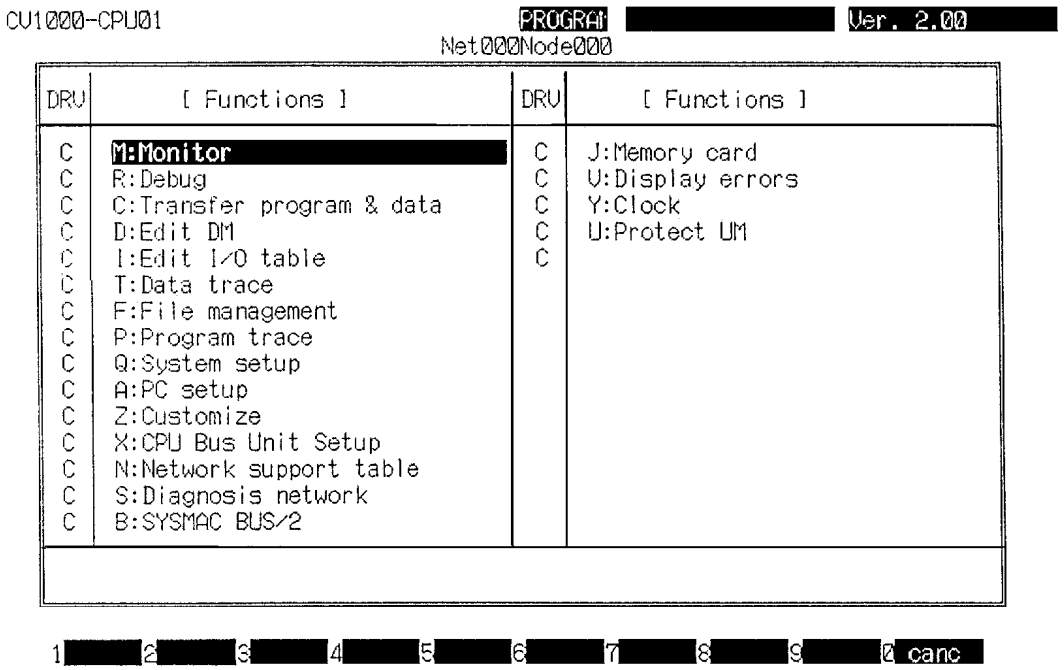
CV Support Software Version 2: Online

Operation Manual

Revised February 1993



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 head 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 relative 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.

TABLE OF CONTENTS

About this Manual:

This manual describes online programming for the SYSMAC CV-series Programmable Controllers (PCs) using the CV500-CPU01-E, CV1000-CPU01-E, CV2000-CPU01-E, and CVM1-CPU01-E/11-E CPUs. Although the CV500, CV1000, and CV2000 support both SFC and ladder-diagram programming, the CVM1 supports only ladder-diagram programming and no information in this manual concerning SFC programming is applicable to it. This manual is designed to be used together with two other CVSS Operation Manuals. An introductory guide is also available. The entire set of CVSS manuals is listed below. Catalog number suffixes have been omitted; be sure you have the most recent version for your region.

Manual	Cat. No.
The CV Series Getting Started Guidebook	W203
CV Support Software Version 2 Operation Manual: Basics	W196
CV Support Software Version 2 Operation Manual: Offline	W201
CV Support Software Version 2 Operation Manual: Online	W200

This manual does not cover programming details and details on the operation of specific Units. The operation of the CV-series PCs is covered in the following three manuals. Catalog number suffixes have been omitted; be sure you have the most recent version for your region. Use these manuals together with the CVSS manuals. Manuals on any Link Units (e.g., SYSMAC NET Link Units, SYSMAC LINK Units, or SYSMAC BUS/2 Units) used with the PC will also be necessary.

Manual	Cat. No.
CV-series PC Operation Manual: SFC	W194
CV-series PC Operation Manual: Ladder Diagrams	W202
CV-series PC Operation Manual: Host Interface	W205

Please read this manual completely together with the other CV-series PC manuals, CVSS manuals, and Link Unit manuals and be sure you understand the information provide before attempting to program or operate a CV-series PC. The basic content of each section of this manual is outlined below.

Section 1 provides basic reference material that should be useful when using the CVSS. The lists of operations include the main operations covered in the three CVSS manuals with page references to the proper manual. The tables of ladder-diagram instructions can be used to find instructions either by function code, functional group, or mnemonic. The PC data area tables outline the data areas available for use in programming, and the abbreviations are to aid reading CVSS displays.

Section 2 describes the operations used to monitor and alter the SFC program in a PC.

Section 3 describes the operations used to monitor and alter the ladder diagrams in a PC.

Section 4 describes the operations used to debug programs in the PC, including the operation to trace program execution and read out the resulting data.

Section 5 describes the operations to transfer programs, the I/O table, the PC Setup, and DM/EM data between a PC and the computer and the operations to edit DM/EM data in the PC.

Section 6 describes the operations that can be used to support SYSMAC NET Link Systems., SYSMAC LINK Systems., and SYSMAC BUS/2 Remote I/O Systems.

Section 7 describes the operations to display and clear errors in the PC and Link Units, to clear the PC access right, and to display and set the PC's clock.

Section 8 describes mainly the operations to transfer data to and from memory cards mounted in the CPU. Although general file management operations are also introduced, these are the same as those in the *CV Support Software Version 2 Operation Manual: Offline* and are thus not described in detail in this manual.

Section 9 describes operations used to control CVSS and PC system operation. These include operations to set the host interface with the PC and other CVSS operating parameters, editing and transferring the PC Setup, transferring customized PC settings, and protecting the user memory in the PC.

SECTION 1
Introduction

This section provides basic reference material that should be useful when using the CVSS. The lists of operations include the main operations covered in the three CVSS manuals with page references to the proper manual. The tables of ladder-diagram instructions can be used to find instructions either by function code, functional group, or mnemonic. The PC data area tables outline the data areas available for use in programming, and the abbreviations are to aid reading CVSS displays.

1-1 Lists of Operations

The following tables list the main operations available on CVSS menus.

1-1-1 System Settings and File Management (Online and Offline)

The following items are available during either online or offline operations unless otherwise specified. Page numbers refer to the *CV Support Software Version 2 Operation Manual: Offline*.

System Disks

The file compressing application DIET was used with CVSS. Refer to *CV Support Software Version 2: Basics* for installation of CVSS.

Note

1. MS-DOS is a registered trademark of the Microsoft Corporation.
2. For the IBM PC/AT-compatible or PS/2 Model 50 computers (80286 machines), we recommend the user add a RAM disk with a memory size of 2M bytes minimum for smooth operation of the CVSS.

System Settings (CVSS Operating Environment)

Name	Description	Page
Destination Network Address	Used to specify the network address and node address of the PC with which the CVSS is to communicate.	218
Communications Specifications (offline)	Used to specify communications mode from Binary and ASCII for the PC and the connecting computer.	218
Memory Card Writer	Used to specify which communications port on the computer the Memory Card Writer is connected to.	221
Host Interface Specifications (online)	Used to specify the communications protocol for the CVSS to communicate with the PC via the host interface. The baud rate, PC unit number, parity, data length, and number of stop bits are designated.	161
Program Type	Used to specify whether the program will be written in ladder diagrams only or in SFC and ladder diagrams.	221
Printer Type	Used to specify the printer.	221
Program Check PC	Used to specify the model of PC for which program checks are to be run.	221
Message Number	Used to specify which messages are to be displayed on the CVSS from the message programmed into the PC with the MESSAGE instruction.	221

File Management

Name	Description	Page
File Directory	Used to display a list of files according to file type designations.	204
Copy File	Used to copy files either within the same disk or from one disk to another.	204
Change File Name	Used to change the name of an existing file.	205
Delete File	Used to delete an existing file.	205
Change Drive Path	Used to change the drive path name to which files are saved.	205
Create/Delete Directory	Used to create new directories or to delete existing directories.	205
Print	Used to print the specified list of files.	206

1-1-2 Offline Operations

Page numbers refer to the *CV Support Software Version 2 Operation Manual: Offline*.

Programming in SFC Detail View Mode

The operations in the following table are not supported by CVM1 PCs.

Name	Description	Page
Clear Memory	Used to delete SFC programs, ladder diagram programs (including line comments), I/O names, and I/O comments from the work disk. Can also be used to delete only the SFC program or specified sheets of an SFC program.	17
Display Memory	Used to display the amount of PC user memory, internal memory, I/O names, I/O comments, and line comments used.	19

Name	Description	Page
Change SFC Settings	Used to specify the following parameters for creating SFC programs: If numbers and other inputs are to be made immediately upon creating SFC parts. Whether I/O names or addresses are to be used in SFC parts. The number of rows of SFC parts to display. The sheet size.	20
Writing SFC Parts	Used to create steps, actions, and other SFC parts on-screen.	26
Inputting Text for SFC Parts	Used to input addresses, I/O names, etc., for SFC parts.	27
Deleting SFC Parts	Used to delete SFC parts one at a time from the screen.	32
Edit Action	Used to create action blocks for each SFC step.	32
Edit Step/Transition	Used to modify SFC programs by inserting blank lines, inserting blank columns, deleting lines, deleting columns, and deleting/copying/moving specified regions of SFC programs.	38
Jump	Used to move the cursor to specified locations.	44
Find	Used to search for steps, transitions, or actions.	44
Check Program (SFC)	Used to check the SFC program displayed on the screen. The check is conducted according to the PC model set in the system settings and the specified check level. Three check levels are available.	46
Write/Read Sheet	Used to write SFC programs from the display buffer to the work disk or to read SFC program from the work disk to the display buffer.	49
Save Program	Used to save programs from the work disk to a data disk. All ladder-diagram programs written in program view are also saved.	52
Retrieve Program	Used to retrieve programs from data disk to the work disk. All ladder-diagram programs written in program view are also retrieved.	53
Print SFC Sheet	Used to print either all SFC sheets on the work disk or the sheet presently in the display buffer.	53
Overview	Used to display a wide range of an SFC program from memory.	59
Program View	Used to enable editing of action programs and transition programs.	61

Programming in SFC Program View or Ladder-only Mode

Name	Description	Page
Clear Memory	Used to delete ladder diagram programs from a specified address on when SFC programs are used or a specified program block when only ladder diagrams are used.	65
Display Memory	Used to display the amount of PC user memory, internal memory, I/O names, I/O comments, and line comments used. This operation is not supported in the SFC program view mode.	69
Change Display	Used to switch the display form for ladder diagrams between ladder diagrams with I/O addresses and I/O names; ladder diagrams with I/O addresses only; ladder diagrams with I/O names only; ladder diagrams with 2 lines of I/O comments; I/O addresses and I/O comments; ladder diagrams with 4 lines of I/O comments; or mnemonic ladder diagrams.	70
Writing Programs	Used to create programs in the display form designated above.	77
Store/Store Insert	Used to write programs onto the work disk. Not necessary when writing programs directly in mnemonic form.	90
Read Program	Used to read programs from the work disk in the designated display form.	93
Find	Used to search for instructions (including operands), I/O comments, or line comments.	93
Modifying Programs	Used to change existing programs.	86
Writing Line Comments	Used to create or modify line comments created in ladder diagrams.	99
Edit Section	Used to move, copy, or delete sections of ladder diagrams.	101
Change Block	Used to globally change bit or word addresses designated in programs on the work disk.	103

Name	Description	Page
Edit Interrupt Program	Used to create I/O interrupt, scheduled interrupt, power off interrupt, and power on interrupt programs. This operation is disabled if SFC programming is being used.	111
Check Program (Ladder)	Used to check the program on the work disk according to the PC model set in the system settings and the specified check level. Three check levels are available. Only ladder diagram-portions of the program are checked.	119
Save Program	Used to save programs or program sections from the work disk to a data disk. Only ladder-diagram portions of programs are saved.	121
Retrieve Program	Used to retrieve programs from a data disk to the work disk or to append programs from a data disk to the current program. Only ladder-diagram portions of the program are retrieved.	123
Print	Used to print ladder diagram portions of programs in normal ladder-diagram form or in mnemonic form.	124
Change C/CV mode	Used to change the ladder diagram input mode between C mode and CV mode.	78

Edit DM Operations

Name	Description	Page
Read DM Address	Used to display DM data from the work disk up to 160 words at a time. Displayed data can be modified.	153
Copy	Used to copy DM data on the work disk.	153
Fill	Used to write the same content to multiple DM words on the work disk.	153
Print	Used to print a specified area of DM from the work disk.	154
HEX <–> ASCII	Used to specify whether DM data is to be written in hexadecimal or ASCII.	154
Switch Bank Number	Used to specify the Expansion DM bank on the work disk (for CV1000 PCs only).	155
Save DM	Used to save DM data from the work disk to a data disk.	155
Retrieve DM	Used to retrieve DM data from a data disk to the work disk.	156
Save File	Used to save file data (with an .IOM) extension from the work disk to a data disk.	156
Retrieve File	Use to retrieve file data (with an .IOM extension) from a data disk to the work disk.	157

Edit I/O Table Operations

Name	Description	Page
Write I/O Table	Used to edit I/O table data on the work disk.	158
Check I/O Table	Used to check the contents of the I/O table on the work disk.	167
Save I/O Table	Used to save the I/O table on the work disk to a data disk.	168
Retrieve I/O Table	Used to retrieve an I/O table from a data disk to the work disk.	169
Clear I/O Table	Used to delete the I/O table from the work disk.	169
CPU Bus Units	Used to specify CPU Bus Unit classifications. This operation is presently not supported.	169
PC Setup	Used to set the addresses of the first words for local Racks and for group-1, group-2, and group-3 Slaves.	169

Other Operations

Name	Description	Page
Program Link	Used to join multiple programs on a data disk into one program on the work disk.	142
Edit I/O Name	Used to assign I/O names to bits; to edit, search for, or print existing I/O names; or to link I/O names to programs.	131
Edit I/O Comment	Used to write, edit, search for, or print I/O comments.	138
Display List	Used to create lists of various data or cross-references used in programs on the work disk and to display and/or print them.	194
Edit PC ID	Used to create, edit, search for, or print PC names.	186

Name	Description	Page
Data Tracing	Used to display the results of data traces created in online operations on the work disk.	197
PC Setup	Used to write various PC system parameters onto the work disk.	221
Customize	Used to change function codes, bit/word names, or memory area divisions.	239
Network Support Tables	Used to edit data link tables and routing tables for the SYSMAC NET and SYSMAC LINK Systems.	169
Memory Card	Used to display a list of all files on the memory card within the Memory Card Writer and permits access to these files. The Memory Card Writer is required if an EPROM-type memory card is used. A RAM-type memory card can be directly connected to the PC to enable online operation.	213
Convert UM	Used to convert the program code on the work disk to PC machine language and save it on a data disk. Also used to reverse this process.	207
Format floppy	Used to format floppy disks as data disks for CVSS data.	202
Compare prog.	Used to compare programs in a data disk with the program in the work file in the computer.	211
Command.Com (Basic)	Used to display a MS-DOS prompt. When the MS-DOS prompt is displayed, MS-DOS commands can be input.	34

1-1-3 Online Operations

Page numbers refer the *CV Support Software Version 2 Operation Manual: Online*.

Transfer Program and Data

Name	Description	Page
Transfer Program and Data	Used to transfer programs, I/O names, DM (including Expansion DM), I/O tables, and the PC Setup between the CVSS and the PC. Data can be either converted to editable form and transferred to the work disk or transferred in machine language directly to a data disk. Also used to compare programs in the PC with those in the computer.	82

Monitoring in SFC Detail View Mode

The operations in the following table are not supported by CVM1 PCs.

Name	Description	Page
Sheet Transfer	Used to transfer SFC sheets between the CVSS and the PC. Transferring sheets to the CVSS enables monitoring within those sheets.	16
Change SFC Settings	Used to specify the following parameters for creating SFC programs: If numbers and other inputs are to be made immediately upon creating SFC parts. Whether I/O names or addresses are to be used in SFC parts. The number of rows of SFC parts to display. The sheet size.	18
Action Display	Used to display the action block for a step and monitor action status.	20
Process Monitor	Used to monitor step and action status in list form.	21
All I/O Monitor	Used to monitor bits, words, timers, counters, steps, or transitions and to change bit status or word contents using the entire screen.	24
Part I/O Monitor	Used to monitor bits, words, timers, counters, steps, or transitions and to change bit status or word contents using the bottom third of the screen.	24
Step Status	Used to control step status (execute, pause, halt, inactive).	30
SFC Online Edit	Used to modify the SFC program in the PC.	25
Cross-reference	Used to display cross-references for any bit, word, or register.	25
Cycle Time Read	Used to read and display the cycle time of the PC.	28
Area Clear	Used to delete data from the user Program Area, CPU Bus Link Area, Auxiliary Area, Timer Area, Counter Area, DM Area, or Expansion DM Area in the PC.	29

Monitoring in SFC Program View or Ladder Mode

Name	Description	Page
Change Display	Used to switch the display form for ladder diagrams between ladder diagrams with I/O addresses and I/O names, ladder diagrams with I/O addresses only, ladder diagrams with I/O names only, ladder diagrams with 2 lines of I/O comments, or ladder diagrams with 4 lines of I/O comments.	35
Monitor Interrupt Program	Used to monitor I/O interrupt, scheduled interrupt, power off interrupt, and power on interrupt programs. This operation is disabled if SFC programming is being used.	52
All I/O Monitor	Used to monitor bits, words, timers, counters, steps, or transitions and to change bit status or word contents using the entire screen.	42
Part I/O Monitor	Used to monitor bits, words, timers, counters, steps, or transitions and to change bit status or word contents using the bottom third of the screen.	42
Online Edit	Used to modify the ladder-diagram portions of the program in the PC.	50
Cycle Time Read	Used to read and display the cycle time of the PC.	52
Display Memory	Used to display the amount of user memory used and the amount remaining.	35
Area Clear	Used to delete data from the User Program Area, CPU Bus Link Area, Auxiliary Area, Timer Area, Counter Area, DM Area, or Expansion DM Area in the PC.	54

Edit DM Operations

Name	Description	Page
Read DM Address	Used to display DM data from the PC up to 160 words at a time. Display data can be modified.	96
Copy	Used to copy DM data in the PC.	97
Fill	Used to write the same content to multiple DM words in the PC.	97
Print	Used to print a specified area of DM from the PC.	97
HEX <–> ASCII	Used to specify whether DM data is to be written in hexadecimal or ASCII.	97
Switch Bank Number	Used to specify the Expansion DM bank in the PC (for CV1000 PCs only).	98
Save DM	Used to save DM data from the PC to a data disk.	98
Retrieve DM	Used to retrieve DM data from a data disk to the PC.	99
Transfer DM	Used to transfer DM data between the PC and the CVSS and compare the contents.	99

Edit I/O Table Operations

Name	Description	Page
Transfer I/O Table	Used to transfer or compare the I/O table between the work disk in the CVSS and the PC.	92
Create I/O Table	Used to register in the PC the Units mounted to PC and allocate words to them.	93
Compare I/O Table	Used to compare the actual Units mounted to PC with the I/O table in the PC.	94
PC Setup	Used to set the addresses of the first words for local Racks and for group-1, group-2, and group-3 Slaves.	94

Other Operations

Name		Description	Page
Debugging		Used to execute the program one step at a time or until certain conditions are met and to display step and action status. Debugging can be stopped in progress and monitoring operations used. Debugging operations are not supported by CVM1 PCs.	56
Data Tracing		Used to trace data, display the results, and write the results to data disks.	60
Program Trace	Action	Used to trace actions and display the results.	68
	Instruction	Used to trace instructions and display the results.	71
	Mark	Used to trace marks and display the results.	77

Name	Description	Page
PC Setup	Used to set parameters in the PC Setup.	163
Customize	Used to transfer customized settings from the CVSS to the PC.	164
CPU Bus Unit Setup	Used to set parameters for SYSMAC NET, SYSMAC LINK, and SYSMAC BUS/2 communications.	105
Network Support Tables	Used to to transfer data link tables and routing tables between Link Units, the PC, and the CVSS and to compare these tables. Also used to start and start data links.	113
Network Diagnosis	Used to run tests between nodes, to read node status, and to read error logs from Units for the SYSMAC NET and SYSMAC LINK Systems. Also used for SYSMAC LINK Systems to run broadcast tests and set network parameters.	134
SYSMAC BUS/2	Used to manipulate SYSMAC BUS/2 Remote I/O Master Units.	141
Memory Cards	Used to display files lists from Memory Cards in the PC and to manipulate these files. Writing is not possible for EEPROM and EPROM cards.	152
Read Error	Used to read the current error and error logs. Also used to force release of the access right to a PC.	148
Clock	Used to set the clock in the PC.	149
Protect UM	Used to protect all or part of the user program by creating passwords. Program access will not be possible to protected sections without the proper password.	165

1-2 Ladder Diagram Instructions

This section provides tables of the ladder-diagram instructions for reference in inputting programs. The first table can be used to find instructions by function code. The second table can be used to find instruction by mnemonic.

Refer to the *CV-series PC Operation Manual: Ladder Diagrams* for programming details on ladder-diagram instructions.

1-2-1 Function Codes

The following table lists the instructions that have function codes. Each instruction is listed by mnemonic, with the variations given in parentheses afterward, and by instruction name. The function code for any instruction is derived by using the numbers in the leftmost column as the leftmost digits and the number in the column heading as the rightmost digit.

Code	Rightmost digit										Instruction group
	0	1	2	3	4	5	6	7	8	9	
00	**NOP** NO OPERATION	**END** END	**IL** INTERLOCK	**ILC** INTERLOCK CLEAR	**JMP** JUMP	**JME** JUMP END	**FAL** (j) FAILURE ALARM AND RESET	**FALS** SEVERE ALARM FAILURE	**STEP** STEP DEFINE	**SNXT** STEP START	Sequence Control Instructions
01	**NOT** NOT	**KEEP** (!) KEEP	**CNTR** REVERSIBLE COUNTER	**DIFU** (!) DIFFERENTIATE UP	**DIFD** (!) DIFFERENTIATE DOWN	**TIMH** HIGH-SPEED TIMER	**SET** (j!i) SET	**RSET** (j!i) RESET			
02	**CMP** (!) COMPARE	**CMPL** DOUBLE COMPARE	**BCMP** (j) BLOCK COMPARE	**TCMP** (j) TABLE COMPARE	**MCMP** (j) MULTIPLE COMPARE	**EQU** (j) EQUAL					Data Compare Instructions
03	**MOV** (j!) MOVE	**MVN** (j) MOVE NOT	**MOVL** (j) DOUBLE MOVE	**MVNL** (j) DOUBLE MOVE NOT	**XCHG** (j) DATA EXCHANGE	**XCGL** (j) DOUBLE DATA EXCHANGE	**MOVR** (j) MOVE TO REGISTER	**MOVQ** MOVE QUICK			Data Move Instructions
04	**XFER** (j) BLOCK TRANSFER	**BSET** (j) BLOCK SET	**MOVB** (j) MOVE BIT	**MOVD** (j) MOVE DIGIT	**DIST** (j) DATA DISTRIBUTE	**COLL** (j) DATA COLLECT					
05	**SFT** SHIFT REGISTER	**SFTR** (j) REVERSIBLE SHIFT REGISTER	**ASFT** (j) ASYNCHRONOUS SHIFT REGISTER	**WSFT** (j) WORD SHIFT							Data Shift Instructions
06	**ASL** (j) SHIFT LEFT	**ASR** (j) SHIFT RIGHT	**ROL** (j) ROTATE LEFT	**ROR** (j) ROTATE RIGHT	**ASLL** (j) DOUBLE SHIFT LEFT	**ASRL** (j) DOUBLE SHIFT RIGHT	**ROLL** (j) DOUBLE ROTATE LEFT	**RORL** (j) DOUBLE ROTATE RIGHT	**SLD** (j) SHIFT DIGIT LEFT	**SRD** (j) SHIFT DIGIT RIGHT	

Code	Rightmost digit										Instruction group
	0	1	2	3	4	5	6	7	8	9	
07	**ADD** (j) BCD ADD	**SUB** (j) BCD SUBTRACT	**MUL** (j) BCD MULTIPLY	**DIV** (j) BCD DIVIDE	**ADDL** (j) DOUBLE BCD ADD	**SUBL** (j) DOUBLE BCD SUBTRACT	**MULL** (j) DOUBLE BCD MULTIPLY	**DIVL** (j) DOUBLE BCD DIVIDE	**STC** (j) SET CARRY	**CLC** (j) CLEAR CARRY	BCD Calculation Instructions
08	**ADB** (j) BINARY ADD	**SBB** (j) BINARY SUBTRACT	**MLB** (j) BINARY MULTIPLY	**DVB** (j) BINARY DIVIDE	**ADBL** (j) DOUBLE BINARY ADD	**SBBL** (j) DOUBLE BINARY SUBTRACT	**MLBL** (j) DOUBLE BINARY MULTIPLY	**DVBL** (j) DOUBLE BINARY DIVIDE			Binary Calculation Instructions
09	**INC** (j) INCREMENT BCD	**DEC** (j) DECREMENT BCD	**INCB** (j) INCREMENT BINARY	**DECB** (j) DECREMENT BINARY	**INCL** (j) DOUBLE INCREMENT BCD	**DECL** (j) DOUBLE DECREMENT BCD	**INBL** (j) DOUBLE INCREMENT BINARY	**DCBL** (j) DOUBLE DECREMENT BINARY			Increment/ Decrement Instructions
10	**BIN** (j) BCD TO BINARY	**BCD** (j) BINARY TO BCD	**BINL** (j) DOUBLE BCD TO DOUBLE BINARY	**BCDL** (j) DOUBLE BINARY TO DOUBLE BCD	**NEG** (j) 2'S COMPLEMENT	**NEGL** (j) DOUBLE 2'S COMPLEMENT	**SIGN** (j) SIGN				Data Format Conversion Instructions
11	**MLPX** (j) 4-TO-16 DECODER	**DMPX** (j) 16-TO-4 ENCODER	**SDEC** (j) 7-SEGMENT DECODER	**ASC** (j) ASCII CONVERT	**BCNT** (j) BIT COUNTER	**LINE** (j) COLUMN TO LINE	**COLM** (j) LINE TO COLUMN				Data Conversion Functions
12	**TTIM** ACCUMULATIVE TIMER	**TIML** LONG TIMER	**MTIM** MULTI-OUTPUT TIMER	**TCNT** TRANSITION COUNTER	**TSR** (j) READ STEP TIMER	**TSW** (j) WRITE STEP TIMER					Special Counter and Timer Instructions
13	**ANDW** (j) LOGICAL AND	**ORW** (j) LOGICAL OR	**XORW** (j) EXCLUSIVE OR	**XNRW** (j) EXCLUSIVE NOR	**ANDL** (j) DOUBLE LOGICAL OR	**ORWL** (j) DOUBLE LOGICAL OR	**XORL** (j) DOUBLE EXCLUSIVE OR	**XNRL** (j) DOUBLE EXCLUSIVE NOR	**COM** (j) COMPLEMENT	**COML** (j) DOUBLE COMPLEMENT	Logical Instructions
14	**ROOT** (j) SQUARE ROOT	**FDIV** (j) FLOATING POINT DIVIDE	**APR** (j) ARITHMETIC PROCESS	**SEC** (j) HOURS TO SECONDS	**HMS** (j) SECONDS TO HOURS	**CADD** (j) CALENDAR ADD	**CSUB** (j) CALENDAR SUBTRACT				Special Instructions
15	**SBN** SUBROUTINE ENTRY	**SBS** (j) SUBROUTINE CALL	**RET** SUBROUTINE RETURN	**MSKS** (j) INTERRUPT MASK	**CLI** (j) CLEAR INTERRUPT	**MSKR** (j) READ MASK					Subroutine Instructions Interrupt Instructions
16	**SSET** (j) SET STACK	**PUSH** (j) PUSH ONTO STACK	**LIFO** (j) LAST-IN, FIRST-OUT	**FIFO** (j) FIRST-IN, FIRST-OUT	**SRCH** (j) DATA SEARCH	**MAX** (j) FIND MAXIMUM	**MIN** (j) FIND MINIMUM	**SUM** (j) SUM			Table Data Processing Instructions
17	**TRSM** TRACE MEMORY	**EMBC** (j) SELECT DM BANK	**CCL** (j) LOAD FLAGS	**CCS** (j) SAVE FLAGS	**MARK** MARK TRACE	**REGL** (j) LOAD REGISTER	**REGS** (j) SAVE REGISTER				Trace Instructions Special Instructions
18	**FILR** (j) READ DATA FILE	**FILW** (j) WRITE DATA FILE	**FILP** (j) READ PROGRAM FILE	**FLSP** (j) CHANGE STEP PROGRAM	**IORF** (j) I/O REFRESH			**IOSP** (j) DISABLE ACCESS	**IORS** ENABLE ACCESS	**IODP** (j) I/O DISPLAY	File Processing Instructions and
19	**READ** READ I/O	**WRIT** WRITE I/O	**SEND** (j) NETWORK SEND	**RECV** (j) NETWORK RECEIVE	**CMND** (j) DELIVER COMMAND	**MSG** (j) MESSAGE					I/O Processing Instructions
20			**TOUT** TRANSITION OUTPUT								SFC Control Instructions
21	**SA** (j) ACTIVATE STEP	**SP** (j) PAUSE STEP	**SR** (j) RESTART STEP	**SF** (j) END STEP	**SE** (j) DEACTIVATE STEP	**SOFF** (j) RESET STEP					
22											—
23							**CNR** (j) RESET TIMER/ COUNTER				—

1-2-2 Alphabetic List of Mnemonics

Mnemonic	Code	Name
ADB (j)	080	BINARY ADD
ADBL (j)	084	DOUBLE BINARY ADD
ADD (j)	070	BCD ADD
ADDL (j)	074	DOUBLE BCD ADD
AND (!ji)	None	AND
ANDL (j)	134	DOUBLE LOGICAL AND
AND LD	None	AND LOAD
AND NOT (!)	None	AND NOT
ANDW (j)	130	LOGICAL AND
APR (j)	142	ARITHMETIC PROCESS
ASC (j)	113	ASCII CONVERT
ASFT (j)	052	ASYNCHRONOUS SHIFT REGISTER
ASL (j)	060	ARITHMETIC SHIFT LEFT
ASLL (j)	064	DOUBLE SHIFT LEFT
ASR (j)	061	ARITHMETIC SHIFT RIGHT
ASRL (j)	065	DOUBLE SHIFT RIGHT
BCD (j)	101	BINARY-TO-BCD
BCDL (j)	103	DOUBLE BINARY-TO-DOUBLE BCD
BCMP (j)	022	BLOCK COMPARE
BCNT (j)	114	BIT COUNTER
BIN (j)	100	BCD-TO-BINARY
BINL (j)	102	DOUBLE BCD-TO-DOUBLE BINARY
BSET (j)	041	BLOCK SET
CADD (j)	145	CALENDAR ADD
CCL (j)	172	LOAD FLAGS
CCS (j)	173	SAVE FLAGS
CLC (j)	079	CLEAR CARRY
CLI (j)	154	CLEAR INTERRUPT
CMND (j)	194	DELIVER COMMAND
CMP (!)	020	COMPARE
CMPL	021	DOUBLE COMPARE
CNR (j)	236	RESET TIMER/COUNTER
CNT	None	COUNTER
CNTR	012	REVERSIBLE COUNTER
COLL (j)	045	DATA COLLECT
COLM (j)	116	LINE TO COLUMN
COM (j)	138	COMPLEMENT
COML (j)	139	DOUBLE COMPLEMENT
CSUB (j)	146	CALENDAR SUBTRACT

Mnemonic	Code	Name
DCBL (j)	097	DOUBLE DECREMENT BINARY
DEC (j)	091	DECREMENT BCD
DECB (j)	093	DECREMENT BINARY
DECL (j)	095	DOUBLE DECREMENT BCD
DIFD (!)	014	DIFFERENTIATE DOWN
DIFU (!)	013	DIFFERENTIATE UP
DIST (j)	044	SINGLE WORD DISTRIBUTE
DIV (j)	073	BCD DIVIDE
DIVL (j)	077	DOUBLE BCD DIVIDE
DMPX (j)	111	16-TO-4 ENCODER
DVB (j)	083	BINARY DIVIDE
DVBL (j)	087	DOUBLE BINARY DIVIDE
EMBC (j)	171	SELECT EM BANK
END	001	END
EQU (j)	025	EQUAL
FAL (j	006	FAILURE ALARM
FALS (j)	007	FAILURE ALARM
FDIV (j)	141	FLOATING POINT DIVIDE
FIFO (j)	163	FIRST IN FIRST OUT
FILP (j)	182	READ PROGRAM FILE
FILR (j)	180	READ DATA FILE
FILW (j)	181	WRITE DATA FILE
FLSP (j)	183	CHANGE STEP PROGRAM
HMS (j)	144	SECONDS TO HOURS
IL	002	INTERLOCK
ILC	003	INTERLOCK CLEAR
INBL (j)	096	DOUBLE INCREMENT BINARY
INC (j)	090	INCREMENT BCD
INCB (j)	092	INCREMENT BINARY
INCL (j)	094	DOUBLE INCREMENT BCD
IODP (j)	189	I/O DISPLAY
IORF (j)	184	I/O REFRESH
IORS	188	ENABLE ACCESS
IOSP (j)	187	DISABLE ACCESS
JME	005	JUMP END
JMP	004	JUMP
KEEP (!)	011	KEEP
LD (!ji)	None	LOAD
LD NOT (!)	None	LOAD NOT

Mnemonic	Code	Name
LIFO (j)	162	LAST IN FIRST OUT
LINE (j)	115	COLUMN TO LINE
MARK	174	MARK TRACE
MAX (j)	165	FIND MAXIMUM
MCMP (j)	024	MULTIPLE COMPARE
MIN (j)	166	FIND MINIMUM
MLB (j)	082	BINARY MULTIPLY
MLBL (j)	086	DOUBLE BINARY MULTIPLY
MLPX (j)	110	4-TO-16 DECODER
MOV (!j)	030	MOVE
MOVB (j)	042	MOVE BIT
MOVD (j)	043	MOVE DIGIT
MOVL (j)	032	DOUBLE MOVE
MOVQ	037	MOVE QUICK
MOVR (j)	036	MOVE TO REGISTER
MSG (j)	195	MESSAGE
MSKR (j)	155	READ MASK
MSKS (j)	153	INTERRUPT MASK
MTIM	122	MULTI-OUTPUT TIMER
MUL (j)	072	BCD MULTIPLY
MULL (j)	076	DOUBLE BCD MULTIPLY
MVN (j)	031	MOVE NOT
MVNL (j)	033	DOUBLE MOVE NOT
NEG (j)	104	2'S COMPLEMENT
NEGL (j)	105	DOUBLE 2'S COMPLEMENT
NOP	000	NO OPERATION
NOT	010	NOT
OR (!ji)	None	OR
OR NOT (!)	None	OR NOT
OR LOAD	None	OR LOAD
ORW (j)	131	LOGICAL OR
ORWL (j)	135	DOUBLE LOGICAL OR
OUT (!)	None	OUTPUT
OUT NOT (!)	None	OUTPUT NOT
PUSH (j)	161	PUSH ONTO STACK
READ	190	I/O READ
RECV (j)	193	NETWORK RECEIVE
REGL (j)	175	LOAD REGISTER
REGS (j)	176	SAVE REGISTER
RET	152	SUBROUTINE RETURN
ROL (j)	062	ROTATE LEFT

Mnemonic	Code	Name
ROLL (j)	066	DOUBLE ROTATE LEFT
ROOT (j)	140	SQUARE ROOT
ROR (j)	063	ROTATE RIGHT
RORL (j)	067	DOUBLE ROTATE RIGHT
RSET (!ji)	017	RSET
SA (j)	210	ACTIVATE STEP
SBB (j)	081	BINARY SUBTRACT
SBBL (j)	085	DOUBLE BINARY SUBTRACT
SBN	150	SUBROUTINE ENTER
SBS (j)	151	SUBROUTINE CALL
SDEC (j)	112	7-SEGMENT DECODER
SE (j)	214	DEACTIVATE STEP
SEC (j)	143	HOURS TO SECONDS
SEND (j)	192	NETWORK SEND
SET (!ji)	016	SET
SF (j)	213	END STEP
SFT	050	SHIFT REGISTER
SFTR (j)	051	REVERSIBLE SHIFT REGISTER
SIGN (j)	106	SIGN
SLD (j)	068	SHIFT DIGIT LEFT
SNXT	009	STEP START
SOFF (j)	215	RESET STEP
SP (j)	211	PAUSE STEP
SR (j)	212	RESTART STEP
SRCH (j)	164	DATA SEARCH
SRD (j)	069	SHIFT DIGIT RIGHT
SSET (j)	160	SET STACK
STC (j)	078	SET CARRY
STEP	008	STEP DEFINE
SUB (j)	071	BCD SUBTRACT
SUBL (j)	075	DOUBLE BCD SUBTRACT
SUM (j)	167	SUM
TCMP (j)	023	TABLE COMPARE
TCNT	123	TRANSITION COUNTER
TIM	None	TIMER
TIMH	015	HIGH-SPEED TIMER
TIML	121	LONG TIMER
TOUT	202	TRANSITION OUTPUT
TRSM	170	TRACE MEMORY
TSR (j)	124	READ STEP TIMER
TSW (j)	125	WRITE STEP TIMER

Mnemonic	Code	Name
TTIM	120	ACCUMULATIVE TIMER
WRIT	191	I/O WRITE
WSFT (j)	053	WORD SHIFT
XCGL (j)	035	DOUBLE DATA EXCHANGE
XCHG (j)	034	DATA EXCHANGE

Mnemonic	Code	Name
XFER (j)	040	BLOCK TRANSFER
XNRL (j)	137	DOUBLE EXCLUSIVE NOR
XNRW (j)	133	EXCLUSIVE NOR
XORL (j)	136	DOUBLE EXCLUSIVE OR
XORW (j)	132	EXCLUSIVE OR

1-3 PC Data Areas

The following table outlines the data areas provided in the PC. Refer to the *CV-series PC Operation Manual: Ladder Diagrams* for programming details on ladder-diagram instructions.

Area	PC	Range	Function
I/O Area	CV500-CPU01-E CVM1-CPU01-E	Words: CIO 0000 to CIO 0031 Bits: CIO 000000 to CIO 003115 ($0000 to $001F)	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. Once I/O table has been registered, input bits are displayed on CVSS with an I; output bits, with a Q.
	CV1000-CPU01-E CVM1-CPU11-E	Words: CIO 0000 to CIO 0063 Bits: CIO 000000 to CIO 006315 ($0000 to $003F)	
	CV2000-CPU01-E	Words: CIO 0000 to CIO 0127 Bits: CIO 000000 to CIO 012715 ($0000 to $007F)	
Work Area	CV500-CPU01-E CVM1-CPU01-E	Words: CIO 0032 to CIO 0199 Bits: CIO 003200 to CIO 019915 ($0020 to $00C7)	These bits are used in the program to manipulate or to temporarily store data.
	CV1000-CPU01-E CVM1-CPU11-E	Words: CIO 0064 to CIO 0199 Bits: CIO 006400 to CIO 019915 ($0040 to $00C7)	
	CV2000-CPU01-E	Words: CIO 0128 to CIO 0199 Bits: CIO 012800 to CIO 019915 ($0080 to $00C7)	
SYSMAC BUS/2 Area	CV500-CPU01-E CVM1-CPU01-E	Words: CIO 0200 to CIO 0599 Bits: CIO 020000 to CIO 059915 ($00C8 to $0257)	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.
	CV1000-CPU01-E CV2000-CPU01-E CVM1-CPU11-E	Words: CIO 0200 to CIO 0999 Bits: CIO 020000 to CIO 099915 ($00C8 to $03E7)	
Link Area	All	Words: CIO 1000 to CIO 1199 Bits: CIO 100000 to CIO 119915 ($03E8 to $04AF)	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	Words: CIO 1200 to CIO 1499 Bits: CIO 120000 to CIO 149915 ($04B0 to $05DB)	Used to store data and to retain the data values when the power is turned off.
CPU Bus Unit Area	All	Words: CIO 1500 to CIO 1899 Bits: CIO 150000 to CIO 189915 ($05DC to $076B)	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.
Work Area	All	Words: CIO 1900 to CIO 2299 Bits: CIO 190000 to CIO 229915 ($076C to $08FB)	These bits are used in the program to manipulate or to temporarily store data. These bits can be set as holding bits via the PC Setup.

Area	PC	Range	Function
SYSMAC BUS Area	CV500-CPU01-E CVM1-CPU01-E	Words: CIO 2300 to CIO 2427 Bits: CIO 230000 to CIO 242715 ($08FC to $097B)	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.
	CV1000-CPU01-E CV2000-CPU01-E CVM1-CPU11-E	Words: CIO 2300 to CIO 2555 Bits: CIO 230000 to CIO 255515 ($08FC to $09FB)	Bits not used to control I/O points can be used as work bits. Up to word 2399 can be set as holding bits via the PC Setup.
Temporary Relay Area	All	TR0 to TR7 (bits only) ($09FF)	Used to temporarily store execution conditions. TR bits are not input when programming directly in ladder diagrams.
CPU Bus Link Area	All	Words: G000 to G255 Bits: G00000 to G25515 ($0A00 to $0AFF)	G000 is the PC Status Area; G001 to G004, the Clock Area. G008 to G127 contain PC output bits; G128 to G255, CPU Bus Unit output bits.
Auxiliary Area	All	Words: A000 to A511 Bits: A00000 to A51115 ($0B00 to $0CFF)	Contains flags and bits with special functions.
Transition Area	CV500-CPU01-E	TN0000 to TN0511 ($0D00 to $0D1F)	Transition Flags for the transitions in the SFC program.
	CV1000-CPU01-E CV2000-CPU01-E	TN0000 to TN1023 ($0D00 to $0D3F)	
Step Area	CV500-CPU01-E	ST0000 to ST0511 ($0E00 to $0E1F)	Step Flags for the steps in the SFC program. A step is active when its flag is ON.
	CV1000-CPU01-E CV2000-CPU01-E	ST0000 to ST1023 ($0E00 to $0E3F)	
Timer Area	CV500-CPU01-E CVM1-CPU01-E	T0000 to T0511 (Completion Flags: $0F00 to $0F1F Present Values: $1000 to $11FF)	Used to define timers (normal, high-speed, and totalizing) and to access Completion Flags, PV, and SV.
	CV1000-CPU01-E CV2000-CPU01-E CVM1-CPU11-E	T0000 to T1023 (Completion Flags: $0F00 to $0F3F Present Values: $1000 to $13FF)	
Counter Area	CV500-CPU01-E CVM1-CPU01-E	C0000 to C0511 (Completion Flags: $0F80 to $0F9F Present Values: $1800 to $19FF)	Used to define counters (normal, reversible, and transition) and to access Completion Flags, PV, and SV.
	CV1000-CPU01-E CV2000-CPU01-E CVM1-CPU11-E	C0000 to C1023 (Completion Flags: $0F80 to $0FBF Present Values: $1800 to $1BFF)	
DM Area	CV500-CPU01-E CVM1-CPU01-E	D00000 to D08191 ($2000 to $3FFF)	Used for internal data storage and manipulation.
	CV1000-CPU01-E CV2000-CPU01-E CVM1-CPU11-E	D00000 to D24575 ($2000 to $7FFF)	
EM Area	CV1000-CPU01-E CV2000-CPU01-E	E00000 to E32765 for each bank; 2, 4, or 8 banks ($8000 to $8FFD)	EM functions just like DM. An Extended Data Memory Unit must be installed.
Index registers	All	IR0 to IR2	Used for indirect addressing.
Data registers	All	DR0 to DR2	Generally used for indirect addressing.

1-4 Abbreviations

The following abbreviations are used in the messages that appear on the CV Support Software Version 2.

A area	Auxiliary Area
AC	action
ACN	action
addr	address
AQ	action qualifier
bkloop	backloop
Blk	block
BIN	binary
BUS	SYSMAC BUS Remote I/O System
BUS2	SYSMAC BUS/2 Remote I/O System
cht	chart
cnd	condition
com	comment
comm	communications
comp	compare
conf	configuration
conn	connection
cont err	non-fatal error (continue error)
CPU SIO	CPU Bus Unit
C-ser	C-series
cum	cumulative
disp	display
dat	data
del	delete
dest	destination
Dup	duplicated
E_UM	Expansion DM and User Program Areas
edt	edit
EM	Expansion DM Area
EOF	end of file
err	error
ExpRck	Expansion CPU/Expansion I/O Rack
FD	floppy disk
FAT	file allocation table
FUN	function code
FV	feedback variable
G area	CPU Bus Link Area
HD	hard disk
IN	input
ind	indirect
INT	interrupt
intr	interrupt
IOIF	I/O Interface Unit
ladd	ladder
lnk	link
MON	monitor
net	network
offl	offline
onl	online
onln	online
op	operation
opt	optical
OUT	output
pwr	power
rak	Rack
rec	reception
RET	return
reg	register/registration
RM	Master
RT	Slave
stat	status
schl	scheduled
sel	select
ser	series
spec	specified/special
stop error	stop error (fatal error)
sht	sheet
SIO	Special I/O Unit
ST	step
stan	standard
SV	set value
sys	system
swit	switch
tbl	table
TN	transition
trans	transition
trigg	trigger
TRN	transition
UM	User Program Memory
undef	undefined
WDT	watchdog timer

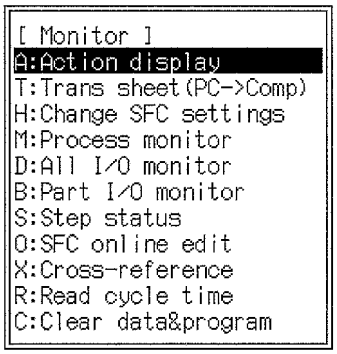
SECTION 2
SFC Programs

This section describes the operations used to monitor and alter the SFC program in a PC.

2-1 Monitor Menu

Connect the computer to the PC and press the Shift+F1 Keys from the main offline menu to go online and display the online menu. Select “M:Monitor” from the menu. The initial (detail view mode) monitor display will appear. Press the End Key or Ctrl+M Keys from the initial monitor display to access the Monitor menu.

Note Before monitoring SFC programs, set the System Settings to “SFC+Ladder.”



To cancel the monitoring operations and return to the online menu, press the Esc Key on the detail view monitor display.

Valid PC Modes

Operation		RUN	MONITOR	DEBUG	PROGRAM
Action display		OK	OK	OK	OK
Trans sheet (PCACComp)		OK	OK	OK	OK
Change SFC settings		OK	OK	OK	OK
Process monitor	Step monitor	OK	OK	OK	OK
	Action monitor				
All I/O monitor		OK	OK	OK	OK
Part I/O monitor		OK	OK	OK	OK
Read cycle time		OK	OK	No	No
SFC online edit	Trans sht (CompAPC)	No	OK	OK	OK
	Edit Step/Trans	OK			
	Edit action	OK			
	Check program	No			
	Memory map	OK			
	Change PC mode	OK			
Step status		NO	OK	OK	No
Cross-reference		OK	OK	OK	OK
Clear data & program (See note)		No	Limited	Limited	OK

Note Programs cannot be cleared in the MONITOR or DEBUG mode. Programs can be cleared only in the PROGRAM mode.

The F1 to F4 and F10 Keys can be used in any PC Mode. Refer to *2-4 Initial Monitor Display* for details on the function keys.

2-2 Transferring Sheets

This section describes how to transfer sheets between the PC user memory and computer main memory. Before monitoring an SFC program online, use the

Trans sheet (PC A Comp) operation to read the sheet to be monitored. Use the *Trans sheet (PC A Comp)* operation again after rewriting the Action Block with the CHANGE STEP PROGRAM instruction (FLSP(183)).

Programs are stored on the computer work disk in an intermediate code, whereas the programs in the PC are in PC machine code. Programs are converted from one code to another during transfer. Program transfer does not stop the moment Esc Key is pressed; transfer will continue until the current block has been transferred.

Operation	Function
Trans sheet (PC A Comp)	Uploads the program from the PC user memory to the computer main memory.
Trans sheet (Comp A PC)	Downloads the program from the computer main memory to the PC user memory.

Note The PC has no I/O name area or I/O comment area. When a program is transferred from the PC to the computer, the I/O names and I/O comments on the computer work disk are linked to the program. If a program is created on the computer with I/O names and I/O comments, the I/O names and I/O comments will not exist in the program stored in the PC after transfer from the computer. If a program is transferred from the PC to the computer after the I/O names and I/O comments have been rewritten on the work disk, the new I/O names and I/O comments will be linked to the transferred program. In this case, the displayed I/O names and I/O comments may not agree with those originally edited or corrected for the program in the PC.

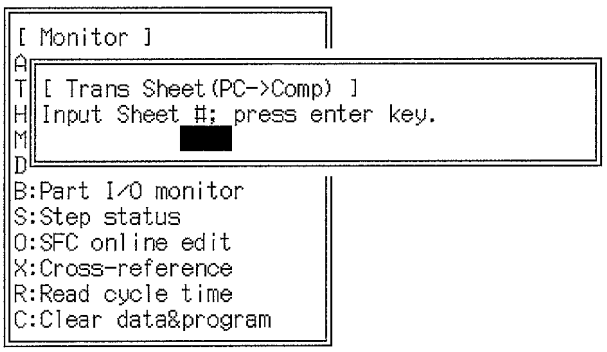
The method for transferring programs from the PC to the computer is described below. See *2-9-3 Transferring Sheets to PC* for details about transferring programs from the computer to a PC. Normally, programs are transferred to a PC from the computer after having read them from a PC and editing them online.

Trans Sheet (PC A Comp)

This operation is possible in any PC Mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

1, 2, 3... 1. Select "T:Trans sheet (PC *A* Comp)" from the Monitor menu. The following display will appear.



The function key menu at the bottom of the screen will change and the sheet number input area will appear.

2. Press the End Key or Ctrl+M Keys to display a table of sheet numbers. Select the sheet number of the sheet to be transferred to the computer and press the Enter Key. The sheet number will appear in the input area.

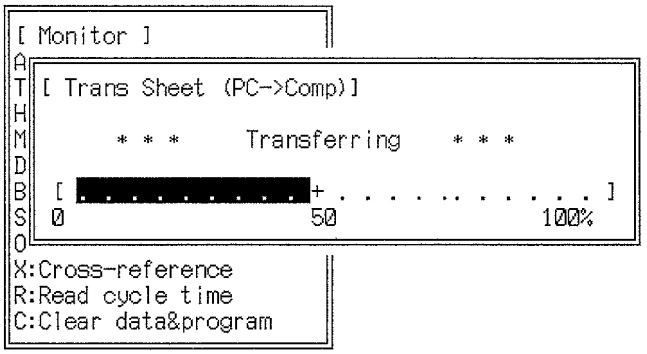
   Use the following procedure to enter the sheet number if the number of the sheet to be transferred is unknown.

   c) Press the F10 (Find) Key. The function key menu at the bottom of the screen will change, and a message and an input area will appear.

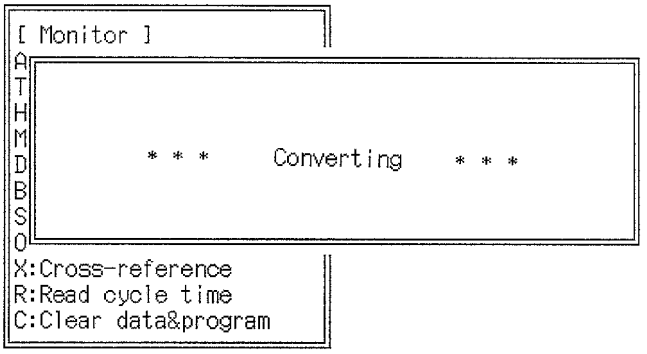
d) Enter the step, transition, or action number of the sheet to find and press the Enter Key. When the sheet is found, the sheet number will appear in the input area. A table of sheet numbers will be displayed if more than one sheet is found. Select the sheet number to be transferred from the table.

3. Program transfer will start when the Enter Key is pressed. A message will flash during program transfer. The amount of the program transferred will be displayed as a percentage.

   Press the Esc Key to cancel the program transfer.



4. Conversion will start when transfer has been completed. A message will flash during program conversion.



   The initial monitor display will be displayed when the conversion is complete.

Note

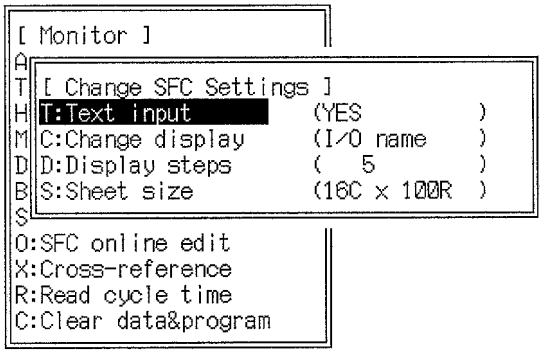
1. If "T:Trans sheet (PC A Comp)" is selected while the program is being edited at the computer, a prompt message will warn that the sheet currently being edited will be lost.
2. Press the Y and Enter Keys if the sheet displayed on the display can be lost.
3. Press the Enter Key or N and Enter Keys to cancel the transfer. Use the *Trans sheet (Comp A PC)* operation before selecting the *Trans sheet (PC A Comp)* operation again.

