
47	-	-
48	-	-

Node	I/O	DM
49	-	-
50	-	-
51	-	-
52	-	-
53	-	-
54	-	-
55	-	-
56	-	-
57	-	-
58	-	-
59	-	-
60	-	-
61	-	-
62	-	-

16-3 Online Data Link Table Menu

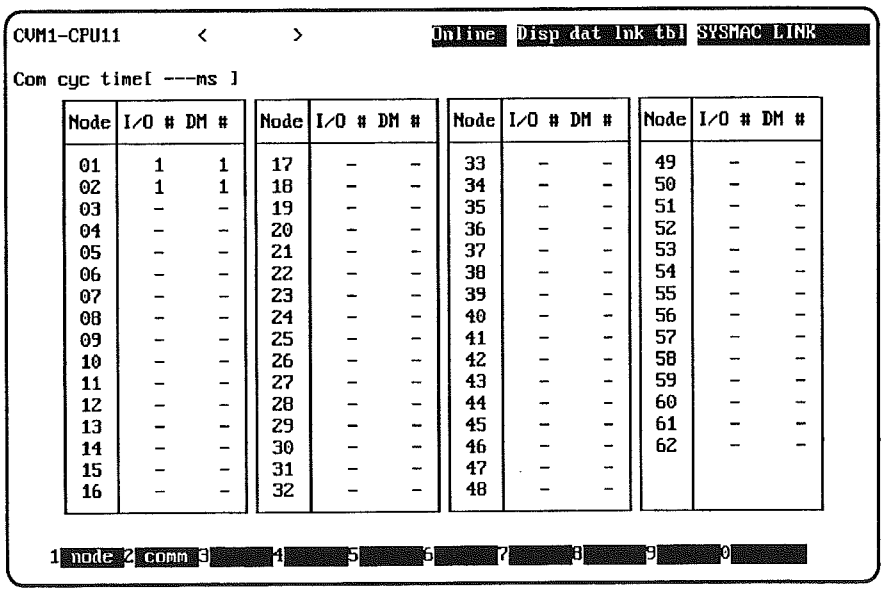
The following support operations are for SYSMAC LINK data links.

Operation	Function
T:Transfer data link table	Used to transfer and compare the data link tables between the SYSMAC LINK Unit and computer system work area.
D:Delete data link table	Used to delete the specified data link table in the SYSMAC LINK Unit.
L:Retrieve data link table	Used to read the data link table from the data disk or hard disk to the computer system work area.
S:Save data link table	Used to write the data link table from the computer system work area to the data disk or hard disk.
K:Start/Stop data link	Used to start or stop the data links for the specified SYSMAC LINK Unit.
M:Monitor data link status	Used to monitor the data link status, communications cycle time, and refresh cycle time.

Use the following procedure to access the online SYSMAC LINK Data Link Table Menu.

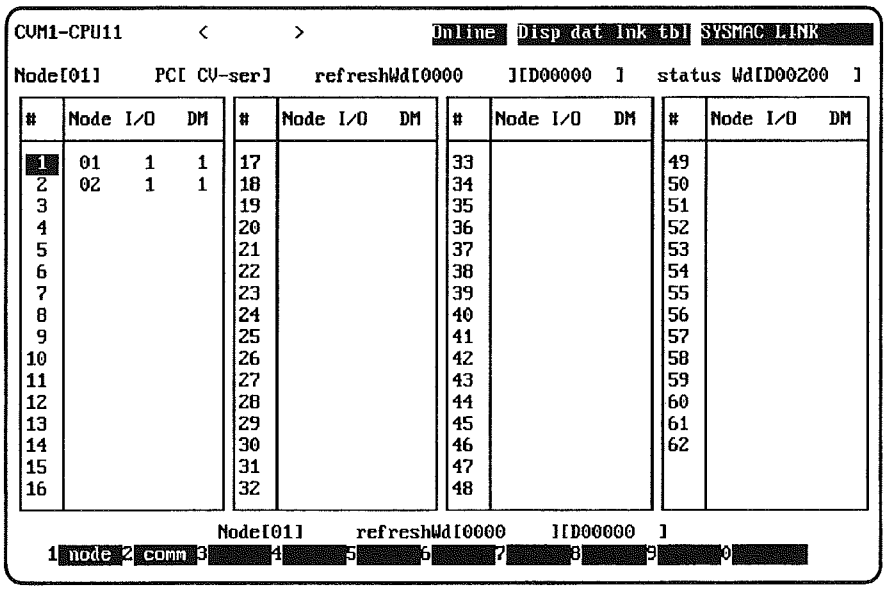
1, 2, 3...

1. Select "W:Net support table" from the online Utility Menu.
2. Select "L:Data link table (SYSMAC LINK)" from the Network Support Table Menu. The default common parameter table will be displayed.

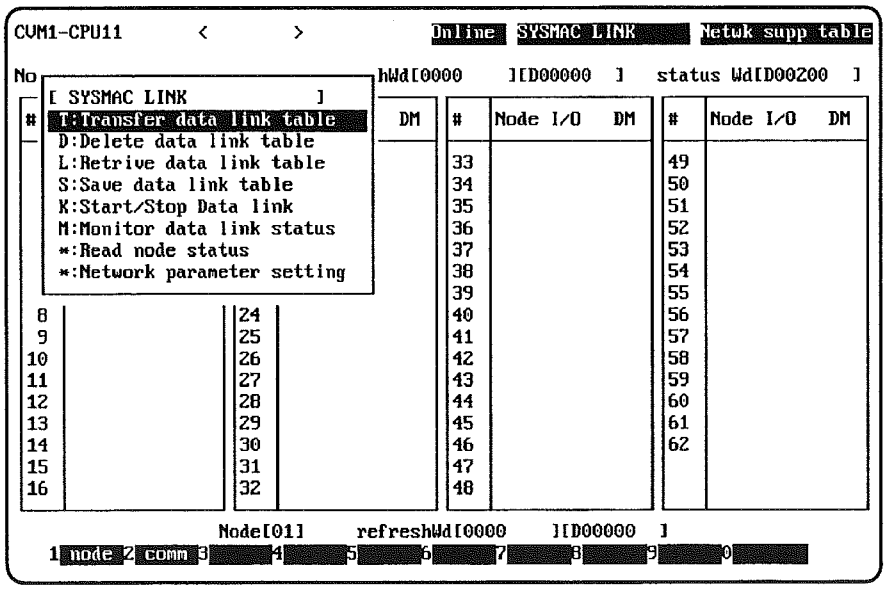


3. To display a specific table, retrieve it from disk or transfer it from a PC.
4. Press the PageUp and PageDown Keys to scroll sequentially through the refresh parameter tables.

or Press F1, *node_address*, Enter to display the refresh parameter display.



5. Press the F2 Key to return to the common link parameter display.
6. Press the End Key from the common link parameter display or refresh parameter display to access the SYSMAC LINK Data Link Table Menu.



7. Select the required item from the menu and continue as described next for individual operations.

16-3-1 Retrieving Data Link Tables

The Retrieve Data Link Table operation retrieves the data link table data from the data disk to the system work area. The data link table that was previously in the system work area will be overwritten.

1, 2, 3...

1. Select "L:Retrieve data link table" from the SYSMAC LINK Data Link Table Menu. A file name input area will be displayed.
2. Enter the file name and press the Enter Key. Press the End Key to display the file names, select the required file name with the cursor, and press the Enter Key to input the file name.
3. Press the Enter Key to retrieve the data link table.

   A message will flash while the table is being retrieved. The data link table will be displayed after the data is retrieved.

16-3-2 Transferring Data Link Tables

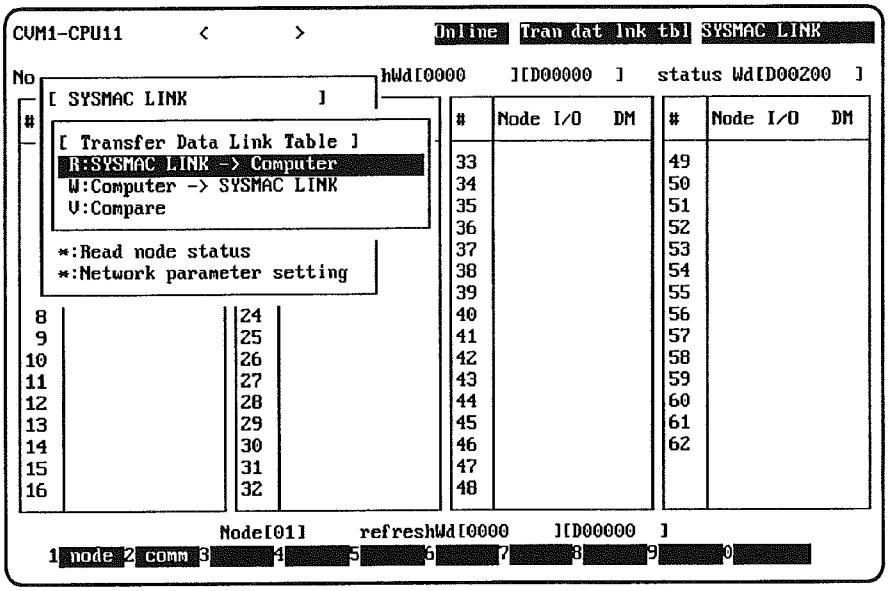
The Transfer Data Link Table operation is used to transfer and compare the data link tables between the SYSMAC LINK Unit and computer system work area. The following operations are available. The status of the data link in which these operations can be used are also shown.

Operation	Valid data link status		Function
	Stopped	Running	
SYSMAC LINK Computer	OK	OK	Used to read the contents of the data link table in the SYSMAC LINK Unit to the computer system work area. The data link table already existing in the computer system work area will be overwritten.
Computer SYSMAC LINK	OK	No	Use to write the contents of the data link table in the computer system work area to the SYSMAC LINK Unit. The data link table already existing in the SYSMAC LINK Unit will be overwritten.
Compare	OK	OK	Used to compare the data link table in the computer system work area with the data link table in the SYSMAC LINK Unit.

Use the following procedure to access the menu.

1, 2, 3...

1. Select "T:Transfer data link table" from the SYSMAC LINK Data Link Table Menu to access the following menu.



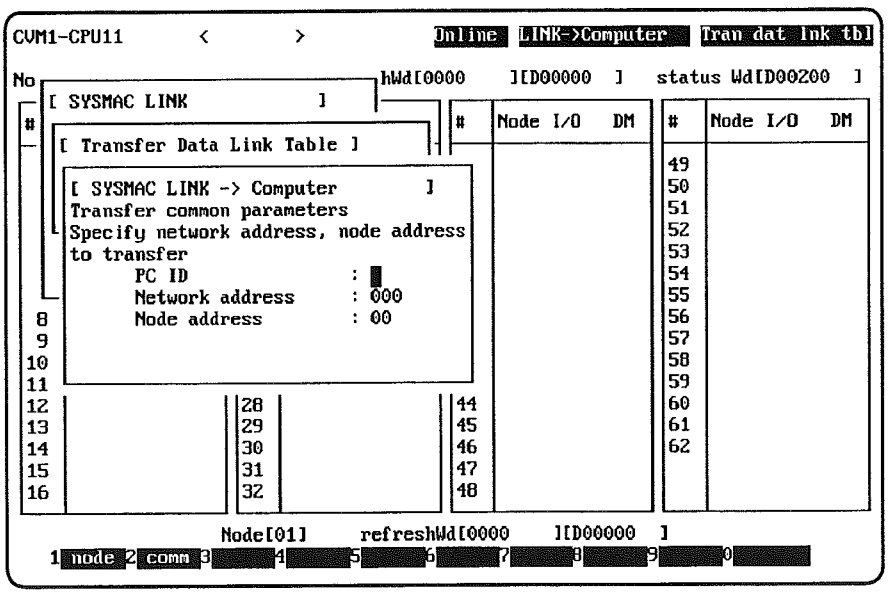
Uploading Link Tables

The SYSMAC LINK Computer operation is used to upload the common link parameters and refresh parameters from a specified node.

This operation can be used to modify the data link tables at one or more node by transferring them to the computer, modifying them with the offline Edit Data Link Table operation, and then transferring them back to the PC.

1, 2, 3...

1. Select the "R:SYSMAC LINK Computer" from the Transfer Data Link Table Menu to access the following display.



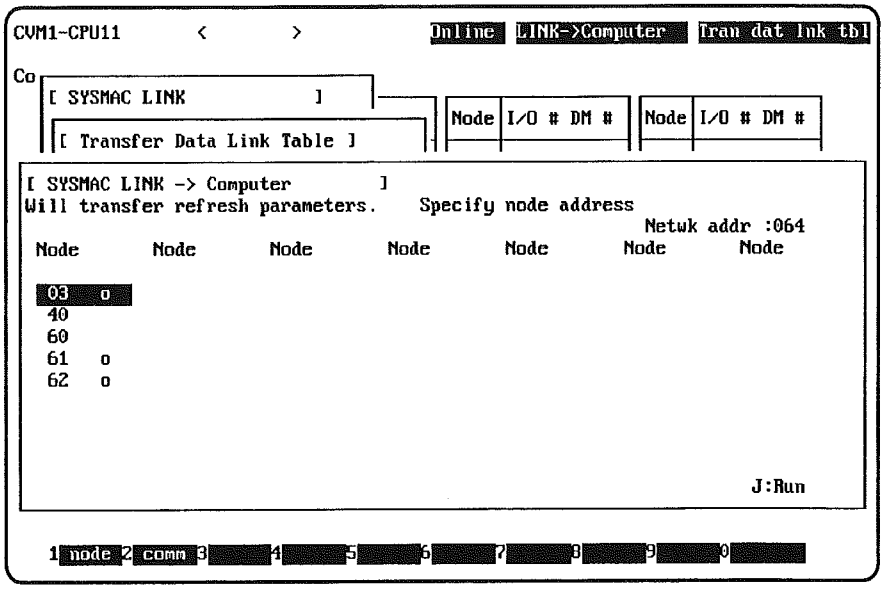
2. Press the Up and Down Keys to move the cursor and input the network address and node address.

   The network address and node address can be specified using PC names. Press the End Key to display the PC name table and select the required PC name with

the cursor. The network address and node address will be displayed automatically when the Enter Key is pressed.

The common link parameters are normally the same for each node. Therefore, the node address of any node currently belonging to the data link can be specified in the display as the node address. If the common link parameters vary from one node to another, specify the desired node.

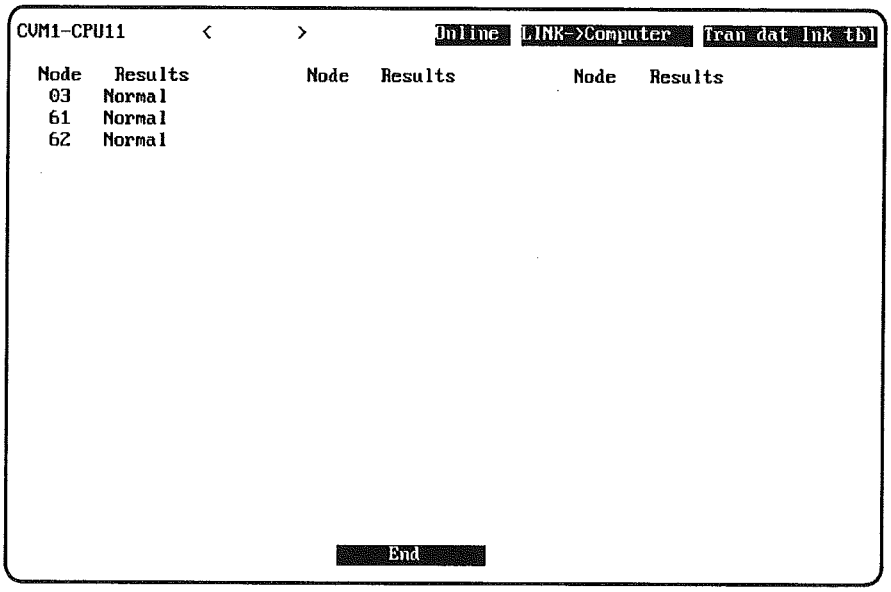
3. Press the Enter Key to upload the common link parameter table. A message will flash during the transfer and the following display will appear when finished.



The nodes connected to the current SYSMAC LINK network will be displayed. Source node addresses are marked "YES" in the table. The nodes enabled in offline operations are marked "YES" as the default values.

4. "o"? will be displayed by all nodes that are enabled in the common link parameters to indicate the nodes from which refresh parameters will be transferred. The designations for transfer can be toggled by moving the cursor to the specification for a node and pressing Enter.

5. After selecting all the nodes to be transferred, select "J:Run" from the screen. The refresh parameters will be uploaded. A message will flash during the transfer and the results will be displayed for each node read. The following display will appear when all specified nodes have been uploaded.



6. Press Escape to return to the SYSMAC LINK Computer Menu after the transfer is complete.

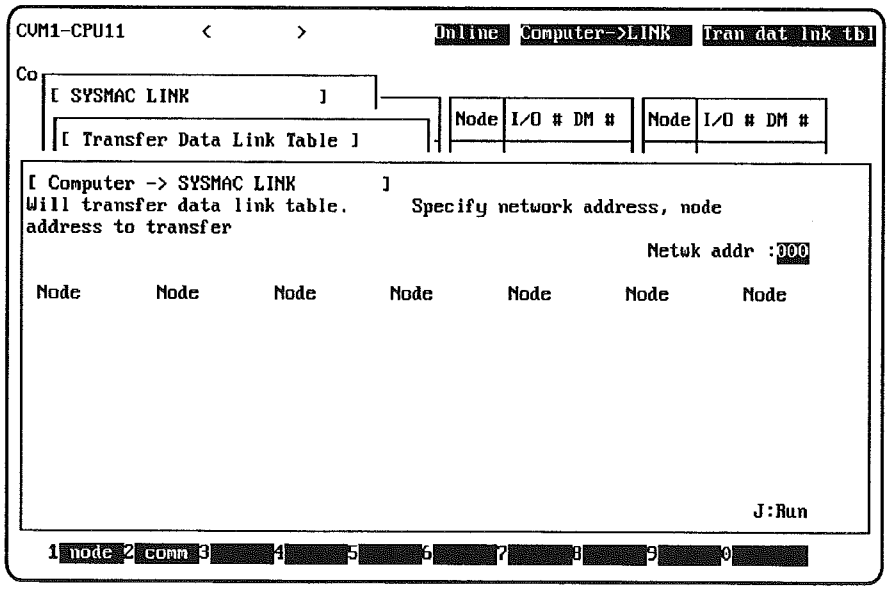
Downloading Link Tables

The Computer SYSMAC LINK operation downloads the common link parameters and refresh link parameters to specified nodes. The data link tables already in the PCs will be overwritten when this operation is executed.

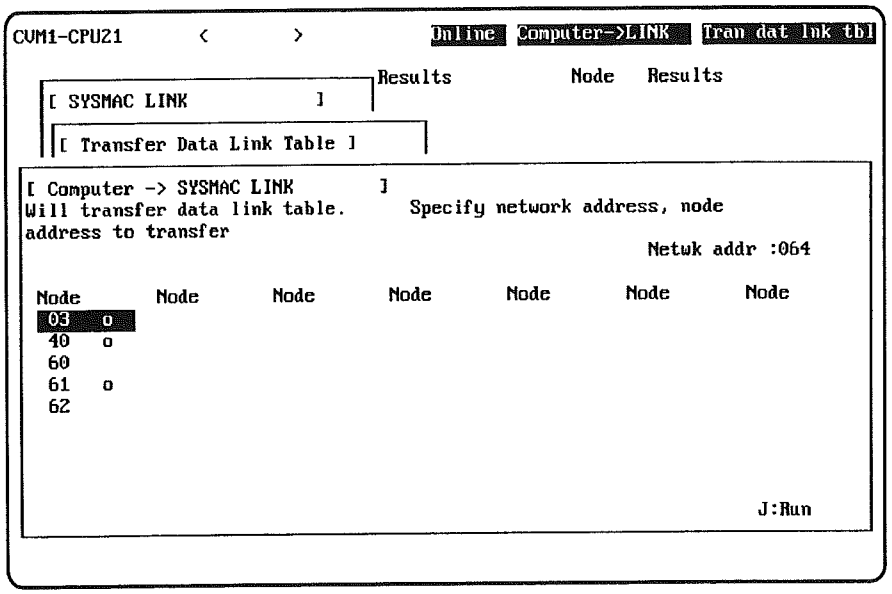
Before using this operation, display the desired link tables using the Retrieve Data Link Table operation.

1, 2, 3...

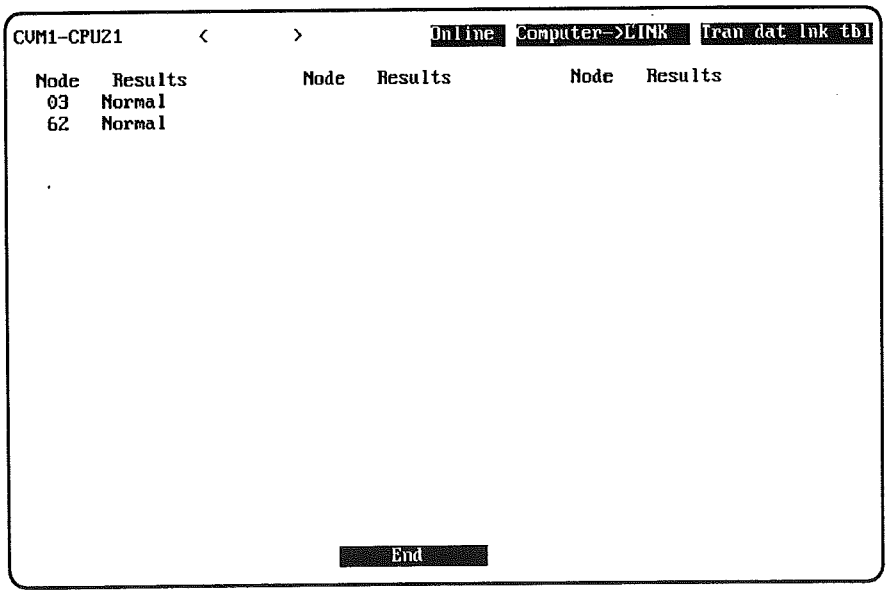
1. Select "W:Computer SYSMAC LINK" from the Transfer Data Link Table Menu to access the following display.



2. Enter the network address and press the Enter Key. The node addresses connected to the SYSMAC LINK System will be displayed. "o" will be displayed by the nodes enabled in the common link parameters to indicate the default nodes to when data link tables are to be transferred.



3. The designations for transfer can be toggled by moving the cursor to the specification for a node and pressing Enter.
4. After selecting all the nodes to be written, select "J:Run" from the screen. The refresh parameters will be downloaded to each specified node. A message will flash during the transfer and the results will be displayed for each node written. The following display will appear when all specified nodes have been written.



5. Press Escape to return to the Computer Menu after the transfer is complete.

SYSMAC LINK Data Link Table

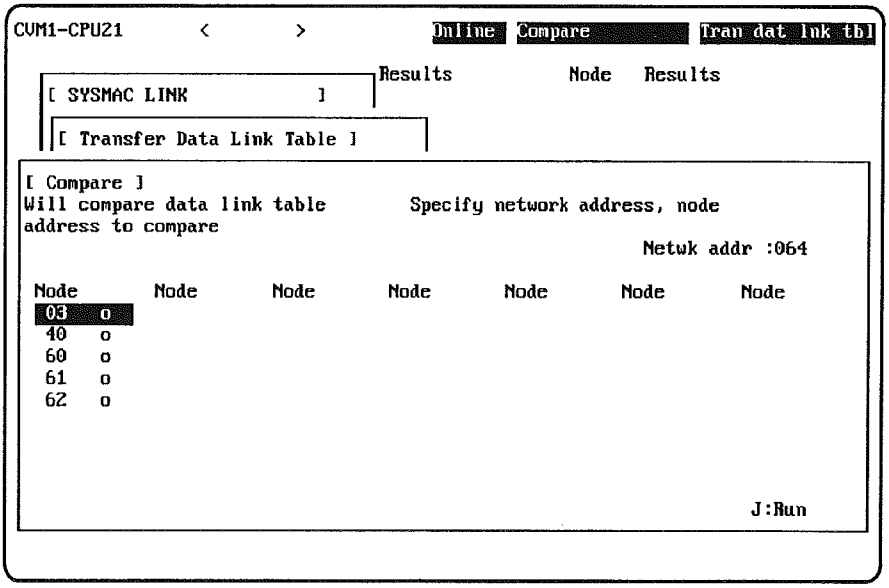
Comparing Data Link Tables

The Compare operation is used to compare the data link table in the computer system work area with the data link table in the SYSMAC LINK Unit.

Use the Compare operation after using the SYSMAC LINK Computer or Computer SYSMAC LINK operation to confirm that the link tables are the same. If the tables are not the same, repeat the transfer operation and comparing them again.

1, 2, 3...

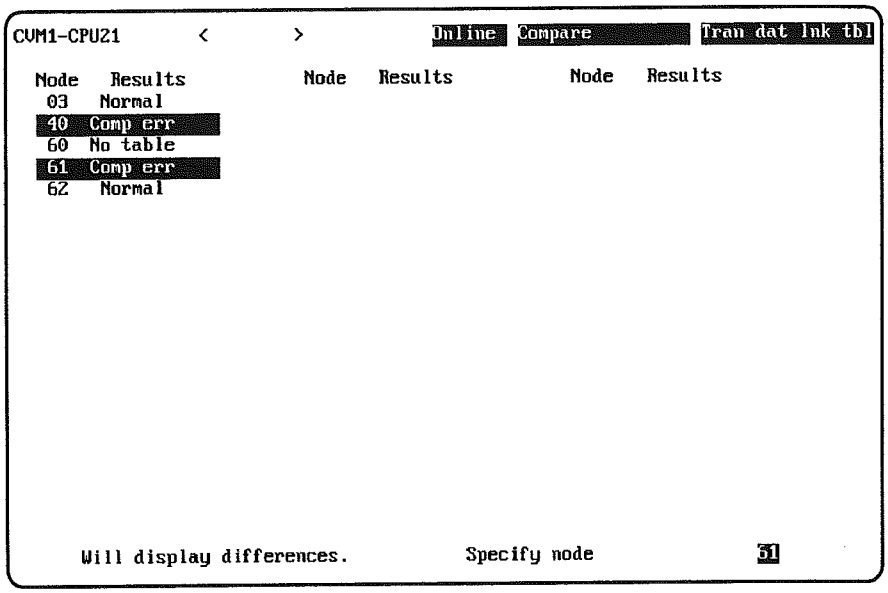
1. Select "V:Compare" from the Transfer Data Link Table Menu to access the network specification display.
2. Enter the network address and press the Enter Key. The nodes connected to the SYSMAC LINK System will be displayed.



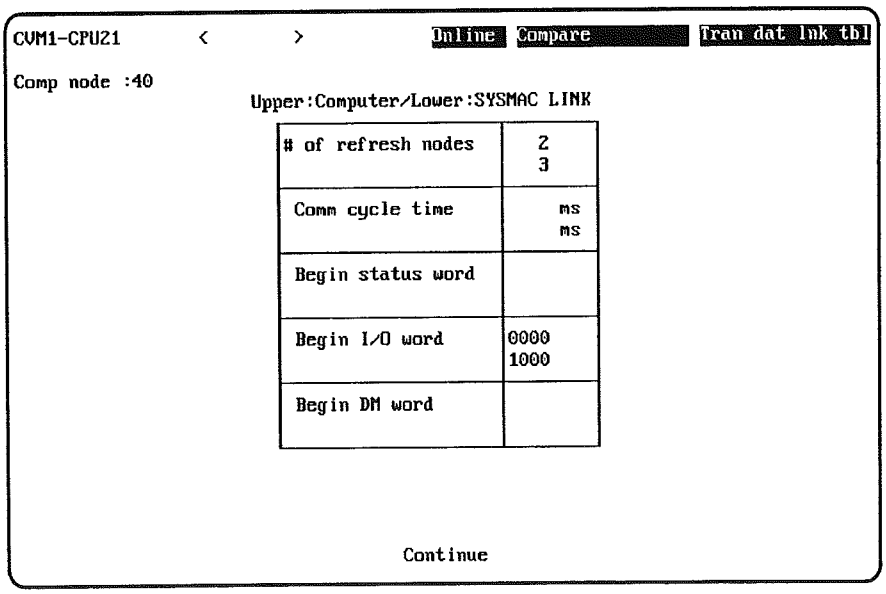
Nodes to be compared will be marked "o" in the table. The nodes enabled in offline operations are marked "o" as the defaults.

3. The designations for transfer can be toggled by moving the cursor to the specification for a node and pressing Enter.

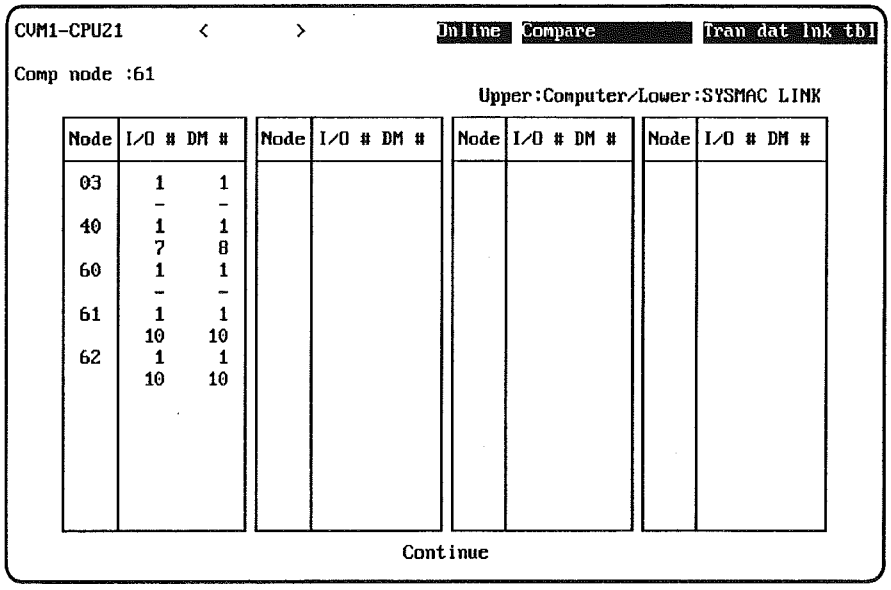
4. After selecting all the nodes to be compared, select "J:Run" from the screen. The comparison of each node will start. A message will flash during the comparison and the results will be displayed for each node that was compared. The following display will appear when all specified nodes have been compared.



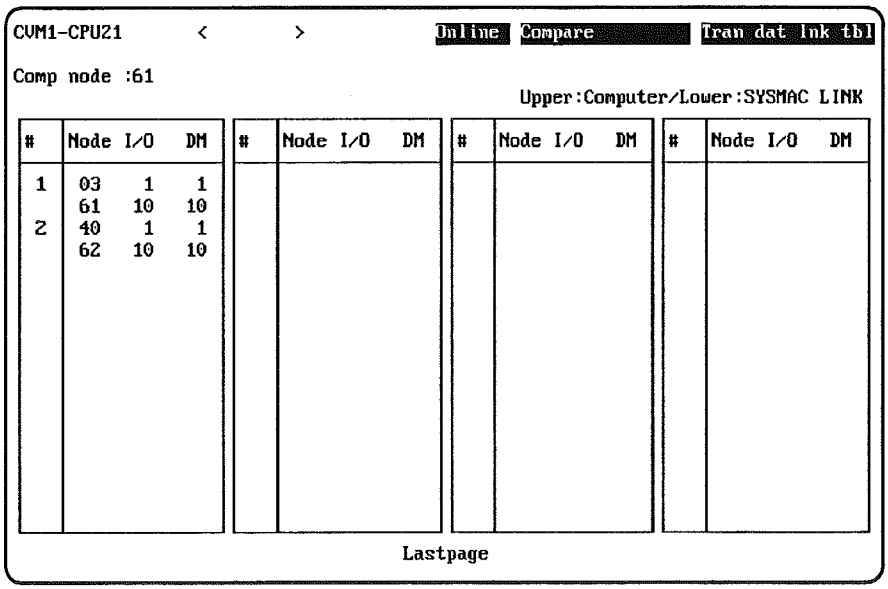
5. If the comparison discovers no differences between the data link tables in the computer and the SYSMAC LINK Unit, a message will indicate that the comparison was OK.
6. If a message indicates that an error occurred, input the node address and press the Enter Key to display a table explaining the errors. Unmatching data items will be displayed with the data in the computer on top and the data in the SYSMAC LINK Unit underneath.



7. Press the PageDown Key to display the next page if the message "Continue" is displayed on the screen. The comparison errors for common link parameters will be displayed.



8. Press the PageDown Key to display the unmatching refresh parameters if "Continue" is displayed at the bottom of the screen. This display cannot be displayed after a serious common link parameter error was discovered, e.g., an incompatible number of refresh nodes.



9. Press Escape if errors occurred for other node addresses. The display of comparison results will appear again.
10. Enter the required node address and press the Enter Key.
11. Repeat the transfer using the *SYSMAC LINK Computer* or *Computer SYSMAC LINK* operation again if differences are discovered.

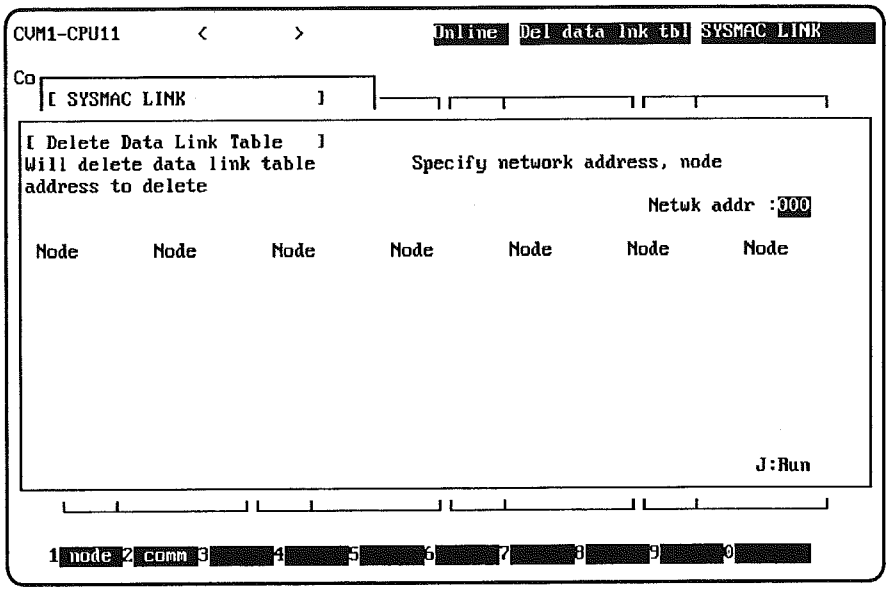
16-3-3 Deleting Data Link Tables

This operation is used to delete the data link tables from one or more SYSMAC LINK Units. This operation is not possible when the data links are active.

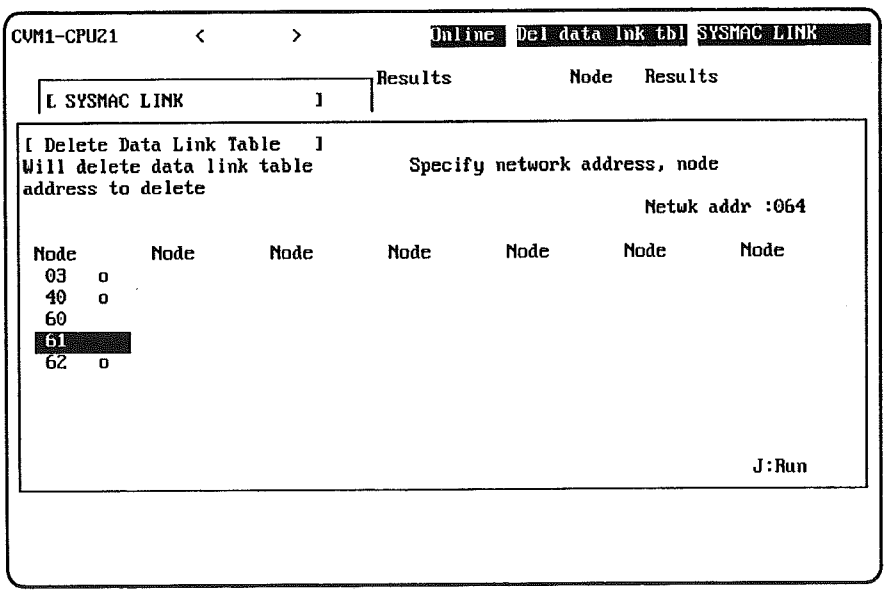
⚠ Caution You should always delete the data link tables from nodes that are no longer participating in a data link.

1, 2, 3...

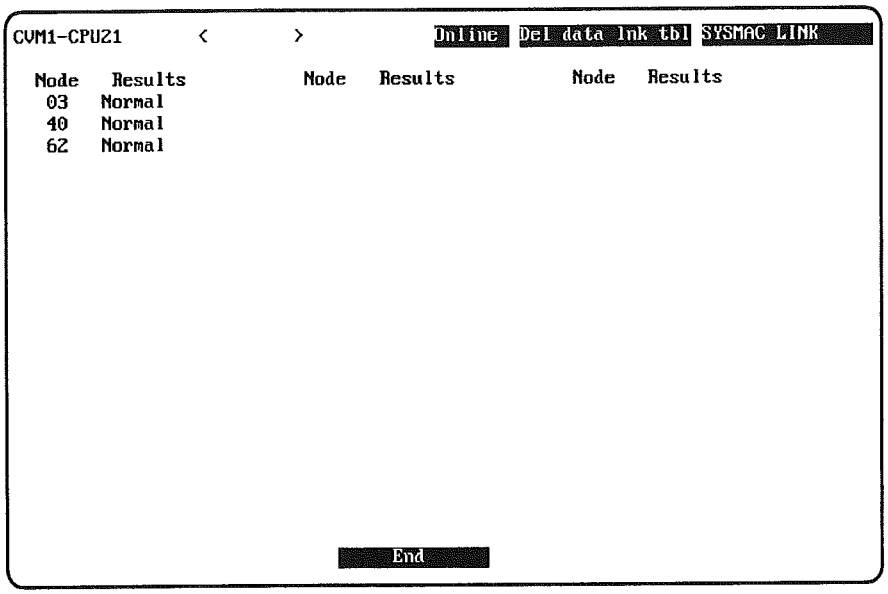
1. Select "D:Delete data link table" from the SYSMAC LINK Data Link Table Menu to access the following display.



2. Enter the network address and press the Enter Key. The node addresses connected to the SYSMAC LINK System will be displayed. Nodes from which the data link tables are to be deleted are marked "YES" ("o") in the table. Nodes disabled in offline operations are marked "YES" as the defaults.



3. The designations for deletion can be toggled by moving the cursor to the specification for a node and pressing Enter.
4. After selecting all the nodes to be deleted, select "J:Run" from the screen. The data link tables will be deleted from the specified nodes. A message will flash during the transfer and the results will be displayed for each node deleted. The following display will appear when all specified nodes have been deleted.



5. Press Escape to return to the Delete Data Link Table Menu after the delete operation is complete. Press the Shift+Esc Keys to return to the data link table display.

16-3-4 Saving Data Link Tables

The Save Data Link Table operation saves the data link table data in the system work area to the data disk.

When using a floppy disk, be sure the data disk has been formatted and is not write-protected. Data link table data cannot be saved if it exceeds the free space available on the data disk.

1, 2, 3...

1. Select "S:Save data link table" from the SYSMAC LINK Data Link Table Menu. A file name input area will be displayed.
2. Enter the file name and press the Enter Key.

   To enter an existing file name, press the End Key to display the current file names, select the required file name with the cursor, and press the Enter Key.
3. If the input file name already exists, a message will ask if the file should be overwritten. Press the Y and Enter Keys to overwrite the file. Press the Enter Key to cancel and input a new file name.

   The title input area will appear when the Enter Key is pressed.
4. Input the title and press the Enter Key. The title can be up to 30 characters long.

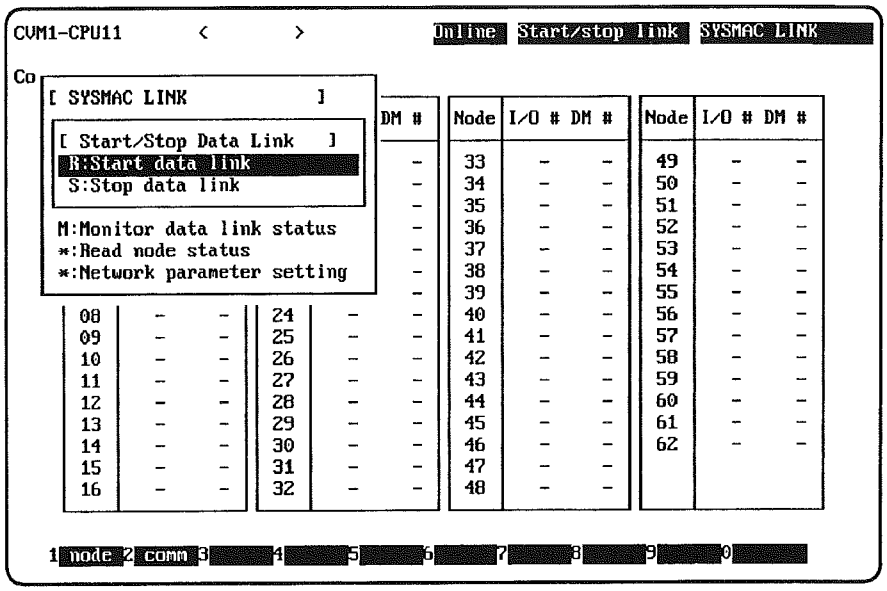
   A message will flash while the table is being saved. The data link table will be displayed after the data is saved.

16-3-5 Starting and Stopping Data Links

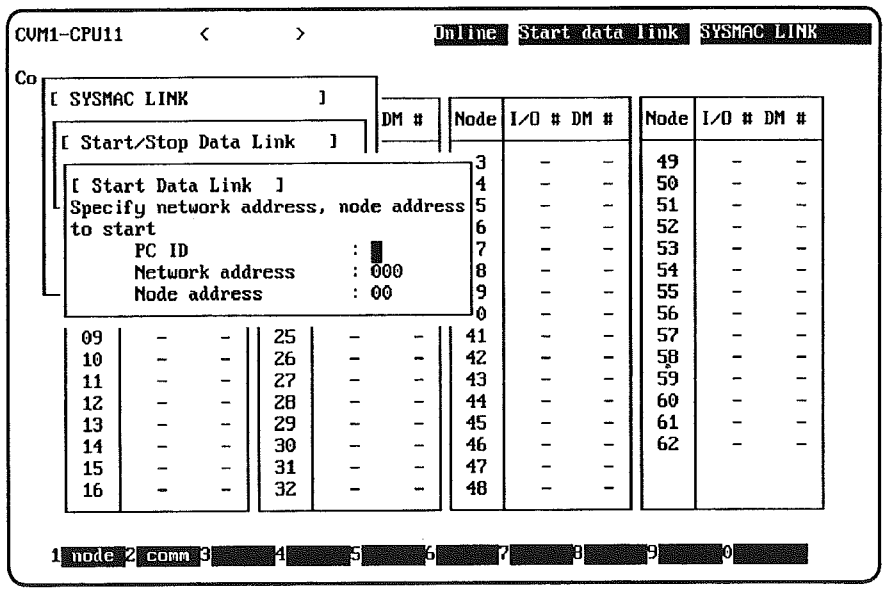
The Start/Stop Data Link operation is used to start or stop the data links for the specified SYSMAC LINK Unit.

1, 2, 3...

1. Select "K:Start/Stop data link" from the SYSMAC LINK Data Link Table Menu to access the following menu.



2. Select the required item. The following will appear when starting a data link is selected. The display for stopping data links is essentially the same.



3. Input the network address and node address.

   The network address and node address can be specified using PC names (IDs). Press the End Key to display the PC name table and select the required PC name with the cursor. The network address and node address will be displayed automatically when the Enter Key is pressed.

4. Press the Enter Key. The data link will start or stop as specified and the display will return to the Start/Stop Data Link Menu.

16-3-6 Monitoring Data Link Status

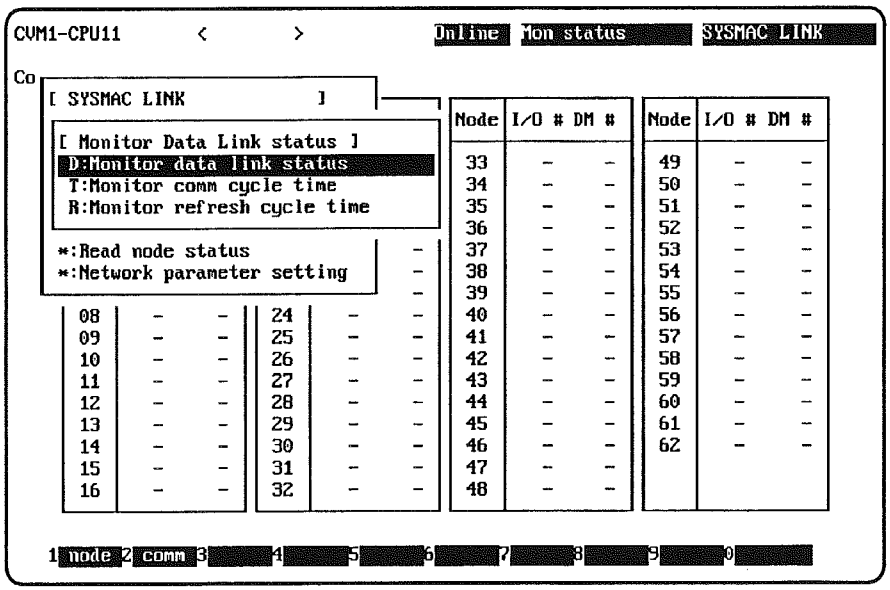
The Monitor Data Link Status is used to monitor the data link status, communications cycle time, and refresh cycle time. The following operations are available. The following table also shows the data link statuses in which each operation can be used.

Operation	Valid data link status		Function
	Stopped	Running	
Monitor data link status	No	OK	Used to display the operating status of each node belonging to the data link.
Monitor comm cycle time	OK	OK	Used to measure and display the communication cycle time of the SYSMAC LINK System.
Monitor refresh cycle time	No	OK	Used to measure and display the refresh cycle time of the data link area in the SYSMAC LINK Unit of each specified node. Refer to the *SYSMAC LINK System Manual* for details of the refresh cycle time.

Use the following procedure.

1, 2, 3...

