

CV Support Software Version 2: Basics

Operation Manual

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< > Ver. 2.00

DRV	[Functions]	DRV	[Functions]
C	P:Program	C	U:Convert UM
C	L:Program Link	C	M:Format floppy
C	H:Data Area Lists	C	G:Compare Prog.
C	S:Edit I/O names	C	X:COMMAND.COM
C	C:Edit I/O comments	C	O:End
C	W:Edit PC ID		
C	D:Edit DM		
C	I:Edit I/O table		
C	T:Data trace		
C	F:File management		
C	Q:System setup		
C	A:PC setup		
C	Z:Customize		
C	N:Network support table		
C	J:Memory card		

1 2 3 4 5 6 7 8 9 0

Notice:

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

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



DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



Caution

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury, or property damage.

OMRON Product References

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

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

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

Visual Aids

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

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

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

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About this Manual:

This manual describes basic 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 CPU Units. 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 provided 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, including lists of operations with references to the proper manual, tables of ladder-diagram instructions, a PC data area table, and abbreviations to aid reading CVSS displays.

Section 2 explains how to connect the PC and peripheral devices to the computer, make backup copies of CVSS, and install CVSS on the computer's hard disk.

Section 3 explains how to select operations from the menus and sub-menus and how to manipulate data in memory. The structure of memory, data files, and programs is also described.

Section 4 provides an introduction to the procedures necessary to set up a basic PC system, write SFC and ladder programs, transfer the program to the PC, and monitor program execution. The use of I/O names in programming is also explained briefly.

Section 5 provides a list of error messages and probable causes of errors that can occur with CVSS.



WARNING

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

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 outlines the data areas available for use in programming, and the abbreviations are to aid reading CVSS displays. Read the CV-series PC Operation Manuals and Installation Guide before using the CVSS.

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1-1 CVSS Basics

1-1-1 CVSS Package

The CVSS package includes the CV Support Software (CVSS) Version 2, which is available on either 3.5" or 5.25" low density floppy disks, and three Operation Manuals.

The CVSS package with 3.5" floppy disks contains 2 install disks, while the package with 5.25" disks contains 7 install disks. Make backup copies of the install disks and store the originals in a safe place as a precaution. The file compressing application DIET was used with CVSS.

CVSS package	Contents	Notes
CV500-ZS3AT1-EV2	Install disks 1 to 2	High density (1.44M byte) 3.5" disks
	Operation Manuals	3 CV Support Software Version 2 Manuals
CV500-ZS5AT1-EV2	Install disks 1 to 7	Low density (360K byte) 5.25" disks
	Operation Manuals	3 CV Support Software Version 2 Manuals

The floppy disks should be inserted into the floppy disk drive only when the computer is on. Disks should also be removed when the computer is on, but never when the floppy disk drive indicator is lit (indicating that the computer is writing to or reading from the disk).

1-1-2 Computer Specifications

CV Support Software (CVSS) Version 2 is a powerful tool providing online and offline support of CV-series PCs. CVSS can be installed on an IBM-compatible computer running DOS version 3.20 or higher as long as the computer meets the minimum specifications listed in the table below.

- 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.

Specification	Minimum requirement
RAM capacity	640K bytes
Free work disk capacity	4 MB (can be a combination of hard disk and work disk)
Floppy disk drive	5.25" or 3.5" drive
Keyboard	Home, Esc, Ctrl, PgUp, PgDn, Backspace, F1 to F10, End, Ins, Del, and Tab Keys are required.
Video	EGA or VGA (EGA mode)

CVSS operation has been successfully tested with the following computer/DOS combinations:

Computer	DOS version
IBM PC/AT	Version 3.20
IBM PS/2 (Model 50 286)	Version 4.01
Toshiba T3200	Version 3.20
Compaq LTE 386S/20, DESKPRO 386S	Version 4.01

Online operations can be performed with CVSS when the optional RS-232C Communications Board is used. CVSS can support up to 2 ports. Refer to the relevant Operation Manual for details on settings necessary when using a Communications Board.

1-1-3 CVSS Features

Programming	<p>Programming with CVSS is simpler because operations can be selected from menus. The PC program can be written either with or without SFC programming. Ladder programs can be entered either as diagrams or by mnemonics. SFC (Sequential Function Chart) programming conforms to IEC standards and SFC action and transition programs are entered as ladder programs.</p> <p>The program can be edited online when the optional RS-232C Communications Board is used.</p>
Debugging and Monitoring	<p>Program execution can be debugged and monitored with the Debug, SFC Monitor, Ladder Diagram Monitor, Program Trace, and Data Trace operations.</p>
Communications with PCs in Link Systems	<p>The computer running CVSS can communicate with any PC that is connected to it through a SYSMAC NET Link or SYSMAC LINK System.</p>

1-1-4 CVSS Version 2.1 Improvements

The following information is provided for convenience for readers already familiar with version 1 of the CVSS.

New CPU Unit Support	<p>Version 2.1 supports three new CPU Units, the CV2000-CPU01-E, the CVM1-CPU01-E, and the CVM1-CPU11-E. The CVM1 CPU Units are designed as low-cost model to provide efficient machine control and the CV2000 CPU Unit, with an I/O capacity of 2,048 points, now provides the largest capacity of the CV-series PCs.</p>
Programming and Monitoring	<p>Two program input modes have been provided for flexibility: the mode originally provided in version 1 (CV mode) and the input mode used with the LSS (C mode); the location of the program location that was last displayed and display mode that were last used are recorded in memory and automatically restored when the program is displayed again; and searches during cross-referencing now apply to all ladder diagrams held in memory and not just the current one; and the search operation is automatically entered when the monitoring operation is specified to save key inputs (the F1 Key can be pressed to cancel the search and access other operations at this point).</p>
I/O Comment Input	<p>I/O comments are now input at the same time as ladder diagrams and displayed immediately (in the I/O comment display mode).</p>
Printing	<p>More ladder diagrams can be printed on the same sheet of paper to save paper and printing time. Also, unused words are not printed on usage lists to save paper and print time.</p>
Comparison Operations	<p>You can compare the program in the PC with the program in the CVSS work file by specifying <i>Program compare</i> under the <i>Transfer program and data</i> operation. This is the same operation as is available for C-series PCs using the LSS. You can also compare the program in the CVSS work file to a program in a file on a disk to display the differences between them. Select <i>Program compare</i> from the main offline menu.</p>
Global Changes	<p>Bit and word addresses are now easier to globally change and can be done when using I/O comments.</p>
CPU Bus Unit Settings	<p>New operations have been added to set CPU Bus Unit operating parameters.</p>
Customization	<p>It is possible to register or delete an HIS program.</p>

1-1-5 Differences between LSS and CVSS

There are several differences between LSS (Ladder Support Software) and CVSS operation. These differences are described below.

- 1, 2, 3...**
1. Menu selection, display, and key operation
 - a) The number of headings in the main menus and the size of the display has been increased. The Esc Key can be pressed to return to the main menu from any operation display.
 - b) CVSS can be switched between offline and online operation whenever a main menu is being displayed.
 - c) Letter designations are possible in the menu of each operation.
 2. Programming (common features)
 - a) The PC program can be written with or without SFC programming.
 - b) The program can be made easier to understand by using I/O names instead of bit or word addresses.
 3. Programming (ladder diagrams)
 - a) Instruction operands are displayed along the side.
 - b) Instructions can be entered in the ladder diagram using mnemonics or function codes.
 - c) I/O comments can be up to 30 characters long.
 - d) The Clear mode has been eliminated.
 4. Programming (mnemonic)

The screen can display only 20 lines because I/O comments can now be 30 characters long.
 5. Other offline operations

Directories can be made on data disks.
 6. Other online operations
 - a) CVSS can communicate with PCs in a SYSMAC NET Link System without using a SYSMAC NET Link Interface Board.
 - b) Monitoring is possible even if the program in the PC is different from the program on the computer's hard disk.
 - c) The program, DM, etc. can be transferred together with the Transfer Program and Data operation.
 - d) A PC ID can be assigned to each node on a network and this ID can be used to identify the node instead of the network and node addresses.

1-2 Lists of Operations

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

1-2-1 System Settings and File Management (Online and Offline)

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

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

1-2-2 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
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

Name	Description	Page
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
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

Name	Description	Page
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
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

Name	Description	Page
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

1-2-3 Online Operations

Page numbers refer the *CV Support Software Version 2 Operation Manual: On-line*.

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
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

1-3 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.