2-3 Changing SFC Settings

This operation is possible in any PC Mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

Select “H:Change SFC settings” item from the Monitor menu. The current settings will be displayed in parentheses ( ).



Text Input for SFC Parts

This setting determines whether text is input after each SFC part is written. This setting is identical to that in the offline mode.

Select “T:Text input” from the Change SFC Settings menu and specify the SFC text input mode.

Display Setting

This setting determines if I/O names are displayed with SFC parts. This setting is identical to that in the offline mode.

Select “C:Change display” from the Change SFC Settings menu and specify the display mode.

Number of Displayed Steps

This setting determines the number of lines of SFC parts displayed. This setting is identical to that in the offline mode.

Select “D:Display steps” from the Change SFC Settings menu and specify the number of steps to be displayed.

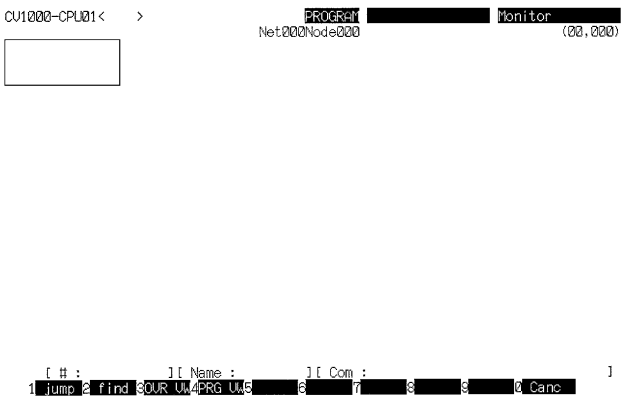
Sheet Size Setting

This setting determines the sheet size when creating SFC programs. This setting is identical to that in the offline mode.

Select “S:Sheet sizes” from the Change SFC Settings menu and specify the sheet size.

2-4 Initial Monitor Display

The function keys on the initial monitor display allow PC operation status to be monitored after sheets have been read using the *Trans sheet (PC* A *Comp)* operation.



The sheet that was monitored last will be displayed when “M:Monitor” is selected from the online menu, and the currently active steps will be displayed in reverse

video. The operation of the F1, F2, F3, and F4 Keys are identical to offline operation.

Function key	Operation	Description
F1	Jump	Displays and selects the SFC part at the specified position.
F2	Find	Finds the specified SFC part text, displays the SFC part corresponding to the text, and selects it with the cursor.
F3	Select overview mode	Displays a large-scale view of a larger range of the SFC program and monitors the PC operation status.
F4	Select program view mode	Displays the specified transition or action in ladder-diagram form and monitors the PC operation status.
F10	Clear error	Clears errors in the PC from the computer.
Shift+F7	Select RUN mode.	Sets the PC in RUN mode.
Shift+F8	Select MONITOR mode.	Sets the PC in MONITOR mode.
Shift+F9	Select DEBUG mode.	Sets the PC in DEBUG mode.
Shift+F10	Select PROGRAM mode.	Sets the PC in PROGRAM mode.

2-5 Action Display

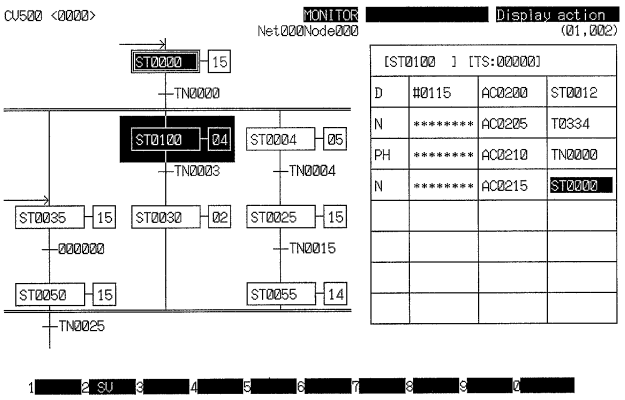
This operation is used to display action status. This operation is possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

Use the Shift+Right Keys instead of the Enter Key to select the step for which the actions are to be displayed. Press the Shift+Left Keys when the action block is displayed to hide the action block and allow another step to be selected. These operations make it easy to consecutively monitor actions in several steps.

1, 2, 3...

1. Select “A:Action display” from the Monitor menu.
2. Move the cursor to the required step and press the Enter Key. The function key menu at the bottom of the screen will change and the action block will be displayed at the right-hand side of the display. The currently active PC actions will be displayed in reverse video.



3. Up to 8 actions in a single step can be monitored simultaneously. If a step contains more than 8 actions, press the PgDn and PgUp Keys to switch between the 1st and 2nd action block displays. The top line of the second action block display shows the same action as the bottom line of the first action block display.

4. Press the Shift+Esc Keys to return to the initial monitor display.
   or
   Press the Esc Key from the action display to return to the display to specify steps.

Function key	Operation	Description
F2	Changes set values (SVs).	Changes the SVs for the action selected in the action block. The contents of the PC user memory will be changed.

F2: Changing SVs

This operation is used to change the set value assigned to an action. The set value can be changed only if it is defined as a constant. To change the SV, specify the step and action numbers. The contents of the PC user memory will be changed.

Use the Action Monitor item under the Process Monitor menu to change the step timer PV.

1, 2, 3...

1. Press the F2 Key.
2. Enter the step number and press the Enter Key.
3. Enter the action number and press the Enter Key.
4. Enter the SV and press the Enter Key. Input SVs as 4-digit decimal values.

2-6 Process Monitor

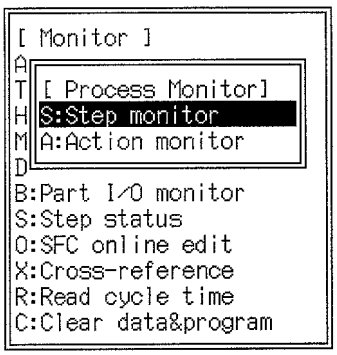
2-6-1 Step Monitor

This operation is used to monitor step status. Up to 70 steps can be selected from the user program. The currently active steps among the selected steps will be displayed in reverse video. This operation is possible in any PC mode.

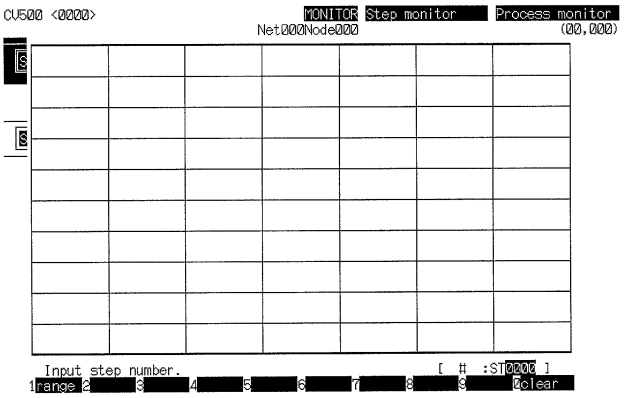
RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

1, 2, 3...

1. Select “M:Process monitor” from the Monitor menu.



2. Select “S:Step monitor” from the Process Monitor menu. The step monitor display will appear and the function key menu will change. A message and a step number input area will also appear.



3. Enter the step numbers to be monitored and press the Enter Key. The input step numbers will be displayed sequentially from the top-left corner of the step monitor area. Up to 70 step numbers can be specified.
4. Press the Shift+Esc Keys to return to the monitor display.
   or
   Press the Esc Key to return to the Process Monitor menu.

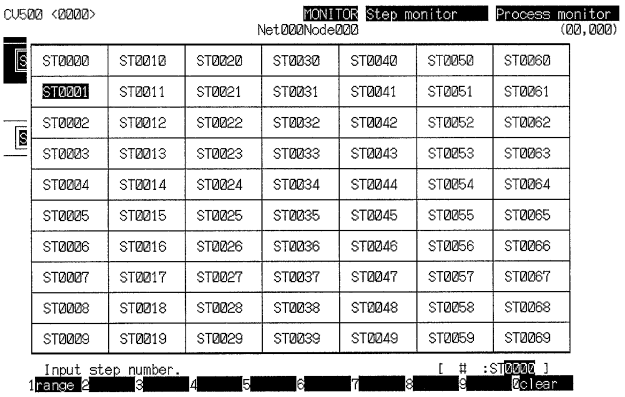
Function key	Operation	Description
F1	Specifies steps to be monitored	Used when designating a consecutive range of step numbers. The specified range of step numbers will be displayed in the step monitor area.
F10	Clears step monitor area	Deletes the entire step monitor area.

F1: Range

The F1 Key can be pressed to specify the step number to be displayed in the step monitor area. This operation is possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

The input area will change when the F1 Key is pressed. The insertion point will appear in the input area for the first step number in the range to be monitored. After the first step number has been input, the insertion point moves to the input area for the last step number. The insertion point can be moved between the input areas for the first and last step numbers by pressing the Left and Right Keys. After the last step number has been input, the step numbers will be display for the specified range. The step numbers of the currently active steps will be displayed in reverse video in the step monitor table.



F10: Clear

The F10 Key is used to clear the step monitor area. This operation is possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

To clear the entire step monitor area, press the F10 and then the Enter Key.

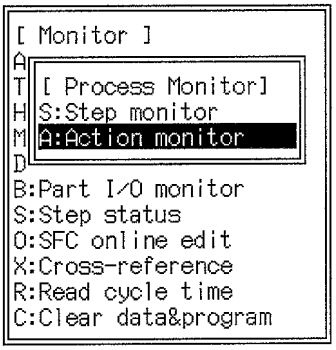
or To cancel the clear, press the F10 Key, the N Key, and then the Enter Key.

2-6-2 Action Monitor

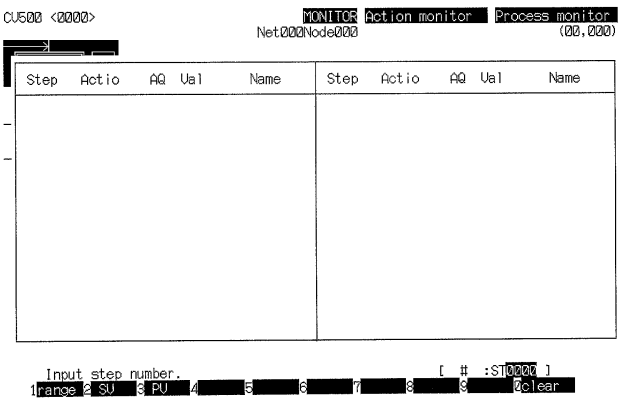
This operation is used to monitor action status. This operation is possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

1, 2, 3... 1. Select “M:Process monitor” from the monitor menu.



2. Select “A:Action” from the Process Monitor menu. The action monitor display will appear and the function key menu will change. A message and a step number input area will also appear.
3. Enter the step number of the action to be monitored and press the Enter Key. The actions in the input step number will be displayed sequentially from the top-left corner of the step monitor area. The active steps and actions being executed will be displayed in reverse video in the step monitor table.



4. Press the Shift+Esc Keys to return to the monitor display.
   or
   Press the Esc Key to return to the Process Monitor menu.

Function key	Operation	Description
F1	Enters the action monitor step number range.	Use to specify consecutive step numbers. The actions belonging to the specified range of step numbers are displayed in the action monitor area.
F2	Changes the SV.	Change the SV. The change is also displayed on the computer screen.
F3	Changes the PV.	Change the PV of the specified step timer. The change is also displayed on the computer screen.
F10	Clears the action monitor area.	Clear the entire action monitor area display.

F1: Range

The F1 Key can be used to monitor the actions belonging to the specified range of steps. This operation is possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

This operation is identical to the step monitor *range* operation. See page 22 for details.

F2: SV

The F2 Key can be used to change the SV of a specified action. This operation is possible in any PC mode except the RUN Mode.

RUN	MONITOR	DEBUG	PROGRAM
No	OK	OK	OK

This operation is identical to the action display *SV* operation. See page 21 for details.

F3: PV

The F3 Key can be used to change the PV of a specified step timer. This operation is possible in any PC mode except the RUN Mode.

RUN	MONITOR	DEBUG	PROGRAM
No	OK	OK	OK

1, 2, 3...

1. When the F3 (PV) Key is pressed, a step number input area will appear above the function key menu at the bottom of the screen.
2. Enter the step number and press the Enter Key. A PV number input area will appear above the function key menu.
3. Press the Backspace Key to clear the PV.
4. Enter the new PV in the range from 0 to 65535.
5. Press the Enter Key to complete the PV setting.

F10: Clear

The F10 Key can be used to clear the action monitor area. This operation is possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

To clear the entire action monitor area, press the F10 and then the Enter Key.

or To cancel the clear, press the F10 Key, the N Key, and then the Enter Key.

2-7 I/O Monitor

This operation monitors the ON/OFF status of the PC inputs and outputs and the PV of each word. The two monitor modes are the all I/O monitor mode, which

monitors 34 points using the entire screen; and the part I/O monitor, which monitors 10 points using only the bottom portion of the screen.

Press the END Key from the initial monitor display. Select “D:All I/O monitor” from the Monitor menu to display the All I/O Monitor display, or select “B:Part I/O monitor” from the Monitor menu to display the Part I/O Monitor display.

or Press the Esc Key to cancel the I/O monitor operation.

The I/O monitor can monitor all memory areas, steps, transitions, and actions, with the exception of TR bits. Steps, transitions, and actions are monitored as either active or inactive.

Refer to *3-5 I/O Monitor* for descriptions of the monitoring displays and methods.

2-8 Cross-references

This operation searches all SFC programs under specified conditions and displays the results. This operation is possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

No other operations can be carried out in the cross-reference mode.

1, 2, 3...

1. Select “X:Cross-reference” from the Monitor menu.
2. Specify the word, bit, constant, step, transition, action, or sub-chart as specified below to start the search. If corresponding data is found, the sheet number, step number or transition number will be displayed at the bottom of the screen.

   F2 *Word* **Enter**
   or
   F3 *Bit* **Enter**
   or
   F4 *Constant* **Enter**
   or
   F7 *Step_number* **Enter**
   or
   F8 *Transition_number* **Enter**
   or
   F9 *Action_number* **Enter**
   or
   F10 *Subchart_number* **Enter**
3. Press the Esc Key to return to the initial display.

2-9 SFC Online Editing

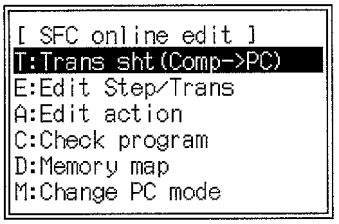
This operations can be used to create, edit, and/or transfer SFC programs online. This operation is possible in any PC mode, except that the *Trans sht (Comp* A *PC)* and *Check program* operations are not available in the RUN mode and the program cannot be changed in RUN mode.

RUN	MONITOR	DEBUG	PROGRAM
Limited	OK	OK	OK

The operations to write and delete SFC parts online are identical to the operations when inputting SFC parts.

Use the *Trans sht (Comp* A *PC)* operation to rewrite data changed with the online editing operations. Select *Trans sheet (PC* A *Comp)* from the Monitor menu

to read the sheet to be edited into the computer main memory and display it on the screen.



Write/Edit SFC Refer to *Section 2 SFC Programs* in the *CV Support Software Version 2: Offline*.

Trans Sheet (PC A Comp) Transfer the edited sheet back to the PC. The PC program will be overwritten.

Note
1. Online editing is not possible if the CPU is protected using the keyswitch or if UM protection is on.
2. If a partially protected sheet contains an initial step, initial steps in other unprotected sheets cannot be deleted, appended, or changed online.

1, 2, 3...
1. Use the Trans sheet (PC A Comp) operation to read the sheet to be edited into the main memory. (See *2-2 Transferring Sheets*.)

   If the SFC part numbers match the I/O names and I/O comments in the work disk, the numbers, I/O names, and I/O comments will be displayed in the SFC part text area above the function key menu at the bottom of the screen. It is not possible to append new I/O names as this would prevent the sheet being transferred. The program view mode cannot be selected.
2. Switch to the program view mode from the monitor display.

   Always use the Trans sht (Comp A PC) operation after editing a sheet. (See *2-2 Transferring Sheets*.) The function of all operations is identical to the corresponding offline operations, except the *Change PC mode* operation.

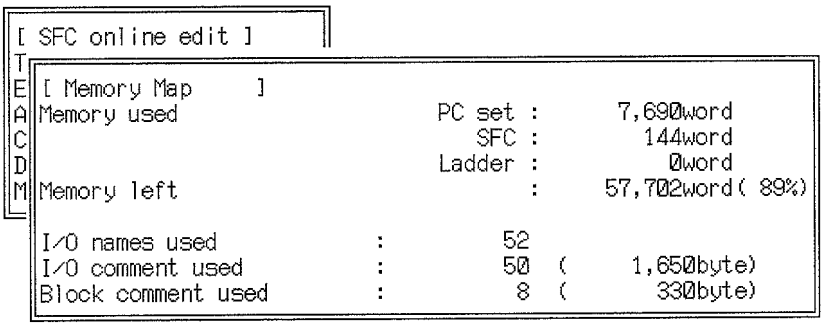
Note A fatal SFC error will occur if an attempt is made to change an active step or transition, or an action that is being executed.

2-9-1 Memory Map

This operation is used to display the amount of user memory used in the PC and on the work disk. This operation is possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

1, 2, 3...
1. Select “D:Memory map” from the SFC Online Edit menu.



2. Press the Shift+Esc Keys to return to the initial SFC online editing display.

or Press the Esc Key to return to the SFC online edit menu.

Key to Displays

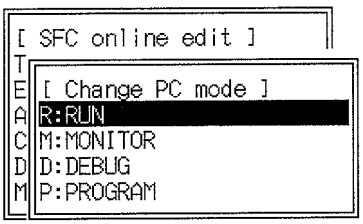
Item	Description
Memory used (PC set)	Displays the entire amount of memory required for data to run the PC, excluding the program.
Memory used (SFC)	Displays the amount of PC memory occupied by the SFC program. Does not include I/O names or I/O comments.
Memory used (Ladder)	Displays the amount of PC memory occupied by ladder and mnemonic programs. Does not include I/O names, I/O comments, or block comments.
Memory left	Shows the amount of free memory remaining in the PC as a percentage of the total.
I/O names used	Displays the number of I/O names on the work disk.
I/O comments used	Displays the number of I/O comments on the work disk and the amount of space they occupy.
Block comments used	Displays the number of block comments on the work disk and the amount of space they occupy.

2-9-2 Changing the PC Mode

This operation can be used to change the PC mode during online editing. This operation is possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

1, 2, 3... 1. Select “M:Change PC mode” from the SFC online edit menu. The Change PC Mode menu will appear.



2. Move the cursor to the required mode and press the Enter Key. The selected mode will be displayed for the PC mode at the top of the screen.
3. Press the Shift+Esc Keys to return to the initial SFC online editing display.

or Press the Esc Key to return to the SFC online edit menu.

Note When switching from the RUN or MONITOR mode to the PROGRAM or DEBUG mode, a prompt will be displayed above the function key menu asking if operation can be stopped. Press the Enter Key to stop the PC operation. Press the N+Enter Keys if PC operation is not to be stopped. The menu disappears and the SFC initial SFC online editing display will be displayed.

2-9-3 Transferring Sheets to PCs

This operation used to transfer sheets of the SFC program from the main computer memory to the PC. This operation is possible in any PC mode except the RUN Mode.

RUN	MONITOR	DEBUG	PROGRAM
No	OK	OK	OK

1, 2, 3... 1. Select “O:SFC online edit” from the menu. The SFC online editing display will be displayed.
2. Select “T:Trans sht (Comp A PC)” from the SFC online edit menu. An input area will appear for the sheet number of the transfer destination. Initially the

sheet number of the sheet currently being edited on the screen will appear in the input area.

3. Press the Enter Key to input the displayed sheet number, or enter a different sheet number and press the Enter Key. To update a sheet existing in the PC, use the following procedure to input the sheet number:
   a) Press the End Key or Ctrl+M Keys to display the sheet number table.
   b) Select the sheet number to be updated with the cursor and press the Enter Key.
4. A message will ask if the sheet can be updated. Press the Y and Enter Keys to update the sheet or the Enter Key to cancel the operation and specify a new sheet number. Program conversion will start and a message will be displayed to indicate that the conversion is underway.
5. The transfer will start when program conversion is complete. A message will flash during program transfer, and the amount of the program transferred will be displayed as a percentage.

   Press the Esc Key to cancel the program transfer.

   The SFC online editing display will be displayed when the transfer is complete.

Note When "T:Trans sht (Comp A PC)" is selected, a message in the top-left of the screen indicates if the program edited with the SFC online editing operations contains errors. If this occurs, press the Shift+Esc Keys, then press the End Key to display the SFC online edit menu and select "C:Check program." Correct the errors in the program and select "T:Trans sht (Comp A PC)" again.

Related Operation

The following operation is used to save an SFC program edited online to the work disk.

1, 2, 3...

1. End monitoring
2. Select *Transfer program & data* then upload the program.
3. Switch to the offline mode.
4. If I/O names are used, select *Edit I/O names* then select *Link I/O name to UM*.
5. Select *Program*.
6. Select *Save program*.

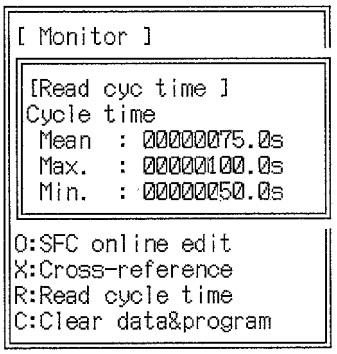
2-10 Reading the Cycle Time

This operation is used to measure the cycle time of the program and displays the maximum, minimum, and mean values. This operation is only possible in RUN or MONITOR mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	No	No

1, 2, 3...

1. Select "R:Read cycle time" from the Monitor menu.



2. Press the Esc Key or the Shift+Esc Keys to clear the cycle time display.

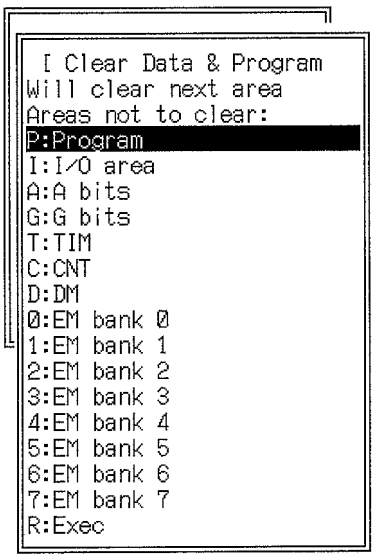
2-11 Clearing Memory Areas

This operation clears programs and memory areas in the PC. The corresponding areas on the work disk are not cleared. This operation is possible in any PC mode except RUN mode, except that programs can be cleared only in PROGRAM mode.

Programs can be cleared even if the UM protect operation is set at the computer. However, programs cannot be cleared if programs are protected by the key-switch on the CPU.

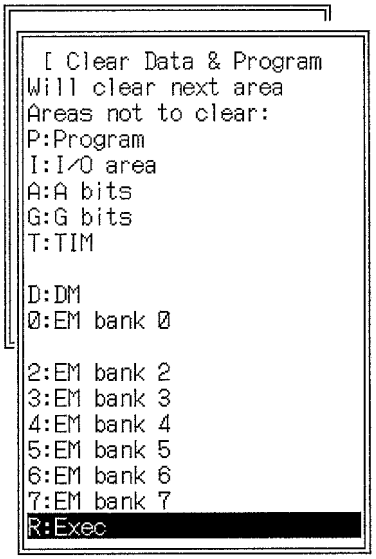
RUN	MONITOR	DEBUG	PROGRAM
No	Limited	Limited	OK

1, 2, 3... 1. Select “C:Clear data&program” from the Monitor menu. A sub-menu will be displayed. Press the Esc Key to return to the Monitor menu.



2. Select the areas not to be cleared with the cursor and press the Enter Key. Skip areas to be cleared by pressing the Down Key. If a displayed area is cleared accidentally, move the cursor back up to the position of the display

with the Up Key and press the Enter Key again. In the example here, all areas are cleared except the CNT (counter) area and EM Bank 1.



3. When the required memory areas have been specified, select “R:Exec.” All displayed areas will be cleared. The name of the area being cleared will be displayed, and a message indicates when the clear operation is complete.
4. Press the Esc Key to end the operation. The SFC Monitor display will be displayed.

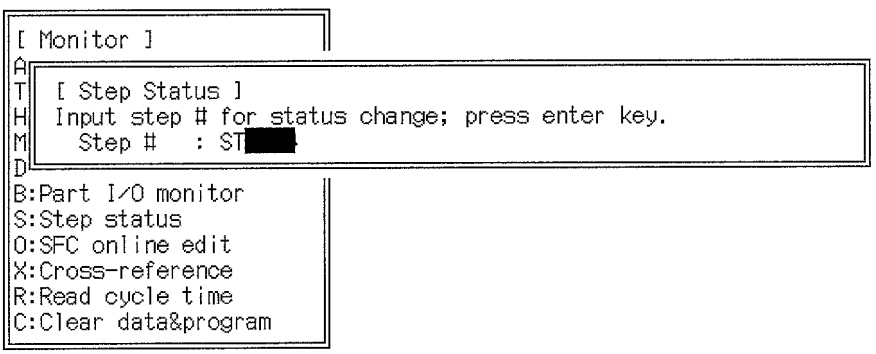
2-12 Changing Step Status

Changes the status of a specified step. This operation is possible only in MONITOR and DEBUG modes.

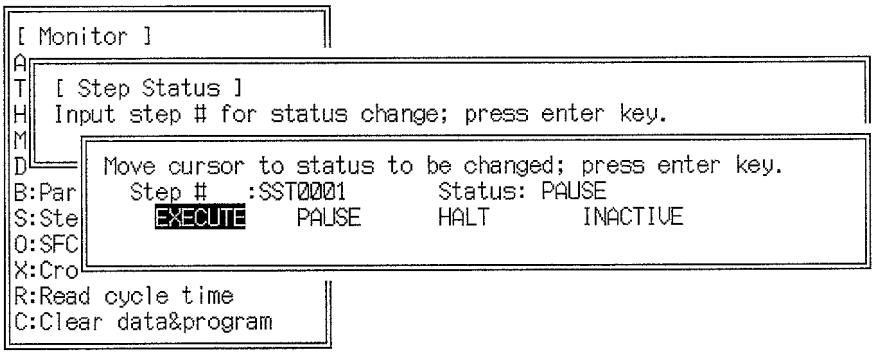
RUN	MONITOR	DEBUG	PROGRAM
No	OK	OK	No

The step statuses which can be changed by this method are identical to the step statuses which can be changed with the adder-diagram SFC control instruction. Refer to the *CV500/CV1000 Operation Manual: Ladder Diagrams* for details.

1, 2, 3... 1. Select “S:Step status” from the Monitor menu. A step number input area will appear.



2. Enter the step number. The current status of the specified step will be displayed.



3. Select the status to be selected with the cursor. A prompt will appear if the EXECUTE, PAUSE, or HALT status is changed to INACTIVE.
4. Press the Enter Key or Y and Enter Keys to change the status.

or Press the N and Enter Keys cancel the operation and leave the status unchanged.

2-13 Overview Mode

This overview mode displays a larger range of an SFC program. Online editing of SFC programs is not possible in overview mode. Action blocks cannot be displayed in the overview mode and the double lines used to indicate parallel branching in the SFC program are displayed as single lines. The overview mode display format depends on the current sheet size setting.

2-14 Program View Mode

The program view move displays action or transition programs. This section describes how to select the program view mode. Refer to *Section 3 Ladder Diagrams* for details on monitoring and editing ladder diagrams.

Preparations

1, 2, 3...

1. Trans sht (Comp A PC):
   After creating or editing a program using the online editing operations, use the *Trans sht (Comp A PC)* operation before selecting the program view mode. If the created or edited program is not transferred with the *Trans sht (Comp A PC)* operation, it will be lost when the program view mode is selected.
2. Cursor Position:
   The program view mode can be selected when the cursor is selecting a step, transition, or blank. A step that is selected must contain at least one action; a transition that is selected must be defined with a transition number.

Selecting a Step

1, 2, 3...

1. Select the step with the cursor on the detail view mode initial display. Select a step containing at least one action.
2. Press the F4 Key. The action block will be displayed for the selected step. A message will appear and the display mode will not change if the selected step contains no actions.
3. Press the Up, Down, PgUp, and PgDn Keys to select the action from the action block and press the Enter Key. Select an action defined with an action number. A message will warn you if the selected action is defined with a bit instead of an action number.

4. Press the Enter Key to switch to the program view mode.

   If the sheet was not transferred with the *Trans sht (Comp* A *PC)* operation, a message will warn you that the currently edited sheet will be lost. Press the Enter Key to return to the original display and transfer the sheet with the *Trans sht (Comp* A *PC)* operation before switching to the program view mode.

Selecting a Transition

1, 2, 3...

1. Select the transition with the cursor on the detail view mode initial display. Select a transition defined with a transition number.
2. Press the F4 Key. The program view mode will be entered. A message will warn you if the selected transition is not defined with a transition number.

   If the sheet was not transferred with the *Trans sht (Comp* A *PC)* operation, a message will warn you that the currently edited sheet will be lost. Press the Enter Key to return to the original display and transfer the sheet with the *Trans sht (Comp* A *PC)* operation before switching to the program view mode.

Specifying a Blank

Move the cursor to a blank to directly specify a transition number or an action number when selecting the program view mode.

1, 2, 3...

1. Move the cursor to a blank part of the detail view mode initial display.
2. Press the F4 Key. An input area will appear at the bottom of the screen for input of a transition number or action number.
3. Enter the transition number or action number and press the Enter Key.

Returning to Detail View

Press the Esc Key or Shift+Esc Keys to return to the detail view display from the program view display. Unlike offline operation, the top of the sheet will be displayed when this operation is carried out in online operation.

SECTION 3
Ladder Diagrams

This section describes the operations used to monitor and alter the ladder diagrams in a PC.

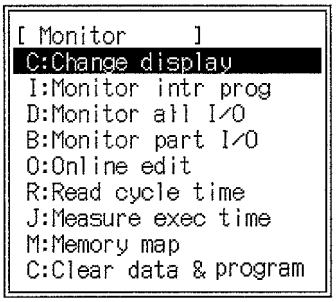
3-1 Monitor Menu

Before monitoring ladder programs, use the offline *System setup* operations to set the program type the PC model for the PC connected to the computer.

If the program type is set to SFC+Ladder, press the F4 Key on the initial SFC monitoring display to switch to the monitoring display shown below.

If the program type is set to Ladder only, press the Shift+F1 Keys from the offline menu displayed after the computer and PC are connected to display the online menu. The ladder-diagram monitor display will appear.

Select “M:Monitor” from the main online menu and the press the End Key or Ctrl+M Keys from the initial monitoring display to access the Monitor menu.



Note
1. The destination network set in the System Setup menu will be displayed.
2. The PC number will be displayed if a host link has been set.
3. “I:Monitor intr prog” is displayed only when the program type is set to Ladder.

Valid PC Modes

Main Online Menu

Operation	RUN	MONITOR	DEBUG	PROGRAM
Change display	OK	OK	OK	OK
Monitor intr prog	OK	OK	OK	OK
All I/O monitor	OK	OK	OK	OK
Part I/O monitor	OK	OK	OK	OK
Online edit	No	OK	OK	OK
Read cycle time	OK	OK	OK	No
Measure exec time	OK	OK	OK	No
Memory map	OK	OK	OK	OK
Clear data & prgram	No	OK	OK	OK

Initial Display Function Keys

Operation	RUN	MONITOR	DEBUG	PROGRAM
SV	No	OK	OK	OK
pause	OK	OK	OK	OK
diff	OK	OK	OK	OK
cross	OK	OK	OK	OK
find	OK	OK	OK	OK
Canc	OK	OK	OK	OK

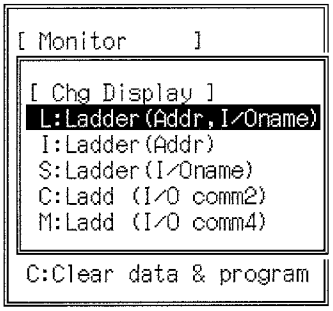
3-2 Changing the Display

This operation changes the type of monitoring display. The display mode should normally match the type of user program connected online.

Display mode	Operation	Lines per Screen
Ladder (Addr, I/O name)	Monitor using a ladder diagram showing I/O addresses.*	5
Ladder (Addr)	Monitor using a ladder diagram showing I/O addresses.	7
Ladder (I/O name)	Monitor using a ladder diagram showing I/O names.	10
Ladder (I/O comment 2)	Monitor using a ladder diagram showing 2 lines of I/O comments.	4
Ladder (I/O comment 4)	Monitor using a ladder diagram showing 4 lines of I/O comments.	3

*I/O names are not displayed when the Ladder (Addr, I/O name) mode is selected. The only difference between this mode and the Ladder (Addr) mode is the number of lines displayed.

1, 2, 3... 1. Select “H:Change display” from the online menu.



2. Select the required display mode. The screen will switch to the selected display mode.

Note Operands for advanced instructions cannot be monitored in the “Ladder (I/O name)” display mode.

3-3 Memory Map

This operation is used to display the amount of user memory occupied in the PC and on the work disk. This operation is possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

Select “M:Memory map.”

The following information is displayed:

- PC memory required (Setup)
- PC memory required (SFC) (Reserved)
- PC memory required (Ladder)
- PC memory left
- I/O names used
- I/O comments used
- Block comments used

Refer to the description in *2-9-1 Memory Map* for details.

3-4 Operations from the Initial Monitoring Display

The initial monitoring display shows the ladder diagram and operand status so that the PC operation status can be monitored. The operation can be controlled with the function keys.

Key to the Initial Display

The first section of the ladder program in the connected PC will be displayed first. Conditions that are ON are displayed in reverse video, and the current contents of word operands are displayed above the operands. For double-length instructions, two words will be displayed for each operand. The numerical values will change according to PC operation. Use the F1 to F10 or Shift+F1 to Shift+F10 Keys from the function key menu at the bottom of the screen to control monitoring operations. The operations are described in the following sections.

Note
1. The destination network set in the System Setup menu will be displayed at the top of the screen.
2. The PC number will be displayed, but only when a host link has been set.

Functions when the F1 Key is "Opt"

Function Key	Operation	Description
F1	Optional	Accesses the change SV, pause monitor, differential monitor, and cross-reference operations.
F2	Clear	Clears errors from the PC.
F3	Address	Read the program from a specified program address. It is not necessary to press the F3 Key to read from a specified address if the cursor is at a connecting line or blank spot on the screen; just type in the address.
F4	String	Searches mnemonic programs for operands and instructions.
F5	Operand	Searches for operands or I/O names.
F6	I/O comment	Searches for I/O comments.
F7	LD/AND	Search for I/O bits used in ladder instructions. It makes no difference which key is used; they both access the same operation.
F8	OR	
F9	OUT	Searches for I/O bits used in output instructions.
F10	Function code	Searches for instructions through their functions codes.
Shift+F2	Block comment	Searches for block comments.
Shift+F3	Differentiate up	Searches for only specific differentiate up instructions.
Shift+F4	Differentiate down	Searches for only specific differentiate down instructions.
Shift+F5	TIM	Searches for timer instructions.
Shift+F6	CNT	Searches for counter instructions.
Shift+F7	LD NOT/AND NOT	Function exactly as the F7 and F8 Keys.
Shift+F8	OR NOT	
Shift+F9	OUT NOT	Functions exactly as the F9 Key.
Shift+F10	Immediate refresh	Searches for only specific immediate refresh instructions.

Note The PC mode cannot be changed while the F1 key is "Optional."

Functions when the F1 Key is "Read"

Function Key	Operation	Description
F1	Read	Enters the search operation.
F2	SV	Changes set values (SVs) for timers (TIM, TIMH, TTIM, TIML) and counters (CNT, CNTR, TCNT) used in a program. The changed settings are overwritten in the PC user memory.
F3	Pause monitor	Freezes the PC monitoring display. PC operation continues unchanged.
F4	Differential monitor	The display is highlighted when a rising edge or falling edge is detected for specified inputs. Other monitoring operations can be continued.
F5	Cross-reference	Finds a specified input, word, or register in the user program.
F10	Clear	Clears errors from the PC.
Shift+F7	RUN mode	Switches the PC operating mode to RUN mode.
Shift+F8	MONITOR mode	Switches the PC operating mode to MONITOR mode.

Function Key	Operation	Description
Shift+F9	DEBUG mode	Switches the PC operating mode to DEBUG mode.
Shift+F10	PROGRAM mode	Switches the PC operating mode to PROGRAM mode.

3-4-1 Reading Programs

Find Operation

The find operation is used to read and display sections of a ladder diagram.

Press the F5 Key to switch to the find operation. The find operation is identical to the operation described for the offline read mode, except that the DIFU(013), DIFD(014), KEEP(011), and SET(016) instructions can be found by searching for either input or output bits.

The currently displayed program section is not cleared unless the screen display range is exceeded. Multiple instruction blocks can be displayed simultaneously for monitoring. The previous program section cannot be displayed by pressing the Tab Key. Program sections exceeding the maximum display range (22 lines) cannot be converted to mnemonics: a program section error will occur and monitoring will not be permitted.

Program Sections

The PgDn and PgUp Keys are used the same as in offline operations to read and display adjacent program sections. The Up and Down Keys can also be used the same as in offline operations to display the remainder of a program section when a program section exceeds the display range.

Note If a search is made for a text string for instructions and operands which exist several times in a user program, it may take well over 10 minutes before the results of the search are displayed. To cancel the search, press the Esc Key and then use another search method, such as operand search.

3-4-2 Changing Set Values

This operation is used to change timer or counter set values and is possible in any PC mode except RUN mode.

RUN	MONITOR	DEBUG	PROGRAM
No	OK	OK	OK

Use the I/O monitor change operations to change PVs.

The SV can be changed for the following timers and counters:
TIM, CNT, TIMH, CNTR, TTIM, TCNT, TIML

1, 2, 3...

1. Press the F1 (Opt) Key to change the function key menu.
2. Press the F2 (SV) Key to enable SVs to be changed.
3. Specify the timer or counter number by either enter the F1 Key followed by the timer/counter number, or by inputting the timer/counter prefix and number, and then press the Enter Key.
4. Input the new SV.

   If the SV has been input as a constant, you can press the F9 Key to increment and decrement the SV with the Up and Down Keys. Press the Enter Key when the desired SV has been input and then press the Esc Key to end SV incrementing/decrementing.

   To numerically input a new SV (either as a constant or memory address), press the F10 Key followed by the new SV and the Enter Key.
5. If a constant has been changed to a memory address, the F8 Key can be presses to restore the constant.
6. Press the Home Key to hide the input area.
7. The menu and ladder diagrams cannot be displayed while the SV is being changed. Press the Esc Key to return to the initial display.

Key	Name	Operation
F1	FUN()	Specifies a timer (TIMH, TTIM, TIML) or counter (CNTR, TCNT) instruction via the instruction's function code. Press **F1**, *Function_code*, **Enter**, *TIM_or_CNT_number*, **Enter**. Next, change the SV.
F3	TIM	Specifies an advanced timer instruction. Press **F3**, *Timer_number*, **Enter**. Next, change the SV.
F4	CNT	Specifies an advanced counter instruction. Press **F4**, *Counter_number*, **Enter**. Next, change the SV.
F8	const	Changes a constant by numerical key input.
F9	fine	Used to fine adjust a constant. Press the Up Key to increment the constant, or the Down Key to decrement the constant.
F10	chng	Changes an SV by alphanumeric input. To change the SV to a constant, first specify the timer or counter number, then press **F10**, **F8**, *Constant*, **Enter**. To change the SV to a word address, first specify the timer or counter number, then press **F10**, *Word_address*, **Enter**.

3-4-3 Pause Monitor

This operation is used to freeze monitoring displays. Displays can be frozen based on a specified condition. This operation is possible in any PC mode.

The menu and ladder diagrams cannot be displayed in the pause monitor mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

The following conditions can be set:

- Stop monitoring when the specified word data reaches a limit.
- Stop monitoring on the rising edge or falling edge of a specified bit.
- Stop monitoring on the rising edge of A00814 (Trace Trigger Flag).

Pause Monitor Procedure

1, 2, 3...

1. Press the F1 (Opt) Key to change the function key menu.
2. Press the F3 Key to switch to the pause monitor mode.
3. Press the F9 Key to freeze monitoring without specifying a condition.

or Press the F2 to F3 Keys to set pause conditions as follows:

Word:	**F2** *Word_address* **Enter** *Value* **Enter**
Rising edge of bit:	**F3** *Bit_address* **Enter F6 Enter**
Falling edge of bit:	**F3** *Bit_address* **Enter F7 Enter**

or Press the F4 Key to set the Trace Trigger Flag as the pause condition.

The monitoring display will be frozen as soon as the set condition is fulfilled.

4. Press the F10 Key following any of the above operation to restart the pause monitoring operation with the same pause condition.
5. Press the Esc Key to return to the initial display.

Caution The pause monitor will stop when the first pause condition is met. After the conditions are met, the data at the time of the first I/O refresh is displayed. Consequently, the displayed data may differ from the data when the conditions were met.

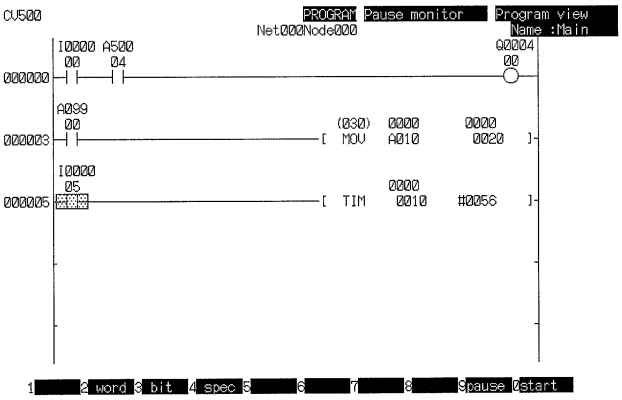
The Always ON (A50013) and Always OFF (A50014) Flags do not cause monitoring to stop.

Example

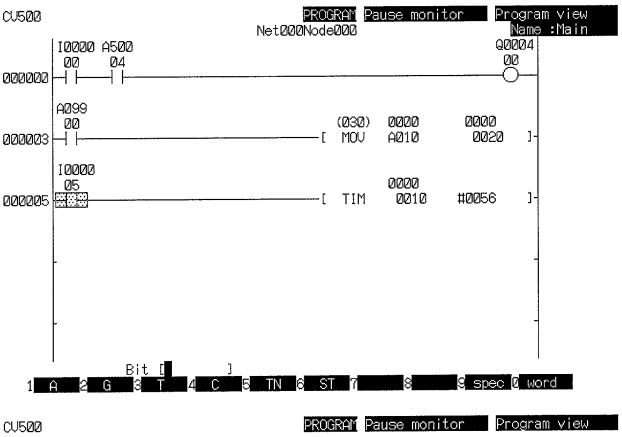
The following example shows how to display the program section to be used for the pause monitor and freeze the monitor display when CIO bit 000000 turns ON.

1, 2, 3...

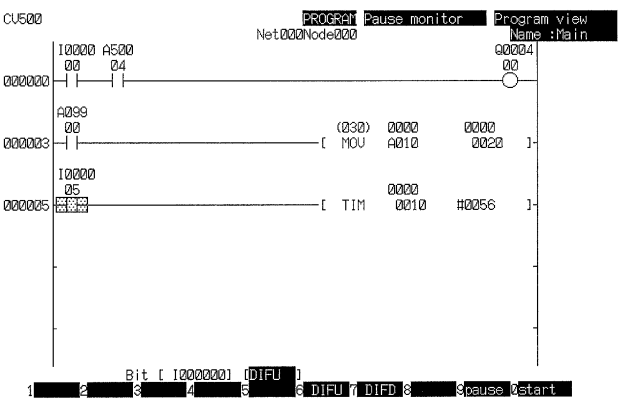
1. Press F1 and then F3 to set the pause monitor mode. The function key menu will change and a message will flash on the screen.



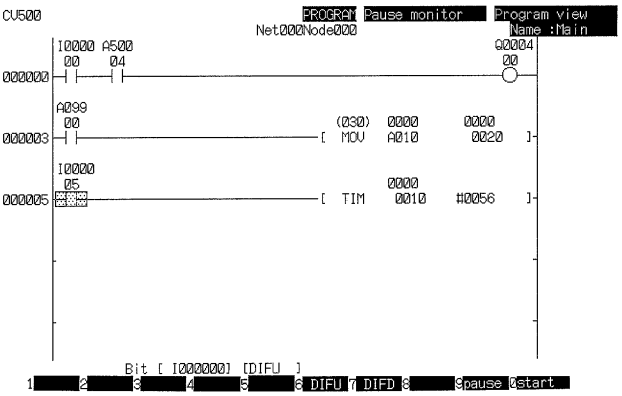
2. Specify the bit condition by pressing the F3 Key to specify a bit as the pause condition.



3. Specify the bit by pressing the 0 and Enter Keys.



4. Press the F6 Key to specify the rising edge of the bit and press the Enter Key. Input of the pause condition is now complete. The screen freeze when the bit 000000 turns ON.



5. Press the F10 (start) Key to restart with the same pause condition.

3-4-4 Differentiate Monitor

This operation detects the rising edge or falling edge of a specified bit (including step flags, transition flags, etc.) and displays it in reverse video. The monitor display is not frozen. This operation is possible in any PC mode.

Other operations, such as displaying the menu and ladder diagrams, are not possible in the differentiate monitor mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

Procedure

1, 2, 3...

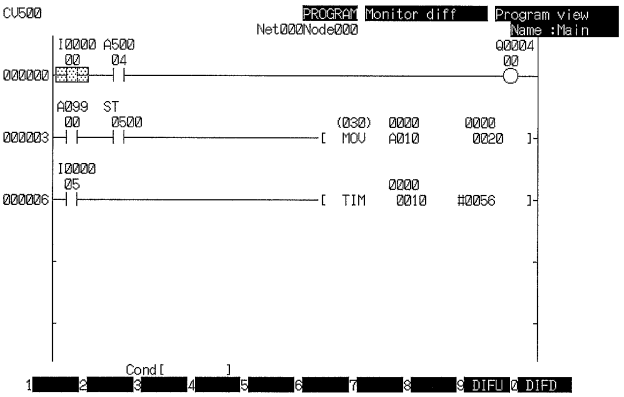
1. Press the F1 (Opt) Key to change the function key menu.
2. Press the F4 (diff) Key to set the different monitor mode.
3. Select the bit to be monitored with the cursor.
4. Press the F9 Key to specify the rising edge or press the F10 Key to specify the falling edge and press the Enter Key to start monitoring.
5. Press the Esc Key to return to the initial display.

Examples

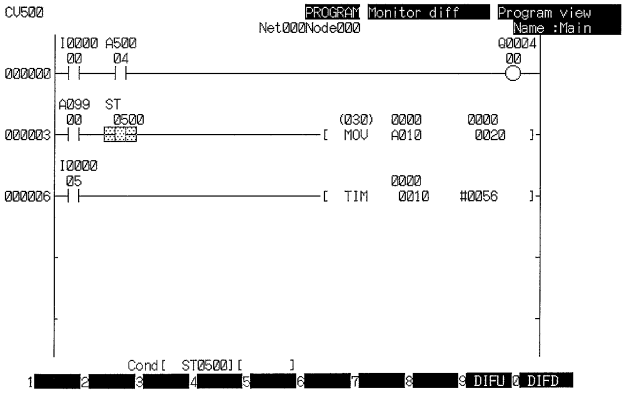
The following example shows how to monitor the rising edge of ST0500.

1, 2, 3...

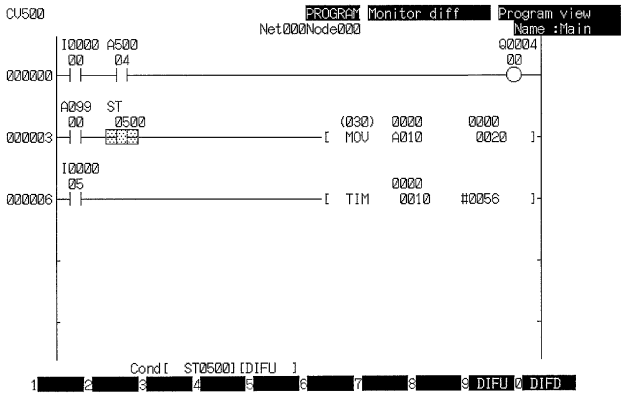
1. Press F1 and F3 to select the differentiate monitor mode. The function key menu will change.



2. Select the bit to be monitored with the cursor and press the Enter Key.



3. Specify the rising edge (DIFU) condition by pressing the F9 Key and press the Enter Key to start the differentiate monitor. When the specified condition has been met, the bit will be displayed in reverse video on the screen.



3-4-5 Cross-referencing

This operation is used to search the user program being monitored under specified conditions and displays the results at the bottom of the screen. This operation is possible in any PC mode.

Other operations, such as displaying the menu and ladder diagrams, are not possible in the cross-reference mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

The differences between the cross-reference and find operations are as follows:

The find (read) operation only searches the currently displayed program (e.g., for SFC programming, only the current transition or action program), but the cross-reference operations searches all programs (e.g., for SFC programming, all transition and action programs).

Furthermore, when matching data is found with the find operation, the program section is displayed and the data is selected by the cursor. In contrast, when data is found with the cross-reference operation, the program section (the action and transition number if the program type is SFC+ladder), word, and instruction are displayed at the bottom of the screen.

1, 2, 3...

1. Press the F1 (Opt) Key to change the function key menu.
2. Press the F5 Key to set the cross-reference mode.
3. Specify the bit or action number (F3), word (F2), or register(F4) to be found and press the Enter Key to start the search. If corresponding data is found,

the program address and instruction will be displayed at the bottom of the screen.

4. Press the Esc Key to return to the initial display.

3-4-6 Clearing Errors

This operation is used to clear errors from PC memory and is possible in any PC mode, except that fatal errors can be cleared in the PROGRAM mode only.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

Clear the PC error if an error message is displayed at the top-left of the screen after taking appropriate measures to remove the cause of the alarm.

Errors are cleared from the PC itself. When a fatal error has occurred, the following procedure is required to restart operation.

1, 2, 3...

1. Press the F1 (Opt) Key to change the function key menu.
2. Press the F10 Key to clear the current error message from the top-left of the screen and display the next error message.
3. Press the F10 Key repeatedly until no more error messages are displayed. An error message can be cleared only after the cause of the alarm has been removed.

3-5 I/O Monitor

This section describes how to monitor the ON/OFF status of bits and the present values (PVs) of words. The two monitor modes are available: all I/O monitor mode, which monitors up to 34 items using the entire screen; and the part I/O monitor mode, which monitors a maximum of 10 items using the bottom section of the screen. All operations are identical for the all I/O monitor and part I/O monitor. The only difference is the number of items that can be monitored.

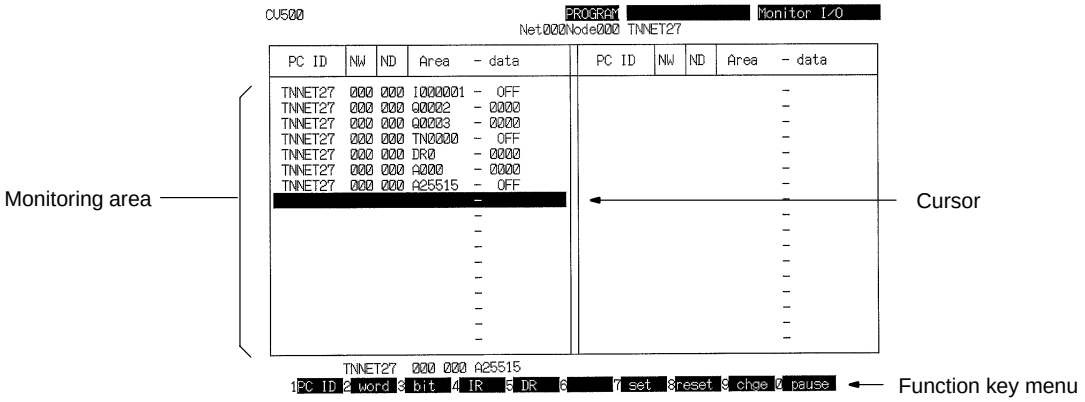
All memory areas except the TR Area can be monitored, as can the status of steps, transitions, and actions.