1. Select "M:Monitor data link status" from the SYSMAC LINK Data Link Table Menu to access the following menu.



2. Select the desired operation and continue as described next for individual operations.

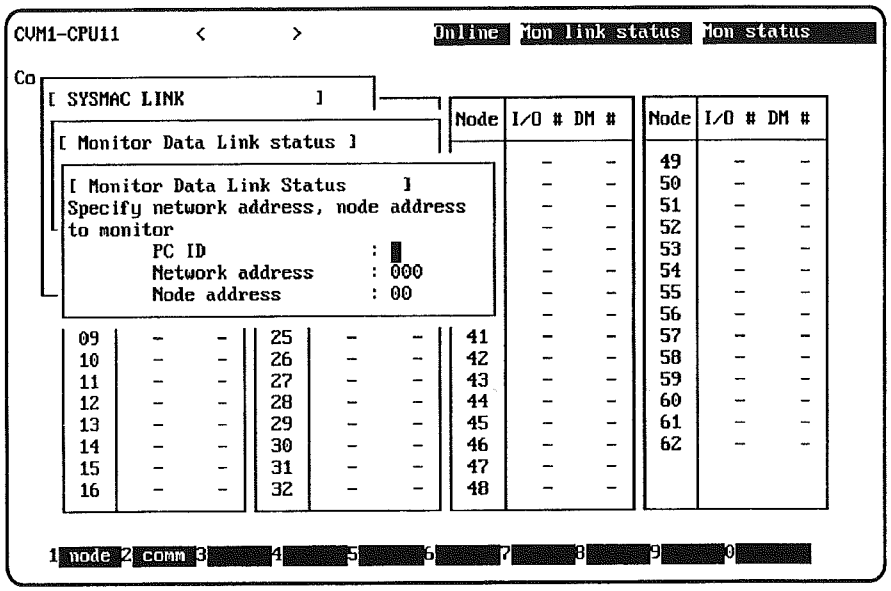
Monitoring Data Link Status

The Monitor Data Link Status is used to display the operating status of each node belonging to the data link.

The data link must be active to use this operation.

1, 2, 3...

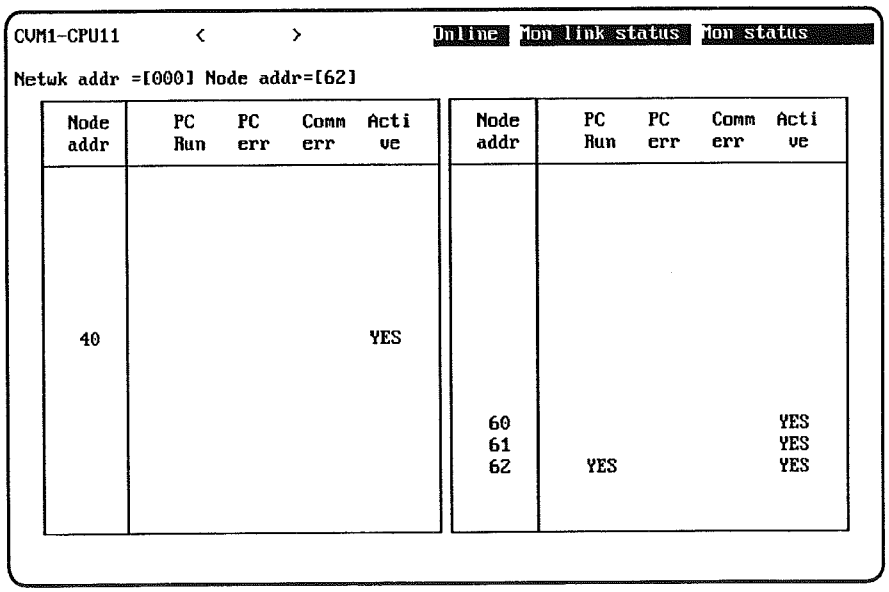
1. Select "D:Monitor data link status" the Monitor Data Link Status Menu to access the following display.



2. Press the Up and Down Keys to move the cursor and input the network address and node address and press the Enter Key.

   The network address and node address can be specified using PC names. Press the End Key to display the PC name table and select the required PC name with the cursor.

   The data link status will appear for each node.



"YES" ("o") in the table will indicate the status of each node address for the following items.

PC running	The PC is in RUN or MONITOR mode.
PC error	PC is stopped due to a PC error.
Communications error	A data link error has occurred and the node is not participating in the data link.
Running	The data link is running normally.

3. Press the PageDown Key to display the node 33 to 62.
4. Press Escape or Shift+Esc Keys to end the monitoring.

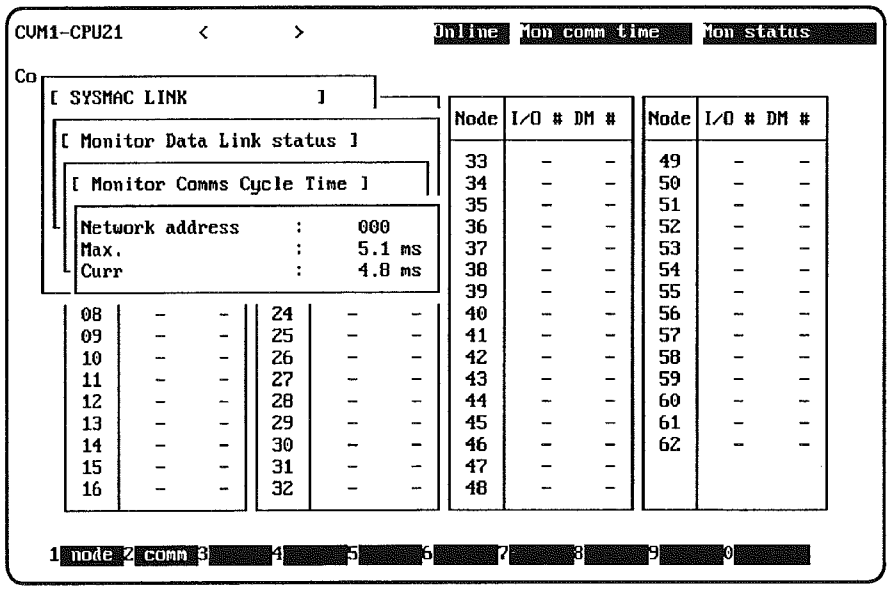
Monitoring the Communication Cycle Time

The Monitor Communications Cycle Time operation is used to measure and display the communication cycle time of the SYSMAC LINK System.

The operation can be used even when the data link is not active.

1, 2, 3...

1. Select "T:Monitor comm cycle time" from the Monitor Data Link Status Menu to access the network designation display.
2. Input the network address and press the Enter Key. The maximum value and current value of the SYSMAC LINK communication cycle time will be displayed.



3. Press Escape or Shift+Esc Keys to end the monitoring.

Monitoring the Refresh Cycle Time

The Monitor Refresh Cycle Time is used to measure and display the refresh cycle time of the data link area in the SYSMAC LINK Unit of each specified node.

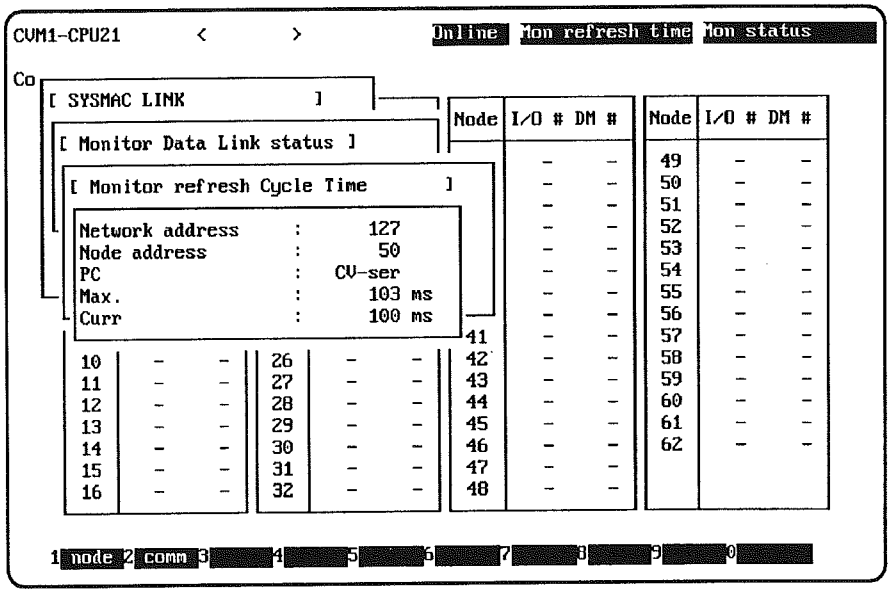
The data link must be active to use this operation.

1, 2, 3...

1. Select "R:Monitor refresh cycle time" from the Monitor Data Link Status Menu to access the node designation display.
2. Press the Up and Down Keys to move the cursor and input the network address and node address. Specify the node address of a node belonging to the data link.

   The network address and node address can be specified using PC names. Press the End Key to display the PC name table and select the required PC name with the cursor. The network address and node address will be displayed automatically when the Enter Key is pressed.

3. Press the Enter Key. The PC at the specified node and the maximum and present values of the cycle time will be displayed.



4. Press Escape or Shift+Esc Keys to end the monitoring.

SECTION 17
Routing Tables

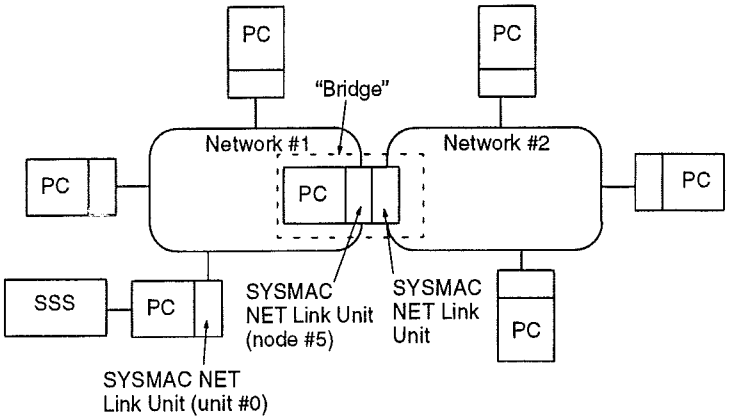
This section describes the operations to input, check, save, retrieve, and transfer routing tables. Routing tables are required to communicate with remote network. Routing tables are not required if communications are only made within on network.

17-1 Overview 398
17-2 Overall Input and Transfer Procedure 398
17-3 Network Communication Range 399
17-4 Offline Routing Table Operations 400
17-4-1 Editing Routing Tables 401
17-4-2 Checking Routing Tables 403
17-4-3 Clearing Routing Tables 404
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17-5 Online Routing Table Operations 406
17-5-1 Retrieving Routing Tables 407
17-5-2 Transferring Routing Tables 408

17-1 Overview

Routing tables are required in networks to execute communications between two or more interconnected networks. A routing table is not required unless the SSS is going to be used to communicate with remote networks.

Example Routing tables describe the nodes through which communications must pass to reach a remote network. The following example will be used to describe the data required in routing tables.



In the above system, the following information must be input into the routing tables and transferred to the PC's CPU for a node on network #1 to communicate with nodes on network #2.

- The address of the local network (**local network**).
- The unit number of the Communications Unit (here, SYSMAC NET Link Unit) connected to the local network (**SIOU unit number)**
- The node number of the of the Communications Unit that must be passed through to reach a remote network (**relay node**).
- The network that must be passed through to reach a remote network (**relay network**).
- The address of the remote network with which communications are desired (**end network**)

This information is input into routing tables as follows for the above example:

Local network	SIOU unit No.
001	00

End network	Relay network	Relay node
002	001	005

17-2 Overall Input and Transfer Procedure

Use the following procedure to input routing tables and transfer them to a PC.

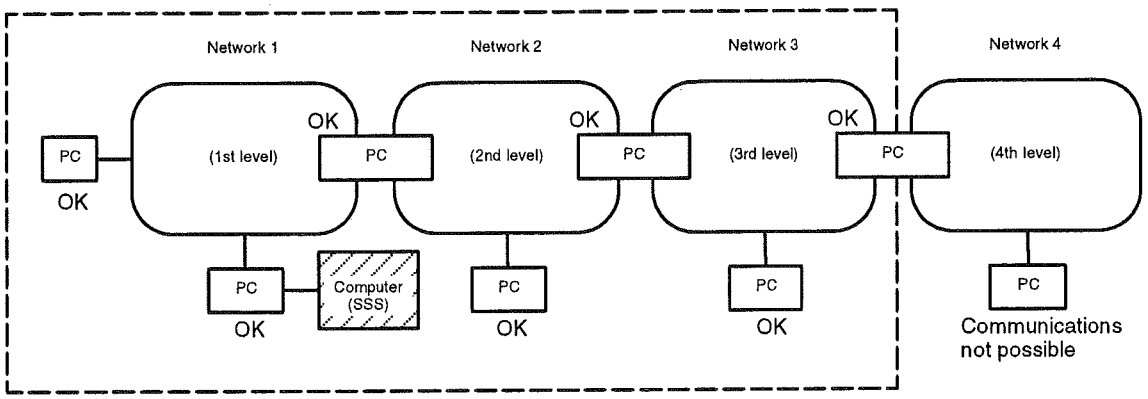
1, 2, 3...

1. Input the routing tables.
2. Check the routing tables.
3. Save the routing tables to disk.
4. Switch to online operation.
5. Retrieve the routing tables from disk.
6. Transfer the routing tables to the PC.

Note
1. Always save routing tables to disk after inputting them.
2. All CPU Bus Units will be restarted when routing tables are transferred to the PC.
3. Existing routing tables can also be retrieved from the disk or transferred from a PC for changes.

17-3 Network Communication Range

The SSS offers SYSMAC NET and SYSMAC LINK network communication for transfer of user data and for monitor between the PCs and computers on the network. Communications is possible to up to two network levels away (3, including the local network level). An example is shown below.



Communication range of shaded computer (SSS).

In the example shown above, the computer connected to the PC in network 1 can communicate with PCs on networks 2 or 3. It cannot communicate with the PCs on network 4, which is the 4th level of communications.

Communication with a C-series PCs

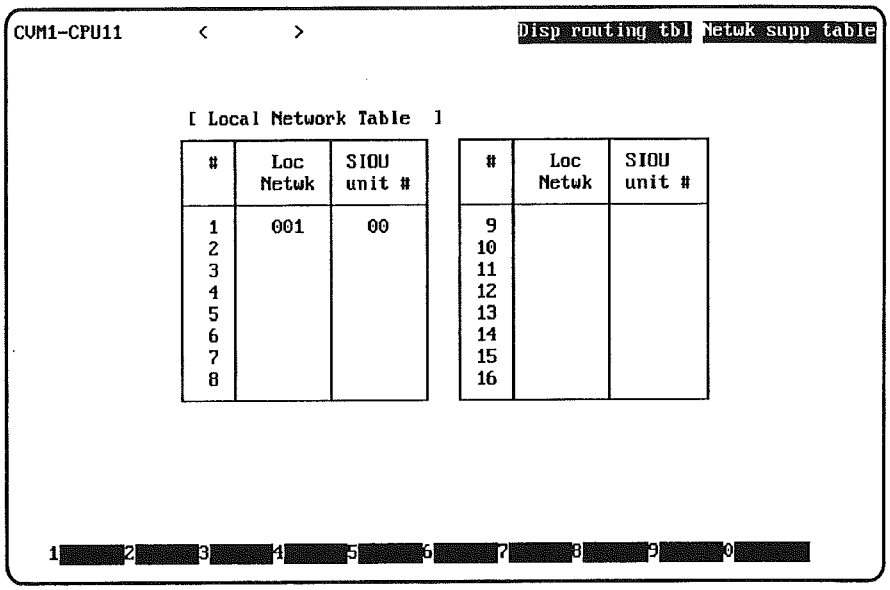
When the SSS is set for CVM1 PC's, C-series PC's cannot be operated via the networks, except for the I/O monitor operations which can be used with C-series PC's on the SYSMAC LINK network.

CVM1 PC's cannot operate a PC through the network if the SYSMAC LINK unit for the PC is set to C mode.

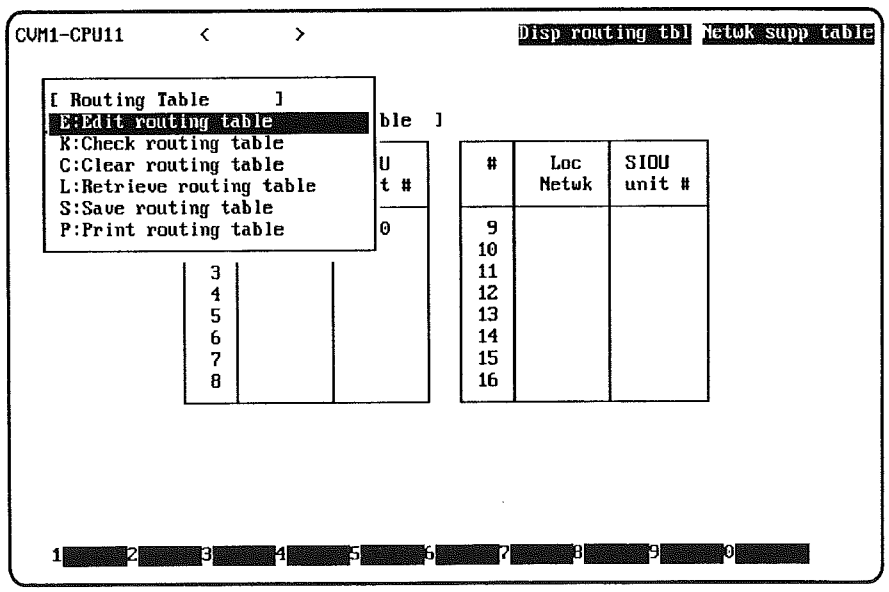
17-4 Offline Routing Table Operations

The offline Routing Table operations can be used to input or change routing tables.

Select "R:Routing table" from the Network Support Table Menu. The local network table will be displayed.



Press the End Key to access the Routing Table Menu from the routing table display.



The operations on the Routing Table Menu are described in the following table.

Operation	Function
E:Edit routing table	Used to input and edit routing tables.
K:Check routing table	Checks the routing table in system work area and displays any errors found.
C:Clear routing table	Clears all routing table data from the system work area.
L:Retrieve routing table	Retrieves the routing table data from the data disk to the system work area.
S:Save routing table	Saves the routing table data in the system work area to the data disk.
P:Print routing table	Prints the routing table data in the system work area.

17-4-1 Editing Routing Tables

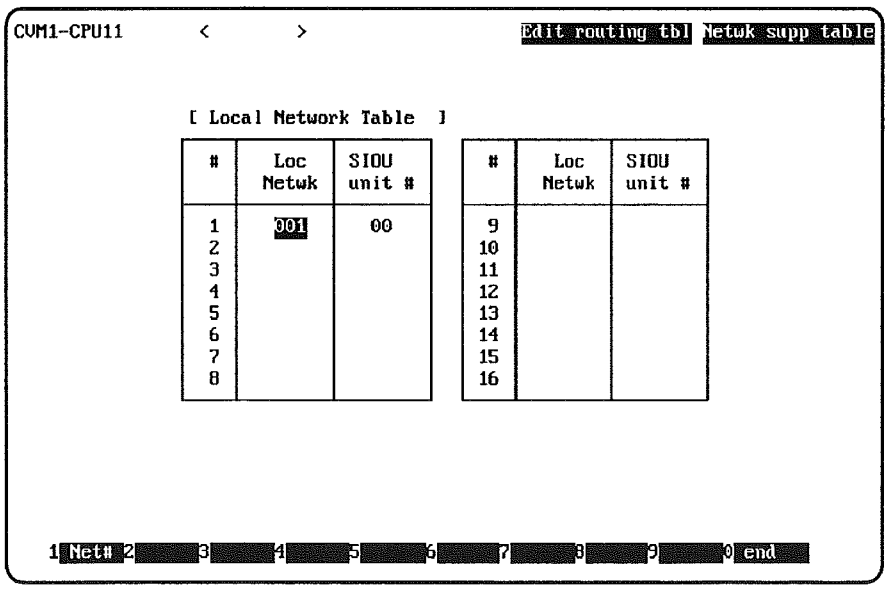
The Edit Routing Table operation is used to input and edit the local network and relay network routing tables.

Note Always save new or modified routing tables to disk. All routing table data that has been input will be deleted from memory when the power is turned OFF, the computer is reset, or you return to the top-level menu.

Use the following procedure to edit the routing tables.

1, 2, 3...

1. Select "E:Edit routing table" from the Routing Table Menu. The local network table will appear and a message at the top-right of the display will indicate that the routing table is being edited.

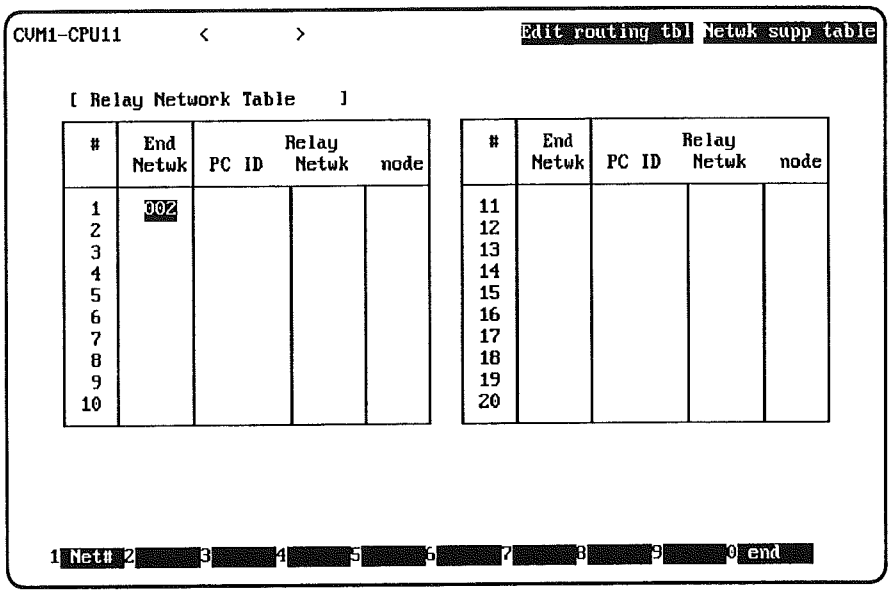


2. Press F1, specify the number of networks to which the local PC is connected, and press Enter. The maximum value that can be input is 16.

3. Move the cursor to the required locations, input the setting, and press Enter to input each item in the local network table. Input items are described in the following table.

Item	Setting method
Loc Netwk	Set the network address of each CPU Bus Unit mounted to the PC. Set the network addresses in the range 1 to 127. Make sure that the same network address is not input twice. Press the Insert Key to insert a network address or the Delete Key to delete a network address.
SIOU unit #	Set the unit number of each CPU Bus Unit mounted to the PC and connecting it to a network. Set the unit numbers in the range 0 to 15. (Use the numbers set on the rotary switches on the front of each Unit.) Make sure that the same unit number is not set twice.

4. Press the PageDown Key to display the relay network table editing display (see next diagram).



5. Press F1, input the number of networks to be set, and press Enter. Up to 20 network can be set.

6. Move the cursor to the required locations, input the setting, and press Enter to input each item in the local network table. Input items are described in the following table.

Item	Setting method
End Netwk	When setting two or more networks, set the network addresses in the range 1 to 127. Do not set the same address twice.
Relay network	Set the network and node addresses of the first node that must be passed through to reach the destination network. The addresses must indicate the Communication Unit actually connected to the local network. Set the network addresses in the range 1 to 127. Only set networks that are in the local network table.
Relay node	Set the node address to between 1 and 126.
Relay PC ID	The network and node addresses can also be set using PC name (ID). Move the cursor to the PC ID column and input the Enter Key, *PC_name*, and Enter Key. Press the End Key to display PC IDs. Select the required PC ID from the table with the cursor and press the Enter Key. The network address and node address will automatically be displayed when the PC ID is input.

7. Press the PageUp Key to return to the local network table editing display.

17-4-2 Checking Routing Tables

The following operation is used to check routing tables.

1, 2, 3...

1. Select "K:Check routing table" from the Routing Table Menu.

   A message will indicate if no errors were detected. An error message table will be displayed if errors are found.

2. If "Continue" is displayed at the bottom of the display, press the PageDown Key to display the next page of error messages.

   If errors are detected, correct the routing table (see following error message table) and run the check again.

CVM1-CPU11 < > Chk routing tbl Netwk supp table

[Local Network Table]

#	Loc Netwk	Error meassage
1	001	Dup local netwk addr
2	001	Dup local netwk addr
3	002	Dup local netwk addr
4	002	Dup local netwk addr Dup SIOU unit # err
5	002	Dup local netwk addr Dup SIOU unit # err
6	002	Dup local netwk addr Dup SIOU unit # err

#	Loc Netwk	Error meassage

Lastpage

Error Message Table

Local Network Error Messages

Error message	Error description	Remedy
Dup local netwk addr	Duplicate network addresses set.	Do not set the same network address twice.
Dup SIOU unit # err	Duplicate unit numbers CPU Bus Units.	Do not set the same unit number for two CPU Bus Units.
Local netwk addr err	A network address is set outside the range 1 to 127.	Set the network address within the range 1 to 127.
SIOU unit # range err	Unit number of a CPU Bus Unit is set outside the range 0 to 15.	Set the unit number within the range 0 to 15.
Too many networks	More than 16 networks are set.	Set no more than 16 networks.

Relay Network Error Messages

Error message	Error description	Remedy
Dup end netwk addr	Duplicate network addresses set.	Do not set the same network address twice.
End netwk addr range err	A network address is set outside the range 1 to 127.	Set the network address within the range 1 to 127.
Relay netwk addr err	The set network address is not set in the local network table.	Only set network addresses already set in the local network table.
Relay netwk addr rng err	A network address is set outside the range 1 to 127.	Set the network address within the range 1 to 127.
Relay node addr rng err	A node address is set outside the range 1 to 126.	Set the node address within the range 1 to 126.
Too many networks	More than 20 networks are set.	Set no more than 20 networks.

17-4-3 Clearing Routing Tables

The Clear Routing Table operation is used to delete all input data from the routing tables.

1, 2, 3...

1. Select "C:Clear routing table" from the Routing Table Menu.
2. Press the Y and Enter Keys to clear the contents of the routing table.

or Press the N and Enter Keys to cancel and return to the menu.

17-4-4 Saving Routing Tables

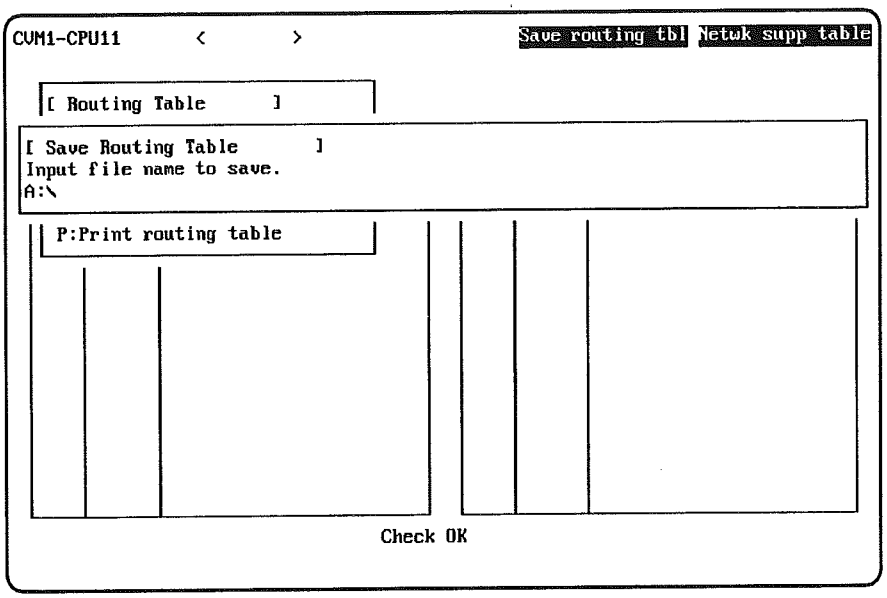
The Save Routing Table operation saves the routing table data in the system work area to the data disk.

When saving to a floppy disk, be sure the data disk has been formatted and is not write-protected. Routing tables data cannot be saved if they exceed the free space available on the data disk.

1, 2, 3...

1. Select "S:Save routing table" from the Routing Table Menu.

A file name input area will be displayed.



2. Enter the file name and press the Enter Key.

   To enter an existing file name, press the End Key to display the current file names, select the required file name with the cursor, and press the Enter Key.

3. If the input file name already exists, a message will ask if the file should be overwritten. Press the Y and Enter Keys to overwrite the file. Press the Enter Key to cancel and input a new file name.

   The title input area will appear when the Enter Key is pressed.

4. Input the title and press the Enter Key.

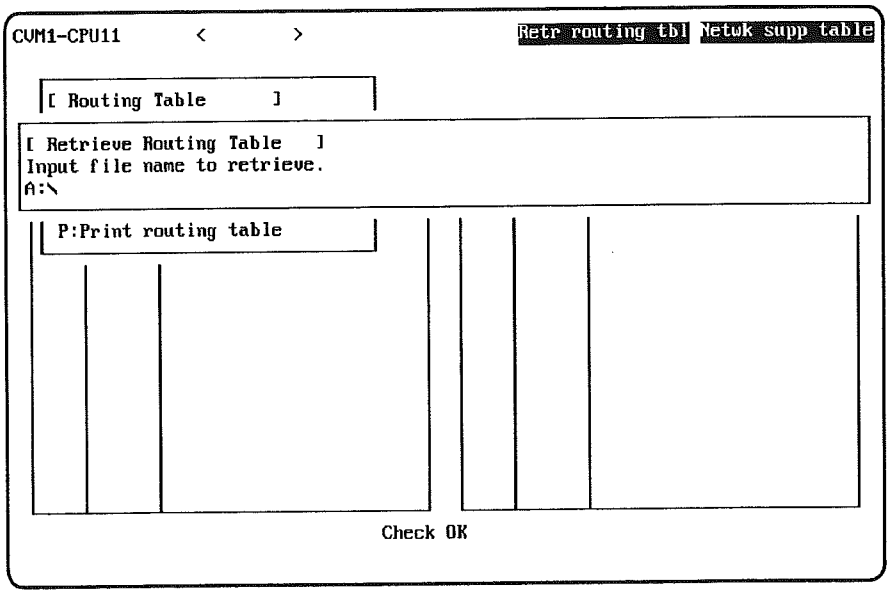
   A message will flash while the table is being saved. The routing table will be displayed after the data is saved.

17-4-5 Retrieving Routing Tables

The Retrieve Routing Table operation retrieves the routing table data from the data disk to the system work area.

1, 2, 3...

1. Select "L:Retrieve routing table" from the Routing Table Menu. A file name input area will be displayed.



2. Enter the file name and press the Enter Key.

   Press the End Key to display the file names. Select the required file name with the cursor and press the Enter Key to input the file name.

3. Press the Enter Key to retrieve the routing table.

   A message will flash while the table is being retrieved. The routing table will be displayed after the data is retrieved.

17-4-6 Printing Routing Tables

The Print Routing Table operation prints the routing table data in the system work area. Before printing, connect the printer and turn power on so that the printer is ready to print.

1, 2, 3...

1. Select "P:Print routing table" from the Routing Table Menu. Printing will be started.

   The "Printing" message will disappear when printing is complete.

2. Press Escape to cancel printing. All characters in the print buffer will be printed before printing stops.

17-5 Online Routing Table Operations

The following support operations are for the routing tables required for internetwork communications.

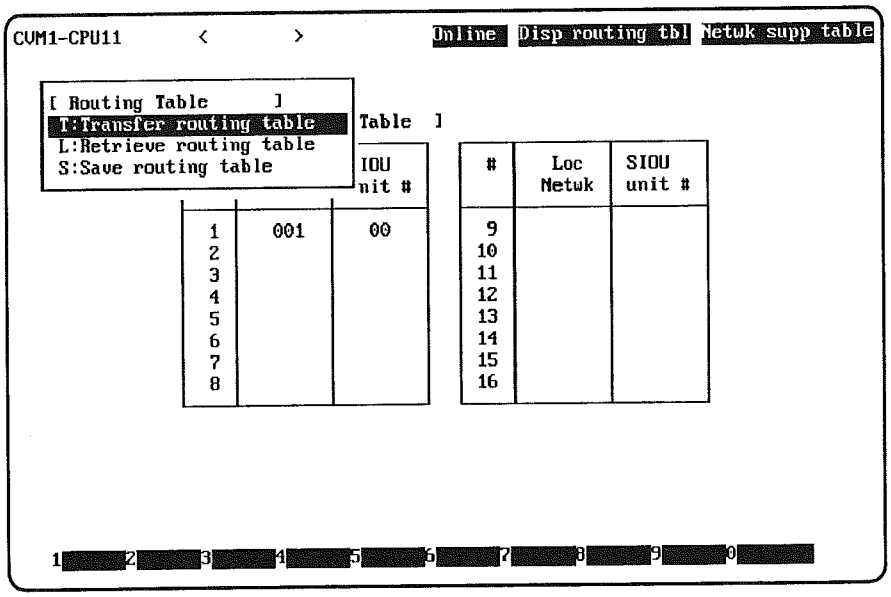
Operation	Function
T:Transfer routing table	Used to transfer and compare the routing tables between the SYSMAC LINK Unit and computer system work area.
L:Retrieve routing table	Used to read the routing tables from the data disk to the computer system work area.
S:Save routing table	Used to write the routing tables from the computer system work area to the data disk.

Use the following procedure to access the menu

1, 2, 3...

1. Select "W:Net support table" from the online Utility Menu.

2. Select "R:Routing table" from the Network Support Table Menu. The routing table will be displayed.
3. Press End to access the Routing Table Menu.



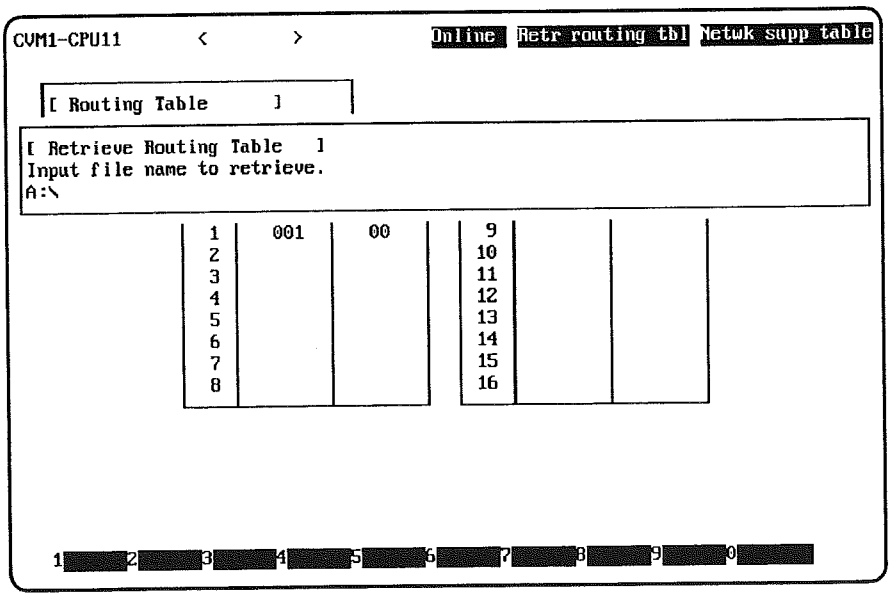
4. Select the desired operation and continue as described next for individual operations.

17-5-1 Retrieving Routing Tables

The Retrieve Routing Table operation retrieves the routing table data from the data disk to the system work area.

1, 2, 3...

1. Select "L:Retrieve routing table" from the Routing Table Menu. A file name input area will be displayed.



2. Enter the file name and press the Enter Key.
   Press the End Key to display the file names. Select the required file name with the cursor and press the Enter Key to input the file name.

3. Press the Enter Key to retrieve the routing table.

   A message will flash while the table is being retrieved. The routing table will be displayed after the data is retrieved.

17-5-2 Transferring Routing Tables

The Transfer Routing Table operations are used to transfer and compare the routing tables between the SYSMAC LINK Unit and system work area. The following operations are available.

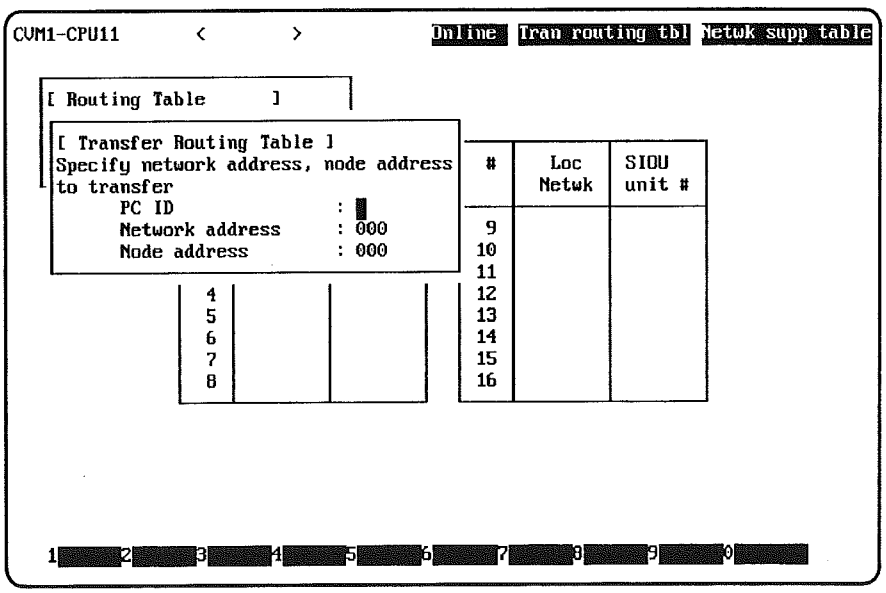
Operation	Function
R:PC Computer	Used to upload the contents of the routing table in the PC to the computer system work area. The routing table already existing in the computer system work area will be overwritten.
W:Computer PC	Used to download the contents of the routing table in the computer system work area to the PC. The routing table already existing in the PC will be overwritten.
V:Compare	Used to compare the routing table in the computer system work area with the routing table in the PC.

⚠ **Caution** All CPU Bus Units except for SYSMAC BUS/2 Masters will be reset then the routing tables are transferred to a PC.

Use the following procedure to access the Transfer Routing Table Menu.

1, 2, 3...

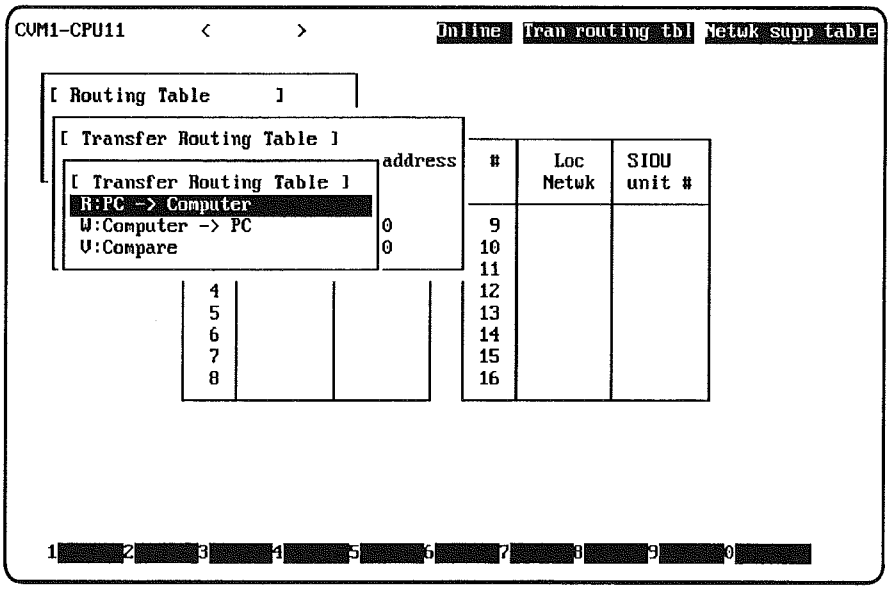
1. Select "T:Transfer routing table" from the Routing Table Menu to access the following display.



2. Press the Up and Down Keys to move the cursor and input the network address and node address.

   The network address and node address can be specified using PC names (IDs). Press the End Key to display the PC name table and select the required PC name with the cursor. The network address and node address will be displayed automatically when the Enter Key is pressed.

3. Press the Enter Key to access the following menu.

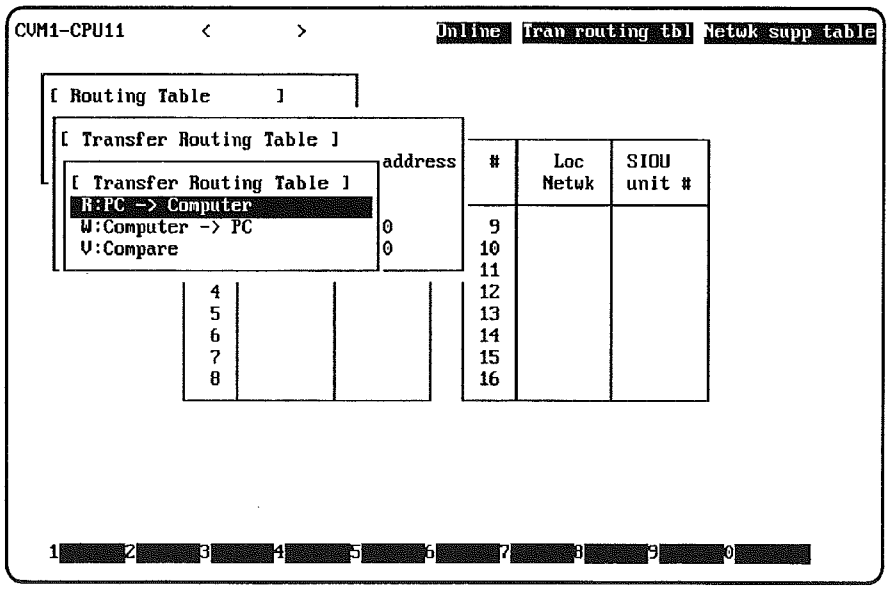


Uploading Routing Tables

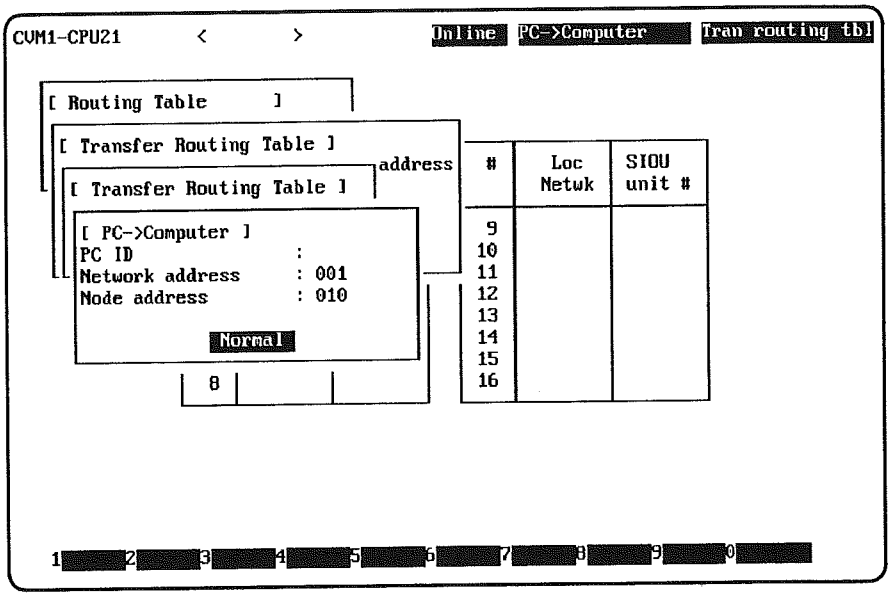
This operation is used to upload routing tables from the PC to the computer. Any routing table data already in the computer will be overwritten.

1, 2, 3...

1. Select "R:PC Computer" from the Transfer Routing Table Menu to start uploading the routing tables. A message will flash during the transfer and the following display will appear when the transfer is complete.



The following display will appear when the transfer has been completed.



2. Press Escape to return to the Transfer Routing Table Menu after the transfer is complete.

Downloading Routing Tables

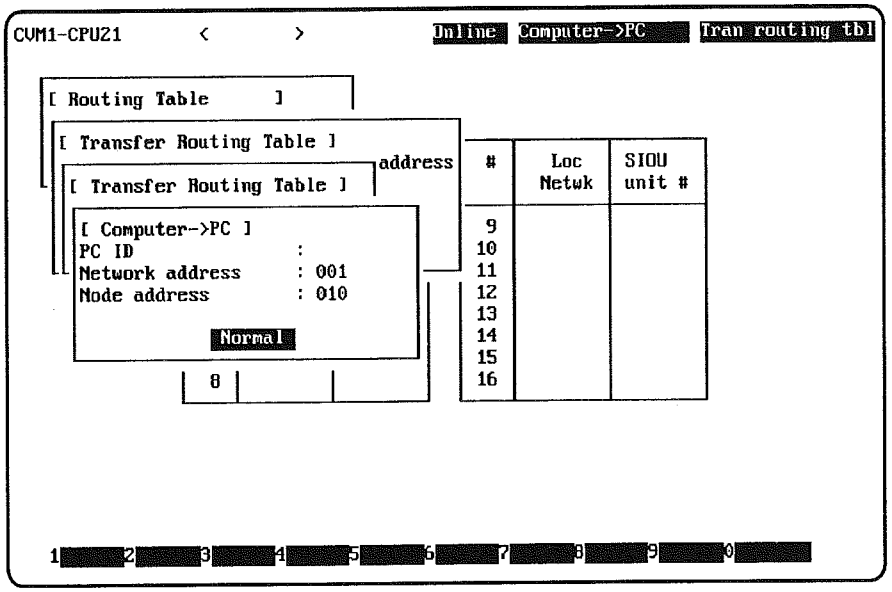
This operation is used to download the contents of the routing table in the computer system work area to the PC. The routing table already existing in the PC will be overwritten.

⚠ Caution When setting routing tables for the first time, connect the computer to the PC for which the routing table is to be set (or another PC on the same network), specify the network address as 0, and use the Computer PC transfer operation. Use the same procedure to change the network addresses in the local network table.

1, 2, 3...

1. Before using this operation, display the routing tables using the Retrieve Routing Table operation unless the desired routing table is already displayed.

2. Select "W:Computer PC" from the Transfer Routing Table Menu to start downloading the routing tables. A message will flash during the transfer and the following display will appear when the transfer is complete.



3. Press Escape to return to the Transfer Routing Table Menu.

Deleting Routing Tables

The only way to delete routing tables is to create routing tables specifying no local networks and no relay networks and then transferring the routing tables to the PC.