1-3-1 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 OPER- ATION	END END	IL INTER- LOCK	ILC INTER- LOCK 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 REVERS- IBLE COUNTER	DIFU (!) DIFFEREN- TATE UP	DIFD (!) DIFFEREN- TATE 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 Com- pare Instruk- tions
03	MOV (j!i) MOVE	MVN (j) MOVE NOT	MOVL (j) DOUBLE MOVE	MVNL (j) DOUBLE MOVE NOT	XCHG (j) DATA EX- CHANGE	XCGL (j) DOUBLE DATA EX- CHANGE	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 DIS- TRIBUTE	COLL (j) DATA COLLECT					
05	SFT SHIFT REGISTER	SFTR (j) REVERS- IBLE SHIFT REGISTER	ASFT (j) ASYNCH- RONOUS SHIFT REGISTER	WSFT (j) WORD SHIFT							Data Shift In- structions
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 DIG- IT LEFT	SRD (j) SHIFT DIG- IT RIGHT	
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 DI- VIDE			Binary Calculation Instructions
09	INC (j) INCRE- MENT BCD	DEC (j) INCRE- MENT BCD	INCB (j) INCRE- MENT BINARY	DECB (j) INCRE- MENT BINARY	INCL (j) DOUBLE INCRE- MENT BCD	DECL (j) DOUBLE DECRE- MENT BCD	INBL (j) DOUBLE INCRE- MENT BINARY	DCBL (j) DOUBLE DECRE- MENT 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 COM- PLEMENT	NEGL (j) DOUBLE 2'S COM- PLEMENT	SIGN (j) SIGN				Data Format Con- version Instruk- tions
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 ACCUMU- LATIVE TIMER	TIML LONG TIMER	MTIM MULTI- OUTPUT TIMER	TCNT TRANSI- TION COUNTER	TSR (j) READ STEP TIMER	TSW (j) WRITE STEP TIMER					Special Counter and Timer Instruk- tions
13	ANDW (j) LOGICAL AND	ORW (j) LOGICAL OR	XORW (j) EXCLU- SIVE OR	XNRW (j) EXCLU- SIVE NOR	ANDL (j) DOUBLE LOGICAL OR	ORWL (j) DOUBLE LOGICAL OR	XORL (j) DOUBLE EXCLU- SIVE OR	XNRL (j) DOUBLE EXCLU- SIVE NOR	COM (j) COMPLE- MENT	COML (j) DOUBLE COMPLE- MENT	Logical Instructions
14	ROOT (j) SQUARE ROOT	FDIV (j) FLOATING POINT DI- VIDE	APR (j) ARITHME- TIC PRO- CESS	SEC (j) HOURS TO SECONDS	HMS (j) SECONDS TO HOURS	CADD (j) CALEN- DAR ADD	CSUB (j) CALEN- DAR SUB- TRACT				Special Instructions

Code	Rightmost digit										Instruction group
	0	1	2	3	4	5	6	7	8	9	
15	SBN SUBROUTINE ENTRY	SBS (j) SUBROUTINE CALL	RET SUBROUTINE RETURN	MSKS (j) INTER-RUPT 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	IOES ENABLE ACCESS	IODP (j) I/O DIS-PLAY	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				---

1-3-2 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
DCBL (j)	097	DOUBLE DECREMENT BINARY
DEC (j)	091	DECREMENT BCD
DECB (j)	093	DECREMENT BINARY
DECL (j)	095	DOUBLE DECREMENT BCD

Mnemonic	Code	Name
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
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

Mnemonic	Code	Name
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
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
SABL (j)	085	DOUBLE BINARY SUBTRACT
SBN	150	SUBROUTINE ENTER
SBS (j)	151	SUBROUTINE CALL

Mnemonic	Code	Name
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
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
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

1-4 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.
	CV1000-CPU01-E CVM1-CPU11-E	Words: CIO 0000 to CIO 0063 Bits: CIO 000000 to CIO 006315 (\$0000 to \$003F)	Once I/O table has been registered, input bits are displayed on CVSS with an I; output bits, with a Q.
	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.
	CV1000-CPU01-E CV2000-CPU01-E CVM1-CPU11-E	Words: CIO 0200 to CIO 0999 Bits: CIO 020000 to CIO 099915 (\$00C8 to \$03E7)	Bits not used to control I/O points can be used as work bits.
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.
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.

Area	PC	Range	Function
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.

1-5 Abbreviations

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

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

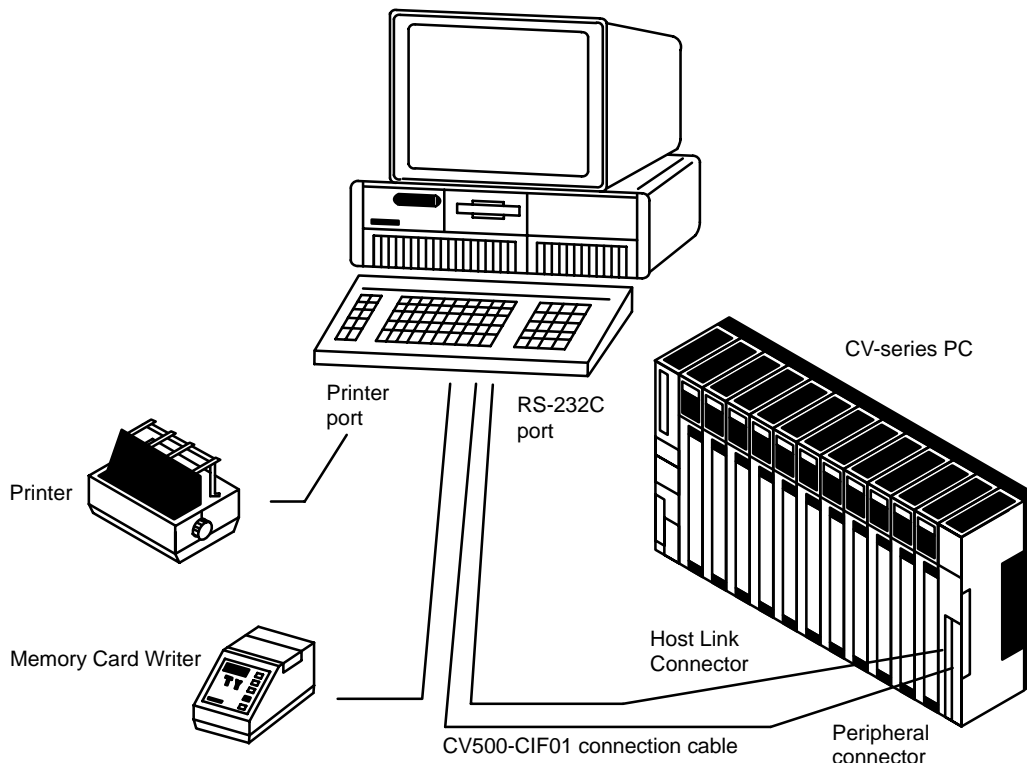
SECTION 2

Getting Started

This section explains how to connect the PC and peripheral devices to the computer, make backup copies of CVSS, and install CVSS on the computer's hard disk.

2-1	Computer Connections	18
2-1-1	Connecting the Computer to the PC	18
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2-1 Computer Connections



2-1-1 Connecting the Computer to the PC

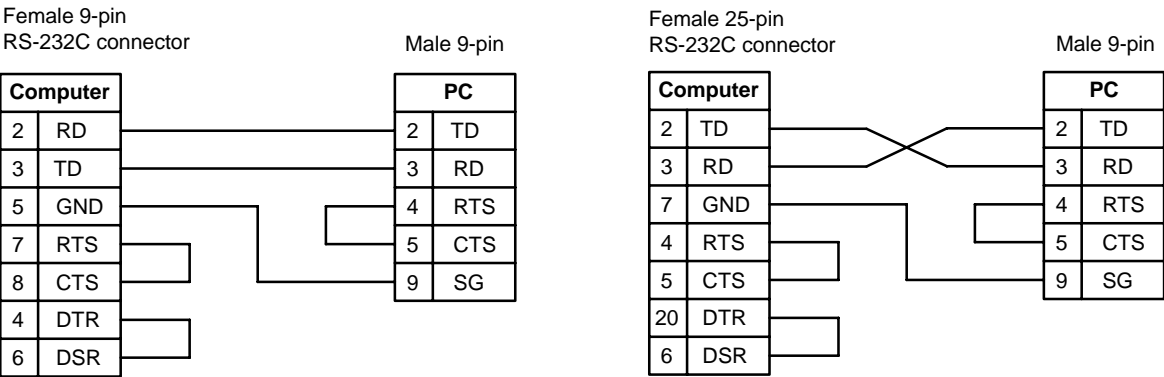
The computer is connected to the PC through either a 9-pin or 25-pin RS-232C port on the computer and the 9-pin RS-232C host interface connector or peripheral connector on the PC CPU Unit. The user must provide a cable that is wired for this connection as shown below. Refer to *2-1-3 Wiring RS-232C and RS-422 Cable Connectors* for details on preparing RS-232C cables.

Connecting Interface and Cable

Interface	Cable
Tool Bus	CV500-CIF01 (see Note)
Host Link Bus	To be prepared by the user.

- Note**
1. You must use the CV500-CIF01 in combination with a conversion cable. To make the conversion cable, refer to *Tool Bus Connections* which follows.
 2. Before you connect the PC to the computer via the Tool Bus Interface, use the CVSS system setting operation (offline) to select the binary system, and make sure that the communications speed that you set coincides with the Tool Bus communications speed that has been set with the DIP switches on the front panel of the PC.
 3. Before you connect the PC to the computer via the Host Link Unit Interface, use the CVSS system setting operation (offline) to select the ASCII system, and make sure that your setting coincides with the Host Link communication system in the PC system setting.