Press the End Key or Ctrl+M Keys from the initial monitoring display to access the menu, and select “D: Monitor all I/O” to display the All I/O Monitor display or select “B:Monitor part I/O” to display the Part I/O Monitor display.

Press the Esc Key to cancel the I/O monitor operation.

All I/O Monitor Display

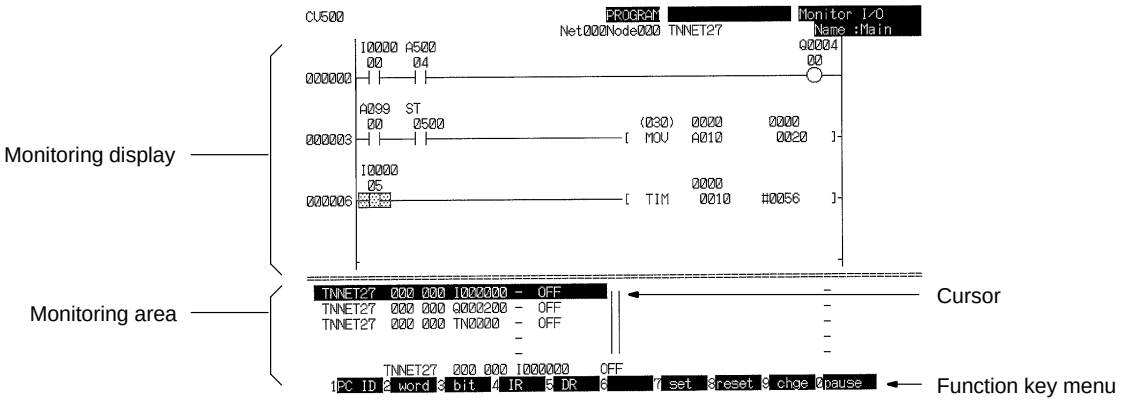
The all I/O monitor display uses the entire area of the screen. Use the part I/O monitor operation to simultaneously monitor the SFC and ladder diagram. Bits, timers, counters, and transition monitored with the I/O monitor operation can be force-set/reset.



Part I/O Monitor Display

The part I/O monitor display uses the bottom 1/3 of the SFC or ladder program monitoring display. SFC or ladder program monitoring continues on the top part

of the screen. Changing the program sections or the menu during part I/O monitoring is not possible. Inputs, timers, counters, and transition monitored with the I/O monitor operation can be force-set/reset.



The following information is shown in the I/O monitor display area.

No.	Item	Description
1	PC ID	Displays the PC ID set with the offline *Edit PC ID* operation.
2	NW	Displays the PC network being monitored. The default is 000 (the PC directly connected to the computer).
3	ND	Displays the PC node being monitored. The default is 000 (the PC directly connected to the computer).
4	Monitor area (see note below)	Displays 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. Step, action, and transition numbers are displayed. After an input is force-set/reset, S (for set) or an R (for reset) will be displayed separated by a dash "–". Refer to *3-5-2 Force Set/Reset* for details.
5	Monitor data	Displays 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 I/O monitor. After timer or counter is 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.

Input Area

As the cursor is moved in the I/O monitor display area, the following information will be displayed in the input area.

- PC ID
- NW
- ND
- Monitor area
- Data (contents or status)

Note No data will be displayed in the monitor area if the area of PC specified for the I/O monitor does not exist, for example, if the EM area is specified for a CV500.

Function Keys

Function key	Operation	Description	Operation
F1	PC ID input	Used to input the PC ID.	I/O monitor
F2	Word input	Used to input word addresses.	
F3	Bit input	Used to input bit addresses.	
F4	IR input	Used to input an index register.	
F5	DR input	Used to input a data register.	
F7	Forced set	Force-sets a bit.	Forced
F8	Forced reset	Force-reset a bit.	set/reset
F9	Change PV	Changes present values (PVs) at the computer. Results of this operation are displayed on the screen.	Change PV
F10	Pause monitor	Freezes the monitoring display of the PC operation status. PC operation will continue uninterrupted.	Pause monitor
Shift+F1	Network/node input	Selects the PC network/node word input mode.	I/O monitor
Shift+F2	ASCII display	Displays the PV of a word or register in ASCII.	
Shift+F3	Cancel all forced set and reset	Clears all forced sets and resets for all inputs in the same network and node.	Forced set/reset
Shift+F4	Cancel forced set and reset	Clears the forced set or reset for the bit at the cursor.	
Shift+F5	Clear I/O monitor display area	Clears the entire I/O monitor display area.	I/O monitor
Shift+F6	Select C/CV Series	Selects the C or CV Series. When the C Series is selected, a “C” is displayed to the left of the PC ID area.	
Shift+F7	Select RUN mode	Switches the PC operating mode to RUN mode.	Select mode
Shift+F8	Select MONITOR mode	Switches the PC operating mode to MONITOR mode.	
Shift+F9	Select DEBUG mode	Switches the PC operating mode to DEBUG mode.	
Shift+F10	Select PROGRAM mode	Switches the PC operating mode to PROGRAM mode.	

3-5-1 I/O Monitor

This operation is possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

Specifying the PC

I/O monitoring can be conducted for PCs on a SYSMAC NET Link or SYSMAC LINK System, as well as for the PC directly connected to the computer. Specify the network and node addresses before monitoring.

The following two methods are available for specifying the addresses.

PC ID

Input the PC ID:
F1, *PC_ID,* **Enter**

When a PC ID set with the offline Edit PC ID operations is specified, the corresponding network address and node address will be displayed.

Addresses

Input the network address and node address:
Shift+F1 *Network_address* **Enter** *Node_address* **Enter**

Network address: 0 to 127

Node address: 1 to 62 (SYSMAC LINK)
1 to 126 (SYSMAC NET)

Enter 000 for both the network address and node address for the PC directly connected to the computer.

Input Methods

A bit or word address, DM, timer, counter, step, action, or transition number can be specified for monitoring. The following inputs specify the item to monitor.

Alphanumeric Inputs

Any area:	*I/O_name* **Enter**
Auxiliary Area:	**A** *Bit_or_word_address* **Enter**
CPU Bus Link Area:	**G** *Bit_or_word_address* **Enter**
Timer Area:	**T** *Timer_number* **Enter**
Counter Area:	**C** *Counter_number* **Enter**
DM Area:	**D** *Word_address* **Enter**
Extended DM Area:	**E** *Word_address* **Enter**
Action Area:	**A C** *Action_number* **Enter**
Step Area:	**S T** *Step_number* **Enter**
Transition Area:	**T N** *Transition_number* **Enter**
Custom Areas:	**B** to **Z** *Bit_or_word_address* **Enter**

The status of address selected by the cursor will be displayed as a 4-digit hexadecimal or a 16-digit binary value. A bit, step, action, or transition status will be displayed as ON or OFF. The PV and ON/OFF status will be displayed for a timer or counter.

To change an item, move the cursor to the required position and overwrite the input.

In the EM area, the bank number is displayed after E (for EM), followed by the word address. The following example is for E0_00000. The current bank is monitored if the bank number is omitted. In this case, the bank number is displayed as @.

Press the Home Key to clear the display in the input area.

Press the Esc Key or Shift+Esc Keys to end I/O monitoring.

Function Keys

Use the following inputs to specify word addresses. Use the F7 Key to change the EM bank.

CIO Area:	**F2** *Word_address* **Enter**
Auxiliary Area:	**F2 F1** *Word_address* **Enter**
CPU Bus Link Area:	**F2 F2** *Word_address* **Enter**
Timer Area (PV):	**F2 F3** *Timer_number* **Enter**
Counter Area (PV):	**F2 F4** *Counter_number* **Enter**
DM Area:	**F2 F5** *Word_address* **Enter**
Extended DM Area:	**F2 F6** *EM_bank Word_address* **Enter**

Use the following inputs to specify bit addresses.

CIO Area:	**F3** *Bit_address* **Enter**
Auxiliary Area:	**F3 F1** *Bit_address* **Enter**
CPU Bus Link Area:	**F3 F2** *Bit_address* **Enter**
Timer Area (Flags):	**F3 F3** *Timer_number* **Enter**
Counter Area (Flags):	**F3 F4** *Counter_number* **Enter**
Transition Area:	**F3 F5** *Transition_number* **Enter**
Step Area:	**F3 F6** *Step_number* **Enter**
Action:	**F3 F7** *Action_number* **Enter**

Press the Esc Key or F9 Key to return to the alphanumeric input mode. Press the F10 Key to switch between the bit and word function key menus. To specify a bit or word in the CIO area, input the bit or word address only. No area prefix is required.

Note

1. If the data area prefixes have been changed, you cannot designate the default prefixes (A, G, T, C, D, E, AC, ST, or TN) and must input the new prefixes.

2. If custom areas have been created within the CIO Area, the addresses in the custom areas must be used, e.g., if CIO 0200 to 0299 have been customized as X00 to X99, you will be able to designate CIO 0200 only as X00.
3. I/O names and custom data areas cannot be used to specify bits or words on remote nodes (i.e., on PCs not directly connected to the computer). To specify words or bits in custom areas, specify the area name as a name change.

Example

This example shows I/O monitoring of bit A25515, word 2555, DM 00230, timer T1000, and action AC0001 in the PC with the PC ID TNNET27. The timer area name has been changed from T to V.

1, 2, 3...

1. Select "B:Monitor part I/O" from the menu.
2. Specify the PC ID after pressing the F1 Key. The network address and node address of the specified PC ID will be displayed. The Shift+F1 Keys can be used to change network or node address.
3. Specify the bit A25515 with the I/O name PBOSET. The ON/OFF status of the bit will be displayed in the I/O monitor area and the previously specified bit address or word address+1 will be displayed in the input area. This makes it simple to specify consecutive addresses of the same I/O area of the same PC just by pressing the Enter Key.
4. Press the F2 Key to select the word input mode and specify CIO word 2555. (No prefix is required for addresses in the CIO Area.) The input value and word data will be displayed in the I/O monitor area when the Enter Key is pressed. The network and node addresses specified previously (see Specify the PC ID) will displayed.
5. Input D00230. The specified DM word and contents will be displayed. It is not necessary to input the leading zeros (0) of the addresses. Press the 0 Key once to specify address 00000.
6. Specifying T1000 by inputting the timer number using the changed prefix, i.e., input "V1000." The specified TIM number, PV, and ON/OFF status will be displayed.
7. Specifying AC0001 by inputting "AC1" and pressing the Enter Key. The specified action address and ON/OFF status will be displayed.

ASCII

This operation can be used when monitoring words, data registers, or index registers in the I/O monitor area to display contents in ASCII. This operation is possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

Press the Shift+F2 Keys during the I/O Monitor operations to toggle the current word or register contents between ASCII display and hexadecimal or BCD display.

Clear

The Shift+F5 Keys can be pressed to clear the I/O monitor area. This operation is possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

A prompt is displayed when the Shift+F5 Keys are pressed. Press the Y and Enter Keys to clear the entire I/O monitor area.

3-5-2 Force Set/Reset

This operation is used to force-set/resets bits or to clear bits that have been force-set/reset. This operation is possible in any PC mode except RUN mode.

Other operations can be carried out while forced set or reset is applied. The set/reset status remains unchanged.

C-series PC bits can be cleared only by pressing the Shift+F3 Keys.

RUN	MONITOR	DEBUG	PROGRAM
No	OK	OK	OK

These operations act on bit addresses, timers, counters, and transitions only.

1, 2, 3...

1. Move the cursor to the position to be set, reset, or cleared.
2. Press the F7 Key to turn ON the specified bit.

or Press the F8 Key to turn OFF the specified bit.

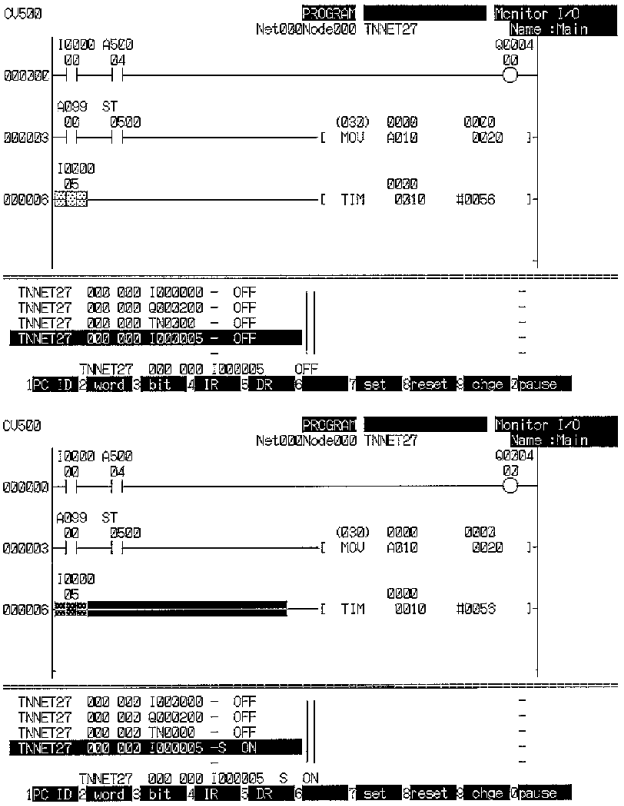
or Press the Shift+F4 Keys to clear the bit.

or Press the Shift+F3 Keys to clear all bits that have been force-set/reset in the word selected by the cursor.

A prompt will be displayed when the Shift+F3 Keys are pressed. Press the Y and Enter Keys to clear all currently set or reset bits at the cursor position.

The letter S or R will be displayed in the input area and the ON/OFF status display will change in the I/O monitor area. If the changed ON/OFF status of the specified bit results in a change in an output status, the output ON/OFF status will also change.

The display position of the S's and R's is different for bits, transitions, and timers/counters.



Note When a timer/counter is force-set/reset, the ON/OFF status of the timer/counter will be displayed on the right.

Auxiliary Area bits cannot be turned ON and OFF merely by force-setting/resetting them.

3-5-3 Changing the PV

This operation is used to change the PV of a DM word, EM word, data register, or index register. This operation is possible in any PC mode except RUN mode.

RUN	MONITOR	DEBUG	PROGRAM
No	OK	OK	OK

1, 2, 3...

1. Move the cursor to the word to be changed.
2. Press the F9 Key to display text cursor in the input area.
3. Input the new value. To input in ASCII, press the Shift+F2 Keys to display values in ASCII in advance and then press the Tab Key to move the cursor before input. To input in binary, press the Tab Key to move the cursor and then use the cursor keys to move the cursor to the position to be changed and press the 0, 1, F7, F8, or Shift+F3 Keys.
4. Press the Enter Key to complete the change.

Note Any bits that are have been force-set/reset will remain unchanged even if a new value is input in BCD or ASCII. To change a word that contains force-set/reset bits, first clear the set or reset status before inputting the new value.

3-5-4 Pause Monitor

This operation is used to freeze monitoring displays. Displays can be frozen based on a specified condition. This operation is possible in any PC mode.

The menu and ladder diagrams cannot be displayed in the pause monitor mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

Stop monitoring on the rising edge or falling edge of a specified bit can be set.

Procedure

1, 2, 3...

1. Press the F10 Key from the I/O monitor display to change the function key menu and switch to the pause monitor mode.
2. Press the F3 Key to set pause conditions as follows:

   Rising edge of bit: **F3** *Bit_address* **Enter F4 Enter**
   Falling edge of bit: **F3** *Bit_address* **Enter F5 Enter**

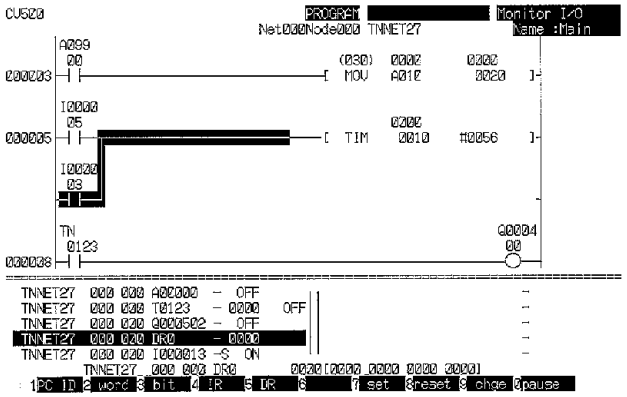
   The monitoring display will be frozen as soon as the set condition is fulfilled.
3. Press the F10 Key following any of the above operation to restart the pause monitoring operation with the same pause condition.
4. Press the Esc Key to return to the initial display.

The Always ON (A50013) and Always OFF (A50014) Flags do not cause monitoring to stop.

Note

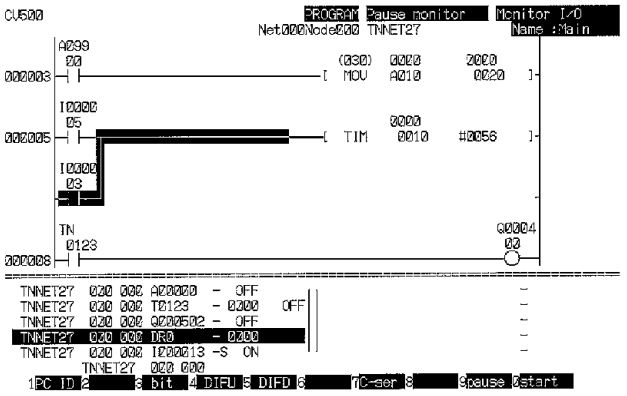
1. Do not set pause conditions which are established only for a short time, such as those that will be ON for one cycle only. Due to the length of the communication cycle, the pause condition may not be read and operation not stopped.
2. If the pause monitor operation is used during the part I/O monitor operation, a difference in timing may occur between the upper (program section) and lower (I/O monitor) parts of the screen. The lower part of the screen will be accurate.

Example This example shows how to freeze the monitor display when G00800 turns ON.



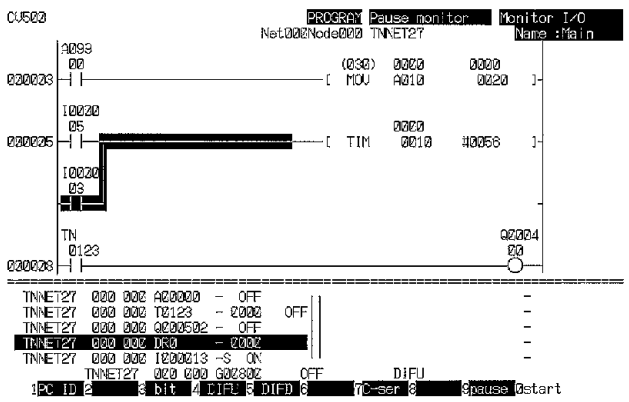
1, 2, 3... 1. Display the ladder program for which the pause monitor is to be used.

2. Press F10 to select the pause monitor mode. The function key menu will change.

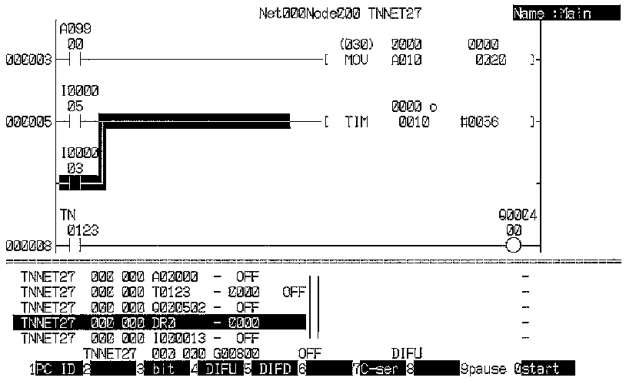


3. Specify the bit for the pause condition by inputting F3, G, 8, 0, 0 Enter.

4. Press the F4 and Enter Keys to specify the rising edge of the bit.



5. Press the Enter Key to start waiting for the specified pause condition. The current ON/OFF status will be displayed for the specified bit.



6. The monitoring display will freeze when the G00800 turns ON.

3-6 Online Editing

The following operation can be used to change or create ladder diagrams in any PC operating mode except the RUN mode.

RUN	MONITOR	DEBUG	PROGRAM
No	OK	OK	OK

The procedures to write or change a ladder diagram is identical to those performed offline, except that only a single instruction block can be edited at one time using the online editing operations. To make a large number of changes or to move or copy a program section, use the offline editing operations and transfer the program.

Programs cannot be read out once the online editing operation has begun. Before editing, read the program section to be edited from the initial monitoring display. Be sure to store the edited program to change the program in the PC.

The program input mode can be changed between C and CV mode from the offline programming menu using the “Change C/CV mode” operation.

Basic Procedure

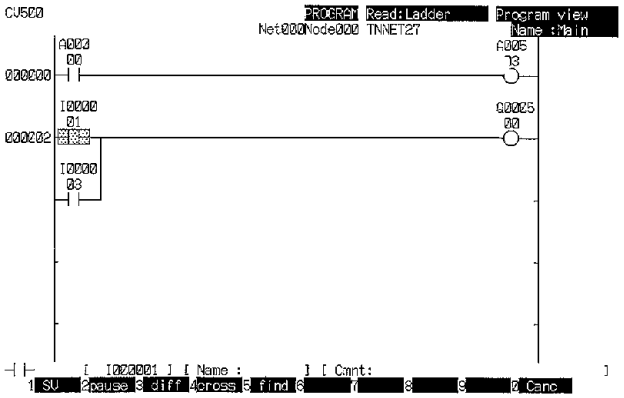
To create or change a ladder diagram, first display the section to be changed and select “O:Online edit” from the menu. The create or edit the ladder diagram and press F3 to save the program changes in the PC. The program in the computer work disk will not be changed.

Example

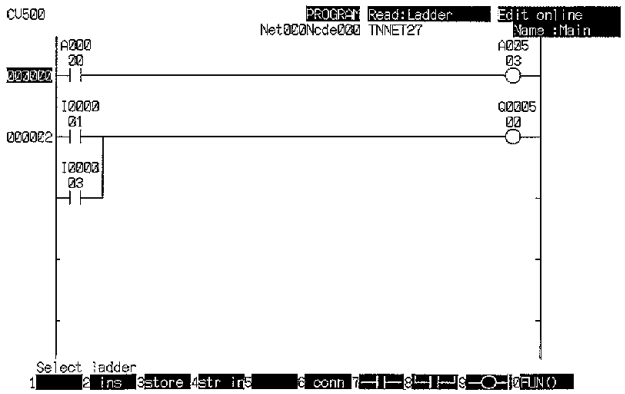
In this example, CIO 000002 is added and CIO 000500 and CIO 000501 are changed.

1, 2, 3...

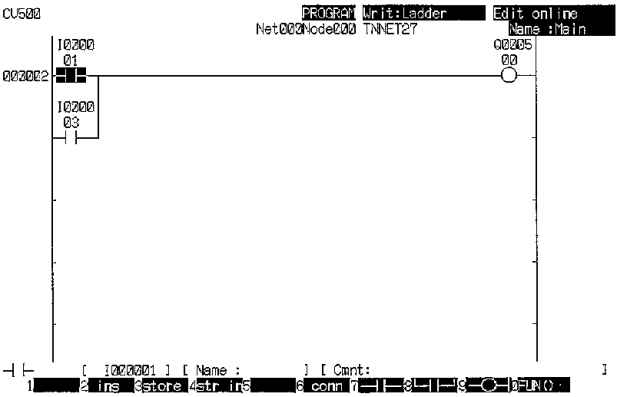
1. Read the program section to be edited from the initial monitoring display.



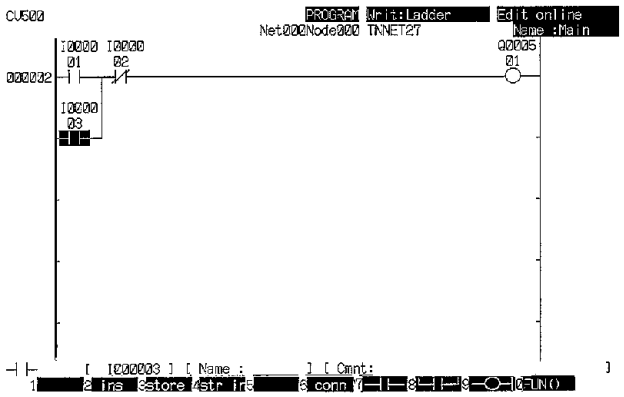
2. Select “O:Online edit.” A message will flash asking you to select the instruction block to be edited.



3. Move the cursor to the program address at the left of the required instruction block and press the Enter Key. The procedure from here on is identical to the offline write mode.



4. Edit the program section. Here, the following key sequence has been used to add a normally closed AND condition as shown below: A, Shift+F7, 2, Enter, Q, Q, Q, F9, 5, 0, 1, Enter.



5. Press F3 and Enter. The edited program section will be stored and the initial monitoring display will be displayed.
6. To make further changes, repeat the above operation.

Related Operation

The method for saving programs edited online to a data disk is described below.

1, 2, 3...

1. Online editing
2. End monitoring
3. Select *Trans. prog&data* followed by *PC* A *computer* (see *Caution* below).
4. Switch to the offline mode.
5. If I/O names are used, select *Edit I/O names* then run the *Link I/O name to UM* operation.
6. Select *Program.*
7. Select *Save program*.

Caution It may be impossible to use the *PC* A *computer* operation if online editing is used to create a program for a CV1000 which approaches the maximum program capacity.

3-7 Interrupt Program Monitor

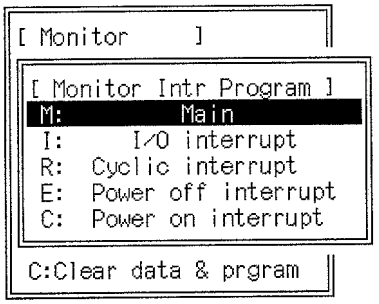
This operation is used to monitor interrupt programs, such as I/O interrupt or scheduled interrupt programs. This operation is possible in any PC mode except DEBUG mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	No	OK

These interrupt programs can be used only when the program type is set to ”Ladder only” in the System Setup. The method of monitoring the programs is identical to monitoring other ladder diagrams.

1, 2, 3...

1. Press the End Key to access the menu.
2. Select “I:Monitor intr prog” from the menu. The following menu will appear.



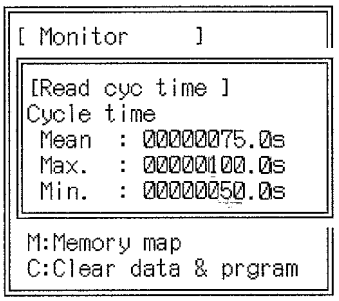
3. Select the program to be monitored.
4. A number input area will be displayed if an I/O interrupt program or a cyclic interrupt program is selected. Input the I/O interrupt number in the range 0 to 31. Input the cyclic interrupt number as either 0 or 1.
5. Monitor the selected interrupt program using the normal monitoring procedure.

3-8 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 in RUN and MONITOR modes.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	No	No

1, 2, 3... 1. Select “R:Read cycle time” from the menu.



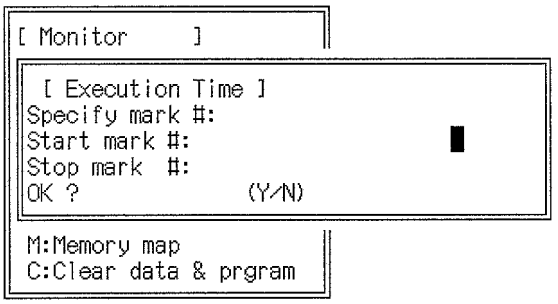
2. Press the Esc Key or the Shift+Esc Keys to end the cycle time display.

3-9 Measuring Execution Time

This operation is used to measures and display the execution time between two MARK instructions. This operation is possible in RUN and MONITOR modes.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	No	No

1, 2, 3... 1. Select “J:*Measure exec time.”*



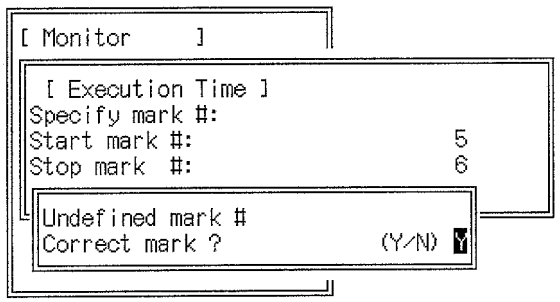
2. Enter the start and stop mark numbers. Enter the mark numbers in the range 0000 to 9999 and press the Enter Key.
3. Make a response to the prompt displayed on the screen. Press the Enter Key to return to the menu.

or Press the Y and Enter Keys to measure the execution time (see Note).

4. If the execution time is measured, the prompt will disappear and a message will indicate that the time is being measured.
5. The execution time will be displayed. Press the Esc Key to return to the menu.

or Press the Shift+Esc Keys to return to the ladder monitoring display.

The following message will be displayed if an undefined mark number is specified.



Press the Y and Enter Keys or the Esc Key to return to the mark input display.

or Press the N and Enter Keys to return to the menu.

or Press the Shift+Esc Keys to return to the ladder monitoring display.

3-10 Clearing Memory Areas

This operation can be used to clear programs and memory areas in the PC. This operation is possible in any PC mode except RUN mode.

RUN	MONITOR	DEBUG	PROGRAM
No	OK	OK	OK

The corresponding areas on the work disk are not cleared.

Display the menu from the initial monitoring display and select “C:Clear data & prgram.” Subsequent operations are identical to clearing the data and programs from the SFC display.

SECTION 4
Debug and Trace Operations

This section describes the operations used to debug programs in the PC, including the operation to trace program execution and read out the resulting data.

4-1 Debugging

The debugging operations permit operating status to be monitored in the overview mode. Use the monitor operations to monitor the I/O status after debugging is complete. The debugging operations enable SFC programs to be debugged. Use the program trace operations to debug programs if the program type is set to Ladder-only in the *System Setup* operation.

Note This operation is not supported if the program type is set to ladder-only.

The I/O status after debugging is cleared when the PC power supply is turned off. Store debugging information by using the *Memory card* operations from the menu (refer to *8-2 Memory Card Operations*). The data stored in the memory card can be used to continue debugging after the PC power supply is turned off.

The debugging operation executes the program one step at a time or until a stop condition is met, and displays the status of steps and transitions. This operation is possible only in DEBUG mode.

RUN	MONITOR	DEBUG	PROGRAM
No	No	OK	No

The I/O status can be monitored with the *Monitor* operations.

The Esc Key or Shift+Esc Keys may be pressed from the initial debugging display to cancel debugging and return to the menu.

Step Debugging

With set debugging, the program is executed from a specified step one step at a time until the stop condition is met. After the execution of each step, a prompt message will ask if the status of the next transition should be turned ON. Turn ON the transition to execute the next step. Even a transition program can be treated as a bit and turned ON during step debugging.

Section Debugging

With section debugging, the program is executed from a specified step until the stop condition is met.

Specifying the First Step

You can specify an initial step as the first step to debug. It is not necessary to specify active steps when starting from an initial step.

To start debugging from steps that are not initial steps, it is necessary to specify the both the first step and the active steps. Multiple active steps may be specified to allow proper start conditions to be set for debugging operation. Specify a single step from amongst the active steps as the start step.

Setting Stop Conditions

A step or word can be specified as the debugging stop condition. See *3-4-3 Pause Monitor* for details.

Function Keys

Use the F1 to F10 Keys from the function key menu at the bottom of the screen to control debugging. The function key menu will change when the Shift Key is held down.

Initial display

When the Shift Key is pressed.

Function key	Operation	Description
F1	Jump	Used in response to prompt messages.
F2	Find	
F6	Abort debugging	Aborts the PC debugging operation.
F7	Clear active status	Reverts all steps made active with the F8 Key back to inactive status.
F8	Set active status	Used in response to prompt messages. Specifies the active step when restarting debugging.
F9	Cancel active status	Changes the step at the cursor position to inactive status if it was made active with the F8 Key.
F10	Transfer sheet	Identical to the *Trans sheet (PC A Comp)* item in the Monitor menu.
Shift+F7	Select RUN mode	Switches the PC operating mode to RUN mode.
Shift+F8	Select MONITOR mode	Switches the PC operating mode to MONITOR mode.
Shift+F9	Select DEBUG mode	Switches the PC operating mode to DEBUG mode.
Shift+F10	Select PROGRAM mode	Switches the PC operating mode to PROGRAM mode.

The following keys can be used when one of the prompt messages is displayed: F1 (jump), F2 (find), F7(tran sht), PgDn, PgUp, Up, Down, Left, Right.

The Shift+Esc Keys can be pressed after step or section debugging has been started to pause the debug operation and move to another operation.

Procedure

Press the Shift+F9 Key to set the PC into the debug mode and select “R:Debug” from the menu. The display will switch to the overview mode.

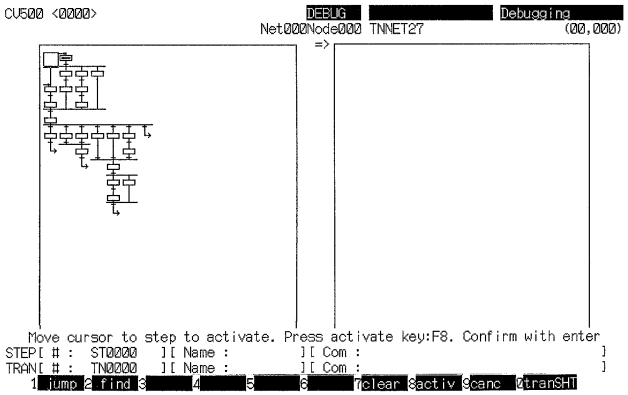
If the previous debugging operation was stopped and the prompt message asking the operator whether to continue is still displayed, *Preparations* can be skipped and you can proceed to *Step Debugging* or *Section Debugging*. The display displayed before operation was stopped will be displayed again and debugging can be restarted immediately.

Preparations

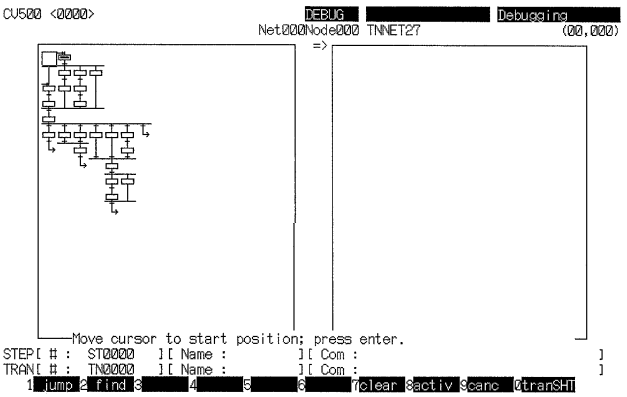
The initial preparations are required under the following conditions:

- Debugging is run for the first time.
- When the PC is switched from the debug mode to another mode.

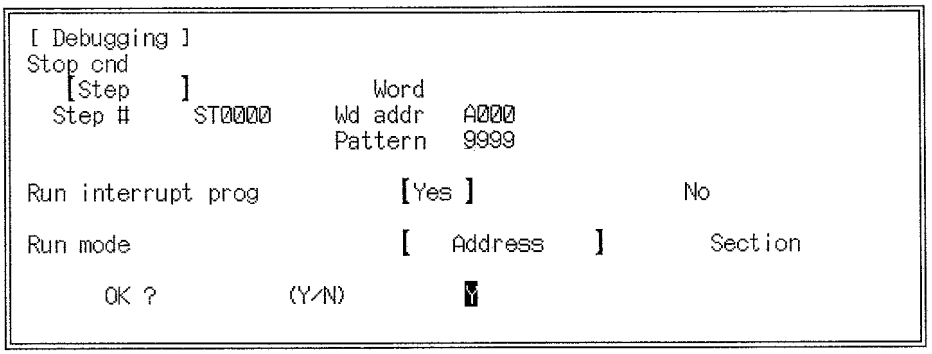
The initial debugging display will be displayed. Press the F10 Key, enter the number of sheet to be debugged, and press the Enter Key. The sheet will be transferred from the PC to the computer and the specified sheet will be displayed on the screen. A message will appear above the I/O name and I/O comment at the bottom of the screen.



Specify the active steps at the start of debugging operation. Multiple active steps can be specified.



A message will appear above the I/O name and I/O comment at the bottom of the screen. Specify which of the active steps is to be the first step to be debugged.



The stop conditions set used will be displayed as defaults and the cursor will flash at the Y next to the prompt. Press the Enter Key if the previous stop conditions are acceptable.

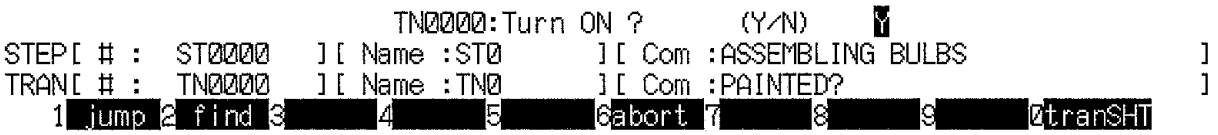
To change the parameters, press the N and Enter Keys. The cursor will move to the stop condition input position. Press the Down Key to move the cursor to the next stop condition or the Up Key to move it to the previous stop condition. Move the cursor to the condition to be changed, enter the new condition, and press the Enter Key. The function key menu will change.

Step Debugging

When step debugging is selected, a prompt message will appear above the I/O name and I/O comment at the bottom of the screen asking if the next step can be run.

If the message is displayed at the start of a step, press the Enter Key or Y and Enter Key to debug the step displayed in the message. Press the N and Enter Keys to return to the display to specify active steps.

If the message is displayed while a transition is ON, press the Enter Key or Y and Enter Key to debug the transition. Press the N and Enter Keys to return to the display to specify active steps.



Press the Shift+Esc Keys to return to the display to specify active steps.

Press the Esc Key to return to the display to set the stop conditions.

Section Debugging

When section debugging is selected, a prompt message appears above the I/O name and I/O comment at the bottom of the screen asking if operation can be continued. Press the Enter Key to continue. Press the N and Enter Keys to return to the display to specify active steps.

Note If PC operation does not stop due to an incorrect stop condition during section debugging, press the F6 Key to to stop the PC operation.

```
          Stop cnd ST0000       occurred. Continue debugging?(Y/N) Y
STEP[ # :  ST0000   ][ Name :ST0      ][ Com :ASSEMBLING BULBS                ]
TRAN[ # :  TN0000   ][ Name :TN0      ][ Com :PAINTED?                        ]
   1 jump 2 find 3       4       5       6abort 7       8       9       0tranSHT
```

Press the Shift+Esc Keys to return to the display to specify active steps.

Press the Esc Key to return to the display to set the stop conditions.

When the specified stop condition is met, a prompt message will appear above the I/O name and I/O comment at the bottom of the screen asking if operation can be continued. From this point, operation is identical to section debugging.

Debugging Stop Condition Input Display

```
CV500 <0000>                          DEBUG                 Debugging
                                 Net000Node000 TNNET27          (00,000)
 [ Debugging ]
 Stop cnd
    [Step    ]              Word
   Step #     ST0000     Wd addr   I0000
                         Pattern   0000

 Run interrupt prog          [Yes ]              No

 Run mode                    [   Address   ]       Section

       OK ?          (Y/N)          Y
                                    =>
STEP[ # :  ST0000   ][ Name :ST0      ][ Com :ASSEMBLING BULBS                ]
TRAN[ # :  TN0000   ][ Name :TN0      ][ Com :PAINTED?                        ]
Initial display ──→ 1 A 2 G 3 T 4 C 5 D 6 E 7       8       9       0

                          Trig mon:ON     TraceEnd:ON     Trcing:OFF
When the Shift Key
is pressed.     ──→ 1       2       3       4       5       6       7 RUN 8 MON 9 DBG 0 PRG
```

A the stop conditions and the valid keys are shown in the table below. Press the Enter Key after setting a parameter.

Item	Operation	Key sequence	Range
Stop cnd	Specifies if the stop condition is a step or word address.	Left, Right Keys	Select with the cursor.
Step #	Specifies the step number for the stop condition.	0 through 9 Keys	Refer to *1-3 PC Data Areas*.
Wd addr	Specifies the word address for the stop condition. Clear the display by pressing the Backspace Key or Home Key to change this setting.	0 through 9 Keys F1 through F6 Keys	Refer to *1-3 PC Data Areas*.
Pattern	Specify the status of the specified word in hexadecimal.	0 through 9 Keys A through F Keys	0 through FFFF
Run interrupt prog	Specify whether an interrupt programs are to be executed during debugging.	Left, Right Keys	Select with the cursor.
Run mode	Select step (address) or section debugging.	Left, Right Keys	Select with the cursor.

4-2 Data Tracing

Data tracing can be used to facilitate debugging programs. Tracing can be used in conjunction with TRSM(170) as described below. Refer to the *CV500/CV1000 Operation Manual: Ladder Diagrams* for details on ladder-diagram programming.

4-2-1 Introduction

Description

TRSM(170) is used in the program to mark locations where specified data is to be stored in Trace Memory. Up to 12 bits and up to 3 words may be designated for tracing.

TRSM(170) is not controlled by an execution condition, but rather by two bits in the Auxiliary Area of the PC: A00815 and A00814. A00815 is the Sampling Start Bit. This bit is turned ON to start the sampling processes for tracing. The Sampling Start Bit must not be turned ON from the program, i.e., it must be turned ON only from CVSS. A00814 is the Trace Start Bit. When it is set, the specified data is recorded in Trace Memory. The Trace Start Bit can be set either from the program or from CVSS. If desired, a bit other than A00814 can be set from the CVSS. A positive or negative delay can also be set to alter the actual point from which tracing will begin.

Data can be recorded in two ways. In the first method, a timer interval is set from CVSS so that the specified data will be traced at a regular interval independent of the cycle time. The timer interval can be set to between 5 and 2550 ms, in 5 ms increments. If the timer interval is set to 0 ms, the sampling will take place once each cycle; data will thus be recorded periodically and TRSM(170) instructions in the program won't trigger sampling.

To disable periodic sampling and enable sampling when TRSM(170) is executed in the program, the timer interval is set to "TRSM." TRSM(170) can be placed at one or more locations in the program to indicate where the specified data is to be traced.

TRSM(170) can be incorporated anywhere in a program, any number of times. The data in the trace memory can be monitored via the CVSS.

Control Bits and Flags

The following control bits and flags are used during data tracing. The Tracing Flag will be ON during tracing operations. The Trace Completed Flag will turn ON when enough data has been traced to fill Trace Memory.

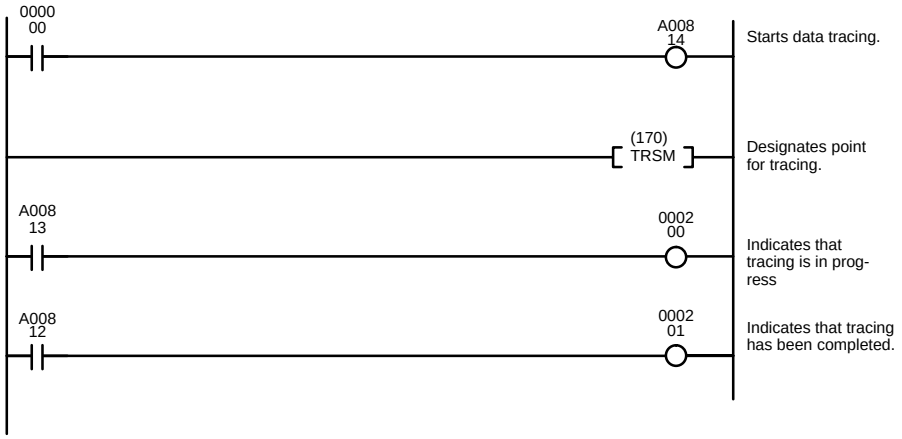
Only A00814 and A00815 are meant to be controlled by the user, and A00815 must not be turned ON from the program, i.e., it must be turned ON only from CVSS.

Flag	Function
A00811	Trace Trigger Monitor Flag
A00812	Trace Completed Flag
A00813	Trace Busy Flag
A00814	Trace Start Bit
A00815	Sampling Start Bit

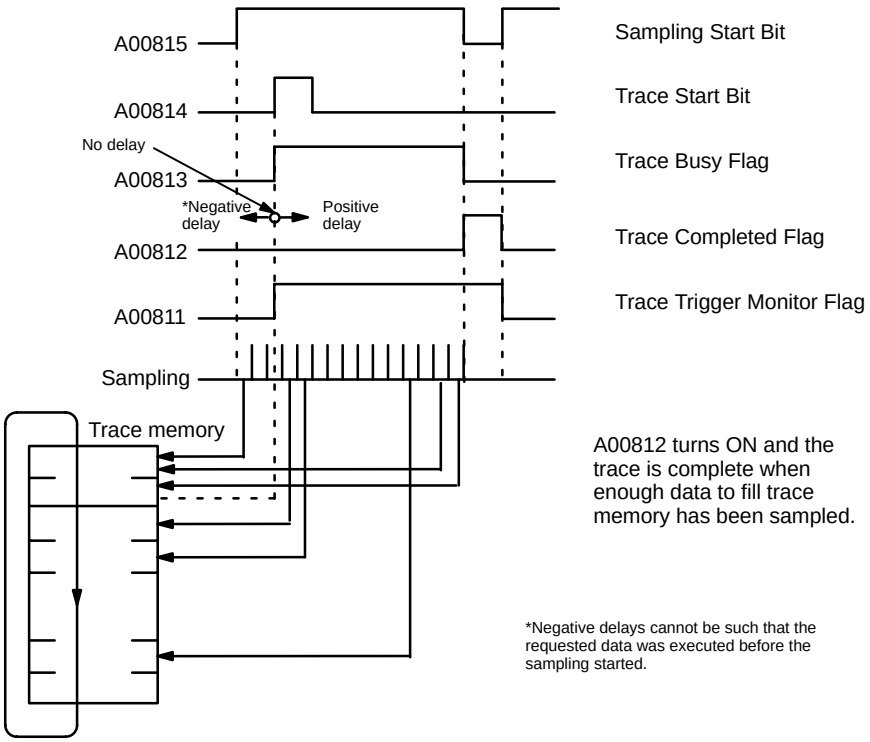
Example

The following shows the basic program and operation for data tracing. The Sampling Start Bit starts the sampling. The data is read and stored into trace memory in the CV500/CV1000. 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 sampled data is written to trace memory, jumping to the beginning of the memory area once the end has been reached and continuing up to the start marker. This might mean that previously recorded data (i.e., data from this sample that falls before the start marker) is overwritten (this is especially true if the delay is posi-

tive). The negative delay cannot be such that the required data was executed before sampling was started.



Address	Instruction	Operands
00000	LD	000000
00001	OUT	A00814
00002	TRSM(170)	
00003	LD	A00813
00004	OUT	000200
00005	LD	A00812
00006	OUT	000201



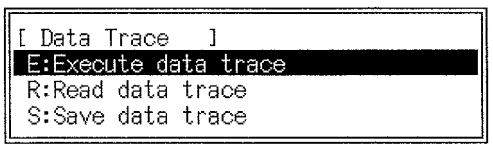
4-2-2 Data Trace Menu

Operation

The following keys can be used during data tracing.

- Press the Shift+Esc Keys to display the data trace menu.
- Press the Esc Key to display to revert one display.
- Press the END Key or Ctrl+M Keys to access the Data Trace menu. The file name table, however, will be displayed when a file name input is required.

Select “T:Data trace” from the menu. The Data Trace menu will be displayed.



The data trace operations are as follows.

Item	Operation
Execute data trace	Sends the data trace setting and execute instruction to the PC.The data trace is automatically displayed when the trace is complete.
Read data trace	Displays the trace data. Data trace executing in the PC can be interrupted with this operation.
Save data trace	Save the trace data to a data disk or hard disk.

The PC mode can be changed while the menu is displayed.

Mode	Operation
RUN mode	Press the Shift+F7 Keys.
MONITOR mode	Press the Shift+F8 Keys.
DEBUG mode	Press the Shift+F9 Keys.
PROGRAM mode	Press the Shift+F10 Keys.

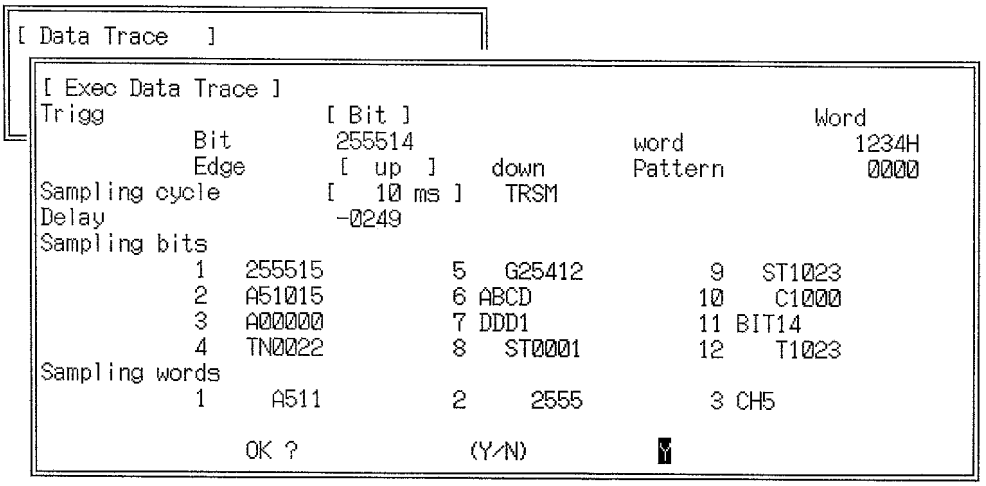
Note All online data trace operations act on the PC. Consequently, it is not possible to read or save data trace data on the work disk.

4-2-3 Executing Data Traces

This operation is possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

Select “E:Execute data trace” from the menu. The parameter setting menu will be displayed. The parameters set previously will be displayed as defaults.



When the cursor is at the OK? (Y/N) position at the bottom of the screen, the ON/OFF status of the Trace Trigger Flag (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 *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 will be 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 main online menu.

Parameter	Function	Key Sequence	Range
Trigg	If using a trigger other than the Trace Trigger Flag (A00814), specify if this trigger is to be a bit or a word.	**Enter**	---
Trigger bit	Specifies the trigger bit. Input the bit address or I/O name. This setting is valid when the trigger parameter is set to Bit. Leave this parameter blank to set A00814 as the trigger.	**F1** to **F10** (Memory area) **0** to **9** (Number) (See Note 1)	(See Note 2)
Trigger bit edge (rising/falling)	Specify the rising edge or falling edge of the trigger bit as the trigger condition. This setting is valid when the trigger parameter is set to Bit. Only the rising edge (up) setting is valid when A00814 is set as the trigger.	**Enter**	---
Trigger word	Specify the trigger word. Input the word address or I/O name. This setting is valid when the trigger parameter is set to Word.	**F1** to **F10** (Memory area) **0** to **9** (Number) (See Note 1)	(See Note 2)
Trigger word pattern	Set the target content of the trigger word in 4-digit hexadecimal. This setting is valid when the trigger parameter is set to Word.	**0** to **9** **A** to **F**	0000 through FFFF (hex)
Sampling cycle	Select a time or the TRACE MEMORY instruction (TRSM(170)). Set the time in 5 ms increments. Sampling is conducted once per cycle if the time is set to zero.	**0** to **9** **Enter**	0005 to 2550 or TRSM
Delay	Set the delay as a number of sampling cycles before sampling is started after the trigger condition is met. A positive (+) value indicates after the trigger condition is met, a negative (–) value indicates before the trigger condition is met (note 4).	**+**, **–** **0** to **9**	(See Note 3)
Sampling bits	Specify the bits to be sampled. Input the bit addresses or I/O names. Up to 12 bits can be specified. The ON/OFF status of each bit will be displayed in a time chart.	**F1** to **F10** (Memory area) **0** to **9** (Number) (See Note 1)	(See Note 2)
Sampling words	Specify the words to be sampled. Input the word addresses or I/O names. Up to 3 words can be specified. The content of each word will be displayed in hexadecimal.	**F1** to **F10** (Memory area) **0** to **9** (Number) (See Note 1)	(See Note 2)

Note 1. All keys are valid for I/O names.

2. The bits and words that can be used for the trigger and those that can be sampled are listed in the following table.

Item	Trigger		Sampling	
	Bit	Word	Bit	Word
CIO Area	OK	OK	OK	OK
Timer and Counter Areas	OK	OK	OK	OK
DM Area	No	OK	No	OK
Transitions	OK	No	OK	No
Step (Flag ON/OFF)	OK	No	OK	No
EM Area (Bank 0 to Bank 7)	No	OK	No	OK
Actions	No	No	No	No
Registers	No	No	No	No

3. The delay varies according to the PC and number of sampling words.
4. If the delay is set as a negative value, no delay value will be displayed when the data trace is read if the number of samples set with the delay value cannot be completed before the trigger condition is met. The range of delay settings are listed in the table below.