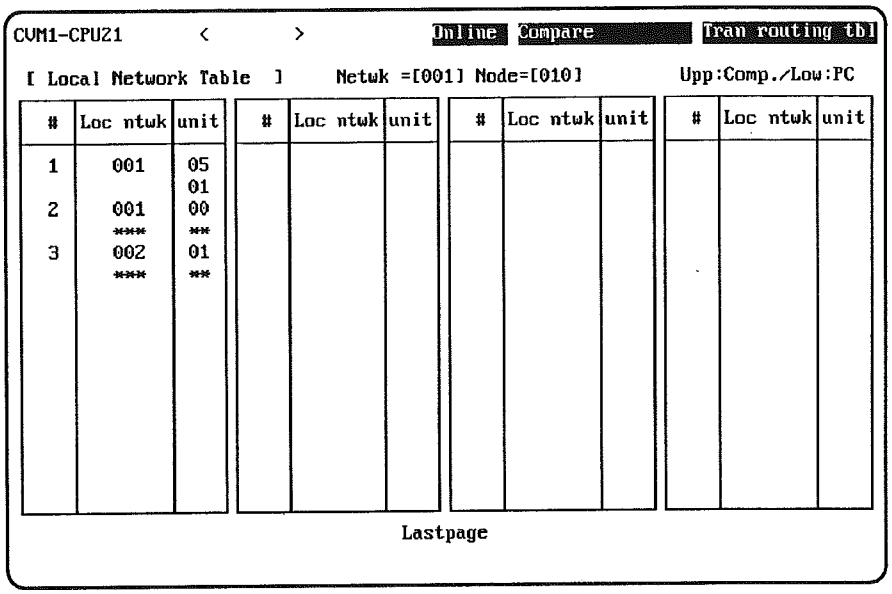
Compare

The Compare operation is used to compare the routing table in the computer system work area with the routing table in the PC.

Use the Compare operation after using the PC Computer or Computer PC operation to confirm that the routing tables are the same. If any differences are detected, repeat the transfer operation and then compare the tables again.

1, 2, 3...

1. Select "V:Compare" from the Transfer Routing Table Menu to start comparing the routing tables. A message will flash during the comparison and the following display will appear when the comparison is complete. Unmatching data items will be displayed with the data in the computer on top and the data in the PC underneath.



2. Press the PageDown Key to display the next page if the message "Continue" is displayed on the display. If the comparison discovers no differences between the routing tables in the computer and the PC, a message will indicate that the comparison was OK.
3. Press Escape to return to the Transfer Routing Table Menu.
4. Use PC Computer or Computer PC again if differences are discovered.

Saving Routing Tables

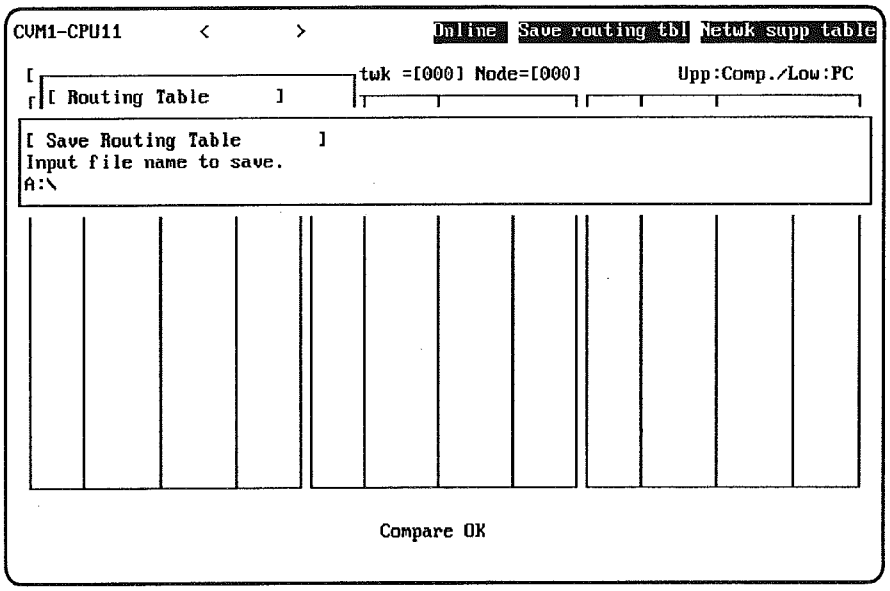
The Save Routing Table operation saves the routing table data in the system work area to the data disk.

When saving to a floppy disk, be sure the data disk has been formatted and is not write-protected. Routing tables data cannot be saved if they exceed the free space available on the data disk.

1, 2, 3...

1. Select "S:Save routing table" from the Routing Table Menu.

A file name input area will be displayed.



2. Enter the file name and press the Enter Key.

   To enter an existing file name, press the End Key to display the current file names, select the required file name with the cursor, and press the Enter Key.

3. If the input file name already exists, a message will ask if the file should be overwritten. Press the Y and Enter Keys to overwrite the file. Press the Enter Key to cancel and input a new file name.

   The title input area will appear when the Enter Key is pressed.

4. Input the title and press the Enter Key.

   A message will flash while the table is being saved. The routing table will be displayed after the data is saved.

SECTION 18
Support for CPU Bus Units

This section describes the operations to set parameters for CPU Bus Units, including parameters for data links.

18-1 CPU Bus Unit Operations 416
18-2 Communications Unit Settings 416
18-2-1 SYSMAC NET Link Systems 418
18-2-2 SYSMAC LINK Systems 420
18-2-3 SYSMAC BUS/2 Remote I/O System 422
18-3 Software Switch Settings 424
18-3-1 SYSMAC NET Software Switches 426
18-3-2 SYSMAC LINK Software Switches 426
18-3-3 Software Switches for SYSMAC BUS/2 Masters 427
18-4 CPU Bus Unit System Setup 427
18-5 CPU Bus Unit Software Switches 428

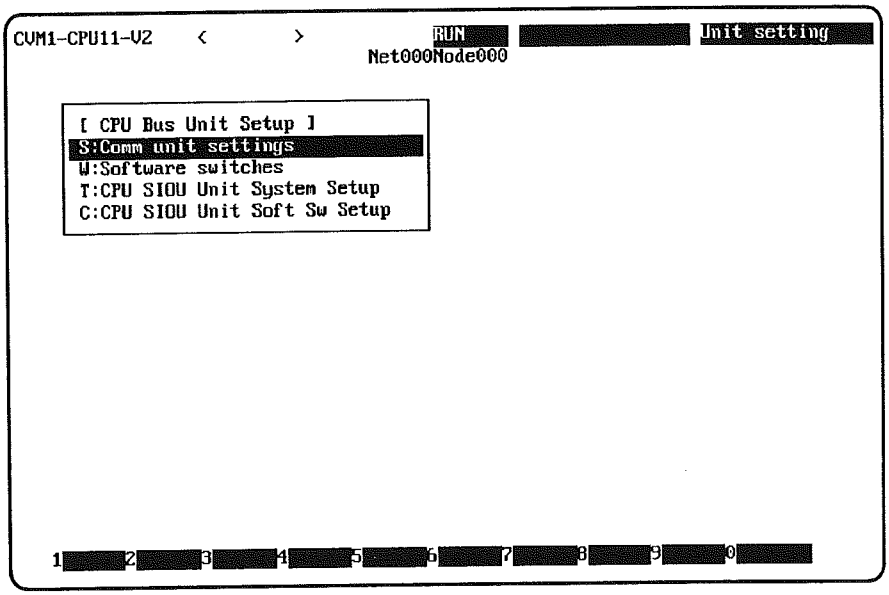
18-1 CPU Bus Unit Operations

The Communications Setup operation on the online Utility Menu can be use to make settings for CPU Bus Units, including settings for SYSMAC BUS/2, SYSMAC NET, and SYSMAC LINK (Communications Units). These operations are divided into four areas, the first two for Communications Units and the last two for other CPU Bus Units. These operations are outlined next.

Item	Function
S:Comm unit settings	Used to read and change the setup for the Communications Units in the PC.
W:Software switches	Used to read and change the software switches for the Communications Units in the PC.
T:CPU SIOU Unit System Setup	Used to read and change the system setups for the CPU Bus Units (other than Communications Units) in the PC. Use "S:Comm unit settings" to change the setups for Communication Units.
C:CPU SIOU Unit Soft Sw Setup	Used to read and change the software switches in the CIO and DM Areas for the CPU Bus Units (other than Communications Units) in the PC. Use "W:Software switches" to change software switch settings for Communications Units.

Use the following procedure to access the CPU Bus Unit Menu.

1, 2, 3... 1. Select "X:CPU Bus Unit setup" from the main online menu to access the following menu.



2. Select the required item from the menu and continue as described next for individual operations.

18-2 Communications Unit Settings

This operation is used to input settings for each SYSMAC NET Link Unit, SYSMAC LINK Unit, and SYSMAC BUS/2 Remote I/O Master Units mounted to the PC set as the destination network address in the System Settings. If you are directly connected to a PC, the settings can be changed without altering the default destination network addresses.

These settings are made in the System Setting area in the PC. Refer to the operation manuals of the Communications Units for operational details.

The settings cannot be changed if the CPU is write-protected via the keyswitch on the CPU.

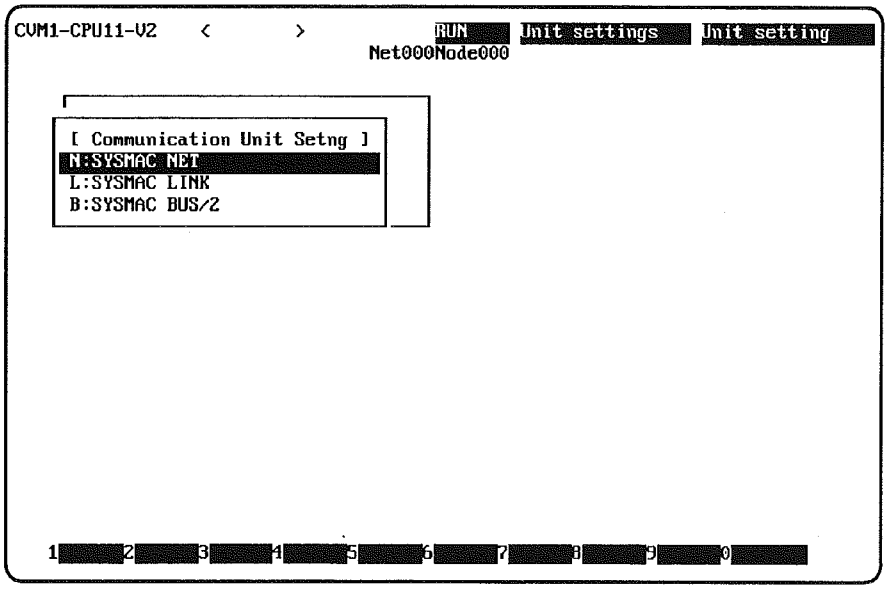
The following operations are available. These operations are described in more detail in following subsections.

System	Function
SYSMAC NET	Used to read and set the data link areas, linked words, transmission delay, master/slave, binary/ASCII, and datagram format for the SYSMAC NET Link Units.
SYSMAC LINK	Used to read and set the data link areas, linked words, and polling/polled units for the SYSMAC LINK Units.
SYSMAC BUS/2	Used to read and set the error check method, communications error process, hardware checks, communications cycle time, transfer error count, and response monitor time for the SYSMAC BUS/2 Masters.

Use the following procedure to access the menu.

1, 2, 3...

1. Select "S:Comm unit setting" from the CPU Bus Unit Menu. The following display will appear.



2. Select the desired item and continue as described next for individual operations.

Note

1. CPU Bus Link Units are allocated 25 words each between CIO 1500 to CIO 1899 of the CPU Bus Link Area in the PC. The software switch settings are stored in these areas. Consequently, the following area of the CPU Bus Link Area cannot be used in a user program:

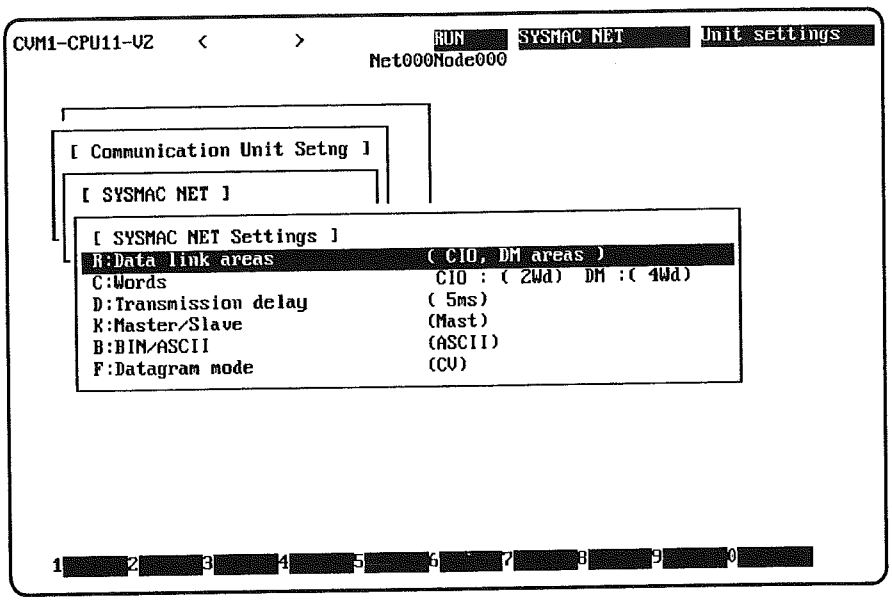
   25 words starting from word 1500 + (unit number x 25)

2. The above words will be cleared whenever the power to the PC is turned off or the PC mode is changed unless they are set as holding words in the PC Setup.
3. Refer to the operation manuals for individual Units for further details on Unit operation.

18-2-1 SYSMAC NET Link Systems

This operation is used to read and change the settings for SYSMAC NET Link Units.

Select "N:SYSMAC NET" from the Communication Unit Setting Menu. Enter a unit number between 0 and 15 and press Enter. The current settings will be displayed in parentheses.

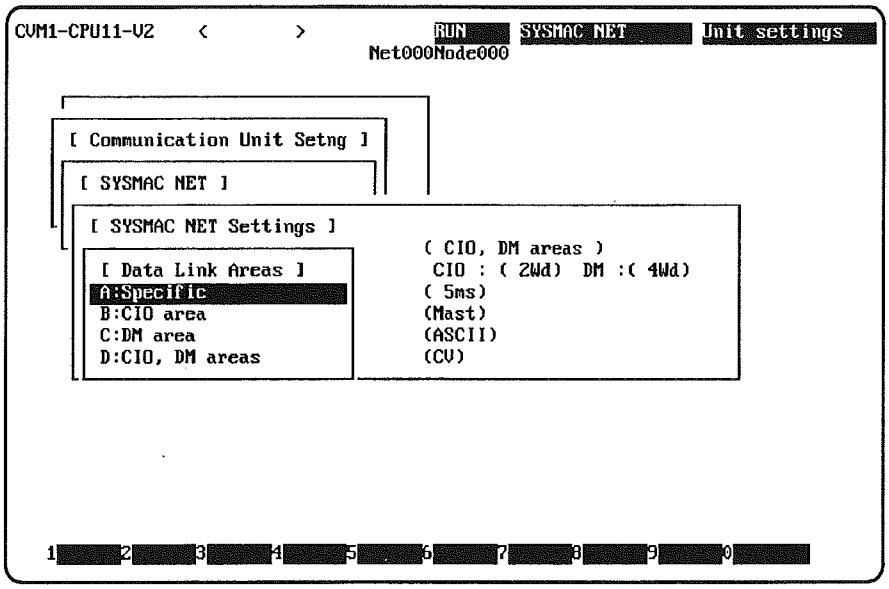


The setting method for each item is described below. These settings cannot be changed if the system protect key is set to protect the system.

⚠ **Caution** The changed settings are not immediately recognized by the Link Units. Carry out one of the following procedures to use the new settings:

- Turn the PC power supply off then back on again.
- Force set or reset the CPU Bus Unit Restart Bit (A00100 to A00115) corresponding to the unit. This restarts the Link Unit with the current settings. This operation is effective only for the PC connected to the computer.

Data Link Areas The following menu will appear when "R:Data link areas" is selected from the SYSMAC NET Settings Menu.



Specify the areas to be used for the data links.

The data set using the offline Edit Data Link Tables operation will be used if "Specific" is selected from the Data Link Areas Menu.

If data links are to be setup automatically, specify the required areas. The settings will be written to the PC and the SYSMAC NET Settings Menu will appear.

Number of Words The number of words to be allocated must be set if "B:CIO area," "C:DM area," or "D:CIO, DM areas" is selected from the Data Link Areas Menu.

1, 2, 3...

1. Select "C:Words" from the SYSMAC NET Settings Menu.
2. Set the number of words to be allocated to each node for each area selected from the Data Link Areas Menu. Although both CIO and DM are displayed, the settings are valid only for the areas selected from the Data Link Areas Menu.

   The settings will be written to the PC and the SYSMAC NET Settings Menu will appear.

Transfer Delay Time

1, 2, 3...

1. Select "D:Transmission delay" from the SYSMAC NET Settings Menu.
2. Select the transmission delay time. The setting will be written to the PC and the SYSMAC NET Settings Menu will appear.

Master and Slave

1, 2, 3...

1. Select "K:Master/Slave" from the SYSMAC NET Settings Menu.
2. Select Master or Slave. The setting will be written to the PC and the SYSMAC NET Settings Menu will appear.

Binary or ASCII

1, 2, 3...

1. Select "B:BIN/ASCII" from the SYSMAC NET Settings Menu.
2. Specify whether the SYSMAC NET Link Unit is to handle BIN (binary) or ASCII data. The setting will be written to the PC and the SYSMAC NET Settings Menu will appear.

Datagram Format

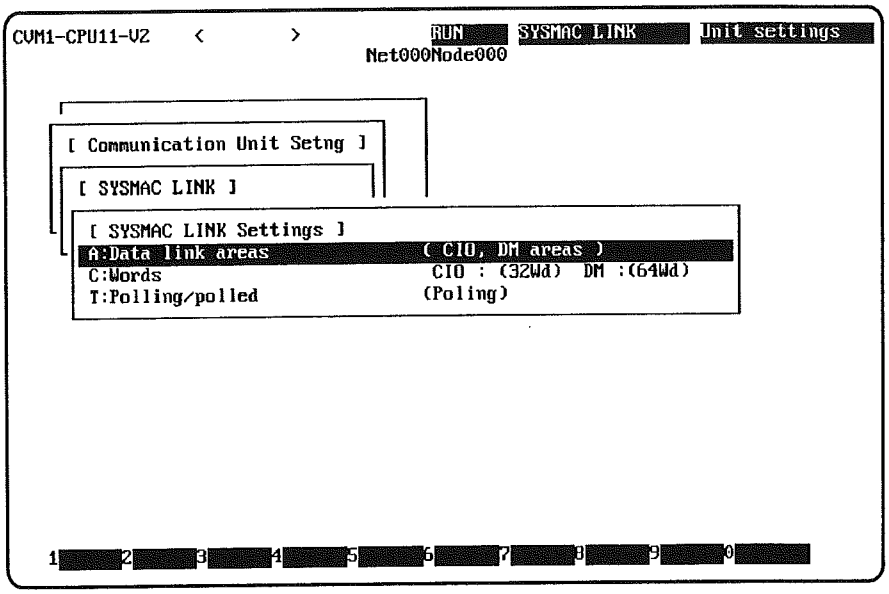
1, 2, 3...

1. Select "F:Datagram mode" from the SYSMAC NET Settings Menu.
2. Select datagram format for the SYSMAC NET Link Unit. The C mode must be used when PCs other than CVM1 PC are to be used on the network. The setting will be written to the PC and the SYSMAC NET Settings Menu will appear.

18-2-2 SYSMAC LINK Systems

This operation is used to read and change the settings for the SYSMAC LINK Units.

Select "L:SYSMAC LINK" from the Communication Unit Setting Menu. Enter a unit number between 0 and 15 and press Enter. The current settings will be displayed in parentheses.

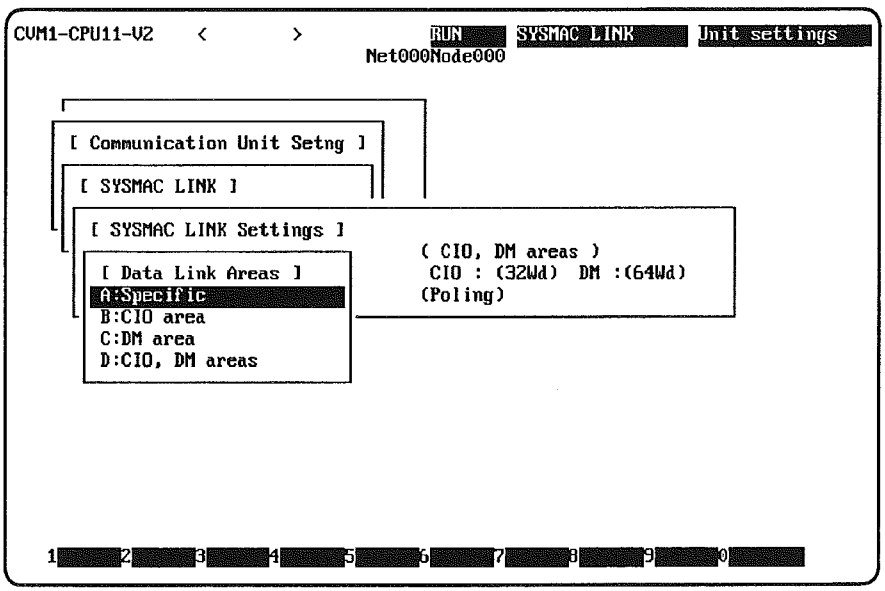


The setting method for each item is described below.

⚠ Caution The changed settings are not immediately recognized by the Link Units. Carry out one of the following procedures to use the new settings:

- Turn the PC power supply off then back on again.
- Force set or reset the CPU Bus Unit Restart Bit (A00100 to A00115) corresponding to the unit. This restarts the Link Unit with the current settings. This operation is effective only for the PC connected to the computer.

Data Link Areas The following menu will appear when "A:Data link areas." is selected from the SYSMAC LINK Settings Menu.



Specify the areas to be used for the data links.

The data set using the offline Edit Data Link Tables operation will be used if "Specific" is selected from the Data Link Areas Menu.

If data links are to be setup automatically, specify the required areas. The settings will be written to the PC and the SYSMAC LINK Settings Menu will appear.

Number of Words The number of words to be allocated must be set if "B:CIO area," "C:DM area," or "D:CIO, DM areas" is selected from the Data Link Areas Menu.

1, 2, 3...

1. Select "C:Words" from the SYSMAC LINK Settings Menu.
2. Set the number of words to be allocated to each node for each area selected from the Data Link Areas Menu. Although both CIO and DM are displayed, the settings are valid only for the areas selected from the Data Link Areas Menu.

   The settings will be written to the PC and the SYSMAC LINK Settings Menu will appear.

Setting Polled or Polling

1, 2, 3...

1. Select "T:Polling/polled" from the SYSMAC LINK Settings Menu.
2. Specify whether the Unit is to be a polling unit or polled unit. The settings will be written to the PC and the SYSMAC LINK Settings Menu will appear.

Refer to the *SYSMAC LINK Unit System Manual* for details on polling and polled units.

Polled Units

Polled Units in SYSMAC LINK Systems do not send data to other Units when power is turned on. Any Unit being removed from one network and being added to another should be set as a polled unit. If a Unit with a low unit number and set to a polling unit is added to a network, the network parameters in the new Unit will be used to operate the network.

Polling Units

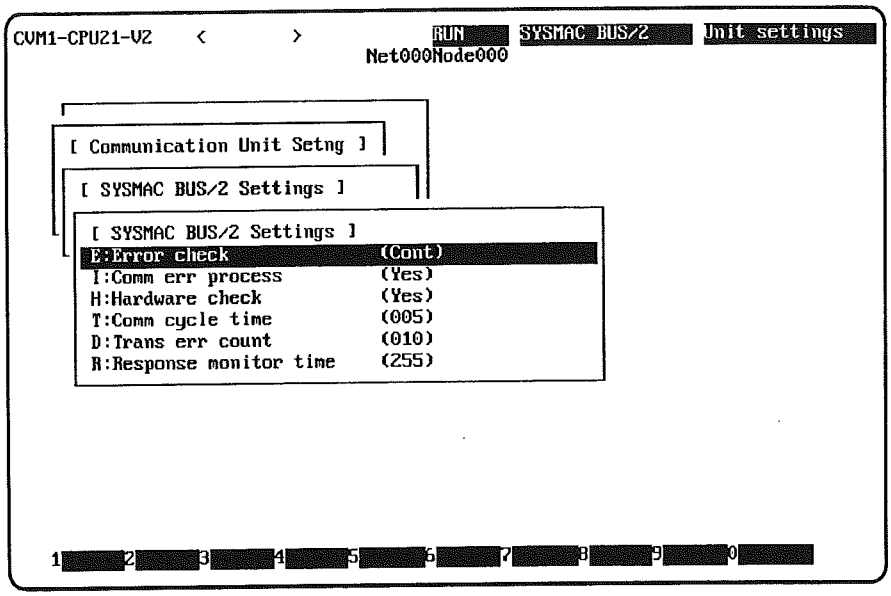
Data links in SYSMAC LINK Systems are controlled by the Unit with the lowest unit number of all Units set as a polling unit. All other Units are considered to be polled Units.

18-2-3 SYSMAC BUS/2 Remote I/O System

This operation is used to read and set the settings for the SYSMAC BUS/2.

1, 2, 3...

1. Select "B:SYSMAC BUS/2" from the Communication Unit Setting Menu.
2. Specify the Master for which the settings are to be made. Enter an Master's unit number 0 and 15 and press Enter. The current settings will be displayed.



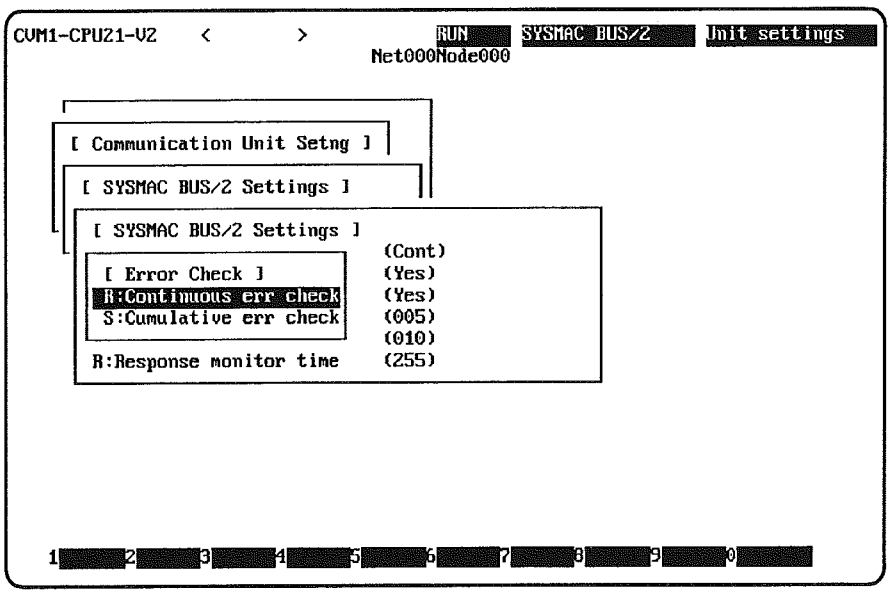
The setting method for each item is described below.

⚠ Caution The changed settings are not immediately recognized by the Link Units. Carry out one of the following procedures to use the new settings:

- Turn the PC power supply off then back on again.
- Force set or reset the CPU Bus Unit Restart Bit (A00100 to A00115) corresponding to the unit number. This restarts the Link Unit with the current settings. This operation is effective only for the PC connected to the computer.

Error Check

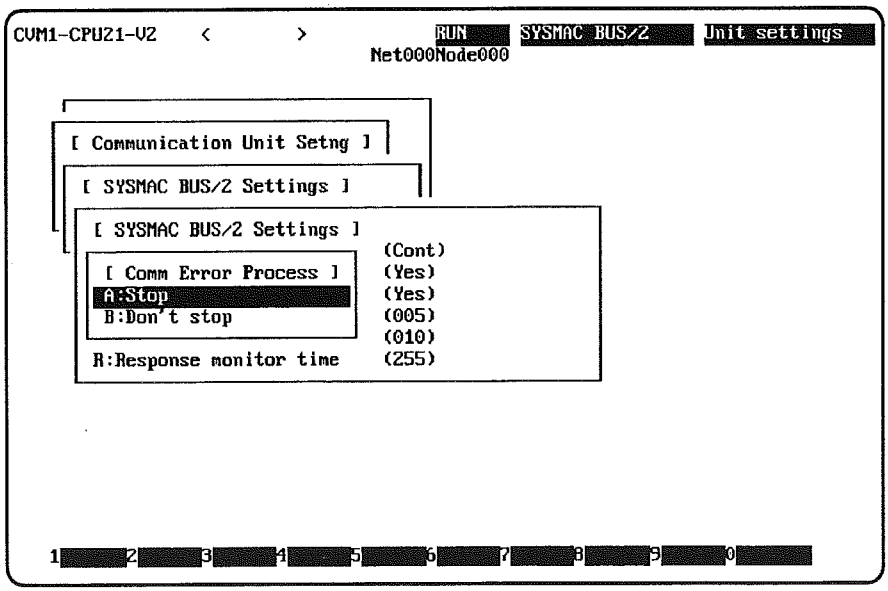
1, 2, 3... 1. Select "E:Error check" from the SYSMAC BUS/2 Settings Menu.



2. Select the error checking method. The setting will be written to the PC and the SYSMAC BUS/2 Settings Menu will appear.

Communication Error Process

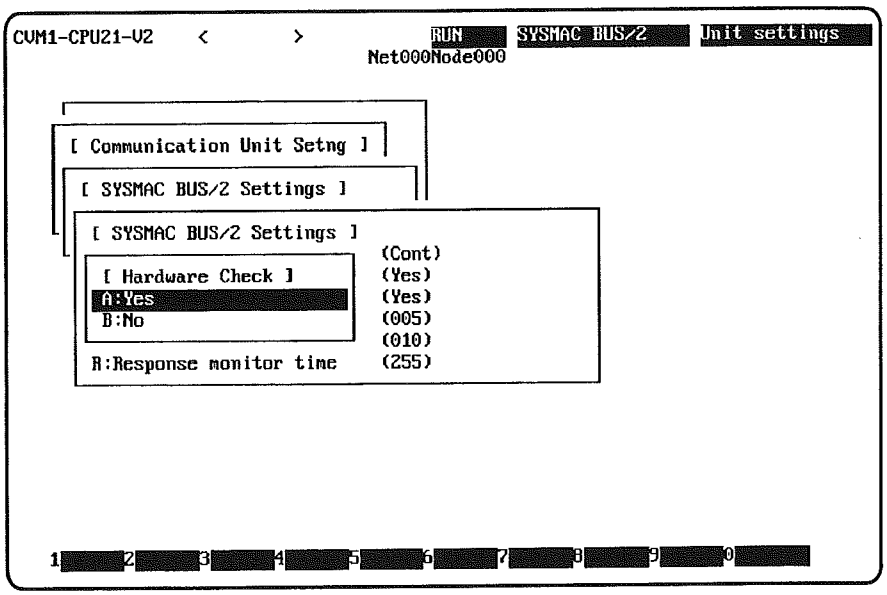
1, 2, 3... 1. Select "I:Comm err process" from the SYSMAC BUS/2 Settings Menu.



2. Select whether or not communications are to stop when an error occurs. The setting will be written to the PC and the SYSMAC BUS/2 Settings Menu will appear.

Hardware Checks

1, 2, 3... 1. Select "H:Hardware check" from the SYSMAC BUS/2 Settings Menu.



2. Select the Hardware check. The setting will be written to the PC and the SYSMAC BUS/2 Settings Menu will appear.

Communication Cycle Time

1, 2, 3... 1. Select "T:Comm cycle time" from the SYSMAC BUS/2 Settings Menu.

2. Enter the communication cycle time between 0 and 255 and press Enter. The setting will be written to the PC and the SYSMAC BUS/2 Settings Menu will appear.

Transfer Error Count

1, 2, 3... 1. Select "D:Trans err count" from the SYSMAC BUS/2 Settings Menu.

2. Enter the transfer error count between 0 and 255 and press Enter. The setting will be written to the PC and the SYSMAC BUS/2 Settings Menu will appear.

Response Monitor Time

1, 2, 3... 1. Select "R:Response monitor time" from the SYSMAC BUS/2 Settings Menu.

2. Enter the response monitor time between 0 and 255 and press Enter. The setting will be written to the PC and the SYSMAC BUS/2 Settings Menu will appear.

18-3 Software Switch Settings

This operation is used to input settings for each SYSMAC NET Link Unit, SYSMAC LINK Unit, and SYSMAC BUS/2 Remote I/O Master Units mounted to the PC set as the destination network address in the System Settings.

Refer to the System Manuals for individual Link Units for operational details.

The settings cannot be changed if the CPU is write-protected via the keyswitch on the CPU.

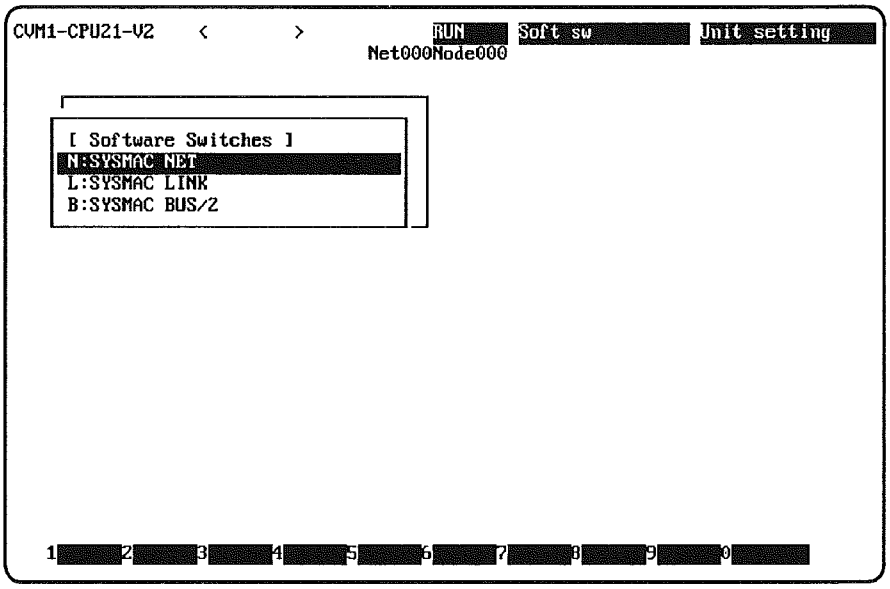
The following menu will appear when the Software Switches operation is selected from the Communications Unit Menu.

System	Function
SYSMAC NET	Used to start or stop the data link, run or stop intemode tests, and set the destination network and node addresses for intemode tests.
SYSMAC LINK	Used to start or stop tests, start or stop data links, and set the test type and test parameters.
SYSMAC BUS/2	Used to set whether to stop communication when an error occurs, start communications tests, start or stop communications, restart Group-3 Slaves, set the communication test area, and communication participation areas.

Use the following procedure to access the menu.

1, 2, 3...

1. Select "W:Software Switches" from the CPU Bus Unit Menu. The following display will appear.



2. Select the desired item and continue as described next for individual operations.

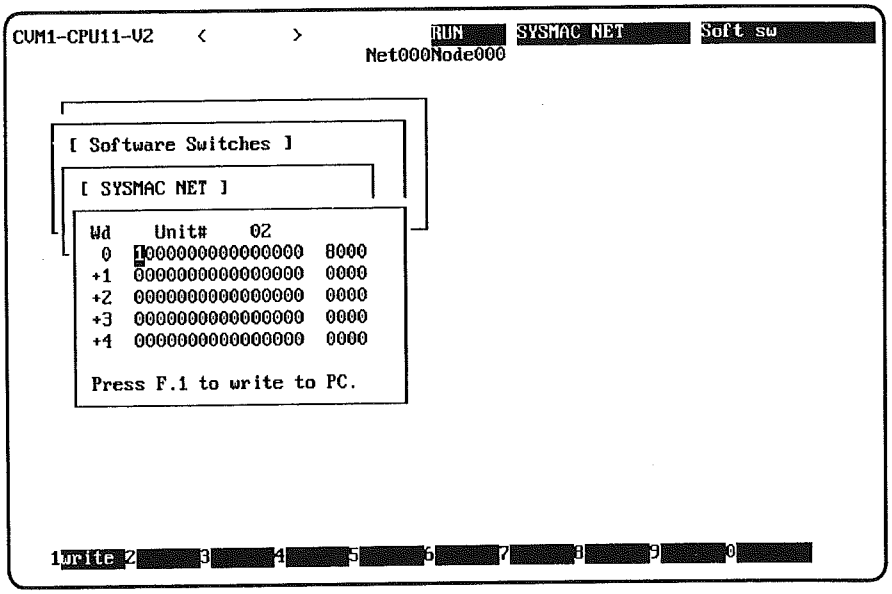
Note

1. CPU Bus Link Units are allocated 25 words each between CIO 1500 to CIO 1899 of the CPU Bus Link Area in the PC. The software switch settings are stored in these areas. Consequently, the following area of the CPU Bus Link Area cannot be used in a user program:
   25 words starting from word 1500 + (unit number x 25)
2. The above words will be cleared whenever the power to the PC is turned off or the PC mode is changed unless they are set as holding words in the PC Setup.
3. Refer to the operation manuals for individual Units for further details on Unit operation.

18-3-1 SYSMAC NET Software Switches

1, 2, 3...

1. Select "N:SYSMAC NET" from the Software Switches Menu.
2. Enter a unit number between 0 and 15 and press Enter. The 16-bit binary and hexadecimal settings will appear for each word.



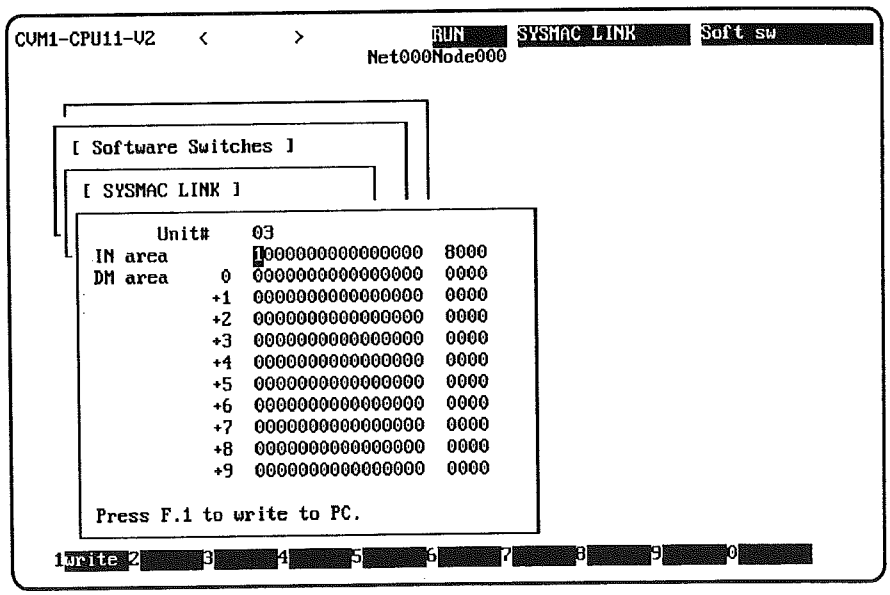
3. Move the cursor to the bits to be changed, enter a 0 or 1, and press Enter. The hexadecimal value will change to reflect the input binary value.

   Use the Left, Right, Up, And Down Keys to move the cursor.
4. Press the F1 Key when the changes are complete. The software switch settings will be written to the Unit.

18-3-2 SYSMAC LINK Software Switches

1, 2, 3...

1. Select "L:SYSMAC LINK" from the Software Switches Menu.
2. Enter a unit number between 0 and 15 and press Enter. The 16-bit binary and hexadecimal setting will appear for each word.



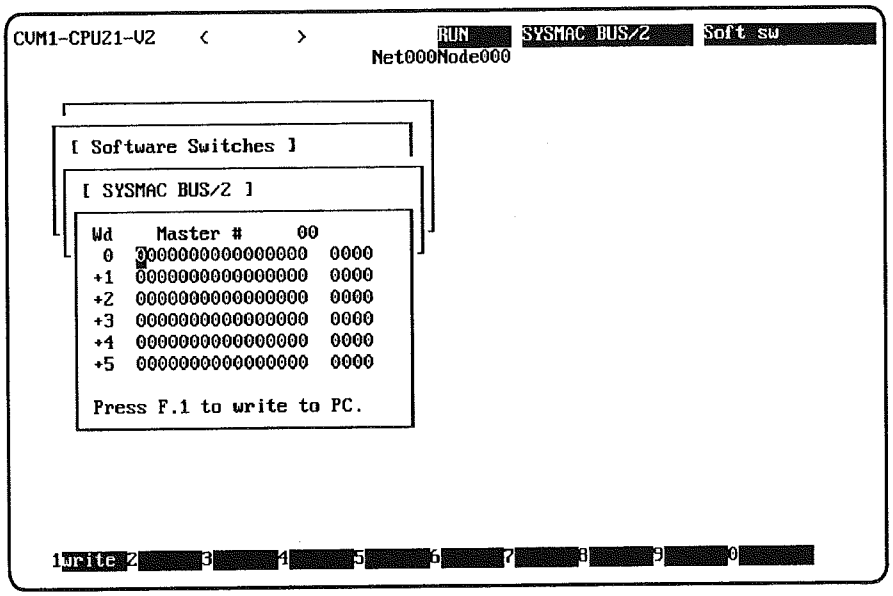
3. Move the cursor to the bits to be changed, enter a 0 or 1, and press Enter. The hexadecimal value will change to reflect the input binary value.

   Use the Left, Right, Up, And Down Keys to move the cursor.

4. Press the F1 Key when the changes are complete. The software switch settings will be written to the Unit.

18-3-3 Software Switches for SYSMAC BUS/2 Masters

1, 2, 3... 1. Select "B:SYSMAC BUS/2" from the Software Switches Menu.



2. Enter a unit number between 0 and 15 and press Enter. The 16-bit binary and hexadecimal setting will appear for each word.
3. Move the cursor to the bits to be changed, enter a 0 or 1 and press Enter. The hexadecimal value will change to reflect the input binary value.

   Use the Left, Right, Up, And Down Keys to move the cursor.

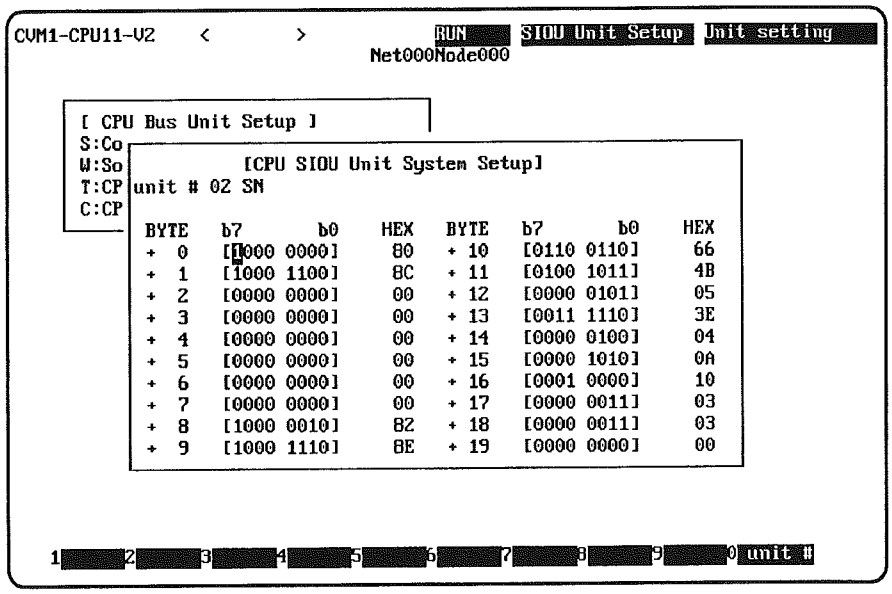
4. Press the F1 Key when the changes are complete. The software switch settings will be written to the Master.

18-4 CPU Bus Unit System Setup

This operation is used to read and set the system setup area in the PC for CPU Bus Units. These setups are designed for CPU Bus Units other that SYSMAC NET Link, SYSMAC LINK, and SYSTEM BUS/2 Remote I/O Units, which are set using the "Comm Unit Settings" described above.

Refer to the operation manuals for the CPU Bus Units for the meanings of the settings.

1, 2, 3... 1. Select "T:CPU SIOU Unit System Setup" from the CPU Bus Unit Setup Menu. The display for the CPU Bus Unit with the lowest unit number will appear.



2. Use the PageUp and PageDown Keys to scroll the display.
3. Press the F10 Key and input the unit number of the CPU Bus Unit to be set if it is not the one already shown. The unit number will be displayed at the top left of the screen.
4. Move the cursor to the location to be set.
5. Input 0 or 1 and press Enter.

or Press the Shift+Right Cursor Keys to move to the hexadecimal input area, input the hexadecimal value, and press Enter. You can return to the binary input area by pressing the Shift+Left Cursor Keys.

6. Press Escape to write the current settings to the PC.

18-5 CPU Bus Unit Software Switches

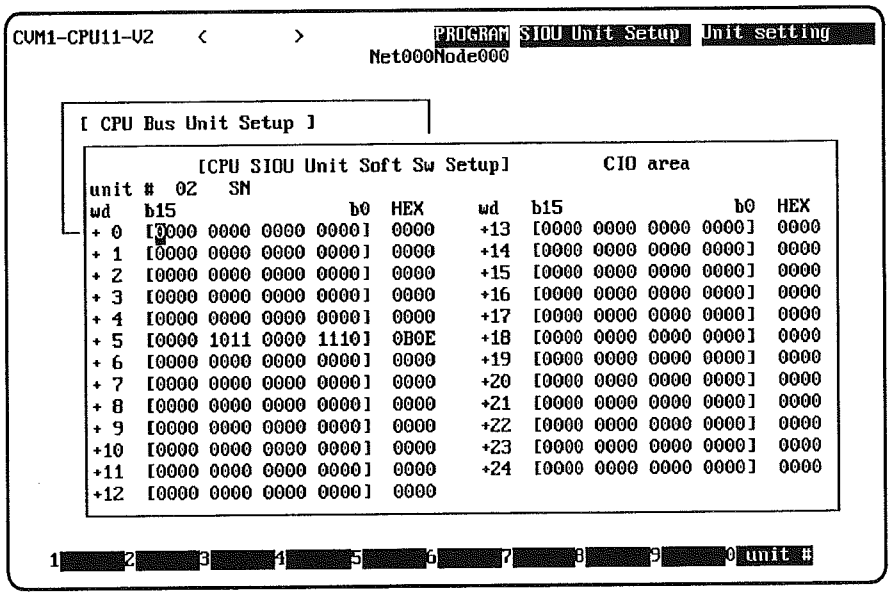
This operation is used to read and set the software switches in the DM Area and in the CPU Bus Unit Area of the CIO Area in the PC for CPU Bus Units. These software switches are designed for CPU Bus Units other that SYSMAC NET Link, SYSMAC LINK, and SYSTEM BUS/2 Remote I/O Units, which are set using the "Software Switches" described above.