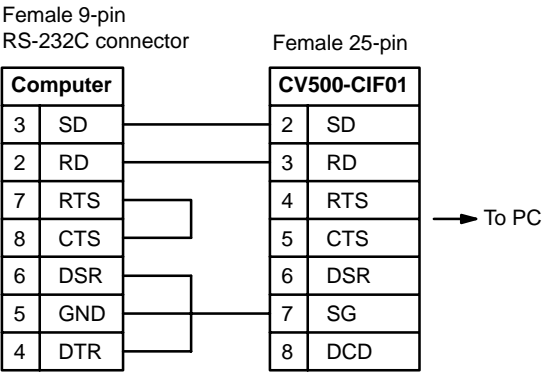
Host Link Bus Connections



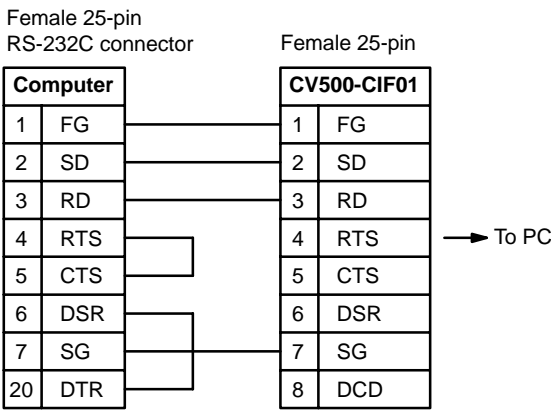
Turn off the computer and PC when the connecting the cables. The maximum cable length is 15 meters.

Tool Bus Connections

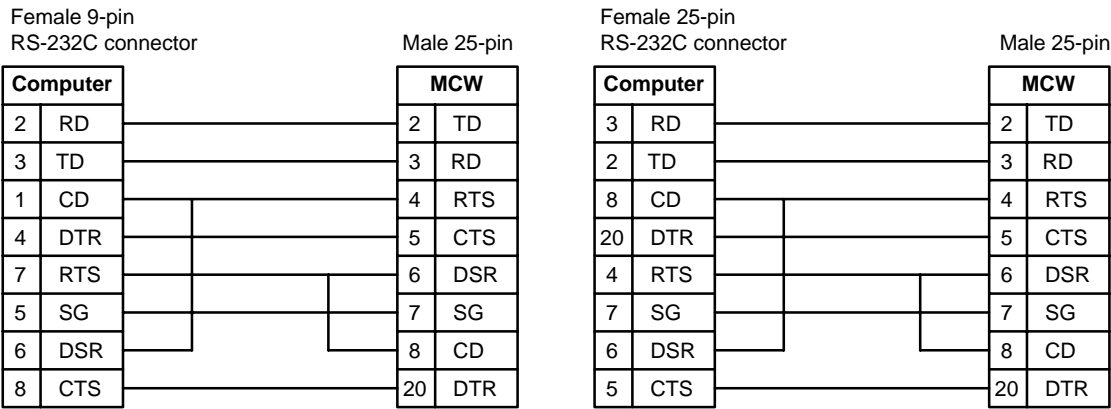
IBM PC/AT Computer



IBM PS/2 Computer



Memory Card Writer Connections



2-1-2 Connecting the Computer to a Printer

The computer is connected to a printer through a printer port on the computer. The operator must provide a standard Centronics interface cable. Centronics interface cables are commercially available.

The connectors on each end of a Centronics cable are identical and pins of the same number are connected. The following table shows the function of each pin.

Pin No.	Name	Input/Output
1	STROBE	Output
2	DATA 1	Output
3	DATA 2	Output
4	DATA 3	Output
5	DATA 4	Output
6	DATA 5	Output
7	DATA 6	Output
8	DATA 7	Output
9	DATA 8	Output
10	ACK	Input
11	BUSY	Input
12	---	---
13	---	---
14	GND	---

Turn off the computer and printer when the connecting the cables.

OMRON recommends using one of the following printers:

Maker/Model
IBM 4201-002
IBM 4201-003
IBM 4202-001
IBM 4208-002
EPSON FX-800
Hewlett Packard HP33471A

2-1-3 Wiring RS-232C and RS-422 Cable Connectors

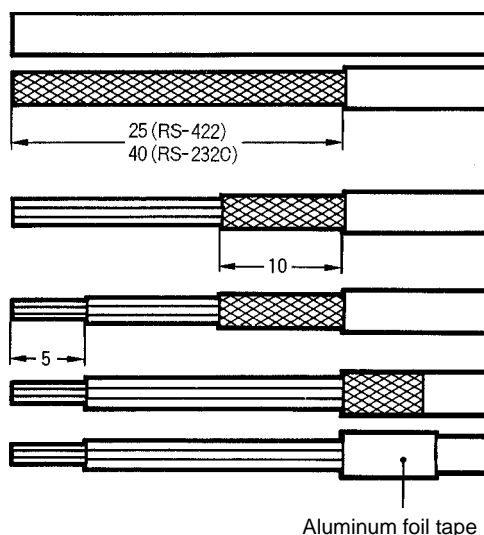
The following procedures should be followed when wiring RS-232C and RS-422 connectors. Both the connectors and the cable are commercially available.

Shielded Wire Connecting to FG

The procedures listed below correspond to the following diagrams.

- 1, 2, 3...
 1. Cut the cable to the required length.
 2. Use a razor blade to cut away the sheath (being careful not to damage the braiding underneath): 25 mm for RS-422 cable; 40 mm for RS-232C cable.
 3. Use scissors to cut away all but 10 mm of the exposed braiding.
 4. Use wire strippers to remove the insulation from the last 5 mm of each wire.
 5. Move the boot to cut the edge of the sheath and fold the braiding back over the end of it.

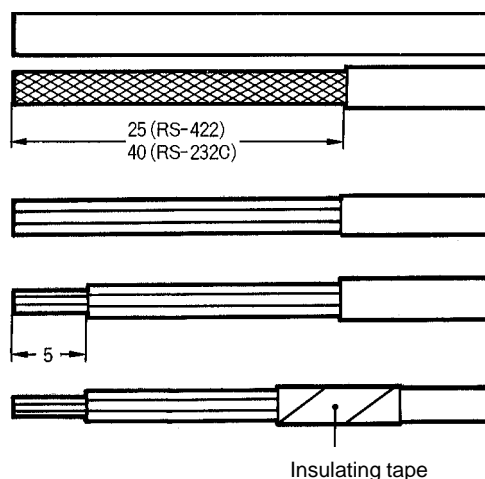
6. Wrap aluminum foil tape over the top of the braiding on top of the boot for one and a half turns.



Shielded Wire Not Connecting to FG

The procedures outlined in the list below correspond to the following diagrams.

- 1, 2, 3...
 1. Cut the cable to the required length.
 2. Use a razor blade to cut away the sheath: 25 mm for RS-422 cable; 40 mm for RS-232C cable.
 3. Use scissors to cut away the exposed braiding.
 4. Use wire strippers to remove the insulation from the last 5 mm of all wires.
 5. Wrap insulating tape over the top and end of the the cut sheath.



Soldering

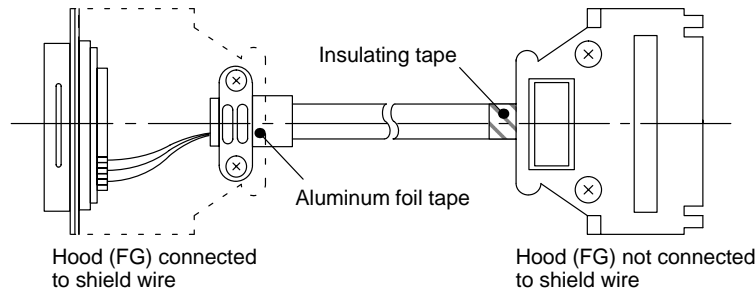
Observe the following when soldering the prepared wires onto the connectors.

- 1, 2, 3...
 1. Place heat-shrinking tubes over all wires, far enough away from the end so as not to interfere with the soldering.
 2. Pre-solder all wires and connector terminals.

3. Solder wires, inserting 4 mm of the exposed 5 mm of wire into the connector terminal.
4. Move the heat-shrinking tubes onto the soldered area and shrink them into place.

Hood Assembly

Assemble the hood as shown in the following diagram. Be sure to connect one end of the shielded wire to FG.



2-2 Handling CVSS Floppy Disks

2-2-1 Using the Floppy Disks

The CVSS package includes the CV Support Software Version 2 (CVSS) on either 3.5" high-density floppy disks or 5.25" low density floppy disks.

CVSS package	Contents	Notes
CV500-ZS3AT1-EV2	Install disks 1 to 2	High density (1.44M byte) 3.5" disks
CV500-ZS5AT1-EV2	Install disks 1 to 7	Low density (360K byte) 5.25" disks

The install disks contain the actual CV Support Software Version 2 that is installed on the computer's work disk.