PC	Number of sampling words	Range
CV1000-CPU01-E CV2000-CPU01-E CVM1-CPU11-E	0	–1999 to 2000
	1	–999 to 1000
	2	–665 to 666
	3	–499 to 500
CV500-CPU01-E CVM1-CPU01-E	0	–999 to 1000
	1	–499 to 500
	2	–332 to 333
	3	–249 to 250

Inputting Parameters

1, 2, 3...

1. Press the Up, Down, Left, And Right Keys to move the cursor to the item to be set.
2. Input the parameter. Some parameters are selected, while others require a letter or number to be input.

   To set a parameter which is selected, move the cursor to the required setting on the display and press the Enter Key. Square brackets [ ] will be displayed around the selected item. To set a parameter requiring a letter or number, 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. An incorrect setting will not be entered when the Enter Key is pressed.

Resetting Parameters

When setting the trigger bit or word address or the sampling bit or word address, press the Home Key to set the input 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 pattern, sampling cycle, or delay.

Executing the Data Trace

After setting all the required parameter, move the cursor to the N position by the OK? prompt and press the Y and Enter Keys. A message will indicate that the data trace is running.

Change the delay or sampling word setting if a buzzer sounds when the Y and Enter Keys are pressed. Refer to the previous tables for the permitted setting ranges.

It is possible to monitor and set/reset the Trace Trigger Flag (A00814) during data trace execution. Trace data is automatically read and displayed when the data trace is complete.

Cancelling the Data Trace

Press the Esc Key or the Shift+Esc Keys to cancel data trace operation. A message at the bottom of the screen will ask whether to cancel the data trace operation. Press the Y and Enter Keys to cancel the operation.

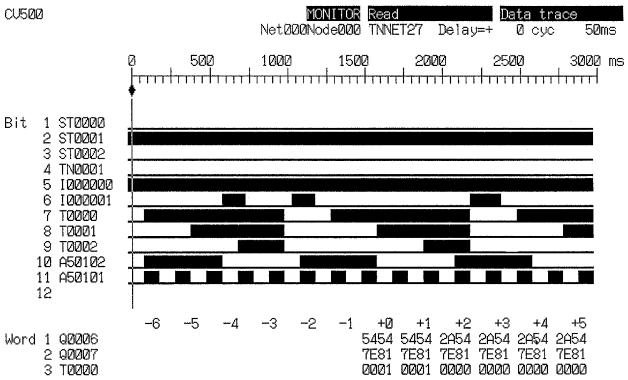
4-2-4 Reading the Data Trace

This operation is possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

1, 2, 3...

1. Select “R:Read data trace” from the menu. The parameter setting menu will be displayed.
2. Press the Enter Key. The parameter setting menu will be replaced by the read display.
3. If *Read data trace* is selected from the menu during PC trace execution, a message will indicate that the data trace is being executed. Press the following key sequences:
   a) Press the Y and Enter Keys to cancel the data trace. Check that data trace execution has been cancelled before reading and displaying the data trace data.
   b) Press the Enter Key or N and Enter Keys to continue the data trace.



Use the Left and Right Keys to move the cursor horizontally. The cursor will move faster if the key is held down. Data from the previous or subsequent display will be displayed as the cursor is moved.

A total of 12 words of data can be displayed: 6 before and after the cursor position. A “0” indicates the cursor position.

4-2-5 Saving the Data Trace

This operation is possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

1, 2, 3...

1. Select “S:Save data trace” from the menu. A file name input area will appear to input the name of the file to be saved.
2. Place the data disk into the drive.
3. Input the file name using up to 8 characters. Specify the drive and directory names using the following format:
   drive_name, \, *directory_name*, \, *file_name*

If an existing file is to be overwritten and updated, use the following procedure to input the file name:

a) Press the End Key or Ctrl+M Keys to display the file name table

b) Select the required file name with the cursor and press the Enter Key to input the file name and delete the file name table

4. Enter the title using up to 30 characters and press the Enter Key. The Enter Key can be pressed by itself to continued without entering a title.

   Titles can be used in the file name table. This operation is convenient for checking files loaded with the offline data trace.

5. If the input file name already exists, a message will ask if the file can be updated. Press the Y and Enter Keys to update the file. Press the Enter Key to cancel and input a new file name.

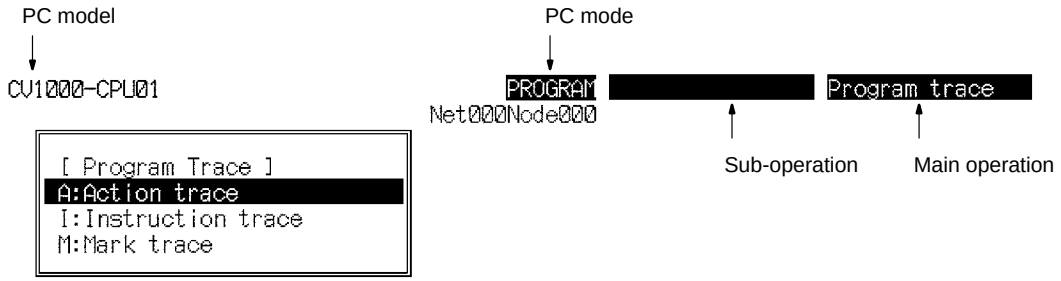
The data trace menu will be displayed when the data trace save operation is complete.

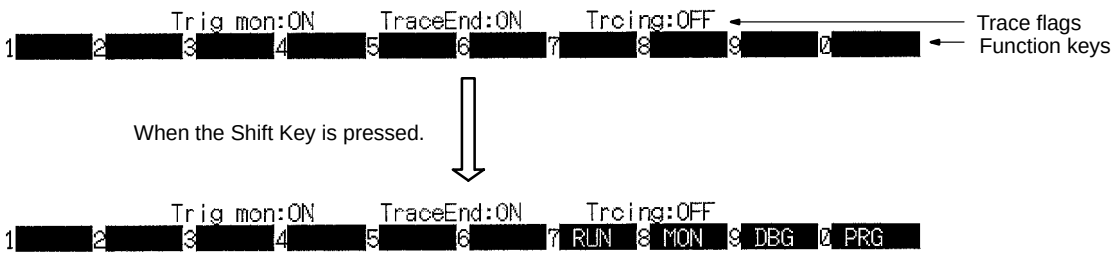
4-3 Program Tracing

Program tracing is used to trace the execution sequence of actions, specified instructions, or MARK instructions.

The trace flag display shows the status of the Trace Trigger Flag (A00814), Trace Completed Flag (A00812), and Trace Busy Flag (A00813).

Select “P:Data trace” from the menu. The program trace initial display will be displayed as shown below.



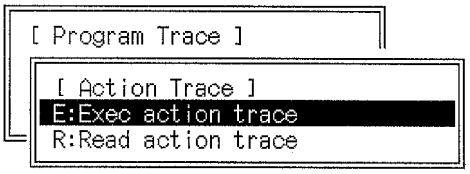


The function key menu changes when the Shift Key is pressed. Press the F7 to F10 Key while the Shift Key is held down.

4-3-1 Action Traces

This operation is used to store the order of action execution in the PC trace memory. The action trace data stored in the PC trace memory can be displayed on the screen. Two data words can be sampled with the action trace.

Select "A:Action" from the Program Trace menu. The Action Trace menu will be displayed.



Operation	Function
Exec action trace	Sets parameters and executes the action trace.
Read action trace	Displays the action trace data from the PC.

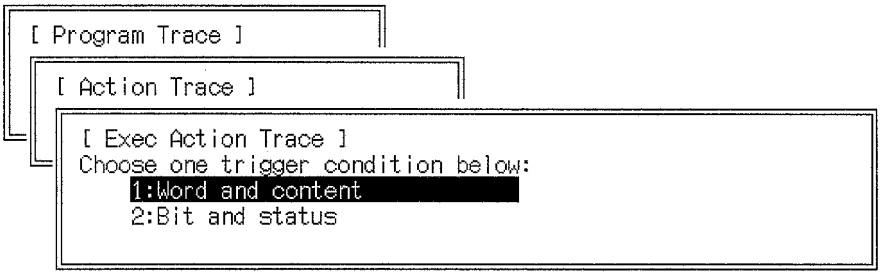
Note The PC has a single trace memory, which is used for the data tracing, action tracing, instruction tracing, and mark tracing. Consequently, the read action trace operation cannot be used if the trace memory contains data not resulting from an action trace.

Executing Action Traces

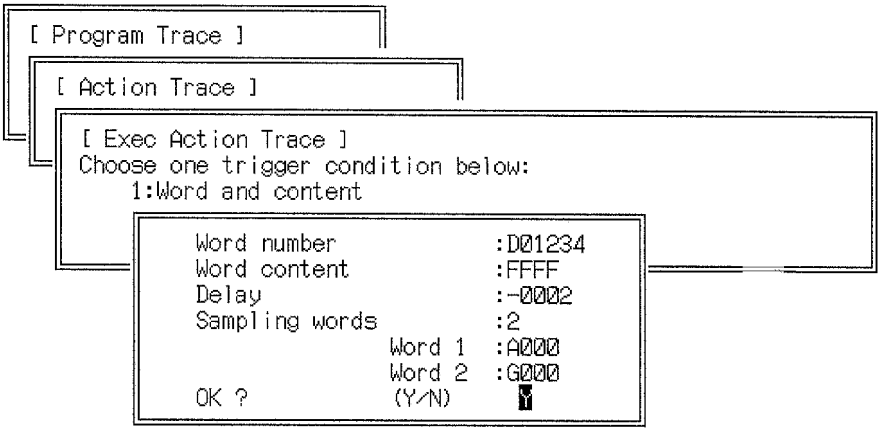
This operation is possible in any PC mode except PROGRAM mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	No

1, 2, 3... 1. Select "E:Exec action trace" from the sub-menu. The following display will appear.



2. Select word and content or bit and status as the trigger condition for the action trace and press the Enter Key. The remainder of this procedure shows displays for when "word and content" has been selected.



3. The parameters set previously will be displayed and the cursor will flash at the Y next to the prompt message. Press the Enter Key if the previous parameters are acceptable.

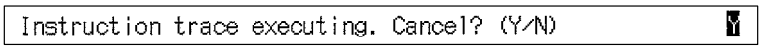
or To change the parameters, press the N and Enter Keys. The cursor will move to the word address input position and the function key menu will change. Press the Down Key to move the cursor to the next stop condition or the Up Key to move it to the previous stop condition. Move the cursor to the parameter to be changed, enter the new parameter, and press the Enter Key.

After all parameters are input, the cursor moves to the prompt position ready for the next key input.

4. Press the Y and Enter Keys to start the action trace and return to the program trace initial display.

The following message will be displayed above the function key menu at the bottom of the screen if a PC trace is executing.

The following message will appear while the instruction trace is running.



5. Press the N and Enter Key to return to the Exec Action Trace sub-menu.

Note Refer to the section Instruction Traces (see page 71) for the parameter settings and valid keys when the trigger condition is set to *Bit and status*.

The parameters and the valid keys are shown in the following table.

Parameter	Function	Key sequence	Range
Word number	Specifies the address of the trigger word for action trace execution.	**F1** to **F6** **0** to **9**	Refer to *1-3 PC Data Areas*.
Word content	Specifies the contents of the trigger word for action trace execution.	**0** to **9** **A** to **F**	0 to FFFF
Delay	Sets the delay as a number of actions. The start of the display will be shifted to after the trigger condition is met if a positive (+) value is input and to before the trigger condition if a negative (–) value is input.	**+**, **–** **0** to **9**	See table below.
Sampling words	Specify the number of words sampled during the action trace.	**0** to **2**	0 to 2
Word 1	Specify the address of the word to be sampled.	**F1** to **F6** **0** to **9**	Refer to *1-3 PC Data Areas*.
Word 2	Specify the address of the word to be sampled.	**F1** to **F6** **0** to **9**	Refer to *1-3 PC Data Areas*.

The following shows the range of delay settings for action trace.

PC	Number of sampling words	Range
CV1000-CPU01-E CV2000-CPU01-E CVM1-CPU11-E	0	–999 to 1000
	1	–665 to 666
	2	–499 to 500
CV500-CPU01-E CVM1-CPU01-E	0	–499 to 500
	1	–332 to 333
	2	–249 to 250

If the delay is set as a negative value, no delay value will be displayed when the action trace is read if the number of samples set with the delay value cannot be completed before the trigger condition is met.

Reading the Action Trace

This operation is possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

1, 2, 3...

1. Select “R:Read action trace” from the sub-menu.
2. A message like the following one will be displayed above the function key menu at the bottom of the screen if a PC trace is being executed.

```
Instruction trace executing. Cancel? (Y/N)  Y
```

Press the Enter Key to read the trace data or press the N and Enter Keys to cancel the action trace read and return to the program trace initial display.

3. The parameters set previously will be displayed and the cursor will flash at the Y next to the prompt message.

```
[ Program Trace ]
  [ Action Trace ]
    Word number              :D01234
    Word content             :FFFF
    Delay                    :-0002
    Sampling words           :2
                   Word 1    :A000
                   Word 2    :G000
    OK ?           (Y/N)     Y
```

Press the Enter Key to read the trace data for the displayed parameters. The data from the PC trace memory will be displayed on the screen. It takes approximately one minute to read the action trace if I/O names are used.

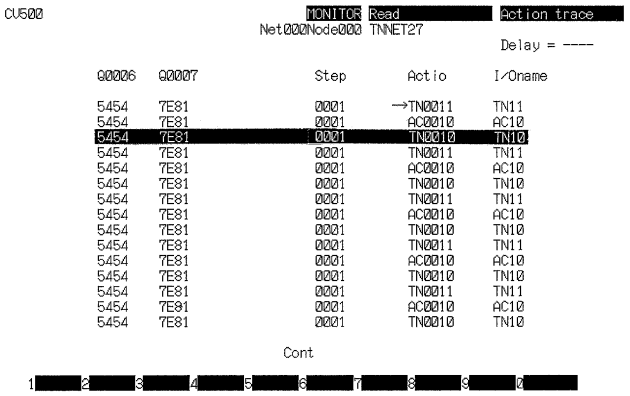
or Press the N and Enter Keys to cancel the action trace read and return to the program trace initial display.

4. The following message will be displayed in the top-left of the screen and the display will return to the program trace initial display if the parameters differs from the data contained in the trace memory.

```
Wrong trace data
```

5. Press the Up and Down Keys to move the cursor vertically. The delay value at the current cursor position will be displayed at the top-right of the screen.

Press the PgDn and PgUp Keys to display the subsequent and previous displays.



Item	Description
Step No. Action No. I/O name	Display the step and action numbers of the steps executed by the action trace and the I/O names of the actions.
Sampling word 1 Sampling word 2	Displays the word data immediately before the action was executed.
Trigger	The executed action line will be displayed in reverse video when the status of the bit or word designated as the trigger matches the specified condition.
Delay	Displays the relative position of the trigger from the cursor (unrelated to the Delay parameter setting).

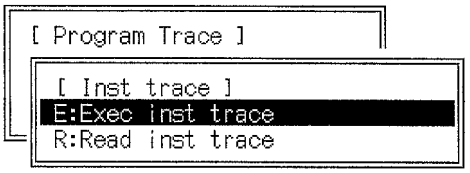
Ladder programs are listed as separate blocks, allocated the step and action numbers shown in the table below. As each block is executed, the step and action numbers are displayed on the screen as shown in the table below.

Block name	Step number	Action number
Main	ST0000	AC0000
I/O interrupt	ST0001 to ST0032	AC0001 to AC0032
Scheduled interrupt	ST0033 ST0034	AC0033 AC0034
Power off interrupt	ST0035	AC0035
Power on interrupt	ST0036	AC0036

4-3-2 Instruction Traces

Instruction traces are executed to store the sequence of ladder instruction execution in the PC trace memory. The instruction trace data stored in the PC trace memory can then be displayed on the screen. The two data words specified for the action trace can be sampled during the instruction trace.

Select “E:Instruction trace” from the Program Trace menu. The Instruction Trace menu will be displayed.



Operation	Function
Exec inst trace	Sets parameters and executes the instruction trace.
Read inst trace	Displays the instruction trace data from the PC.

Note

1. The cycle time increases dramatically (more than 10 times) if the instruction trace is executed in the RUN mode and the excessive cycle time may cause operation to stop.
2. The instruction trace data will not be displayed correctly if the user program is changed using online editing or the FILP(182) instruction during trace execution.

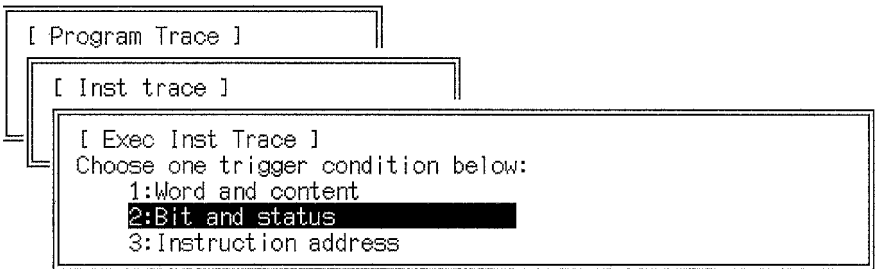
Executing Instruction Trace

This operation is possible in any PC mode except PROGRAM mode.

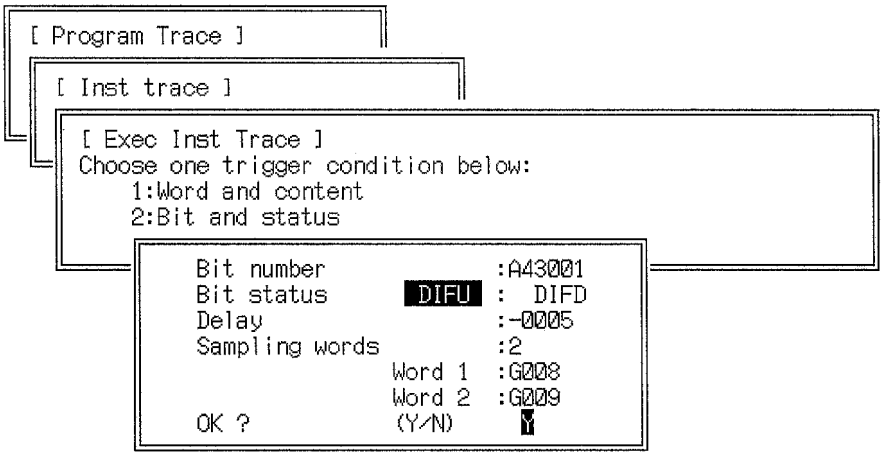
RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	No

1, 2, 3...

1. Select “E:Exec inst trace” from the Inst Trace sub-menu. The following menu will appear.



2. Select word and content, bit and status, or the instruction address as the trigger condition for the instruction trace and press the Enter Key. The displays in the remainder of this procedure are those shown for “Bit and status.”



3. The parameters set previously will be displayed as defaults and the cursor will flash at the Y next to the prompt message. Press the Enter Key if the previous parameters are acceptable.

or To change the parameters, press the N and Enter Keys. The cursor will move to the bit address input position and the function key menu will change. Press the Down Key to move the cursor to the next stop condition or the Up Key to move it to the previous stop condition. Move the cursor to the parameter setting to be changed, enter the new parameter and press the Enter Key.

After all parameters are input, the cursor moves to the prompt position ready for the next key input.

Press the Y and Enter Keys to start the instruction trace and return to the program trace initial display.

4. The following message will appear when the mark trace is running.

```
Mark trace executing. Cancel ? (Y/N)                Y
```

Press the Enter Key to start the trace or press the N and Enter Key to return to the Exec Inst Trace sub-menu.

Note Refer to *4-3-1 Action Traces* for the parameter settings and valid keys when the trigger condition is set to *Word and content*.

Parameters and the valid keys when instruction when bit and status is selected as the trigger condition are shown in the table below.

Parameter	Function	Key Sequence	Range
Bit number	Specifies the address of the trigger bit for instruction trace execution.	**0** to **9** **F1** to **F7**	Refer to *1-3 PC Data Areas*.
Bit status	Specifies the target contents of the trigger word for instruction trace execution.	**Left Key**, **Right Key**	Select with the cursor.
Delay	Sets the delay as a number of program addresses. The start of the display will be shifted to after the trigger condition is met if a positive (+) value is input and to before the trigger condition if a negative (–) value is input.	**+**, **–** **0** to **9**	Refer to table of delays on page 75.
Sampling words	Specifies the number of words sampled during the instruction trace.	**0** to **2**	0 to 2
Word 1	Specifies the address of the word to be sampled.	**F1** to **F6** **0** to **9**	Refer to *1-3 PC Data Areas*.
Word 2	Specifies the address of the word to be sampled.	**F1** to **F6** **0** to **9**	Refer to *1-3 PC Data Areas*.

Parameters and the valid keys when instruction address is selected as the trigger condition are shown in the table below.

Parameter	Function	Key Sequence	Range
Transition/action number	Specifies the transition or action program specified as the trigger for instruction trace execution.	**F5**, **F7** **0** to **9**	Refer to *1-3 PC Data Areas*.
Address	Specifies the trigger address to determine the start position of the display for the instruction trace results.	**0** to **9**	Refer to *1-3 PC Data Areas*.
Delay	Sets the delay as a number of program addresses. The start of the display will be shifted to after the trigger condition is met if a positive (+) value is input and to before the trigger condition if a negative (–) value is input.	**+**, **–** **0** to **9**	Refer to table of delays on page 75.
Sampling words	Specifies the number of words sampled during the instruction trace.	**0** to **2**	0 to 2
Word 1	Specifies the address of the word to be sampled.	**F1** to **F6** **0** to **9**	Refer to *1-3 PC Data Areas*.
Word 2	Specifies the address of the word to be sampled.	**F1** to **F6** **0** to **9**	Refer to *1-3 PC Data Areas*.

If the delay is set as a negative value, no delay value will be displayed when the instruction trace is read if the number of samples set with the delay value cannot be completed before the trigger condition is fulfilled.

Reading the Instruction Trace This operation is possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

Note The PC has a single trace memory, which is used for the data tracing, action tracing, instruction tracing, and mark tracing. Consequently, the read instruction trace operation cannot be used if the trace memory contains data not related to the instruction trace.

1, 2, 3... 1. Select “R:Read inst trace” from the Inst Trace sub-menu.

2. A message like the following one will be displayed above the function key menu at the bottom of the screen if a PC trace is executing.

```
Instruction trace executing. Cancel? (Y/N)  Y
```

Press the Enter Key to cancel the current trace and read the trace data or press the N and Enter Keys to cancel the instruction trace and return to the program trace initial display.

3. The parameters set previously will be displayed and the cursor will flash at the Y next to the prompt.

```
[ Program Trace ]
 [ Inst trace ]
    Bit number              :A43001
    Bit status      DIFU    :  DIFD
    Delay                   :-0005
    Sampling words          :2
                    Word 1  :G008
                    Word 2  :G009
    OK ?            (Y/N)    Y
```

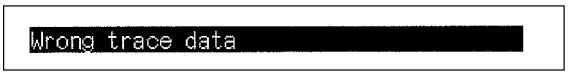
Press the Enter Key to read the trace data with these parameters or press the N and Enter Keys to cancel the instruction trace and return to the program trace initial display.

If the read is executed, the data from the PC trace memory will be displayed on the screen. It takes approximately one minute to read the instruction trace if I/O names are used.

The range of delay values for the instruction trace is shown in the table below.

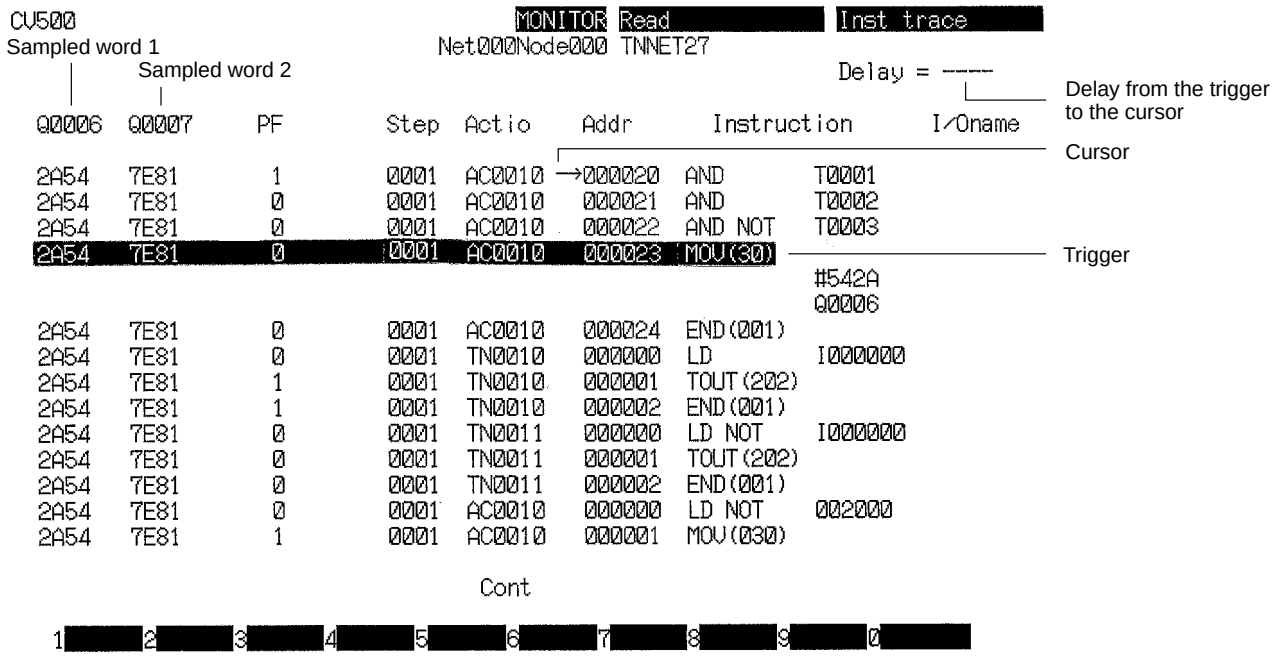
PC	Number of sampling words	Range
CV1000-CPU01-E CV2000-CPU01-E CVM1-CPU11-E	0	–499 to 500
	1	–399 to 400
	2	–332 to 333
CV500-CPU01-E CVM1-CPU01-E	0	–249 to 250
	1	–199 to 200
	2	–165 to 166

4. The following message will be displayed in the top-left of the screen and the display returns to the program trace initial display if the type of data read differs from the data contained in the trace memory. Rerun the trace or correct the read parameters.



5. Press the Up and Down Keys to move the cursor vertically. The delay value at the current cursor position will be displayed at the top-right of the screen. Press the PgDn and PgUp Keys to display the subsequent and previous dis-

plays. Press the Esc Key or Shift+Esc Keys to return to the program trace initial display.



Item	Description
Step No. Action No. Address Instruction I/O name	Display the step and action numbers, address, instruction type, and I/O name of the instructions executed by the instruction trace.
IL	Displayed for interlocked instructions.
JMP	Displayed for an instruction during a jump.
PF	The results of logical operations on input conditions from the PC bus displayed as 0 or 1.
Sampling word 1 Sampling word 2	Displays the word data immediately before the instructions were executed.
Trigger	The executed action line will be displayed in reverse video when status of the bit or word designated as the trigger matches the specified condition.
Delay	Displays the relative position of the trigger from the cursor. Unrelated to the delay parameter setting.

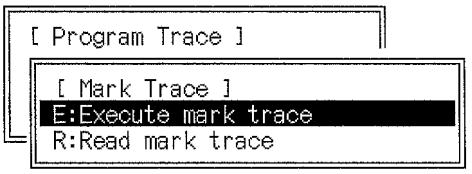
If an SFC program is not used, the ladder program is listed as separate blocks allocated the step and action numbers shown in the table below. As each block is executed, the step and action numbers are displayed on the screen as shown in the table below.

Block	Step number	Action number
Main program	ST0000	AC0000
I/O interrupt programs 0 to 31	ST0001 to ST0032	AC0001 to AC0032
Scheduled interrupt programs 0 and 1	ST0033 ST0034	AC0033 AC0034
Power off interrupt program	ST0035	AC0035
Power on interrupt program	ST0036	AC0036

4-3-3 Mark Traces

Mark traces can be sued to store in PC trace memory two data items, the order the MARK instruction (MARK(174)) execution, and the word contents at the time of MARK instruction execution. The mark trace data stored in the PC trace memory can then be displayed on the screen.

Select “M:Marks” from the Program Trace menu. The mark trace sub-menu will be displayed.



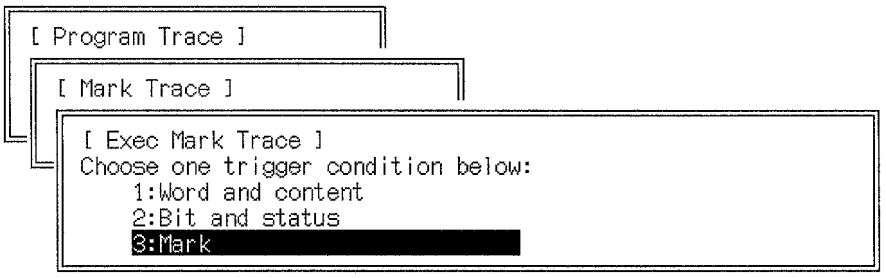
Operation	Function
Exec mark trace	Sets parameters and executes the mark trace.
Read mark trace	Displays the mark trace data from the PC.

Executing Mark Traces

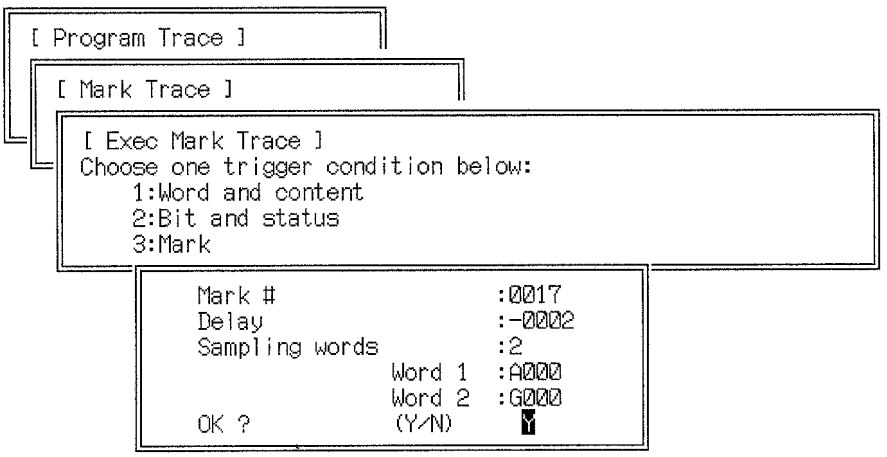
This operation is possible in any PC mode except PROGRAM mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	No

1, 2, 3... 1. Select “E:Exec mark trace” from the Inst Trace sub-menu. The following menu will appear.



2. Select word and content, bit and status, or a mark number as the trigger condition for the mark trace and press the Enter Key. The displays shown in the remainder of this procedure are those that appear when “Mark” is selected.



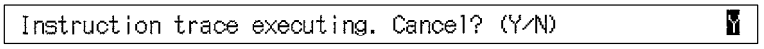
3. The parameters set previously will be displayed and the cursor will flash at the Y next to the prompt message. Press the Enter Key if the previous parameters are acceptable.

or To change the parameters, press the N and Enter Keys. The cursor will move to the mark number input position and the function key menu will change. Press the Down Key to move the cursor to the next stop condition or the Up Key to move it to the previous stop condition. Move the cursor to the parameter setting to be changed, enter the new parameter and press the Enter Key.

After all parameters are input, the cursor will move to the prompt position ready for the next key input.

Press the Y and Enter Keys to start the mark trace and return to the program trace initial display.

4. A message like the following one will be displayed above the function key menu at the bottom of the screen if a PC trace is executing.



Press the Enter Key to start mark trace execution or press the N and Enter Key to return to the Exec Mark Trace sub-menu.

Note Refer to *4-3-1 Action Traces* for the parameter settings and valid keys when the trigger condition is set to *Word and content*. The parameter settings and valid keys when the trigger condition is set to *Bit and status* are identical to those for instruction traces (see *4-3-2 Instruction Traces*).

The parameters and the valid keys for execution with MARK instructions are shown in the following table below.

Parameter	Function	Key sequence	Range
Mark number	Specifies the mark number of the trigger for mark trace execution.	**0** to **9**	(0 to 9999)
Delay	Sets the delay as a number of program addresses. The start of the display will be shifted to after the trigger condition is met if a positive (+) value is input and to before the trigger condition if a negative (–) value is input.	**+**, **–** **0** to **9**	(Refer to table below.)
Sampling words	Specifies the number of words sampled during the mark trace.	**0** to **2**	(0 to 2)
Word 1	Specifies the address of the word to be sampled.	**F1** to **F6** **0** to **9**	Refer to *1-3 PC Data Areas*.
Word 2	Specifies the address of the word to be sampled.	**F1** to **F6** **0** to **9**	Refer to *1-3 PC Data Areas*.

The range of delay values for the mark trace is shown in the table below.

PC	Number of sampling words	Range
CV1000-CPU01-E CV2000-CPU01-E CVM1-CPU11-E	0	–665 to 666
	1	–499 to 500
	2	–399 to 400
CV500-CPU01-E CVM1-CPU01-E	0	–332 to 333
	1	–249 to 250
	2	–199 to 200

If the delay is set as a negative value, no delay value will be displayed when the mark trace is read if the number of samples set with the delay value cannot be completed before the trigger condition is met.

Reading the Mark Trace

This operation is possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

Note The PC has a single trace memory, which is used for the data trace, action trace, instruction trace, and mark trace. Consequently, the read mark trace operation cannot be used if the trace memory contains data not related to the mark trace.

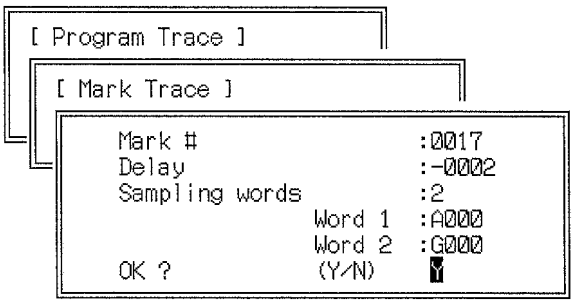
1, 2, 3...

1. Select “R:Read mark trace” from the Mark Trace sub-menu.
2. A message like the following one will be displayed above the function key menu at the bottom of the screen if a PC trace is executing.

```
Instruction trace executing. Cancel? (Y/N)  Y
```

   Press the Enter Key to cancel the current trace and continue the read operation or press the N and Enter Keys to return to the program trace initial display.

3. The parameters set previously will be displayed and the cursor will flash at the Y next to the prompt message.



   Press the Enter Key to read the trace data with these parameters or press the N and Enter Keys to interrupt the mark trace and return to the program trace initial display.

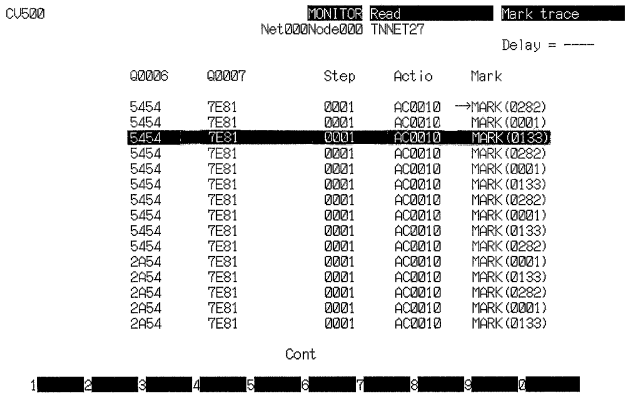
   The data from the PC trace memory will be displayed on the screen.

4. The following message will be displayed in the top-left of the screen and the display will return to the program trace initial display if the type of data read differs from the data contained in the trace memory.

```
Wrong trace data
```

5. Press the Up and DowN Keys to move the cursor vertically. The delay value at the current cursor position will be displayed at the top-right of the screen.

Press the PgDn and PgUp Keys to display the subsequent and previous displays.



Item	Description
Step No. Action No. Address	Display the step, action, and mark numbers of the MARK instructions executed by the mark trace.
Sampling word 1 Sampling word 2	Display the word data immediately before the MARK instructions were executed.
Trigger	The executed mark number will be displayed in reverse video when status of the bit, word, or mark designated as the trigger matches the specified condition.
Delay	Displays the relative position of the trigger from the cursor (unrelated to the Delay parameter setting).

If an SFC program is not used, the ladder diagrams will be listed as separate blocks, allocated the step and action numbers shown in the table below. As each block is executed, the step and action numbers will be displayed on the screen as shown in the table below.

Block	Step number	Action number
Main program	ST0000	AC0000
I/O interrupt programs 0 to 31	ST0001 to ST0032	AC0001 to AC0032
Scheduled interrupt programs 0 and 1	ST0033 ST0034	AC0033 AC0034
Power off interrupt program	ST0035	AC0035
Power on interrupt program	ST0036	AC0036

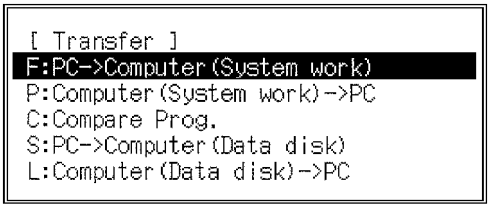
SECTION 5
Transfer and Editing Operations

This section describes the operations to transfer programs, the I/O table, the PC Setup, and DM/EM data between a PC and the computer and the operations to edit DM/EM data in the PC.

5-1 Transferring Programs and Data

This section describes how to transfer data between the computer and the PC. Data can be transferred between the data disks or the work disk (i.e., hard disk) and the PC.

Select “C:Trans. prog & data” from the main online menu. The following menu will appear.



Operation	Block load
PC–>Computer (System work)	Transfers data from the PC to the computer work disk.
Computer (System work) –> PC	Transfers data from the computer work disk to the PC.
Compare Prog.	Compares the program in the CVSS work area to the program in the PC.
PC –> Computer (Data disk)	Transfers data from the PC to the data disk or hard disk.
Computer (Data disk) –> PC	Transfers data from the data disk or hard disk to the PC.

The following data can be transferred.

Data	Description
Programs	Programs are stored on the computer work disk in the form of an intermediate code, whereas the programs in the PC are in the form of machine code. Computer (System work) –> PC and PC–>Computer (System work) Programs are automatically converted between intermediate code and machine code when transferred between the computer work disk and the PC. PC –> Computer (Data disk) and Computer (Data disk) –> PC Machine code programs are transferred between a data disk or hard disk and the PC. The UM conversion operation must thus be used to convert to and from machine code programs.
I/O names	I/O names. The Computer (System work) –> PC operation transfers the I/O names to the memory card inserted in the PC.
DM	DM data.
EM	EM data.
I/O tables	I/O tables.
PC setup	PC Setup data.

Note

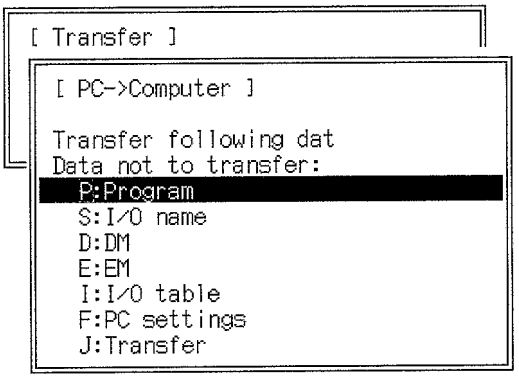
1. Data and programs cannot be transferred to the PC during PC operation. Set the PC in PROGRAM mode before transferring data or programs to the PC.
2. Always use the program check operations before transferring a program to the PC. Refer to *2-9 Checking SFC Programs* and *3-11 Checking the Program* of the *CV Support Software Version 2: Offline* for details about the program check operation.

5-1-1 Uploading to the Work Disk

This operation is possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

1, 2, 3... 1. Select “F:PC–>Computer (System work)” from the menu. A menu will appear to select the data to transfer.



Specify the data not to be transferred. The selected data displays will be cleared from the menu when the Enter Key is pressed and this data will not be transferred.

2. Select “J:Transfer” from the PC A Computer menu. A message flashes during the transfer and the percentage complete will appear.

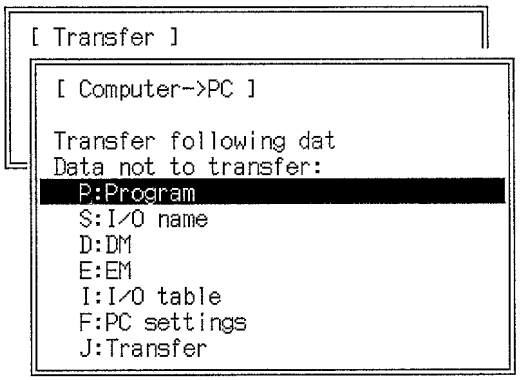
   The time for the transfer depends on the program size but may exceed 5 minutes.

5-1-2 Download from the Work Disk

This operation is possible only in the PROGRAM Mode.

RUN	MONITOR	DEBUG	PROGRAM
No	No	No	OK

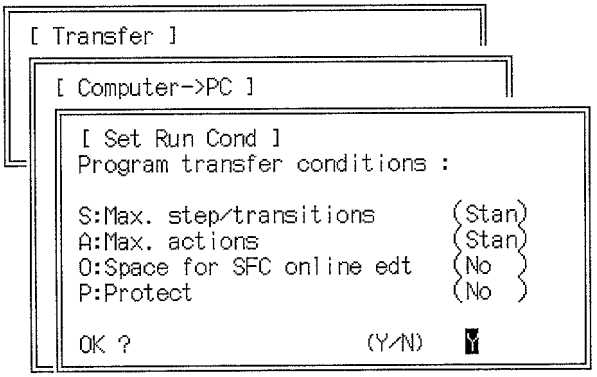
1, 2, 3... 1. Select “P:Computer (System work) –> PC” from the menu. A menu will appear to select the data to transfer.



Note “P:Program” in the above display will read “P:Program (UM+HIS)” when an HIS program is currently registered.

Select the data not to be transferred. The selected data displays will be cleared from the menu when the Enter Key is pressed and this data will not be transferred.

2. Select “J:Transfer” from the Computer A PC menu. A display will appear to set the transfer conditions. The default values will be shown in parentheses.



3. To change any item, select the item with the cursor and input the required value. Refer to *6-3 UM Conversion* of the *CV Support Software Version 2: Offline* for details of the operations and settings.
4. When the settings are complete, move the cursor to the Y by the OK? message and press the Enter Key. A message will flash during the transfer and the percentage complete will appear.

   The time for the transfer depends on the program size but may exceed 5 minutes.

Note Only ladder-diagram programs can be transferred to CVM1 CPUs; they do not support SFC programming.

5-1-3 Comparing Programs

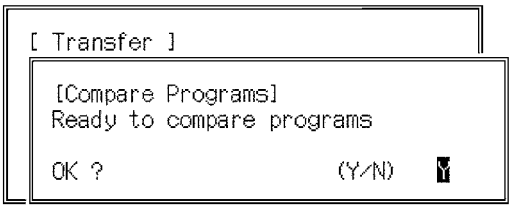
The following operation is used to compare programs in the CVSS work area and the PC. This operation is possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

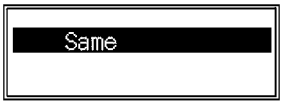
The procedure is as follows:

1, 2, 3...

1. Select “C:Compare Prog.” from the menu. A display will appear to confirm beginning the comparison.



2. To execute, press the Enter Key.
3. When the comparison finishes, the results will be displayed. If the programs are identical, a message will appear indicating that. If differences are found, an error message will appear along with a message indicating the location of the differences.



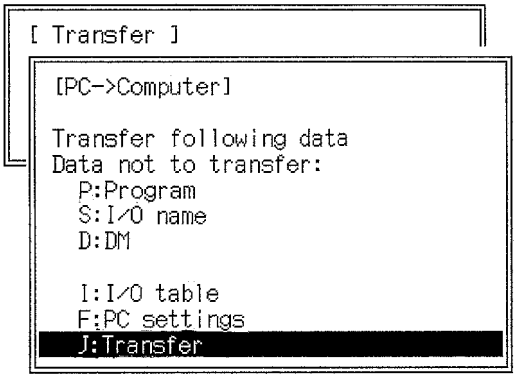
5-1-4 Uploading to Data Disks or Hard Disk

This operation is possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

Initialize new data disks as described in *6-1 Initialization* of the *CV Support Software Version 2 Operation Manual: Offline*.

1, 2, 3... 1. Select “S:PC –> Computer (Data disk)” from the menu. A menu will appear to select the data to transfer.



Specify the data not to be transferred. The selected data displays will be cleared from the menu when the Enter Key is pressed and this data will not be transferred.

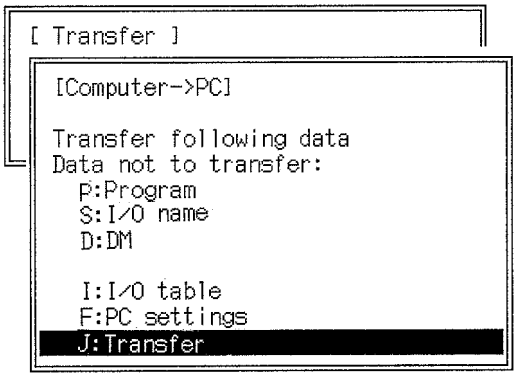
2. Select “J:Transfer” from the menu. A file name input area will appear.
3. Insert the data disk and enter the file name using up to eight characters.
4. Press the Enter Key to start the transfer. A message will flash during the transfer and the percentage complete will appear.

5-1-5 Downloading from Data Disks or Hard Disk

This operation is possible only in PROGRAM Mode.

RUN	MONITOR	DEBUG	PROGRAM
No	No	No	OK

1, 2, 3... 1. Insert a disk into the floppy disk drive containing data saved with the PC –> Computer (Data disk) operation or UM conversion operation.
2. Select “L:Computer (Data disk) –> PC” from the Blk Tran menu. A menu will appear to select the data to transfer.



Specify the data not to be transferred. The selected data displays will be cleared from the menu when the Enter Key is pressed and this data will not be transferred.

3. Select “J:Transfer” from the menu. A file name input area will appear.
4. Enter the file name to load. Press the End Key or Ctrl+M Keys to display the file name table, select the required file name with the cursor, and press the Enter Key twice to input the file name.
5. Press the Enter Key to start the transfer. A message will flash during the transfer and the percentage complete will appear.

Note Only ladder-diagram programs can be transferred to CVM1 CPUs; they do not support SFC programming. If an attempt is made to transfer an SFC program, and error message will appear (“program error”) and transfer will not be possible.

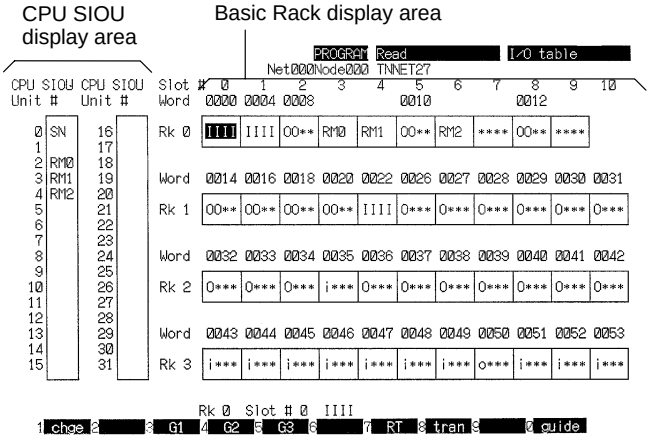
5-2 I/O Tables

This section describes how to carry out the following operations:

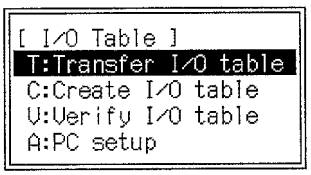
- Display and edit the I/O table in the PC.
- Transfer and compare the registered I/O tables on the computer work disk and in the PC.
- Register the actual Units mounted to the PC in the I/O table.
- Compare the actual Units mounted to the PC and the I/O table in the PC.
- Set the PC Setup related to the I/O table.

Note All online I/O table operations, except the transfer operation, operate on the I/O table in the PC. Use the offline operations to display data from the work disk. The transfer operation can be used to keep the same I/O table data in the PC and on the work disk.

1, 2, 3... 1. Select “I:Edit I/O table” from the menu with the cursor. The registered I/O table will be read from the PC and the status of each mounted Unit will appear. This I/O table is unrelated to the I/O table on the work disk.



2. The basic Racks will appear. Press the PgDn and PgUp Keys to display other Racks.
3. Press the End Key or Ctrl+M Keys to display the I/O table menu.



Operation	Function
Transfer I/O table	Writes the I/O table from the PC to the work disk, writes the I/O table data from the work disk to the PC, or compares the I/O table data from the work disk to the PC. An error table will show any errors discovered during comparisons.
Create I/O table	Registers the actual Units mounted to the PC to the I/O table.
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.
PC setup	Sets the first words allocated to local Racks, Slave Rack, Group-1 and -2 Slaves, and I/O Terminals.

Note The Transfer I/O table and Create I/O table operations cannot be used from a computer connected to a SYSMAC BUS II remote I/O slave unit.

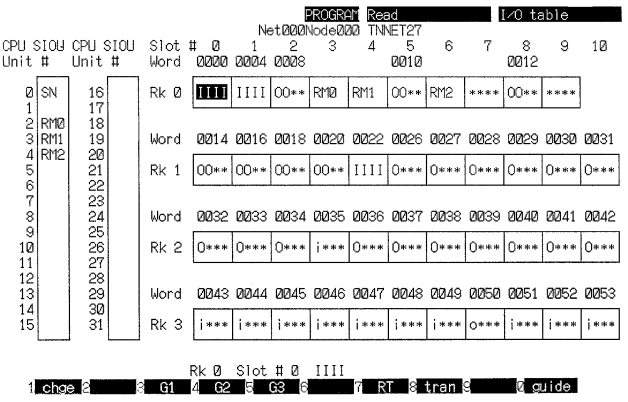
The following table shows the PC modes in which each operation can be used.

Operation		RUN	MONITOR	DEBUG	PROGRAM
Transfer I/O table	PC A Computer	OK	OK	OK	OK
	Computer A PC	No	No	No	OK
	Compare	OK	OK	OK	OK
Create I/O table		No	No	No	OK
Verify I/O table		OK	OK	OK	OK
PC setup		No	No	No	OK

The following is a list of function keys on the I/O table display.

Operation	RUN	MONITOR	DEBUG	PROGRAM
chge (changing the I/O table)	No	No	No	OK
Changing displays (F3 to F5, F7, and F8)	OK	OK	OK	OK

The I/O table display is shown below.



The function keys can be used during I/O table operations.

Function key	Name	Description	
F1	chge	Registers dummy I/O words. Use this operation to enable adding future I/O Units and to prevent displacement of the word addresses due to unused I/O Units. This operation rewrites the registered I/O table in the PC only. Use the *Create I/O table* operation to register the I/O table after changing the mounted Units. If the *Create I/O table* operation is used, any settings made previously with the *Edit I/O table* operation will be lost.	
F3	G1	Displays the I/O table for a Group-1 Slaves connected to SYSMAC BUS/2.	Move the cursor to the unit number of the Master in the CPU Bus Unit area and press the appropriate function key.
F4	G2	Displays the I/O table for a Group-2 Slaves connected to SYSMAC BUS/2.	
F5	G3	Displays the I/O table for a Group-3 Slaves (Slave Racks) connected to SYSMAC BUS/2.	
F7	RT	Displays the I/O table for an Slaves connected to SYSMAC BUS.	Move the cursor to the Master on the basic Rack and press the appropriate function key.
F8	tran	Display the I/O table for a I/O Terminals or I/O Link Units connected to SYSMAC BUS.	
F10	guide	Displays a guidance display explaining the Unit display.	
Shift+F7	RUN	Switches the PC operating mode to RUN mode.	
Shift+F8	MON	Switches the PC operating mode to MONITOR mode.	
Shift+F9	DBG	Switches the PC operating mode to DEBUG mode.	
Shift+F10	PRG	Switches the PC operating mode to PROGRAM mode.	

Press the Shift+Left Keys or Shift+Right Keys to move the cursor between the Basic Rack and CPU Bus Unit areas.