Refer to the operation manuals for the CPU Bus Units for the meanings of the settings.

CIO Area

1, 2, 3...

1. Select "C:CPU SIOU Unit Soft Sw Setup" from the CPU Bus Unit Setup Menu. The display of the CIO Area for the CPU Bus Unit with the lowest unit number will appear.



2. Use the PageDown Keys to shift to the DM Area display for the same Unit, then the CIO Area display for the Unit with the next smallest unit number, then the DM Area display for the Unit, etc. The PageUp Key can be used to scroll backwards.
3. Press the F10 Key and input the unit number of the CPU Bus Unit to be set if it is not the one already shown. The unit number will be displayed at the top left of the screen.
4. Move the cursor to the location to be set.
5. Input 0 or 1 and press Enter.

or Press the Shift+Right Cursor Keys to move to the hexadecimal input area, input the hexadecimal value, and press Enter. You can return to the binary input area by pressing the Shift+Left Cursor Keys.

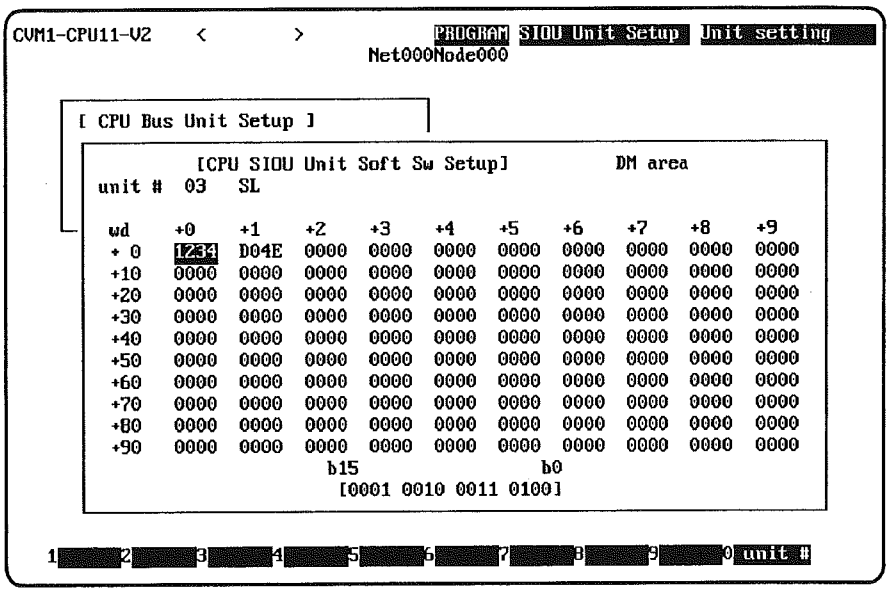
6. Press Escape to write the current settings to the PC.

DM Area

1, 2, 3...

1. Select "C:CPU SIOU Unit Soft Sw Setup" from the CPU Bus Unit Setup Menu.
2. Input the unit number of the CPU Bus Unit to be set if it is not the one already shown. The unit number will be displayed at the top left of the screen.

3. Use the PageDown Keys to shift to the DM Area display for the same Unit. You can continue to press the PgDn Key to scroll between displays. The PageUp Key can be used to scroll backwards.



4. Move the cursor to the location to be set.
5. Input the hexadecimal value and press Enter.
6. Press Escape to write the current settings to the PC.

SECTION 19
Diagnosing Networks

This section describes the operations that can be used to diagnose SYSMAC NET and SYSMAC LINK networks.

19-1 Overview 432
19-1-1 SYSMAC NET 432
19-1-2 SYSMAC LINK 436

19-1 Overview

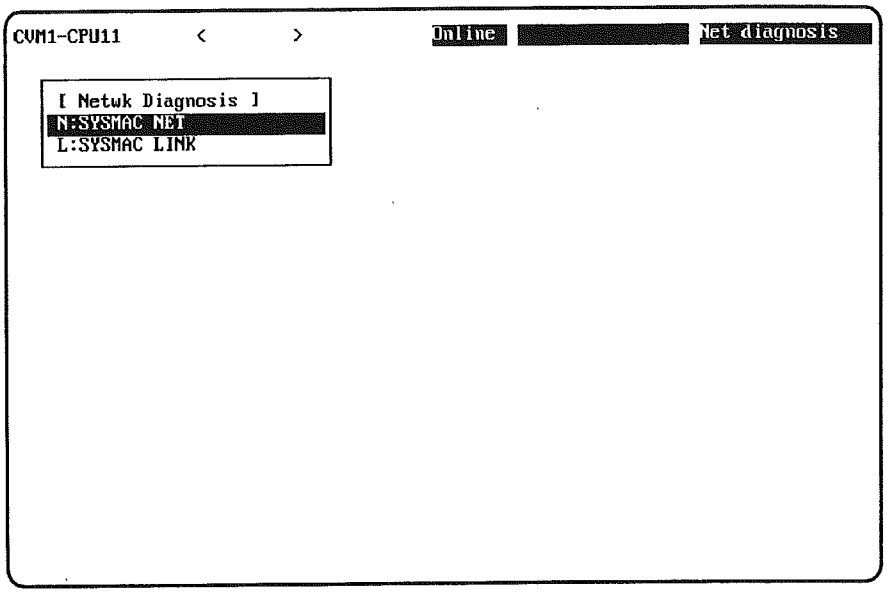
Network Diagnostics are available to help troubleshoot SYSMAC NET and SYSMAC LINK networks. Operations in the following two areas are provided.

Area	Operations
SYSMAC NET	Operations are provided to test communications display network status, and read error histories.
SYSMAC LINK	Operations are provided to test communications display network status and read error histories.

Use the following procedure to display the Network Diagnosis Menu.

1, 2, 3...

1. Select "N:Net diagnosis" from the main online menu. The Network Diagnosis Menu will appear.



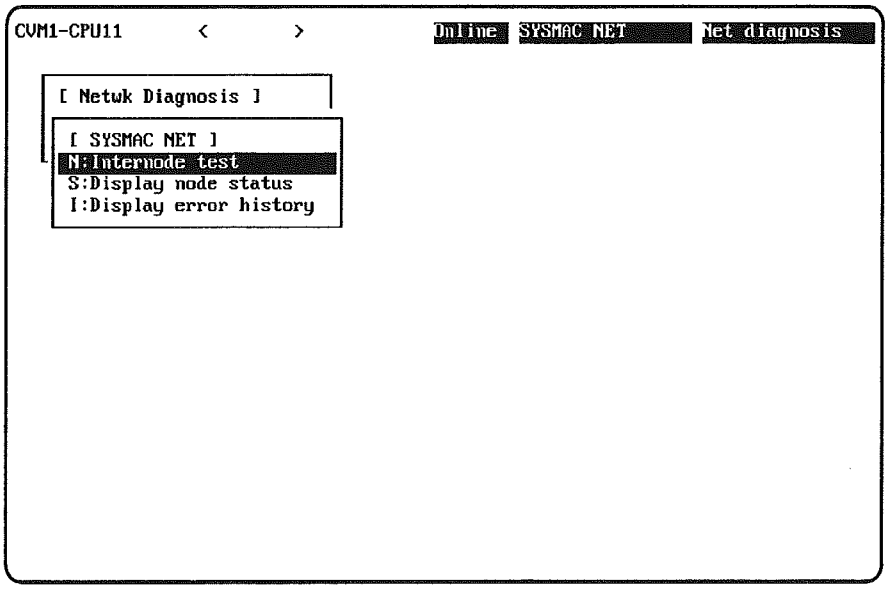
2. Select the required item from the menu and continue as described next for individual operations.

19-1-1 SYSMAC NET

The following table lists the SYSMAC NET Network Diagnostic operations.

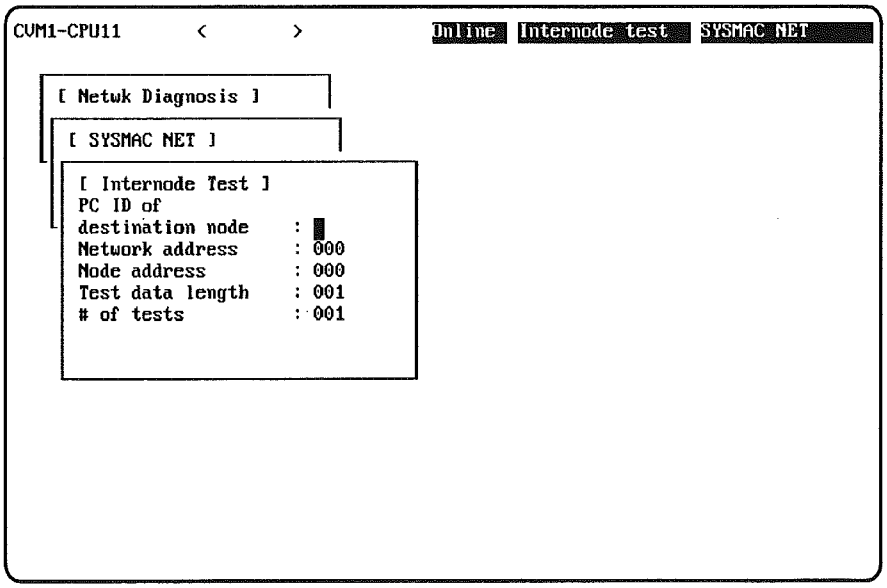
Operation	Function
N:Internode test	Used to run the loop-back test between the computer and specified node.
S:Display node status	Used to read status data from the specified SYSMAC NET Link Unit.
I:Display error history	Used to read and clear the error history.

Select "N:SYSMAC NET" from the Network Diagnosis Menu and the select the required item from the menu. Individual operations are described next.



Internode Test This operation runs the loop-back test between the computer and specified node.

1, 2, 3... 1. Select "N:Internode test" from the SYSMAC NET Menu.



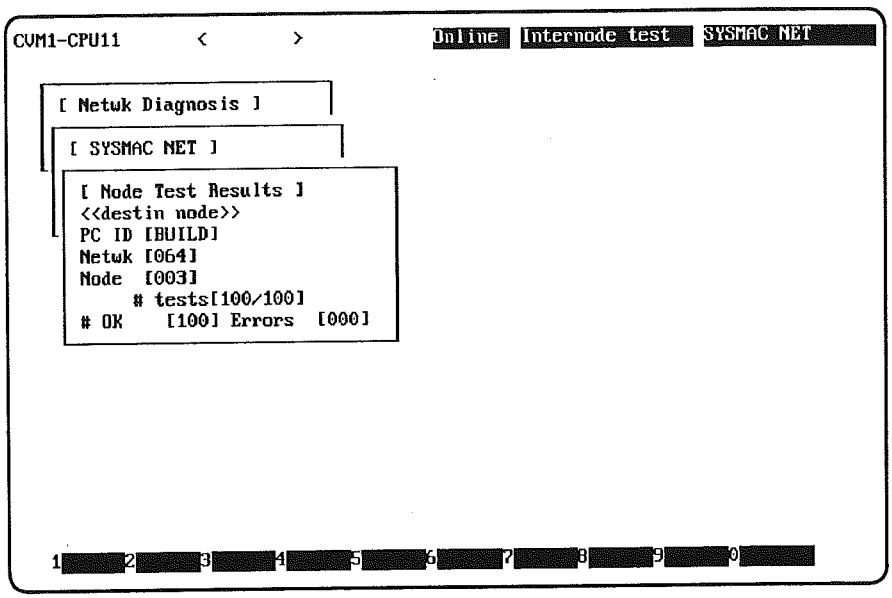
2. Enter the network address and node address of the destination node. Enter the network address between 0 and 127 and press the Down Key. Specify 0 as the network address for the local network.

   Note The network address and node address can be specified using PC names. Press the End Key to display the PC name table and select the required PC name with the cursor. The network address and node address will be displayed automatically when Enter is pressed.

3. Enter the node address between 0 and 126 and press the Down Key. Specify 0 as the node address for the node directly connected to the computer.

4. Enter the length of the test data between 1 and 512 and press the Down Key.
5. Enter the number of tests between 1 and 999 and press Enter. Press the Asterisk Key to specify an endless test.

   If the Asterisk Key is pressed to specify an endless test, the test will continue indefinitely until Escape is pressed. Press Escape to interrupt the internode test run.
6. Press the Y and Enter Keys to run the internode test or press the N and Enter Keys to cancel the internode test and return the cursor to the position to input the PC name.
7. The following display will appear when the test has been completed. The number of passed and failed internode tests will be displayed.

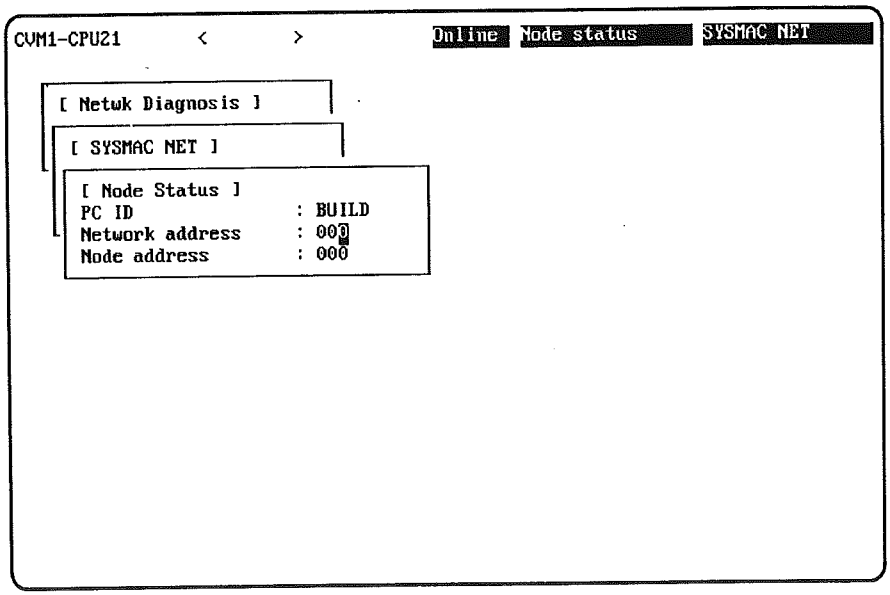


Displaying the Node Status

This operation reads status data from the specified SYSMAC NET Link Unit.

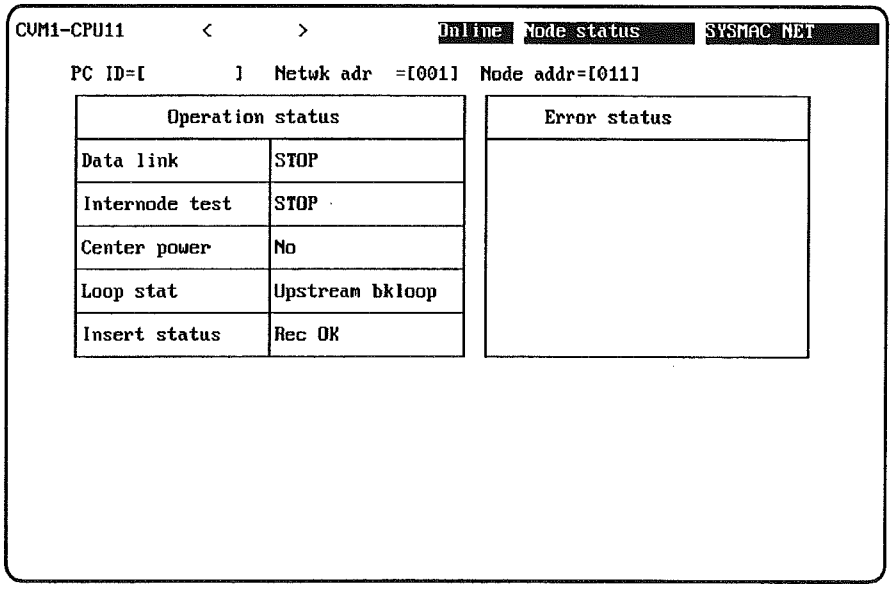
1, 2, 3...

1. Select "S:Display node status" from the SYSMAC NET Menu.



2. Enter the network address and node address of the node to be read. The PC name can be specified as described above for the internode test.

   The operating status and errors will be displayed on the screen.

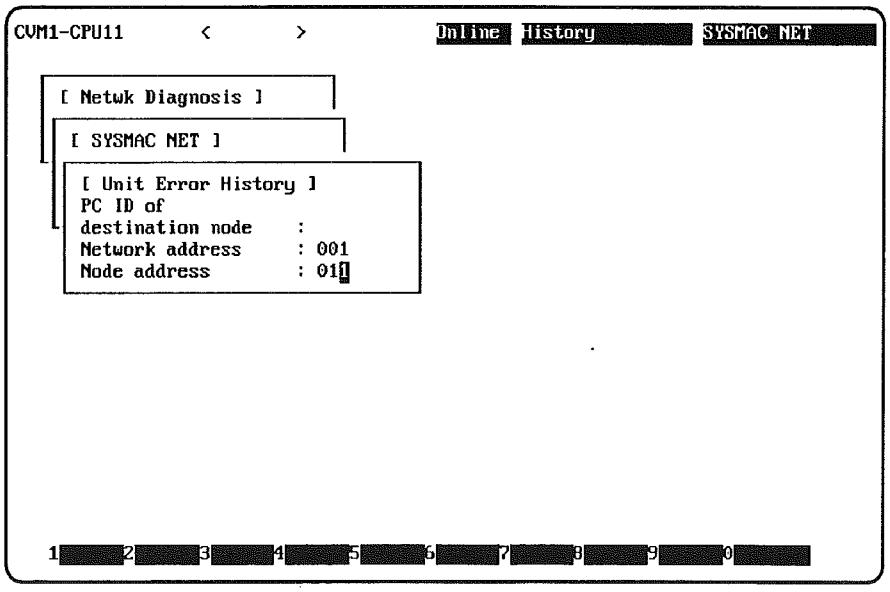


Displaying the Unit Error History

This operation reads and clears the error history in the SYSMAC NET Link Unit.

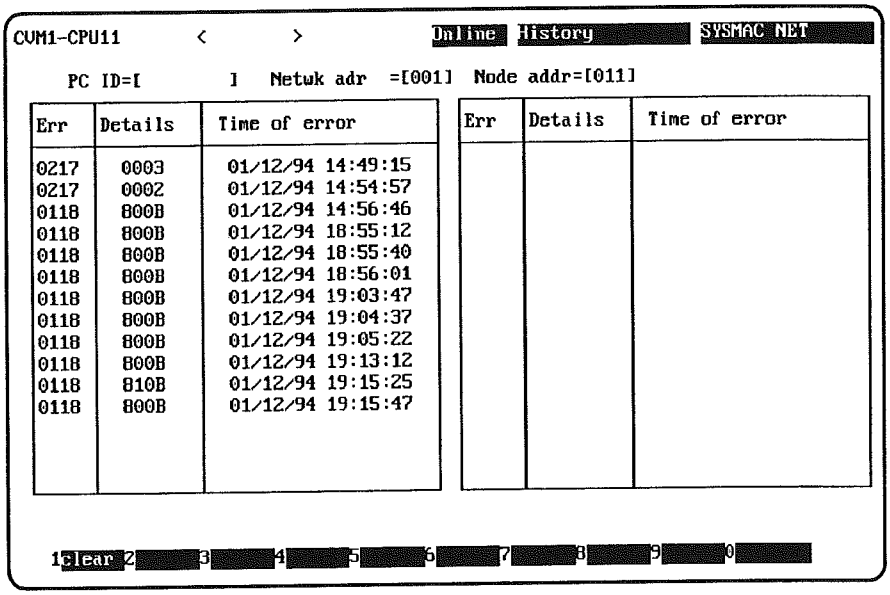
1, 2, 3...

1. Select "I:Display error history" from the SYSMAC NET Menu to access the following display.



2. Enter the network address and node address of the node to be read and press Enter. The PC name can be specified as described above for the internode test.

Error codes, detailed error descriptions, and times of the errors will be displayed on the screen.



3. Press the F1 Key followed by the Y and Enter Keys to clear the Unit's error history or press the N and Enter Keys to cancel the clear operation.

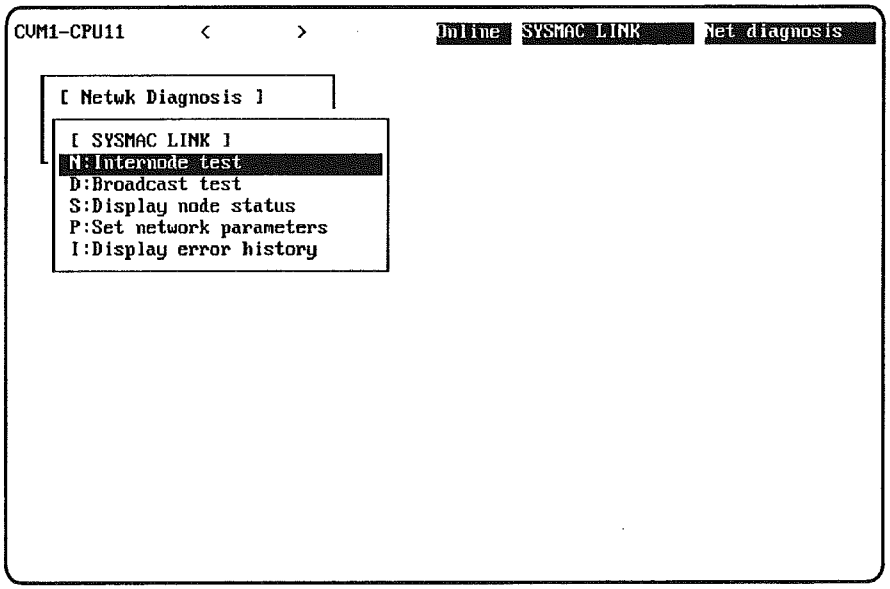
Refer to the *SYSMAC NET Link System Manual* for details on errors.

19-1-2 SYSMAC LINK

The following table lists the SYSMAC LINK Network Diagnostic operations.

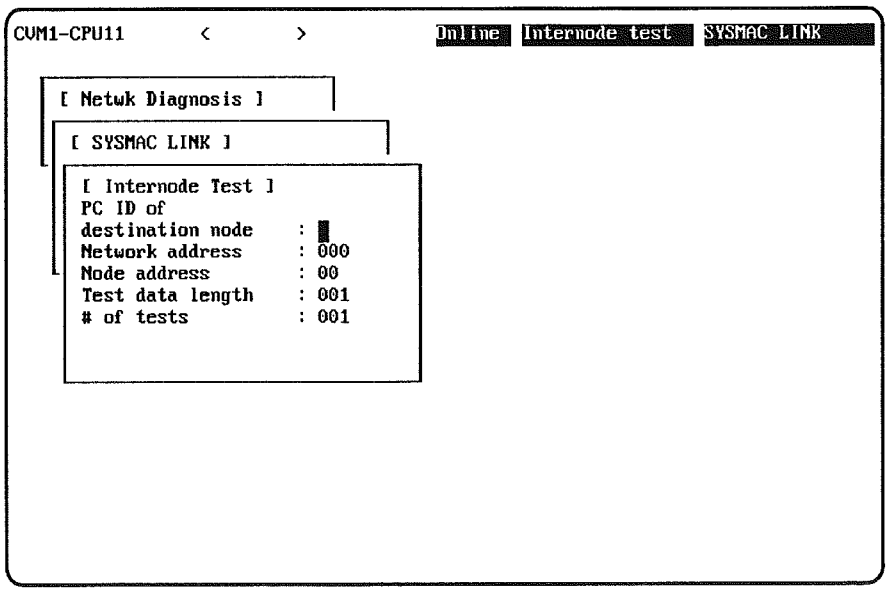
Operation	Function
N:Internode test	Used to run the loop-back test between the computer and specified node.
D:Broadcast test	Used to run the broadcast test to all nodes in the specified network.
S:Display node status	Used to read status data from the specified SYSMAC LINK Unit.
P:Set network parameters	Used to set and change network parameters.
I:Display error history	Used to read and clear the error history.

Select "L:SYSMAC LINK" from the Network Diagnosis Menu and select the required item from the menu.



Internode Test This operation is used to run the loop-back test between the computer and a specified node.

1, 2, 3... 1. Select "N:Internode test" from the SYSMAC LINK Menu.

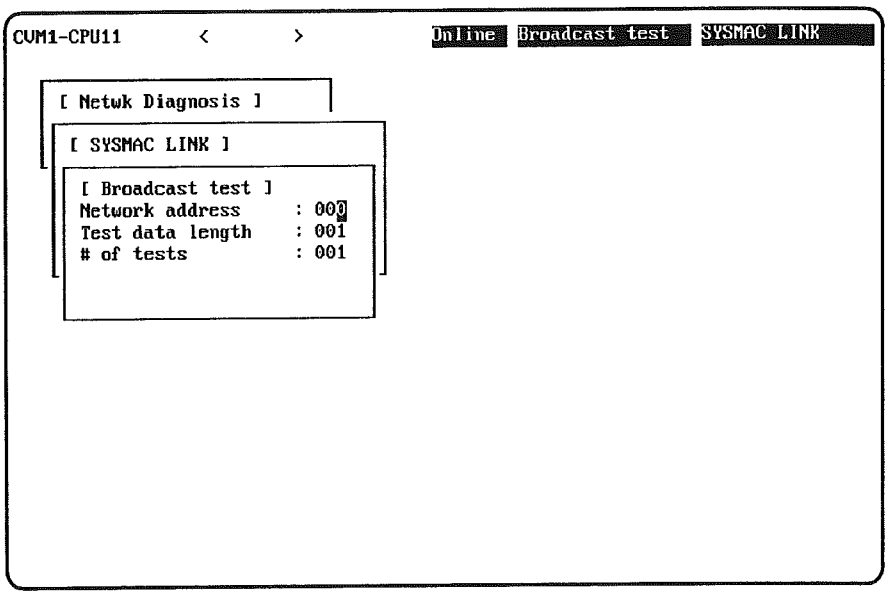


2. The input method and input range of all parameters (except the node address) is identical to the SYSMAC NET internode test.
3. Enter the node address between 0 and 62 and press Enter. The test results display and the key operations are identical to the SYSMAC NET internode test.

Broadcast Test This test sends test data to all nodes connected to a SYSMAC LINK System and counts the number of times data is received back to check whether or not nodes can communicate with each other. Each test will require 2 s.

Note Broadcast tests cannot be conducted if the computer running the SSS is connected to a Slave in a SYSMAC BUS/2 System.

1, 2, 3... 1. Select "D:Broadcast test" from the SYSMAC LINK Menu.



2. Enter the network address between 0 and 127 and press the Down Key.
3. Enter the length of the test data between 1 and 512 and press the Down Key.
4. Enter the number of tests between 1 and 999 and press Enter.
5. Press the Y and Enter Keys to run the broadcast test or press the N and Enter Keys to cancel the broadcast test and return the cursor to the position to input the network address.

   The number of successful tests will be displayed for each connected Unit. Question marks (???) will be displayed when the number of successful tests could not be read due to time-out errors.

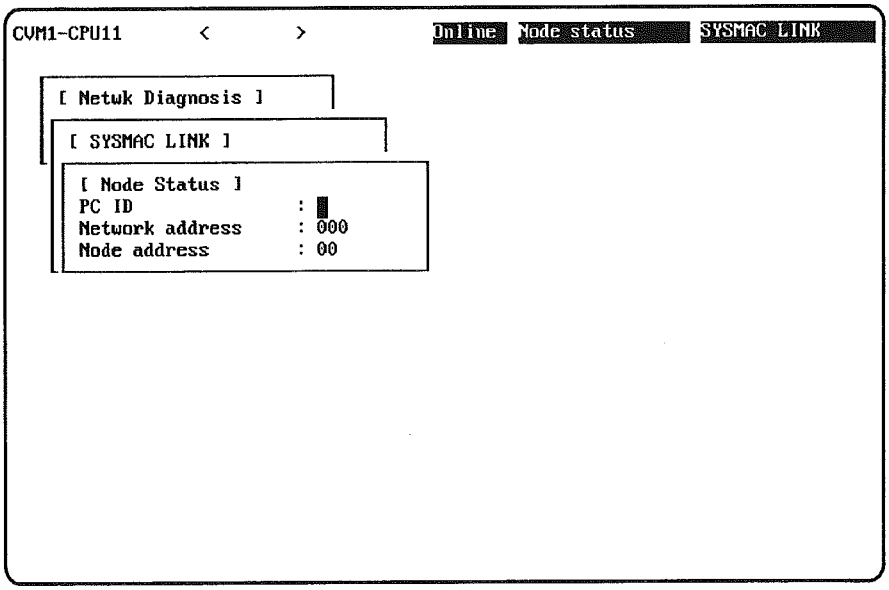
   The cursor will return to the network address input field when N and the Enter Keys are input.
6. Press Escape to interrupt the broadcast test run. The results immediately before Escape was pressed will appear for 62 nodes. Press the Shift+Esc Keys again to display the Network Diagnosis Menu or Escape to return to the display to input the broadcast test parameters.

Displaying Node Status

This operation is used to read information from the specified SYSMAC LINK Unit.

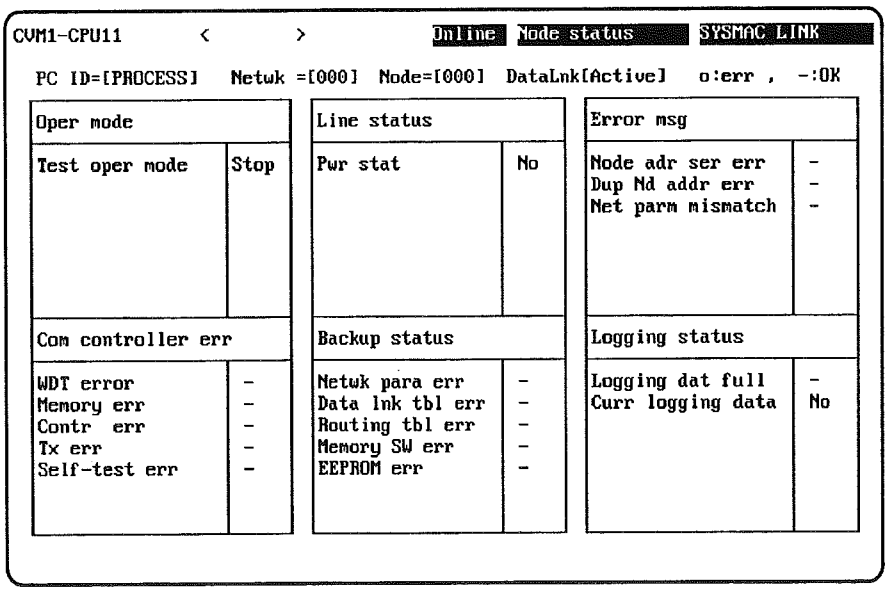
1, 2, 3...

1. Select "S:Display node status" from the SYSMAC LINK Menu.



2. Enter the network address and node address of the node to be read and press Enter. The PC name can be specified as described above for the internode test.

   Node status will be displayed with "–" indicating normal items and "o" indicating errors.



Network Parameters

This operation is used to set and change network parameters. This operation is possible only when the data link is stopped.

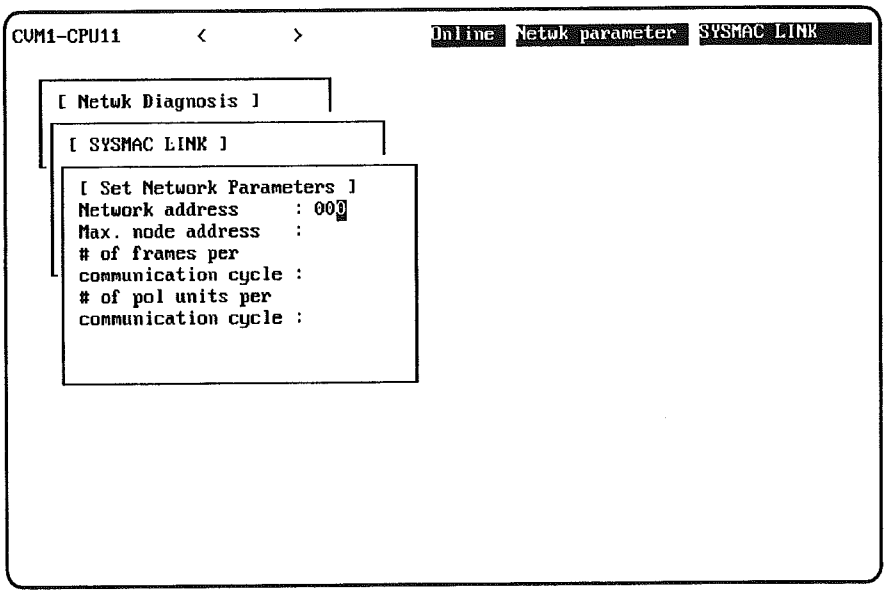
The following parameters are set.

Parameter	Function
Maximum node address	The highest node address that will participate in the network. The highest node address can be set to eliminate needless polling.
Number of frames per communications cycle	The maximum number of instruction that can be simultaneously processed during the same communications cycle. Although a high number of frames will increase the communications cycle; too low of a number will increase the chance of communications errors.
Number of polled units per communications cycle	The number of nodes that will be check for participation during each communications cycle. Although a high number of polled units will increase the communications cycle time it will also decrease the time required for nodes that have been separated from the network to store participation.

Set the parameters using the following procedure.

1, 2, 3...

1. Select "P:Set network parameters" from the SYSMAC LINK Menu to access the following display.



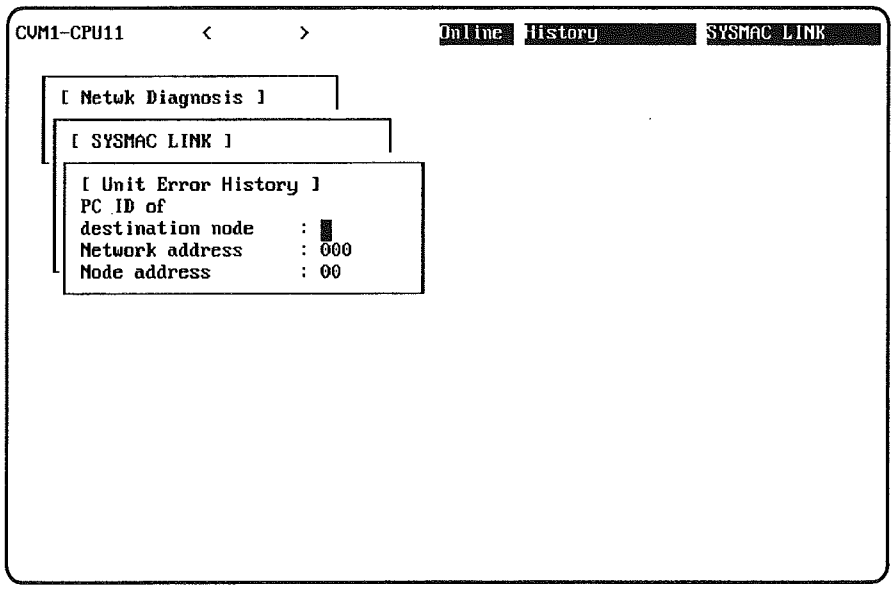
2. Enter the network address between 0 and 127 and press Enter. The maximum node address, total number frames per cycle, and number of frames per polling unit for the specified network will be displayed. An error message will indicate if the specified network address does not exist or is not connected.
3. Select the parameter using the Up and Down Cursor Keys and enter the following:
   - Enter the maximum node address between 2 and 62 and press Enter.
   - Enter the total number of frames per cycle between 5 and 255 and press Enter.
   - Enter the number of frames per polling unit between 1 and 61 and press Enter.
4. Press the Y and Enter Keys to set the network parameters or press the N and Enter Keys to cancel the setting and return the cursor to the position to input the network address.

Displaying the Unit Error History

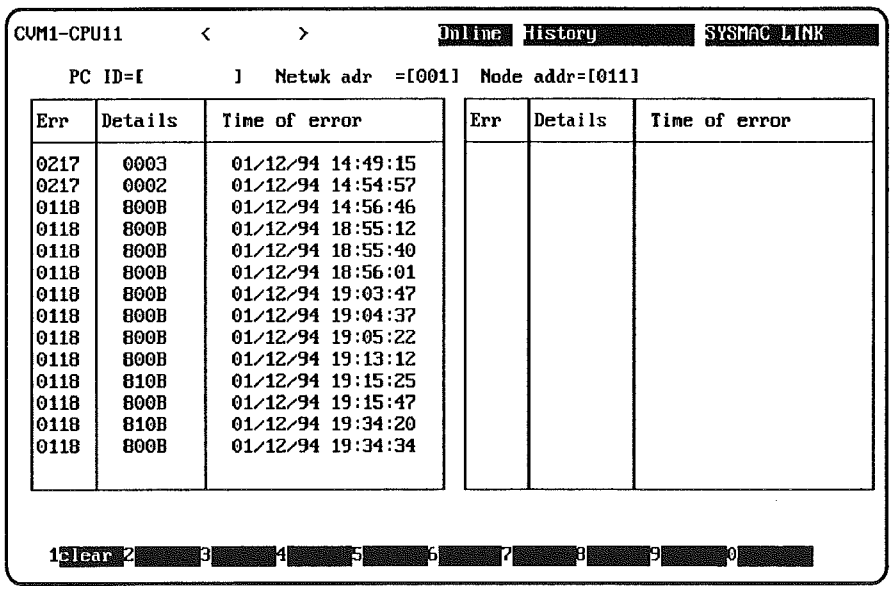
This operation is used to read and clear the error history in the SYSMAC LINK Unit.

1, 2, 3...

1. Select "I:Display error history" from the SYSMAC LINK Menu to access the following display.



2. Enter the network address and node address of the node to be read and press Enter. The PC name can be specified as described above for the internode test. Error codes, detailed error descriptions, and times of the errors will be displayed on the screen.



3. If more than 31 errors exist, press the PageDown Key to display the next page of the error history. Press the PageUp Key to return to the previous page.
4. Press the F1 Key followed by the Y and Enter Keys to clear the Unit's error history or press the N and Enter Keys to cancel the clear operation.

Refer to the *SYSMAC LINK System Manual* for details on errors.

SECTION 20
Support for SYSMAC BUS/2 Systems

This section describes the operations used to support SYSMAC BUS/2 Systems, including displaying status, testing communications, reading the cycle time, displaying Slave connection status, and switching the optical line mode.

20-1 Overview 444
20-2 Displaying Status 445
20-3 Test 446
20-4 Reading the Cycle Time 447
20-5 Slave Connection Status 448
20-6 Switching the Line Mode 450

20-1 Overview

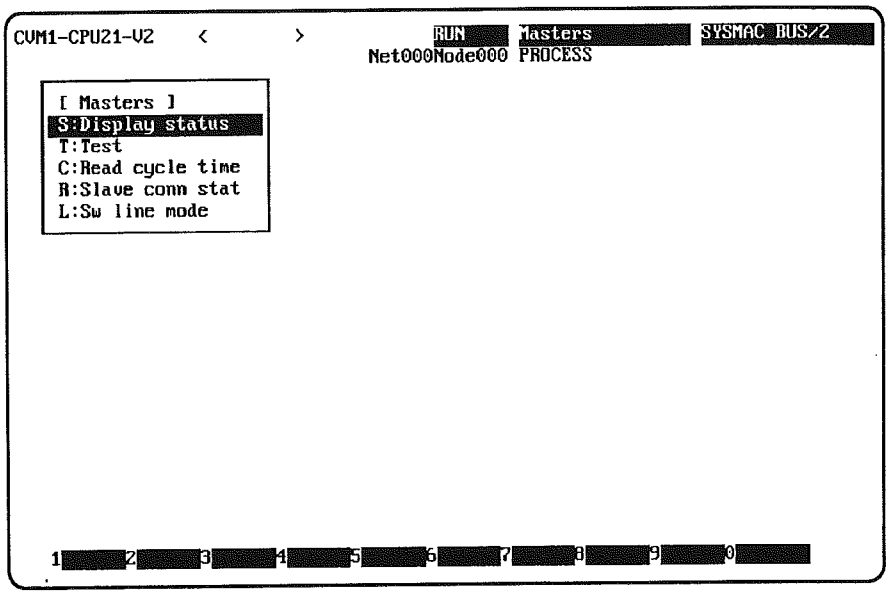
The following operations are available to support the SYSMAC BUS/2 Remote I/O Master Units.

Operation	Function
S:Display status	Used to display the contents of the remote status area and terminator information.
T:Test	Used to test the transfer path between the Master and Slaves.
C:Read cycle time	Used to read and initialize the Master communication cycle time.
R:Slave conn stat	Used to display the participation status, operating status, application error status, and transmission error status for Slaves. Used to control Slave participation in communications.
L:Sw line mode	Used to select the line mode for Optical Masters.

Use the following operation to access the menu.

1, 2, 3...

1. Select "B:SYSMAC BUS/2" from the online Utility Menu. The SYSMAC BUS/2 Masters Menu will appear.



2. Select the required item from the menu and continue as described next for individual operations.

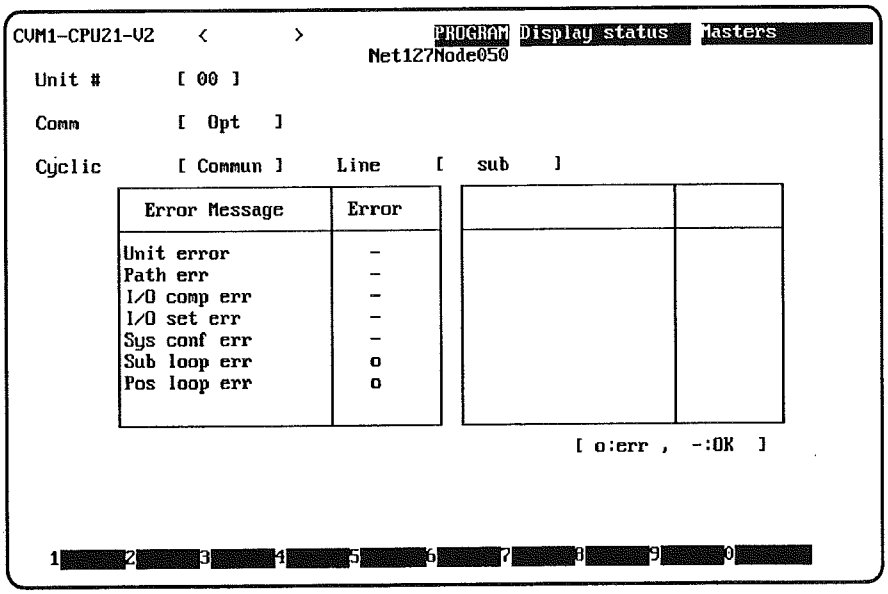
20-2 Displaying Status

This operation displays transmission path and terminator status. Terminator status is displayed for Wired Systems only.

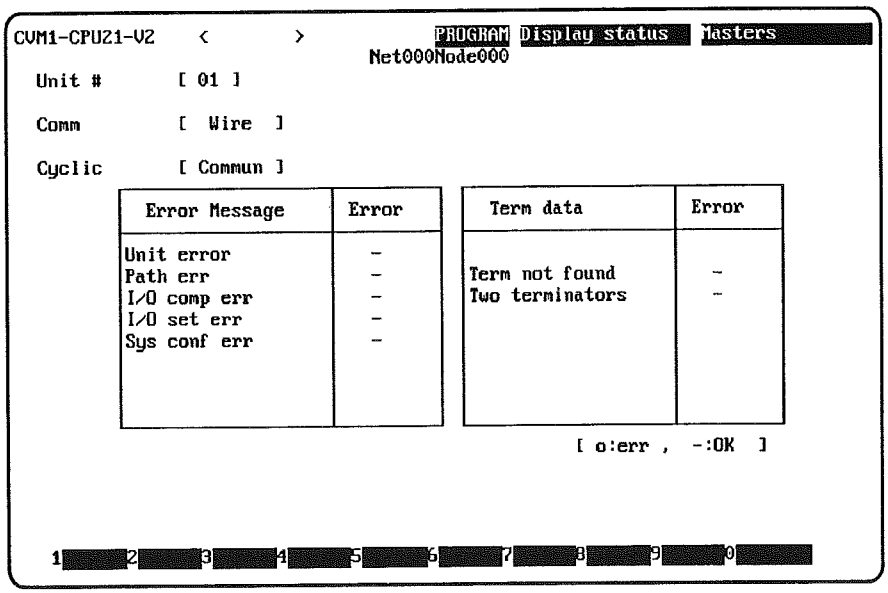
1, 2, 3...

1. Select "S:Display status" from the Masters Menu.
2. Input the Master's unit number between 0 and 15 and press Enter. The status display will appear.

   The following display will appear for Optical Masters.



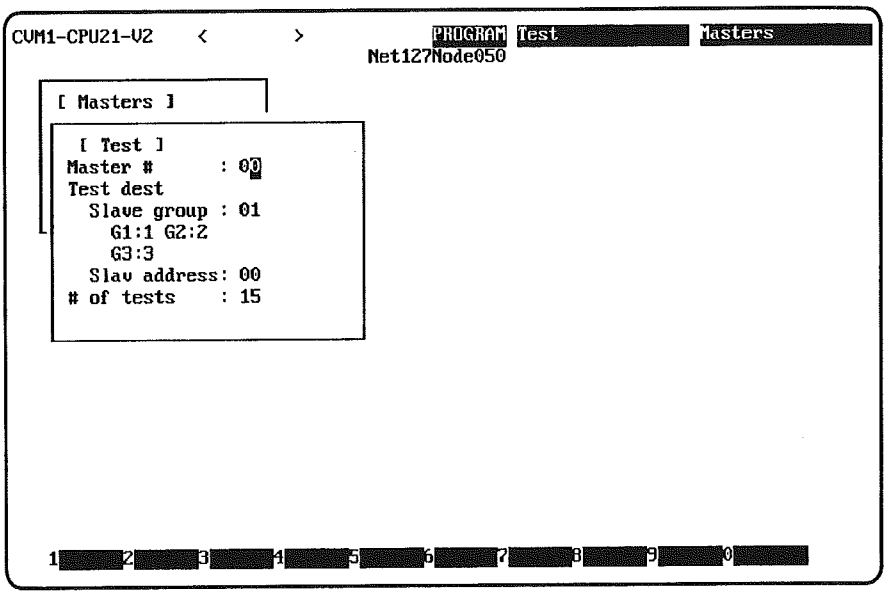
The following display will appear for Wired Masters.