As a precaution, make backup copies of the install disks and store the originals in a safe place. After the CVSS is installed on the work disk, the install disks won't be needed unless the files on the work disk or the work disk itself are damaged, but it is always a good idea to have an extra copy of the software just in case. The procedure for making backup copies of floppy disks is described in 2-2-2 *Copying Floppy Disks*.

The floppy disks should be inserted into the floppy disk drive only when the computer is on. Disks should also be removed when the computer is on, but never when the floppy disk drive indicator is lit (indicating that the computer is writing to or reading from the disk). Removing a disk when the LED indicator is on can destroy files on the disk.

2-2-2 Copying Floppy Disks

The install disks should be copied to prevent accidental loss of the data they contain. The following procedure uses a single floppy disk drive. Refer to your DOS User's Guide for details on using the diskcopy command.

- 1, 2, 3... 1. Purchase the same type of disk that is to be copied and make sure that the new disks are not write-protected (the sliding tab on the lower left corner of the floppy disk should cover the hole). The original disks should remain write-protected.
2. Turn the computer on. When DOS loads from the work disk, the DOS prompt will appear on the display.
C:\>

3. Type `DISKCOPY A: A:` and press Enter.

Your display should look like this:

```
C:\>DISKCOPY A: A:
```

```
Insert SOURCE diskette in drive A:
```

```
Press any key to continue...
```

4. Insert the disk that you want to copy (SOURCE) into drive A and press any key.

5. When the data on the original disk has been copied into the computer, your display should look like this:

```
Copying 80 tracks
```

```
9 Sectors/Track, 2 Side(s)
```

```
Insert TARGET diskette in drive A:
```

```
Press any key to continue...
```

6. Remove the original disk, insert the new disk into drive A, and press any key.

7. Your display should look like this if there is some uncopied data remaining on the source disk:

```
Formatting while copying
```

```
Insert SOURCE diskette in drive A:
```

```
Press any key to continue...
```

8. If there is some uncopied data remaining, repeat steps 4, 5, and 6.

9. When all of the data has been copied onto the new disk, your display will look like this:

```
Volume Serial Number is 1AD2-0F14
```

```
Copy another diskette (Y/N)? N
```

10. If you want to copy another disk, type `Y`, press Enter, and repeat steps 4 through 9. If you don't want to copy another disk, type `N` and press Enter.

11. Make sure that backup install disks are write-protected by sliding the tab on the lower left corner of the floppy disk so that a hole appears where the tab had been.

2-3 CVSS Installation

To use the CVSS, it must first be installed on a DOS hard disk with a minimum of 4 megabytes of free space. Basically speaking, this means copying the CVSS from the install disks it is supplied on to the hard disk using the installation utility provided on one of the install disks. You will thus need a computer with a floppy disk drive and a formatted hard disk running DOS.

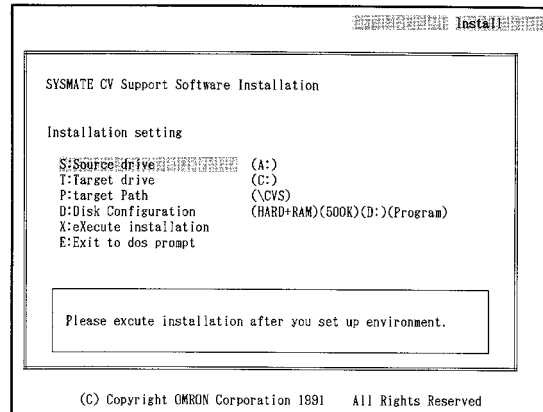
The CVSS needs to be installed only once unless the data on your hard disk is damaged or requires reformatting. Once you have installed the CVSS, store the install disks in a safe place. You will want to make an additional copy for extra protection. If you have not yet backed up the install disks, refer to *2-2-2 Copying Floppy Disks* for the procedure.

The installation procedure is described below.

- 1, 2, 3...** 1. Turn on the computer and startup DOS from the hard disk. The DOS prompt should appear.

```
C:\>
```

2. Insert install disk 1 into the floppy disk, change the current drive to the floppy disk drive, and execute `INSTALL` to activate the installation utility. The following display will appear.



Note The last item on the above display, “E:Exit to dos prompt” can be used anytime this menu is displayed to return to DOS.

3. Select and specify each of the first four items on the display, pressing the Enter Key after specifying each one. These are outlined below with possible values given in parentheses. Items can be selected either with the Cursor Keys or by typing the letter given at the far left of each item.

Item	Meaning
S:Source drive	Specify the floppy drive that contains the install disk. (A to Z)
T:Target drive	Specify the hard disk drive onto which the CVSS is to be installed. This will normally be drive C. (A to Z)
P:target Path	Specify the directory path name where the CVSS is to be installed. (Any legal DOS directory name; avoid long names.)
D:Disk Configuration	Specify whether the hard disk is being used alone or together with a work disk. (HARD or HARD+WORK DISK)

4. If a work disk is specified for the disk configuration, you will also be asked the size of the work disk, the disk drive name of the work disk, and which part of the software is to be placed in the work disk first (if the work disk is large enough, it makes no difference which part is selected). Input the requested data. When you type the letter D and press the Enter key for the work disk drive D, the following will be displayed on the screen so that you can set the bus that includes `VDISK.SYS` for the work disk driver. To short-cut, press `\`, input the path name, and press the Enter key.

[Device Driver Path]

Note You do not necessarily have to use the work disk just because your computer is equipped with one; the choice is yours. Using the work disk, however, will increase the operation speed of the CVSS.

5. When the above settings have been completed, the initial display will return and actual installation can begin. To install, select “X:eXecute installation” and then confirm installation when the confirmation prompt appears.
6. Once installation has started, you will be asked if `CONFIG.SYS` and `AUTO-EXEC.BAT` should be updated. If they are not updated, sample files with CVS will be copied to the target directory. If they are updated, the extensions of the old files will be changed to CVS and new files will be created as described below. Here, it is assumed that CVSS is being run under the same environment as LSS.

- a) Change the CONFIG.SYS file name to CONFIG.CVS.
- b) If VDISK.SYS is written on the old CONFIG.SYS when a work disk is used, change only the work disk size and the description of the VDISK.SYS path. If VDISK.SYS is not written on the CONFIG.SYS, add the following:

DEVICE = \ (add the VDISK.SYS path that was designated at the time of installation)\VDISK . SYS (add the work disk size that was designated at the time of installation) 512 128\ E

- c) If the host link disk driver (SPDWADRV.DEV) and tool bus device driver (SPDTLDRV.DEV) have been already written on the old CONFIG.SYS, change only the description of the path. If neither SPDWADRV.DEV nor SPDTLDRV.DEV has been written on the old CONFIG.SYS, add the following:

DEVICE=C:\ (add Target path)\SPDWADRV.DEV

DEVICE=C:\ (add Target path)\SPDTLDRV.DEV

- d) Change the AUTOEXEC.BAT file name to AUTOEXEC.CVS.
- e) Add "C:\CVS" to the path for AUTOEXEC.BAT.
- f) Add the following line to AUTOEXEC.BAT.

SET CVERR=C:\CVS

Input Y or N and press the Enter Key to continue installation. The names of the file currently being installed will be displayed on the display.

7. You will be asked to change the install disk and press a key from the keyboard as installation proceeds. Change the disks as instructed until all of the CVSS has been installed.
8. If the settings in CONFIG.SYS and AUTOEXEC.BAT do not suit your computers configuration, use a standard screen editor and changes the settings as required.
9. Once the last disk has been inserted and installation completed, you will be asked to reboot the computer. Remove the last install disk from the drive and simultaneously press the Ctrl, Alt, and Del Keys to reboot the system.

2-4 Starting CVSS

The CVSS can be started by changing to the directory into which CVSS is installed and entering CVS. An example is shown below.

C :>

C :> CVSSs

The CVSS will be started and the main offline menu will appear.

Ver. 2.00

DRU	[Functions]	DRU	[Functions]
C	P:Program	C	U:Convert UM
C	L:Program Link	C	M:Format floppy
C	H:Data Area Lists	C	G:Compare Prog.
C	S>Edit I/O names	C	X:COMMAND.COM
C	C>Edit I/O comments	C	O:End
C	W>Edit PC ID		
C	D>Edit DM		
C	I>Edit I/O table		
C	T:Data trace		
C	F:File management		
C	Q:System setup		
C	A:PC setup		
C	Z:Customize		
C	N:Network support table		
C	J:Memory card		

1 2 3 4 5 6 7 8 9 0

SECTION 3

CVSS Operations

This section explains how to select operations from the menus and sub-menus and how to manipulate data in memory. The structure of memory, data files, and programs is also described.

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3-1 Operating Modes and Screen Displays

There are two basic CVSS operating modes: online and offline. In the offline mode, the CVSS is operated independently from the PC. In the online mode, the CVSS is operated while communicating with the PC. The operations that are possible vary with the operating mode.

To switch between online and offline mode, go to the main menu for the mode you are in, press the Shift+F1 Keys. The mode and menu display will change.

You must be connected to the PC to enter online mode.