Displaying I/O Tables

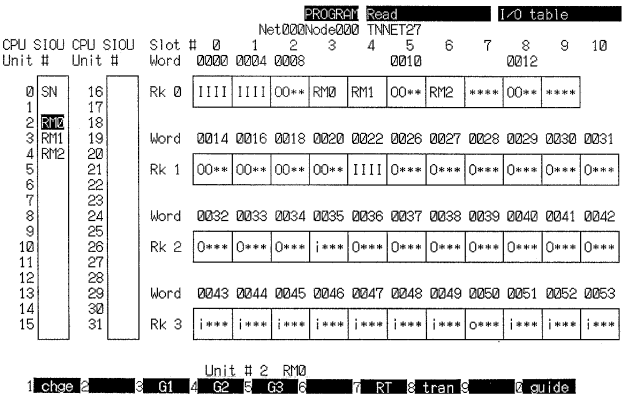
SYSMAC BUS/2 Slaves

This operation is used to display Group-1, -2, or -3 Slaves connected to SYSMAC BUS/2 Masters. This operation is possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

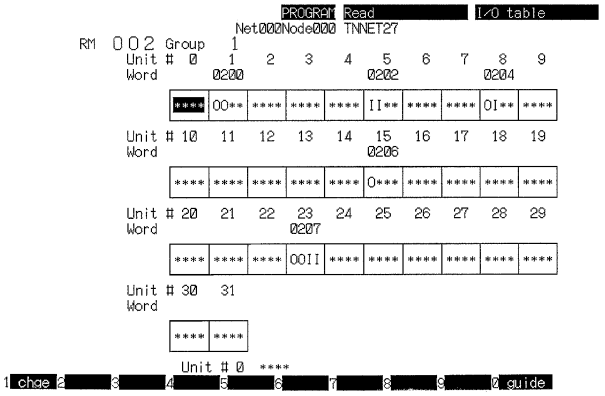
1, 2, 3...

1. Press the Shift+Left Keys or Shift+Right Keys to move the cursor to the CPU Bus Unit area.



2. Move the cursor to the unit number for the SYSMAC BUS/2 Master, and then press the F3, F4, or F5 Key to display the Group-1, -2, or -3 Slaves connected to the Master.

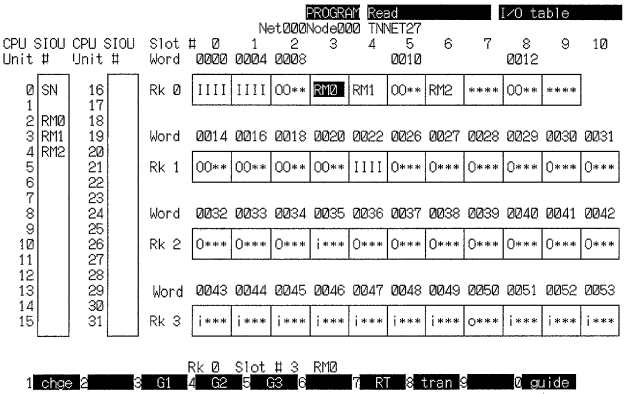
The following is an example for Group-1.



3. Press the Esc Key to return to the basic rack display.

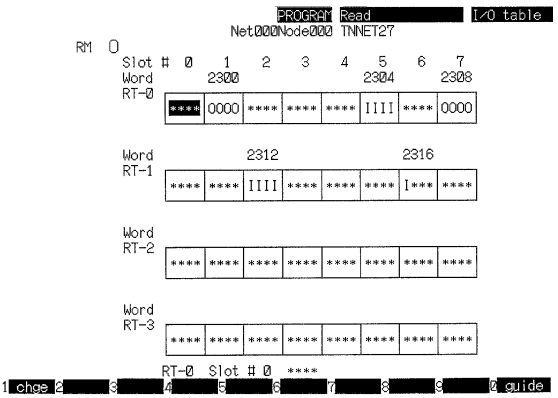
SYSMAC BUS Slaves

1, 2, 3... 1. Press the Shift+RIGHT Keys to move the cursor to the Basic Rack area.

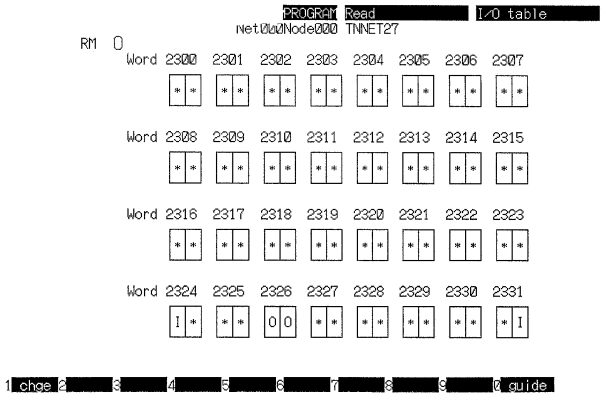


2. Move the cursor to the SYSMAC BUS Master, and then press the F7 or F8 Key to display the Slave Racks or I/O Terminals connected to the Master.

   The following is an example for Slave Racks.



The following is an example for I/O Terminals.



3. Press the Esc Key to return to the basic rack display.

Guidance Displays

The guidance display can obtained from any display.

1, 2, 3... 1. Press the F10 Key from any I/O table display to display the guidance display.
2. Press the Esc Key to return to the original display.

I/O Units

Display	Unit	Display	Unit	Display	Unit
****	No unit	OI**	32-point I/O	GL**	128-point I/O
o***	8-point output	NN**	32-point dummy	HH**	128-point dummy
i***	8-point input	OOOO	64-point output	GGGG	256-point output
O***	16-point output	IIII	64-point input	LLLL	256-point input
I***	16-point input	OOII	64-point I/O	GGLL	256-point I/O
N***	16-point dummy	NNNN	64-point dummy	HHHH	256-point dummy
OO**	32-point output	GG**	128-point output		
II**	32-point input	LL**	128-point input		

SYSMAC BUS Masters RM#, where # is master number (0 to 7).

Interrupt Units INT#, where # is Interrupt Unit number (0 to 3).

I/O Terminals

Display	Unit
O	8-point output
I	8-point input
W	Duplicated Unit

Units with Group-2 Events

Display	Unit
4MH	32-point I/O
0NH	No I/O

CPU Bus Unit Displays

SYSMAC BUS/2 Masters: RM# where # is master number (0 to 3)
SYSMAC LINK Units: SL
SYSMAC NET LINK Units: SN
Basic Units: BA

The unit number will appear to the left of 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.

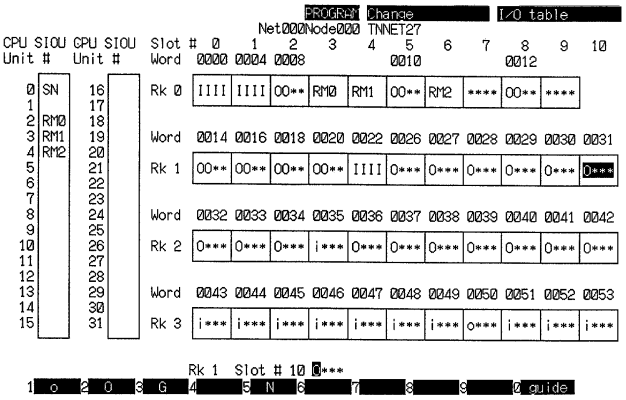
Changing the I/O Table

This operation can be used to changes allocations to Racks in the I/O table. This operation is possible only in PROGRAM Mode.

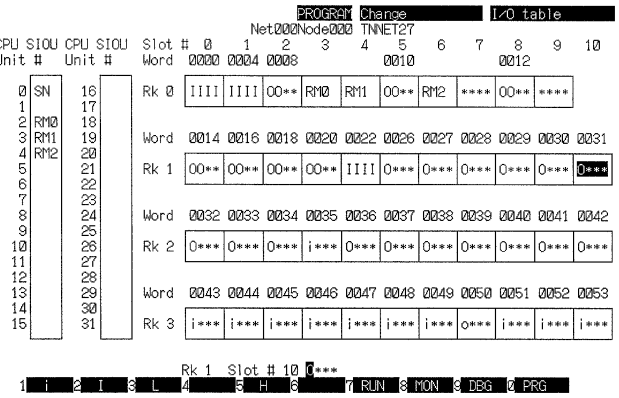
RUN	MONITOR	DEBUG	PROGRAM
No	No	No	OK

1, 2, 3... 1. Display the Rack for which allocations are to be changed

2. Press the F1 Key. The function key menu will change.



3. Press the Shift Key to get the following display.



4. Move the cursor to the required slot.

5. Select the slot to be changed with the function keys then press the Enter Key.

6. Use the keys shown in the following table to allocate the desired word(s) to the slot and press the Enter Key.

Key	Display	Function
F1 (O)	o	Allocates an 8-output unit.
F2 (O)	O	Allocates an 16-output unit.
F3 (G)	G	Allocates an 64-output unit.
F5 (N)	N	Allocates a 16-point unit.
Shift+F1 (i)	i	Allocates an 8-input unit.
Shift+F2 (I)	I	Allocates an 16-input unit.
Shift+F3 (L)	L	Allocates an 64-input unit.
Shift+F5 (H)	H	Allocates a 64-point unit.
Home	****	Deletes the allocation at the cursor position.

7. Press the Esc Key to return to the I/O table read display.

Note 1. An I/O verification error will be indicated and the alarm indicator will light on the PC after input or output words are allocated, but operation continues unchanged.

2. An I/O setting error will occur if any position not marked by asterisks (****) is changed.
3. It is not possible to change the I/O table for blank slots or slot occupied by any of the following Units: CPU Bus Unit, SYSMAC BUS Remote I/O Master Units, I/O Terminals, Interrupt Input Unit.
4. The *Create I/O table* and *Edit I/O table* operations cannot be used from the CVSS running on a computer connected to a SYSMAC BUS/2 Remote I/O Slave Unit.

5-2-1 Transferring I/O Tables

This operation is used to transfer and compare the I/O table on the computer work disk with the I/O table in the PC. Use the *Verify I/O table* operation to compare an I/O table to the Units actually mounted to the PC.

The transfer and comparison operations do not affect the I/O tables.

The following operations are available:

Sub-menu operation	Description
PC A Computer	Uploads the I/O table from the PC to the work disk.
Computer A PC	Downloads the I/O table from the work disk to the PC.
Compare I/O table	Compares the I/O table in the PC with the I/O table on the work disk and displays any differences found.

The Trans I/O Table menu will appear after the PC A Computer or Computer A PC operation has been completed.

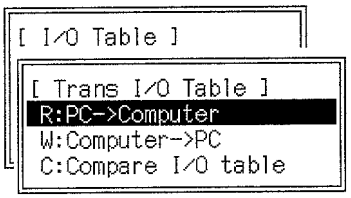
PC A Computer

This operation is possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

1, 2, 3...

1. Select “T:Transfer I/O table” from the menu. The following menu will appear.



2. Select “R:PC A Computer” from the menu. A confirmation message will appear.
3. Press the Y and Enter Keys to upload the I/O table from the PC to the work disk. The Trans I/O Table menu will appear after the transfer has been completed.

Computer A PC

This operation is possible only in the PROGRAM Mode.

RUN	MONITOR	DEBUG	PROGRAM
No	No	No	OK

1, 2, 3...

1. Select “T:Transfer I/O table” from the menu.
2. Select “W:Computer A PC” from the sub-menu. A confirmation message will appear.
3. Press the Y and Enter Keys to download the I/O table from the work disk to the PC. The Trans I/O Table menu will appear after the transfer is complete.
4. Turn the PC power supply off then back on after transferring an I/O table from the computer to the PC.

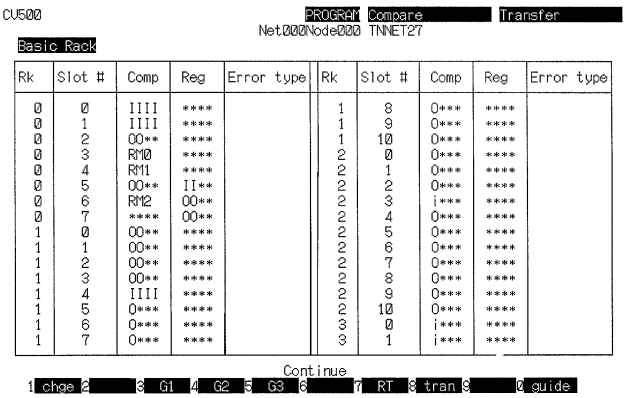
Comparing I/O Tables

This operation is possible in any PC Mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

1, 2, 3...

1. Select “T:Transfer I/O table” from the menu.
2. Select “C:Compare I/O table” from the sub-menu. Any errors found during the comparison will be displayed.



3. A message will indicate if the comparison is completed normally. The message *Continue* will appear at the bottom of the screen if differences are found in Racks other than the basic Rack.

   The comparison errors are displayed on separate displays in the following order: basic Racks, CPU Bus Units, Group-3 Slaves, Group-1 and -2 Slaves, SYSMAC BUS Slave Racks, and I/O Terminals.

   Press the PgDn Key to display the next rack in the sequence described above. A message indicates when the final display will appear. Press the PgUp Key to display the previous display in the sequence listed above.

   If the comparison discovers no differences, the final display will appear and a message indicates that the comparison was OK.
4. Press the Esc Key or Shift+Esc Keys to end the comparison. Refer to page 94 for details on the error types.

5-2-2 Creating I/O Tables

This operation is used to create an I/O table in the PC. When the following operation is carried out, an I/O table that reflects the Units actually connected to the PC will be written into the I/O table in the PC. This operation is possible only in the PROGRAM Mode.

RUN	MONITOR	DEBUG	PROGRAM
No	No	No	OK

1, 2, 3...

1. Select “C:Create I/O table” from the menu. A message will ask if the CPU Bus Unit settings are to be changed.
2. In most cases, press the Enter key to continue. Alternatively, press the N and Enter Keys to save CPU Bus Unit settings about Units no longer mounted in any Rack. The I/O table will be created.
3. A message will indicate when the I/O table creation is complete. Press the Enter Key to display the new registered I/O table.

“CPU Bus Unit settings” refers to settings made with the online *Communication unit settings* and the data link tables.

Note The *Create I/O table* and *Edit I/O table* operations cannot be used from CVSS running on a computer connected to a SYSMAC BUS/2 Remote I/O Slave Unit.

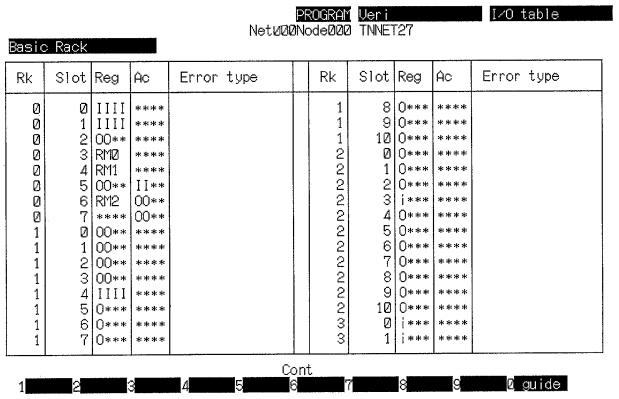
5-2-3 Verifying I/O Tables

This operation is used to compare the actual Units mounted to the PC to the I/O table in the PC and display any differences found. This operation is unrelated to the I/O table data on the work disk. Use “C:Compare I/O table” from the Trans I/O table menu to compare I/O table data on the computer work disk to the registered I/O table in the PC. This operation is possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

1, 2, 3... 1. Select “V:Verify I/O table” from the menu.

The following is an example of the Verification Error display.



Error	Meaning	Remedy
RT status error	Incorrect Slave designation (58M/122M) for SYSMAC BUS/2 Group-3 Slave.	Redesignate the Slave type.
Data error	I/O table data is corrupted	Create or transfer I/O table.

2. The message *Continue* will appear at the bottom of the screen if differences are found in Racks other than the basic Racks. Comparison errors are displayed on separate displays in the following order: basic Racks, CPU Bus Units, Group-3 Slaves, Group-1 and -2 Slaves, SYSMAC BUS Slave Racks, and I/O Terminals.

   Press the PgDn Key to display the next rack in the sequence described above. A message will indicate when the final display will appear. Press the PgUp Key to display the previous rack in the sequence described above.

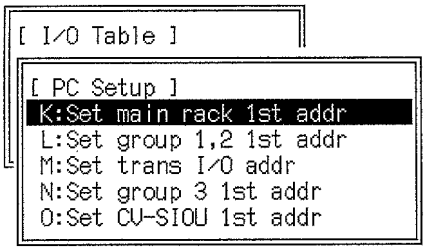
3. If the comparison discovers no differences, the final display will appear and a message will indicate that the verification was OK. Press the Esc Key or Shift+Esc Keys to end the verification operation.

5-2-4 PC Setup

This operation is used to change the settings for the first word allocated to each basic Rack, Slave Rack, Group-1 and -2 Slaves, and I/O Terminals. These online operations act on the PC Setup in the PC. They do not affect the data in the work disk. This operation is possible only in the PROGRAM Mode.

RUN	MONITOR	DEBUG	PROGRAM
No	No	No	OK

1, 2, 3... 1. Select “A:PC setup” from the menu.



2. Select the setting to be changed from the sub-menu.

   Refer to *7-2 PC Setup* in the *CV Support Software Version 2: Offline* for details about setting the items.

   Use *PC* A *Computer* from *Transfer I/O table* sub-menu to read data from the PC system area of the work disk.

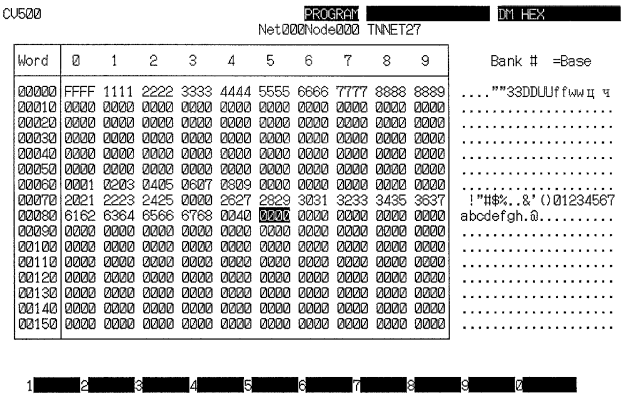
5-3 Editing DM

This section describes how to carry out the following operations. In all cases, EM data can also be manipulated providing that the optional EM Area is provided.

- Write data to the DM (Data Memory) Area in the PC. Data can be written and displayed in either 4-digit hexadecimal or ASCII.
- Save or retrieve the contents of the PC’s DM Area to and from data disks or the hard disk.
- Print the contents of the DM Area in the PC.
- Transfer and compare the contents of the PC’s DM Area and the computer’s DM data.

Initial Display

Select “D:Edit DM” from the menu. The DM initial display will appear to allow DM data to be written.



Switching Pages

Each page displays 160 words of DM data from the PC. Use on of the procedures below to display the page containing the required DM word:

Press the End Key, then select the Read DM addr operation from the menu and enter the required DM word.

or Press the PgDn Key to display the next page or the PgUp Key to display the previous page.

Moving the Cursor

Press the Left or Right Keys to move the cursor horizontally. Press the Up or Down Keys to move the cursor vertically.

The cursor will move to the next DM word each time the Enter Key is pressed. The cursor will jump from the bottom-right of the screen to the top-left of the screen if the Enter Key is pressed at the last word.

Writing Data

Move the cursor to the required DM word and enter the desired data.

Data can be entered as hexadecimal or ASCII. Hexadecimal data can be input when the display first appears. To enter ASCII, press the End Key and select the HEX <–> ASCII operation from the menu. The cursor moves to the ASCII display at the right of the screen to allow ASCII to be input.

DM data entered in the table is simultaneously written to the DM Area of the PC.

This operation is possible in any mode except RUN Mode.

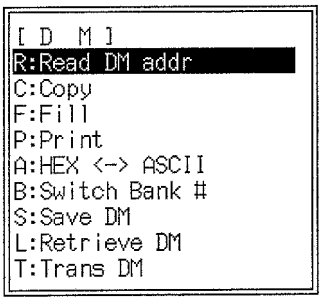
RUN	MONITOR	DEBUG	PROGRAM
No	OK	OK	OK

Switching PC Modes

Press the Shift Key and one of the function keys shown in the table below to set the PC's operating mode.

F7	F8	F9	F10
RUN	MONITOR	DEBUG	PROGRAM

Press the End Key to display the menu from the DM initial display.



Operation	Function
Read DM addr	Reads data from the specified DM word of the PC's DM Area. Each page on the display displays 160 words of DM data.
Copy	Writes multiple, consecutive words of DM data starting from a specified destination DM word.
FILL	Copies the same DM data to multiple, consecutive words of the DM area. Multiple words can be cleared by setting the fill data to 0000.
Print	Prints multiple, consecutive words of DM data.
HEX <–> ASCII	Sets if data is input as hexadecimal or ASCII. The mode set with this operation will be displayed in the top-right of the screen.
Switch Bank #	Switches editing between the DM and the EM banks.
Save DM	Uploads the DM data from the PC to the data disk or hard disk.
Retrieve DM	Downloads the DM data from the data disk or hard disk to the PC.
Trans DM	Transfers DM data between the PC and computer work disk and compares the data.

The DM and EM capacities depends on the PC as shown in the table below.

PC	DM	EM
CV500-CPU01-E or CVM1-CPU01-E	8,192 words	Not supported.
CVM1-CPU11-E	24,576 words	Not supported.
CV1000-CPU01-E or CV2000-CPU01-E	24,576 words	32768 words (optional)

5-3-1 Reading a DM Address

This operation reads data from a specified DM word of the PC's DM Area to the work disk. This operation is possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

To read EM data, first select the required bank number with the *Switch Bank #* operation before using the *Read DM addr* operation. A display to input the DM word will appear when *Read DM addr* is selected from the DM menu.

The display and the method of operation are identical to the offline *Read DM addr* operation. Refer to *4-4 Editing the Data Memory Area* in the *CV Support Software Version 2: Offline* for details.

The differences between the online and offline operations are as follows:

Offline: data is read from the work disk and displayed.
Online: data is read from the PC and displayed on the computer screen.

5-3-2 Copying

This operation writes multiple, consecutive words of DM data starting from a specified destination DM word. This operation is possible in any PC mode except RUN Mode.

RUN	MONITOR	DEBUG	PROGRAM
No	OK	OK	OK

A display to input the copy word, the number of words to copy, and first copy destination word will appear when *Copy* is selected from the DM menu. The display and the method of operation are identical to the offline *Copy* operation. Refer to *4-4 Editing the Data Memory Area* in the *CV Support Software Version 2: Offline* for details.

5-3-3 FILL

This operation copies the same DM data to multiple, consecutive words of the DM area. This operation is possible in any PC mode except RUN Mode.

RUN	MONITOR	DEBUG	PROGRAM
No	OK	OK	OK

A display to input the start and end words and the fill data will appear when *Fill* is selected from the DM menu.

The display and the method of operation are identical to the offline *Fill* operation. Refer to *4-4 Editing the Data Memory Area* in the *CV Support Software Version 2: Offline* for details.

5-3-4 Printing

This operation prints multiple, consecutive words of DM data. This operation is possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

Connect the printer and enable printing before using the *Print* operation. A display to input the printing start and end words will appear when *Print* is selected from the DM menu.

The display and the method of operation are identical to the offline *Print* operation. Refer to *4-4 Editing the Data Memory Area* in the *CV Support Software Version 2: Offline* for details.

5-3-5 HEX <–> ASCII

This operation is used to specify whether data is input as hexadecimal or ASCII. This operation is possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

The display and the method of operation are identical to the offline *HEX <–> ASCII* operation. Refer to *4-4 Editing the Data Memory Area* in the *CV Support Software Version 2: Offline* for details.

5-3-6 Switching Bank Numbers

This operation switches editing between the DM Area and the EM banks. This operation is possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

A display to input the bank number will appear when *Switch Bank #* is selected from the DM menu.

The display and the method of operation are identical to the offline *Switch Bank #* operation. Refer to *4-4 Editing the Data Memory Area* in the *CV Support Software Version 2: Offline* for details.

5-3-7 Saving DM Data

This operation saves the DM data from the work disk to the data disk or hard disk. This operation is possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

1, 2, 3...

1. Clear the data disk write protection and insert the data disk in the floppy disk drive before using the *Save DM* operation. A new disk must be initialized before data can be stored to it. Refer to *4-4 Editing the Data Memory Area* in the *CV Support Software Version 2: Offline* for details.

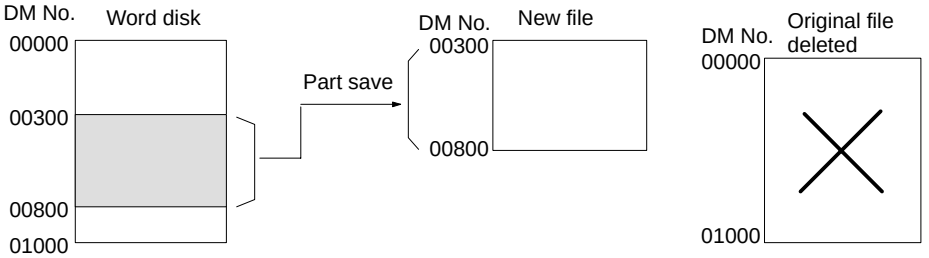
   Note Data cannot be saved if it exceeds the amount of free space remaining on the data disk. Use a new disk if necessary.

2. A message will appear when the *Save DM* operation is selected from the DM menu. Press the B and Enter Keys to save the DM data. To save EM data, specify the source bank number.

The method of operation is identical to the offline *Save DM* operation. Refer to *4-4 Editing the Data Memory Area* in the *CV Support Software Version 2: Offline* for details.

The differences between the online and offline operations are as follows:
Offline: data is saved from work disk to the data disk.
Online: data is saved from PC to the data disk.

Note If an existing file name is input to save part of the total DM area, the entire file containing the previous DM data will be cleared and the new file will contain only the new DM data.



5-3-8 Retrieving DM Data

This operation downloads the DM data from the data disk or hard disk to the DM area of the PC. This operation is possible in any PC mode except RUN mode.

RUN	MONITOR	DEBUG	PROGRAM
No	OK	OK	OK

1, 2, 3...

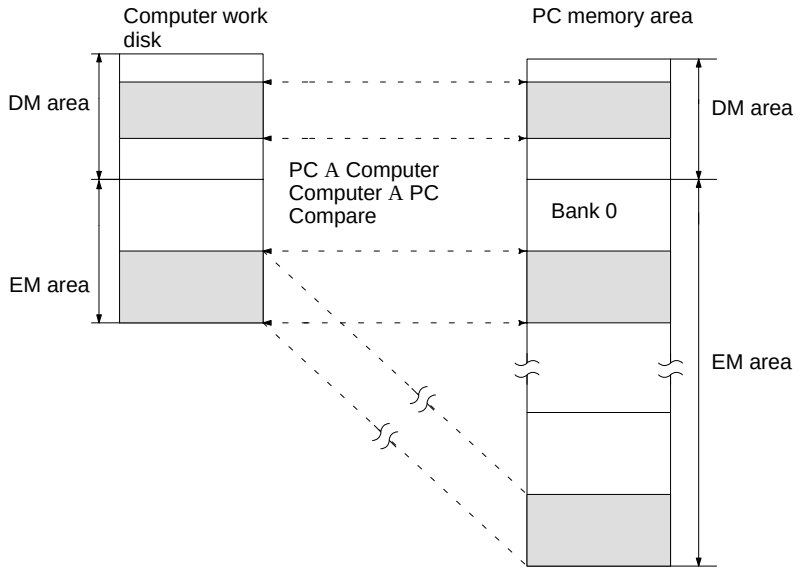
1. Insert the data disk containing the DM data to be retrieved in the floppy disk drive before using the *Retrieve DM* operation.
2. A message will appear when the *Retrieve DM* operation is selected from the DM menu. Press the B and Enter Keys to retrieve the DM data. To retrieve EM data, specify the source bank number.

The method of operation is identical to the offline *Retrieve DM* operation. Refer to *4-4 Editing the Data Memory Area* in the *CV Support Software Version 2: Offline* for details.

The differences between the online and offline operations are as follows:
Offline: data is retrieved from the data disk to the work disk.
Online: data is retrieved from the data disk to the PC.

5-3-9 Transferring DM Data

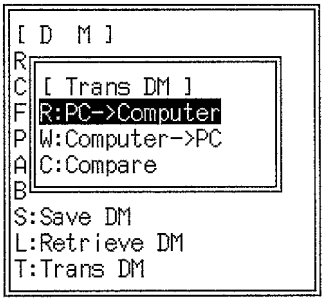
DM data can be transferred between the memory areas shown in the diagram below.



As indicated in the diagram, only one bank of the EM can exist on the work disk.

New EM data created on the RAM disk or edited data previously read to the work disk from the PC (PC A Computer) can be transferred to any bank 0 to 7 of the EM Area in the PC. Data can be transferred and compared between any work disk areas. However, transfer and comparison are not possible between different work areas of the work disk and PC.

The message below will appear when *Trans DM* is selected from the DM menu.



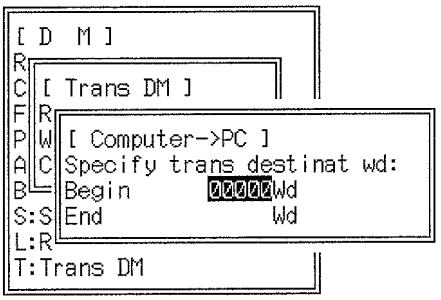
Operation	Function
PC A Computer	Read DM data from the PC to the computer work disk.
Computer A PC	Write DM data from the computer work disk to the PC.
Compare	Compare the DM data in the PC to the DM data on the work disk and display any differences found.

Downloading DM Data

This operation is possible in any PC mode except RUN Mode.

RUN	MONITOR	DEBUG	PROGRAM
No	OK	OK	OK

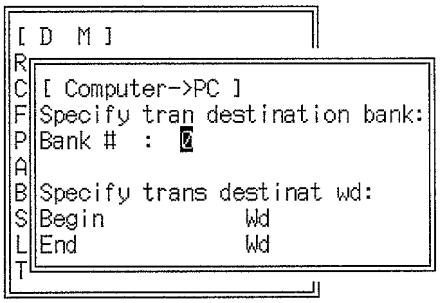
The following message will appear when *Computer* A *PC* is selected from the Trans DM sub-menu while editing DM data.



Specify the range of PC memory for the transfer and press the Enter Key. DM data will be transferred from the computer to the DM area of the PC.

Downloading EM Data

The following message will appear when *Computer* A *PC* is selected from the Trans DM sub-menu while editing EM data.



1, 2, 3...

1. Specify the bank number for the transfer and press the Enter Key.
2. Specify the range of PC memory for the transfer source and press the Enter Key. EM data will be transferred from the computer to the specified bank of the PC EM area. The percentage of the transfer complete will be displayed.

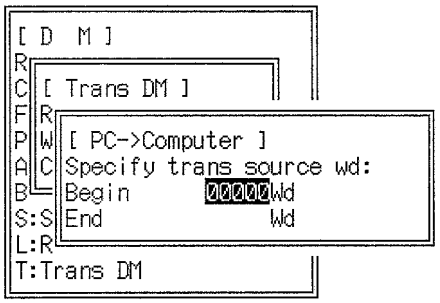
3. A message will indicate when the transfer is complete. Press any key to return to the initial display.

Uploading DM Data

This operation is possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

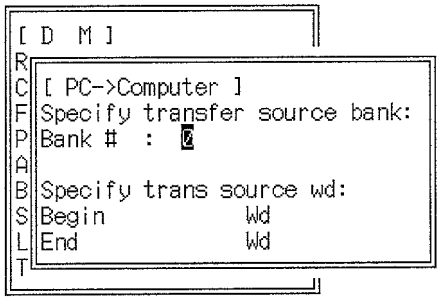
The following message will appear when *PC* A *Computer* is selected from the Trans DM sub-menu while editing DM data.



Specify the range of PC memory for the transfer and press the Enter Key. DM data is transferred from the PC to the DM area of the computer.

Uploading EM Data

The following message will appear when *PC* A *Computer* is selected from the Trans DM sub-menu while editing the EM.



1, 2, 3...

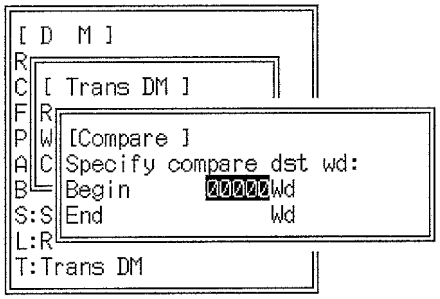
1. Specify the bank number for the transfer and press the Enter Key.
2. Specify the range of PC memory as the transfer destination and press the Enter Key. EM data will be transferred from the specified bank of the PC to the computer EM area. The percentage of the transfer complete will be displayed.
3. A message will indicate when the transfer is complete. Press any key to return to the initial display.

Comparing DM Data

This operation is possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

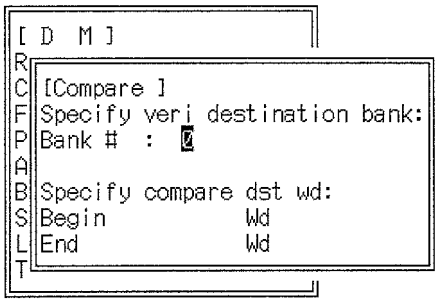
The following message will appear when *Compare* is selected from the Trans DM sub-menu while editing DM data.



Specify the range of PC memory to compare and press the Enter Key. DM data in the computer will be compared against the DM data in the PC.

Comparing EM Data

The following message will appear when *Compare* is selected from the Trans DM sub-menu while editing EM data.



1, 2, 3...

1. Specify the PC bank number and press the Enter Key.
2. Specify the range of PC memory to compare and press the Enter Key. The specified range of data in the computer EM area is compared against the specified bank of the PC EM area. The percentage of the comparison complete will appear and differences between the DM data in the computer and PC will be displayed.

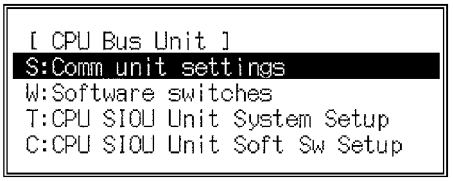
   Press any key other than the Esc Key to continue the comparison from the position of the discovered differences.
3. A message will indicate when the comparison is complete. Press any key to return to the initial display.

SECTION 6
Network Support Operations

This section describes the operations that can be used to support SYSMAC NET Link Systems., SYSMAC LINK Systems., and SYSMAC BUS/2 Remote I/O Systems.

6-1 CPU Bus Unit Settings

Select “X:CPU Bus Unit setup” from the main online menu to access the following menu.



Select the required item from the menu.

Comm 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 *Dest network addr* in the System Settings. These settings are made in the System Setting area in the PC. The settings cannot be changed if the CPU is write-protected via the keyswitch on the CPU.

System	Function
SYSMAC NET	Used to read and set the data link areas, linked words, transmission delay, master/slave, binary or 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.

Software Switches

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 *Dest network addr* in the System Settings. The software switch settings are written to the PC’s Auxiliary Area.

System	Function
SYSMAC NET	Used to start or stop the data link, run or stop internode tests, and set the destination network and node addresses for internode 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.

Note

1. CPU Bus Link Units are allocated 25 words each between Word 1500 to 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) for each unit number
2. Refer to the operation manuals for individual Units for further details on Unit operation.

CPU SIOU Unit System Setup

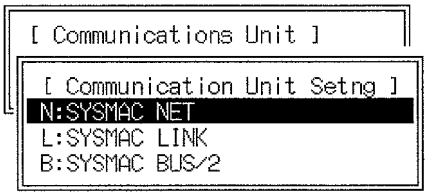
This operation is used to read and set the system setup area in the PC for CPU Bus Units. These setups are designed for CPU Bus Units other that SYSMAC NET Link, SYSMAC LINK, and SYSTEM BUS/2 Remote I/O Units, which are set using the “Comm Unit Settings” described above.

CPU SIOU Unit Soft Sw Setup

This operation is used to read and set the software switches in the CIO and DM Areas 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.

6-1-1 Communication Unit Settings

The following sub-menu will appear when *Comm unit settings* is selected from the Communications Unit menu.



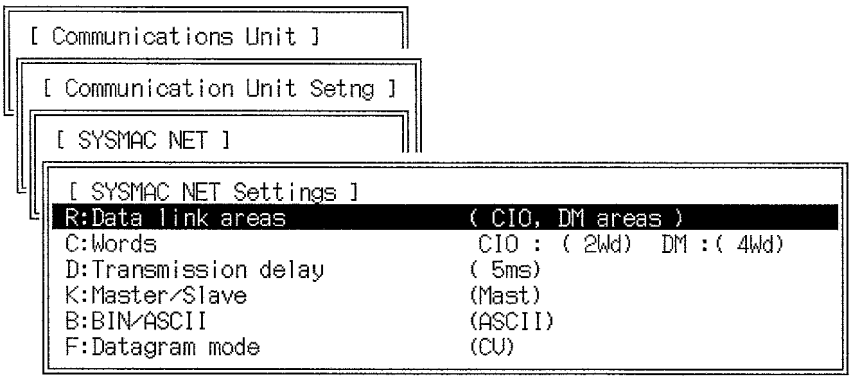
Select the Unit to be set.

Note The settings cannot be changed if the CPU is write-protected via the keyswitch on the CPU.

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 Setng sub-menu. Enter a unit number between 0 and 15 and press the Enter Key. The current settings will be displayed.



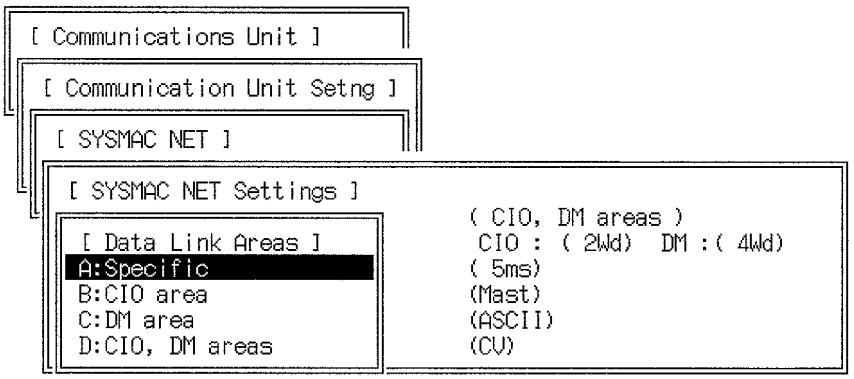
The setting method for each item is described below.

The display shown above will appear with the new values after settings are changed and transferred to the PC. 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. Refer to *3-5-2 Force Set/Reset* for details of the forced set and reset operations.

Data Link Areas

The following sub-menu will appear when “R:Data link areas.” is selected from the SYSMAC NET Settings menu.



The data set using the offline *Edit dat lnk tbl* (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. Select BIN (binary) or ASCII. The setting will be written to the PC and the SYSMAC NET Settings menu will appear.

Datagram Format

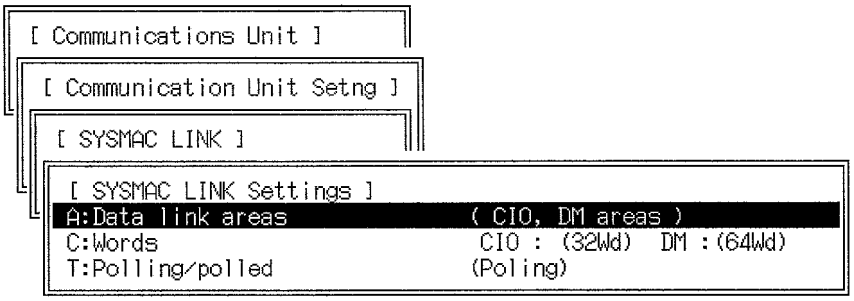
1, 2, 3...

1. Select “F:Datagram mode” from the SYSMAC NET Settings menu.
2. Select datagram format. The setting will be written to the PC and the SYSMAC NET Settings menu will appear.

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 sub-menu. Enter a unit number between 0 and 15 and press the Enter Key. The current settings will be displayed.



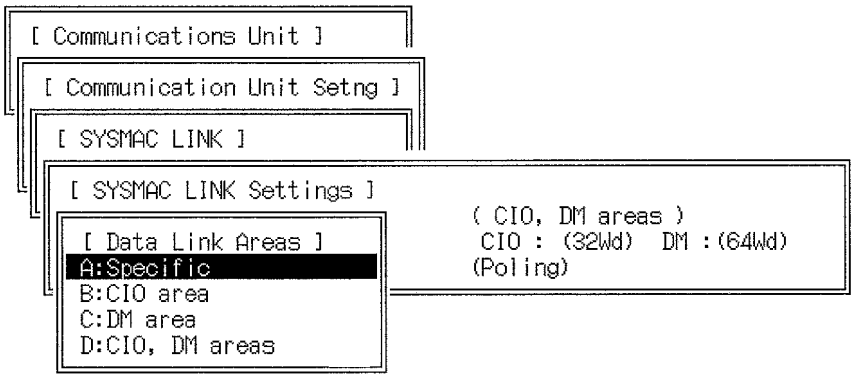
The setting method for each item is described below.

The display shown above will appear with the new values after settings are changed and transferred to the PC. 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. Refer to *3-5-2 Forced Set/Reset* for details of the forced set and reset operations.

Data Link Areas

The following sub-menu will appear when “A:Data link areas.” is selected from the SYSMAC LINK Settings menu.



The data set using the offline *Edit dat lnk tbl* (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...

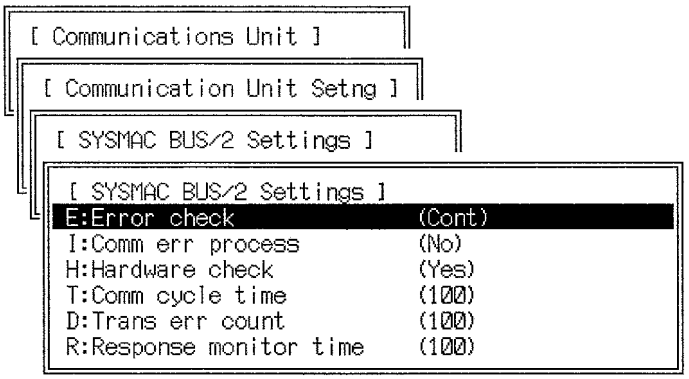
1. Select “T:Polling/polled” from the SYSMAC LINK Settings menu.
2. Select polling or polled. The settings will be written to the PC and the SYSMAC LINK Settings menu will appear.

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 sub-menu.
2. Specify the Master for which the settings are to be made. Enter an Master’s unit number 0 and 15 and press the Enter Key. The current settings will be displayed.



The setting method for each item is described below.

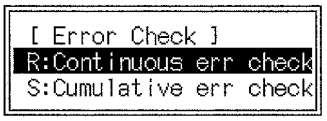
The display shown above will appear with the new values after settings are changed and transferred to the PC. The changed settings are not immediately recognized by the Link Units. Carry out one of the following procedures to use the new settings:

- 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. Refer to *3-5-2 Forced Set/Reset* for details of the forced set and reset operations.

Error Check

1, 2, 3...

1. Select “E:Error check” from the SYSMAC BUS/2 Settings menu.

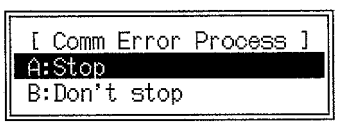


2. Select the error checking method. The setting will be written to the PC and the SYSMAC BUS/2 Settings menu will appear.

Communication Error Process

1, 2, 3...

1. Select “I:Comm err process” from the SYSMAC BUS/2 Settings menu.

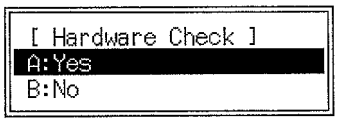


2. Select whether or not communication are to stop when an error occurs. The setting will be written to the PC and the SYSMAC BUS/2 Settings menu will appear.

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 the Enter Key. 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 the Enter Key. The setting will be written to the PC and the SYSMAC BUS/2 Settings menu will appear.

Response Monitor Time

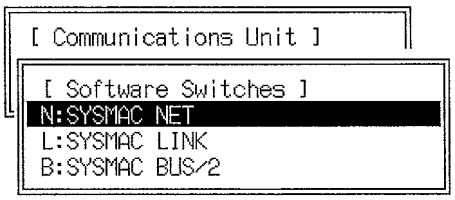
1, 2, 3...

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 the Enter Key. The setting will be written to the PC and the SYSMAC BUS/2 Settings menu will appear.

6-1-2 Software Switch Settings

These operations read and change the software switches for the SYSMAC NET, SYSMAC LINK, and SYSMAC BUS/2 Masters. Refer to the System Manuals for individual Link Units for operational details.

The following sub-menu will appear when *Software switches* is selected from the Communications Unit menu.



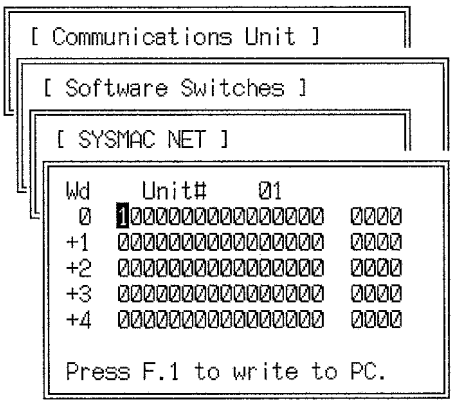
Select the Unit to be set.

SYSMAC NET Software Switches

1, 2, 3...

1. Select “N:SYSMAC NET” from the Software Switches sub-menu.

2. Enter a unit number between 0 and 15 and press the Enter Key. 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 the Enter Key. The hexadecimal value will change to reflect the input binary value.

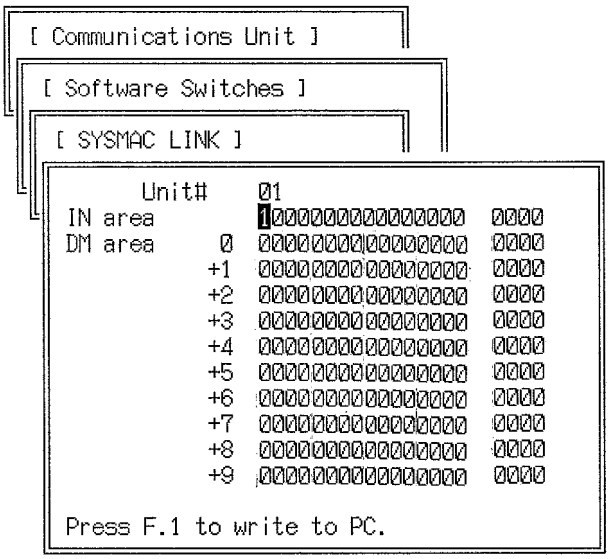
   Use the Left, Right, Up, And Down Keys to move the cursor.

4. Press the F1 Key when the changes are complete. The software switch settings will be written to the Unit.

SYSMAC LINK Software Switches

1, 2, 3... 1. Select “L:SYSMAC LINK” from the Software Switches sub-menu.

2. Enter a unit number between 0 and 15 and press the Enter Key. 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 the Enter Key. The hexadecimal value will change to reflect the input binary value.

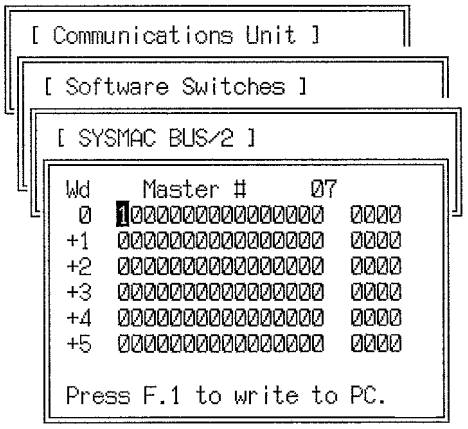
   Use the Left, Right, Up, And Down Keys to move the cursor.

4. Press the F1 Key when the changes are complete. The software switch settings will be written to the Unit.

Software Switches for SYSMAC BUS/2 Masters

1, 2, 3... 1. Select “B:SYSMAC BUS/2” from the Software Switches sub-menu.

2. Enter a unit number between 0 and 15 and press the Enter Key. 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 the Enter Key. 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.

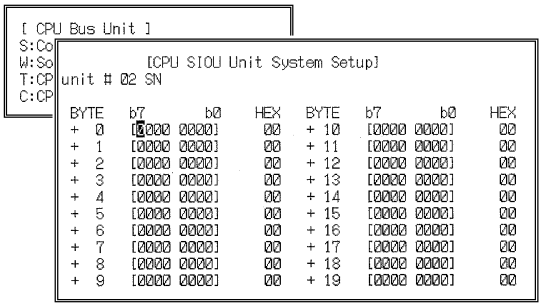
6-1-3 CPU SIOU Unit System Setup

The following operation is used to set system operating parameters for CPU Bus Units other than the SYSMAC NET Link, SYSMAC LINK, and SYSMAC BUS/2 Remote I/O Units.

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 PgUp and PgDn 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 the Enter Key.

or Press the Shift+Right Arrow Keys to move to the hexadecimal input area, input the hexadecimal value, and press the Enter Key. You can return to the binary input area by pressing the Shift+Left Arrow Keys.

6. Press the Esc Key to write the current settings to the PC.

6-1-4 CPU SIOU Unit Software Switches

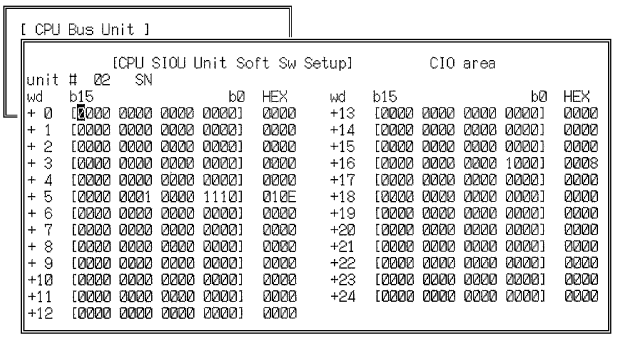
The following operation is used to set software switches in the CIO and DM Areas for CPU Bus Units other than the SYSMAC NET Link, SYSMAC LINK, and SYSMAC BUS/2 Remote I/O Units.

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 PgDn 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 PgUp 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 the Enter Key.

or Press the Shift+Right Arrow Keys to move to the hexadecimal input area, input the hexadecimal value, and press the Enter Key. You can return to the binary input area by pressing the Shift+Left Arrow Keys.

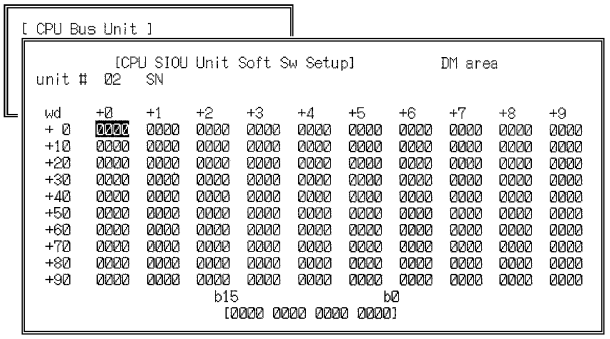
6. Press the Esc Key to write the current settings to the PC.

DM Area

1, 2, 3...

1. Select “C:CPU SIOU Unit Soft Sw Setup” from the CPU Bus Unit Setup menu. The display of the CIO Area for the CPU Bus Unit with the lowest unit number will appear.
2. 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.

3. Use the PgDn 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 PgUp Key can be used to scroll backwards.



4. Move the cursor to the location to be set.
5. Input the hexadecimal value and press the Enter Key.
6. Press the Esc Key to write the current settings to the PC.

6-2 Network Support Tables

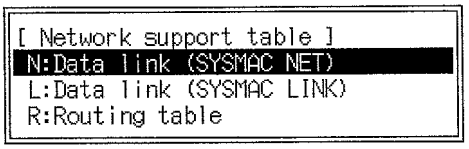
This section describes the following operations:

- Support operations related to the SYSMAC NET data links.
- Support operations related to the SYSMAC LINK data links.
- Support operations related to the routing tables required for inter-network communications.

Note

1. Immediately save all data created for the network support tables to a data disk or hard disk.
2. Network support table data is created in the main memory and not written to the work disk. Therefore, the network support table data will be lost if the reset switch is pressed, the POWER switch is turned off, or the main online menu is selected.

Select “N:Network support table” from the main online menu. The Network Support Table menu will appear.