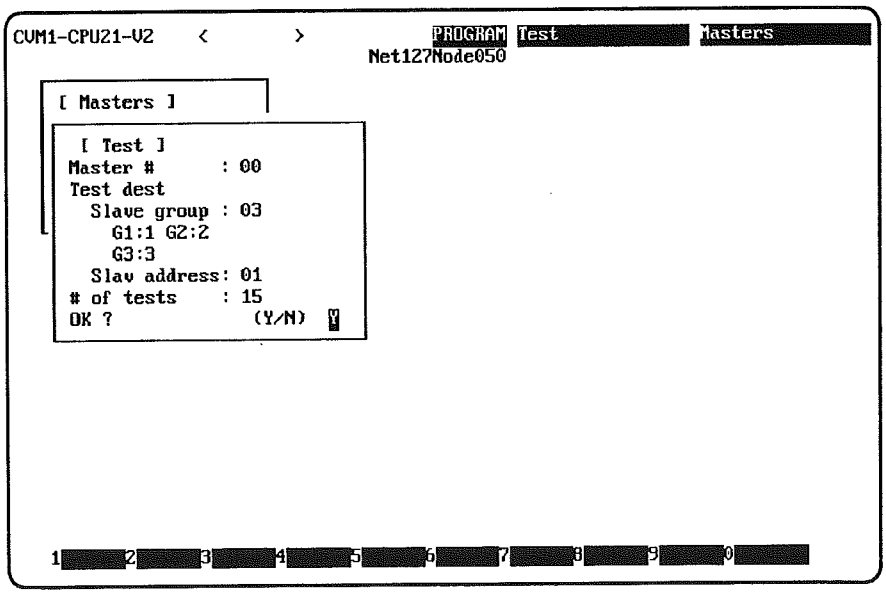
20-3 Test

This operation is used to test the transmission path between the Master and Slaves.

1, 2, 3... 1. Select "T:Test" from the Masters Menu.

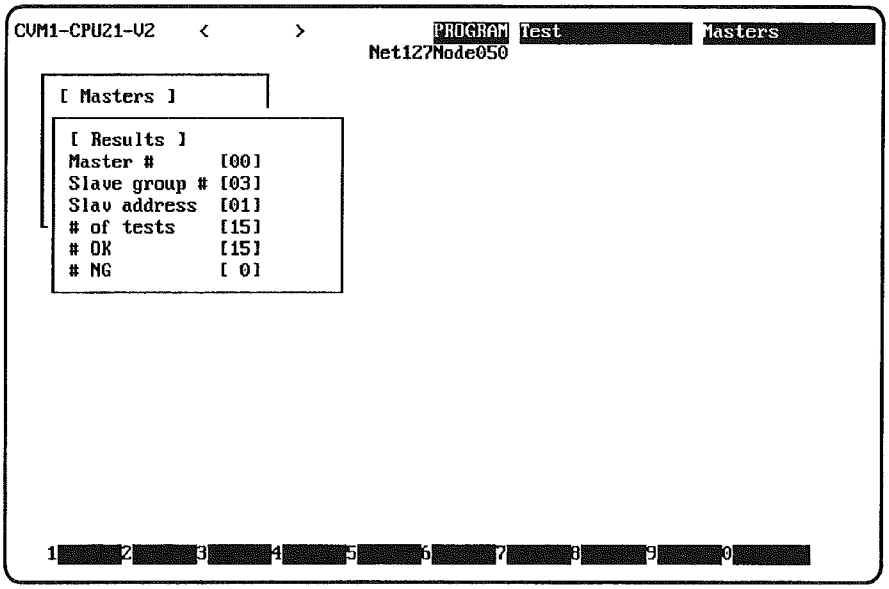


2. Input the Master's unit number between 0 and 15 and press Enter.
3. Input the Slave group to be tested between 1 and 3 and press Enter.
4. Input the Slave's unit number (address) to be tested between 0 and 31 and press Enter.
5. Input the number of tests between 1 and 15 and press Enter.



6. Press the Y and Enter Keys to run the test or press the N and Enter Keys to cancel the test and return the cursor to the position to input the Master's unit number.

The number of successful and unsuccessful tests will be displayed. Blanks will be displayed for the number of successful and unsuccessful tests if the results cannot be read.

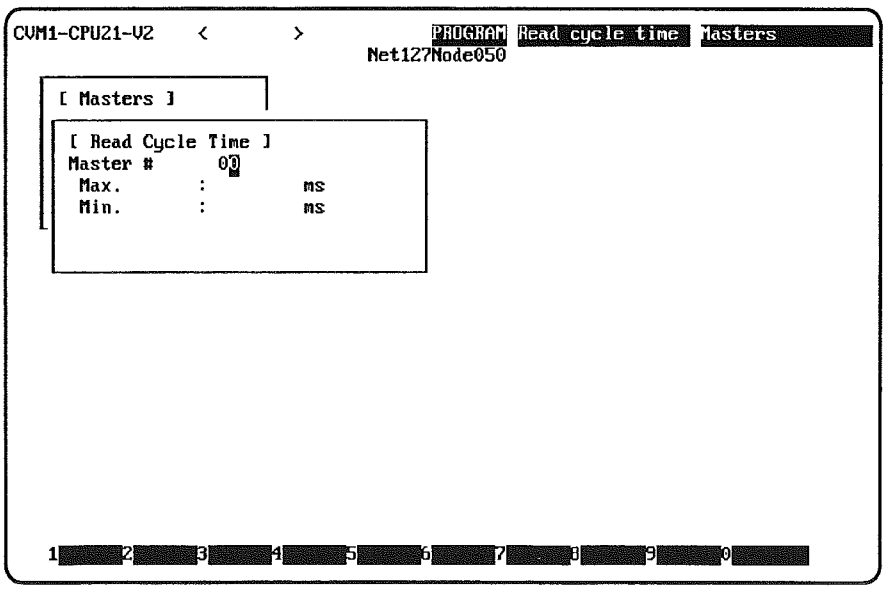


20-4 Reading the Cycle Time

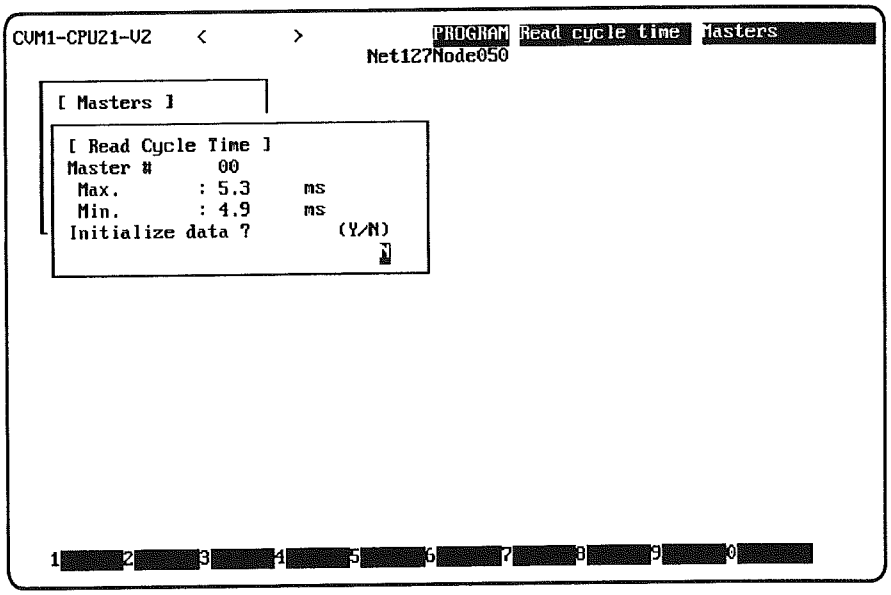
This operation is used to read and initialize the Master communications cycle time.

1, 2, 3...

1. Select "C:Read cycle time" from the Masters Menu. The following display will appear.



2. Input the Master's unit number between 0 and 15 and press Enter. The Master's unit number and the maximum and minimum values of the actual cycle time will be displayed.



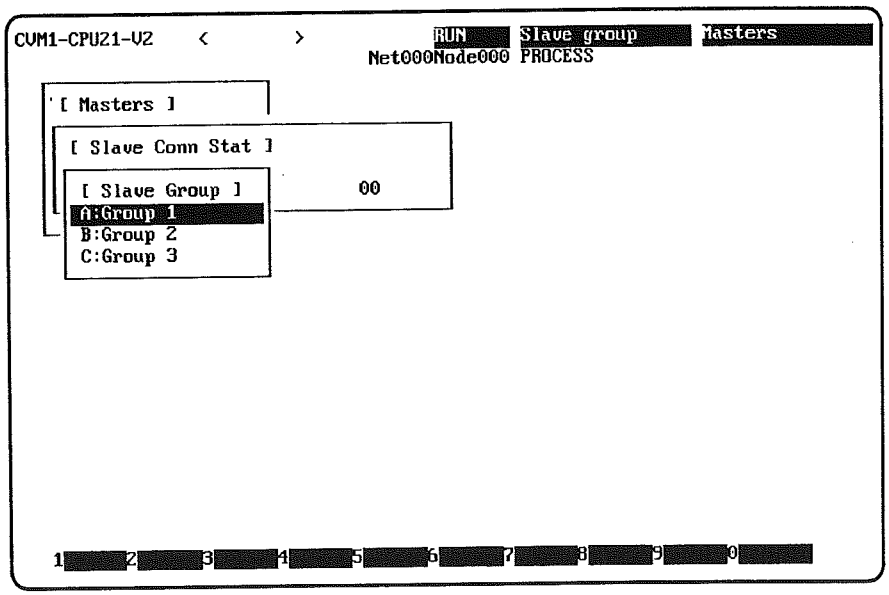
3. Press the Y and Enter Keys to initialize the data or press the N and Enter Keys to return to the menu.

20-5 Slave Connection Status

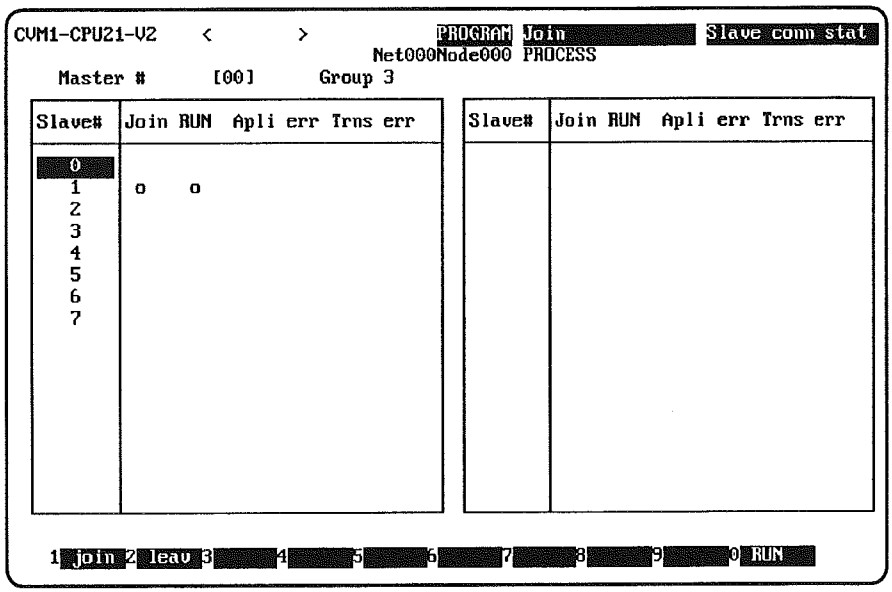
This operation displays the communications participation status, operating status, application error status, and transmission path error status for Slaves. It also allows a Slave to be placed into or removed from active communications status.

1, 2, 3...

1. Select "R:Slave conn stat" from the Masters Menu.
2. Input the Master's unit number between 0 and 15 and press Enter. The following display will appear.



3. Select the Slave group. The Slave connection status will appear for the specified Master and Slave group.



"o" is displayed in the Join column if the Slave is participating in SYSMAC BUS/2 communications.

"o" is displayed in the RUN column if the Slave is running.

"o" is displayed in the Apli err column if an I/O bus error has occurred in the Slave.

"o" is displayed in the Trns err column if an error has occurred in the SYSMAC BUS/2 transmission path.

Activating Slaves

While the above display is on the screen, Slaves that are currently not participating in Remote I/O System communications can be made active.

1, 2, 3...

1. Press the F1 (join) Key.
2. Move the cursor to the address of Slave address to be activated.
3. "o" will be displayed when Enter is pressed. Press Enter once more to delete the "o."
4. Press the F10 Key. A prompt will appear.
5. Press the Y and Enter Key to activate the Slave or press the N and Enter Key to select a new Slave with the cursor.

Inactivating Slaves

While the above display is on the screen, Slaves that are currently participating in Remote I/O System communications can be made inactive.

1, 2, 3...

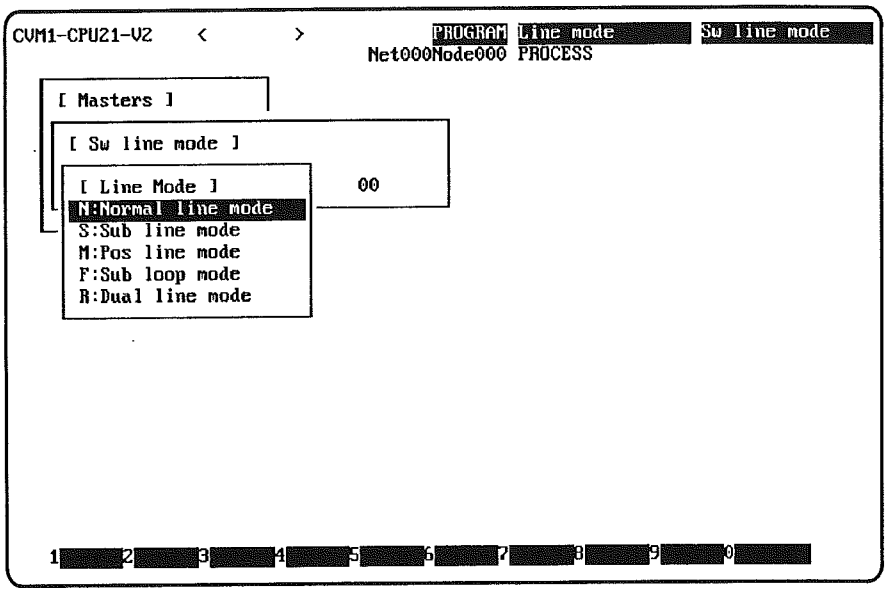
1. Press the F2 Key.
2. Move the cursor to the address of Slave address to be inactivated.
3. Press F1. "o" will be displayed when Enter is pressed. Press Enter once more to delete the "o."
4. Press the F10 Key. A prompt message will appear.
5. Press the Y and Enter Key to make the Slave inactive or press the N and Enter Key to select a new Slave with the cursor.

20-6 Switching the Line Mode

This operation is used to select the line mode for an optical Master.

1, 2, 3...

1. Select "L:Sw line mode" from the Masters Menu.
2. Input the Master's unit number between 0 and 15 and press Enter. The following display will appear.



3. Select the required line mode.

Part 5
Appendices

This part of the manual provides lists of error messages, data file extensions, PC data areas, function codes, mnemonics, offline operations, online operations, and network operations. Instructions on how to correct converted programs are also provided.

Appendix A
Error Messages

If an error occurs during execution, an error message will be displayed on the upper left or the lower part of the screen. The following table lists the error messages that may be displayed. By referring to this table, corrective action can be taken to correct an error.

Error	Cause	Corrective action
1st page	The currently displayed page is the first page.	Display the next page by using the PageDown key.
Address range err	Bit or word addresses have been specified incorrectly.	Verify that the bit or word addresses are compatible with the PC model and reenter.
Already registered	The new data area prefix assigned in the "Change data area abbreviation" operation has already been assigned.	Assign another prefix.
Battery error	The battery is not connected. The PC battery is low.	Check the connection of the battery. Replace the battery with a new one.
Can't change operand	An incorrect operand has been used in a ladder program change.	Check the program.
Can't compare [SFC + ladder] program	An "SFC + ladder" program that cannot be used with the SSS was specified for verification.	Use the CVSS to check the file contents.
Can't exec	The memory failed or the setting is wrong.	Check the available capacity of the memory of the PC, computer, and File Memory Unit. Check the set value and file name.
Can't retrieve [SFC + ladder] program	An attempt was made to retrieve an "SFC + ladder" file.	Use the CVSS to retrieve the file contents.
Can't write	The specified area is a read-only area.	Check the area that is specified.
Can't write trace data	The data trace file on the work disk is damaged.	Create a new data trace file or load it from the data disk.
Comm error Comm err	An error has occurred in communications between the PC and SSS computer.	Check that cable connections are correct, the PC is ON, the System Setup is correct, etc.
CPU bus err	An error has occurred at the CPU bus.	Check the CPU bus.
CPU wait	The start input terminals on the PC are not connected.	Connect the start input terminals.
Cycle time over	The program execution time has exceeded the monitor cycle time.	Check the program.
Data destroyed	The data in the system work disk of the computer has been destroyed.	Install the SSS again.
Data link active - can't run	The PC is in the MONITOR or RUN mode.	Set to the PROGRAM mode.
Data link active - can't run	Cannot execute because the data link is in operation.	Stop the data link.
Data link internal setting	Automatic data link area settings have been selected.	Select the manual data link area settings.
Data link stopped - can't run	Cannot execute because the data link is stopped.	Start the data link.
Data link table err - can't run	Cannot execute because data link tables are not registered.	Register the data link tables.

Error	Cause	Corrective action
DM addr BCD error	An indirect DM address that is not in BCD has occurred during program execution.	Check the data.
DOS message	An error occurred in DOS while the disk was being accessed.	Write-enable the floppy disk, input A, and start the SSS again.
Drive device err	The indicated disk drive doesn't exist.	Check the disk drive name.
Dup defi	The indicated I/O address or I/O name already exists.	Assign another I/O address or I/O name.
Dup error Dup err	The new function code assigned in the "Change function code" operation already exists.	Assign another function code.
Dup interupt #	The indicated interrupt number is already being used.	Eliminate interrupt number duplication.
Duplex error	An error occurred during duplex operation.	Correctly perform the setting for duplex operation.
Dup JME #	There are two or more JME(005) instructions with the same jump number in an action or transition program.	Eliminate jump number duplication in JME(005) instructions.
Dup range err	The custom areas assigned in the "Word grouping" operation overlap.	Eliminate overlapping in the custom areas.
EEPROM error	The contents of the EEPROM in a SYSMAC Link Unit have been damaged.	Reset the data link table and network parameters.
Error in SYSMAC BUS	An error has occurred in transmissions between a SYSMAC BUS System and the PC.	Check for problems such as loose cables.
Error in SYSMAC BUS/2	An error has occurred in transmissions between a SYSMAC BUS/2 System and the PC.	Check for problems such as loose cables.
Executing - can't run	The PC is in Monitor or Run mode.	Switch the PC to Program mode.
FAT is destroyed	The floppy disk is damaged.	Replace the floppy disk.
File access error	The file couldn't be accessed (read/write).	Recreate the read/write data
File does not exists	The specified file does not exist on the specified data disk, Memory Card, or hard disk.	Press the End Key to display a list of file names, and check the file name.
File error	An error has occurred in the floppy disk or Memory Card.	Format and use a new floppy disk or Memory Card.
Floppy not loaded	There is no floppy disk in the indicated floppy disk drive.	Insert a floppy disk into the indicated floppy disk drive.
High address	An address exceeding the last address of the user program has been specified.	Specify the correct address.
HIS program is not recorded	The HIS program is not recorded.	Record the HIS program with the "Customization" operation.
IC card not loaded	The Memory Card is not installed in the CPU or Memory Card power is OFF.	Verify that a Memory Card is installed and the power is ON.
I/O bus err	An error occurred in the bus between the CPU and I/O Units.	Check the bus line between the CPU and I/O Unit. Check whether the cable of each I/O Unit is correctly connected. Clear the error after the corrective action has been taken.

Error	Cause	Corrective action
I/O name that can't be replaced by I/O address changed to bad operand.	An attempt was made to retrieve a file that has I/O name that cannot be used with the SSS.	Use the illegal operand search to assign a correct I/O no. to the illegal operand, or use the CVSS to replace the I/O name with an I/O number.
I/O setting err	The registered I/O table does not agree with the actual I/O Units installed. Input and Output Units might be mixed, Remote I/O Masters used incorrectly, or Optical I/O Units duplicated.	Create the I/O table offline, then transfer the I/O table online. After verifying the I/O table online, either edit it or create it.
I/O Unit error	The registered I/O table does not match the conditions of the mounted I/O. The possible causes are mismatching of the number of input and output points, illegal use of Remote I/O Slave Unit, or duplication of the Transmission Unit.	Verify the I/O table, correct the setting of the I/O Units, and create the I/O table.
I/O verify error	The registered I/O table does not match the conditions of the mounted I/O. Probably some I/O Units are not mounted.	Create the I/O table offline, then transfer the I/O table online. After verifying the I/O table online, either edit it or create it.
Illegal instruction cannot save	The program could not be saved because it contains an illegal instruction.	Check the program and correct it.
Insuff disk capacity	The capacity of the data disk, Memory Card, or hard disk has been exceeded.	Delete unnecessary files or use another data disk or Memory Card.
Inter-node comm error	There is some obstacle in network communications.	Check the network.
Invalid table	The data link table has not been set.	Set the data link table correctly.
JMP error	A jump destination is missing.	Check the program.
Ladder convt err	More than one error has occurred during data conversion.	Check the program.
Ladder err	The ladder diagram can't be saved with the Store operation. An instruction block with more than 22 lines can't be saved as a ladder diagram.	Check the ladder diagram and correct it if necessary. If an instruction block exceeds 22 lines, it must be entered in mnemonics.
Last page	The page currently displayed is the final page.	Display the preceding page by using the PageUp key.
Memory err	There is an error in the program. There is an error in internal PC memory. There is an error in the installed Memory Card.	Identify errant addresses in the program with the "Check program" operation, correct the errors, and transfer the corrected program to the PC. Correct the data in the relevant memory locations. Verify that the Memory Card is properly installed. Correct the data in the relevant memory locations if necessary. (Error locations can be identified by listing errors. Select Error Dir from the Read Errors Menu.)
Mem overflow	The operation cannot be performed because of insufficient memory.	First cancel the operation and then repeat again.
Need an END	The END instruction is missing from the program.	Write the END instruction at the end of the program.

Error	Cause	Corrective action
Network does not exist	The specified network does not exist.	Check the specified network and enter it correctly.
No comment	The specified I/O comment does not exist.	Check the specified I/O comment and enter it correctly.
No data link table - can't run	The data of the data link table is not on the system work disk.	Store the data in the system work disk.
Node number err	A link node number in the SYSMAC NET LInk data link table is incorrect.	Set the correct link node number.
No drive	There is no floppy disk in the indicated disk drive.	Insert a floppy disk into the indicated disk drive.
No EM	Can't execute because no EM Unit is installed.	Install an EM Unit in the PC.
No END instr	The END(001) instruction is missing from the end of a ladder program.	Write an END(001) instruction at the end of the program and save the new program.
No file drive	There is no Memory Card in the CPU.	Insert a Memory Card into the CPU.
No program	The specified program does not exist.	Check the specified program and enter it correctly.
No space	No unused area is available on the data disk.	Delete an unnecessary file, or use a new disk.
No such data	The indicated data does not exist. The specified words are not being used.	Input the correct data. Specify a range of memory containing words that are being used.
No such PC ID	The PC name that was entered doesn't exist.	Check the specified PC name and enter it correctly.
Not CV series - can't run	Cannot execute because the indicated node is not a CV-series PC.	Check nodes in the network.
Not in network	The indicated node is not in the network.	Check the nodes in the network.
Not initialized	The floppy disk or Memory Card has not been formatted.	Save the file after formatting the floppy disk.
Not master unit - can't run	The indicated node can't be used because it isn't the Master Unit.	Check the nodes in the network.
Not part of data link	The specified node is not a data link.	Check the specified node.
No trace data	The data trace data on the work disk contains incorrect data.	Load the data trace data from the data disk.
No unit	The specified Unit does not exist.	Check the I/O table and the network.
No vector table - can't store	Cannot store because there is no vector table on the work disk.	Set the number of files in the CONFIG.SYS 20.
Online - can't run	The operation is not possible while the PC is online.	Switch to offline operations.
Out of range	The I/O table cannot be transferred because the unused area in the user memory is insufficient. The DM area is exceeded.	Separately save and transfer the program and I/O table. Observe the range of the DM area.
Out of range	The indicated bit or word address exceeds the acceptable range.	Reenter the data correctly.
Page out of range	The display range is exceeded. The limit is 22 lines for a ladder diagram.	Check the program.
Parameter error	The parameters entered are incorrect.	Enter the correct parameters.
Parity/sum check error	A parity/sum check error has occurred in internal PC memory.	Rewrite the program and PC Setup.

Error	Cause	Corrective action
Password wrong	The password required to clear UM is incorrect.	Enter the correct password.
PC model err	The system contains a non-CVM1 PC.	Use only CVM1 PCs.
Printer err	There is an error with the printer or printer cable or the computer and printer aren't connected properly.	Check the printer and printer cable. Press the Escape Key and verify that the computer and printer are connected properly.
Program error	PC cannot operate because an error has occurred in the ladder program. A fatal error exists in a ladder diagram or an SFC program was downloaded to a CVM1 CPU.	Check the program. Check the ladder diagrams. If you are using an CVM1 CPU, make sure an SFC program was not transferred to it.
Protected	The File Memory is protected.	Cancel the protection.
Range error Range err	The specified range is incorrect. The first word is higher than the last in a custom area assigned in the Word Grouping operation.	Enter an acceptable range. Reenter the settings so that the first word is lower than the last.
Refresh node number err	A link node number in the SYSMAC LINK data link table is incorrect.	Set the correct link node number.
Relay error Netwk (???) Node (???)	An error has occurred in the PC that relays the transmission.	Check the relay PC.
Remote I/O error	A transmission error has occurred between the Remote I/O and PC.	Check the transmission line between the PC and Remote I/O. Check whether the Slave Rack is normal.
Response time out	A response has not been returned within the response interval during network communications.	Check the destination unit.
ROM - can't run	A ROM Unit is mounted on the PC. Or, the write protect switch of the RAM Unit on the PC is ON.	Use the RAM Unit, or turn OFF the protect switch of the RAM Unit.
Run comment file error	The block comment data on the data disk has been damaged.	Check the data disk and program and correct if necessary.
Routing table err Routing table error	The routing table settings are incorrect.	Check the routing table.
Sys FAL	A FAL instruction has been executed. PC operation continues.	Check the program.
Sys FALS	A FALS instruction has been executed. PC operation has stopped.	Check the program.
That name exists	A file with that file name already exists on the data disk. File names are not case-sensitive, i.e. "lan" and "LAN" indicate the same file.	Choose another file name or save the file on another disk.
Too many blk comments	The number of line comments has exceeded the maximum of 512, or the total number of characters in line comments has exceeded the maximum of 65, 535.	Reduce the number of line comments or characters below the maximums.
Too many files	The number of files in the data disk has exceeded 255.	Use another floppy or delete unnecessary files.
Too many I/O comments	The number of I/O comments has exceeded the maximum number of 10,000.	Check the I/O comments with the "Edit comments" operation, and eliminate unneeded comments.
Too many Units	The number of I/O Units has exceeded the maximum number allowed.	Reduce the number of I/O Units used to below the maximum.

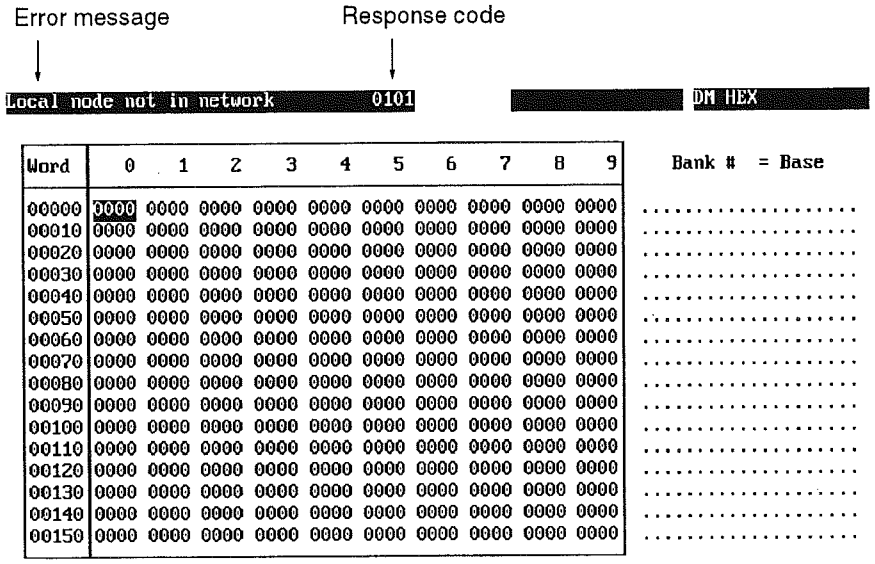
Error	Cause	Corrective action
UM too large	The program is too large for the specified PC.	Use a different model PC. Eliminate unnecessary programs or parts of programs.
WDT error	A watchdog timer error has occurred due to noise or some other cause.	After eliminating the cause, turn the PC OFF and then ON.
Write protected	The data disk or Memory Card is write-protected.	Disable the disk write protection. Use a RAM/EEPROM-type Memory Card, and set the switch to so that is write enabled.
Wrong data	The specified data cannot be processed.	Specify the correct data.
Wrong delay	The entered delay is outside the acceptable range.	Enter the correct delay.
Wrong drive, path name	The specified drive and path names are wrong. The data disk drive in the System Setup is wrong.	Check the drive and path names and enter them correctly.
Wrong edit mode	A wrong edit mode (read, write, insert, delete, store, store/delete) has been specified.	Change the edit mode. Check the setting of "OutBitCommentType" in the System Setup Menu.
Wrong file name	The file name entered is incorrect.	Check the file name and file name extension and reenter.
Wrong floppy type	The specified size of the floppy disk is different from the size of the actual disk.	Specify the correct size.
Wrong key	The wrong type of data (data area, constant, bit/word) has been input.	Input the correct data.
Wrong medium	The actual floppy disk is not of the specified size.	Specify the correct size.
Wrong netwk number	The network address set in the routing table is incorrect.	Correct the network address in the routing table.
Wrong network type	Cannot execute because the indicated network is of the wrong type.	Check the network.
Wrong PC mode	The PC is in the wrong mode (RUN, MONITOR, DEBUG, PROGRAM).	Set the PC in the correct mode.
Wrong PC model	A wrong PC model is specified.	Check the PC and the parameters of the System Setup Menu.
Wrong position	The specified function cannot be executed because the cursor is at a wrong position.	Move the cursor to the correct position.
Wrong position	The position specified for copy, move, or delete is wrong.	Check the operation and program.
Wrong RAM disk data	The program on the work disk is damaged.	Reinstall SSS.
Wrong setting	Wrong operation Wrong key input	Check the numeric value, mode, and keys. Input the correct data.
Wrong trace data	The trace data contains data other than data trace.	Create new data trace data or load it from the data disk.

Error Messages Related to Installation

Error	Cause	Corrective action
Cannot create file CONFIG. SYS. Verify the number of files in the root directory.	The number of the files in the root directory is the maximum value that can be managed by DOS, or the capacity of the hard disk is insufficient.	Reduce the number of files in the root directory or increase the capacity of the hard disk (use a larger disk).
Drive specification is wrong.	A not existent drive number has been specified.	Specify the correct drive number.
Files required for processing do not exist. Reinstall system.	Essential files are missing or damaged.	Install the system one more time.
Insufficient hard disk capacity. Check and verify sufficient capacity, and execute again.	The number of files in the root directory that can be managed by DOS was exceeded when the LSS subdirectory was created in the root directory.	Increase the capacity of the hard disk. To install the system, 3M bytes of unused disk space is necessary.
No RAM disk in Drive □. Press any key to continue. (□ represents the drive name.)	Specified RAM disk drive does not exist at the time of installation or when the system configuration setting command (SYSSET) is executed.	Reset by means of SYSSET. (Specify the correct RAM disk drive or specify hard disk only.)
Unable to execute function. Missing task file. Reinstall.	A required file is damaged or missing.	Install the system one more time.
Wrong data disk	The floppy disk in the data drive is not the correct disk for installation.	Insert the correct disk.

FINS Command Response Codes

Error messages and response codes for FINS commands from Host Link Systems, SYSMAC NET Link Systems, and SYSMAC LINK Systems are displayed in the upper left part of the display. Refer to the relevant Operation Manual for details on response codes.

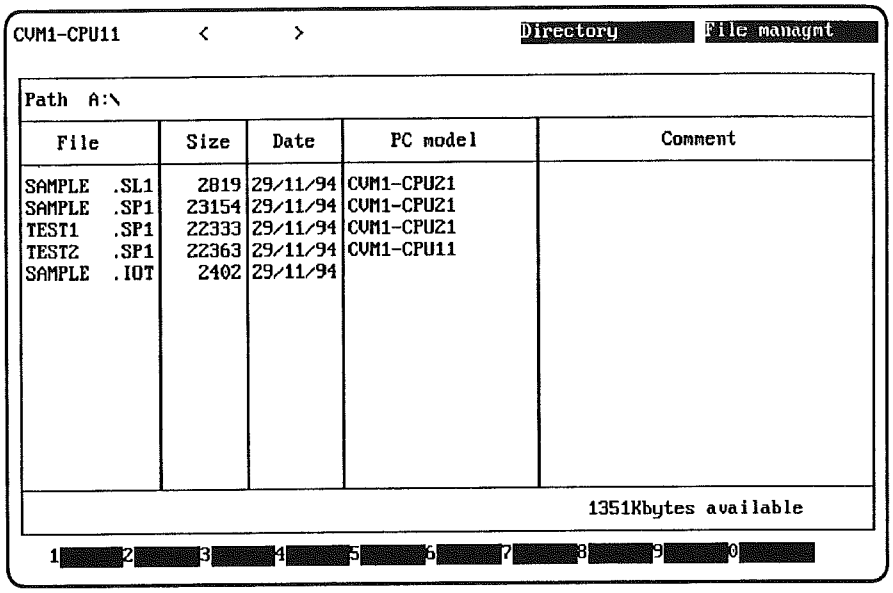


Appendix B
Data File Extensions

The files that can be created on data disks and Memory Cards are listed in the following table. Before new disks can be used they must be formatted.

File type	Filename extension	Function	Operations using file
Program	.SP1	Contains all of the elements composing the program, including ladder/mnemonics, I/O comments, and block comments.	Programming, Edit I/O comments, Convert UM, Monitoring
I/O comment	.CMT	Contains the I/O comments that are displayed on the screen or printed out when creating the program. Up to 10,000 I/O comments can be stored.	Edit I/O comments
PC ID	.PCN	Contains the PC ID assigned to nodes in SYSMAC NET Link and SYSMAC LINK systems. Up to 500 PC IDs can be stored.	Edit PC ID, Network support table, Network diagnosis, Monitoring
PC Setup	.CPU	Contains the PC Setup information.	PC Setup
Customize data	.CUS	Contains the settings recorded in the Customize operation.	Customization
I/O table	.IOT	Contains the I/O table information.	Edit I/O table
Data link table (SYSMAC NET)	.SNT	Contains the data link table information for the SYSMAC NET Link System.	Network support table
Data link table (SYSMAC LINK)	.SLK	Contains the data link table information for the SYSMAC Link System.	Network support table
Routing table	.RTG	Contains the network routing table information.	Network support table, Monitoring
DM	.DMD	Contains Data Memory data.	Edit DM, Transfer program & data
EM	.EMD	Contains Expansion Data Memory data. Used with the CVM1-CPU21 only.	Edit DM
File data	.IOM	Contains Memory Card file data (IOM/DM).	Edit DM
Data trace	.DTR	Contains the results from data trace operations.	Data trace
Save part	.SL1	Contains the part of the program saved by means of the "B:Save part" operation under "S:Save program" in the Programming Menu.	Programming
Extended PC setup	.STD	Contains the seven types of system settings, such as PC Setup, custom data, and I/O table.	Memory Card operations

Files are classified in directories according to filenames and filename extensions. The diagram below is an example of a file directory. The file type can be determined from the filename extension. Filename extensions are automatically attached by the SSS, so there is no need to type them in. It is sometimes useful to give the same name to files that are closely related but of different file types. In this example a program file and its "Save part" file have the same filename "SAMPLE" and are distinguished by their filename extensions.



Appendix C
PC Data Areas

The following table outlines the data areas provided in the PC. Refer to the *CV/CVM1 PCs Operation Manual: Ladder Diagrams* for programming details.

Area	PC	Range	Function
I/O Area	CPU01 (512 points)	Words: CIO 0000 to CIO 0031 Bits: CIO 000000 to CIO 003115	Allocated to I/O in the System and used to control I/O points. Bits not used to control I/O points can be used as work bits. The PC Setup can be used to control allocations. I/O word addresses are determined by the mounting position of the I/O Units.
	CPU11 (1,024 points)	Words: CIO 0000 to CIO 0063 Bits: CIO 000000 to CIO 006315	
	CPU21 (2,048 points)	Words: CIO 0000 to CIO 0127 Bits: CIO 000000 to CIO 012715	
Work Area	CPU01 (2,688 points)	Words: CIO 0032 to CIO 0199 Bits: CIO 003200 to CIO 019915	These bits are used in the program to manipulate or to temporarily store data.
	CPU11 (2,176 points)	Words: CIO 0064 to CIO 0199 Bits: CIO 006400 to CIO 019915	
	CPU21 (1,152 points)	Words: CIO 0128 to CIO 0199 Bits: CIO 012800 to CIO 019915	
	CPU01, CPU11, CPU21 (6,400 points)	Words: CIO 1900 to CIO 2299 Bits: CIO 190015 to CIO 229915	
SYSMAC BUS/2 Area	CPU01 (1,024 points)	Words: CIO 0200 to CIO 0599 Bits: CIO 020000 to CIO 059915	These bits are used for remote I/O points in the SYSMAC BUS/2 Remote I/O System unless the default allocations are changed in the PC Setup. Bits not used to control I/O points can be used as work bits.
	CPU11, CPU21 (2,048 points)	Words: CIO 0200 to CIO 0999 Bits: CIO 020000 to CIO 099915	
Link Area	All (3,200 points)	Words: CIO 1000 to CIO 1199 Bits: CIO 100000 to CIO 119915	These bits are used for SYSMAC NET Link and SYSMAC LINK Systems. Bits not used for data links can be used as work bits. These bits can be set as holding bits via PC Setup.
Holding Area	All (4,800 points)	Words: CIO 1200 to CIO 1499 Bits: CIO 120000 to CIO 149915	Used to store data and to retain the data values when the power is turned off. The range can be changed (within words to 1000 to 2399) by the System Setup. An "H" is shown after the bit addresses on the screen.
CPU Bus Unit Area	All (6,400 points)	Words: CIO 1500 to CIO 1899 Bits: CIO 150000 to CIO 189915	Used to store the operating status of CPU Bus Units. Bits not used by CPU Bus Units can be used as work bits. These bits can be set as holding bits via the PC Setup. Unit #0 to #15 are each allocated 25 words.

Area	PC	Range	Function
SYSMAC BUS Area	CPU01 (512 points)	Words: CIO 2300 to CIO 2427 Bits: CIO 230000 to CIO 242715	These bits are used for remote I/O points in the SYSMAC BUS Remote I/O System unless the default allocations are changed in the PC Setup.
	CPU11, CPU21	Words: CIO 2300 to CIO 2555 Bits: CIO 230000 to CIO 255515	Default setting is 32 words per Master (#0 to #7, in order of mounting). Bits not used to control I/O points can be used as work bits.
Temporary Relay Area	All (8 points)	TR0 to TR7 (bits only)	Used to temporarily store execution conditions. TR bits are not input when programming directly in ladder diagrams.
CPU Bus Link Area	All (4,096 points)	Words: G000 to G255 Bits: G00000 to G25515	There are 120 words for the output link area from the CPU and 128 words (8 words x 16 Units) for the output link area from the CPU Bus Units. G000 to G004 are for the PC Status Area and the Clock Area.
Auxiliary Area	All (8,192 points)	Words: A000 to A511 Bits: A00000 to A51115	Contains flags and bits with special functions.
Timer Area	CPU01 (512 points)	T0000 to T0511	Used to define timers (normal, high-speed, and totalizing) and to access Completion Flags, PV, and SV.
	CPU11, CPU21 (1,024 points)	T0000 to T1023	
Counter Area	CPU01 (512 points)	C0000 to C0511	Used to define counters (normal, reversible, and transition) and to access Completion Flags, PV, and SV.
	CPU11, CPU21 (1,024 points)	C0000 to C1023	
DM Area	CPU01 (8,192 words)	D00000 to D08191	Used for internal data storage and manipulation. Data is retained during power failure.
	CPU11, CPU21 (24,576 words)	D00000 to D24575	
EM Area	CPU21-E only (32,766 words x 8 banks max.)	E00000 to E32765 for each bank x 2, 4, or 8 banks	EM functions just like DM. An Extended Data Memory Unit must be installed.
Index registers	All (3 words)	IR0 to IR2	Used as operands. Contents handled as PC memory address.
Data registers	All (3 words)	DR0 to DR2	Used as operands. Can be processed faster than other operands. Contents handled as data. Can also be used as index register address supplements.

Appendix D
Function Codes

The mnemonics followed by an asterisk (*) are supported only by version-2 CVM1 PCs.