Main Offline Menu

<

>

Ver. 2.00

DRV	[Functions]	DRV	[Functions]
C	P:Program	C	U:Convert UM
C	L:Program Link	C	M:Format floppy
C	H:Data Area Lists	C	G:Compare Prog.
C	S:Edit I/O names	C	X:COMMAND.COM
C	C:Edit I/O comments	C	O:End
C	W:Edit PC ID		
C	D:Edit DM		
C	I:Edit I/O table		
C	T:Data trace		
C	F:File management		
C	Q:System setup		
C	A:PC setup		
C	Z:Customize		
C	N:Network support table		
C	J:Memory card		

1234567890

SFC Detail View Mode

CV1000-CPU01<

>

PROGRAM

Monitor

Net000Node000

(00,000)

Message display:
Displays messages errors that may occur during operation or when information is transmitted from the PC. Normally displays the PC model, filename, sheet number, or sheet title.

Operation display:
Displays the operation being executed.

Cursor position:
Displays the row and column position of the cursor.

Network and node addresses:
Displays network and node addresses when communicating with a SYSMAC LINK Unit or SYSMAC NET Link Unit.

Host unit number:
Displays the Host unit number when communicating with a Host Link System.

Function key display:
Displays the function associated with F1 to F10 Keys.

Address, I/O name, and I/O comment:
Displays the bit address, I/O name, or I/O comment at the cursor position.

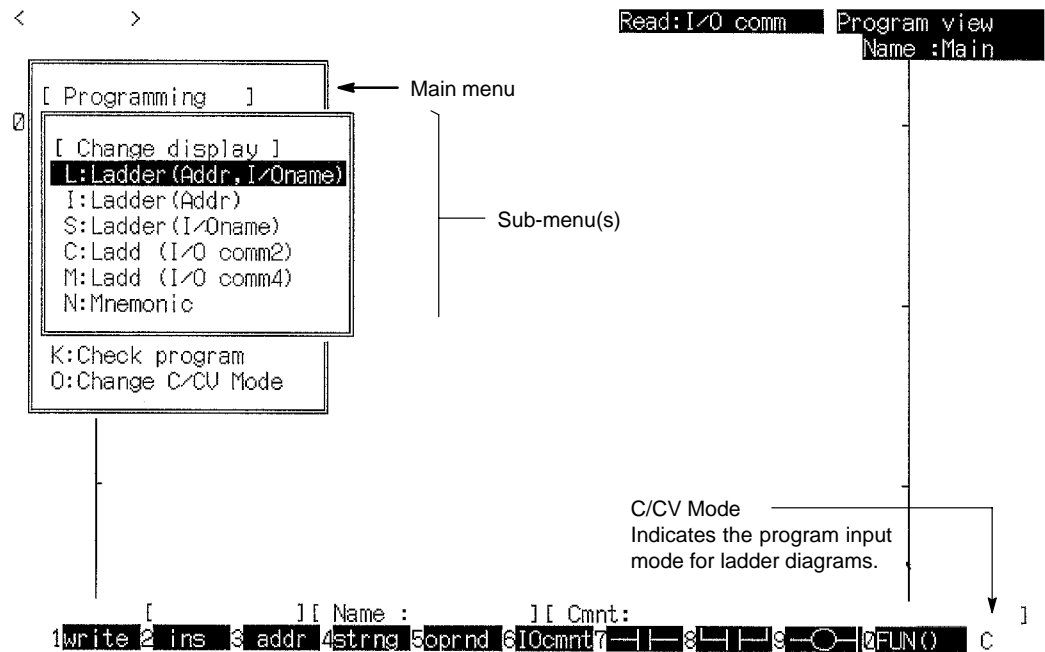
Input display area:
Displays the characters input from the keyboard during editing.

[# :] [Name :] [Com :]

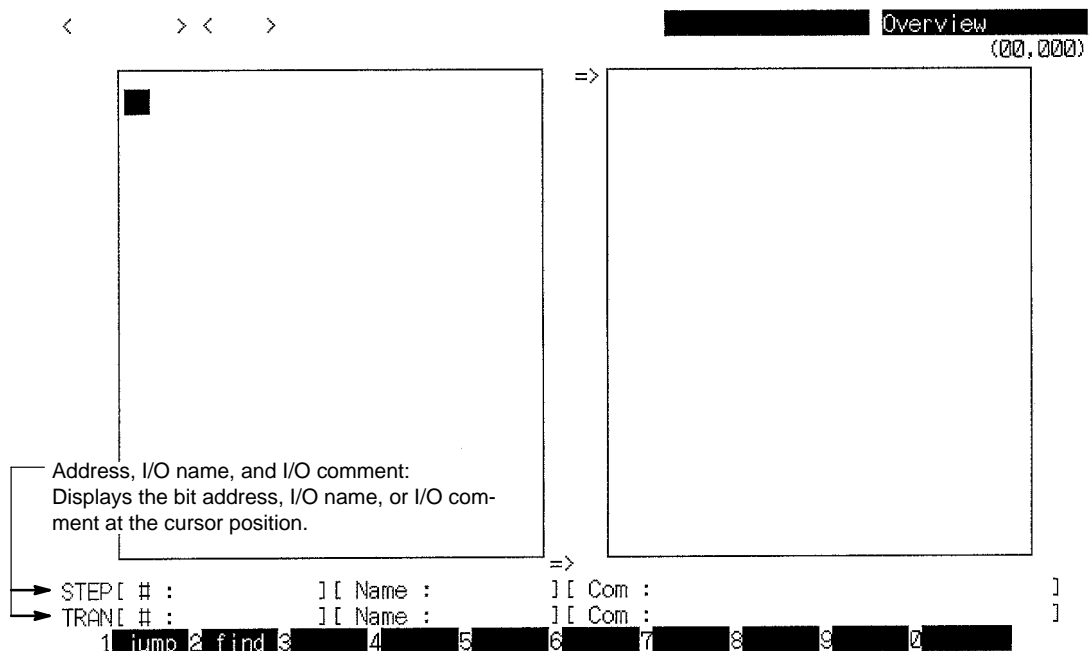
1 jump 2 find 3OUR UM4PRG UM567890 Cane

Ladder Program View Mode

Execution of an operation will begin when it is selected from the main menu. Some operations have up to 4 sub-menus from which more specific settings or selections must be made. Other operations have no sub-menu. Press the Esc Key to display the main menu operations. Main menus and sub-menus are displayed in both the detail view and program view modes.



Overview Mode



3-2 Keyboard


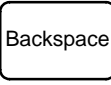
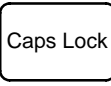

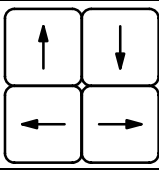





Keys








Character Keys

Character keys include letter keys, number keys, the space bar, and a few other keys just to the right of the letters. These keys are often a lighter color than other keys on the keyboard and are used to input characters. The letter keys can also be used to select operations when a menu is displayed on the screen.

Special Keys

The following table describes the function of other keys on the keyboard (except function keys). The use of function keys is described after the table. The appearance of the keys may vary depending on the keyboard used.

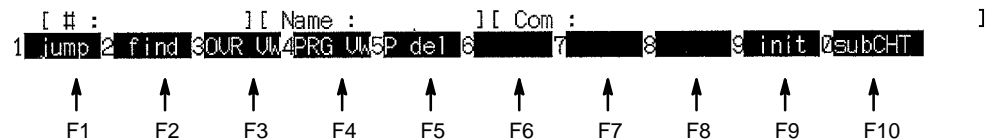
Key	Name	Function
	Alt Key	Not used.
	Backspace Key	When correcting a ladder diagram, the Backspace Key can be pressed to delete the symbol to the left of the cursor. If the cursor is at the left bus bar (the left edge of the diagram), pressing the Backspace Key will delete the instruction at the right bus bar (the right edge of the diagram).
	Capitals Lock Key	Press to toggle the letter input between lower case and upper case (capital). When the Capitals Lock is ON, letters will be upper case if a letter key is pressed alone and lower case if the Shift Key is held while the letter key is pressed.
	Ctrl Key	The Ctrl Key is used in the combinations below. The Ctrl Key alone has no function.
		Ctrl+M Brings up the main menu.
		Ctrl+G Brings up the I/O No. or I/O name display in a ladder diagram.
		Ctrl+L When inputting a ladder diagram, press Ctrl+L to switch to line connection mode.
		Ctrl+F Instead of entering a function code at the "FUN(???) prompt after pressing F10, you can press Ctrl+F to bring up a list of instructions and then move the cursor to select the desired instruction.
	Cursor Keys	Used to move the cursor one position up, down, left, or right. Also used to adjust timer and counter SVs during online monitoring.
	Del Key	If the cursor is at an empty position when inputting a ladder diagram, the Del Key can be pressed to delete that position and move the instruction to the right of the cursor one position to the left. When inputting characters, the Del Key can be pressed to delete the character at the cursor position.
	End Key	Used to display the menu. When inputting a file name, the End Key can be pressed to display a list of file names.
	Enter Key	Used to begin execution of a operation.
	Esc Key	Press the Esc Key to cancel the current operation and return to the previous display.
	Home Key	When used alone, the Home Key resets SVs to 0 or their initial values. When inputting a ladder program as a ladder diagram or in mnemonics, the Shift+Home keys can be pressed to delete all of the instructions currently shown on the display.