Operation	Function
Data link (SYSMAC NET)	Used to transfer and compare the data link table between a SYSMAC NET Link Unit and computer main memory. This operation is valid only when *Specific* is selected from the Data Link Areas sub-menu of the SYSMAC NET Settings menu. Used to start or stop the data links for the specified SYSMAC NET Link Unit. Used to display the operating status of each node belonging to a data link.
Data link (SYSMAC LINK)	Used to transfer and compare the data link table between the SYSMAC LINK Unit and computer main memory. This operation is valid only when *Specific* is selected from the Data Link Areas sub-menu of the SYSMAC LINK Settings menu. Used to delete the data link table for a specified SYSMAC LINK Unit. Used to start or stop the data link with the specified SYSMAC LINK Unit. Used to display the operating status of each node belonging to the data link.
Routing table	Used to transfer, compare, save, and retrieve the routing tables between PCs and computer.

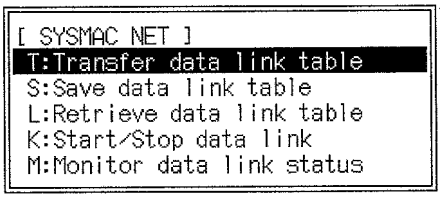
6-2-1 SYSMAC NET Data Links

The following support operations are for SYSMAC NET data links.

1, 2, 3... 1. Select “N:Data link (SYSMAC NET)” from the Network Support Table menu with the cursor to access the data link table.

Note Default values will be shown in the data link table when it is first displayed. The current settings can be displayed in the table by executing the *SYSMAC NET* A *Computer* operation from the Retrieve Data Link Table or Transfer Data Link Table sub-menu.

2. Press the End Key from the data link table to access the SYSMAC NET menu and select the required item from the menu.



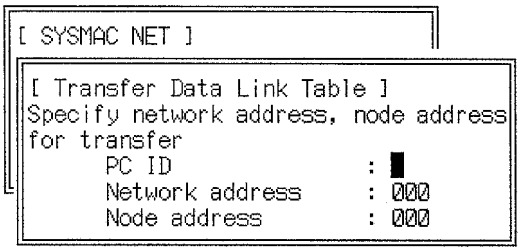
Operation	Function
Transfer data link table	Used to transfer and compare the data link table between the SYSMAC NET Link Unit and computer main memory.
Save data link table	Used to write the data link table from the computer main memory to the data disk.
Retrieve data link table	Used to read the data link table from the data disk to the computer main memory.
Start/Stop data link	Used to start or stop the data link with the specified SYSMAC NET Link Unit.
Monitor data link status	Used to display the operating status of each node belonging to the data link.

Retrieving the Data Link Table

The method of operation is identical to the offline *Retr dat lnk tbl* operation. Refer to *4-6 Editing Network Support Tables* of the *CV Support Software Version 2 Operation Manual: Offline* for details.

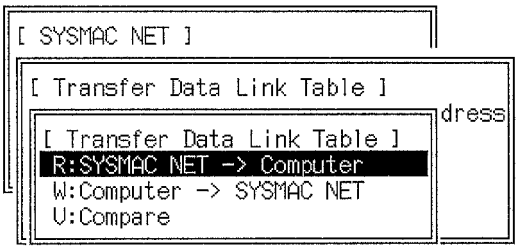
Transferring the Data Link Table

1, 2, 3... 1. Select “T:Transfer data link table” from the SYSMAC NET 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 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 sub-menu will appear after the network address and node address are displayed.

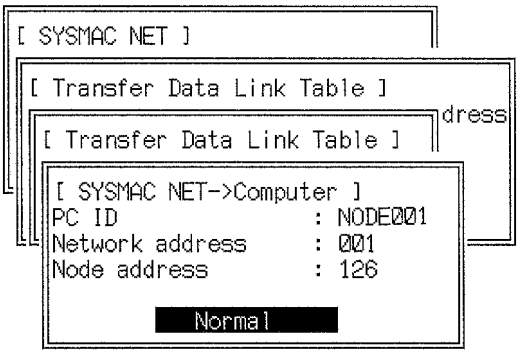


The following table shows the valid data link statuses for each operation.

Operation	Valid data link status		Function
	Stopped	Running	
SYSMAC NET A Computer	OK	OK	Uploads the contents of the data link table in the SYSMAC NET Link Unit to the computer main memory. The data link table already existing in the computer main memory will be overwritten.
Computer A SYSMAC NET	OK	No	Downloads the contents of the data link table in the computer main memory 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 main memory with the data link table area in the SYSMAC NET Link Unit.

Uploading Data Link Tables

1, 2, 3... 1. Select "R:SYSMAC NET A 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.

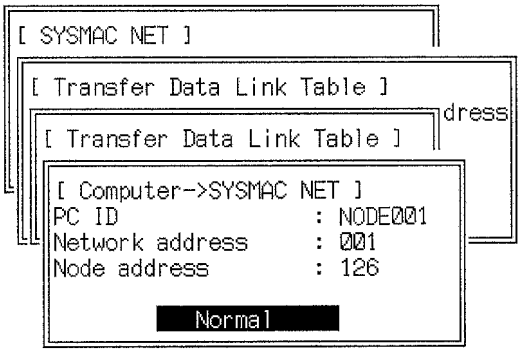


2. Press the Esc Key to return to the Transfer Data Link Table menu after the transfer is complete or press the Shift+Esc Keys to return to the data link table display.

Downloading Data Link Tables

Before using this operation, display the data link tables using the *Retrieve data link table* operation.

1, 2, 3... 1. Select “W:Computer A SYSMAC NET” from the Transfer Data Link Table menu to start downloading the data link table. A message will flash during the transfer. The following display will appear when the transfer is complete.

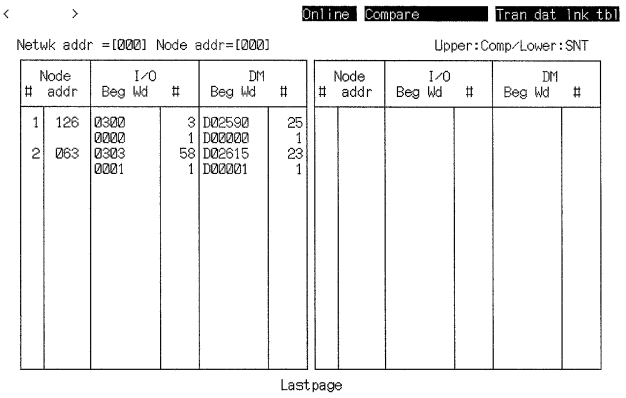


2. Press the Esc Key to return to the Transfer Data Link Table menu after the transfer is complete or press the Shift+Esc Keys to return to the data link table display.

Compare

Use the Compare operation after using the *SYSMAC NET* A *Computer* or *Computer* A *SYSMAC NET* operation to confirm that the tables agree.

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.



2. Press the PgDn 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. Use the *SYSMAC NET* A *Computer* or *Computer* A *SYSMAC NET* operation again if differences are discovered.
3. Press the Esc Key to return to the Transfer Data Link Table menu or press the Shift+Esc Keys to return to the data link table display.

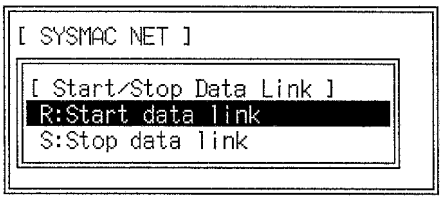
Saving Data Link Tables

The method of operation is identical to the offline *Save dat lnk tbl* operation. Refer to *4-6 Editing Network Support Tables* of the *CV Support Software Version 2 Operation Manual: Offline* for details.

Starting and Stopping Data Links

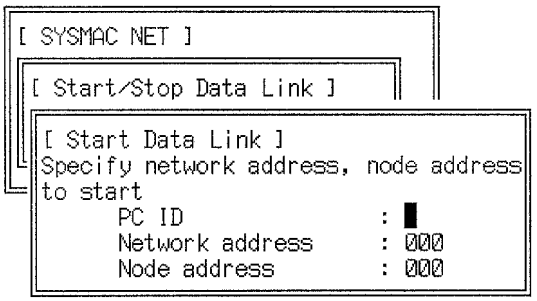
1, 2, 3...

1. Select “K:Start/Stop data link” from the SYSMAC NET menu to access the following sub-menu.

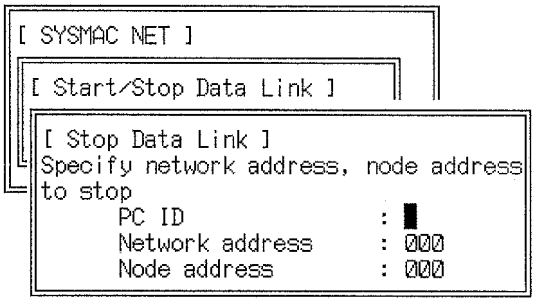


2. Select the required item from the menu.

   The following displayed when *Start Data Link* is selected.



   The following is displayed when *Stop Data Link* is selected.



3. 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.

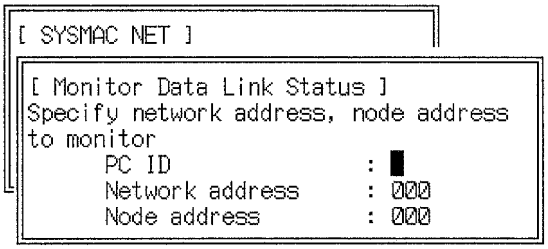
4. Press the Enter Key. The data link will start or stop, as specified and the display will return to the Start/Stop Data Link menu.

Monitoring Data Link Status

This operation is possible only when the Data Link is running.

Stopped	Running
No	OK

1, 2, 3... 1. Select “M:Monitor data link status” from the SYSMAC NET 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.

PC running	The PC is in RUN or MONITOR mode.
Communication error	A data link error has occurred.
Table error	A table setting error was discovered.

< > Online Mon link status SYSMAC NET

Netwk addr =[001] Node addr=[015]

Node addr	PC run	Comm err	Table warn	Node addr	PC run	Comm err	Table warn
001				017			
002				018		YES	
003				019		YES	
004				020			
005				021			
006				022			
007		YES		023			
008		YES		024			
009				025			
010		YES		026			
011		YES		027			
012		YES		028		YES	
013				029		YES	
014				030		YES	
015				031	YES		
016		YES		032		YES	

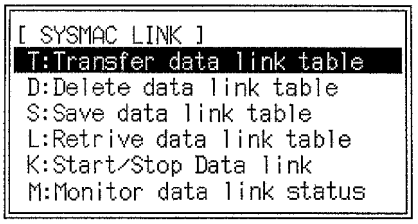
4. Press the Esc Key or Shift+Esc Keys to end monitoring.

6-2-2 Data Link Table (SYSMAC LINK)

The following support operations are for SYSMAC LINK data links.

SYSMAC LINK Menu

1, 2, 3... 1. Press the End Key from the common link parameter display or refresh parameter display (see below) to access the SYSMAC LINK menu.



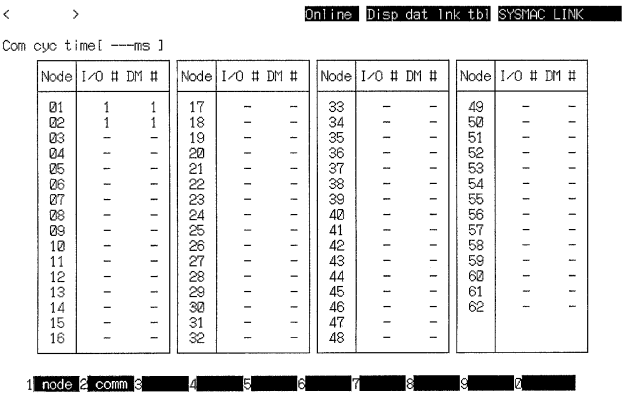
2. Select the required item from the menu.

Operation	Function
Transfer data link table	Used to transfer and compare the data link tables between the SYSMAC LINK Unit and computer main memory.
Delete data link table	Used to delete the specified data link table in the SYSMAC LINK Unit.
Save data link table	Used to write the data link table from the computer main memory to the data disk or hard disk.
Retrieve data link table	Used to read the data link table from the data disk or hard disk to the computer main memory.
Start/Stop data link	Used to start or stop the data links for the specified SYSMAC LINK Unit.
Monitor data link status	Used to monitor the data link status, communication cycle time, and refresh cycle time.

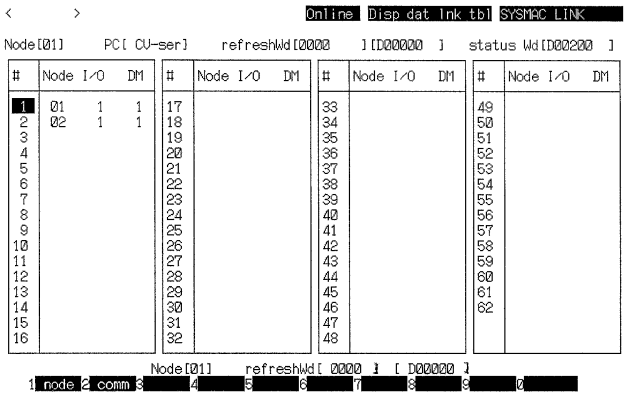
Display and Menu

1, 2, 3... 1. Select “L:Data link (SYSMAC LINK)” from the Network Support Table menu with the cursor to display the common parameter table. The set values will not be displayed in the table immediately after common link parameter display or the refresh parameter display are selected from the main online menu. The set values will be displayed in the table only after the *SYSMAC LINK* A *Computer* operation is executed from the Retrieve Data Link Table or Transfer Data Link Table sub-menu.

The following will appear when *Common Link Parameter Display* is selected.



The following will appear when *Refresh Parameter Display* is selected.



2. Press the PgUp and PgDn Keys to scroll sequentially through the parameter displays for nodes 1 to 62.
3. Press F1, *node_address*, Enter to display the refresh parameter display or press the F2 Key to return to the common link parameter display.

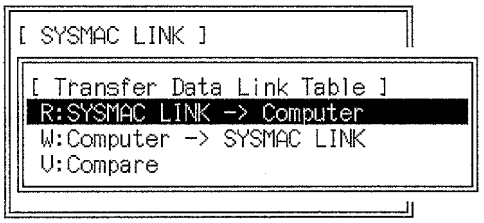
Retrieving Data Link Tables

The method of operation is identical to the offline *Retr dat lnk tbl* operation. Refer to *4-6 Editing Network Support Tables* of the *CV Support Software Version 2 Operation Manual: Offline* for details.

Transferring Data Link Tables

1, 2, 3...

1. Select "T:Transfer data link table" from the SYSMAC LINK menu to access the following sub-menu.



The following table shows the valid data link statuses for each operation.

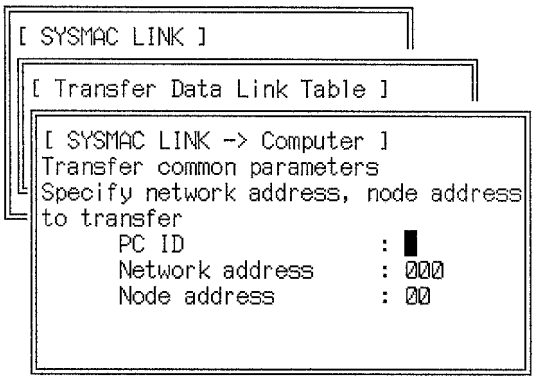
Operation	Valid data link status		Function
	Stopped	Running	
SYSMAC LINK A Computer	OK	OK	Used to read the contents of the data link table in the SYSMAC LINK Unit to the computer main memory. The data link table already existing in the computer main memory will be overwritten.
Computer A SYSMAC LINK	OK	No	Use to write the contents of the data link table in the computer main memory 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 main memory with the data link table in the SYSMAC LINK Unit.

Uploading Link Tables

This operation is used to upload the common link parameters and refresh link parameters from a specified node. The following example is for transferring common link parameters.

1, 2, 3...

1. Select the "R:SYSMAC LINK A Computer" from the Transfer Data Link Table menu to access the following display.

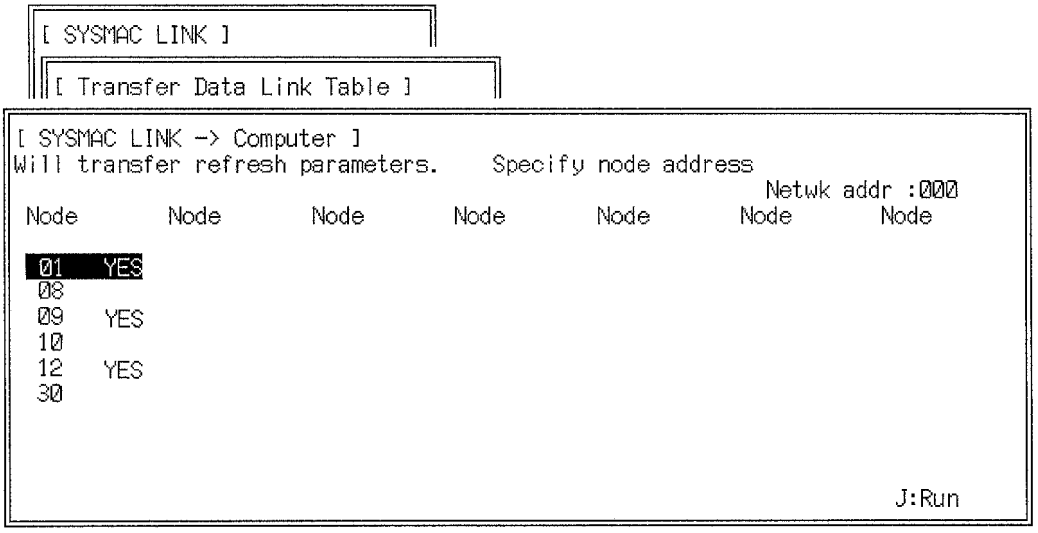


The common link parameters are normally the same for each node. Therefore, the node address of any node currently belonging to the data link can be specified in the display as the node address. If the common link parameters vary from one node to another, specify the desired node.

2. Press the Up and Down Keys to move the cursor and input the network address and node address.

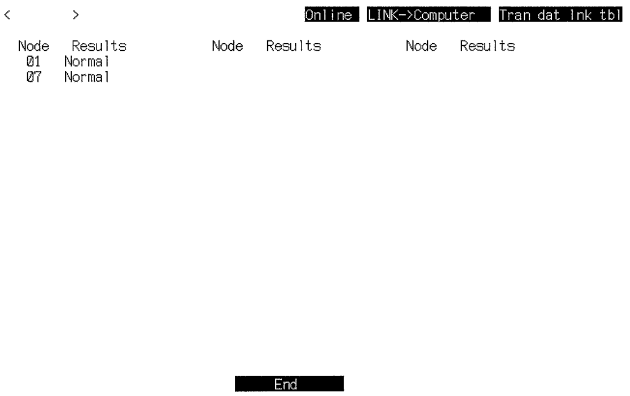
The network address and node address can be specified using PC names. Press the End Key to display the PC name table and select the required PC name with the cursor. The network address and node address will be displayed automatically when the Enter Key is pressed.

3. Press the Enter Key to upload the data link table. A message will flash during the transfer.



The nodes connected to the current SYSMAC LINK network will be displayed. No Unit is connected to node addresses with nothing displayed. Source node addresses are marked “YES” in the table. The nodes enabled in offline operations are marked “YES” as the default values.

4. Display “YES” by nodes to be transferred. Move the cursor to the blank position by the node to be selected and press the Enter Key to display “YES.” Conversely, move the cursor to a “YES” and press the Enter Key to delete it.
5. After selecting all the nodes to be transferred, select “J:Run” from the menu. 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.



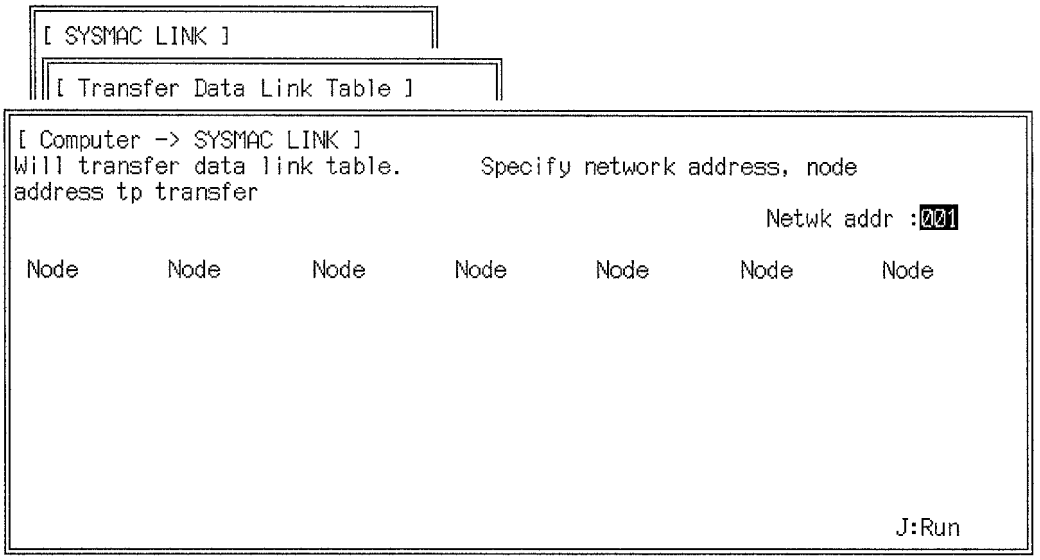
6. Press the Esc Key to return to the SYSMAC LINK A Computer menu after the transfer is complete or press the Shift+Esc Keys to return to the data link table display.

Downloading Link Tables

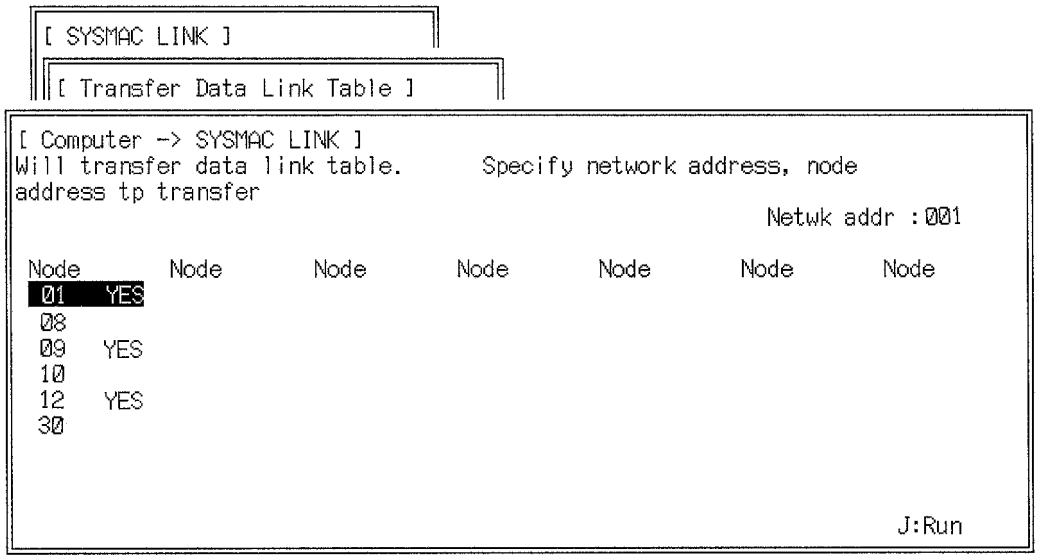
This operation downloads the common link parameters and refresh link parameters to specified nodes.

Before using this operation, display the link tables using the *Retrieve data link table* operation.

1, 2, 3... 1. Select “W:Computer A 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. No Unit is connected to node addresses with nothing displayed.



3. Destination nodes are marked “YES” in the table. The nodes enabled in offline operations are marked “YES” as the defaults. Nodes disabled at the computer cannot be specified.
4. Display “YES” by nodes to be transferred. Move the cursor to the blank position by the node to be selected and press the Enter Key to display “YES.” Conversely, move the cursor to a “YES” and press the Enter Key to delete it.

5. After selecting all the nodes to be written, select “J:Run” from the menu. 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.

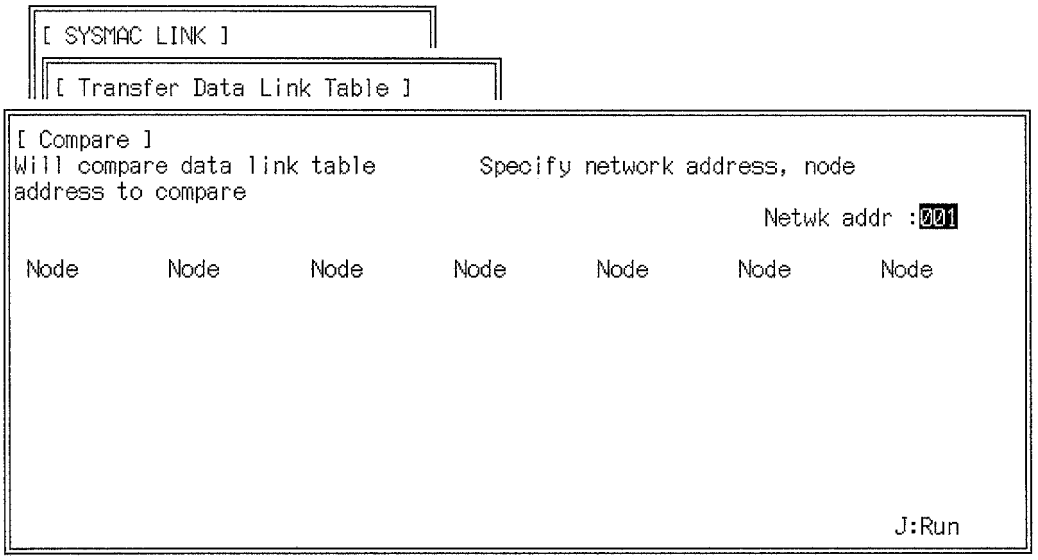
6. Press the Esc Key to return to the Computer A SYSMAC LINK menu after the transfer is complete or press the Shift+Esc Keys to return to the data link table display.

Compare

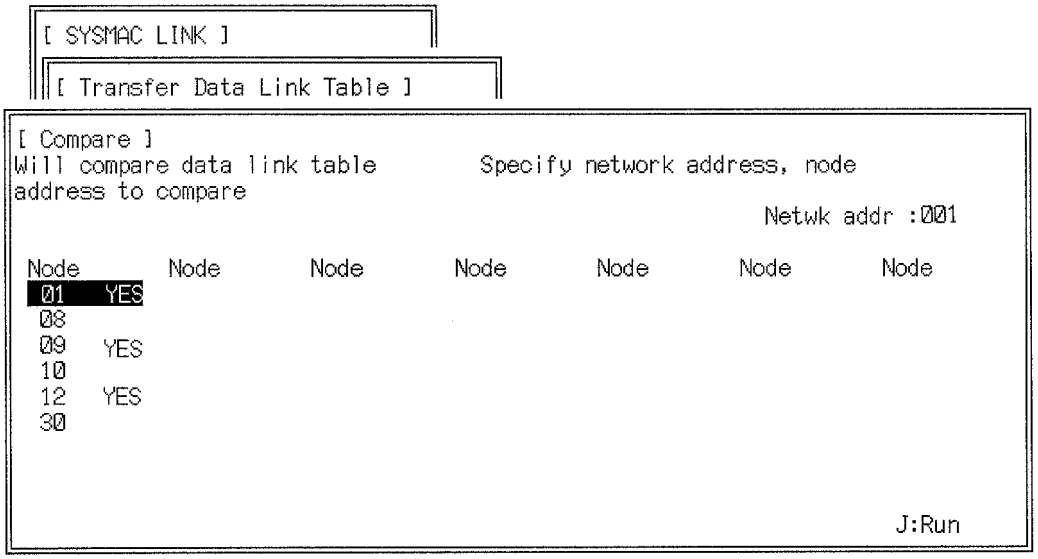
Use the *Compare* operation after using the *SYSMAC LINK* A *Computer* or *Computer* A *SYSMAC LINK* operation to confirm that the link tables match.

1, 2, 3...

1. Select “V:Compare” from the Transfer Data Link Table menu to access the following display.

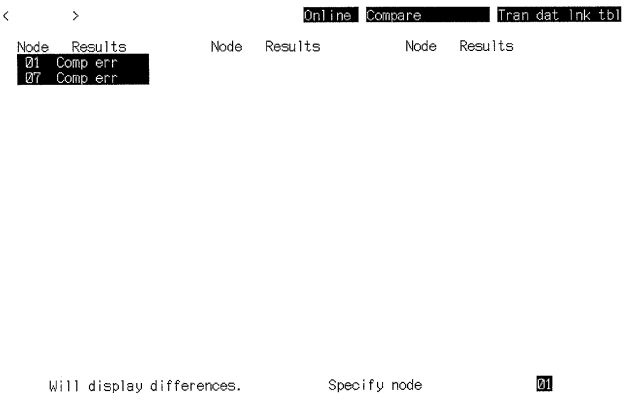


2. Enter the network address and press the Enter Key. The nodes connected to the SYSMAC LINK System will be displayed. No Unit is connected to node addresses with nothing displayed.



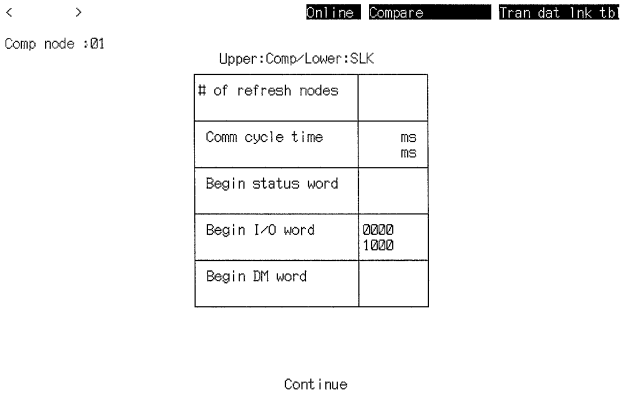
Nodes to be compared are marked “YES” in the table. The nodes enabled in offline operations are marked “YES” as the defaults. Nodes disabled at the computer cannot be specified.

3. Display “YES” by nodes to be compared. Move the cursor to the blank position by the node to be selected and press the Enter Key to display “YES.” Conversely, move the cursor to a “YES” and press the Enter Key to delete it.
4. After selecting all the nodes to be compared, select “J:Run” from the menu. 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.

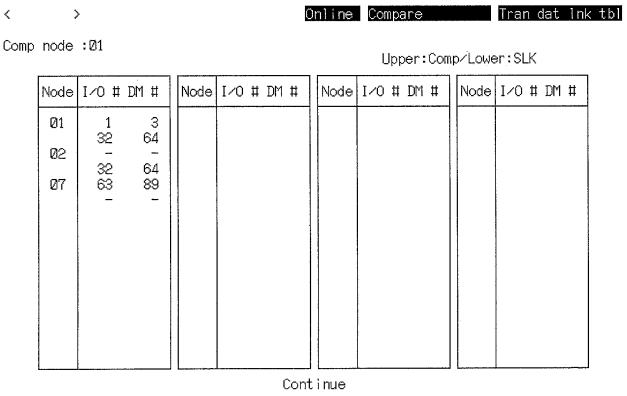


5. If the comparison discovers no differences between the data link tables in the computer and the SYSMAC LINK Unit, a message will indicate that the comparison was OK.
6. If a message indicates that an error occurred, press the Enter Key to display a table explaining the errors. Unmatching data items will be displayed with

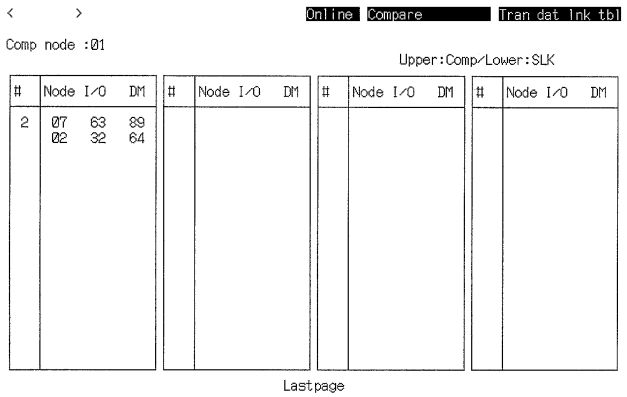
the data in the computer on top and the data in the SYSMAC LINK Unit underneath.



7. Press the PgDn Key to display the next page if the message *Continue* is displayed on the screen.



8. Press the PgDn Key to display the unmatching refresh parameters. This display cannot be displayed after a serious common link parameter error was discovered, e.g., an incompatible number of refresh nodes.



9. Press the Esc Key if errors occurred for other node addresses. The display of comparison results will appear again. Enter the required node address and press the Enter Key.
10. Press the Shift+Esc Keys to return to the data link table display.
11. Use the *SYSMAC LINK* A *Computer* or *Computer* A *SYSMAC LINK* operation again if differences are discovered.

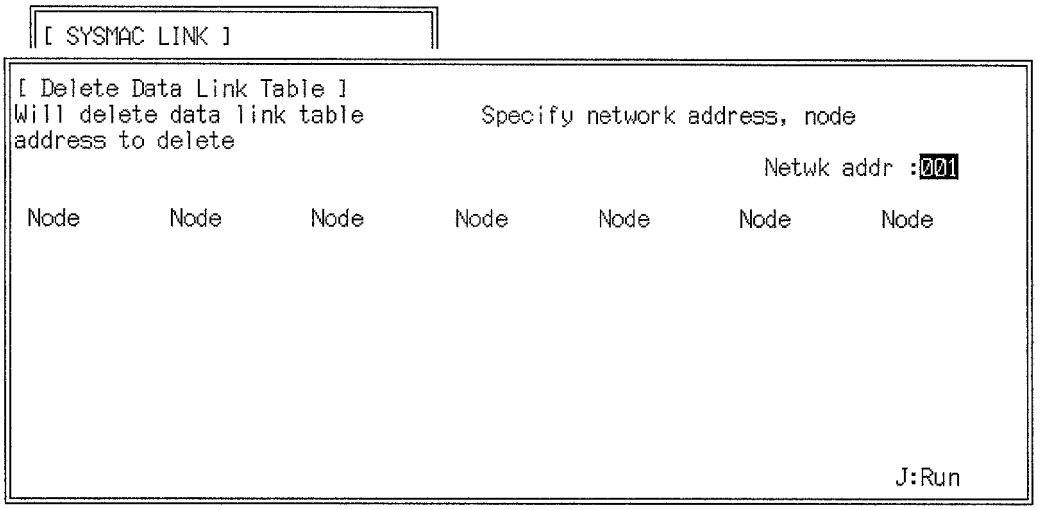
Deleting Data Link Tables

This operation is used to delete the data link tables from a specified SYSMAC LINK Unit. This operation is possible only when the data links are stopped.

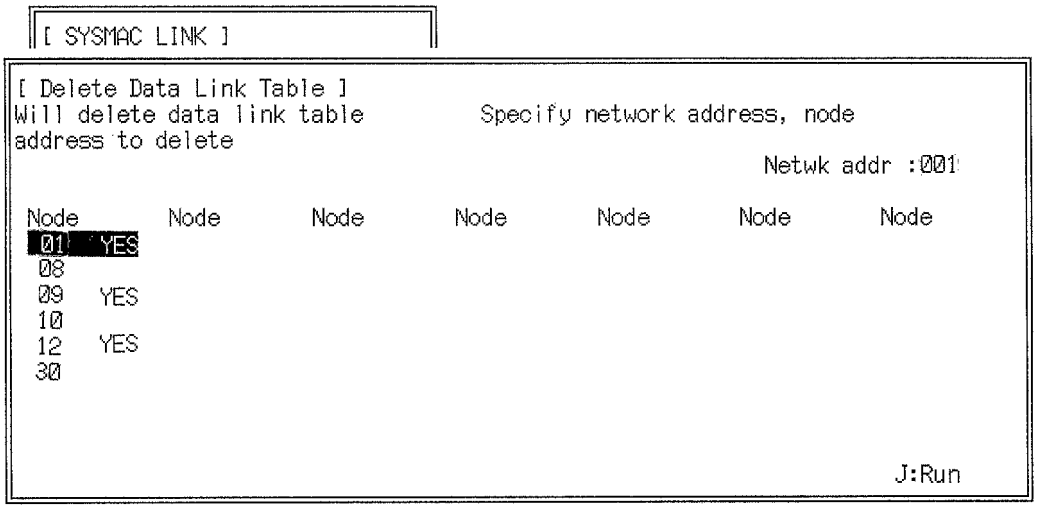
Stopped	Running
OK	No

1, 2, 3...

1. Select “D:Delete data link table” from the SYSMAC LINK 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. No Unit is connected to node addresses with nothing displayed. Nodes from which the data link tables are to be deleted are marked “YES” in the table. Nodes disabled in offline operations are marked “YES” as the defaults.

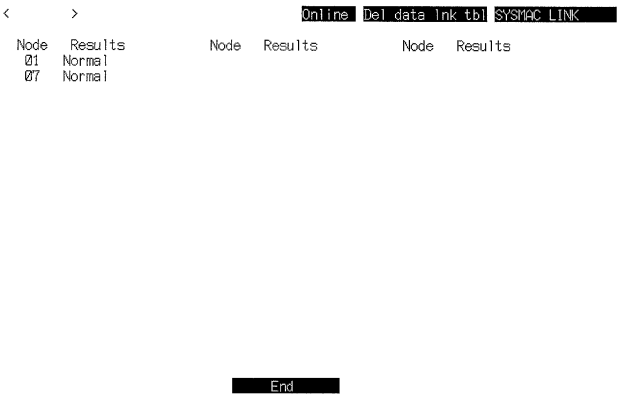


3. Display “YES” by nodes to be deleted. Move the cursor to the blank position by the node to be selected and press the Enter Key to display “YES.” Conversely, move the cursor to a “YES” and press the Enter Key to delete it.

   Note Be sure to delete the data link tables from nodes previously written using the Computer A SYSMAC LINK operation but subsequently removed from the data link.

4. After selecting all the nodes to be deleted, select “J:Run” from the menu. The specified nodes will be deleted. 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 the Esc Key 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.

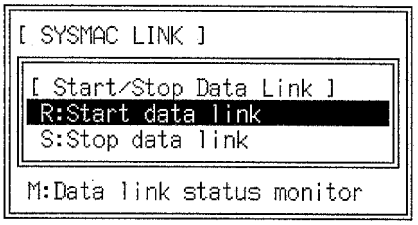
Saving Data Link Tables

The method of operation is identical to the offline *Save dat lnk tbl* operation. Refer to *4-6 Editing Network Support Tables* of the *CV Support Software Version 2 Operation Manual: Offline* for details.

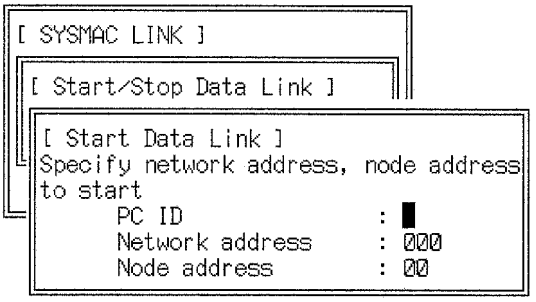
Starting and Stopping Data Links

1, 2, 3...

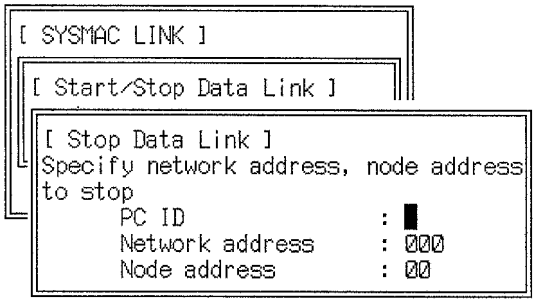
1. Select “K:Start/Stop data link” from the SYSMAC LINK menu to access the following sub-menu. Select the required item.



The following will appear when *Start Data Link* is selected.



The following will appear when *Stop Data Link* is selected.



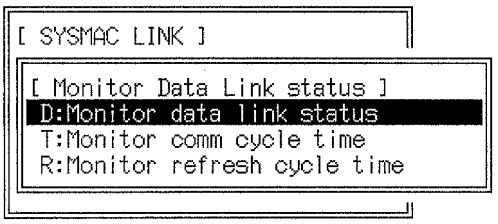
2. Input the network address and node address.

   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.

3. 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

Select "M:Monitor data link status" from the SYSMAC LINK menu to access the following menu.



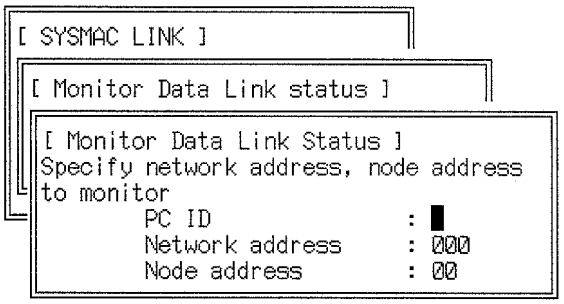
The following table shows the data link statuses in which each operation can be used.

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.

Monitoring Data Link Status

1, 2, 3...

1. Select "D:Monitor data link status" the Monitor Data Link Status menu to access the following display.



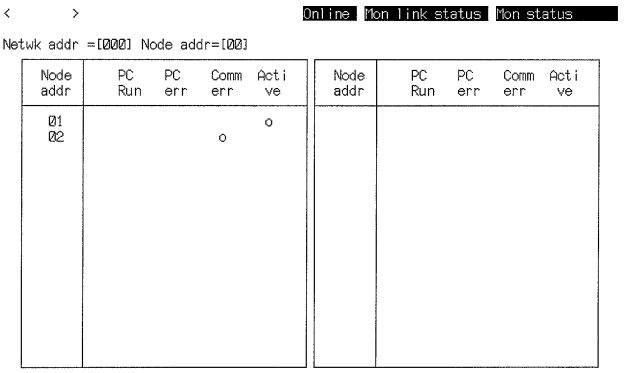
2. Press the Up and Down Keys to move the cursor and input the network address and node address and press the Enter Key. The data link status will appear for each node.

3. Specify the node addresses of the nodes 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.

4. Press the Enter Key. The network address and node address will be displayed. “YES” in the table will indicate the status of each node address for the following items.

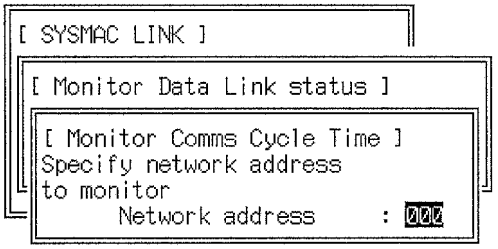
PC running	The PC is in RUN or MONITOR mode.
PC error	PC is stopped due to a PC error.
Communication error	A data link error has occurred.
Running	The data link is running normally



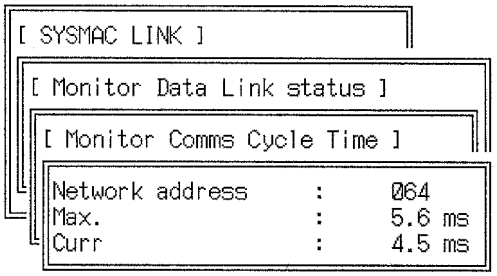
5. Press the PgDn Key to display the node 33 to 62.
6. Press the Esc Key or Shift+Esc Keys to end the monitoring.

Monitoring the Communication Cycle Time

1, 2, 3... 1. Select “T:Monitor comm cycle time” from the Monitor Data Link Status menu to access the following display.



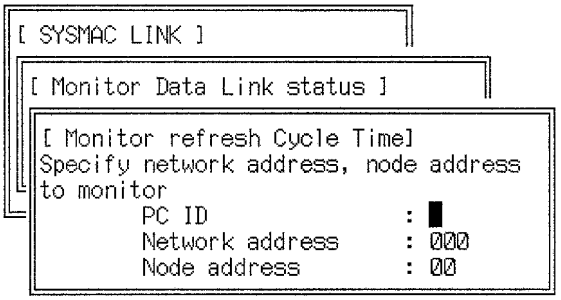
2. Input the network address and press the Enter Key. The maximum value and current value of the SYSMAC LINK communication cycle time will be displayed.



3. Press the Esc Key or Shift+Esc Keys to end the monitoring.

Monitoring the Refresh Cycle Time

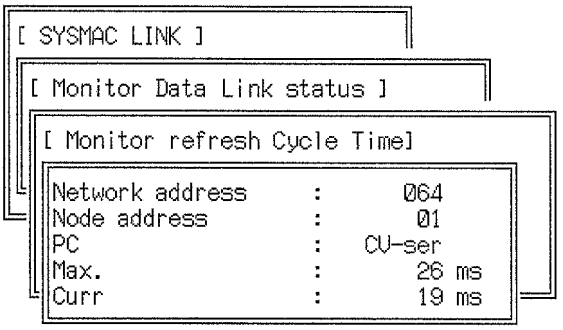
1, 2, 3... 1. Select “R:Monitor refresh cycle time” from the Monitor Data Link Status menu to access the following display.



2. Press the Up and Down Keys to move the cursor and input the network address and node address. 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 the Esc Key or Shift+Esc Keys to end the monitoring.

6-2-3 Routing Tables

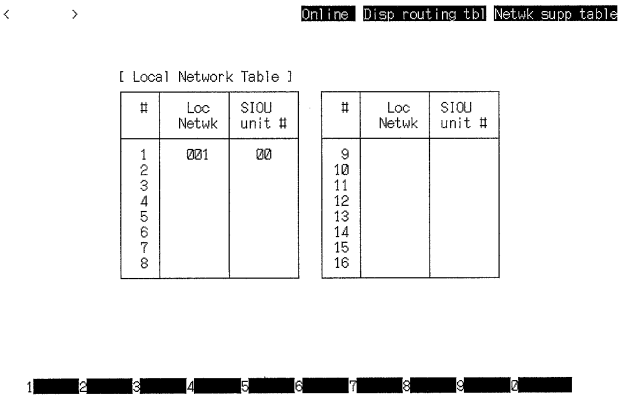
The following support operations are for the routing tables required for internetwork communications.

Operation	Function
Transfer routing table	Used to transfer and compare the routing tables between the SYSMAC LINK Unit and computer main memory.
Save routing table	Used to write the routing tables from the computer main memory to the data disk or hard disk.
Retrieve routing table	Used to read the routing tables from the data disk or hard disk to the computer main memory.

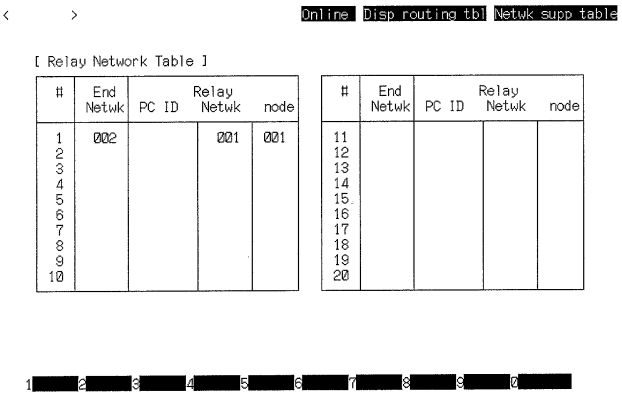
Display and Menu

Select “R:Routing table” from the Network Support Table menu. Use *Retrieve routing table* to display the routing table created offline on the screen.

The following is an example of a local network table.

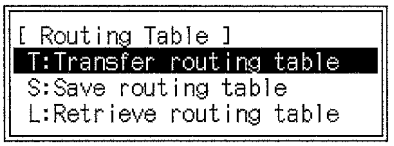


The following is an example of a relay network table.



Routing Table Menu

1, 2, 3... 1. Press the End Key from the routing table display to access the Routing Table menu.

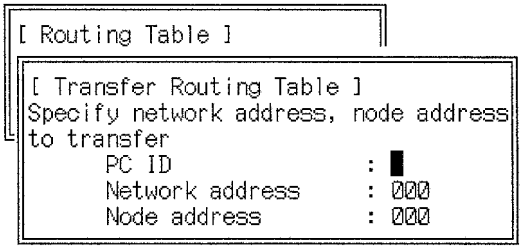


2. Select the required item from the menu.

Retrieving Routing Tables The method of operation is identical to the offline *Retr routing tbl* operation. Refer to *4-6 Editing Network Support Tables* of the *CV Support Software Version 2 Operation Manual: Offline* for details.

Transferring Routing Tables 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* A *PC* transfer operation. Use the same procedure to change the network addresses in the local network table.

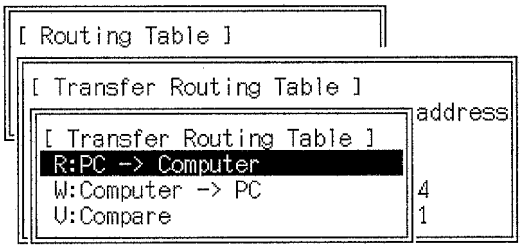
1, 2, 3... 1. Select “T:Transfer routing table” from the Routing Table menu to access the following display.



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. 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.



Operation	Function
PC A Computer	Used to upload the contents of the routing table in the PC to the computer main memory. The routing table already existing in the computer main memory will be overwritten.
Computer A PC	Used to download the contents of the routing table in the computer main memory to the PC. The routing table already existing in the PC will be overwritten.
Compare	Used to compare the routing table in the computer main memory with the routing table in the PC.

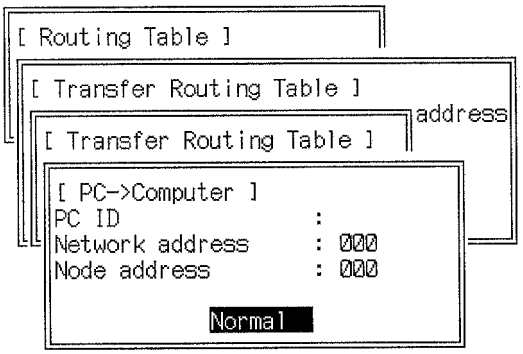
Deleting Routing Tables This operation is used to delete routing tables.

1, 2, 3... 1. Use the offline operations to edit the routing table to create a routing table specifying no local or relay networks and then save this routing table to the data disk or hard disk.

2. Use the online *Retrieve routing table* operation to display the above routing table on the screen and transfer it to the PC using the *Computer* A *PC* operation from the Transfer Routing Table menu.

Uploading Routing Tables This operation is used to upload routing tables.

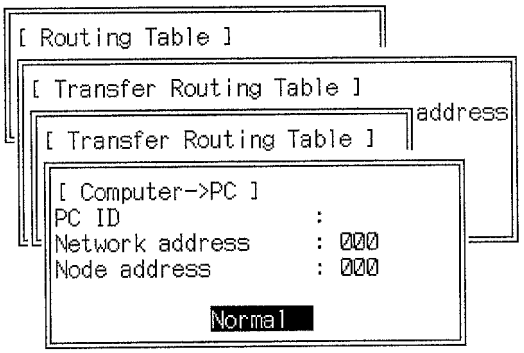
1, 2, 3... 1. Select “R:PC A Computer” from the Transfer Routing Table menu to start uploading the routing tables. A message will flash during the transfer and the following display will appear when the transfer is complete.



2. Press the Esc Key to return to the Transfer Routing Table menu after the transfer is complete. Press the Shift+Esc Keys to return to the routing table display.

Downloading Routing Tables Before using this operation, display the routing tables using the *Retrieve routing table* operation.

1, 2, 3... 1. Select “W:Computer A 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.



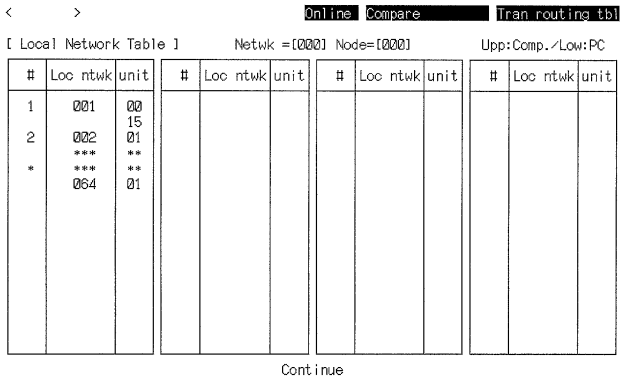
Caution After the routing tables are transferred to a PC, all CPU Bus Units connected to the PC will be restarted.

2. Press the Esc Key to return to the Transfer Routing Table menu. Press the Shift+Esc Keys to return to the routing table display.

Compare Use the Compare operation after using the *PC* A *Computer* or *Computer* A *PC* operation to confirm that the routing tables are the same.