Sequence Control, Error Handling, and Step Control Instructions

Code	Mnemonic	Name
000	NOP	NO OPERATION
001	END	END
002	IL	INTERLOCK
003	ILC	INTERLOCK CLEAR
004	JMP	JUMP
005	JME	JUMP END
006	FAL ( )	FAILURE ALARM
007	FALS	FAILURE ALARM
008	STEP	STEP DEFINE
009	SNXT	STEP START

Sequence I/O Instructions

Code	Mnemonic	Name
010	NOT	NOT
011	KEEP (!)	KEEP
012	CNTR	REVERSIBLE COUNTER
013	DIFU (!)	DIFFERENTIATE UP
014	DIFD (!)	DIFFERENTIATE DOWN
015	TIMH	HIGH-SPEED TIMER
016	SET (!)	SET
017	RSET (!)	RSET
018	UP (*)	CONDITION ON
019	DOWN (*)	CONDITION OFF

Data Compare Instructions

Code	Mnemonic	Name
020	CMP (!)	COMPARE
021	CMPL	DOUBLE COMPARE
022	BCMP ( )	BLOCK COMPARE
023	TCMP ( )	TABLE COMPARE
024	MCMP ( )	MULTIPLE COMPARE
025	EQU ( )	EQUAL
026	CPS (!) (*)	SIGNED BINARY COMPARE
027	CPSL (!)	DOUBLE SIGNED BINARY COMPARE
028	CMP (!) (*)	UNSIGNED COMPARE
029	CMPL (!)	DOUBLE UNSIGNED COMPARE

Data Move and Sequence Output Instructions

Code	Mnemonic	Name
030	MOV (!)	MOVE
031	MVN ( )	MOVE NOT
032	MOVL ( )	DOUBLE MOVE
033	MVNL ( )	DOUBLE MOVE NOT
034	XCHG ( )	DATA EXCHANGE
035	XCGL ( )	DOUBLE DATA EXCHANGE
036	MOVR ( )	MOVE TO REGISTER
037	MOVQ	MOVE QUICK
038	XFRB ( ) (*)	MULTIPLE BIT TRANSFER
040	XFER ( )	BLOCK TRANSFER
041	BSET ( )	BLOCK SET
042	MOVB ( )	MOVE BIT
043	MOVD ( )	MOVE DIGIT
044	DIST ( )	SINGLE WORD DISTRIBUTE
045	COLL ( )	DATA COLLECT
046	BXFR ( ) (*)	INTERBANK BLOCK TRANSFER
047	SETA ( ) (*)	MULTIPLE BIT SET
048	RSTA ( ) (*)	MULTIPLE BIT RESET

Data Shift Instructions

Code	Mnemonic	Name
050	SFT	SHIFT REGISTER
051	SFTR ( )	REVERSIBLE SHIFT REGISTER
052	ASFT ( )	ASYNCHRONOUS SHIFT REGISTER
053	WSFT ( )	WORD SHIFT
054	NSFL ( ) (*)	SHIFT N-BIT DATA LEFT
055	NSFR ( ) (*)	SHIFT N-BIT DATA RIGHT
056	NASL ( ) (*)	SHIFT N-BITS LEFT
057	NASR ( ) (*)	SHIFT N-BITS RIGHT
058	NSLL ( ) (*)	DOUBLE SHIFT N-BIT LEFT
059	NSRL ( ) (*)	DOUBLE SHIFT N-BIT RIGHT
060	ASL ( )	ARITHMETIC SHIFT LEFT
061	ASR ( )	ARITHMETIC SHIFT RIGHT
062	ROL ( )	ROTATE LEFT
063	ROR ( )	ROTATE RIGHT
064	ASLL ( )	DOUBLE SHIFT LEFT
065	ASRL ( )	DOUBLE SHIFT RIGHT
066	ROLL ( )	DOUBLE ROTATE LEFT
067	RORL ( )	DOUBLE ROTATE RIGHT
068	SLD ( )	SHIFT DIGIT LEFT
069	SRD ( )	SHIFT DIGIT RIGHT

BCD Calculation and Carry Instructions

Code	Mnemonic	Name
070	ADD ( )	BCD ADD
071	SUB ( )	BCD SUBTRACT
072	MUL ( )	BCD MULTIPLY
073	DIV ( )	BCD DIVIDE
074	ADDL ( )	DOUBLE BCD ADD
075	SUBL ( )	DOUBLE BCD SUBTRACT
076	MULL ( )	DOUBLE BCD MULTIPLY
077	DIVL ( )	DOUBLE BCD DIVIDE
078	STC ( )	SET CARRY
079	CLC ( )	CLEAR CARRY

Binary Calculation Instructions

Code	Mnemonic	Name
080	ADB ( )	BINARY ADD
081	SBB ( )	BINARY SUBTRACT
082	MLB ( )	BINARY MULTIPLY
083	DVB ( )	BINARY DIVIDE
084	ADBL ( )	DOUBLE BINARY ADD
085	SBBL ( )	DOUBLE BINARY SUBTRACT
086	MLBL ( )	DOUBLE BINARY MULTIPLY
087	DVBL ( )	DOUBLE BINARY DIVIDE

Increment/Decrement Instructions

Code	Mnemonic	Name
090	INC ( )	INCREMENT BCD
091	DEC ( )	DECREMENT BCD
092	INCB ( )	INCREMENT BINARY
093	DECB ( )	DECREMENT BINARY
094	INCL ( )	DOUBLE INCREMENT BCD
095	DECL ( )	DOUBLE DECREMENT BCD
096	INBL ( )	DOUBLE INCREMENT BINARY
097	DCBL ( )	DOUBLE DECREMENT BINARY

Data Format Conversion and Special Calculation Instructions

Code	Mnemonic	Name
100	BIN ( )	BCD-TO-BINARY
101	BCD ( )	BINARY-TO-BCD
102	BINL ( )	DOUBLE BCD-TO-DOUBLE BINARY
103	BCDL ( )	DOUBLE BINARY-TO-DOUBLE BCD
104	NEG ( )	2'S COMPLEMENT
105	NEGL ( )	DOUBLE 2'S COMPLEMENT
106	SIGN ( )	SIGN

Basic I/O Unit Instructions

Code	Mnemonic	Name
110	MLPX ( )	4-TO-16 DECODER
111	DMPX ( )	16-TO-4 ENCODER
112	SDEC ( )	7-SEGMENT DECODER
113	ASC ( )	ASCII CONVERT
114	BCNT ( )	BIT COUNTER
115	LINE ( )	COLUMN-TO-LINE
116	COLM ( )	LINE-TO-COLUMN
117	HEX ( ) (*)	ASCII-TO-HEX

Special Timer and SFC Control Instructions

Code	Mnemonic	Name
120	TTIM	ACCUMULATIVE TIMER
121	TIML	DOUBLE TIMER
122	MTIM	MULTI-OUTPUT TIMER
123	TCNT	TRANSITION COUNTER
124	TSR ( )	READ STEP TIMER
125	TSW ( )	WRITE STEP TIMER

Logical Instructions

Code	Mnemonic	Name
130	ANDW ( )	LOGICAL AND
131	ORW ( )	LOGICAL OR
132	XORW	EXCLUSIVE OR
133	XNRW ( )	EXCLUSIVE NOR
134	ANDL ( )	DOUBLE LOGICAL AND
135	ORWL ( )	DOUBLE LOGICAL OR
136	XORL ( )	DOUBLE EXCLUSIVE OR
137	XNRL ( )	DOUBLE EXCLUSIVE NOR
138	COM ( )	COMPLEMENT
139	COML ( )	DOUBLE COMPLEMENT

Special and Time-related Instructions

Code	Mnemonic	Name
140	ROOT ( )	BCD SQUARE ROOT
141	FDIV ( )	FLOATING POINT DIVIDE (BCD)
142	APR ( )	ARITHMETIC PROCESS
143	SEC ( )	HOURS-TO-SECONDS
144	HMS ( )	SECONDS-TO-HOURS
145	CADD ( )	CALENDAR ADD
146	CSUB ( )	CALENDAR SUBTRACT

Subroutine and Interrupt Instructions

Code	Mnemonic	Name
150	SBN	SUBROUTINE ENTER
151	SBS ( )	SUBROUTINE CALL
152	RET	SUBROUTINE RETURN
153	MSKS ( )	INTERRUPT MASK
154	CLI ( )	CLEAR INTERRUPT
155	MSKR ( )	READ MASK
156	MCRO ( ) (*)	MACRO

Table Data Processing Instructions

Code	Mnemonic	Name
160	SSET ( )	SET STACK
161	PUSH ( )	PUSH ONTO STACK
162	LIFO ( )	LAST IN FIRST OUT
163	FIFO ( )	FIRST IN FIRST OUT
164	SRCH ( )	DATA SEARCH
165	MAX ( )	FIND MAXIMUM
166	MIN ( )	FIND MINIMUM
167	SUM ( )	SUM

Debugging, Special, Error Processing and Time-related Instructions

Code	Mnemonic	Name
170	TRSM	TRACE MEMORY
171	EMBC ( )	SELECT EM BANK
172	CCL ( )	LOAD FLAGS
173	CCS ( )	SAVE FLAGS
174	MARK	MARK TRACE
175	REGL ( )	LOAD REGISTER
176	REGS ( )	SAVE REGISTER
177	FPD (*)	FAILURE POINT DETECTION
178	WDT ( ) (*)	SCAN TIME MONITOR
179	DATE ( ) (*)	CLOCK COMPENSATION

File Memory, Basic I/O, and Special I/O Instructions

Code	Mnemonic	Name
180	FILR ( )	READ DATA FILE
181	FILW ( )	WRITE DATA FILE
182	FILP ( )	READ PROGRAM FILE
183	FLSP ( )	CHANGE STEP PROGRAM
184	IORF ( )	I/O REFRESH
187	IOSP ( )	DISABLE ACCESS
188	IORS	ENABLE ACCESS
189	IODP ( )	I/O DISPLAY
190	READ	I/O READ
191	WRIT	I/O WRITE
192	SEND ( )	NETWORK SEND
193	RECV ( )	NETWORK RECEIVE
194	CMND ( )	DELIVER COMMAND
195	MSG ( )	MESSAGE

SFC Control Instructions

Code	Mnemonic	Name
202	TOUT	TRANSITION OUTPUT
210	SA ( )	ACTIVATE STEP
211	SP ( )	PAUSE STEP
212	SR ( )	RESTART STEP
213	SF ( )	END STEP
214	SE ( )	DEACTIVATE STEP
215	SOFF ( )	RESET STEP

Sequence Control and Timer/Counter Reset Instructions

Code	Mnemonic	Name
221	CJP (*)	CONDITIONAL JUMP
222	CJPN (*)	CONDITIONAL JUMP
236	CNR ( )	RESET TIMER/COUNTER

Block Program Instruction ( )

Code	Mnemonic	Name
250	BPRG (*)	BLOCK PROGRAM

Block Program Instructions < >

Code	Mnemonic	Name
<001>	BEND (*)	BLOCK PROGRAM END
<002>	IF (NOT) (*)	CONDITIONAL BRANCH
<003>	ELSE (*)	NO CONDITIONAL BRANCH
<004>	IEND (*)	END OF BRANCH
<005>	WAIT (NOT) (*)	1-SCAN WAIT
<006>	EXIT (NOT) (*)	CONDITIONAL END
<009>	LOOP (*)	REPEAT BLOCK
<010>	LEND (NOT) (*)	REPEAT BLOCK END
<011>	BPPS (*)	BLOCK PROGRAM PAUSE
<012>	BPRS (*)	BLOCK PROGRAM RESTART
<013>	TIMW (*)	TIMER WAIT
<014>	CNTW (*)	COUNTER WAIT
<015>	TMHW (*)	HIGH-SPEED TIMER WAIT

Data Shift Instructions

Code	Mnemonic	Name
260	RLNC ( ) (*)	ROTATE LEFT WITHOUT CARRY
261	RRNC ( ) (*)	ROTATE RIGHT WITHOUT CARRY
262	RLNL ( ) (*)	DOUBLE ROTATE LEFT WITHOUT CARRY
263	RRNL ( ) (*)	ROTATE LEFT WITHOUT CARRY

Data Control, Special Calculation, and Data Conversion Instructions

Code	Mnemonic	Name
270	PID (*)	PID CONTROL
271	LMT ( ) (*)	LIMIT CONTROL
272	BAND ( ) (*)	DEAD BAND CONTROL
273	ZONE ( ) (*)	DEAD-ZONE CONTROL
274	ROTB ( ) (*)	BINARY ROOT
275	BINS ( ) (*)	SIGNED BCD-TO-BINARY
276	BCDS ( ) (*)	SIGNED BINARY-TO-BCD
277	BISL ( ) (*)	DOUBLE SIGNED BCD-TO-BINARY
278	BDSL ( ) (*)	DOUBLE SIGNED BINARY-TO-BCD

Special I/O Instructions

Code	Mnemonic	Name
280	RD2 (*)	I/O READ 2
281	WR2 (*)	I/O UNIT WRITE 2

Data Comparison Instructions

Code	Mnemonic	Name
300	= (*)	EQUAL
301	=L (*)	DOUBLE EQUAL
302	=S (*)	SIGNED EQUAL
303	=SL (*)	DOUBLE SIGNED EQUAL
305	<> (*)	NOT EQUAL
306	<>L (*)	DOUBLE NOT EQUAL
307	<>S (*)	SIGNED NOT EQUAL
308	<>SL (*)	DOUBLE SIGNED NOT EQUAL
310	< (*)	LESS THAN
311	<L (*)	DOUBLE LESS THAN
312	<S (*)	SIGNED LESS THAN
313	<SL (*)	DOUBLE SIGNED LESS THAN
315	<= (*)	LESS THAN OR EQUAL
316	<=L (*)	DOUBLE LESS THAN OR EQUAL
317	<=S (*)	SIGNED LESS THAN OR EQUAL
318	<=SL (*)	DOUBLE SIGNED LESS THAN OR EQUAL
320	> (*)	GREATER THAN
321	>L (*)	DOUBLE GREATER THAN
322	>S (*)	SIGNED GREATER THAN
323	>SL (*)	DOUBLE SIGNED GREATER THAN
325	>= (*)	GREATER THAN OR EQUAL
326	>=L (*)	DOUBLE GREATER THAN OR EQUAL
327	>=S (*)	SIGNED GREATER THAN OR EQUAL
328	>=SL (*)	DOUBLE SIGNED GREATER THAN OR EQUAL

Bit Tests

Code	Mnemonic	Name
350	TST (*)	BIT TEST
351	TSTN (*)	BIT TEST

Symbol Math Instructions

Code	Mnemonic	Name
400	+ ( ) (*)	SIGNED BINARY ADD WITHOUT CARRY
401	+L ( ) (*)	DOUBLE SIGNED BINARY ADD WITHOUT CARRY
402	+C ( ) (*)	SIGNED BINARY ADD WITH CARRY
403	+CL ( ) (*)	DOUBLE SIGNED BINARY ADD WITH CARRY
404	+B( ) (*)	BCD ADD WITHOUT CARRY
405	+BL( ) (*)	DOUBLE BCD ADD WITHOUT CARRY
406	+BC ( ) (*)	BCD ADD WITH CARRY
407	+BCL ( ) (*)	DOUBLE BCD ADD WITH CARRY
410	– ( ) (*)	SIGNED BINARY SUBTRACT WITHOUT CARRY
411	-L ( ) (*)	DOUBLE SIGNED BINARY SUBTRACT WITHOUT CARRY
412	–C ( ) (*)	SIGNED BINARY SUBTRACT WITH CARRY
413	–CL ( ) (*)	DOUBLE SIGNED BINARY SUBTRACT WITH CARRY
414	–B ( ) (*)	BCD SUBTRACT WITHOUT CARRY
415	–BL ( ) (*)	DOUBLE BCD SUBTRACT WITHOUT CARRY
416	–BC ( ) (*)	BCD SUBTRACT WITH CARRY

417	–BCL ( ) (*)	DOUBLE BCD SUBTRACT WITH CARRY
420	* ( ) (*)	SIGNED BINARY MULTIPLY
421	*L ( ) (*)	DOUBLE SIGNED BINARY MULTIPLY
422	*U ( ) (*)	UNSIGNED BINARY MULTIPLY
423	*UL ( ) (*)	DOUBLE UNSIGNED BINARY MULTIPLY
424	*B ( ) (*)	BCD MULTIPLY
425	*BL ( ) (*)	DOUBLE BCD MULTIPLY

Symbol Math Instructions (Continued)

Code	Mnemonic	Name
430	/ ( ) (*)	SIGNED BINARY DIVIDE
431	/L ( ) (*)	DOUBLE SIGNED BINARY DIVIDE
432	/U ( ) (*)	UNSIGNED BINARY DIVIDE
433	/UL ( ) (*)	DOUBLE UNSIGNED BINARY DIVIDE
434	/B ( ) (*)	BCD DIVIDE
435	/BL ( ) (*)	DOUBLE BCD DIVIDE

Floating-point Math Instructions

Code	Mnemonic	Name
450	FIX ( ) (*)	FLOATING-TO-16-BIT
451	FIXL ( ) (*)	FLOATING-TO-32-BIT
452	FLT ( ) (*)	16-BIT-TO-FLOATING
453	FLTL ( ) (*)	32-BIT-TO-FLOATING
454	+F ( ) (*)	FLOATING-POINT ADD
455	–F ( ) (*)	FLOATING-POINT SUBTRACT
456	*F ( ) (*)	FLOATING-POINT MULTIPLY
457	/F ( ) (*)	FLOATING-POINT DIVIDE
458	RAD ( ) (*)	DEGREES-TO-RADIANS
459	DEG ( ) (*)	RADIANS-TO-DEGREES
460	SIN ( ) (*)	SINE
461	COS ( ) (*)	COSINE
462	TAN ( ) (*)	TANGENT
463	ASIN ( ) (*)	SINE-TO-ANGLE
464	ACOS ( ) (*)	COSINE-TO-ANGLE
465	ATAN ( ) (*)	TANGENT-TO-ANGLE
466	SQRT ( ) (*)	SQUARE ROOT
467	EXP ( ) (*)	EXPONENT
468	LOG ( ) (*)	LOGARITHM

Appendix E
Alphabetic List of Mnemonics

The mnemonics followed by an asterisk (*) are supported only by version-2 CVM1 PCs.

Mnemonic	Code	Name
ACOS ( ) (*)	464	COSINE-TO-ANGLE
ADB ( )	080	BINARY ADD
ADBL ( )	084	DOUBLE BINARY ADD
ADD ( )	070	BCD ADD
ADDL ( )	074	DOUBLE BCD ADD
ANDL ( )	134	DOUBLE LOGICAL AND
ANDW ( )	130	LOGICAL AND
APR ( )	142	ARITHMETIC PROCESS
ASC ( )	113	ASCII CONVERT
ASFT ( )	052	ASYNCHRONOUS SHIFT REGISTER
ASIN ( ) (*)	463	SINE-TO-ANGLE
ASL ( )	060	ARITHMETIC SHIFT LEFT
ASLL ( )	064	DOUBLE SHIFT LEFT
ASR ( )	061	ARITHMETIC SHIFT RIGHT
ASRL ( )	065	DOUBLE SHIFT RIGHT
ATAN ( ) (*)	465	TANGENT-TO-ANGLE
BAND ( ) (*)	272	DEAD BAND CONTROL
BCD ( )	101	BINARY-TO-BCD
BCDL ( )	103	DOUBLE BINARY-TO-DOUBLE BCD
BCDS ( ) (*)	276	SIGNED BINARY-TO-BCD
BCMP ( )	022	BLOCK COMPARE
BCNT ( )	114	BIT COUNTER
BDSL ( ) (*)	278	DOUBLE SIGNED BINARY-TO-BCD
BEND (*)	<001>	BLOCK PROGRAM END
BIN ( )	100	BCD-TO-BINARY
BINL ( )	102	DOUBLE BCD-TO-DOUBLE BINARY
BINS ( ) (*)	275	SIGNED BCD-TO-BINARY
BISL ( ) (*)	277	DOUBLE SIGNED BCD-TO-BINARY
BPPS (*)	<011>	BLOCK PROGRAM PAUSE
BPRG (*)	250	BLOCK PROGRAM
BPRS (*)	<012>	BLOCK PROGRAM RESTART
BSET ( )	041	BLOCK SET

Mnemonic	Code	Name
BXFR ( ) (*)	046	INTERBANK BLOCK TRANSFER
CADD ( )	145	CALENDAR ADD
CCL ( )	172	LOAD FLAGS
CCS ( )	173	SAVE FLAGS
CJP (*)	221	CONDITIONAL JUMP
CJPN (*)	222	CONDITIONAL JUMP
CLC ( )	079	CLEAR CARRY
CLI ( )	154	CLEAR INTERRUPT
CMND ( )	194	DELIVER COMMAND
CMP (!)	020	COMPARE
CMP (!) (*)	028	UNSIGNED COMPARE
CMPL	021	DOUBLE COMPARE
CMPL (*)	029	DOUBLE UNSIGNED COMPARE
CNR ( )	236	RESET TIMER/COUNTER
CNTR	012	REVERSIBLE COUNTER
CNTW (*)	<014>	COUNTER WAIT
COLL ( )	045	DATA COLLECT
COLM ( )	116	LINE-TO-COLUMN
COM ( )	138	COMPLEMENT
COML ( )	139	DOUBLE COMPLEMENT
COS ( ) (*)	461	COSINE
CPS (!) (*)	026	SIGNED BINARY COMPARE
CPSL (*)	027	DOUBLE SIGNED BINARY COMPARE
CSUB ( )	146	CALENDAR SUBTRACT
DATE ( ) (*)	179	CLOCK COMPENSATION
DCBL ( )	097	DOUBLE DECREMENT BINARY
DEC ( )	091	DECREMENT BCD
DECB ( )	093	DECREMENT BINARY
DECL ( )	095	DOUBLE DECREMENT BCD
DEG ( ) (*)	459	RADIANS-TO-DEGREES
DIFD (!)	014	DIFFERENTIATE DOWN
DIFU (!)	013	DIFFERENTIATE UP
DIST ( )	044	SINGLE WORD DISTRIBUTE
DIV ( )	073	BCD DIVIDE
DIVL ( )	077	DOUBLE BCD DIVIDE

Mnemonic	Code	Name
DMPX ( )	111	16-TO-4/256-8 ENCODER
DOWN (*)	019	CONDITION OFF
DVB ( )	083	BINARY DIVIDE
DVBL ( )	087	DOUBLE BINARY DIVIDE
ELSE (*)	<003>	NO CONDITIONAL BRANCH
EMBC ( )	171	SELECT EM BANK
END	001	END
EQU ( )	025	EQUAL
EXIT (NOT) (*)	<006>	CONDITIONAL END
EXP ( ) (*)	467	EXPONENT
FAL ( )	006	FAILURE ALARM
FALS	007	FAILURE ALARM
FDIV ( )	141	FLOATING POINT DIVIDE (BCD)
FIFO ( )	163	FIRST IN FIRST OUT
FILP ( )	182	READ PROGRAM FILE
FILR ( )	180	READ DATA FILE
FILW ( )	181	WRITE DATA FILE
FIX ( ) (*)	450	FLOATING-TO-16-BIT
FIXL ( ) (*)	451	FLOATING-TO-32-BIT
FLSP ( )	183	CHANGE STEP PROGRAM
FLT ( ) (*)	452	16-BIT-TO-FLOATING
FLTL ( ) (*)	453	32-BIT-TO-FLOATING
FPD (*)	177	FAILURE POINT DETECTION
HEX ( ) (*)	117	ASCII-TO-HEX
HMS ( )	144	SECONDS-TO-HOURS
IEND (*)	<004>	END OF BRANCH
IF (NOT) (*)	<002>	CONDITIONAL BRANCH
IL	002	INTERLOCK
ILC	003	INTERLOCK CLEAR
INBL ( )	096	DOUBLE INCREMENT BINARY
INC ( )	090	INCREMENT BCD
INCB ( )	092	INCREMENT BINARY
INCL ( )	094	DOUBLE INCREMENT BCD
IODP ( )	189	I/O DISPLAY
IORF ( )	184	I/O REFRESH
IORS	188	ENABLE ACCESS
IOSP ( )	187	DISABLE ACCESS
JME	005	JUMP END
JMP	004	JUMP
KEEP (!)	011	KEEP

Mnemonic	Code	Name
LEND (NOT) (*)	<010>	REPEAT BLOCK END
LIFO ( )	162	LAST IN FIRST OUT
LINE ( )	115	COLUMN-TO-LINE
LMT ( ) (*)	271	LIMIT CONTROL
LOG ( ) (*)	468	LOGARITHM
LOOP (*)	<009>	REPEAT BLOCK
MARK	174	MARK TRACE
MAX ( )	165	FIND MAXIMUM
MCMP ( )	024	MULTIPLE COMPARE
MCRO ( ) (*)	156	MACRO
MIN ( )	166	FIND MINIMUM
MLB ( )	082	BINARY MULTIPLY
MLBL ( )	086	DOUBLE BINARY MULTIPLY
MLPX ( )	110	4-TO-16/8-TO-256 DECODER
MOV (!)	030	MOVE
MOVB ( )	042	MOVE BIT
MOVD ( )	043	MOVE DIGIT
MOVL ( )	032	DOUBLE MOVE
MOVQ	037	MOVE QUICK
MOVR ( )	036	MOVE TO REGISTER
MSG ( )	195	MESSAGE
MSKR ( )	155	READ MASK
MSKS ( )	153	INTERRUPT MASK
MTIM	122	MULTI-OUTPUT TIMER
MUL ( )	072	BCD MULTIPLY
MULL ( )	076	DOUBLE BCD MULTIPLY
MVN ( )	031	MOVE NOT
MVNL ( )	033	DOUBLE MOVE NOT
NASL ( ) (*)	056	SHIFT N-BITS LEFT
NASR ( ) (*)	057	SHIFT N-BITS RIGHT
NEG ( )	104	2'S COMPLEMENT
NEGL ( )	105	DOUBLE 2'S COMPLEMENT
NOP	000	NO OPERATION
NOT	010	NOT
NSFL ( ) (*)	054	SHIFT N-BIT DATA LEFT
NSFR ( ) (*)	055	SHIFT N-BIT DATA RIGHT
NSLL ( ) (*)	058	DOUBLE SHIFT N-BIT LEFT
NSRL ( ) (*)	059	DOUBLE SHIFT N-BIT RIGHT
ORW ( )	131	LOGICAL OR
ORWL ( )	135	DOUBLE LOGICAL OR
PID (*)	270	PID CONTROL
PUSH ( )	161	PUSH ONTO STACK

Mnemonic	Code	Name
RAD ( ) (*)	458	DEGREES-TO-RADIANS
RD2 (*)	280	I/O READ 2
READ	190	I/O READ
RECV ( )	193	NETWORK RECEIVE
REGL ( )	175	LOAD REGISTER
REGS ( )	176	SAVE REGISTER
RET	152	SUBROUTINE RETURN
RLNC ( ) (*)	260	ROTATE LEFT WITHOUT CARRY
RLNL ( ) (*)	262	DOUBLE ROTATE LEFT WITHOUT CARRY
ROL ( )	062	ROTATE LEFT WITH CARRY
ROLL ( )	066	DOUBLE ROTATE LEFT WITH CARRY
ROOT ( )	140	BCD SQUARE ROOT
ROR ( )	063	ROTATE RIGHT WITH CARRY
RORL ( )	067	DOUBLE ROTATE RIGHT WITH CARRY
ROTB ( ) (*)	274	BINARY ROOT
RRNC ( ) (*)	261	ROTATE RIGHT WITHOUT CARRY
RRNL ( ) (*)	263	ROTATE LEFT WITHOUT CARRY
RSET (!)	017	RSET
RSTA ( ) (*)	048	MULTIPLE BIT RESET
SA ( )	210	ACTIVATE STEP
SBB ( )	081	BINARY SUBTRACT
SBBL ( )	085	DOUBLE BINARY SUBTRACT
SBN	150	SUBROUTINE ENTER
SBS ( )	151	SUBROUTINE CALL
SDEC ( )	112	7-SEGMENT DECODER
SE ( )	214	DEACTIVATE STEP
SEC ( )	143	HOURS-TO-SECONDS
SEND ( )	192	NETWORK SEND
SET (!)	016	SET
SETA ( ) (*)	047	MULTIPLE BIT SET
SF ( )	213	END STEP
SFT	050	SHIFT REGISTER
SFTR ( )	051	REVERSIBLE SHIFT REGISTER
SIGN ( )	106	SIGN
SIN ( ) (*)	460	SINE
SLD ( )	068	SHIFT DIGIT LEFT
SNXT	009	STEP START
SOFF ( )	215	RESET STEP
SP ( )	211	PAUSE STEP

Mnemonic	Code	Name
SQRT ( ) (*)	466	SQUARE ROOT
SR ( )	212	RESTART STEP
SRCH ( )	164	DATA SEARCH
SRD ( )	069	SHIFT DIGIT RIGHT
SSET ( )	160	SET STACK
STC ( )	078	SET CARRY
STEP	008	STEP DEFINE
SUB ( )	071	BCD SUBTRACT
SUBL ( )	075	DOUBLE BCD SUBTRACT
SUM ( )	167	SUM
TAN ( ) (*)	462	TANGENT
TCMP ( )	023	TABLE COMPARE
TCNT	123	TRANSITION COUNTER
TIMH	015	HIGH-SPEED TIMER
TIML	121	DOUBLE TIMER
TIMW (*)	<013>	TIMER WAIT
TMHW (*)	<015>	HIGH-SPEED TIMER WAIT
TOUT	202	TRANSITION OUTPUT
TRST	170	TRACE MEMORY
TSR ( )	124	READ STEP TIMER
TST (*)	350	BIT TEST
TSTN (*)	351	BIT TEST
TSW ( )	125	WRITE STEP TIMER
TTIM	120	ACCUMULATIVE TIMER
UP (*)	018	CONDITION ON
WAIT (NOT) (*)	<005>	1-SCAN WAIT
WDT ( ) (*)	178	SCAN TIME MONITOR
WR2 (*)	281	I/O UNIT WRITE 2
WRIT	191	I/O WRITE
WSFT ( )	053	WORD SHIFT
XCGL ( )	035	DOUBLE DATA EXCHANGE
XCHG ( )	034	DATA EXCHANGE
XFER ( )	040	BLOCK TRANSFER
XFRB ( ) (*)	038	MULTIPLE BIT TRANSFER
XNRL ( )	137	DOUBLE EXCLUSIVE NOR
XNRW ( )	133	EXCLUSIVE NOR
XORL ( )	136	DOUBLE EXCLUSIVE OR
XORW ( )	132	EXCLUSIVE OR
ZONE ( ) (*)	273	DEAD-ZONE CONTROL
/ ( ) (*)	430	SIGNED BINARY DIVIDE
/B ( ) (*)	434	BCD DIVIDE
/BL ( ) (*)	435	DOUBLE BCD DIVIDE

Mnemonic	Code	Name
/F ( ) (*)	457	FLOATING-POINT DIVIDE
/L ( ) (*)	431	DOUBLE SIGNED BINARY DIVIDE
/U ( ) (*)	432	UNSIGNED BINARY DIVIDE
/UL ( ) (*)	433	DOUBLE UNSIGNED BINARY DIVIDE
+ ( ) (*)	400	SIGNED BINARY ADD WITHOUT CARRY
+B( ) (*)	404	BCD ADD WITHOUT CARRY
+BC ( ) (*)	406	BCD ADD WITH CARRY
+BCL ( ) (*)	407	DOUBLE BCD ADD WITH CARRY
+BL ( ) (*)	405	DOUBLE BCD ADD WITHOUT CARRY
+C ( ) (*)	402	SIGNED BINARY ADD WITH CARRY
+CL ( ) (*)	403	DOUBLE SIGNED BINARY ADD WITH CARRY
+F ( ) (*)	454	FLOATING-POINT ADD
+L ( ) (*)	401	DOUBLE SIGNED BINARY ADD WITHOUT CARRY
– ( ) (*)	410	SIGNED BINARY SUBTRACT WITHOUT CARRY
–B ( ) (*)	414	BCD SUBTRACT WITHOUT CARRY
–BC ( ) (*)	416	BCD SUBTRACT WITH CARRY
–BCL ( ) (*)	417	DOUBLE BCD SUBTRACT WITH CARRY
–BL ( ) (*)	415	DOUBLE BCD SUBTRACT WITHOUT CARRY
–C ( ) (*)	412	SIGNED BINARY SUBTRACT WITH CARRY
–CL ( ) (*)	413	DOUBLE SIGNED BINARY SUBTRACT WITH CARRY
–F ( ) (*)	455	FLOATING-POINT SUBTRACT
–L ( ) (*)	411	DOUBLE SIGNED BINARY SUBTRACT WITHOUT CARRY
= (*)	300	EQUAL
=L (*)	301	DOUBLE EQUAL

Mnemonic	Code	Name
=S (*)	302	SIGNED EQUAL
=SL (*)	303	DOUBLE SIGNED EQUAL
< (*)	310	LESS THAN
<= (*)	315	LESS THAN OR EQUAL
<=L (*)	316	DOUBLE LESS THAN OR EQUAL
<=S (*)	317	SIGNED LESS THAN OR EQUAL
<=SL (*)	318	DOUBLE SIGNED LESS THAN OR EQUAL
<> (*)	305	NOT EQUAL
<>L (*)	306	DOUBLE NOT EQUAL
<>S (*)	307	SIGNED NOT EQUAL
<>SL (*)	308	DOUBLE SIGNED NOT EQUAL
<L (*)	311	DOUBLE LESS THAN
<S (*)	312	SIGNED LESS THAN
<SL (*)	313	DOUBLE SIGNED LESS THAN
> (*)	320	GREATER THAN
>= (*)	325	GREATER THAN OR EQUAL
>=L (*)	326	DOUBLE GREATER THAN OR EQUAL
>=S (*)	327	SIGNED GREATER THAN OR EQUAL
>=SL (*)	328	DOUBLE SIGNED GREATER THAN OR EQUAL
>L (*)	321	DOUBLE GREATER THAN
>S (*)	322	SIGNED GREATER THAN
>SL (*)	323	DOUBLE SIGNED GREATER THAN
* ( ) (*)	420	SIGNED BINARY MULTIPLY
*B ( ) (*)	424	BCD MULTIPLY
*BL ( ) (*)	425	DOUBLE BCD MULTIPLY
*F ( ) (*)	456	FLOATING-POINT MULTIPLY
*L ( ) (*)	421	DOUBLE SIGNED BINARY MULTIPLY
*U ( ) (*)	422	UNSIGNED BINARY MULTIPLY
*UL ( ) (*)	423	DOUBLE UNSIGNED BINARY MULTIPLY

Appendix F
Offline Operations

The following tables list the basic SSS offline operations.

Programming Menu

Operation	Function	Page
R:Connect Line	Creates connecting lines between programming elements (vertical line, symbols, etc.).	34
S:Save Program	Writes the ladder or mnemonic program in the system work area to the data disk.	71
L:Retrieve Program	Reads the ladder or mnemonic program on the data disk to the system work area.	73
H:Change Display	Sets the method for displaying ladder diagrams and mnemonic programs.	16
K:Search	Searches for instructions with their operands. Specified by alphanumeric inputs.	75
I:I/O Comments	Writes I/O comments and searches ladder diagrams for specified I/O comments.	81
G:Block Comments	Writes block comments between instruction blocks or searches for instructions comments.	61
E:Edit Ladder	Moves, copies, or deletes instruction blocks for a program in the system work area.	84
N:Edit Comments	Displays I/O comments on the screen 32 at a time, and edits the comments.	58
D:Retrieve Comments	Reads I/O comments and block comments from programs stored on the data disk.	75
M:Memory Usage	Displays how the memory area is being used in the system work area.	20
C:Clear Memory	Clears the user program in the system work area.	14
P:Check Program	Checks whether ladder and mnemonic programs in the system work area are correct.	68
W:Edit Interrupt Program	Edits I/O interrupt, scheduled interrupt, power off interrupt, and power on interrupt ladder programs.	86
Z:Program Input Mode	Specifies the mode for inputting instructions (including operands) when creating ladder programs.	21

DM Menu

Operation	Function	Page
D:Read DM Address	Displays the 160-word page of DM data from the system work area that includes the specified DM address.	106
C:Copy	Copies multiple, consecutive words of DM data to a specified destination DM address.	107
F:FILL	Places a specified value into multiple, consecutive words of the DM area. Filling with 0000 clears the DM words.	108
R:Print	Prints multiple, consecutive words of DM data.	108
A:HEX ↔ ASCII	Sets input mode to hexadecimal or ASCII. The mode set will be displayed at the top-right of the screen.	106
B:Switch Bank #	Switches editing between the standard DM and EM banks.	109
S:Save DM Data	Saves the DM data from the system work area to the data disk.	110
L:Retrieve DM Data	Retrieves the DM data on the data disk to the system work area.	111
K:Save File	Saves the DM data from the system work area to the data disk as file data (with IOM suffix).	112
Y:Retrieve File	Retrieves the file data (with IOM suffix) on the data disk to the system work area. Retrieved file data can be edited in the same way as DM data. Files transferred from Memory Cards to disk or files saved with "K:Save file" can be retrieved.	112

I/O Table Menu

Operation	Function	Page
W:Write I/O Table	Used to write and edit the I/O table on the system work area.	119
C:Check I/O Table	Checks the contents of the I/O table on the system work area and displays errors if detected.	126
S:Save I/O Table	Saves the I/O table contents on the system work area and the first words set in the PC Setup to the data disk.	127
L:Retrieve I/O Table	Retrieves the I/O table contents from the data disk to the system work area.	128
I:Clear I/O Table	Clears the I/O table data from the system work area.	129
Z:Custom I/O Table SIOU	Registers the types of CPU Bus Units. Not used at present.	129

Utility Menu

Operation	Function	Page
H:Data Area Lists	Displays data area information (such as used areas and cross-references) for the program in the system work area.	135
I:Change Addresses	Changes bit and word addresses in the program in the system work area.	139
P:Print Lists	Prints lists of data and the program (ladder diagrams or mnemonics) using the program in the system work area.	147
R:EPROM/Memory Card	Performs a variety of Memory Card operations, such as transferring files between data disks and Memory Cards and initializing Memory Cards.	154
N:Program Conversion	Converts the program format (C2000H→CVM1).	161
T:Data Trace	Accesses the data trace displays that were produced online.	169
Q:PC Setup	Sets the PC Setup parameters used by the C200HS and CQM1.	171
V:Compare Programs	Compares a program on data disk to the one in the system work area.	199
M:Edit PC ID	Creates, edits, searches for, and prints PC names.	200

Operation	Function	Page
Z:Customization	Changes function codes, creates custom data areas, or controls HIS programs.	209
W:Network Support Tables	Edits data link tables and routing tables for SYSMAC NET Link and SYSMAC LINK Systems.	354, 371, 400

Data Area List Menu

Operation	Function	Page
U:Used Data Area	Lists the data area words and bits that are used in the program and how they are used.	136
C:Used Data Areas W/Comments	Lists the data area words and bits that are used in the program along with their I/O comments.	137
X:Cross-references	Lists the addresses and instructions in the program that use the specified bit.	138

Change Address Menu

Operation	Function	Page
R:Bit adr, T/C no.	Changes individual bits in the CIO, Auxiliary, and CPU Bus Link Areas or ranges of timer or counter numbers.	140
C:Wd adr, DM/EM adr	Changes word addresses in the CIO, Auxiliary, CPU Bus Link, Timer, Counter, DM, and EM Areas. Also changes multiple, consecutive words. Changes cannot be made to individual bits.	145
W:Wd adr (with bit adr)	Changes all word and bit addresses for specified words. Changes can be made in the CIO, Auxiliary, and CPU Bus Link Areas only.	146

Print Lists Menu

Operation	Function	Page
U:Used Data Areas	Prints a list, in the order of bit numbers, of the bits and words used in the program in the system work area.	148
C:Used Areas W/Cmnts	Prints a list of the bits and words used in the program with I/O comments.	148
X:Cross-references	Prints a list of all the places where the specified bit or word is used in the program in the system work area.	148
I:Ladder Diagram & I/O	Prints out the program as a ladder diagram. Letters X and Y show whether bits are allocated to Input or Output Units.	151
N:Mnemonic	Prints out the program in mnemonic code in the system work area.	153

Memory Card Operations Menu

Operation	Function	Page
M:Computer ↔ Memory Card	Transfers files between the Memory Card Writer buffer RAM and the data disk.	157, 158
C:Copy File	Copies files in the Memory Card Writer buffer RAM.	159
N:Change File Name	Renames files in the Memory Card Writer buffer RAM.	160
D:Delete File	Deletes files in the Memory Card Writer buffer RAM.	160
F:Initialize	Initializes the Memory Card Writer buffer RAM. Always use this operation to initialize new Memory Cards.	155
P:Print	Prints a list of the files in the Memory Card Writer buffer RAM.	161

Program Conversion Menu (C2000H to CVM1)

Operation	Function	Page
P:Program + I/O Comments	Converts the program and I/O comments to the format usable by CVM1 PCs.	161
C:I/O Comments	Converts I/O comments to the format usable by CVM1 PCs.	161
D:DM Data	Writes DM data into the equivalent DM addresses in the CVM1 PC.	165
E:Fix List	Displays, prints, or files a list of items requiring modification after program conversion.	166

Data Trace Menu

Operation	Function	Page
R:Read Data Trace	Displays the data trace data in the system work area.	169
L:Retrieve Data Trace	Retrieves data trace data from a data disk to the system work area.	170
S:Save Data Trace	Saves data trace data from the system work area to a data disk.	171

PC Setup Menu

Operation	Function	Page
A:PC Setup	Sets or changes the PC Setup in the system work area.	175
S:Save PC Settings	Saves the PC Setup data in the system work area to a data disk.	192
L:Retrieve PC Settings	Reads the PC Setup data from a data disk to the system work area.	193
C:Clear PC Settings	Resets all parameters in the PC Setup in the system work area to their default values.	193

Compare Program Menu

Operation	Function	Page
V:Compare Programs	Compares a program on data disk to the one in the system work area.	199

Edit PC ID Menu

Operation	Function	Page
S:Save PC ID	Saves the PC ID data in the system work area to a data disk.	203
L:Retrieve PC ID	Retrieves the PC ID data from a data disk to the system work area.	204
F:Fill	Writes the same specified network address, node address, or PC ID data to consecutive rows.	204
C:Clear	Clears data from all rows in a specified range.	205
P:Print	Prints the PC ID data.	206
K:Check	Checks the edited PC ID and displays any errors found.	207
O:Sort	Sorts PC IDs in numerical and alphabetical order.	208
R:Find	Finds a specified item in PC ID data.	208

Customization Menu

Operation	Function	Page
T:Prefixes and Codes	Changes data area prefixes and divides the CIO Area into smaller custom data areas.	210
H:HIS	Registers or deletes HIS programs developed by the user.	214

Network Support Table Menu

SYSMAC NET Data Link Table Menu

Operation	Function	Page
E:Edit Data Link Table	Used to create and edit data link tables.	356
K:Check Data Link Table	Checks the data link table in memory and displays any error found.	357
C:Clear Data Link Table	Clears all data link table data from the system work area.	358
L:Retrieve Data Link Table	Retrieves the data link table data from the data disk to the system work area.	358
S:Save Data Link Table	Saves the data link table data in the system work area to the data disk.	358
P:Print Data Link Table	Prints the data link table data in the system work area.	359

SYSMAC LINK Data Link Table Menu

Operation	Function	Page
E:Edit Data Link Table	Used to create and edit data link tables.	373
K:Check Data Link Table	Checks the data link table in memory and displays any errors found.	375
Y:Copy Data Link Table	Copies refresh parameters from a specified node to one or more other nodes.	377
C:Clear Data Link Table	Clears all data link data from the system work area.	378
L:Retrieve Data Link Table	Retrieves the data link table data from the data disk to the system work area.	379
S:Save Data Link Table	Saves the data link table data in the system work area to the data disk.	378
P:Print Data Link Table	Prints the data link table data in the system work area.	379

Routing Table Menu

Operation	Function	Page
E:Edit Routing Table	Used to input and edit routing tables.	401
K:Check Routing Table	Checks the routing table in the system work area and displays any errors found.	403
C:Clear Routing Table	Clears all routing table data from the system work area.	404
L:Retrieve Routing Table	Retrieves the routing table data from the data disk to the system work area.	405
S:Save Routing Table	Saves the routing table data in the system work area to the data disk.	404
P:Print Routing Table	Prints the routing table data in the system work area.	406

System Setup Menu

Operation	Function	Page
K:PC Model	Specifies the model of PC that is to be used. This settings affects peripheral devices, program checks, and communications.	219
C:PC Interface	Specifies the interface for Programmable Controller communications (either peripheral or Host Link).	219
N:Network Address	Specifies the node address and network address for the destination PC when communicating on a network.	222
G:Message No.	Specifies the MSG(195) message number to be displayed by the SSS.	223
R:EPROM interface	Specifies the communications protocol between the PROM Writer and computer.	223
P:Printer Model	Specifies the model of printer connected.	223
D:Data Disk Drive	Specifies the data disk drive for saving and retrieving data.	224
M:Exit to DOS	Terminates SSS operation and returns to DOS.	224

File Management Menus

DOS

Operation	Function	Page
I:Directory	Displays directories for programs, DM, I/O tables, etc., on the screen. File directories can be displayed individually by type.	227
C:Copy File	Copies files.	229
N:Change File Name	Renames files.	230
D:Delete File	Deletes files.	231
R:Create/Delete Directory	Creates or deletes subdirectories under the current directory.	232
L:LSS File Management	Switches to the LSS File Management Menu.	233

LSS

Operation	Function	Page
I:Directory	Displays directories for LSS-format programs, DM, I/O tables, etc., on the screen. File directories can be displayed individually by type.	234
C:Copy File	Copies LSS-format files.	235
N:Change File Name	Renames LSS-format files.	238
D:Delete File	Deletes LSS-format files.	238

Appendix G
Online Operations

The following tables list the basic SSS online operations.

Monitoring Menu

Operation	Function	Page
N:Monitor Data	Uses the lower third of the screen to monitor and change the status or contents of timers, counters, bits, and words in memory.	249
P:Transfer Program	Transfers or compares programs between the computer and the PC.	251
H:Change Display	Changes the display mode during monitoring to any of the following: Ladder (no comments), Ladder (2 comment rows), or ladder (4 comment rows).	258
O:Online Edit	Makes direct changes to the PC's program in mnemonic or ladder form in MONITOR/PROGRAM mode without interrupting its operation.	286
Y:Read Cycle Time	Measures the scan time of the program and displays the maximum, minimum, and mean values.	290
A:Clear Area	Clears the CIO, Auxiliary, CPU Bus Link, Timer, Counter, DM, and/or EM data areas in the PC.	254
K:Search	Finds particular instructions, including operands, in a PC program that is being monitored.	255
I:I/O Comments	Finds instruction blocks containing I/O comments.	255
G:Block Comments	Finds block comments.	255
M:Memory Usage	Shows the amount of user memory currently being used and the amount remaining.	291
W:Monitor Interrupt Program	Monitors interrupt programs.	289
Z:Program Input Mode	Specifies whether symbol input (using function keys) or string input (using alphanumeric keys) is to be used for inputting programs during online editing.	255
R:Monitor Other Node	Displays the status of other nodes when connected to the network. Also executes forced set/reset, changes present values, etc.	292

DM Menu

Operation	Function	Page
D:Read DM Address	Reads the data for a specified DM address from the DM area of the PC. Up to 160 DM words can be displayed on a single screen.	296, 106
C:Copy	Copies multiple, consecutive words of DM data to a specified destination DM address.	296, 107
F:Fill	Places a specified value into multiple, consecutive words of the DM area. Filling with 0000 clears the DM words.	296, 108
R:Print	Prints multiple, consecutive words of DM data.	296, 108
A:HEX ↔ ASCII	Sets input to hexadecimal or ASCII. The mode set will be displayed in the top-right of the screen.	296, 106
B:Switch Bank #	Switches editing between the standard DM and EM banks.	296, 109
S:Save DM Data	Saves the DM data from the system work area to the data disk.	298
L:Retrieve DM Data	Retrieves the DM data on the data disk to the system work area.	299
T:Transfer DM	Transfers DM data between the PC and computer and compares the data.	300

I/O Table Menu

Operation	Function	Page
A:Transfer I/O Table	Writes the I/O table from the PC to the system work area.	309
	Writes the I/O table data from the system work area to the PC.	309
	Compares the I/O tables in the system work area and the PC. An error table will show any errors discovered during comparison.	309
C:Create I/O Table	Registers the actual Units mounted to the PC to the I/O table.	314
V:Verify I/O Table	Compares the contents of the I/O table in the PC and the actual Units mounted to the PC and displays any errors found.	316

Utility Menu

Operation	Function	Page
F:File Memory/Memory Card	Manages files in a Memory Card installed in a CVM1 PC.	320
T:Data Trace	Samples the status of specified bits and words at fixed intervals and stores the data in the PC's trace memory.	330
Y:Display/Set Clock	Displays or sets the PC's system clock.	339
Z:Custom Data	Transfers and compares the customized settings that were set with the offline Customization operation.	339
X:CPU Bus Unit Setup	Sets operating parameters for CPU Bus Units	416
Q:PC Setup	Sets or transfers the PC Setup parameters.	171
B:SYSMAC BUS/2	Controls, monitors, or tests SYSMAC BUS/2 Remote I/O Systems.	444
V:Read Error Log	Displays and clears errors which have occurred in the PC, displays and clears the error history, and clears the right to access PC memory.	341
U:Protect UM	Sets or cancels total or partial protection for the PC user program memory (UM).	344
W:Network Support Table	Manages data link tables and routing tables for SYSMAC NET and SYSMAC LINK networks. See *Appendix I Network Operations* for details.	
N:Network Diagnosis	Used to diagnose networks. See *Appendix I Network Operations* for details.	

Memory Card Operations Menu

Operation		Function	Page
P:PC ↔Memory Card	A:All programs	Transfers all programs between the PC and the Memory Card in the PC.	323, 327
	L:Ladder	Transfers the ladder program from the PC to the Memory Card in the PC.	324
	I:IOM	Transfers a consecutive block of IOM words (CIO, G, A, D, E) between the PC and the Memory Card inserted in the PC.	326, 328
	S:PC Setup, SIOU Settings	Transfers the extended PC Setup between the PC and the Memory Card in the PC. This data includes the PC Setup, customize settings, I/O table, data link tables, routing tables, communications unit settings, and BASIC Unit settings.	326, 329
M:Computer ↔ Memory Card		Transfers files between a data disk and the Memory Card in the PC.	329
C:Copy File		Copies files in the Memory Card in the PC.	159
N:Change File Name		Renames files in the Memory Card in the PC.	160
D:Delete File		Deletes files from the Memory Card in the PC.	160
F:Initialize		Initializes the Memory Card in the PC. Always use this operation to initialize new Memory Cards.	155

Data Trace Menu

Operation	Function	Page
J:Execute Data Trace	Sets the data trace parameters and executes data traces. Execute "R:Read Data Trace" after executing the trace.	336
R:Read Data Trace	Displays the trace data. Can be used to cancel data trace execution after it has begun.	337
S:Save Data Trace	Saves the trace data to a data disk.	338

PC Setup Menu

Operation	Function	Page
A:PC Setup	Sets or changes the PC Setup in the CVM1.	197
S:Save PC Settings	Saves the PC system setup data in the CVM1 to a data disk.	197
L:Retrieve PC Settings	Reads the PC Setup data from a data disk to the CVM1.	197
T:Transfer PC Settings	PC → Computer: Transfers the PC Setup data from the CVM1 to the system work area at the computer. Computer → PC: Transfers the PC Setup data from the system work area at the computer to the CVM1.	197

Custom Data Menu

Operation	Function	Page
R:PC → Computer	Transfers customized settings from the PC to the computer.	340
W:Computer → PC	Transfers customized settings from the computer to the PC.	340
V:Verify	Compares the customized settings between the PC and computer.	340

Read Error Log Menu

Operation	Function	Page
E:Error Directory	Used to display the current PC error directory and to clear specified errors.	341
L:History	Used to display the PC error history with dates and times the errors occurred and to clear the error history.	342
A:Cancel Access Right	Used to release the access right. Use this operation during online operations when a message on the screen indicates that you do not have the access right.	343

UM Protect Menu

Operation	Function	Page
P:Protect	Used to protect all or part of the user program in the PC.	344
A:Delete Total Protect	Used to clear all program protection.	346
B:Delete Part Protect	Used to clear part of the program protection.	346

System Setup Menu

Operation	Function	Page
M:Message No.	Specifies the MSG(195) message number to be displayed by the SSS.	223

Appendix H
Network Operations

The following tables list the basic SSS network-related operations.