Key	Name	Function
	Ins Key	When inputting a ladder diagram, the Ins Key can be pressed to insert an empty line at the cursor position and move the instruction to the right of the cursor one line to the right. When inputting characters, the Ins Key can be pressed to insert a space just to the left of the cursor.
	Numeral Lock Key	Press the Numeral Lock Key to toggle between number and function inputs if your keyboard is equipped with a number pad.
	PgDn Key	Used to display the next instructions or the next display. When inputting a ladder diagram, this key deletes an empty line.
	PgUp Key	Used to display the previous instructions or the previous display. When inputting a ladder diagram, this key adds an empty line.
	PrtSc Key	Not used.
	Shift Key	The Shift Key is used in the combinations below. The Shift Key alone has no function.
		Shift+any letter or shift symbol Used to input capital letters or the shift symbols on the top of other character keys.
		Shift+Function Keys Used to execute the functions displayed at the bottom of the display when editing (see below).
		Shift+Esc Press Shift+Esc to cancel the current operation and return to the original display.
	Tab Key	Used to return to the previous instruction or display when searching a ladder diagram or mnemonics.

Function Keys

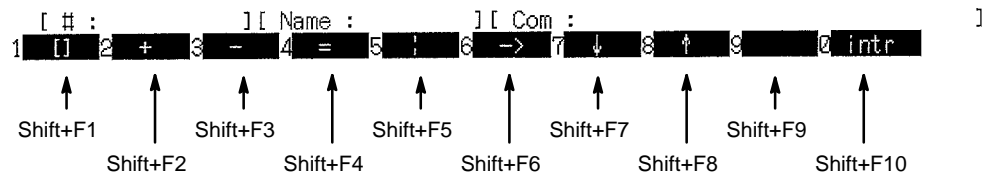
The 10 function keys (F1 to F10) are used to select the functions displayed at the bottom of the display. For example, when inputting a program, the function keys can be used to perform functions and input symbols or instructions into the program.

The following diagram shows the functions performed by the function keys when inputting a program.



A second set of functions will be displayed at the bottom of the display when the Shift Key is pressed. Press the desired function key while holding down the Shift Key to perform one of these functions.

The following diagram shows the second set of functions performed by the function keys when inputting a program.



3-3 Using the Menus

This section shows how to move between displays and how to select the desired operation from the menus. There are two ways to select an operation from the menu displayed on the screen:

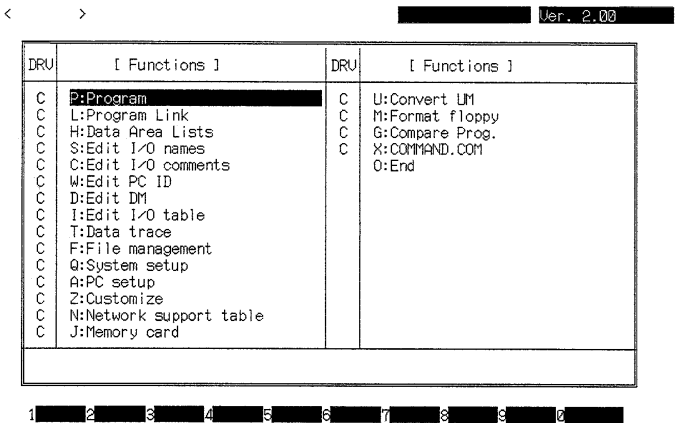
- 1, 2, 3...
1.

Press the letter key of the letter that precedes the operation in the menu.
2.

Move the cursor until the desired operation is highlighted and then press the Enter Key.

3-3-1 Offline Operations

The diagram below shows the main offline menu as it appears when the program is started. To return to the main menu from another offline operation, press Ctrl+M. To return to the original display, press either the Esc or Shift+Esc Keys.



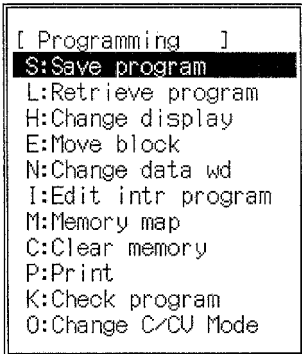
P: Program

With SFC Programming:

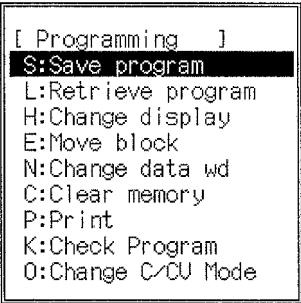
Ladder Programming only:

From the programming display:

From the programming display:



From the program view display:



Note The "Move block" and "Disp memory" operations are not shown when the display is set for mnemonics.

L: Program Link and H: Data Area Lists

```
[ Link Program ]
M:Link mode
S:Save link parameters
R:Retrieve link parameter
C:Clear link parameters
P:Print link parameters
E:Exec link
```

```
[Data Ar. Lst]
S:Used data area
C:Used data areas w/ I/O Comments
X:Cross-references
T:Print used areas
D:Print used areas with I/O Comments
Y:Print cross-references
```

S: Edit I/O Names and C: Edit I/O Comments

```
[ Edit I/O name ]
S:Save I/O names
R:Retrieve I/O names
C:Clear I/O names
P:Print I/O names
J:Link I/Oname to prg
M:Del unused I/Onames
K:Check
O:Sort
F:Find
```

```
[Edit I/O Comments ]
D:I/O address
S:Save comments
R:Retrieve comments
C:Clear comments
P:Print comments
F:Find comments
```

W:Edit PC ID and D: Edit DM

```
[ Edit PC ID ]
S:Save PC ID
R:Retrieve PC ID
I:Fill
C:Clear
P:Print
K:Check
O:Sort
F:Find
```

```
[ D M ]
R:Read DM addr
C:Copy
F:Fill
P:Print
A:HEX <-> ASCII
B:Switch Bank #
S:Save DM
L:Retrieve DM
K:Save file
Y:Retr file
```

I: Edit I/O Table and T: Data Trace

```
[ Edit I/O Table ]
W:Write I/O table
K:Check I/O table
S:Save I/O table
L:Retrieve I/O table
C:Clear I/O table
Z:Custom I/O table SIOU
A:PC setup
```

```
[ Data Trace ]
R:Read data trace
S:Save data trace
L:Retrieve data trace
```

F: File Management and Q: System Setup

```
[File managemnt]
I:File dir
C:Copy file
N:Chge file name
D>Delete file
E:Chge drive&path
R>Create/del directory
P:Print
```

```
[ System Setup ]
N:Dest network addr (Net:000 Node:000 PC ID: )
C:Comm use (COM1) (Ascii )
R:Memory card writer (COM1)
T:Program type (SFC+1add)
P:Printer type (WIDE CARRIAGE GRAPHICS)
K:Program check PC (CV1000-CPU01)
M:Message # ( 0 )
```

A: PC Setup and Z: Customize

```
[ PC Setup ]
A:PC setup
S:Save PC settings
R:Retrieve PC settings
C:Clear PC settings
```

```
[ Customize ]
S:Save custom data
R:Retrieve custom data
F:Chge FUN code
E:Chge data area abbr
G:Word grouping
```

N: Network Support Table and J: Memory Card

```
[ Network Support Table ]
N:Data link table (SYSMAC NET)
L:Data link table (SYSMAC LINK)
R:Routing table
```

```
[ Memory Card Oper ]
M:Computer<->memory card
C:Copy file
N:Change file name
D>Delete file
F:Initialize
P:Print
```

U: Convert UM and M: Format Floppy

```
[ Convt UM ]
U:SFC/ladder to UM
S:UM to SFC/ladder
```

```
[ Formatting ]
Format floppy disk?
Warning : Format will erase all data
          on the disk.
          Do not format the Hard Disk!
Are you sure you want to format?(Y/N)
N
```

X:Command.Com and O: End

These operations don't have sub-menus.

3-3-2 Online Operations

With the main offline menu displayed on the screen, press the Shift+F1 Keys to place the CVSS online with the PC. The main online menu will appear as shown below. You can place the CVSS online only when the main offline menu is displayed, the PC and computer are connected, and the PC is ON. Also, you can take the CVSS offline only when the main online menu is displayed.

To return to the main menu from another online menu, press the End or Ctrl+M Keys. To return to the original display, press either the Esc or Shift+Esc Keys. While the CVSS is online with the PC, the PC mode can be changed by pressing F7 to F10 Keys while holding down the Shift Key.