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 PgDn Key to display the next page if the message *Continue* is displayed on the screen. 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 the Esc Key to return to the Transfer Routing Table menu. Press the Shift+Esc Keys to return to the routing table display.
4. Use *PC* A *Computer* or *Computer* A *PC* again if differences are discovered.

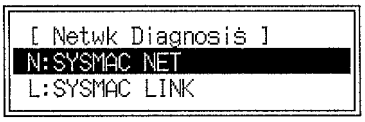
Saving Routing Tables

The method of operation is identical to the offline *Save routing tbl* operation. Refer to *4-6 Editing Network Support Tables* of the *CV Support Software Version 2 Operation Manual: Offline* for details.

6-3 Network Diagnosis

1, 2, 3...

1. Select “S:Diagnosis network” from the main online menu. The Netwk Diagnosis menu will appear.



2. Select the required item from the menu.

   The following table lists the SYSMAC NET network diagnostic operations.

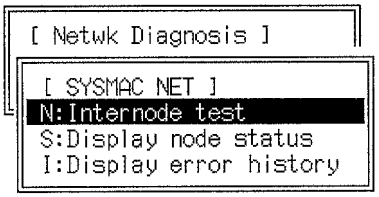
Operation	Function
Internode test	Used to run the loop-back test between the computer and specified node.
Display node status	Used to read status data from the specified SYSMAC NET Link Unit.
Display error history	Used to read and clear the error history.

The following table lists the SYSMAC LINK network diagnostic operations.

Operation	Function
Internode test	Used to run the loop-back test between the computer and specified node.
Broadcast test	Used to run the broadcast test to all nodes in the specified network.
Display node status	Used to read status data from the specified SYSMAC LINK Unit.
Set network parameters	Used to set and change network parameters.
Display error history	Used to read and clear the error history.

6-3-1 SYSMAC NET

Select “N:SYSMAC NET” with the cursor from the Netwk Diagnosis menu and the select the required item from the menu.

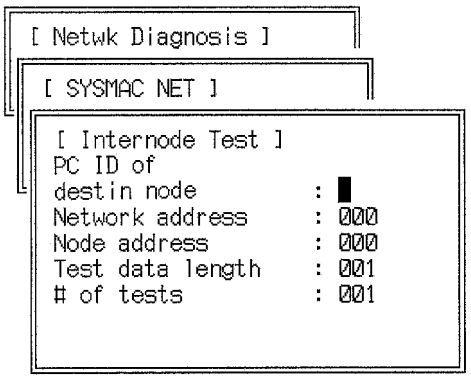


Internode Test

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 the Enter Key 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 the Enter Key. Press the Asterisk Key to specify an endless test.

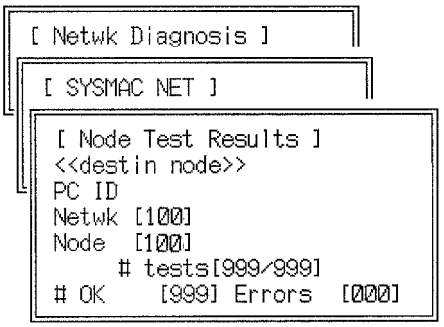
   If the Asterisk Key is pressed to specify an endless test, the test will continue indefinitely until the Esc Key is pressed. Press the Esc Key to interrupt the internode test run.
6. Press the Y and Enter Keys to run the internode test or press the N and Enter Keys to cancel the internode test and return the cursor to the position to input the PC name.

The # Tests results will be displayed as follows:

OK=(999/999)

Set value

Actual number of tests counted.



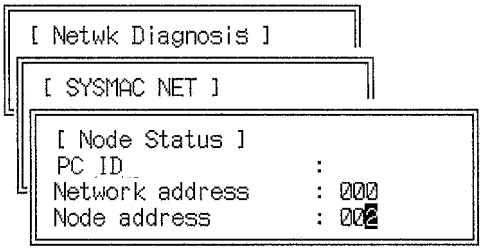
The number of passed and failed internode tests will be displayed.

Displaying the Node Status

This operation reads status data from the specified SYSMAC NET Link Unit.

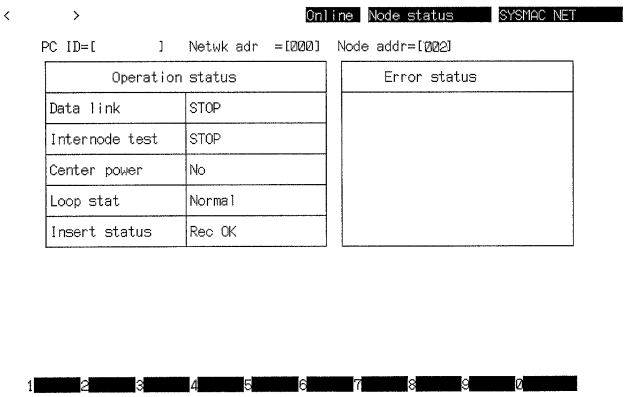
1, 2, 3...

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.

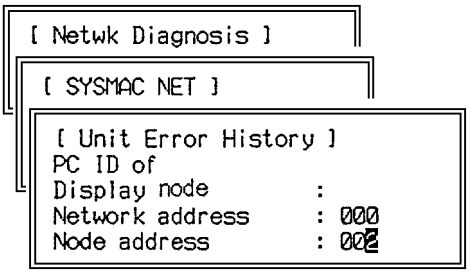
   The operating status and errors will be displayed on the screen.



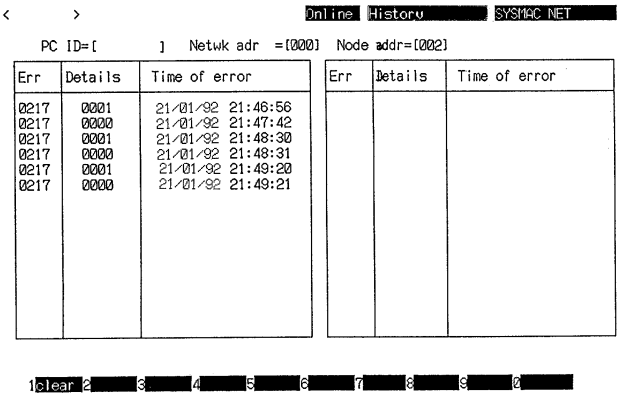
Displaying the Unit Error History

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. 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.

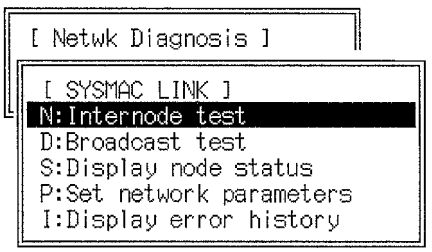


3. Press the F1 Key followed by the Y and Enter Keys to clear the Unit’s error history or press the N and Enter Keys to cancel the clear operation.

Refer to the *SYSMAC NET Link System Manual* for details on errors.

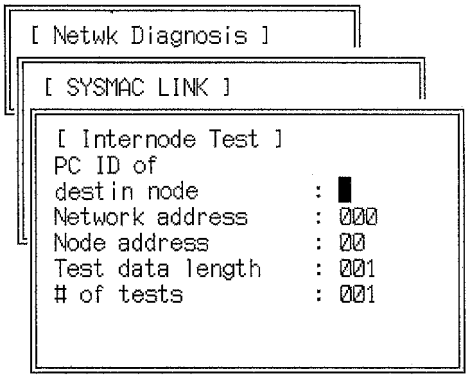
6-3-2 SYSMAC LINK

Select “L:SYSMAC LINK” from the Netwk Diagnosis menu and select the required item from the menu.

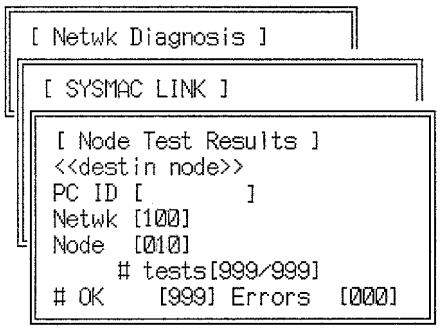


Internode Test This operation is used to run the loop-back test between the computer and a specified node.

1, 2, 3... 1. Select “N:Internode test” from the SYSMAC LINK menu.



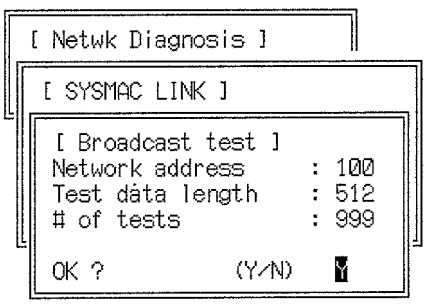
2. The input method and input range of all parameters (except the node address) is identical to the SYSMAC NET internode test.
3. Enter the node address between 0 and 62 and press the Enter Key. The test results display and the key operations are identical to the SYSMAC NET internode test.



Broadcast Test

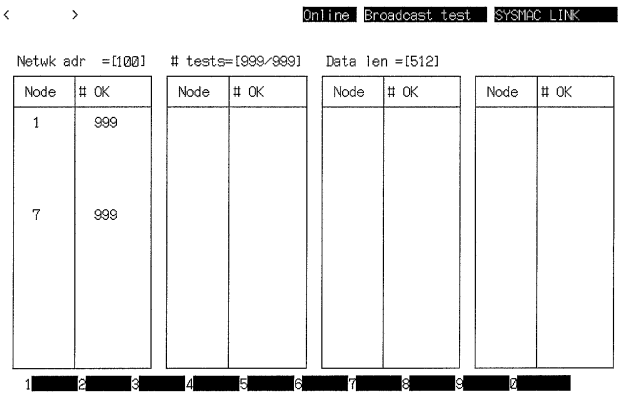
This test sends test data to all nodes connected to a SYSMAC LINK System and counts the number of times data is received back.

1, 2, 3... 1. Select “D:Broadcast test” from the SYSMAC LINK menu.

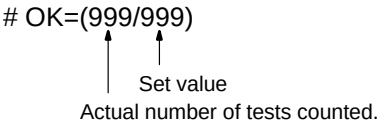


2. Enter the network address between 0 and 127 and press the Down Key.
3. Enter the length of the test data between 1 and 512 and press the Down Key.
4. Enter the number of tests between 1 and 999 and press the Enter Key.

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 # Tests results will be displayed as follows:



The test duration is approximately 2 seconds. 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.

6. Press the Esc Key to interrupt the broadcast test run. The results immediately before the Esc Key was pressed will appear for 62 nodes. Press the Shift+Esc Keys again to display the Netwk Diagnosis menu or the Esc Key to return to the display to input the broadcast test parameters.

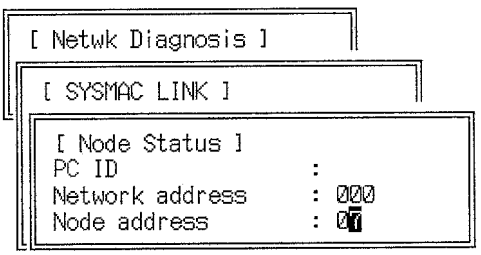
Note The broadcast test cannot be run from a computer connected to a SYSMAC BUS/2 Slave.

Displaying Node Status

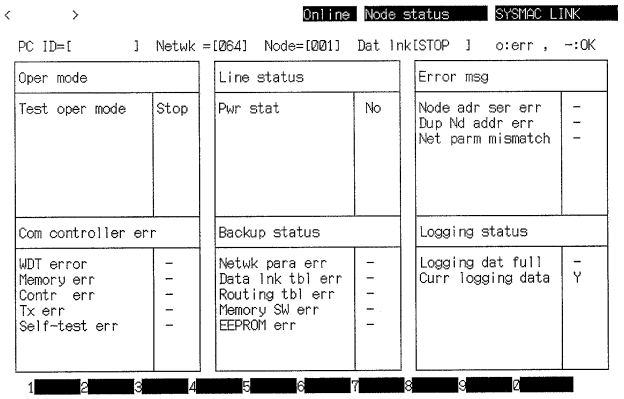
This operation is used to read information from the specified SYSMAC LINK Unit.

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. The PC name can be specified as described above for the internode test.



3. The node status will appear on the screen.

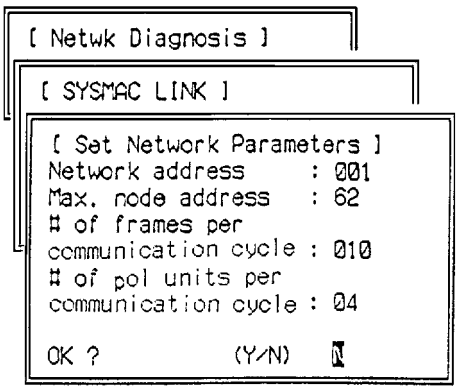
Network Parameters

This operation is used to set and change network parameters. This operation is possible only when the Data Link is stopped.

Stopped	Running
OK	No

1, 2, 3...

1. Select “P:Set network parameters” from the SYSMAC LINK menu to access the following display.

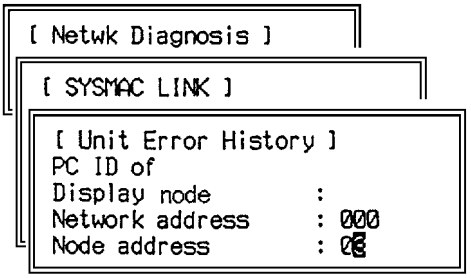


2. Enter the network address between 0 and 127 and press the Enter Key. The maximum node address, total number frames per cycle, and number of frames per polling unit for the specified network will be displayed. An error message will indicate if the specified network address does not exist or is not connected. Select the parameter using the Up and Down Keys and enter the following:
   - Enter the maximum node address between 2 and 62 and press the Enter Key.
   - Enter the total number of frames per cycle between 5 and 255 and press the Enter Key.
   - Enter the number of frames per polling unit between 1 and 61 and press the Enter Key.
3. 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.

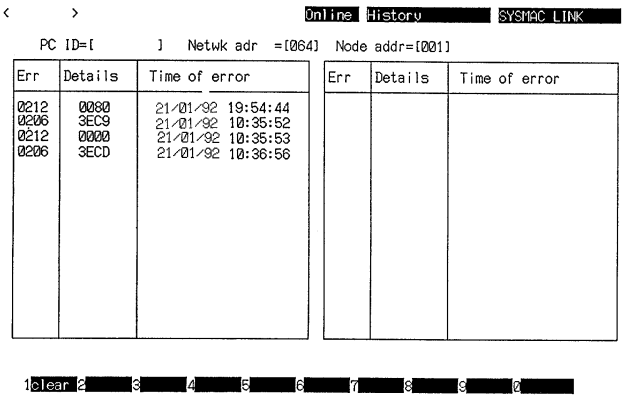
Displaying the Unit Error History

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. 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.

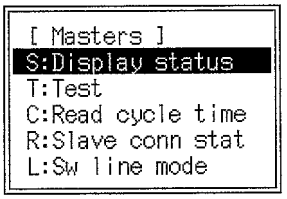


3. If more than 31 errors exist, press the PgDn Key to display the next page of the error history. Press the PgUp Key to return to the previous page.
4. Press the F1 Key followed by the Y and Enter Keys to clear the Unit’s error history or press the N and Enter Keys to cancel the clear operation.

Refer to the *SYSMAC LINK System Manual* for details on errors.

6-4 SYSMAC BUS/2 Support

1, 2, 3... 1. Select “B:SYSMAC BUS/2” from the main online menu. The SYSMAC BUS/2 menu will appear.



2. Select the required item from the menu.

These operations act on SYSMAC BUS/2 Remote I/O Master Units mounted to the PC set with *Dest network addr* of the System Settings.

Operation	Function
Display status	Used to display the contents of the remote status area and terminator information.
Test	Used to test the transfer path between the Master and Slaves.
Read cycle time	Used to read and initialize the Master communication cycle time.
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.
Sw line mode	Used to select the line mode for Optical Masters.

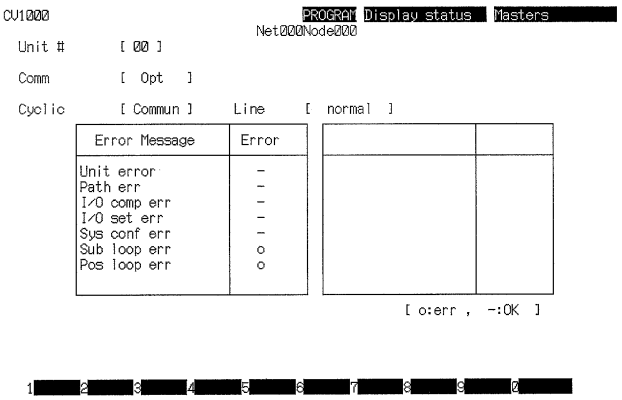
Displaying Status

This operation displays transfer path and terminator status.

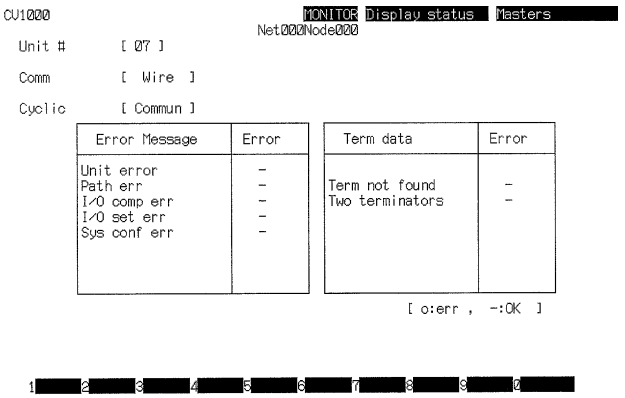
1, 2, 3...

1. Select “S:Display status” from the Masters menu.
2. Input the Master’s unit number between 0 and 15 and press the Enter Key.

The following display will appear for Optical Masters.



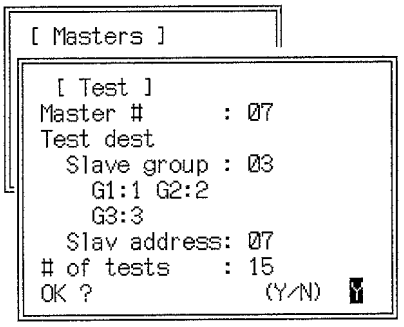
The following display will appear for Wired Masters.



Test

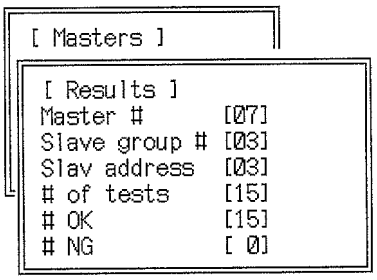
This operation is used to test the transfer path between the Master and Slaves.

1, 2, 3... 1. Select “T:Test” from the Masters menu.



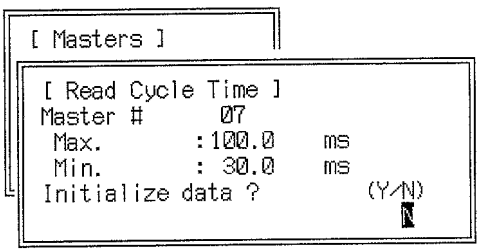
2. Input the Master’s unit number between 0 and 15 and press the Enter Key.
3. Input the Slave group to be tested between 1 and 3 and press the Enter Key.
4. Input the Slave’s unit number (address) to be tested between 0 and 31 and press the Enter Key.
5. Input the number of tests between 1 and 15 and press the Enter Key.
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.



Reading the Cycle Time This operation is used to read and initialize the Master communication cycle time.

1, 2, 3... 1. Select “C:Read cycle time” from the Masters menu. The Master’s unit number and the maximum and minimum values of the actual cycle time will be displayed.



2. Press the Y and Enter Keys to initialize the data or press the N and Enter Keys to return to the menu.

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 the Enter Key.
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.

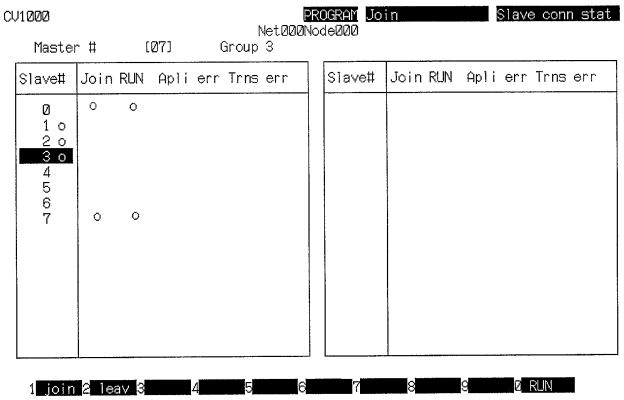
   "o" is displayed in the Trns err column if an error has occurred in the SYSMAC BUS/2 transmission path.

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...

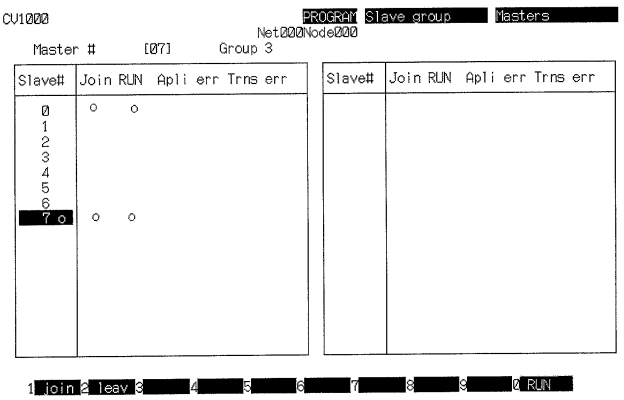
1. Press the F1 (join) Key.



2. Move the cursor to the address of Slave address to be activated.
3. "o" will be displayed when the Enter Key is pressed. Press the Enter Key once more to delete the "o."
4. Press the F10 Key. A prompt message 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. "o" will be displayed when the Enter Key is pressed. Press the Enter Key once more to delete the "o."

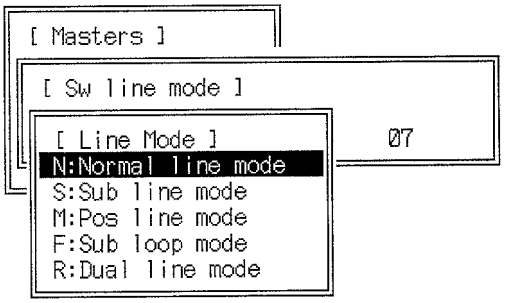
4. Press the F10 Key. A prompt message will appear.
5. Press the Y and Enter Key to make the Slave inactive or press the N and Enter Key to select a new Slave with the cursor.

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 the Enter Key.
3. Select the required line mode.



SECTION 7
Display Operations

This section describes the operations to display and clear errors in the PC and Link Units, to clear the PC access right, and to display and set the PC's clock.

7-1 Displaying Errors

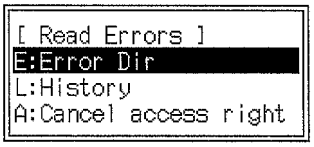
This section describes the following operations:

- Displaying the current PC error directory and clearing the errors.
- Displaying the PC error history and clearing the errors.

This operation is possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

1, 2, 3... 1. Select “V:Display errors” from the main online menu.



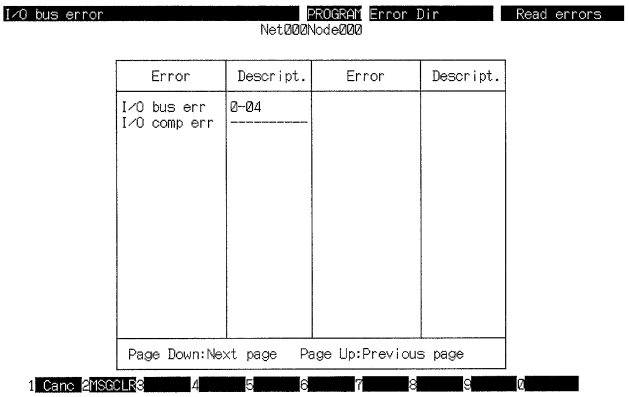
2. Select the required item from the menu.

Function	Operation
Error Dir	Used to display the current PC error directory and to clear specified errors.
History	Used to display the PC error history with dates and times the errors occurred and to clear the recorded history of errors.
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.

Note Access rights to the PC are maintained while using the online editing operations. Access rights can also be acquired by using the MESSAGE instruction. A message on the screen will indicate that you do not have access right when the right is held at another node. Do not use the *Clear access rights* operation in this situation unless you know that doing so is okay. Refer to the *CV500/CV1000 Operation Manual: Host Interface* for details about access rights.

7-1-1 Current Error Directory

1, 2, 3... 1. Select “E:Error Dir” with the cursor from the menu. The current error directory will be displayed.

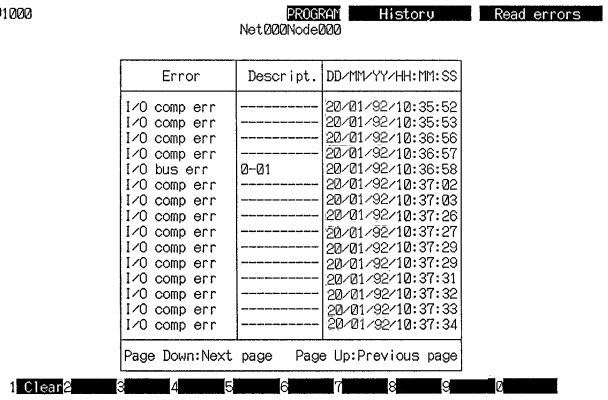


2. If the error directory covers more than one page, press the PgDn Key to display the next page or the PgUp Key to display the previous page of the directory.
3. To enter the mode to clear errors, press the F1 Key with the cursor at the top-left of the screen.

4. Press the Up and Down Keys to move the cursor to the error to be deleted.
5. Press the Enter Key to delete the error.
6. Press the F2 Key to clear messages generated by the MESSAGE instruction. Messages for the MESSAGE instruction are displayed below the error message at the top-left of the display.

7-1-2 Error History

1, 2, 3... 1. Select “L:History” with the cursor from the menu. The error history screen will be displayed.



2. If the error history covers more than one page, press the PgDn Key to display the next page or the PgUp Key to display the previous page of the error history.
3. Press the F1 Key to clear the errors. A prompt message will ask if the error history can be cleared.
4. Press the Y and Enter Keys to clear the error history or press the N and Enter Keys or the Esc Key to cancel the prompt message and return to the error history screen.

7-1-3 Releasing the Access Right

1, 2, 3... 1. Select “A:Cancel access right” with the cursor from the menu. A prompt message will ask if the access right should be released.
2. Press the Y and Enter Keys to release the access rights or press the N and Enter Keys or the Esc Key to return to the menu.

7-2 Displaying and Setting the Clock

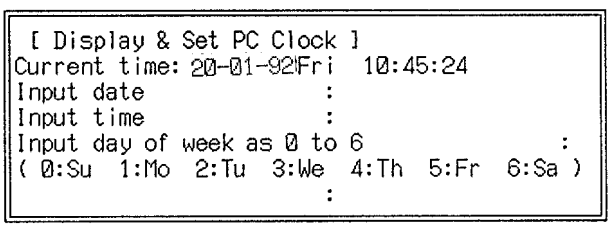
This section describes the following operations:

- Displaying the PC system clock.
- Changing the date, time, and day of the week for the PC system clock.

This operation is possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

1, 2, 3... 1. Select “Y:Display & Set PC Clock” from the menu.



2. Inputting the Date:

   If the current date is correct, press the Enter Key to enter the displayed date.

   To change the date, input the date in the following format:
   0, **8**, (date) **–**, **1**, **1**, (month) **–**, **9**, **1** (year).

3. Inputting the Time:
   If the current time is correct, press the Enter Key to enter the displayed time.

   To change the time, input the time in the following format
   1, **9**, (hour) **:**, **3**, **0**, (minute) **:**, **0**, **0** (second).

4. Inputting the Day of the Week:
   If the current day of the week is correct, press the Enter Key to enter the displayed day.

   To change the day, input the 0 to 6 Keys to input the day of the week as shown on the screen and press the Enter Key.

   The menu will be displayed when the settings are complete.

SECTION 8
File Management Operations

This section describes mainly the operations to transfer data to and from memory cards mounted in the CPU. Although general file management operations are also introduced, these are the same as those in the *CV Support Software Version 2 Operation Manual: Offline* and are thus not described in detail in this manual.

8-1 File Management

This section describes the following operations:

- Displaying, copying, renaming, and deleting files stored in the data disk or hard disk.
- Renaming drives and paths.
- Creating, deleting, and printing directories.

These operations are possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

1, 2, 3... 1. Insert a data disk into the floppy disk drive and select “F:File management” from the main online menu. The File Management menu will be displayed.

2. Select the required operation.

Operation	Function
File dir	Displays directories for a total of 9 file types, including programs, DM, etc.
Copy file	Copies files.
Chge file name	Renames files.
Delete file	Deletes existing files.
Chge drive & path	Changes drive and path names to specify the current directory for save and retrieve operations. The save and retrieve operations from the CVSS menus act on the directory specified with this operation.
Create directory Delete directory	Create: Creates a new directory in the current directory. Delete: Deletes the specified directory in the current directory.
Print	Prints file name tables for specified files.

The menu operations are identical to the offline file management operations. Refer to *6-2 File Management* of the *CV Support Software Version 2 Operation Manual: Offline* for details.

Note The term “path” refers to the route to the target directory. The file name is separated from the directory name by a backslash (\). Multiple directory names are also separated by a backslash (\).

Example: \samples\tests\abc

8-2 Memory Card Operations

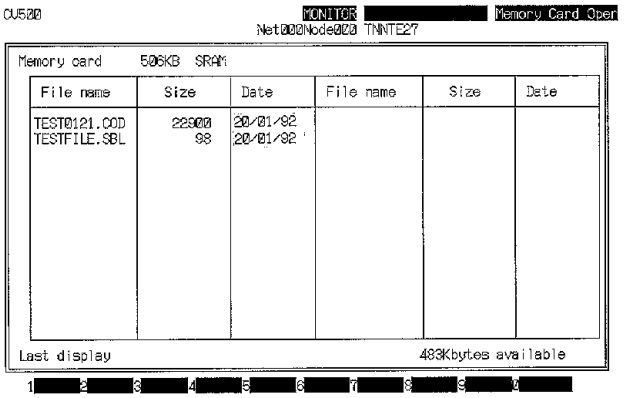
This section describes how to display the file names in the memory card inserted in the PC and manage these files. Only download operations from the memory card to the computer are possible for EEPROM and EPROM memory cards. It is not possible to write data to these types of memory cards.

Note The online memory card operations act on the memory card installed in the memory card drive in the PC.

Complete the following preparations before using these operations:

1, 2, 3... 1. Insert a memory card in the memory card drive.

2. Select “J:Memory card” from the main online menu with the cursor. The files in the memory card will be displayed in a file name table.



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

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

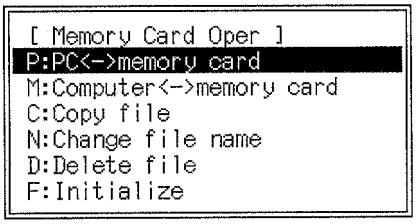
Date: Shows the date when the file was saved.

Up to 28 files can be displayed on a single page. Multiple pages are used to display more than 28 files.

Press the PgDn Key to display the next page.

Press the End Key or Ctrl+M Keys to display the Memory Card Operation menu or press the Esc Key to return to the main online menu.

3. Press the End Key or Ctrl+M Keys to display the Memory Card Operation menu and select the required operation.



Operation		Function
PC <–> memory card	All programs	Transfers all programs between the PC and the memory card inserted in the PC.
	SFC	Transfers the action block for one step of the SFC program from the PC to the memory card inserted in the PC.
	Ladder	Transfers an action program or transition program from the PC to the memory card inserted in the PC.
	IOM	Transfers consecutive multiple IOM words (CIO, G, A, D, E) between the PC and the memory card inserted in the PC.
	PC and SIOU settings	Transfers the extended PC Setup between the PC and the memory card inserted in the PC. This data includes the following: PC Setup, customize settings, I/O table, data link tables, routing tables, communication unit settings, BASIC Unit software switch settings.
Computer <–> memory card		Transfers files between a floppy disk and the memory card inserted in the PC.
Copy file		Copies files in the memory card inserted in the PC.
Change file name		Renames files in the memory card inserted in the PC.
Delete file		Deletes files from the memory card inserted in the PC.
Initialize		Initializes the memory card inserted in the PC. Always use this operation to initialize new memory cards.

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.

File types and their extensions are shown in the table below.

File type	Extension
All programs	.OBJ
SFC programs	.SFC
Ladder programs	.LDP
IOM file data	.IOM
Extended PC setup	.STD

The following table shows the PC modes in which each operation can be used.

Menu	Sub-menu		RUN	MONITOR	DEBUG	PROGRAM
Initialize			OK	OK	OK	OK
PC <–> memory card	PC A memory card	Program	OK	OK	OK	OK
		IOM	OK	OK	OK	OK
		PC and SIOU settings	OK	OK	OK	OK
	Memory card A PC	All programs	No	No	No	OK
		IOM	No	OK	No	OK
		PC and SIOU settings	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

8-2-1 Initialize

1, 2, 3...

1. Select “F:Initialize” from the main menu.

   The memory card drive is drive #0. Press the Enter key.
2. Press the Y and Enter Keys to initialize the memory card.

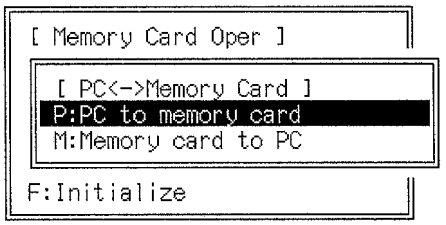
   The Memory Card Menu will be displayed when initialization is complete.

8-2-2 Transfers between PC and Memory Card

File extensions are not required and should not be input for operations in this section.

1, 2, 3...

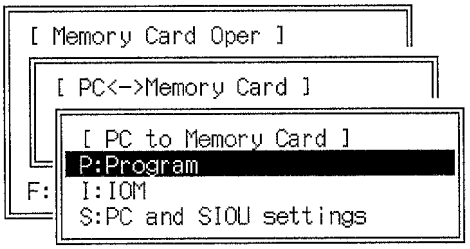
1. Select “P:PC <–> memory card” from the menu to display the following sub-menu.



2. Select the required item from the menu.

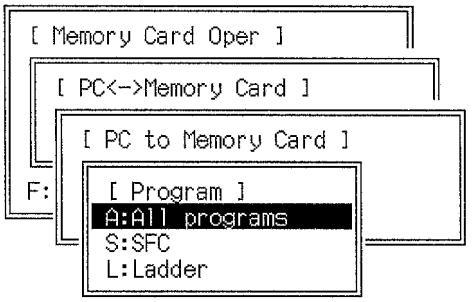
Transfers from PC to Memory Card

Select “P:PC to memory card” from the PC <–> Memory Card menu. The PC to Memory Card menu will be displayed to select the type of data to be transferred.



Programs

Select “P:Program” from the PC to Memory Card menu. The Program menu will be displayed to select the type of program.



All Programs

1, 2, 3...

1. Select “A:All programs” from the Program menu. A file input area will be displayed to input the file name to be transferred.
2. Enter the file name of the programs and press the Enter Key.
3. If the input file name already exists, a message will ask if the file can be updated. Press the Y and Enter Keys to update the file or press the N and Enter Key to cancel and input a new file name.

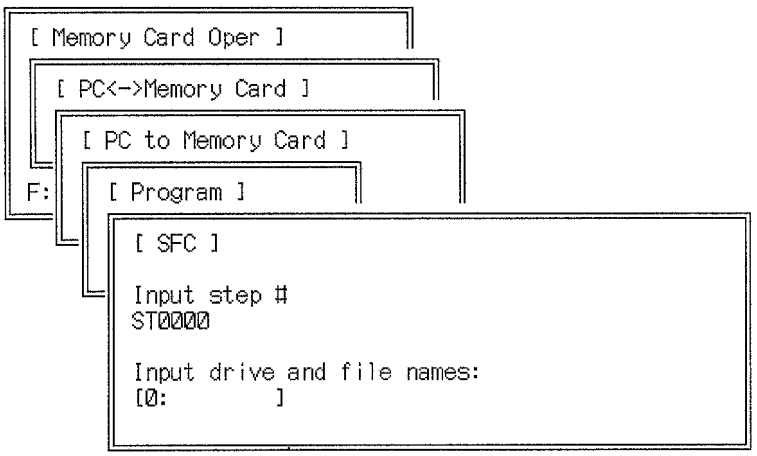
   The Program menu will be displayed when the transfer is complete.

SFC Program

This operation transfers one step of an SFC program from the PC to the memory card inserted in the PC. Ladder programs cannot be transferred with this operation.

1, 2, 3...

1. Select “S:SFC” from the Program menu. An input area will be displayed to input the step number and file name to be transferred.



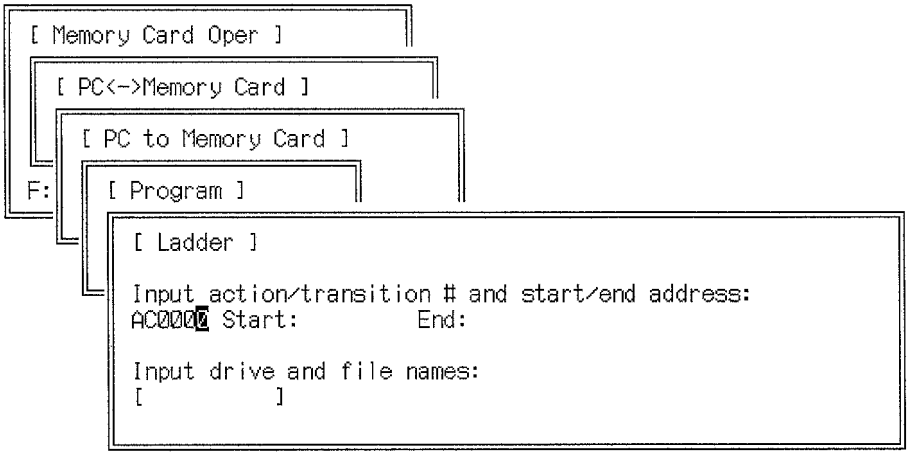
2. Input the step number of the SFC program to be transferred to the memory card and press the Enter Key.
3. Input the file name for the specified step and press the Enter Key.
4. If the input file name already exists, a message will asks if the file can be updated. Press the Y and Enter Keys to update the file or press the N and Enter Key to cancel and input a new file name.

   The Program menu will be displayed when the transfer is complete.

Ladder Programs

This operation is used to transfer an action program or transition program from the PC to the memory card inserted in the PC.

1, 2, 3... 1. Select “L:Ladder” from the Program menu.



2. Input the action or transition number and press the Enter Key.

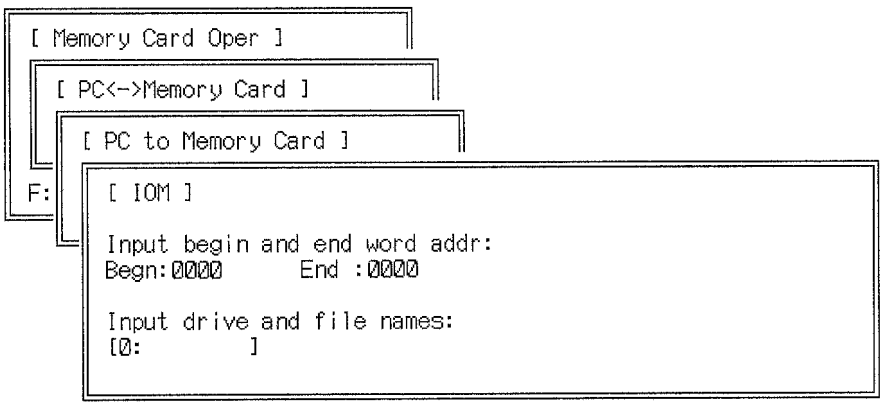
   AC0000 is displayed as the default. To input a transition number, press the F2 Key and enter the transition number.
3. Enter the first program address to be transferred and press the Enter Key.
4. Enter the last program address to be transferred and press the Enter Key.
5. Input the file name of the ladder program and press the Enter Key.
6. If the input file name already exists, a message will ask if the file can be updated. Press the Y and Enter Keys to update the file or press the N and Enter Key to cancel and input a new file name.

   The Program menu will be displayed when the transfer is complete.

IOM

This operation transfers consecutive multiple IOM words (CIO, G, A, D, E) between the PC and the memory card inserted in the PC.

1, 2, 3... 1. Select “I:IOM” from the PC to Memory Card menu.



2. Enter the first word of the IOM to be transferred and press the Enter Key.

   Press the F1 to F4 Key or the F7 Key to specify the memory area for the CPU Bus Link Area, Auxiliary Area, DM Area, or EM area (G, A, D, E) before entering the word address. No specification is necessary for the CIO area.
3. Enter the last word to be transferred and press the Enter Key.
4. Input the file name of the specified IOM and press the Enter Key.
5. If the input file name already exists, a message will ask if the file can be updated. Press the Y and Enter Keys to update the file or press the N and Enter Key to cancel and input a new file name.

   The Program menu will be displayed when the transfer is complete.

Extended PC Setup

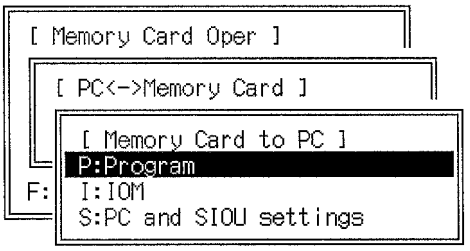
1, 2, 3...

1. Select “S:PC and SIOU settings” from the PC to Memory Card menu.
2. Input the file name of the extended PC setup file and press the Enter Key.
3. If the input file name already exists, a message asks if the file can be updated. Press the Y and Enter Keys to update the file or press the N and Enter Key to cancel and input a new file name.

   The Program menu will be displayed when the transfer is complete.

Transfer from Memory Card to PC

Select “M:Memory Card to PC” from the PC <–> Memory Card menu. The Memory Card to PC menu will be displayed to select the type of data to be transferred.



All Programs

1, 2, 3...

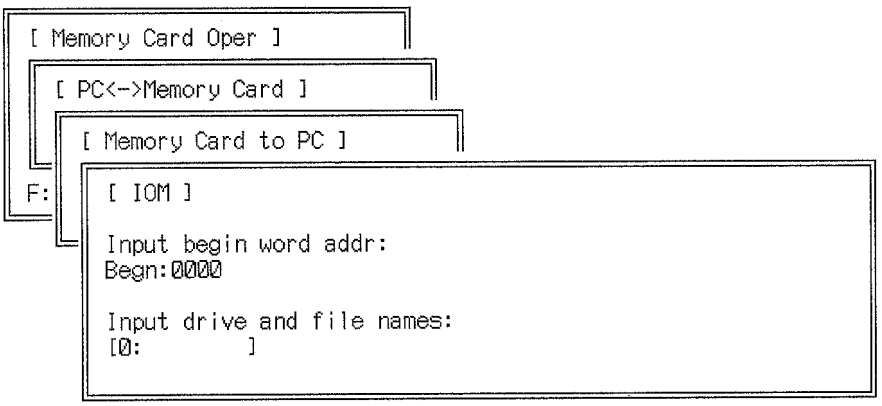
1. Select “P:Programs” from the Memory Card to PC menu. A file input area will be displayed.
2. Enter the file name and press the Enter Key. A message will indicate if the specified file name does not exist. The Memory Card to PC menu will be displayed when the transfer is complete.

IOM

This operation transfers IOM word data (CIO, G, A, D, E) from a specified start word to a PC from a memory card inserted in the PC.

1, 2, 3...

1. Select “I:IOM” from the Memory Card to PC menu.



2. Enter the start word in the PC where data is to be transferred and press the Enter Key. Press the F1 to F4 Key or the F7 Key to specify the memory area for the CPU Bus Link Area, Auxiliary Area, DM Area, or EM area (G, A, D, E) before entering the word address. No specification is necessary for the CIO area.
3. Input the file name and press the Enter Key. A message will indicate if the specified file name does not exist. The Memory Card to PC menu will be displayed when the transfer is complete.

Note If the upper limit of the CIO or CPU Bus Link Area (CIO 2555, G255) is exceeded when specifying a transfer to one of these memory areas, the data above the upper limit will be transferred to the next area of the memory.

Extended PC Setup

1, 2, 3...

1. Select "S:PC and SIOU settings" from the Memory Card to PC menu. A file input area will be displayed.
2. Enter the drive name and file name where data is to be transferred and press the Enter Key. A message will indicate if the specified file name does not exist. The Memory Card to PC menu will be displayed when the transfer is complete.

8-2-3 Transfer between Computer and Memory Card

Select "M:Computer <--> memory card" from the main menu, select the required transfer direction and then proceed as shown below.

Transfer from Computer to Memory Card

1, 2, 3...

1. Select "F:Computer -> memory card" from the menu. A file name input area will be displayed.
2. Enter the name of the file to be transferred to the memory card. Press the End Key or Ctrl+M Keys to display the file names, select the required file name, and press the Enter Key twice.
3. Enter the file name to be used in the memory card and press the Enter Key.

   The previous menu will be displayed after the file is transferred to the Memory Card inserted in the PC.

Transfer from Memory Card to Computer

1, 2, 3...

1. Select "M:Memory card -> Computer" from the menu.

   A file name input area will be displayed.
2. Enter the name of the file to be transferred from the memory card and press the Enter Key.
3. Enter the file name to be used on the data disk or hard disk and press the Enter Key.

   The previous menu will be displayed after the file is transferred to the data disk.

8-2-4 Copying Files

1, 2, 3...

1. Select "C:Copy file" from the main menu. A file name input area will be displayed.
2. Enter the source file name and press the Enter Key.
3. Enter the destination file name and press the Enter Key.

   The main menu will be displayed when the copy is complete.

8-2-5 Changing Files

1, 2, 3...

1. Select "N:Change file name" from the main menu. A file name input area will be displayed.

2. Enter the file name to be changed and press the Enter Key.
3. Enter the new file name and press the Enter Key.

   The main menu will be displayed when the file is changed.

8-2-6 Deleting Files

1, 2, 3...

1. Select “D:Delete file” from the main menu. A file name input area will be displayed.
2. Enter the file name to be deleted and press the Enter Key. A confirmation message will be displayed.
3. Press the Y and Enter Keys to delete the file.

or Press the Enter Key to cancel the file delete operation.

SECTION 9
System Setup Operations

This section describes operations used to control CVSS and PC system operation. These include operations to set the host interface with the PC and other CVSS operating parameters, editing and transferring the PC Setup, transferring customized PC settings, and protecting the user memory in the PC.

9-1 System Setup

This section describes setting the communication conditions for the computer and PCs connected online to it. Set up the computer to match the connected peripherals.

Changes to the host link communication specifications with the online system setup operations affect the PC. However, settings of the destination network address and printer type act on the computer.

This operation is possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

1, 2, 3...

1. Select “Q:System setup” from the main online menu. The System Setup menu will be displayed with the current settings shown at the right side.
2. Select items on the menu and make any required changes to the settings.

```
[ System Setup ]
N:Dest network addr     (Net:000 Node:000 PC ID:        )
C:Host Link specs       (COM1)
P:Printer type          (WIDE CARRIAGE GRAPHICS)
M:Message #             ( 0 )
```

The function key menu will change as shown below when the Shift Key is pressed:

Press the Shift+F7 to Shift+F10 Keys to change the mode of connected PCs.

The following table lists the system setup menu operations.

Operation	Function
Dest network addr	Specifies the PC network address and node address for computer communications. PC names may be specified.
Host link specs	Changes the host interface specifications for PCs communicating with the computer. The PC communication port number, baud rate, PC unit number, parity, data length, and number of stop bits can be changed with this operation.
Printer type	Specifies the type of printer connected to the computer.
Message #	Sets the message number displayed on the computer by the MESSAGE instruction (MSG(195)).

9-1-1 Destination Network

This operation is identical to the offline *Dest network addr* operation. Refer to *7-1 System Setup* of the *CV Support Software Version 2: Offline* for details.

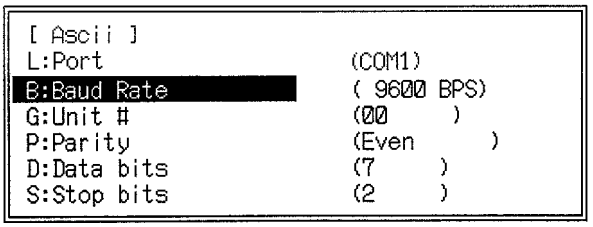
Note If the destination PC is on another network, the routing tables must be set and transferred before using this operation.

Refer to *4-6 Editing Network Support Tables* of the *CV Support Software Version 2: Offline* for details about setting the routing table.

Refer to *6-2 File Management* of the *CV Support Software Version 2: Offline* for details about transferring the routing table.

9-1-2 Host Interface Specifications

The menu shown in the diagram will be displayed when *Host link spec* is selected from the menu. The current settings are shown at the right side of the menu.



Press the Up and Down Keys to select items on the menu and make any required changes to the settings.

This operation is identical to the offline *Comm Use* operation. Refer to *7-1-1 Communications Mode* of the *CV Support Software Version 2: Offline* for details.

Note

1. The communications port setting cannot be changed online. Use the offline operation to change this setting.
2. A communications error will result if the communications specifications are changed during online connection. Use the offline *Comm Use* operation to change the communications specifications. Refer to *7-1-1 Communications Mode* of the *CV Support Software Version 2: Offline* for details.

9-1-3 Printer Type

This operation is identical to the offline *Printer type* operation. Refer to *7-1 System Setup* of the *CV Support Software Version 2: Offline* for details.

9-1-4 Message Number

This operation is identical to the offline *Message #* operation. Refer to *7-1 System Setup* of the *CV Support Software Version 2: Offline* for details.

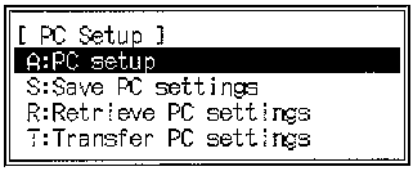
9-2 PC Setup

This section describes the following operations:

- Saving and retrieving the PC Setup to and from the data disk and hard disk.
- Transferring the PC Setup between the PC and the work disk.
- Setting and changing the system set-up data in the PC.

1, 2, 3...

1. Select “A:PC setup” from the main online menu. The PC Setup menu will be displayed.



2. Select the required operation.

Operation	Function
PC setup	Sets or changes the PC Setup in the PC.
Save PC settings	Saves the PC Setup in the PC to the data disk or hard disk.
Retrieve PC settings	Retrieves the PC Setup from the data disk or hard disk to the PC.
Transfer PC settings	Transfers the PC Setup between the PC and the work disk.

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		No	No	No	OK
Retrieve PC settings		OK	OK	OK	OK
Transfer PC settings	PC A Computer	OK	OK	OK	OK
	Computer A PC	No	No	No	OK

9-2-1 Setting the PC Setup

This operation is identical to the offline *PC setup* operation. Refer to *7-2 PC Set-up* of the *CV Support Software Version 2: Offline* for details.

9-2-2 Saving PC Settings

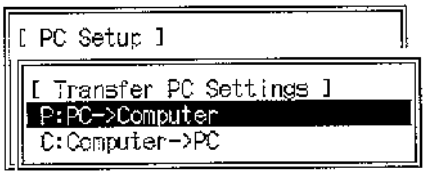
This operation is identical to the offline *Save PC settings* operation. Refer to *7-2 PC Setup* of the *CV Support Software Version 2: Offline* for details.

9-2-3 Retrieving PC Settings

This operation is identical to the offline *Retrieve PC settings* operation. Refer to *7-2 PC Setup* of the *CV Support Software Version 2: Offline* for details.

9-2-4 Transferring PC Settings

A menu will be displayed to select the transfer direction.



Select *PC* A *Computer* to upload the PC Setup from the PC to the work disk or select *Computer* A *PC* to download the PC Setup from the work disk to the PC.

A message will flash during the transfer.

9-3 Customization

This section describes how to transfer the customized data set offline to the PC. The customize data set offline is effective only after it is transferred to the PC.

The following data can be transferred:

- Customized function codes
- Custom data areas

This operation is possible in any PC Mode.

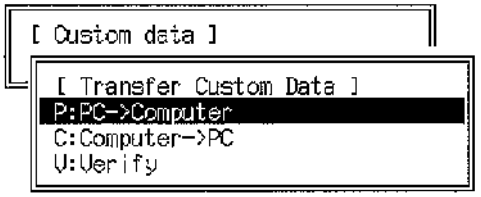
RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

The following table lists the customize table operations.

Operation	Function
PC –> Computer	Transfer customized data from the PC to the computer work disk.
Computer –> PC	Transfer customized data from the computer work disk to the PC.
Compare	Compares the customized data between the PC and computer work disk.