Offline

SYSMAC NET Data Link Table Menu

Operation	Function	Page
E:Edit Data Link Table	Used to create and edit data link tables.	356
K:Check Data Link Table	Checks the data link table in memory and displays any error found.	357
C:Clear Data Link Table	Clears all data link table data from the system work area.	358
L:Retrieve Data Link Table	Retrieves the data link table data from the data disk to the system work area.	358
S:Save Data Link Table	Saves the data link table data in the system work area to the data disk.	358
P:Print Data Link Table	Prints the data link table data in the system work area.	359

SYSMAC LINK Data Link Table Menu

Operation	Function	Page
E:Edit Data Link Table	Used to create and edit data link tables.	373
K:Check Data Link Table	Checks the data link table in memory and displays any errors found.	375
Y:Copy Data Link Table	Copies refresh parameters from a specified node to one or more other nodes.	377
C:Clear Data Link Table	Clears all data link data from the system work area.	378
L:Retrieve Data Link Table	Retrieves the data link table data from the data disk to the system work area.	379
S:Save Data Link Table	Saves the data link table data in the system work area to the data disk.	378
P:Print Data Link Table	Prints the data link table data in the system work area.	379

Routing Table Menu

Operation	Function	Page
E:Edit Routing Table	Used to input and edit routing tables.	401
K:Check Routing Table	Checks the routing table in the system work area and displays any errors found.	403
C:Clear Routing Table	Clears all routing table data from the system work area.	404
L:Retrieve Routing Table	Retrieves the routing table data from the data disk to the system work area.	405
S:Save Routing Table	Saves the routing table data in the system work area to the data disk.	404
P:Print Routing Table	Prints the routing table data in the system work area.	406

Online

SYSMAC NET Data Link Table Menu

Operation	Function	Page
T:Transfer Data Link Table	Used to transfer and compare the data link table between the SYSMAC NET Link Unit and computer system work area.	361
L:Retrieve Data Link Table	Used to read the data link table from the data disk to the computer system work area.	360
S:Save Data Link Table	Used to write the data link table from the computer system work area to the data disk.	364
K:Start/Stop Data Link	Used to start or stop the data link with the specified SYSMAC NET Link Unit.	365
M:Monitor Data Link Status	Used to display the operating status of each node belonging to the data link.	366

SYSMAC LINK Data Link Table Menu

Operation	Function	Page
T:Transfer Data Link Table	Used to transfer and compare the data link tables between the SYSMAC LINK Unit and computer system work area.	382
D:Delete Data Link Table	Used to delete the specified data link table in the SYSMAC LINK Unit.	390
L:Retrieve Data Link Table	Used to read the data link table from the data disk to the computer system work area.	382
S:Save Data Link Table	Used to write the data link table from the computer system work area to the data disk.	391
K:Start/Stop Data Link	Used to start or stop the data links for the specified SYSMAC LINK Unit.	392
M:Monitor Data Link Status	Used to monitor the data link status, communications cycle time, and refresh cycle time.	393

Routing Table Menu

Operation	Function	Page
T:Transfer Routing Table	Used to transfer and compare the routing tables between the SYSMAC LINK Unit and computer system work area.	408
L:Retrieve Routing Table	Used to read the routing tables from the data disk to the computer system work area.	407
S:Save Routing Table	Used to write the routing tables from the computer system work area to the data disk.	412

CPU Bus Unit Setup Menu

Operation	Function	Page
S:Communication Unit Settings	Used to read and change the setup for the Communications Units in the PC.	416
W:Software Switches	Used to read and change the software switches for the Communications Units in the PC.	424
T:CPU SIOU Unit System Setup	Used to read and change the system setups for the CPU Bus Units (other than Communications Units) in the PC.	427
C:CPU SIOU Unit Software Switch Setup	Used to read and change the software switches in the CIO and DM Areas for the CPU Bus Units (other than Communications Units) in the PC.	428

SYSMAC NET Network Diagnostic Menu

Operation	Function	Page
N:Internode Test	Used to run the loop-back test between the computer and specified node.	433
S:Display Node Status	Used to read status data from the specified SYSMAC NET Link Unit.	434
I:Display Error History	Used to read and clear the error history.	435

SYSMAC LINK Network Diagnostic Menu

Operation	Function	Page
N:Internode Test	Used to run the loop-back test between the computer and specified node.	437
D:Broadcast Test	Used to run the broadcast test to all nodes in the specified network.	438
S:Display Node Status	Used to read status data from the specified SYSMAC LINK Unit.	439
P:Set Network Parameters	Used to set and change network parameters.	440
I:Display Error History	Used to read and clear the error history.	441

SYSMAC BUS/2 Master Unit Menu

Operation	Function	Page
S:Display Status	Used to display the contents of the remote status area and terminator information.	445
T:Test	Used to test the transfer path between the Master and Slaves.	446
C:Read Cycle Time	Used to read and initialize the Master communication cycle time.	447
R:Slave Connection Status	Used to display the participation status, operating status, application error status, and transmission error status for Slaves. Used to control Slave participation in communications.	448
L:Switch Line Mode	Used to select the line mode for Optical Masters.	450

Appendix I
Correcting Converted Programs

This appendix describes the methods for correcting instructions converted from C2000H-family programs to CVM1 programs.

Correcting Instructions from C1000H/C2000H Programs

This section describes the procedures for correcting instructions when C1000H or C2000H programs are converted to CVM1 programs.

JMP(04)/JME(05)

- JMP(04) is converted to JMP(004).
- JME(05) is converted to JMP(005).

Differences
There is no need to correct the program itself, but the PC Setup must be set to allow multiple use of JMP000 if they are used in the program.

Correction Procedure
Confirm that multiple use of JMP000 is set to enabled in the execution control 2 part of the PC Setup.

INT(89) and Related Subroutines

- INT(89) is converted to MSKS(153), CLI(154), or MSKR(155).
- SBN(92) is converted to SBN(150).
- RET(93) is converted to RET(152).

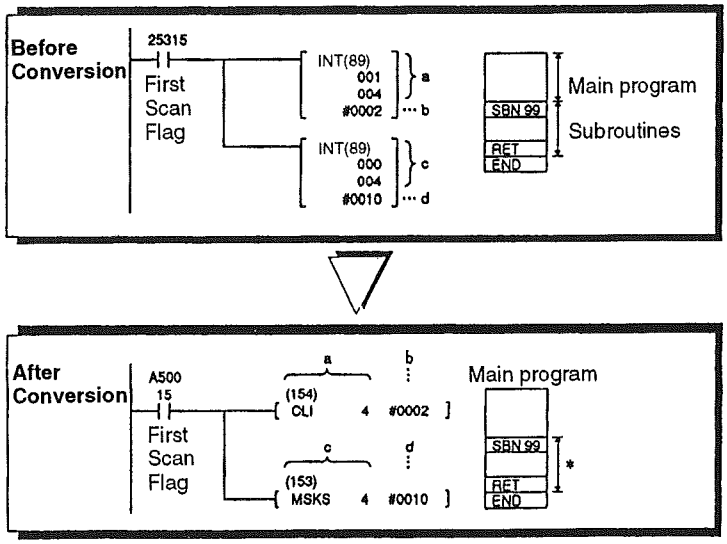
⚠**Caution** Although C1000H/C2000H interrupts are held when disabled for execution after being enabled, CVM1 interrupts are not held and therefore not executed even after interrupts are enabled again.

Scheduled Interrupt Programs

INT(89) is used for scheduled interrupts when the first operand is 000 or 001 and the second operand is 004.

Differences
CVM1 PCs store scheduled interrupts in a separate area from the main program. When INT(89) is being used to create a scheduled interrupt, it must be moved to this special area.

Conversion



Correction Procedure

1, 2, 3...

1. In offline operation, select "Save part" from the "Save program" operation on the Programming Menu.
2. Specify the scheduled interrupt subroutine (the part indicated with the asterisk in the converted program) and save it in a file.
3. Specify the "Edit ladder" operation on the Programming Menu.
4. Delete the interrupt subroutine (the part indicated with the asterisk in the converted program).
5. Store the remaining main program.
6. Select the "Edit interrupt program" operation from the Programming Menu, select the schedule interrupt (cyclic interrupt), and specify a interrupt number of 0.
7. Use the"Add retrieve" option under the "Retrieve program" operation on the Programming Menu to retrieve the scheduled interrupt subroutine from the file you saved it in.
8. Specify the "Edit ladder" operation on the Programming Menu.
9. Delete SBN and RET from the scheduled interrupt program.
10. Write END(001) at the end of the scheduled interrupt program. (There must also be an END(001) at the end of the main program.)
11. Store the scheduled interrupt program.
12. In online operations set the PC Setup for a scheduled interrupt time of 10.0 ms.
13. Restart the CVM1 PC.

Reading the Scheduled Interrupt Time

INT(89) is used to read the scheduled interrupt time when the first operand is 002 and the second operand is 004.

Differences

The unit for setting the scheduled interrupt time can be changed in the PC Setup for CVM1 PCs whereas a fixed unit is used for C-series PCs. The unit is thus set to 10 ms. There is no need to correct the program.

Correction Procedure

1, 2, 3...

1. In online operation, set the scheduled interrupt time in the PC Setup to 10.0 ms.
2. Restart the PC if the PC Setup was changed.

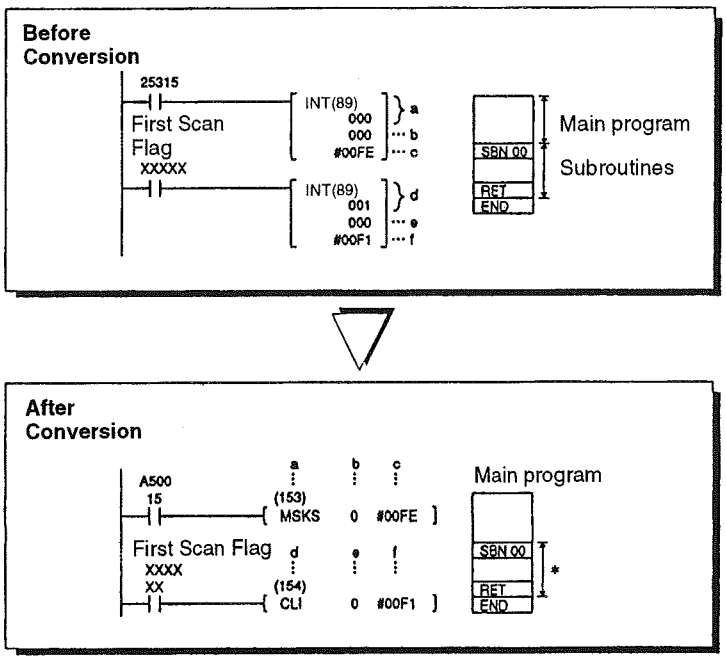
I/O Interrupts

INT(89) is used for I/O interrupts when the first operand is 000 to 002 and the second operand is 000 to 003.

Differences

CVM1 PCs store I/O interrupts in a separate area from the main program. When INT(89) is being used to create an I/O interrupt, it must be moved to this special area.

Conversion



Correction Procedure

1, 2, 3...

1. In offline operation, select "Save part" from the "Save program" operation on the Programming Menu.
2. Specify the I/O interrupt subroutine (the part indicated with the asterisk in the converted program) and save it in a file.
3. Specify the "Edit ladder" operation on the Programming Menu.
4. Delete the interrupt subroutine (the part indicated with the asterisk in the converted program).
5. Store the remaining main program.
6. Select the "Edit interrupt program" operation from the Programming Menu, select the I/O interrupt, and specify the same interrupt number as was used before.
7. Use the"Add retrieve" option under the "Retrieve program" operation on the Programming Menu to retrieve the interrupt subroutine from the file you saved it in.
8. Specify the "Edit ladder" operation on the Programming Menu.
9. Delete SBN and RET from the I/O interrupt program.
10. Write END(001) at the end of the I/O interrupt program. (There must also be an END(001) at the end of the main program.)
11. Store the I/O interrupt program.
12. In online operations set the PC Setup to specify the priority of I/O interrupts under the execution control 2 parameters.
13. Restart the CVM1 PC.

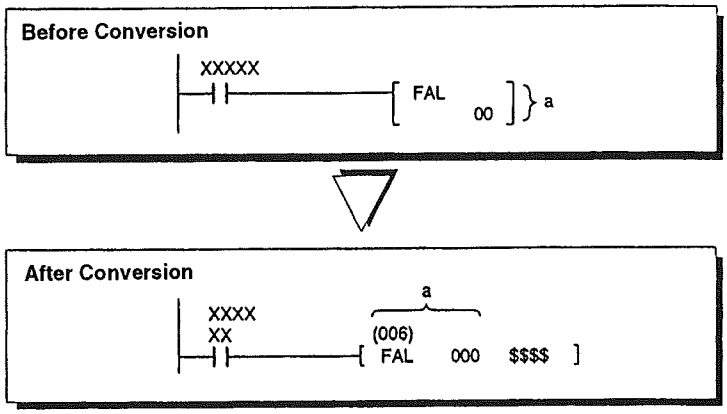
FAL(06), MSG(46), and WDT(94)

- FAL(06) is converted to FAL(006).
- MSG(46) is converted to MSG(195).
- WDT(94) is converted to WDT(178).

FAL00: Clearing FAL Numbers

Differences
The FAL number being cleared must be specified for CVM1 PCs.

Conversion

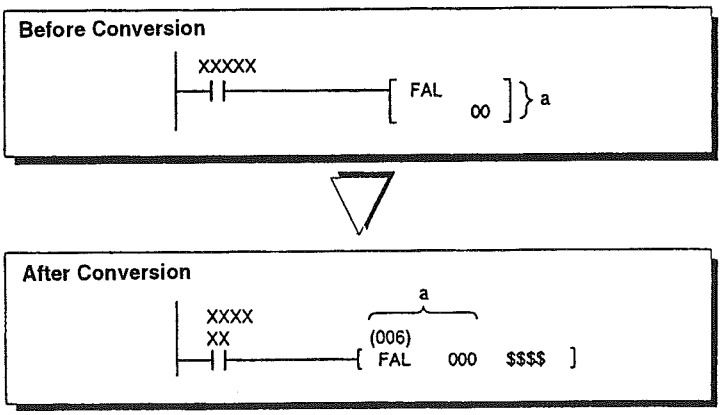


Correction Procedure
Replace $$$$ with the FAL number being cleared.

FAL: Clearing Messages

Differences
With CVM1 PCs, messages are cleared using MSG(195). The message number in the System Setup must be set to 0.

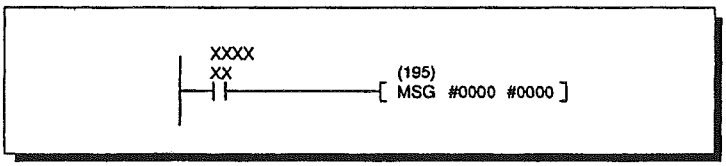
Conversion



Correction Procedure

1, 2, 3...

1. Replace FAL(006) with MSG(195) as shown in the following illustration using #0000 for the first operand. The second operand can be set to any constant.



2. In online operation, set the message number in the System Setup to 0.

MSG(46)

Differences

Although C1000H/C2000H messages only using 16 characters (8 words), CVM1 messages use 32 characters (16 words). The extra words must be allowed for and the message number in the System Setup must be changed to 0. No corrections are needed to the program itself.

Correction Procedure

1, 2, 3...

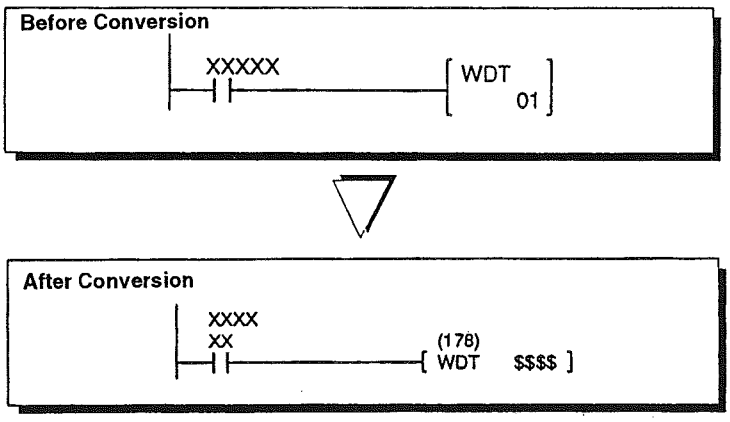
1. In online operation, set the message number in the System Setup to 0.
2. Check to be sure that the 16 words accessed by MSG(195) (starting from the word specified by the second operand) are not being used for anything else. If any of the words are being used for something else, change the operands as required.

WDT(94)

Differences

Although the time for the instruction is set in units of 100 ms for the C1000H/C2000H, the time is set in units of 10 ms for the CVM1. The operand will thus need changed.

Conversion



Correction Procedure

Set the time in the first operand of WDT(178) taking into consideration the scan monitor time set in the PC Setup.

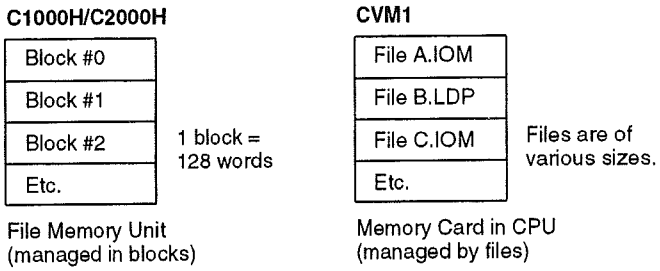
Note CVM1 timers will operate correctly even if the scan time exceeds 100 ms. This eliminates the need to use TIM instructions especially to prevent faulty operation.

File Memory Instructions

- FILR(42) is converted to FILR(180).
- FILW(43) is converted to FILW(181).
- FILP(44) is converted to FILP(182).

Differences

For the C1000H/C2000H, blocks of data are stored in the File Memory Unit, whereas for CVM1 PCs, files are stored in Memory Cards inserted into the CPU.

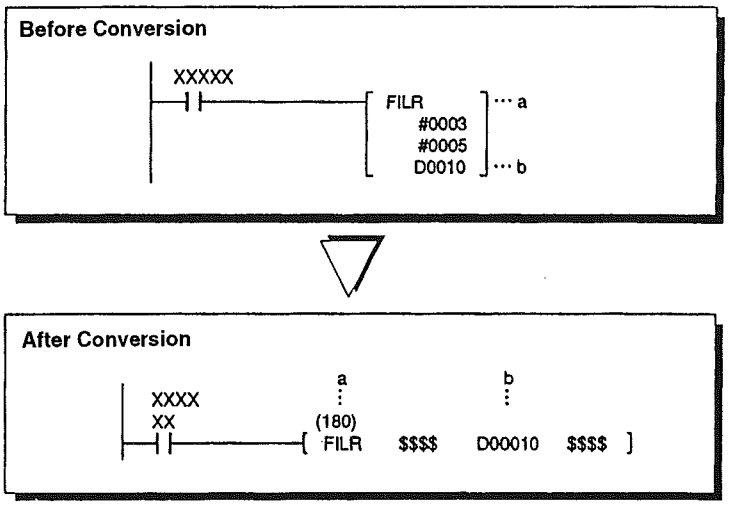


FILR(42)

Differences

FILR operands differ between the C1000H/C2000H and the CVM1. The operands need corrected in the CVM1 program. The following description assumes that the data to be read is already prepared on the Memory Card.

Conversion



Correction Procedure

1, 2, 3...

1. Specify the number of words to be read in the first operand of FILR(180) and the beginning word of the control words in the third operand.
2. Place the control data in the six words starting from the word specified above for the third operand. In the following table, C is the first control word. The file name (in ASCII) is "ABC."

Word	Contents	Function
C	00 00	Bit 4: Offset Enable Bit (ON: offset enabled, OFF: offset disabled)
C+1	41 42	First and second characters in file name = A B
C+2	43 20	Third and fourth characters in file name = C (space)
C+3	20 20	Fifth and sixth characters in file name = (spaces)
C+4	20 20	Seventh and eighth characters in file name = (spaces)
C+5	00 00	Offset from beginning of file (0000 to 9999, BCD)

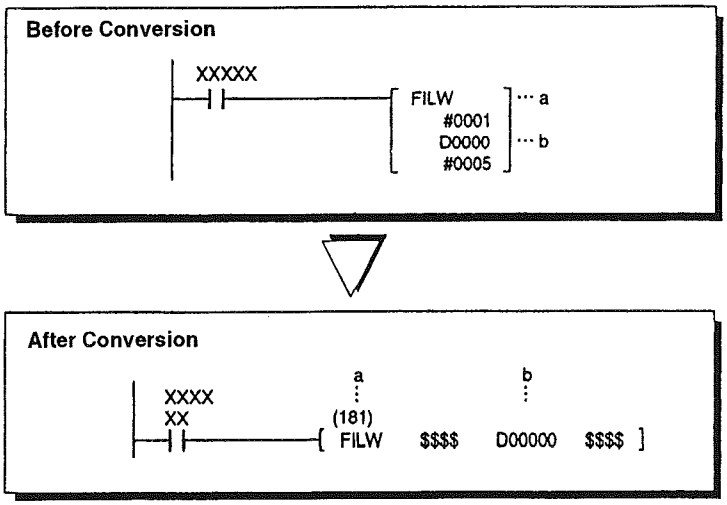
Note The offset can be used to read data from the middle of the file. Refer to the *SYSMAC CV-series PC Operation Manual: Ladder Diagrams* for details.

FILW(43)

Differences

FILR operands differ between the C1000H/C2000H and the CVM1. The operands need corrected in the CVM1 program.

Conversion



Correction Procedure

1, 2, 3...

1. Specify the number of words to be written in the first operand of FILW(181) and the beginning word of the control words in the third operand.
2. Place the control data in the six words starting from the word specified above for the third operand. In the following table, C is the first control word. The file name (in ASCII) is "ABC."

Word	Contents	Function
C	00 80	Bit 4: Offset Enable Bit (ON: offset enabled, OFF: offset disabled)
C+1	41 42	First and second characters in file name = A B
C+2	43 20	Third and fourth characters in file name = C (space)
C+3	20 20	Fifth and sixth characters in file name = (spaces)
C+4	20 20	Seventh and eighth characters in file name = (spaces)
C+5	00 00	Offset from beginning of file (0000 to 9999, BCD)

Note The offset can be used to write data to the middle or end of the file. Refer to the *SYSMAC CV-series PC Operation Manual: Ladder Diagrams* for details.

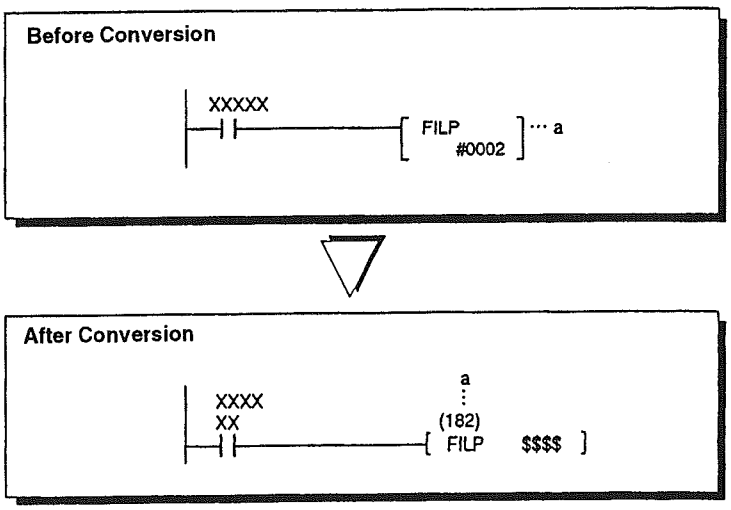
FILP(44)

Differences

FILP operands differ between the C1000H/C2000H and the CVM1. The operands need corrected in the CVM1 program. The program being read must also be converted to a CVM1 program are written to a Memory Card.

⚠Caution With CVM1 PCs, the program being read must not exceed the capacity of the program being replaced, i.e., from FILP(182) to the END(001). Execution will not be possible if this capacity is exceeded.

Conversion



Correction Procedure

1, 2, 3...

1. Specify the beginning word of the control words in the operand.
2. Place the control data in the five words starting from the word specified above for the third operand. In the following table, C is the first control word. The file name (in ASCII) is "ABC."

Word	Contents	Function
C	00 80	Bit 07: Write Method Bit (ON: overwrite, OFF: replace to END(001))
C+1	41 42	First and second characters in file name = A B
C+2	43 20	Third and fourth characters in file name = C (space)
C+3	20 20	Fifth and sixth characters in file name = (spaces)
C+4	20 20	Seventh and eighth characters in file name = (spaces)

Instructions for Special I/O Units

- READ(88) is converted to READ(190).
- WRIT(87) is converted to WRIT(191).

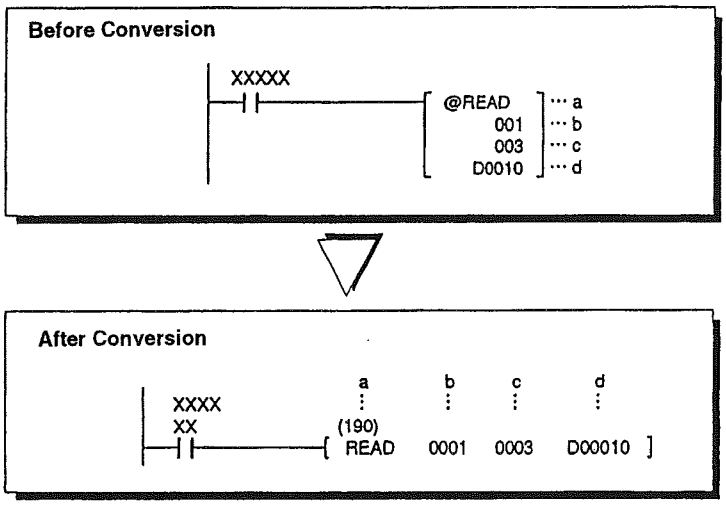
@READ(88)

Differences

CVM1 PCs do not support differentiated I/O READ instructions. Thus a differentiated input condition must thus be used.

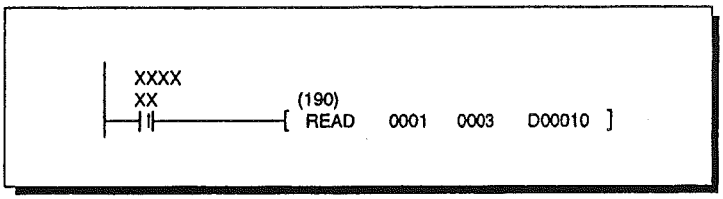
⚠Caution With the CVM1 program, the Special I/O Unit may not be read if it is busy when the first read is attempted.

Conversion



Correction Procedure

Change the input condition for READ(190) to an upwardly differentiated condition as shown in the following example.



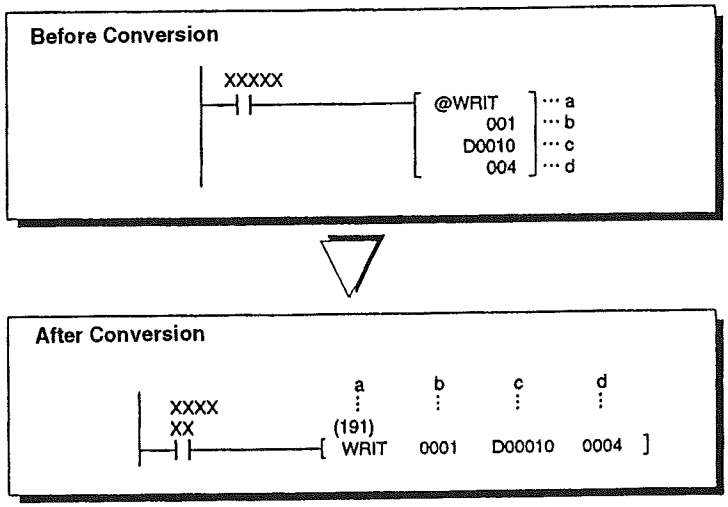
@WRIT(87)

Differences

CVM1 PCs do not support differentiated I/O WRITE instructions. Thus a differentiated input condition must thus be used.

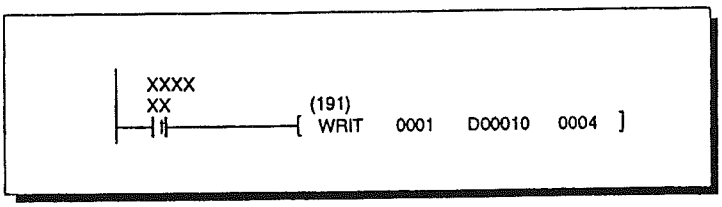
⚠ **Caution** With the CVM1 program, the Special I/O Unit may not be written if it is busy when the first write is attempted.

Conversion



Correction Procedure

Change the input condition for WRIT(191) to an upwardly differentiated condition as shown in the following example.



Instructions for SYSMAC NET and SYSMAC LINK Systems

- SEND(90) is converted to SEND(192).
- RECV(98) is converted to RECV(193).

SEND(90)

Differences

Control data settings are different for the C1000H/C2000H and the CVM1. Correct the control data for the CVM1. No corrections are required to the program itself.

Correction Procedure

Change the control words as follows for the CVM1.

Note The CVM1 requires two more control words than the C1000H/C2000H. Check to be sure that the additional two words are not being used for anything else and change operands if necessary to provide the required number of words.

SYSMAC NET

Word	Bits 08 to 15	Bits 00 to 07
C	Number of words (1 to 0990 in 4-digit hexadecimal, i.e., $0001 to $03DE)	
C+1	Bits 08 to 11: Interrupt number ($0 to $F) Bits 12 to 15: Set to 0.	Destination network address (0 to 127, i.e., $00 to $7F)
C+2	Destination node number 0 to 126 ($00 to $7E)	Destination unit address $00 to $FF
C+3	Bits 08 to 11: Transmission port number ($0 to $7) Bit 12 to 14: Set to 0. Bit 15: ON: No response. OFF: Response returned.	Bits 00 to 03: No. of retries (0 to 15 in hexadecimal, i.e., $0 to $F) Bits 04 to 07: Set to 0.
C+4	Response monitoring time ($0001 to $FFFF = 0.1 to 6653.5 seconds; $0000 = 2 s)	

SYSMAC LINK

Word	Bits 08 to 15	Bits 00 to 07
C	Number of words (1 to 256 in 4-digit hexadecimal, i.e., $0001 to $0100)	
C+1	Bits 08 to 11: Interrupt number ($0 to $F) Bits 12 to 15: Set to 0.	Destination network address (0 to 127, i.e., $00 to $7F)
C+2	Destination node number 0 to 62 ($00 to $3E)	Destination unit address $00 to $FF
C+3	Bits 08 to 11: Transmission port number ($0 to $7) Bit 12 to 14: Set to 0. Bit 15: ON: No response. OFF: Response returned.	Bits 00 to 03: No. of retries (0 to 15 in hexadecimal, i.e., $0 to $F) Bits 04 to 07: Set to 0.
C+4	Response monitoring time ($0001 to $FFFF = 0.1 to 6653.5 seconds; $0000 = 2 s)	

Note Refer to the relevant operation manuals for details.

RECV(98)

Differences

Control data settings are different for the C1000H/C2000H and the CVM1. Correct the control data for the CVM1. No corrections are required to the program itself.

Correction Procedure

Change the control words as follows for the CVM1.

Note The CVM1 requires two more control words than the C1000H/C2000H. Check to be sure that the additional two words are not being used for anything else and change operands if necessary to provide the required number of words.

SYSMAC NET

Word	Bits 08 to 15	Bits 00 to 07
C	Number of words (1 to 0990 in 4-digit hexadecimal, i.e., $0001 to $03DE)	
C+1	Bits 08 to 11: Interrupt number ($0 to $F) Bits 12 to 15: Set to 0.	Source network address (0 to 127, i.e., $00 to $7F)
C+2	Source node number 0 to 126 ($00 to $7E)	Source unit address $00 to $FF
C+3	Bits 08 to 11: Transmission port number ($0 to $7) Bit 12 to 14: Set to 0. Bit 15: ON: No response. OFF: Response returned.	Bits 00 to 03: No. of retries (0 to 15 in hexadecimal, i.e., $0 to $F) Bits 04 to 07: Set to 0.
C+4	Response monitoring time ($0001 to $FFFF = 0.1 to 6653.5 seconds; $0000 = 2 s)	

SYSMAC LINK

Word	Bits 08 to 15	Bits 00 to 07
C	Number of words (1 to 256 in 4-digit hexadecimal, i.e., $0001 to $0100)	
C+1	Bits 08 to 11: Interrupt number ($0 to $F) Bits 12 to 15: Set to 0.	Source network address (0 to 127, i.e., $00 to $7F)
C+2	Source node number 0 to 62 ($00 to $3E)	Source unit address $00 to $FF
C+3	Bits 08 to 11: Transmission port number ($0 to $7) Bit 12 to 14: Set to 0. Bit 15: ON: No response. OFF: Response returned.	Bits 00 to 03: No. of retries (0 to 15 in hexadecimal, i.e., $0 to $F) Bits 04 to 07: Set to 0.
C+4	Response monitoring time ($0001 to $FFFF = 0.1 to 6653.5 seconds; $0000 = 2 s)	

Note Refer to the relevant operation manuals for details.

CMP(20) and CMPL(21)

- CMP(20) is converted to CMP(028).
- CMPL(21) is converted to CMP(029).

Differences

The above conversions will produce the same operation as the C1000H/C2000H program. These instructions can, however, be changed to the CMP(020) and CMPL(021) instructions if desired. Refer to the *SYSMAC CV-series PC Operation Manual: Ladder Diagrams* for details.

Correcting Instructions from C200HS Programs

This section describes the procedures for correcting instructions when C1000H or C2000H programs are converted to CVM1 programs. Refer to *Page 489, Correcting Instructions from C1000H/C2000H Programs* for any C200HS instructions also supported by the C200HS.

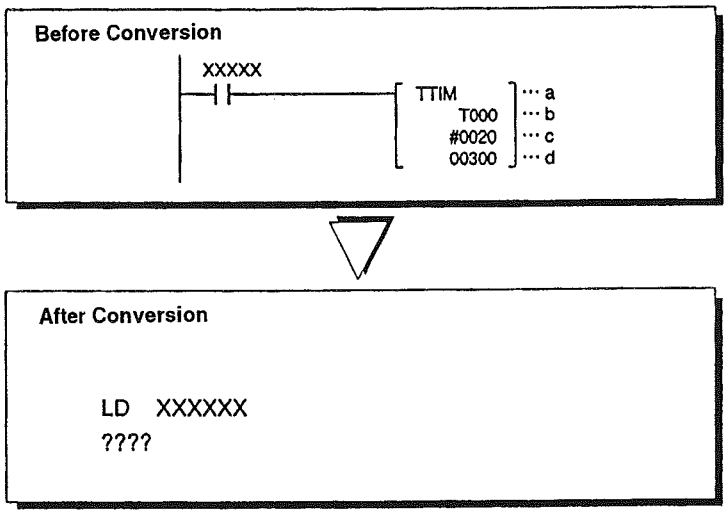
TTIM (Expansion Instruction 87)

TTIM(87) is converted to ????.

Differences

The ladder structure for the CVM1 TTIM(120) instruction differs from the C200HS TTIM(87) instruction. The ladder diagram must be corrected for the CVM1.

Conversion



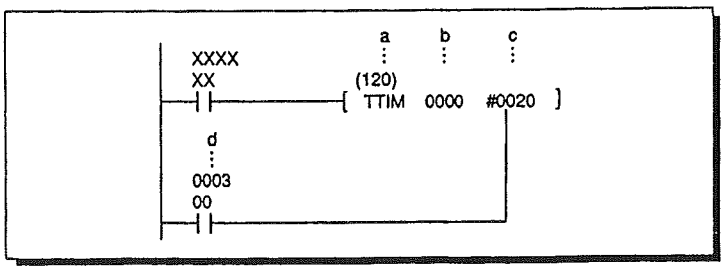
Correction Procedure

1, 2, 3...

1. Change the program as shown below in mnemonic form.

```
LD XXXXXX
LD 000300          ←Replace "????" with a LD for the reset input.
TTIM(120) 0000     ←Insert TTIM(120) and specify the timer number.
          #0020    ←Input the timer's set value.
```

2. Switch the display mode to ladder diagram. The program should appear as follows:



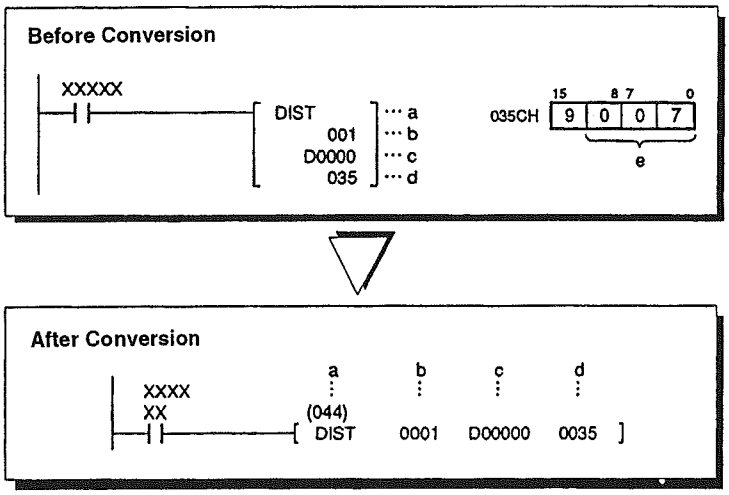
DIST(80): Pushing onto Stacks

DIST(80) is converted to DIST(044).

Differences

Different instructions are used to push data onto stacks for the C200HS and the CVM1. If DIST(80) was being used to push data onto a stack, change the instruction for the CVM1.

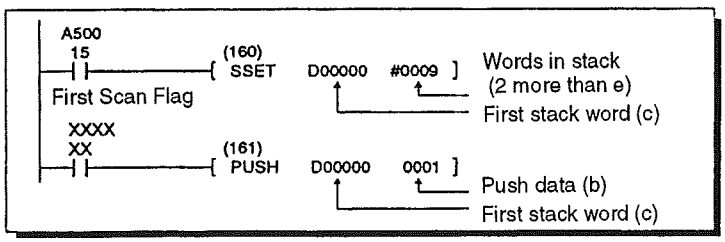
Conversion



Correction Procedure

1, 2, 3...

1. Create a stack using SSET(160). Create the same length of stack as was designated in the control data for DIST(80). Refer to the *SYSMAC CV-series PC Operation Manual: Ladder Diagrams* for details on operands.
2. Replace DIST(044) with PUSH(161) to push onto the stack, specifying the first word of the stack and the data to be pushed. The finished program should appear as follows:



Note As shown above, the same size of stack requires two more words in the CVM1. Check to be sure that the additional two words are not being used for anything else and change operands if necessary to provide the required number of words.

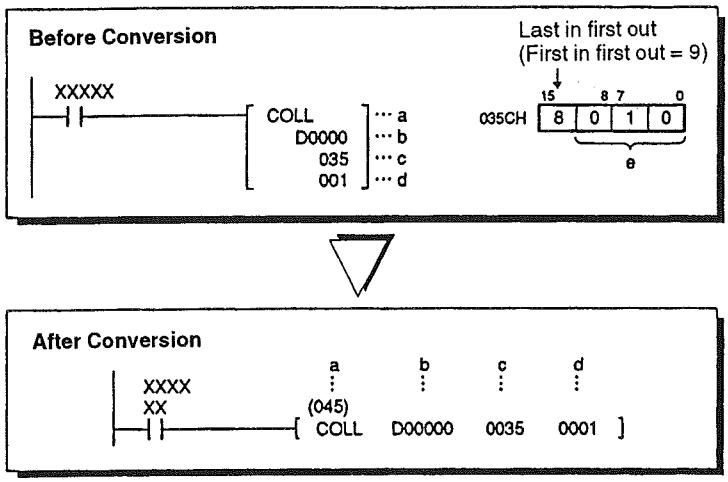
COLL(81): Popping from Stacks

COLL(81) is converted to COLL(045).

Differences

Different instructions are used to pop data from stacks for the C200HS and the CVM1. If COLL(81) was being used to pop data from a stack, change the instruction for the CVM1.

Conversion

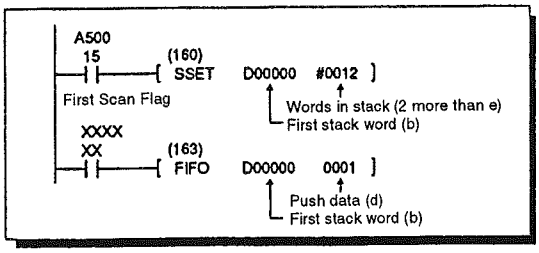


Correction Procedure

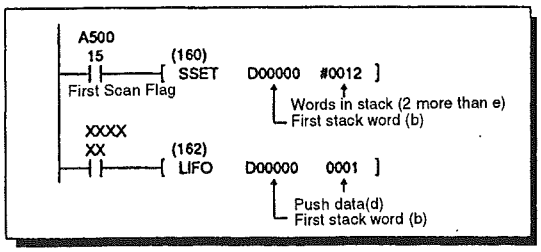
1, 2, 3...

1. Create a stack using SSET(160). Create the same length of stack as was designated in the control data for COLL(81). Refer to the *SYSMAC CV-series PC Operation Manual: Ladder Diagrams* for details on operands.
2. Replace COLL(045) with LIFO(162) or FIFO(163) to pop from the stack, depending on the desired operation, and specify the first word of the stack and the data to be pushed. LIFO(162) pops last in first out and FIFO(163) pops first in first out. The finished program should appear as follows:

First In First Out



Last In First Out



Note As shown above, the same size of stack requires two more words in the CVM1. Check to be sure that the additional two words are not being used for anything else and change operands if necessary to provide the required number of words.

NEG and NEGL

- NEG is converted to NEG(104).
- NEGL is converted to NEGL(105).

NEG

The Underflow Flag will turn ON when the conversion data is #8000 for the C200HS, but the CVM1 Underflow Flag (A50010) will not turn on for #8000. Correct the program as required to ensure that #8000 is processed the same way as before.

NEGL

The Underflow Flag will turn ON when the conversion data is #80000000 for the C200HS, but the CVM1 Underflow Flag (A50010) will not turn on for #80000000. Correct the program as required to ensure that #80000000 is processed the same way as before.

PID (Expansion Instruction)

PID is converted to PID(270).

Differences

The PID parameters differ between the C200HS and the CVM1. Correct the parameters for the CVM1. No corrections are required to the program itself.

Correction Procedure

Set the PID parameters as shown in the following table. C is the first PID parameter word.

Note The CVM1 requires six more words for PID parameters than the C200HS. Check to be sure that the additional six words are not being used for anything else and change operands if necessary to provide the required number of words.

Word	Bits															
	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
C	Set value, $0000 to $FFFF															
C+1	Proportional band, 0001 to 9999 BCD															
C+2	Integral constant, 0001 to 8191 or 9990 BCD															
C+3	Derivative constant, 0000 to 8191 BCD															
C+4	Sampling frequency, 0001 to 9999 BCD															
C+5	2-PID parameter, 000 or 100 to 199 BCD												Forward or reverse control, 0 or 1 BCD			
C+6	Output limit enable, 0 or 1 BCD				Input range, 0 to 8 BCD				1				Output range, 0 to 8 BCD			
C+7	Output lower limit, $0000 to $FFFF															
C+8	Output upper limit, $0000 to $FFFF															
C+9 to C+ 38	Work area															

Refer to the *SYSMAC CV-series PC Operation Manual: Ladder Diagrams* for details. (Among the differences, the unit for setting the sampling time is 100 ms for the C200HS and 10 ms for the CVM1.

INT (Expansion Instruction 89) and Related Subroutines

- INT is converted to MSKS(153), CLI(154), or MSKR(155).
- SBN(92) is converted to SBN(150).
- RET(93) is converted to RET(152).

⚠ **Caution** Although C200HS interrupts are held when disabled for execution after being enabled, CVM1 interrupts are not held and therefore not executed even after interrupts are enabled again.

Scheduled Interrupt Programs

INT is used for scheduled interrupts when the first operand is 000 or 001 and the second operand is 004.

Differences

CVM1 PCs store scheduled interrupts in a separate area from the main program. When INT(89) is being used to create a scheduled interrupt, it must be moved to this special area.

Correction Procedure
The conversion method is the same as the one used when converting from C1000H/C2000H programs. Refer to page 489 for details.

Reading the Scheduled Interrupt Time

INT(89) is used to read the scheduled interrupt time when the first operand is 002 and the second operand is 004.

Differences
The unit for setting the scheduled interrupt time may not be the same before and after conversion. There is no need to correct the program.

Correction Procedure

1, 2, 3...

1. In online operation, set the scheduled interrupt time in the PC Setup to to the same as it was before.
2. Restart the PC if the PC Setup was changed.

I/O Interrupts

INT(89) is used for I/O interrupts when the first operand is 000 to 002 and the second operand is 000.

Differences
CVM1 PCs store I/O interrupts in a separate area from the main program. When INT(89) is being used to create an I/O interrupt, it must be moved to this special area.

Correction Procedure
The conversion method is the same as the one used when converting from C1000H/C2000H programs. Refer to page 489 for details.

Masking or Unmasking All Interrupts

INT(89) is used to mask all interrupts when the first operand is 100 to unmask all operands when the first operand is 200. With CVM1 PCs, the program must be corrected to use one MSKS(153) instruction to mask or unmask each interrupt individually. Refer to the *SYSMAC CV-series PC Operation Manual: Ladder Diagrams* for details.

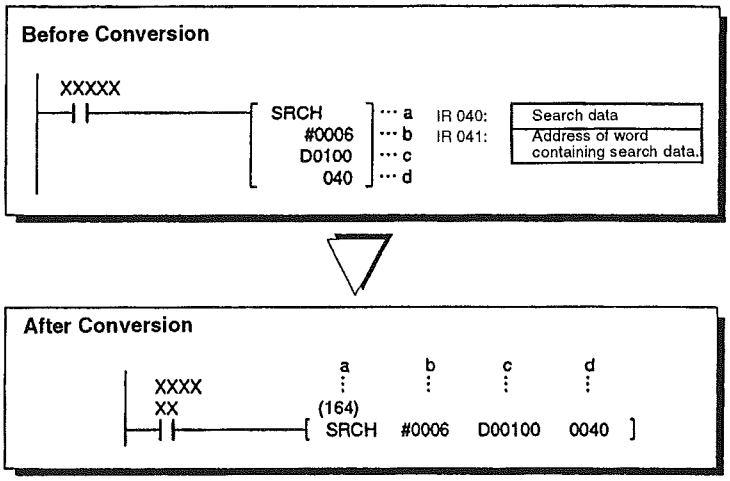
SRCH (Expansion Instruction)

SRCH is converted to SRCH(164).