CV1000-CPU01 PROGRAM# Ver. 2.00
Net000Node000

DRV	[Functions]	DRV	[Functions]
C	M:Monitor	C	J:Memory card
C	R:Debug	C	U:Display errors
C	C:Transfer program & data	C	Y:Clock
C	D>Edit DM	C	U:Protect UM
C	I>Edit I/O table	C	
C	T>Data trace		
C	F:File management		
C	P:Program trace		
C	Q:System setup		
C	A:PC setup		
C	Z:Customize		
C	X:CPU Bus Unit Setup		
C	N:Network support table		
C	S:Diagnosis network		
C	B:SYSMAC BUS/2		

1 2 3 4 5 6 7 8 9 0 cancl

M: Monitor

With SFC Programming:

From the monitoring display:

```
[ Monitor ]
A:Action display
T:Trans sheet(PC->Comp)
H:Change SFC settings
M:Process monitor
D:All I/O monitor
B:Part I/O monitor
S:Step status
O:SFC online edit
X:Cross-reference
R:Read cycle time
C:Clear data&program
```

Ladder Programming only:

From the monitoring display:

```
[ Monitor ]
H:Change display
I:Monitor intr prog
D:Monitor all I/O
B:Monitor part I/O
O:Online edit
R:Read cycle time
J:Measure exec time
M:Memory map
C:Clear data & program
```

From the program view display:

```
[ Monitor ]
H:Change display
D:All I/O monitor
B:Part I/O monitor
O:Online edit
R:Read cycle time
J:Measure exec time
M:Memory map
C:Clear data & program
```

R: Debug

This operation doesn't have sub-menus.

C: Transfer Program & Data and D: Edit DM

```
[ Transfer ]
F:PC->Computer(System work)
P:Computer(System work)->PC
C:Compare Prog.
S:PC->Computer(Data disk)
L:Computer(Data disk)->PC
```

```
[ D M ]
R:Read DM addr
C:Copy
F:Fill
P:Print
A:HEX <-> ASCII
B:Switch Bank #
S:Save DM
L:Retrieve DM
T:Trans DM
```

I: Edit I/O Table and T: Data Trace

```
[ I/O Table ]
T:Transfer I/O table
C:Create I/O table
U:Verify I/O table
A:PC setup
```

```
[ Data Trace ]
E:Execute data trace
R:Read data trace
S:Save data trace
```

F: File Management and P: Program Trace

```
[File managemnt]
I:File dir
C:Copy file
N:Chge file name
D:Delete file
E:Chge drive&path
R:Create/del directory
P:Print
```

```
[ Program Trace ]
A:Action trace
I:Instruction trace
M:Mark trace
```

Q: System Setup and A: PC Setup

```
[ 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 )
```

```
[ PC Setup ]
A:PC setup
S:Save PC settings
R:Retrieve PC settings
T:Transfer PC settings
```

Z: Customize and X: CPU Bus Unit Setup

```
[ Custom data ]
T:transfer custom data
```

```
[ CPU Bus Unit ]
S:Comm unit settings
W:Software switches
T:CPU SIOU Unit System Setup
C:CPU SIOU Unit Soft Sw Setup
```

N: Network Support Table and S: Diagnosis Network

```
[ Network support table ]
N:Data link (SYSMAC NET)
L:Data link (SYSMAC LINK)
R:Routing table
```

```
[ Netwk Diagnosis ]
N:SYSMAC NET
L:SYSMAC LINK
```

B: SYSMAC BUS/2 and J: Memory Card

```
[ Masters ]
S:Display status
T:Test
C:Read cycle time
R:Slave conn stat
L:Sw line mode
```

```
[ Memory Card Oper ]
P:PC<->memory card
M:Computer<->memory card
C:Copy file
N:Change file name
D:Delete file
F:Initialize
```

V: Read Errors and U: Protect UM

```
[ Read Errors ]
E:Error Dir
L:History
A:Cancel access right
```

```
[ Protect UM ]
P:Protect
A:Del total protect
B:Del part protect
```

Y: Clock

This operation doesn't have sub-menus.

3-4 Memory Configuration

The CV Support Software Version 2 uses three memory media: the main memory, the work disk, and data disks.

Memory Media

Main Memory

The main memory is the computer's RAM memory. Data stored in the main memory is lost when the computer power is turned off.

Work Disk

The work disk is the usually the computer's hard disk, but can be a combination of a hard disk and a RAM disk. The user selects whether a hard disk or a combination of hard disk and a RAM disk will be used during installation. If the RAM disk capacity is 5M bytes or higher, it is large enough to act as the work disk by itself.

When using a RAM disk, always select the END operation from the main menu when closing CVSS.

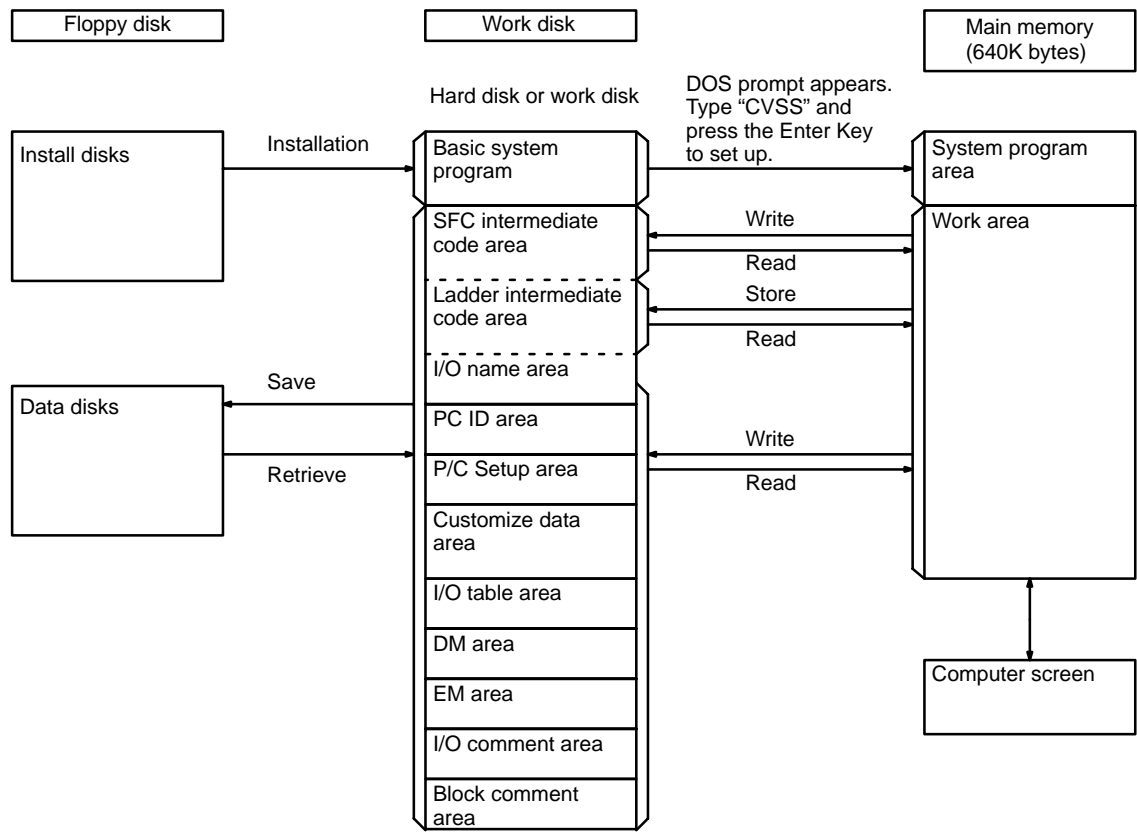
Data Disks

Data disks are floppy disks that are used to contain various data.

Offline Data Flow

Always transfer new or modified SFC programs or ladder diagrams from the main memory to the work disk with the Write Sheet or Store operations. If the data in main memory isn't transferred to the work disk, it will be lost when changing to another main menu or changing between SFC Detail View Mode and SFC Program View Mode.

The following diagram shows the flow of data between the three memory media.



Note 1. Data link tables, routing tables, and program link parameters are not written to the work disk. Data is saved directly to the data disk from the main memory and retrieved directly from the data disk to the main memory. With this procedure, data link tables, routing tables, and program link parameters are saved or loaded.

Data Areas and Data Storage

Data area name	Data storage method
Customize data area	Automatically stored on the work disk either when modified or when the menu is changed, so saving to the work disk by the Store operation isn't necessary.
Data link table area	Created in main memory. Always save this data to the data disk.
Data trace area	
DM area	Automatically stored on the work disk either when modified or when the menu is changed, so saving to the work disk by the Store operation isn't necessary.
EM area	
I/O comment area	Automatically stored on the work disk.
I/O name area	Automatically stored on the work disk either when modified or when the menu is changed, so saving to the work disk by the Store operation isn't necessary.
I/O table area	
Ladder intermediate code area	Stored on the work disk using the Store operation.
Block comment area	
PC name area	Automatically stored on the work disk either when modified or when the menu is changed, so saving to the work disk by the Store operation isn't necessary.
PC Setup area	
Program link parameter area	Created in main memory. Always save this data to the data disk.
Routing table area	
SFC intermediate code area	Stored on the work disk using the Write Sheet operation.