1, 2, 3... 1. Select “Z:Customize” from the main online menu. The Custom Data menu will be displayed.

2. Press the Enter Key to select the *Transfer custom data* item. The Transfer Custom Data menu will be displayed.



9-3-1 Uploading Customized Data

1, 2, 3... 1. Display the Transfer Custom Data sub-menu.
2. Select “P:PC A Computer” from the sub-menu. A message will flash during the transfer and the percentage complete will be displayed. A message will indicate when transfer is complete.
3. Press the Esc Key or Shift+Esc Keys to return to the Transfer Custom Data menu.

9-3-2 Downloading Customized Data

1, 2, 3... 1. Display the Transfer Custom Data sub-menu.
2. Select “C:Computer A PC” from the sub-menu. A message will flash during the transfer and the percentage complete will be displayed. A message will indicate when transfer is complete.
3. Press the Esc Key or Shift+Esc Keys to return to the Transfer Custom Data menu.

9-3-3 Compare

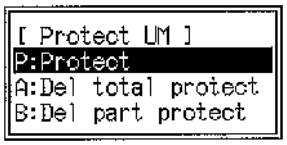
1, 2, 3... 1. Display the Transfer Custom Data sub-menu.
2. Select “V:Verify” from the sub-menu. A message will flash during the comparison and the percentage complete will be displayed. A message will indicate the results of the comparison.

9-4 Protecting UM

This operation can be used to set or cancel total or partial protection for the PC user program memory (UM). Partial protection is applied to individual sheets of the SFC program and to individual action or transition programs. For ladder-only programming, protection is set for individual programs (e.g., interrupt programs). This operation is possible in any PC mode.

RUN	MONITOR	DEBUG	PROGRAM
OK	OK	OK	OK

Caution The program transfer operations and clear operations can still be performed to change or delete the entire user program even if it is protected with this operation.

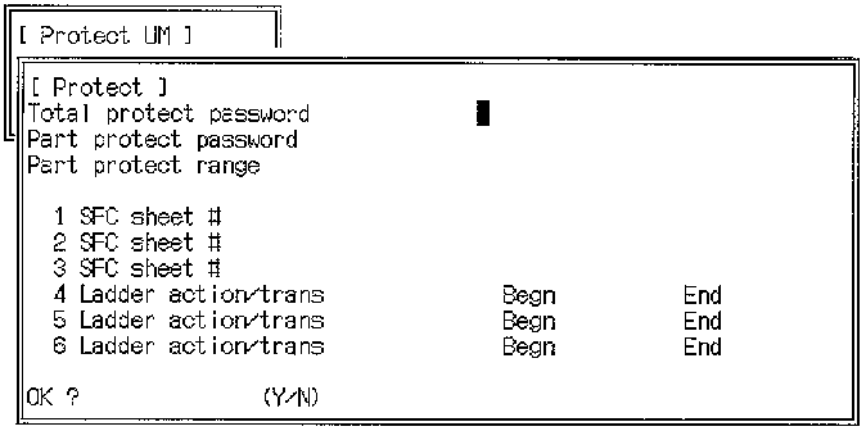


Function	Operation
Protect	Used to protect all or part of the user program in the PC. Individual sheets or action/transition programs can be protected. For ladder-only programming, protection is set for individual programs (e.g., interrupt programs).
Del total protect	Used to clear all program protection.
Del part protect	Used to clear part of the program protection.

Note If the protected sheets include an initial step, the online delete, change, and append operations cannot be used on initial steps in other, unprotected sheets.

9-4-1 Protecting the UM

Select “P:Protect” from the Protect UM menu.



This operation is identical to the offline *Protect UM* operation. Refer to *6-3 UM Conversion* in the *CV Support Software Version 2: Offline* for details.

9-4-2 Clearing All Protection

1, 2, 3... 1. Select “A:Del total protect” from the Protect UM menu.

2. Enter the password and press the Enter Key.

3. A prompt will ask if the protection can be cleared.

   Press the Y and Enter Keys to clear the protection or press the Enter Key or N and Enter Keys return to the password input screen.

9-4-3 Partially Clearing Protection

1, 2, 3... 1. Select “B:Del part protect” from the Protect UM menu.

2. Enter the password and press the Enter Key.

3. A prompt will ask if the protection can be cleared.

   Press the Y and Enter Keys to cancel the protection or press the Enter Key or N and Enter Keys return to the password input screen.

Glossary

action In SFC programs, the individual executable elements in an action block. An action can be defined either as a ladder diagram or as a single bit in memory.

Action Area A memory area that contains flags that indicate when actions are active.

action block A collection of all the actions for a single step in an SFC program. Each action is accompanied by its action qualifier, set value, and feedback variable.

action number A number assigned to an action. Each action has a unique number. These numbers are used to access and to control the status of the action.

action program A ladder diagram program written to define an action.

action qualifier A designation made for a action to control when the action is to be executed in respect to the status of the step.

active status One of the two main statuses that a step can be in. Active status includes pause, halt, and execute status.

active step A step that is in either pause, halt, or execute status. There can be more than one active step.

address A number used to identify the location of data or programming instructions in memory or to identify the location of a network or a unit in a network.

advanced instruction An instruction input with a function code that handles data processing operations within ladder diagrams, as opposed to a basic instruction, which makes up the fundamental portion of a ladder diagram.

allocation The process by which the PC assigns certain bits or words in memory for various functions. This includes pairing I/O bits to I/O points on Units.

analog Something that represents or can process a continuous range of values as opposed to values that can be represented in distinct increments. Something that represents or can process values represented in distinct increments is called digital.

Analog I/O Unit I/O Units that convert I/O between analog and digital values. An Analog Input Input converts an analog input to a digital value for processing by the PC. An Analog Output Unit converts a digital value to an analog output.

AND A logic operation whereby the result is true if and only if both premises are true. In ladder-diagram programming the premises are usually ON/OFF states of bits or the logical combination of such states called execution conditions.

AQ See *action qualifier*.

area See *data area* and *memory area*.

area prefix A one or two letter prefix used to identify a memory area in the PC. All memory areas except the CIO area require prefixes to identify addresses in them.

ASCII Short for American Standard Code for Information Interchange. ASCII is used to code characters for output to printers and other external devices.

asynchronous execution Execution of programs and servicing operations in which program execution and servicing are not synchronized with each other.

Auxiliary Area A PC data area allocated to flags and control bits.

auxiliary bit A bit in the Auxiliary Area.

back-up A copy made of existing data to ensure that the data will not be lost even if the original data is corrupted or erased.

bank One of multiple sections of a storage area for data or settings. The EM Area is divided into banks each of which is accessed using the same addresses, but different bank numbers.

BASIC A common programming language. BASIC Units are programmed in BASIC.

basic instruction A fundamental instruction used in a ladder diagram. See *advanced instruction*.

Basic Rack Any of the following Racks: CPU Rack, Expansion CPU Rack, or Expansion I/O Rack.

BASIC Unit A CPU Bus Unit used to run programs in BASIC.

baud rate The data transmission speed between two devices in a system measured in bits per second.

BCD Short for binary-coded decimal.

binary A number system where all numbers are expressed in base 2, i.e., numbers are written using only 0's and 1's. Each group of four binary bits is equivalent to one hexadecimal digit. Binary data in memory is thus often expressed in hexadecimal for convenience.

binary-coded decimal A system used to represent numbers so that every four binary bits is numerically equivalent to one decimal digit.

bit The smallest piece of information that can be represented on a computer. A bit has the value of either zero or one, corresponding to the electrical signals ON and OFF. A bit represents one binary digit. Some bits at particular addresses are allocated to special purposes, such as holding the status of input from external devices, while other bits are available for general use in programming.

bit address The location in memory where a bit of data is stored. A bit address specifies the data area and word that is being addressed as well as the number of the bit within the word.

bit number A number that indicates the location of a bit within a word. Bit 00 is the rightmost (least-significant) bit; bit 15 is the leftmost (most-significant) bit.

block See *logic block* and *instruction block*.

block comment A comment placed in a ladder diagrams that provides user information on an instruction block.

branching In SFC programs, a means of controlling program flow so that one step leads to two or more steps. See *conditional branch* and *parallel branch*.

buffer A temporary storage space for data in a computerized device.

building-block PC A PC that is constructed from individual components, or “building blocks.” With building-block PCs, there is no one Unit that is independently identifiable as a PC. The PC is rather a functional assembly of Units.

bus A communications path used to pass data between any of the Units connected to it.

bus bar The line leading down the left and sometimes right side of a ladder diagram. Instruction execution proceeds down the bus bar, which is the starting point for all instruction lines.

bus link A data link that passed data between two Units across a bus.

byte A unit of data equivalent to 8 bits, i.e., half a word.

central processing unit A device that is capable of storing programs and data, and executing the instructions contained in the programs. In a PC System, the central processing unit executes the program, processes I/O signals, communicates with external devices, etc.

channel See *word*.

character code A numeric (usually binary) code used to represent an alphanumeric character.

checksum A sum transmitted with a data pack in communications. The checksum can be recalculated from the received data to confirm that the data in the transmission has not been corrupted.

CIO Area A memory area used to control I/O and to store and manipulate data. CIO Area addresses do not require prefixes.

common (link) parameter table A table of settings in a SYSMAC LINK System that specifies what words are to be used in the data links for all PCs in the SYSMAC LINK System. See *refresh parameter table*.

common data Data that is stored in a memory of a PC and which is shared by other PCs in the same the same system. Each PC has a specified section(s) of the area allocated to it. Each PC writes to the section(s) allocated to it and reads the sections allocated to the other PCs with which it shares the common data.

Completion Flag A flag used with a timer or counter that turns ON when the timer has timed out or the counter has reached its set value.

condition A symbol placed on an instruction line to indicate an instruction that controls the execution condition for the terminal instruction. Each condition is assigned a bit in memory that determines its status. The status of the bit assigned to each condition determines the next execution condition. Conditions correspond to LOAD, LOAD NOT, AND, AND NOT, OR, or OR NOT instructions.

conditional branch A branch in an SFC program where one step is connected to multiple steps but the active status can be transferred to only one step at a time.

conditional join In an SFC program, a location where multiple steps coming from the same conditional branch return to a single step.

constant An input for an operand in which the actual numeric value is specified. Constants can be input for certain operands in place of memory area addresses. Some operands must be input as constants.

continued instruction line An automatic process on a Programming Device whereby a single instruction is split in two to allow it to fit on the display. The continuation of the instruction line is indicated by two solid boxes, one at the end of the first line and one at the beginning of the second line, and the two resulting lines are treated as a single instruction line.

control bit A bit in a memory area that is set either through the program or via a Programming Device to achieve a specific purpose, e.g., a Restart Bit is turned ON and OFF to restart a Unit.

control signal A signal sent from the PC to effect the operation of the controlled system.

Control System All of the hardware and software components used to control other devices. A Control System includes the PC System, the PC programs, and all I/O devices that are used to control or obtain feedback from the controlled system.

controlled system The devices that are being controlled by a PC System.

count pulse The signal counted by a counter.

counter A dedicated group of digits or words in memory used to count the number of times a specific process has occurred, or a location in memory accessed through a TC bit and used to count the number of times the status of a bit or an execution condition has changed from OFF to ON.

CPU See *central processing unit*.

CPU Bus Unit A special Unit used with CV-series PCs that mounts to the CPU bus. This connection to the CPU bus enables special data links, data transfers, and processing.

CPU Rack The main Rack in a building-block PC, the CPU Rack contains the CPU, a Power Supply, and other Units. The CPU Rack, along with the Expansion CPU Rack, provides both an I/O bus and a CPU bus.

cross-reference An operation that searches the program for usage of a specific data area bit or word to see where and how the bit or word is being used. Used during program changes and debugging.

C-series PC Any of the following PCs: C2000H, C1000H, C500, C200H, C40H, C28H, C20H, C60K, C60P, C40K, C40P, C28K, C28P, C20K, C20P, C120, or C20.

custom data area A data area defined by the user within the CIO Area. Custom data areas can be set from the CVSS and certain other Programming Devices.

CV Support Software A programming package run on an IBM PC/AT or compatible to serve as a Programming Device for CV-series PCs.

CV-mode A form of communications useable only with CV-series PCs. See *C-mode*.

CV-series PC Any of the following PCs: CV500, CV1000, CV2000, or CVM1

CVSS See *CV Support Software*.

cycle One unit of processing performed by the CPU, including SFC/ladder program execution, peripheral servicing, I/O refreshing, etc. The cycle is called the scan with C-series PCs.

cycle time The time required to complete one cycle of CPU processing.

cyclic interrupt See *scheduled interrupt.*

data area An area in the PC's memory that is designed to hold a specific type of data.

data area boundary The highest address available within a data area. When designating an operand that requires multiple words, it is necessary to ensure that the highest address in the data area is not exceeded.

data disk A disk that is used to store user data.

data length In communications, the number of bits that is to be treated as one unit in data transmissions.

data link An automatic data transmission operation that allows PCs or Units within PC to pass data back and forth via common data areas.

data link area A common data area established through a data link.

data link table A table of settings kept in memory that specifies what words are to be part of a data link for all PCs involved in the link.

data register A storage location in memory used to hold data. In CV-series PCs, data registers are used with or without index registers to hold data used in indirect addressing.

data trace A process in which changes in the contents of specific memory locations are recorded during program execution.

data transfer Moving data from one memory location to another, either within the same device or between different devices connected via a communications line or network.

debug A process by which a draft program is corrected until it operates as intended. Debugging includes both the removal of syntax errors, as well as the fine-tuning of timing and coordination of control operations.

DEBUG mode A mode of PC operation which enables basic debugging of user programs.

decimal A number system where numbers are expressed to the base 10. In a PC all data is ultimately stored in binary form, four binary bits are often used to represent one decimal digit, via a system called binary-coded decimal.

decrement Decreasing a numeric value, usually by 1.

default A value automatically set by the PC when the user does not specifically set another value. Many devices will assume such default conditions upon the application of power.

definer A number used as an operand for an instruction but that serves to define the instruction itself, rather that the data on which the instruction is to operate. Definers include jump numbers, subroutine numbers, etc.

destination The location where an instruction places the data on which it is operating, as opposed to the location from which data is taken for use in the instruction. The location from which data is taken is called the source.

differentiated instruction An instruction that is executed only once each time its execution condition goes from OFF to ON. Non-differentiated instructions are executed for each scan as long as the execution condition stays ON.

differentiation instruction An instruction used to ensure that the operand bit is never turned ON for more than one scan after the execution condition goes either from OFF to ON for a Differentiate Up instruction or from ON to OFF for a Differentiate Down instruction.

digit A unit of storage in memory that consists of four bits.

DIP switch Dual in-line package switch, an array of pins in a signal package that is mounted to a circuit board and is used to set operating parameters.

distributed control A automation concept in which control of each portion of an automated system is located near the devices actually being controlled, i.e., control is decentralized and 'distributed' over the system. Distributed control is a concept basic to PC Systems.

DM Area A data area used to hold only word data. Words in the DM area cannot be accessed bit by bit.

DM word A word in the DM Area.

downloading The process of transferring a program or data from a higher-level or host computer to a lower-level or slave computer. If a Programming Device is involved, the Programming Device is considered the host computer.

DR See *data register*.

dummy step A step in an SFC program that contains no actions, such as one used to transfer execution to a subroutine.

EEPROM Electrically erasable programmable read-only memory; a type of ROM in which stored data can be erased and reprogrammed. This is accomplished using a special control lead connected to the EEPROM chip and can be done without having to remove the EEPROM chip from the device in which it is mounted.

electrical noise Random variations of one or more electrical characteristics such as voltage, current, and data, which might interfere with the normal operation of a device.

EM Area Extended Data Memory Area; an area that can be optionally added to certain PCs to enable greater data storage. Functionally, the EM Area operates like the DM Area. Area addresses are prefixes with E and only words can be accessed. The EM Area is separated into multiple banks.

entry step A step in SFC programming that begins a subchart or interrupt program.

entry terminal A triangular symbol in SFC programming that comes before the entry step in a subchart or interrupt program.

EPROM Erasable programmable read-only memory; a type of ROM in which stored data can be erased, by ultraviolet light or other means, and reprogrammed.

error code A numeric code generated to indicate that an error exists, and something about the nature of the error. Some error codes are generated by the system; others are defined in the program by the operator.

Error Log Area An area in System DM that is used to store records indicating the time and nature of errors that have occurred in the system.

even parity A communication setting that adjusts the number of ON bits so that it is always even. See *parity*.

event processing Processing that is performed in response to an event, e.g., an interrupt signal.

execution condition The ON or OFF status under which an instruction is executed. The execution condition is determined by the logical combination of conditions on the same instruction line and up to the instruction currently being executed.

execution cycle The cycle used to execute all processes required by the CPU, including program execution, I/O refreshing, peripheral servicing, etc.

execution time The time required for the CPU to execute either an individual instruction or an entire program.

Expansion CPU Rack A Rack connected to the CPU Rack to increase the virtual size of the CPU Rack. Units that may be mounted to the CPU Backplane may also be mounted to the Expansion CPU Backplane.

Expansion I/O Rack A Rack used to increase the I/O capacity of a PC. In CV-Series PC, either one Expansion I/O Rack can be connected directly to the CPU or Expansion CPU Rack or multiple Expansion I/O Racks can be connected by using an I/O Control and I/O Interface Units.

FA Factory automation.

factory computer A general-purpose computer, usually quite similar to a business computer, that is used in automated factory control.

FAL error An error generated from the user program by execution of an FAL(006) instruction.

FALS error An error generated from the user program by execution of an FALS(007) instruction or an error generated by the system.

FAT File Allocation Table. This is an area of a floppy or hard disk which contains information about the location of the files on the disk.

fatal error An error that stops PC operation and requires correction before operation can continue.

fatal SFC error An error in SFC programming that makes further program execution impossible.

FCS See *frame checksum*.

feedback variable One of the input fields in an action block in a SFC program. Memory area addresses can be input for feedback variables as desired by the user, but do not affect operation in any way.

file directory A list of the files on a floppy or hard disk.

filename extension The portion of a filename after the period. The extension can be no longer than 3 characters. It is usually used to indicate the type of the file (e.g. BAS indicates files containing BASIC programs, and DAT indicates files containing data).

FINS See *CV-mode*.

flag A dedicated bit in memory that is set by the system to indicate some type of operating status. Some flags, such as the carry flag, can also be set by the operator or via the program.

force reset The process of forcibly turning OFF a bit via a programming device. Bits are usually turned OFF as a result of program execution.

force set The process of forcibly turning ON a bit via a programming device. Bits are usually turned ON as a result of program execution.

forced status The status of bits that have been force reset or force set.

frame checksum The results of exclusive ORing all data within a specified calculation range. The frame checksum can be calculated on both the sending and receiving end of a data transfer to confirm that data was transmitted correctly.

function code A two-digit number used to input an instruction into the PC.

FV See *feedback variable*.

GPC An acronym for Graphic Programming Console.

Graphic Programming Console A programming device with advanced programming and debugging capabilities to facilitate PC operation. A Graphic Programming Console is provided with a large display onto which ladder-diagram programs can be written directly in ladder-diagram symbols for input into the PC without conversion to mnemonic form.

guidance display Messages that appear on-screen to aid the operator.

halt One of the three active statuses of steps in an SFC program. Steps in halt status are not executed.

hardware error An error originating in the hardware structure (electronic components) of the PC, as opposed to a software error, which originates in software (i.e., programs).

hexadecimal A number system where all numbers are expressed to the base 16. In a PC all data is ultimately stored in binary form, however, displays and inputs on Programming Devices are often expressed in hexadecimal to simplify operation. Each group of four binary bits is numerically equivalent to one hexadecimal digit.

hold bit A bit in memory designated to maintain status when the PC's operating mode is changed or power is turned off and then back on.

hold Rack A Rack designated to maintain output status when the PC's operating mode is changed or power is turned off and then back on.

holding area Words in memory designated to maintain status when the PC's operating mode is changed or power is turned off and then back on.

host computer A computer that is used to transfer data to or receive data from a PC in a Host Link system. The host computer is used for data management and overall system control. Host computers are generally small personal or business computers.

host interface An interface that allows communications with a host computer.

Host Link System A system with one or more host computers connected to one or more PCs via Host Link Units or host interfaces so that the host computer can be used to transfer data to and from the PC(s). Host Link Systems enable centralized management and control of PC Systems.

Host Link Unit An interface used to connect a C-series PC to a host computer in a Host Link System.

I/O allocation The process by which the PC assigns certain bits in memory for various functions. This includes pairing I/O bits to I/O points on Units.

I/O bit A bit in memory used to hold I/O status. Input bits reflect the status of input terminals; output bits hold the status for output terminals.

I/O Block Either an Input Block or an Output Block. I/O Blocks provide mounting positions for replaceable relays.

I/O capacity The number of inputs and outputs that a PC is able to handle. This number ranges from around one hundred for smaller PCs to two thousand for the largest ones.

I/O comment A comment in a program that is related to the use of operands.

I/O Control Unit A Unit mounted to the CPU Rack to monitor and control I/O points on Expansion CPU Racks or Expansion I/O Racks.

I/O delay The delay in time from when a signal is sent to an output to when the status of the output is actually in effect or the delay in time from when the status of an input changes until the signal indicating the change in the status is received.

I/O device A device connected to the I/O terminals on I/O Units, Special I/O Units, etc. I/O devices may be either part of the Control System, if they function to help control other devices, or they may be part of the controlled system.

I/O Interface Unit A Unit mounted to an Expansion CPU Rack or Expansion I/O Rack to interface the Rack to the CPU Rack.

I/O interrupt An interrupt generated by a signal from I/O.

I/O interrupt entry terminal An entry terminal for an I/O interrupt program.

I/O interrupt return terminal A return terminal for an I/O interrupt program.

I/O name A name assigned to a bit or word used in a program that can be used to input the bit or word, or can be displayed to indicate the bit or word on a monitor.

I/O point The place at which an input signal enters the PC System, or at which an output signal leaves the PC System. In physical terms, I/O points correspond to terminals or connector pins on a Unit; in terms of programming, an I/O points correspond to I/O bits in the IR area.

I/O refreshing The process of updating output status sent to external devices so that it agrees with the status of output bits held in memory and of updating input bits in memory so that they agree with the status of inputs from external devices.

I/O response time The time required for an output signal to be sent from the PC in response to an input signal received from an external device.

I/O table A table created within the memory of the PC that lists the I/O words allocated to each Unit in the PC System. The I/O table can be created by, or modified from, a Programming Device.

I/O Terminal A Remote I/O Unit connected in a Wired Remote I/O System to provide a limited number of I/O points at one location. There are several types of I/O Terminals.

I/O Unit The most basic type of Unit mounted to a Backplane. I/O Units include Input Units and Output Units, each of which is available in a range of specifications. I/O Units do not include Special I/O Units, Link Units, etc.

I/O verification error A error generated by a disagreement between the Units registered in the I/O table and the Units actually mounted to the PC.

I/O word A word in the CIO area that is allocated to a Unit in the PC System and is used to hold I/O status for that Unit.

IBM PC/AT or compatible A computer that has similar architecture to, that is logically compatible with, and that can run software designed for an IBM PC/AT computer.

immediate refreshing A form of I/O refreshing that is executed by certain types of instruction when the instruction is executed to ensure that the most current input status is used for an operand or to ensure that an output is effective immediately.

inactive status The status of a step in an SFC program in which the actions within that step are not executed, with the exception of any actions with action qualifiers that extend execution beyond active status. Inactive status also enables a step to go into active status provided other conditions are met.

increment Increasing a numeric value, usually by 1.

index register A data storage location used with or without a data register in indirect addressing.

initial step A step that automatically goes to active status when SFC program execution is begun.

initialize Part of the startup process whereby some memory areas are cleared, system setup is checked, and default values are set.

input The signal coming from an external device into the PC. The term input is often used abstractly or collectively to refer to incoming signals.

input bit A bit in the CIO area that is allocated to hold the status of an input.

Input Block A Unit used in combination with a Remote Interface to create an I/O Terminal. An Input Block provides mounting positions for replaceable relays. Each relay can be selected according to specific input requirements.

input device An external device that sends signals into the PC System.

input point The point at which an input enters the PC System. Input points correspond physically to terminals or connector pins.

input signal A change in the status of a connection entering the PC. Generally an input signal is said to exist when, for example, a connection point goes from low to high voltage or from a nonconductive to a conductive state.

Input Terminal An I/O Terminal that provides input points.

insert The process by which a program section held in a peripheral device is saved in PC memory at the location just prior to the last program section that was saved.

instruction A direction given in the program that tells the PC of the action to be carried out, and the data to be used in carrying out the action. Instructions can be used to

simply turn a bit ON or OFF, or they can perform much more complex actions, such as converting and/or transferring large blocks of data.

instruction block A group of instructions that is logically related in a ladder-diagram program. A logic block includes all of the instruction lines that interconnect with each other from one or more line connecting to the left bus bar to one or more right-hand instructions connecting to the right bus bar.

instruction execution time The time required to execute an instruction. The execution time for any one instruction can vary with the execution conditions for the instruction and the operands used in it.

instruction line A group of conditions that lie together on the same horizontal line of a ladder diagram. Instruction lines can branch apart or join together to form instruction blocks. Also called a rung.

interface An interface is the conceptual boundary between systems or devices and usually involves changes in the way the communicated data is represented. Interface devices such as NSBs perform operations like changing the coding, format, or speed of the data.

intermediate code A coding form for programs that is partway between the user-written code and machine language code.

intermediate instruction An instruction other than one corresponding to a condition that appears in the middle of an instruction line and requires at least one more instruction between it and the right bus bar.

interrupt (signal) A signal that stops normal program execution and causes a subroutine to be run or other processing to take place.

Interrupt Input Unit A Rack-mounting Unit used to input external interrupts into a PC System.

interrupt program A program that is executed in response to an interrupt.

inverse condition See *normally closed condition*.

IOIF An acronym for I/O Interface Unit.

IOM (Area) A collective memory area containing all of the memory areas that can be accessed by bit, including timer and counter Completion Flags. The IOM Area includes all memory area memory addresses between 0000 and 0FFF.

JIS An acronym for Japanese Industrial Standards.

joining A process used in SFC programs to return execution from steps on multiple branch lines to a single step.

jump A type of programming where execution moves directly from one point in a program to another, without sequentially executing any instructions in between. Jumps in ladder diagrams are usually conditional on an execution condition; jumps in SFC programs are conditional on the step status and transition condition status before the jump.

jump number A definer used with a jump that defines the points from and to which a jump is to be made.

Kanji character A character in one of the three sets of characters used to write the Japanese language

keyed retrieval A method for searching for text that allows an item to be found though inputting only a portion of it. For example, I/O comments can be found by inputting only a portion from the beginning of the text string of which the I/O comment exists.

ladder diagram (program) A form of program arising out of relay-based control systems that uses circuit-type diagrams to represent the logic flow of programming instructions. The appearance of the program is similar to a ladder, and thus the name.

ladder diagram symbol A symbol used in drawing a ladder-diagram program.

leading zero One of one or more consecutive zeros in the leftmost digits of an address or numeric value.

least-significant (bit/word) See *rightmost (bit/word)*.

LED Acronym for light-emitting diode; a device used as for indicators or displays.

leftmost (bit/word) The highest numbered bits of a group of bits, generally of an entire word, or the highest numbered words of a group of words. These bits/words are often called most-significant bits/words.

link A hardware or software connection formed between two Units. “Link” can refer either to a part of the physical connection between two Units or a software connection created to data existing at another location (i.e., data links).

Link Area A data area that is designed for use in data links.

link parameter table See *common link parameter table*.

Link System A system used to connect remote I/O or to connect multiple PCs in a network. Link Systems include the following: SYSMAC BUS Remote I/O Systems, SYSMAC BUS/2 Remote I/O Systems, SYSMAC LINK Systems, Host Link Systems, and SYSMAC NET Link Systems.

Link Unit Any of the Units used to connect a PC to a Link System. These include Remote I/O Units, SYSMAC LINK Units, and SYSMAC NET Link Units.

load The processes of copying data either from an external device or from a storage area to an active portion of the system such as a display buffer. Also, an output device connected to the PC is called a load.

local network table A table that specifies all of the networks that a PC belongs to and the unit numbers of the Units connecting the PC to each of these networks.

logic block A group of instructions that is logically related in a ladder-diagram program and that requires logic block instructions to relate it to other instructions or logic blocks.

logic block instruction An instruction used to locally combine the execution condition resulting from a logic block with a current execution condition. The current execution condition could be the result of a single condition, or of another logic block. AND Load and OR Load are the two logic block instructions.

loop-back The processes of using an alternate communications path that runs in the reverse direction of the normal communications path to prevent communications from being disabled when communications along the normal path are not possible.

machine code The binary program code that is actual executed by a CPU.

machine language A programming language in which the program is written directly into machine code.

main program All of a program except for subroutine and interrupt programs.

mark trace A process in which changes in the contents of specific memory locations are recorded during program execution using MARK (174) instructions.

masked bit A bit whose status has been temporarily made ineffective.

masking 'Covering' an interrupt signal so that the interrupt is not effective until the mask is removed.

Master Short for Remote I/O Master Unit.

master In a SYSMAC NET Link System, a Unit specified to manage network communications.

master number A number assigned to a master in a SYSMAC NET Link System. This number is different from the unit number.

MCR Unit Magnetic Card Reader Unit.

megabyte A unit of storage equal to one million bytes.

memory area Any of the areas in the PC used to hold data or programs.

memory card A data storage media similar to a floppy disk.

memory switch A bit or bits in memory that are used to set operating parameters similar to the way a hardware switch would be.

message number A number assigned to a message generated with the MSG(195) instruction.

mnemonic code A form of a ladder-diagram program that consists of a sequential list of the instructions without using a ladder diagram.

MONITOR mode A mode of PC operation in which normal program execution is possible, and which allows modification of data held in memory. Used for monitoring or debugging the PC.

most-significant (bit/word) See *leftmost (bit/word).*

MS-DOS An operating system in common use on smaller computers.

NC input An input that is normally closed, i.e., the input signal is considered to be present when the circuit connected to the input opens.

negative delay A delay set for a data trace in which recording data begins before the trace signal by a specified amount.

nesting Programming one loop within another loop, programming a call to a subroutine within another subroutine, or programming an IF–ELSE programming section within another IF–ELSE section.

Network Service Board A device with an interface to connect devices other than PCs to a SYSMAC NET Link System.

Network Service Unit A Unit that provides two interfaces to connect peripheral devices to a SYSMAC NET Link System.

network support table Tables of settings used to establish operating parameters for SYSMAC LINK and SYSMAC NET Link Systems.

NO input An input that is normally open, i.e., the input signal is considered to be present when the circuit connected to the input closes.

node One of the positions in a LAN. Each node incorporates a device that can communicate with the devices at all of the other nodes. The device at a node is identified by the node number.

node number A number used to identify a node on a network. The node number of a CV-series PC is called the “unit number” in the PC Setup.

noise interference Disturbances in signals caused by electrical noise.

nonfatal error A hardware or software error that produces a warning but does not stop the PC from operating.

non-fatal SFC error An error in SFC programming that does not make further program execution impossible, but that may be an indication of a problem in programming.

normal condition See *normally open condition*.

normally closed condition A condition that produces an ON execution condition when the bit assigned to it is OFF, and an OFF execution condition when the bit assigned to it is ON.

normally open condition A condition that produces an ON execution condition when the bit assigned to it is ON, and an OFF execution condition when the bit assigned to it is OFF.

NOT A logic operation which inverts the status of the operand. For example, AND NOT indicates an AND operation with the opposite of the actual status of the operand bit.

object code The code that a program is converted to before actual execution. See *source code*.

octal A number system where all numbers are expressed in base 8, i.e., numbers are written using only numerals 0 through 7.

odd parity A communications setting that adjusts the number of ON bits so that it is always odd. See *parity*.

OFF The status of an input or output when a signal is said not to be present. The OFF state is generally represented by a low voltage or by non-conductivity, but can be defined as the opposite of either.

OFF delay The delay between the time when a signal is switched OFF (e.g., by an input device or PC) and the time when the signal reaches a state readable as an OFF signal (i.e., as no signal) by a receiving party (e.g., output device or PC).

offline The state in which a Programming Device is not functionally connected to the CPU, although it may be connected physically.

offset A positive or negative value added to a base value such as an address to specify a desired value.

ON The status of an input or output when a signal is said to be present. The ON state is generally represented by a high voltage or by conductivity, but can be defined as the opposite of either.

ON delay The delay between the time when an ON signal is initiated (e.g., by an input device or PC) and the time when the signal reaches a state readable as an ON signal by a receiving party (e.g., output device or PC).

online The state in which a Programming Device is functionally connected to the CPU so that CPU data and programs can be monitored or accessed.

online edit An edit to a program made from a peripheral device connected to and currently online with a PC in PROGRAM or MONITOR mode. In MONITOR mode, this means that the program is changed while it is actually being executed.

on-line removal Removing a Rack-mounted Unit for replacement or maintenance during PC operation.

operand The values designated as the data to be used for an instruction. An operand can be input as a constant expressing the actual numeric value to be used or as an address to express the location in memory of the data to be used.

operand bit A bit designated as an operand for an instruction.

operand word A word designated as an operand for an instruction.

operating error An error that occurs during actual PC operation as opposed to an initialization error, which occurs before actual operations can begin.

optical cable link In a Wired Remote I/O System, an optical cable connecting two Converting Link Adapters.

optical communications A communications method in which signals are sent over optical fiber cable to prevent noise interference and increase transmission distance.

Optical I/O Unit A Unit that is connected in an Optical Remote I/O System to provide 8 I/O points. Optical I/O Units are not mounted to a Rack.

Optical Master Short for Optical Remote I/O Master Unit.

Optical Slave Rack A Slave Rack connected through an Optical Remote I/O Slave Unit.

OR A logic operation whereby the result is true if either of two premises is true, or if both are true. In ladder-diagram programming the premises are usually ON/OFF states of bits or the logical combination of such states called execution conditions.

output The signal sent from the PC to an external device. The term output is often used abstractly or collectively to refer to outgoing signals.

output bit A bit in the IR area that is allocated to hold the status to be sent to an output device.

Output Block A Unit used in combination with a Remote Interface to create an I/O Terminal. An Output Block provides mounting positions for replaceable relays. Each relay can be selected according to specific output requirements.

output device An external device that receives signals from the PC System.

output point The point at which an output leaves the PC System. Output points correspond physically to terminals or connector pins.

output signal A signal being sent to an external device. Generally an output signal is said to exist when, for example, a connection point goes from low to high voltage or from a nonconductive to a conductive state.

Output Terminal An I/O Terminal that provides output points.

overflow The state where the capacity of a data storage location has been exceeded.

overwrite Changing the content of a memory location so that the previous content is lost.

parallel branch A branch in an SFC program where one step is connection to multiple steps and the active status must be transferred to all of the steps.

parallel join In an SFC program, a location where multiple steps coming from the same parallel branch return to a single step.

Parameter Area A part of System DM used to designate various PC operating parameters.

Parameter Backup Area A part of System DM used to back up the Parameter Area.

parity Adjustment of the number of ON bits in a word or other unit of data so that the total is always an even number or always an odd number. Parity is generally used to check the accuracy of data after being transmitted by confirming that the number of ON bits is still even or still odd.

parity check Checking parity to ensure that transmitted data has not been corrupted.

pause One of the three active statuses of steps in an SFC program. Steps in pause status are not executed.

PC An acronym for Programmable Controller.

PC configuration The arrangement and interconnections of the Units that are put together to form a functional PC.

PC System With building-block PCs, all of the Racks and independent Units connected directly to them up to, but not including the I/O devices. The boundaries of a PC System are the PC and the program in its CPU at the upper end; and the I/O Units, Special I/O Units, Optical I/O Units, Remote Terminals, etc., at the lower end.

PCB An acronym for printed circuit board.

PC Setup A group of operating parameters set in the PC from a Programming Device to control PC operation.

Peripheral Device Devices connected to a PC System to aid in system operation. Peripheral devices include printers, programming devices, external storage media, etc.

peripheral servicing Processing signals to and from peripheral devices, including refreshing, communications processing, interrupts, etc.

PID Unit A Unit designed for PID control.

polling The process whereby a devices consecutively sends signals to other devices in the same network to pass data back and forth, e.g., as in a data link.

positive delay A delay set for a data trace in which recording data begins after the trace signal by a specified amount.

positive loop The normal loop used for communications. See *negative loop*.

power-off interrupt An interrupt executed when power to the PC is turned off.

power-on interrupt An interrupt executed when power to the PC is turned on.

present value The current value registered in a device at any instant during its operation. Present value is abbreviated as PV. The use of this term is generally restricted to timers and counters.

printed circuit board A board onto which electrical circuits are printed for mounting into a computer or electrical device.

PROGRAM mode A mode of operation that allows inputting and debugging of programs to be carried out, but that does not permit normal execution of the program.

Programmable Controller A computerized device that can accept inputs from external devices and generate outputs to external devices according to a program held in memory. Programmable Controllers are used to automate control of external devices. Although single-unit Programmable Controllers are available, building-block Programmable Controllers are constructed from separate components. Such Programmable Controllers are formed only when enough of these separate components are assembled to form a functional assembly, i.e., there is no one individual Unit called a PC.

programmed alarm An alarm given as a result of execution of an instruction designed to generate the alarm in the program, as opposed to one generated by the system.

programmed error An error arising as a result of the execution of an instruction designed to generate the error in the program, as opposed to one generated by the system.

programmed message A message generated as a result of execution of an instruction designed to generate the message in the program, as opposed to one generated by the system.

Programming Console The simplest form or programming device available for a PC. Programming Consoles are available both as hand-held models and as CPU-mounting models.

Programming Device A Peripheral Device used to input a program into a PC or to alter or monitor a program already held in the PC. There are dedicated programming devices, such as Programming Consoles, and there are non-dedicated devices, such as a host computer.

PROM Programmable read-only memory; a type of ROM into which the program or data may be written after manufacture, by a customer, but which is fixed from that time on.

PROM Writer A peripheral device used to write programs and other data into a ROM for permanent storage and application.

prompt A message or symbol that appears on a display to request input from the operator.

protocol The parameters and procedures that are standardized to enable two devices to communicate or to enable a programmer or operator to communicate with a device.

PV — See *present value*.

Rack — An assembly that forms a functional unit in a Rack PC System. A Rack consists of a Backplane and the Units mounted to it. These Units include the Power Supply, CPU, and I/O Units. Racks include CPU Racks, Expansion I/O Racks, and I/O Racks. The CPU Rack is the Rack with the CPU mounted to it. An Expansion I/O Rack is an additional Rack that holds extra I/O Units. An I/O Rack is used in the C2000H Duplex System, because there is no room for any I/O Units on the CPU Rack in this System.

rack number — A number assigned to a Rack according to the order that it is connected to the CPU Rack, with the CPU Rack generally being rack number 0.

Rack PC — A PC that is composed of Units mounted to one or more Racks. This configuration is the most flexible, and most large PCs are Rack PCs. A Rack PC is the opposite of a Package-type PC, which has all of the basic I/O, storage, and control functions built into a single package.

RAM — Random access memory; a data storage media. RAM will not retain data when power is disconnected.

RAS — An acronym for reliability, assurance, safety.

read-only area — A memory area from which the user can read status but to which data cannot be written.

refresh — The process of updating output status sent to external devices so that it agrees with the status of output bits held in memory and of updating input bits in memory so that they agree with the status of inputs from external devices.

refresh parameter (table) — A table of settings that specifies which words in the data links for a System are to be refreshed for a particular PC. See *common link parameter table*.

Register Area — A memory are that contains both index registers and data registers.

relay network table — A table of settings that specifies which node in a network must be passed through to reach another network.

relay-based control — The forerunner of PCs. In relay-based control, groups of relays are interconnected to form control circuits. In a PC, these are replaced by programmable circuits.

Remote I/O Master Unit — The Unit in a Remote I/O System through which signals are sent to all other Remote I/O Units. Remote I/O Master Unit is generally abbreviated to Master.

Remote I/O Slave Unit — A Unit mounted to a Backplane to form a Slave Rack. Remote I/O Slave Unit is generally abbreviated to simply “Slave.”

Remote I/O Subsystem — A Master and all of the Remote I/O Units connected in series to it.

Remote I/O System — A system in which remote I/O points on Slaves are controlled through one or more Masters mounted to a CPU or Expansion CPU Rack.

Remote I/O Unit — Any of the Units in a Remote I/O System. Remote I/O Units include Masters, Slaves, Optical I/O Units, and I/O Terminals.

remote I/O word — An I/O word allocated to a Unit in a Remote I/O System.

reserved bit A bit that is not available for user application.

reserved word A word in memory that is reserved for a special purpose and cannot be accessed by the user.

reset The process of turning a bit or signal OFF or of changing the present value of a timer or counter to its set value or to zero.

response monitoring time The time a device will wait for a response to a data transmission before assuming that an error has occurred.

Restart Bit A bit used to restart a Unit mounted to a PC.

restart continuation A process which allows memory and program execution status to be maintained so that PC operation can be restarted from the state it was in when operation was stopped by a power interruption.

retrieve The processes of copying data either from an external device or from a storage area to an active portion of the system such as a display buffer. Also, an output device connected to the PC is called a load.

retry The process whereby a device will re-transmit data which has resulted in an error message from the receiving device.

return step A step in SFC programming that ends a subroutine or interrupt program.

return terminal A triangular symbol in SFC programming that comes after the return step in a subroutine or interrupt program.

reverse video Displaying characters on a monitor so that the normal colors of the characters and the background are reversed.

right-hand instruction See *terminal instruction*.

rightmost (bit/word) The lowest numbered bits of a group of bits, generally of an entire word, or the lowest numbered words of a group of words. These bits/words are often called least-significant bits/words.

rising edge The point where a signal actually changes from an OFF to an ON status.

ROM Read only memory; a type of digital storage that cannot be written to. A ROM chip is manufactured with its program or data already stored in it and can never be changed. However, the program or data can be read as many times as desired.

routing table Tables of setting that specify what networks a device is a member of and what nodes must be passed through to reach other specific networks. See *local network table* and *relay network table*.

RS-232C interface An industry standard for serial communications.

RS-422 interface An industry standard for serial communications.

RUN mode The operating mode used by the PC for normal control operations.

rung See *instruction line*.

scan The process used to execute a ladder-diagram program. The program is examined sequentially from start to finish and each instruction is executed in turn

based on execution conditions. The scan also includes peripheral processing, I/O refreshing, etc. The scan is called the cycle with CV-series PCs.

scan time The time required for a single scan of a ladder-diagram program.

scheduled interrupt An interrupt that is automatically generated by the system at a specific time or program location specified by the operator. Scheduled interrupts result in the execution of specific subroutines that can be used for instructions that must be executed repeatedly at a specified interval of time.

screen editor A program that is used on-screen to edit files.

self diagnosis A process whereby the system checks its own operation and generates a warning or error if an abnormality is discovered.

sequential function chart A programming method that allows overall processing to be programmed as a flowchart of steps and detailed processing to be programmed as actions within each step.

series A wiring method in which Units are wired consecutively in a string. In Link Systems wired through Link Adapters, the Units are still functionally wired in series, even though Units are placed on branch lines.

servicing The process whereby the PC provides data to or receives data from external devices or remote I/O Units, or otherwise handles data transactions for Link Systems.

set The process of turning a bit or signal ON.

set value The value from which a decrementing counter starts counting down or to which an incrementing counter counts up (i.e., the maximum count), or the time from which or for which a timer starts timing. Set value is abbreviated SV.

SFC An acronym for sequential function chart.

SFC jump A type of programming where execution moves directly from one step in a program to another step, without sequentially executing the steps in between.

SFC jump entry The symbol or process used in an SFC program to indicate an SFC jump.

sheet A unit of programming in an SFC program. There is a limit on the number of steps that can be contained within a single sheet and the types of processes that can take place between sheets.

SIOU See *Special I/O Unit*.

Slave See *Remote I/O Slave Unit*.

Slave Rack A Rack containing a Remote I/O Slave Unit and controlled through a Remote I/O Master Unit. Slave Racks are generally located away from the CPU Rack.

software error An error that originates in a software program.

software protect A means of protecting data from being changed that uses software as opposed to a physical switch or other hardware setting.

software switch See *memory switch*.

source code The code in which a program is written, e.g., ASCII. Source code must be converted to object code before execution.

Special I/O Unit A Unit that is designed for a specific purpose. Special I/O Units include Position Control Units, High-speed Counter Units, Analog I/O Units, etc.

SRAM Static random access memory; a data storage media.

step A basic unit of execution in an SFC program. Steps are used to organize an SFC program by process and control the overall flow of program execution.

Step Area A memory area that contains a flag that indicates the status of steps in an SFC program.

step timer A timer used to time execution of actions within a step in an SFC program.

store The process by which a program section held in a peripheral device is saved in PC memory at the same location from which it was read.

string A sequence of letters, numbers, and/or symbols stored in memory.

subchart A section of an SFC program that is executed like a subroutine. See *subroutine*.

subchart dummy step A step in an SFC program that is used to call (activate) a subchart.

subchart entry step A step in SFC programming that begins a subchart.

subchart entry terminal A triangular symbol in SFC programming that comes before the entry step in a subchart.

subchart return step A step in SFC programming that ends a subchart.

subchart return terminal A triangular symbol in SFC programming that comes after the return step in subchart.

sub-loop A line mode used in a Remote I/O System to maintain communications when an error occurs on the positive line.

subroutine A group of instructions placed separate from the main program and executed only when called from the main program or activated by an interrupt.

subroutine number A definer used to identify the subroutine that a subroutine call or interrupt activates.

SV Abbreviation for set value.

synchronous execution Execution of programs and servicing operations in which program execution and servicing are synchronized so that all servicing operations are executed each time the programs are executed.

syntax The form of a program statement (as opposed to its meaning). For example, the two statements, `LET A=B+B` and `LET A=B*2` use different syntaxes, but have the same meaning.

syntax error An error in the way in which a program is written. Syntax errors can include 'spelling' mistakes (i.e., a function code that does not exist), mistakes in specifying operands within acceptable parameters (e.g., specifying read-only bits as a

destination), and mistakes in actual application of instructions (e.g., a call to a subroutine that does not exist).

SYSMAC BUS/2 Remote I/O System A remote I/O system used to enable placing Slaves at remote locations to extend the applicable range of a PC System.

SYSMAC LINK System A communications system used to create data links and enable network communications between PCs.

SYSMAC NET Link System An optical LAN formed from PCs connected through SYSMAC NET Link Units. A SYSMAC NET Link System also normally contains nodes interfacing computers and other peripheral devices. PCs in the SYSMAC NET Link System can pass data back and forth, receive commands from any interfaced computer, and share any interfaced peripheral device.

SYSMAC NET Link Unit The Unit used to connect PCs to a SYSMAC NET Link System.

system configuration The arrangement in which Units in a System are connected. This term refers to the conceptual arrangement and wiring together of all the devices needed to comprise the System. In OMRON terminology, system configuration is used to describe the arrangement and connection of the Units comprising a Control System that includes one or more PCs.

System DM A dedicated portion of the DM area that is used for special purposes in controlling and managing the PC. Includes the Program Version, Parameter Area, Parameter Backup Area, User Program Header, and Error Log Area.

system error An error generated by the system, as opposed to one resulting from execution of an instruction designed to generate an error.

system error message An error message generated by the system, as opposed to one resulting from execution of an instruction designed to generate a message.

terminal instruction An instruction placed on the right side of a ladder diagram that uses the final execution conditions of an instruction line.

terminator The code comprising an asterisk and a carriage return (* CR) which indicates the end of a block of data in communications between devices. Frames within a multi-frame block are separated by delimiters. Also a Unit in a Link System designated as the last Unit on the communications line.

timer A location in memory accessed through a TC bit and used to time down from the timer's set value. Timers are turned ON and reset according to their execution conditions.

TR Area A data area used to store execution conditions so that they can be reloaded later for use with other instructions.

TR bit A bit in the TR Area.

trace An operation whereby the program is executed and the resulting data is stored to enable step-by-step analysis and debugging.

trace memory A memory area used to store the results of trace operations.

transfer The process of moving data from one location to another within the PC, or between the PC and external devices. When data is transferred, generally a copy

	of the data is sent to the destination, i.e., the content of the source of the transfer is not changed.
transition	A status in a SFC program that determines when active status is transferred from one step to another. Transitions can be defined either as the status of a bit or as an execution condition resulting from a ladder diagram.
Transition Area	A memory area that contains Transition Flags.
Transition Flag	A flag that indicates when a transition is ON or OFF.
transition number	A number assigned to a transition and used to access its Transition Flag.
transmission distance	The distance that a signal can be transmitted.
trigger	A signal used to activate some process, e.g., the execution of a trace operation.
trigger address	An address in the program that defines the beginning point for tracing. The actual beginning point can be altered from the trigger by defining either a positive or negative delay.
UM area	The memory area used to hold the active program, i.e., the program that is being currently executed.
Unit	In OMRON PC terminology, the word Unit is capitalized to indicate any product sold for a PC System. Though most of the names of these products end with the word Unit, not all do, e.g., a Remote Terminal is referred to in a collective sense as a Unit. Context generally makes any limitations of this word clear.
unit address	A number used to control network communications. Unit addresses are computed for Units in various ways, e.g., 10 hex is added to the unit number to determine the unit address for a CPU Bus Unit.
unit number	A number assigned to some Link Units, Special I/O Units, and CPU Bus Units to facilitate identification when assigning words or other operating parameters.
unmasked bit	A bit whose status is effective. See *masked bit*.
uploading	The process of transferring a program or data from a lower-level or slave computer to a higher-level or host computer. If a Programming Devices is involved, the Programming Device is considered the host computer.
vector table	A work file created by CVSS that is used by the software to access ladder programs for editing. The vector table lists the first address of each ladder program block.
verification error	See *I/O verification error*.
volume label	The name of a volume of storage material (a floppy disk, hard disk, or memory card).
watchdog timer	A timer within the system that ensures that the scan time stays within specified limits. When limits are reached, either warnings are given or PC operation is stopped depending on the particular limit that is reached.
WDT	See *watchdog timer*.
wildcard	A special character used in a filename or extension to indicate zero or more possible characters.

wire communications A communications method in which signals are sent over wire cable. Although noise resistance and transmission distance can sometimes be a problem with wire communications, they are still the cheapest and the most common, and perfectly adequate for many applications.

Wired Master A Remote I/O Master Unit connected via 2-conductor wire cables.

Wired Master A Remote I/O Slave Unit connected via 2-conductor wire cables.

Wired Slave Rack A Slave Rack connected through a Wired Slave.

Wired System A Remote I/O Master System connected via 2-conductor wire cables.

word A unit of data storage in memory that consists of 16 bits. All data areas consists of words. Some data areas can be accessed only by words; others, by either words or bits.

word address The location in memory where a word of data is stored. A word address must specify (sometimes by default) the data area and the number of the word that is being addressed.

word allocation The process of assigning I/O words and bits in memory to I/O Units and terminals in a PC System to create an I/O Table.

Word Grouping See *custom data area*.

work area A part of memory containing work words/bits.

work bit A bit in a work word.

work disk The location is memory when data currently being worked with is stored.

work word A word that can be used for data calculation or other manipulation in programming, i.e., a 'work space' in memory. A large portion of the IR area is always reserved for work words. Parts of other areas not required for special purposes may also be used as work words.

write protect switch A switch used to write-protect the contents of a storage device, e.g., a floppy disk. If the hole on the upper left of a floppy disk is open, the information on this floppy disk cannot be altered.

write-protect A state in which the contents of a storage device can be read but cannot be altered.

zero-cross refresh An I/O refresh process in which I/O status is refreshed when the voltage of an AC power supply is at zero volts.

Index

This index covers all three CVSS Operation Manuals. The manual the page numbers refer to is given in italics just prior to the number: Basics, Online, and Offline.

Symbols

A

B

C

D

E

F

H

I

K

L

M

N

O

P

R

S

T

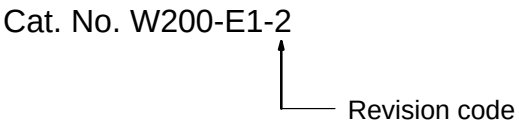
U

V

W

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	May 1992	Original production
2	February 1993	The manual was revised accompany release of version 2 of the software. Major changes are outlined on page 3 of the *CV Support Software: Basics Operation Manual*. Other changes are as follows: **Page 3:** Note added to Memory Map description saying it is not supported in SFC program view mode. **Page 5:** Block Transfer changed to Transfer Program and Data. **Page 37:** Name for function key F1 changed to “FUN().” **Page 41:** Information about the differences between the cross-reference and find operations has been clarified. **Page 163:** Information added to last paragraph for ladder-only programming.