Searching Tables in DM Area

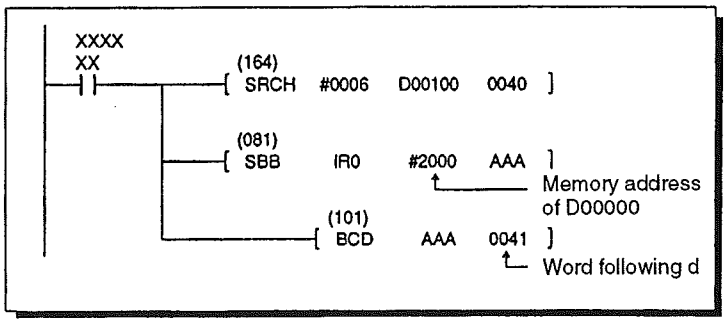
Differences
The methods for storing words containing the search data differ for C200HS and CVM1 instructions. The CVM1 program will need modified accordingly. The C200HS stores the DM address of a word containing the search data as 4 digits of BCD in the next word after the word containing the search data. The CVM1 stores the memory address in index register IR0.

Conversion



Correction Procedure

The program can be corrected to store the results in the same place as for C200HS programs by inserting SBB (binary subtraction) to convert to a hexadecimal word address and then converting it to BCD using the BCD instruction. In the following example, it is assumed that an otherwise unused word is used for AAA.

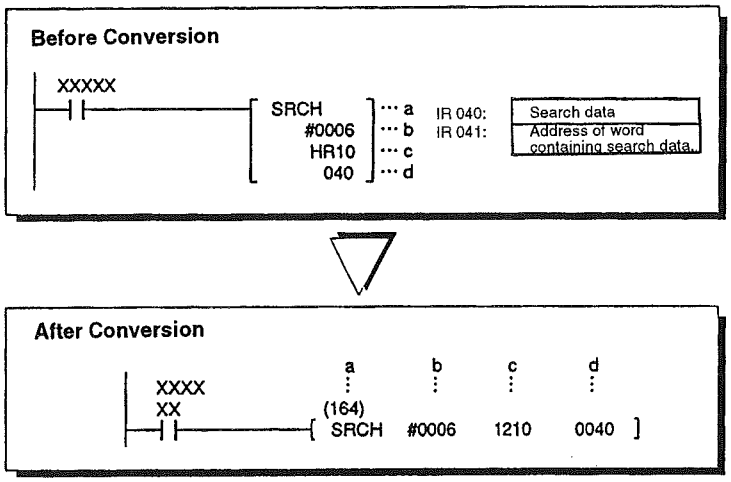


Searching Tables in Areas Other Than the DM Area

Differences

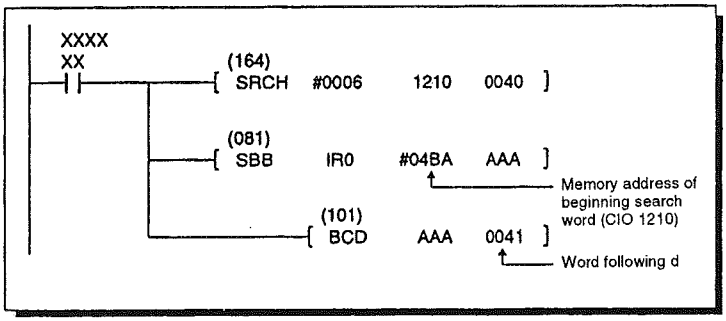
The methods for storing words containing the search data differ for C200HS and CVM1 instructions. The CVM1 program will need modified accordingly. The C200HS stores the address of a word containing the search data as 4 digits of BCD in the next word after the word containing the search data. The CVM1 stores the memory address in index register IR0. When the search table is in any area other than the DM Area, the C200HS stores the address as an absolute address using the beginning search word address as address 0.

Conversion



Correction Procedure

The program can be corrected to store the results in the same place as for C200HS programs by inserting SBB (binary subtraction) to convert to a hexadecimal word address and then converting it to BCD using the BCD instruction. In the following example, it is assumed that an otherwise unused word is used for AAA.



MAX and MIN (Expansion Instructions): Outputting Search Results

- MAX is converted to MAX(165).
- MIN is converted to MIN(166).

The methods for storing words containing the maximum or minimum value differ for C200HS and CVM1 instructions. The CVM1 program will need modified accordingly. The C200HS stores the address of a word containing maximum or minimum value as 4 digits of BCD in the next word after the word containing the search data. The CVM1 stores the memory address in index register IR0. The form of the address of the word containing the maximum or minimum value differ for the DM Area and other areas, just as it does for the SRCH instruction.

Refer to page 505 and correct in the same fashion as for the SRCH instruction.

SUM (Expansion Instruction)

SUM is converted to SUM(167) or ???? (for byte calculations).

Although byte calculations are possible with the C200HS, the CVM1 handles only word calculations. Thus SUM will be converted as ???? if byte calculations are being used. The program will need to be modified to use word calculations.

If the C200HS program uses word calculations, SUM will be converted to SUM(167) and no corrections will be required to the program.

FPD (Expansion Instruction)

Conversion will not be possible if a word address has been used to specify the control data. Adjust the program to use a constant for the control data. Refer to the *SYSMAC CV-series PC Operation Manual: Ladder Diagrams* for details.

Instructions for SYSMAC NET and SYSMAC LINK Systems

- SEND(90) is converted to SEND(192).
- RECV(98) is converted to RECV(193).

SEND(90)

Differences

Control data settings are different for the C200HS and the CVM1. Correct the control data for the CVM1. No corrections are required to the program itself.

Correction Procedure

Change the control words as follows for the CVM1.

Note The CVM1 requires two more control words than the C200HS. Check to be sure that the additional two words are not being used for anything else and change operands if necessary to provide the required number of words.

SYSMAC NET

Word	Bits 08 to 15	Bits 00 to 07
C	Number of words (1 to 0990 in 4-digit hexadecimal, i.e., $0001 to $03DE)	
C+1	Bits 08 to 11: Interrupt number ($0 to $F) Bits 12 to 15: Set to 0.	Destination network address (0 to 127, i.e., $00 to $7F)
C+2	Destination node number 0 to 126 ($00 to $7E)	Destination unit address $00 to $FF
C+3	Bits 08 to 11: Transmission port number ($0 to $7) Bit 12 to 14: Set to 0. Bit 15: ON: No response. OFF: Response returned.	Bits 00 to 03: No. of retries (0 to 15 in hexadecimal, i.e., $0 to $F) Bits 04 to 07: Set to 0.
C+4	Response monitoring time ($0001 to $FFFF = 0.1 to 6653.5 seconds; $0000 = 2 s)	

SYSMAC LINK

Word	Bits 08 to 15	Bits 00 to 07
C	Number of words (1 to 256 in 4-digit hexadecimal, i.e., $0001 to $0100)	
C+1	Bits 08 to 11: Interrupt number ($0 to $F) Bits 12 to 15: Set to 0.	Destination network address (0 to 127, i.e., $00 to $7F)
C+2	Destination node number 0 to 62 ($00 to $3E)	Destination unit address $00 to $FF
C+3	Bits 08 to 11: Transmission port number ($0 to $7) Bit 12 to 14: Set to 0. Bit 15: ON: No response. OFF: Response returned.	Bits 00 to 03: No. of retries (0 to 15 in hexadecimal, i.e., $0 to $F) Bits 04 to 07: Set to 0.
C+4	Response monitoring time ($0001 to $FFFF = 0.1 to 6653.5 seconds; $0000 = 2 s)	

Note Refer to the relevant operation manuals for details.

RECV(98)

Differences

Control data settings are different for the C200HS and the CVM1. Correct the control data for the CVM1. No corrections are required to the program itself.

Correction Procedure
Change the control words as follows for the CVM1.

Note The CVM1 requires two more control words than the C200HS. Check to be sure that the additional two words are not being used for anything else and change operands if necessary to provide the required number of words.

SYSMAC NET

Word	Bits 08 to 15	Bits 00 to 07
C	Number of words (1 to 0990 in 4-digit hexadecimal, i.e., $0001 to $03DE)	
C+1	Bits 08 to 11: Interrupt number ($0 to $F) Bits 12 to 15: Set to 0.	Source network address (0 to 127, i.e., $00 to $7F)
C+2	Source node number 0 to 126 ($00 to $7E)	Source unit address $00 to $FF
C+3	Bits 08 to 11: Transmission port number ($0 to $7) Bit 12 to 14: Set to 0. Bit 15: ON: No response. OFF: Response returned.	Bits 00 to 03: No. of retries (0 to 15 in hexadecimal, i.e., $0 to $F) Bits 04 to 07: Set to 0.
C+4	Response monitoring time ($0001 to $FFFF = 0.1 to 6653.5 seconds; $0000 = 2 s)	

SYSMAC LINK

Word	Bits 08 to 15	Bits 00 to 07
C	Number of words (1 to 256 in 4-digit hexadecimal, i.e., $0001 to $0100)	
C+1	Bits 08 to 11: Interrupt number ($0 to $F) Bits 12 to 15: Set to 0.	Source network address (0 to 127, i.e., $00 to $7F)
C+2	Source node number 0 to 62 ($00 to $3E)	Source unit address $00 to $FF
C+3	Bits 08 to 11: Transmission port number ($0 to $7) Bit 12 to 14: Set to 0. Bit 15: ON: No response. OFF: Response returned.	Bits 00 to 03: No. of retries (0 to 15 in hexadecimal, i.e., $0 to $F) Bits 04 to 07: Set to 0.
C+4	Response monitoring time ($0001 to $FFFF = 0.1 to 6653.5 seconds; $0000 = 2 s)	

Note Refer to the relevant operation manuals for details.

Changes in Mnemonic Displays

The mnemonics displayed for the following operations will change as shown, but the operations of the instructions will remain the same.

MBS	to	* (420)
MBSL	to	*L(421)
DBS	to	/ (430)
DBSL	to	/L (431)

Unconvertible Instructions

The following expansion instructions do not have CVM1 equivalents and thus cannot be converted.

SCAN, ZCP, ZCPL, SCL, AVG, FCS, MPRF, DSW, TKY, HKY, 7SEG, RXD, TXD, MTR, XDMR, TERM, LMSG

Correcting Operands from C1000H/C2000H Programs

This section describes the procedures for correcting bit and word addresses for operands when C1000H or C2000H programs are converted to CVM1 programs.

Precautions

- Only bits in the AR and SR Areas for which there are bits in the CVM1 with corresponding functions are converted. All other bits are not converted.
- Only words and bits for Special I/O Units and Link Units for which there are words or bits in the CVM1 with corresponding functions are converted. All other bits and words are not converted.
- Any data areas that cannot be converted due to differences in the PCs should be changed globally to convertible form in the C1000H/C2000H program before conversion to a CVM1 program.
- Refer to the three notes following the next table.

Conversions

The following table shows the CVM1 words to which C1000H/C2000H words are converted. All bit addresses within these words are also converted.

Area	C1000H/C2000H	CVM1
Internal Relay Area	IR 000 to IR 127	CIO 0000 to CIO 0127
Internal Relay Area	IR 128 to IR 236	CIO 0128 to CIO 0236
Special Relay Area	SR 237 to SR 255	Refer to SR Area conversion tables.
Temporary Relay Area	TR 00 to TR 07	TR0 to TR7
Holding Relay Area	HR 00 to HR 99	CIO 1200 to CIO 1299
Auxiliary Relay Area	AR 00 to AR 27	Refer to AR Area conversion tables.
Link Relay Area	LR 00 to LR 63	CIO 1000 to CIO 1063
Timer/Counter Area	TC 000 to TC 511	T0000 to T0511 and C0000 to C0511
Data Memory Area	DM 0000 to DM 6655	D00000 to D06655

Note

1. Use the SSS Change Address operation under the Programming Menu to change all words used for Remote I/O Slaves and Optical I/O Units to the corresponding words between CIO 2300 and CIO 2555.
2. Use the SSS Change Address operation under the Programming Menu to change all words between IR 237 and IR 245 as well as words between IR 247 and IR 251 to words CIO 1900 or later.
3. Use the SSS Change Address operation under the Programming Menu to change all words between AR 07 and AR 17 as well as words between AR 19 and AR 21 to words between CIO 1307 and CIO 1317 and CIO 1319 and CIO 1321.

SR Word Conversion Table

The following table shows conversions for SR Words used as operands. Converted words shown as $$$$ indicate illegal operands. All illegal operands must be fixed according to the error messages.

Function	Wd	Converted to	Error/warning message	Correction message
SYSMAC LINK or SYSMAC NET Completion code	237	$$$$	E.No destination (comm)	Fix program according to specs of communications unit
Operating level 0 data link status for SYSMAC LINK or SYSMAC NET	238 to 241	$$$$	E.No destination (comm)	
Operating level 1 data link status for SYSMAC LINK or SYSMAC NET	242 to 245	$$$$	E.No destination (comm)	
Not used.	246	$$$$	E.Area not usable as source	Same programming not possible; reprogram operation
PC Link Run and Error Flags	247 to 250	$$$$	E.No destination (PC link)	PC link not supported; fix program
SYSMAC BUS flags	251	$$$$	E.No destination (remote I/O)	Fix program according to specs of Remote I/O Unit
SYSMAC NET and SYSMAC LINK flags	252	A000	E.No destination (comm)	Fix program according to specs of communications unit
Error flags	253	A402	E.Error flag differs	Fix address of desired flag
Special flags and bits	254	$$$$	E.No destination (spec flag)	Same programming not possible; reprogram operation
Special flags and bits	255	A500	E.Only math flags processed	Fix program if words other than math flags are used

SR Bit Conversion Table

The following table shows conversions for SR bits used as operands. Converted bits shown as $$$$ indicate illegal operands. All illegal operands must be fixed according to the error messages.

Wd	Function	Bit(s)	Converted to	Error/warning message	Correction message
237	SYSMAC LINK or SYSMAC NET completion code	00 to 07	$$$$	E.No destination (comm)	Fix program according to specs of communications unit
	Not used.	08 to 15	$$$$	E.Area not usable as source	Same programming not possible; reprogram operation
238 to 241	Operating level 0 data link status for SYSMAC LINK or SYSMAC NET	00 to 15	$$$$	E.No destination (comm)	Fix program according to specs of communications unit
242 to 245	Operating level 1 data link status for SYSMAC LINK or SYSMAC NET	00 to 15	$$$$		
246	Not used.	00 to 15	$$$$	E.Area not usable as source	Same programming not possible; reprogram operation
247 to 250	PC Link Run Flags or data link status for operating level 1	00 to 07	$$$$	E.No destination (PC link)	PC link not supported; fix program
	PC Link Error Flags or data link status for operating level 1	08 to 15	$$$$		
251	Remote I/O Error Flags	00 to 15	$$$$	E.No destination (remote I/O)	Fix program according to specs of Remote I/O Unit

Wd	Function	Bit(s)	Converted to	Error/warning message	Correction message
252	Not used.	00 and 01	$$$$	E.Area not usable as source	Same programming not possible; reprogram operation
	Operating Level 0 Data Link Operating Flag	02	$$$$	E.No destination (comm)	Fix program according to specs of communications unit
	SEND(90)/RECV(98) Error Flag	03	$$$$		
	SEND(90)/RECV(98) Enable Flag	04	$$$$		
	Operating Level 1 Data Link Operating Flag	05	$$$$		
	Rack-mounting Host Link Level 1 Error Flag	06	$$$$		
	Not used.	07	$$$$	E.Area not usable as source	Same programming not possible; reprogram operation
	CPU-mounting Host Link Error Flag	08	$$$$	E.No destination (comm)	Fix program according to specs of communications unit
	CPU-mounting Host Link Restart Bit	09	$$$$		
	Leave set to 0.	10	$$$$	E.Area not usable as source	Same programming not possible; reprogram operation
	Not used.	11	$$$$		
	Data Retention Control Bit	12	A00012	—	—
	Rack-mounting Host Link Restart Bit	13	$$$$	E.No destination (comm)	Fix program according to specs of communications unit
	Leave set to 0.	14	$$$$	E.Area not usable as source	Same programming not possible; reprogram operation
	Output OFF Bit	15	A00015	—	—
253	FAL number output area.	00 to 07	$$$$	E.No destination (system)	Same programming not possible; reprogram operation
	Low Battery Flag	08	A40204	—	—
	Cycle Time Error Flag	09	A40108	—	—
	I/O Verification Error Flag	10	A40209	—	—
	Rack-mounting Host Link Level 0 Error Flag	11	$$$$	E.No destination (comm)	Fix program according to specs of communications unit
	Remote I/O Error Flag	12	A40205	—	—
	Normally ON Flag	13	A50013	—	—
	Normally OFF Flag	14	A50014	—	—
	First Cycle	15	A50015	—	—

Wd	Function	Bit(s)	Converted to	Error/warning message	Correction message
254	1-minute clock pulse bit	00	$$$$	E.No destination (system)	Same programming not possible; reprogram operation
	0.02-second clock pulse bit	01	A50103	—	—
	Reserved for function expansion. Do not use.	02 to 06	$$$$	E.Area not usable as source	Same programming not possible; reprogram operation
	Step Flag	07	A50012	—	—
	Duplex System flags	08 to 12	$$$$	E.No destination (system)	Same programming not possible; reprogram operation
	Reserved for function expansion. Do not use.	13 to 15	$$$$	E.Area not usable as source	
255	0.1-second clock pulse bit	00	A50100	—	—
	0.2-second clock pulse bit	01	A50101	—	—
	1.0-second clock pulse bit	02	A50102	—	—
	Instruction Execution Error (ER) Flag	03	A50003	—	—
	Carry (CY) Flag	04	A50004	—	—
	Greater Than (GR) Flag	05	A50005	—	—
	Equals (EQ) Flag	06	A50006	—	—
	Less Than (LE) Flag	07	A50007	—	—

AR Bit Conversion Table

The following table shows conversions for AR bits used as operands. Converted bits shown as $$$$ indicate illegal operands. All illegal operands must be fixed according to the error messages.

Wd	Function	Bit(s)	Converted to	Error/warning message	Conversion message
00 to 06	Hold bits	00 to 15	130000 to 130615	—	—
07	Data Link setting for operating level 0 of SYSMAC LINK	00 to 03	$$$$	E.No destination (comm)	Fix program according to specs of communications unit
	Data Link setting for operating level 1 of SYSMAC LINK	04 to 07	$$$$		
	Not used. May be used as work bits.	08 to 15	130708 to 130715	—	—
08 to 11	Active Node and Error Flags for SYSMAC LINK operating level 0	00 to 15	$$$$	E.No destination (comm)	Fix program according to specs of communications unit
12 to 15	Node Active and Error Flags for SYSMAC LINK operating level 1	00 to 15	$$$$		
16	SYSMAC LINK or SYSMAC NET operating level 0 service time per cycle	00 to 15	$$$$		
17	SYSMAC LINK or SYSMAC NET operating level 1 service time per cycle	00 to 15	$$$$		

Wd	Function	Bit(s)	Converted to	Error/warning message	Conversion message
18	Not usable	00 to 11	$$$$	E.Area not usable as source	Same programming not possible; reprogram operation
	Trace Complete Flag	12	A00812	—	—
	Tracing Flag	13	A00813	—	—
	Trace Start Bit	14	A00814	—	—
	Sampling Start Bit	15	A00815	—	—
19	File Memory Unit Error Reset Bit	00	$$$$	E.No destination (file memory)	File Memory Unit not supported; fix program
	FM Data Transfer Flag	01	$$$$		
	FM Write/Read Flag	02	$$$$		
	FM Blocks Different Error Flag	03	$$$$		
	FM Write-protected Error Flag	04	$$$$		
	Unsuccessful FM Write Flag	05	$$$$		
	FM Checksum Error Flag	06	$$$$		
	File Memory Unit Low Battery Flag	07	$$$$		
	FM Write-protect Bits	08 to 15	$$$$		
20	FM Blocks Counter	00 to 15	$$$$		
21	Remaining FM Blocks Counter	00 to 15	$$$$		
22	On-line Removal Words	00 to 15	$$$$	E.No destination (system)	Same programming not possible; reprogram operation
23	Power-Off Counter	00 to 15	A01400 to A01415	W.Momentary stops also counted	Momentary stops also counted for CVM1

Wd	Function	Bit(s)	Converted to	Error/warning message	Conversion message
24	Leftmost digit of FALS-generating address	00 to 03	$$$$	E.No destination (system)	Same programming not possible; reprogram operation
	Not used and not accessible by user.	04 and 05	$$$$	E.Area not usable as source	
	Level 1 Network Parameter Flag	06	$$$$	E.No destination (comm)	Fix program according to specs of communications unit
	Level 0 Network Parameter Flag	07	$$$$		
	Not used and not accessible by user.	08 to 10	$$$$	E.Area not usable as source	Same programming not possible; reprogram operation
	PC Link Level 1 Mounted Flag	11	$$$$	E.No destination (PC link)	PC link not supported; fix program
	PC Link Level 0 or Single-level PC Link Mounted Flag	12	$$$$		
	SYSMAC NET Mounted Flag	13	$$$$	E.No destination (comm)	Fix program according to specs of communications unit
	Rack-mounting Host Link Mounted Flag	14	$$$$		
	CPU-mounting Device Flag	15	$$$$	E.No destination (system)	Same programming not possible; reprogram operation
25	Rightmost four digits of FALS-generating address	00 to 15	$$$$		
26	Maximum cycle time	00 to 15	A46200 to A46215	—	—
27	Present cycle time	00 to 15	A46400 to A46415	—	—

Correcting Operands from C200HS Programs

This section describes the procedures for correcting bit and word addresses for operands when C200HS programs are converted to CVM1 programs.

Precautions

- Only bits in the AR and SR Areas for which there are bits in the CVM1 with corresponding functions are converted. All other bits are not converted.
- Only words and bits for Special I/O Units and Link Units for which there are words or bits in the CVM1 with corresponding functions are converted. All other bits and words are not converted.
- Any data areas that cannot be converted due to differences in the PCs should be changed globally to convertible form in the C200HS program before conversion to a CVM1 program.
- Refer to the four notes following the next table.

The following table shows the CVM1 words to which C200HS words are converted. All bit addresses within these words are also converted.

Area	C200HS	CVM1
I/O Areas	IR 000 to IR 231	CIO 0000 to CIO 0231
Work Areas	IR 232 to IR 235 IR 300 to IR 511	CIO 0232 to CIO 0235 CIO0300 to CIO 0511
Special Relay Areas	SR 236 to SR 299	Refer to SR Area conversion tables.
Temporary Relay Area	TR 0 to TR 7	TR0 to TR7
Holding Relay Area	HR 00 to HR 99	CIO 1200 to CIO 1299
Auxiliary Relay Area	AR 00 to AR 27	Refer to AR Area conversion tables.
Link Relay Area	LR 00 to LR 63	CIO 1000 to CIO 1063
Timer/Counter Area	TC 000 to TC 511	T0000 to T0511 and C0000 to C0511
Data Memory Area	DM 0000 to DM 9999	D00000 to D09999

Note

1. Use the SSS Change Address operation under the Programming Menu to change all words used for Remote I/O Slaves and Optical I/O Units to the corresponding words between CIO 2300 and CIO 2555.
2. Use the SSS Change Address operation under the Programming Menu to change all words between IR 237 and IR 245 as well as words between IR 247 and IR 251 to words CIO 1900 or later.
3. Use the SSS Change Address operation under the Programming Menu to change all words between AR 07 and AR 17 as well as words between AR 19 and AR 21 to words between CIO 1307 and CIO 1317 and CIO 1319 and CIO 1321.
4. DM 6000 to DM 6030 and DM 6600 to DM 9999 do not have equivalents in the CVM1 and are not converted.

SR Word Conversion Table

The following table shows conversions for SR Words used as operands. Converted words shown as $$$$ indicate illegal operands. All illegal operands must be fixed according to the error messages.

Function	Wd	Converted to	Error/warning message	Correction message
SYSMAC NET local loop status	236	$$$$	E.No destination (comm)	Fix program according to specs of communications unit
SYSMAC LINK completion code	237	$$$$		
SYSMAC NET and SYSMAC LINK data link status for operating level 0	238 to 241	$$$$		
SYSMAC NET and SYSMAC LINK data link status for operating level 1	242 to 245	$$$$		
Reserved by system	246	$$$$	E.Area not usable as source	Same programming not possible; reprogram operation
PC Link Run and Error Flags for Units 16 through 31 or data link status for operating level 1	247 and 248	$$$$	E.No destination (PC link)	PC link not supported; fix program
PC Link Run and Error Flags for Units 00 through 15 or data link status for operating level 0	249 and 250	$$$$		
Remote I/O Flags	251	$$$$	E.No destination (remote I/O)	Fix program according to specs of Remote I/O Unit
Communications Error Flags	252	A502	E.Error flag differs	Fix address of desired flag
Error flags	253	A402		
Special flags and bits	254	$$$$	E.No destination (spec flag)	Same programming not possible; reprogram operation
Special flags and bits	255	A500	E.Only math flags processed	Fix program if words other than math flags are used
Reserved by system	256 to 261	$$$$	E.Area not usable as source	Same programming not possible; reprogram operation
Longest interrupt subroutine execution time	262	$$$$	E.No destination (program)	
Number of interrupt subroutine with longest execution time.	263	$$$$		
Communications flags	264	$$$$	E.No destination (comm)	Fix program according to specs of communications unit

Function	Wd	Converted to	Error/warning message	Correction message
RS-232C port reception counter	265	$$$$	E.No destination (system)	Same programming not possible; reprogram operation
Peripheral Reception Counter in General I/O Mode (BCD)	266	$$$$		
Host Link flags	267	$$$$	E.No destination (spec flag)	
Reserved by system (not accessible by user)	268	$$$$	E.Area not usable as source	
Special flags and bits	269 to 270	$$$$	E.No destination (spec flag)	
UM size stored in Memory Cassette	271	$$$$	E.No destination (system)	
Special flags and bits	272 to 275	$$$$	E.No destination (spec flag)	
Time units	276	$$$$	E.No destination (system)	
Used for keyboard mapping	277 to 279	$$$$		
Not used.	280 to 289	$$$$	E.Area not usable as source	
Macro Area inputs and outputs	290 to 297	A200 to A207	—	—
Reserved by system	298 to 299	$$$$	E.Area not usable as source	Same programming not possible; reprogram operation

SR Bit Conversion Table

The following table shows conversions for SR bits used as operands. Converted bits shown as $$$$ indicate illegal operands. All illegal operands must be fixed according to the error messages.

Wd	Function	Bit(s)	Converted to	Error/warning message	Conversion message
236	Node loop status output area for operating level 0 of SYSMAC NET	00 to 07	$$$$	E.No destination (comm)	Fix program according to specs of communications unit
	Node loop status output area for operating level 1 of SYSMAC NET	08 to 15	$$$$		
237	Completion code for operating level 0 for SEND(90)/RECV(98) SYSMAC LINK or SYSMAC NET	00 to 07	$$$$		
	Completion code for operating level 1 for SEND(90)/RECV(98) SYSMAC LINK or SYSMAC NET	08 to 15	$$$$		
238 to 241	Data link status output area for operating level 0 of SYSMAC LINK or SYSMAC NET	00 to 15	$$$$		
242 to 245	Data link status output area for operating level 1 of SYSMAC LINK or SYSMAC NET	00 to 15	$$$$		

Wd	Function	Bit(s)	Converted to	Error/warning message	Conversion message
246	Reserved by system	00 to 15	$$$$	E.Area not usable as source	Same programming not possible; reprogram operation
247 and 248	PC Link Run Flags for Units 16 through 31 or data link status for operating level 1	00 to 07	$$$$	E.No destination (PC link)	PC link not supported; fix program
	PC Link Error Flags for Units 16 through 31 or data link status for operating level 1	08 to 15	$$$$		
249 and 250	PC Link Run Flags for Units 00 through 15 or data link status for operating level 0	00 to 07	$$$$		
	PC Link Error Flags for Units 00 through 15 or data link status for operating level 0	08 to 15	$$$$		
251	Remote I/O information	00 to 15	$$$$	E.No destination (remote I/O)	Fix program according to specs of Remote I/O Unit

Wd	Function	Bit(s)	Converted to	Error/warning message	Conversion message
252	SEND(90)/RECV(98) Error Flag for operating level 0 of SYSMAC LINK or SYSMAC NET	00	A50208	—	—
	SEND(90)/RECV(98) Enable Flag for operating level 0 of SYSMAC LINK or SYSMAC NET	01	A50200	—	—
	Operating Level 0 Data Link Operating Flag	02	$$$$	E.No destination (comm)	Fix program according to specs of communications unit
	SEND(90)/RECV(98) Error Flag for operating level 1 of SYSMAC LINK or SYSMAC NET	03	$$$$		
	SEND(90)/RECV(98) Enable Flag for operating level 1 of SYSMAC LINK or SYSMAC NET	04	$$$$		
	Operating Level 1 Data Link Operating Flag	05	$$$$		
	Rack-mounting Host Link Level 1 Communications Error Flag	06	$$$$		
	Rack-mounting Host Unit Level 1 Restart Bit	07	$$$$		
	Peripheral Port Restart Bit	08	$$$$	E.No destination (system)	Same programming not possible; reprogram operation
	RS-232C Port Restart Bit	09	$$$$	E.No destination (comm)	Fix program according to specs of communications unit
	PC Setup Clear Bit	10	$$$$	E.No destination (system)	Same programming not possible; reprogram operation
	Forced Status Hold Bit	11	A00013	—	—
	Data Retention Control Bit	12	A00012	—	—
	Rack-mounting Host Unit Level 0 Restart Bit	13	$$$$	E.No destination (comm)	Fix program according to specs of communications unit
	Not used.	14	$$$$	E.Area not usable as source	Same programming not possible; reprogram operation
	Output OFF Bit	15	A00015	—	—
253	FAL number output area (see error information provided elsewhere)	00 to 07	$$$$	E.No destination (system)	Same programming not possible; reprogram operation
	Low Battery Flag	08	A40204	—	—
	Cycle Time Error Flag	09	A40108	—	—
	I/O Verification Error Flag	10	A40209	—	—
	Rack-mounting Host Link Level 0 Communications Error Flag	11	$$$$	E.No destination (comm)	Fix program according to specs of communications unit
	Remote I/O Error Flag	12	A40205	—	—
	Always ON Flag	13	A50013	—	—
	Always OFF Flag	14	A50014	—	—
	First Cycle Flag	15	A50015	—	—

Wd	Function	Bit(s)	Converted to	Error/warning message	Conversion message
254	1-minute clock pulse bit	00	$$$$	E.No destination (system)	Same programming not possible; reprogram operation
	0.02-second clock pulse bit	01	A50103	—	—
	Reserved for function expansion. Do not use.	02	$$$$	E.Area not usable as source	Same programming not possible; reprogram operation
	MTR Execution Flag	03	$$$$	E.No destination (program)	
	Overflow Flag (for signed binary calculations)	04	A50009	—	—
	Underflow Flag (for signed binary calculations)	05	A50010	—	—
	Differential Monitor End Flag	06	A00809	—	—
	Step Flag	07	A50012	—	—
	MTR Execution Flag	08	$$$$	E.No destination (program)	Same programming not possible; reprogram operation
	7SEG Execution Flag	09	$$$$		
	DSW Execution Flag	10	$$$$		
	Interrupt Input Unit Error Flag	11	$$$$	E.No destination (SIOU)	
	Reserved by system	12	$$$$	E.Area not usable as source	
	Interrupt Programming Error Flag	13	$$$$	E.No destination (program)	
	Group-2 High-density I/O Unit error Flag	14	$$$$	E.No destination (SIOU)	
	Special Unit Error Flag (Special I/O, PC Link, Host Link, Remote I/O Master)	15	$$$$		
255	0.1-second clock pulse bit	00	A50100	—	—
	0.2-second clock pulse bit	01	A50101	—	—
	1.0-second clock pulse bit	02	A50102	—	—
	Instruction Execution Error (ER) Flag	03	A50003	—	—
	Carry (CY) Flag	04	A50004	—	—
	Greater Than (GR) Flag	05	A50005	—	—
	Equals (EQ) Flag	06	A50006	—	—
	Less Than (LE) Flag	07	A50007	—	—
	Reserved by system	08 to 15	$$$$	E.Area not usable as source	Same programming not possible; reprogram operation
256 to 261	Reserved by system	00 to 15	$$$$		

Wd	Function	Bit(s)	Converted to	Error/warning message	Conversion message
262	Longest interrupt subroutine execution time (0.1 ms)	00 to 15	$$$$	E.No destination (program)	Same programming not possible; reprogram operation
263	Number of interrupt subroutine with longest execution time.	00 to 15	$$$$		
264	RS-232C Port Error Code	00 to 03	$$$$	E.No destination (system)	
	RS-232C Port Communications Error	04	$$$$		
	RS-232C Port Send Ready Flag	05	$$$$		
	RS-232C Port Reception Completed Flag	06	$$$$		
	RS-232C Reception Overflow Flag	07	$$$$		
	Peripheral Port Error Code in All but Peripheral Mode	08 to 11	$$$$		
	Peripheral Port Communications Error in All but Peripheral Mode	12	$$$$		
	Peripheral Port Send Ready Flag in All but Peripheral Mode	13	$$$$		
	Peripheral Port Reception Completed Flag in All but Peripheral Mode	14	$$$$		
	Peripheral Port Reception Overflow Flag in All but Peripheral Mode	15	$$$$		
265	RS232C Port Reception Counter in General I/O Mode	00 to 15	$$$$		
266	Peripheral Reception Counter in General I/O Mode (BCD)	00 to 15	$$$$		
267	Reserved by system (not accessible by user)	00 to 04	$$$$	E.Area not usable as source	
	Host Link Level 0 Send Ready Flag	05	$$$$	E.No destination (comm)	Fix program according to specs of communications unit
	Reserved by system (not accessible by user)	06 to 12	$$$$	E.Area not usable as source	Same programming not possible; reprogram operation
	Host Link Level 0 Receive Ready Flag	13	$$$$	E.No destination (comm)	Fix program according to specs of communications unit
	Reserved by system (not accessible by user)	14 and 15	$$$$	E.Area not usable as source	Same programming not possible; reprogram operation

Wd	Function	Bit(s)	Converted to	Error/warning message	Conversion message
268	Reserved by system (not accessible by user)	00 to 15	$$$$	E.Area not usable as source	Same programming not possible; reprogram operation
269	Memory Cassette Contents	00 to 07	$$$$	E.No destination flag (memory)	
	Memory Cassette Capacity	08 to 10			
	Reserved by system (not accessible by user)	11 to 13		E.Area not usable as source	
	EEPROM Memory Cassette Protected or EPROM Memory Cassette Mounted Flag	14		E.No destination flag (memory)	
	Memory Cassette Flag	15			
270	Save UM to Cassette Bit	00	$$$$	E.No destination flag (memory)	Same programming not possible; reprogram operation
	Load UM from Cassette Bit	01			
	Compare UM with Cassette Bit	02	$$$$		
	Comparison Results Flag	03	$$$$		
	Reserved by system (not accessible by user)	04 to 10	$$$$	E.Area not usable as source	
	UM to Memory Cassette Transfer Error Flags	11 to 15		E.No destination flag (memory)	
271	UM size stored in Memory Cassette	00 to 07	$$$$	E.No destination flag (memory)	Same programming not possible; reprogram operation
	UM size and type in CPU	08 to 15			
272	Reserved by system (not accessible by user)	00 to 10	$$$$	E.Area not usable as source	Same programming not possible; reprogram operation
	Checksum Memory Error Flags	11 to 13		E.No destination flag (memory)	
	Memory Error Flag: Memory Cassette Online Disconnection	14			
	Memory Error Flag: Autoboot Error	15			
273	Save IOM to Cassette Bit	00	$$$$	E.No destination flag (memory)	Same programming not possible; reprogram operation
	Load IOM from Cassette Bit	01			
	Reserved by system (not accessible by user)	02 to 11		E.Area not usable as source	
	Transfer Error Flags	12 to 15		E.No destination flag (memory)	
274	Units #0 to #9 Restart Flags	00 to 09	$$$$	E.No destination (system)	Same programming not possible; reprogram operation
	Reserved by system (not accessible by user)	10 to 15	$$$$	E.Area not usable as source	
275	PC Setup Startup Error (DM 6600 to DM 6614)	00	$$$$	E.No destination (system)	Same programming not possible; reprogram operation
	PC Setup RUN Error (DM 6615 to DM 6644)	01			
	PC Setup Communications/Error Setting/Misc. Error (DM 6645 to DM 6655)	02			
	Reserved by system (not accessible by user)	03 to 15		E.Area not usable as source	

Wd	Function	Bit(s)	Converted to	Error/warning message	Conversion message
276	Time data	00 to 15	$$$$	E.No destination (system)	Same programming not possible; reprogram operation
277 to 279	Used for keyboard mapping	00 to 15	$$$$		
280 to 289	Not used.	00 to 15	$$$$	E.Area not usable as source	
290 to 293	Macro Area inputs	00 to 15	A20000 to A20315	—	—
294 to 297	Macro Area outputs	00 to 15	A20400 to A20715	—	—
298 to 299	Not used.	00 to 15	$$$$	E.Area not usable as source	Same programming not possible; reprogram operation

AR Bit Conversion Table

The following table shows conversions for AR bits used as operands. Converted bits shown as $$$$ indicate illegal operands. All illegal operands must be fixed according to the error messages.

Wd	Function	Bit(s)	Converted to	Error/warning message	Conversion message
00	Error Flags for Special I/O Units 0 to 9 (also function as Error Flags for PC Link)	00 to 09	$$$$	E.No destination (SIOU)	Same programming not possible; reprogram operation
	Error Flag for operating level 1 of SYSMAC LINK or SYSMAC NET	10	$$$$	E.No destination (comm)	Fix program according to specs of communications unit
	Error Flag for operating level 0 of SYSMAC LINK or SYSMAC NET	11	$$$$		
	Host Computer to Rack-mounting Host Link Level 1 Error Flag	12	$$$$		
	Host Computer to Rack-mounting Host Link Level 0 Error Flag	13	$$$$		
	Remote I/O Master Unit 1 Error Flag	14	$$$$	E.No destination (remote I/O)	Fix program according to specs of Remote I/O Unit
	Remote I/O Master Unit 0 Error Flag	15	$$$$		

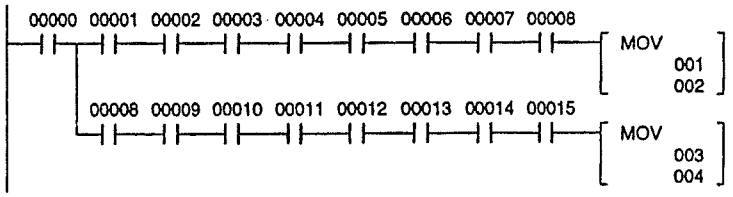
Wd	Function	Bit(s)	Converted to	Error/warning message	Conversion message
01	Restart Bits for Special I/O Units 0 to 9 (also function as Restart Bits for PC Link)	00 to 09	$$$$	E.No destination (SIOU)	Same programming not possible; reprogram operation
	Restart Bit for operating level 1 of SYSMAC LINK or SYSMAC NET	10	$$$$	E.No destination (comm)	Fix program according to specs of communications unit
	Restart Bit for operating level 0 of SYSMAC LINK or SYSMAC NET	11	$$$$		
	Not used.	12, 13	$$$$	E.Area not usable as source	Same programming not possible; reprogram operation
	Remote I/O Master Unit 1 Restart Flag.	14	$$$$	E.No destination (remote I/O)	Fix program according to specs of Remote I/O Unit
	Remote I/O Master Unit 0 Restart Flag.	15	$$$$		
02	Slave Rack Error Flags (#0 to #4)	00 to 04	$$$$		
	Group-2 High-density I/O Unit Error Flags	05 to 14	$$$$		
	Group-2 High-density I/O Unit Error Flag	15	$$$$		
03 to 06	Error Flags for Optical I/O Units	00 to 15	$$$$	E.No source flag (optical I/O)	Fix program according to specs of Optical I/O Unit
07	Data Link setting for operating level 0 of SYSMAC LINK	00 to 03	$$$$	E.No destination (comm)	Fix program according to specs of communications unit
	Data Link setting for operating level 1 of SYSMAC LINK	04 to 07	$$$$		
	Normal TERMINAL Mode/Expansion TERMINAL Mode Input Cancel Bit	08	$$$$	E.No destination (system)	Same programming not possible; reprogram operation
	Expansion TERMINAL Mode Changeover Flag	09	$$$$		
	Reserved by system.	10 and 11	$$$$	E.Area not usable as source	
	Terminal Mode Flag ON: Expansion; OFF: Normal (Same as status of pin 6 on CPU's DIP switch)	12	$$$$	E.No destination (system)	
	Error History Overwrite Bit	13	$$$$		
	Error History Reset Bit	14	A00014	—	—.
	Error History Enable Bit	15	$$$$	E.No destination (system)	Same programming not possible; reprogram operation

Wd	Function	Bit(s)	Converted to	Error/warning message	Conversion message
08 to 11	Active Node Flags for SYSMAC LINK nodes of operating level 0	00 to 15	$$$$	E.No destination (comm)	Fix program according to specs of communications unit
12 to 15	Active Node Flags for SYSMAC LINK nodes of operating level 1	00 to 15	$$$$		
16	SYSMAC LINK or SYSMAC NET operating level 0 service time per cycle	00 to 15	$$$$		
17	SYSMAC LINK or SYSMAC NET operating level 1 service time per cycle	00 to 15	$$$$		
18 to 20	Date and time information	00 to 15	G00100 to G00315	—	—
21	Day of Week: 00 to 06	00 to 06	G00400 to G00406	—	—
	Not used.	07 to 12	$$$$	E.Area not usable as source	Same programming not possible; reprogram operation
	30-second Compensation Bit	13	$$$$	E.No destination (system)	
	Clock Stop Bit	14	$$$$		
	Clock Set Bit	15	$$$$		
22	Keyboard Mapping	00 to 15	$$$$		
23	Power Off Counter (BCD)	00 to 15	A01400 to A01415	W.Momentary stops also counted	Momentary stops also counted for CVM1
24	Reserved by system.	00 to 04	$$$$	E.Area not usable as source	Same programming not possible; reprogram operation
	Cycle Time Flag	05	$$$$	E.No destination	
	SYSMAC LINK Network Parameter Flag for operating level 1	06	$$$$	E.No destination (comm)	Fix program according to specs of communications unit
	SYSMAC LINK Network Parameter Flag for operating level 0	07	$$$$		
	SYSMAC LINK or SYSMAC NET Level 1 Mounted Flag	08	$$$$		
	SYSMAC LINK or SYSMAC NET Level 0 Mounted Flag	09	$$$$		
	Reserved by system.	10	$$$$	E.Area not usable as source	Same programming not possible; reprogram operation
	PC Link Level	11 and 12	$$$$	E.No destination (PC link)	PC link not supported; fix program
	Rack-mounting Host Link Level 1 Mounted Flag	13	$$$$	E.No destination (comm)	Fix program according to specs of communications unit
	Rack-mounting Host Link Level 0 Mounted Flag	14	$$$$		
	CPU-mounting Device Mounted Flag	15	A30615	—	—

Wd	Function	Bit(s)	Converted to	Error/warning message	Conversion message
25	Reserved by system.	00 to 11	$$$$	E.Area not usable as source	Same programming not possible; reprogram operation
	Trace End Flag	12	A00812	—	—
	Tracing Flag	13	A00813	—	—
	Trace Trigger Bit (writeable)	14	A00814	—	—
	Trace Start Bit (writeable)	15	A00815	—	—
26	Maximum Cycle Time (0.1 ms)	00 to 15	A46200 to A46215	—	—
27	Present Cycle Time (0.1 ms)	00 to 15	A46400 to A46415	—	—

Corrections to Ladder Diagram

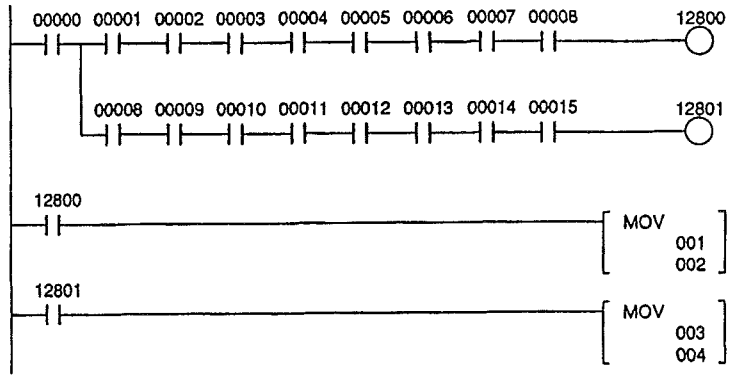
The CVSS and CVM1 operations in the SSS display special instructions for CVM1 programs on one line when displayed in ladder diagram form. This means that converted programs with too many input conditions on an instruction line will not display in ladder diagram form, although they will execute properly and will display in mnemonic form. If you want to display this type of program (see following example), you will have to correct the program.



Conversion Procedure

1, 2, 3...

1. Change the System Setup offline to specify the original PC as the PC model for the SSS.
2. Retrieve the original program offline using the Retrieve Program operation on the Programming Menu.
3. Correct the program as shown below, being sure to use otherwise unused work bits for the OUTPUT instructions.



4. Transfer the modified program to a PC and check it to be sure the original operation is still possible.
5. Save the modified program to disk using the Save Program operation on the Programming Menu.
6. Convert the modified program to a CVM1 program.

Glossary

A glossary for the SSS is provided in the *SSS Operation Manual: Basics (W247).*

Index

This index covers all three SSS Operation Manuals. The manual the page numbers refer to is given in italics just prior to the number: Basics, C-series PCs, and CVM1 PCs.

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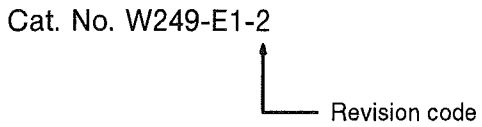
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Revision History

A manual revision code appears as a suffix to the catalog number on the front cover of the manual.



The following table outlines the changes made to the manual during each revision. Page numbers refer to the previous version.

Revision code	Date	Revised content
1	January 1995	Original production
2	June 1996	Contents revised to reflect the upgrade to Version 1.13 and addition of the C200HX/HG/HE PCs. A section on the new Option Menu was added as section 9.

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