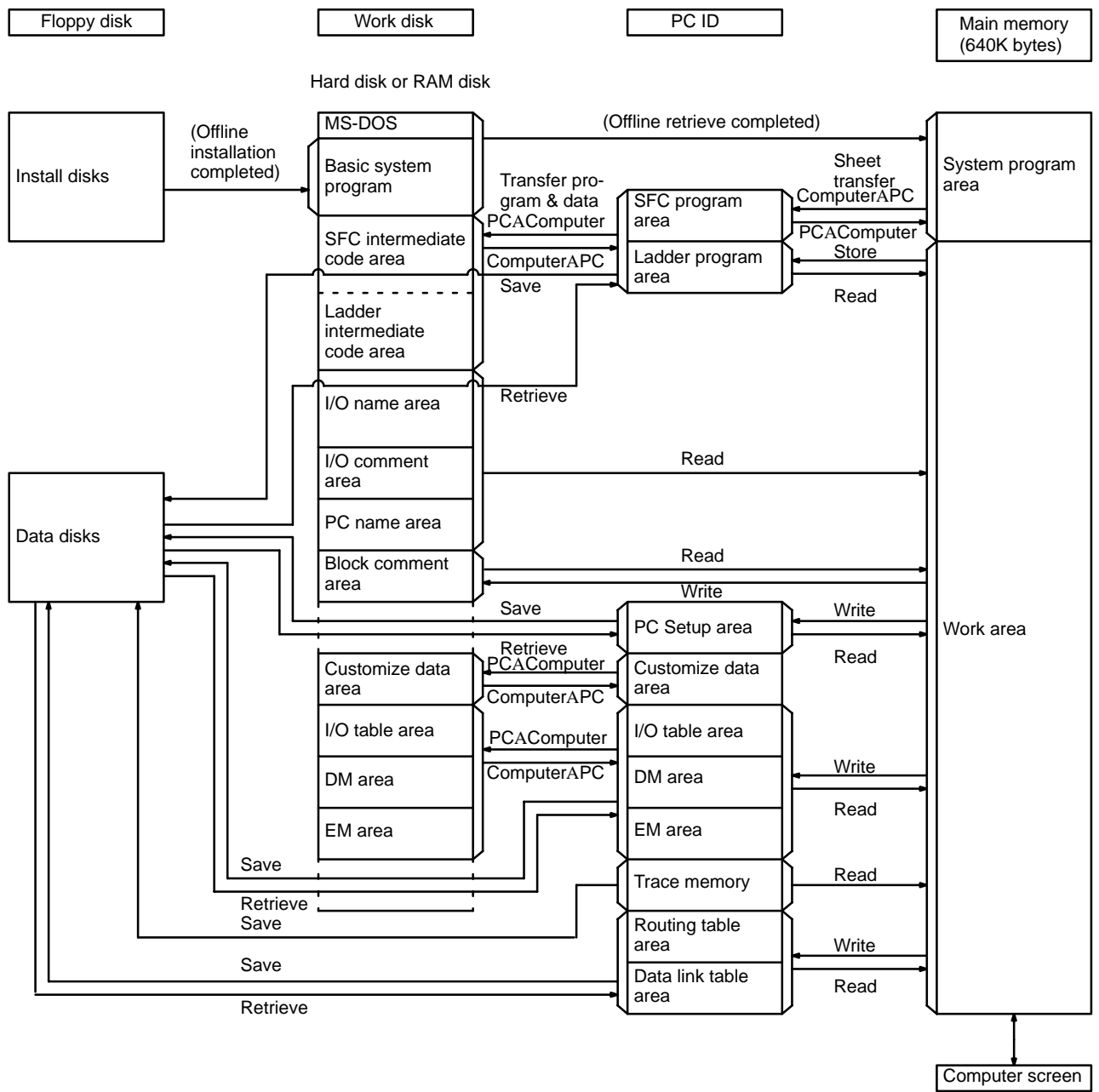
Online Data Flow

In online operation, most data is transferred between the PC and the computer's work disk, main memory, or data disk.

Monitoring and online editing use the program in the PC, not the one in the work disk. On the other hand, I/O names, I/O comments, block comments, and PC names are not stored in the PC but in the work disk. Be sure that the I/O names, I/O comments, and block comments in the work disk agree with the ones used to create the PC program.

PC Setup information, trace memory, the routing table, and the data link table cannot be transferred between the PC and the work disk. Customized data cannot be transferred between the PC and the data disk.

The following diagram shows the flow of data between the three memory media and the PC memory.



3-5 Data File Structure

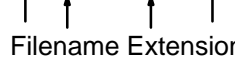
The files that can be created on data disks and memory cards are listed in the following table. Before new data disks can be used they must be formatted with the Format Floppy operation in the main offline menu.

File type	Filename extension	Function	Operations using file
Customize data	.CUS	Contains the settings recorded in the Customize operation.	Customize
Data link table (SYSMAC LINK)	.SLK	Contains the data link table information for the SYSMAC Link System.	Network support table
Data link table (SYSMAC NET Link)	.SNT	Contains the data link table information for the SYSMAC NET Link System.	Network support table
Data trace	.DTR	Contains the results from data trace operations.	Data trace
DM	.DMD	Contains Data Memory data.	Edit DM, Transfer program & data
EM	.EDM	Contains Extended Data Memory data. Used with the CV1000 only.	Edit DM, Transfer program & data
File data	.IOM	Contains Memory Card file data (IOM/DM).	Edit DM
I/O comment	.CMT	Contains the I/O comments that are displayed on the screen or printed out when creating the program. Up to 10,000 I/O comments can be stored.	Edit I/O comments
I/O name	.SBL	Contains the I/O names used when creating the program. Up to 10,000 I/O names can be stored.	Edit I/O names, Programming
I/O table	.IOT	Contains the I/O table information.	Edit I/O table, Transfer program & data
Object	.OBJ	Contains program file data (.COD) that has been converted to machine language by the Convert UM operation.	Convert UM, Transfer program & data
PC name	.PCN	Contains the PC names assigned to nodes in SYSMAC NET Link and SYSMAC LINK systems. Up to 500 PC names can be stored.	Edit PC names, Network support table, Diagnosis network, Monitoring
PC Setup	.CPU	Contains the PC Setup settings.	PC Setup
Program	.COD	Contains all of the elements composing the program, including SFC, ladder/mnemonics, I/O names, I/O comments, and block comments. Refer to 3-6 <i>Program Structure</i> for details.	Programming, Edit I/O names, Edit I/O comments, Transfer program & data, Convert UM, Monitoring
Program link parameter	.LNK	Contains the parameters that determine the order in which programs will be joined by the Program Link operation.	Programming
Program section	.CIR	Contains a section of a program saved with the Program Save operation in SFC Program View mode.	Programming
Routing table	.RTG	Contains the network routing table information.	Network support table, Monitoring

A list of files showing the filenames and filename extensions can be displayed by selecting the File management operation from the main offline or online menu and then selecting File directory. The file directory can also be displayed by pressing the Esc Key when inputting a filename to save a file to the data disk or load a file from the data disk.

The diagram below is an example of a file directory. The file type can be determined from the filename extension. Filename extensions are automatically attached by the CVSS, so it isn't necessary to type them in. It is sometimes useful to give the same filename to files that closely related but of different file types. In this example a program file and its object file have the same filename "SAMPLE" and are distinguished by their filename extensions.

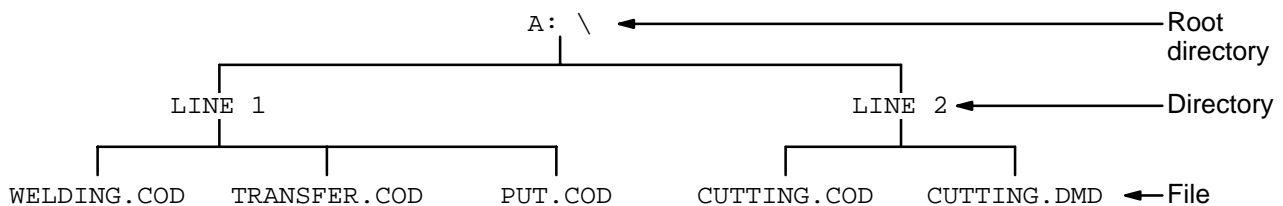
Filename	Size	Date
SAMPLE COD	45567	
SAMPLE OBJ	89745	
WELDING COD	12649	
PARTS STD	564	



About Directories

Managing files becomes complicated as more and more PC programs, I/O tables, DM data files, etc. are added to a data disk. To simplify file management, directories are used to organize files into groups. Directories are like drawers in a file cabinet. Different drawers contain files organized by some grouping: date, owner, client, etc.

The following diagram shows a directory tree for a data disk in which two directories, LINE1 and LINE2, have been created.



In order to create the directories shown in the diagram, select the Create/Delete Directory operation from the File Management menu and create the two directories, A : \LINE1 and A : \LINE2.

A file is identified by its directory and filename. As an example, the WELDING.COD program in directory LINE1 would be saved as A : \LINE1\WELDING in the Program Save operation. Refer to *6-1 File Management* in the *CV Support Software Version 2 Operation Manual: Offline* for details.

Directories can be created within directories. In other words, directories can be nested. To create a directory called OLD within the LINE1 directory, create the directory A : \LINE1\OLD with the Create/del directory operation from the File Management menu.

3-6 Program Structure

This section describes the data generated when an SFC program is created, and how that data is handled.

3-6-1 Types of Data

Three types of data are generated when making an SFC program: the SFC program itself, I/O names, and comments.

The Program

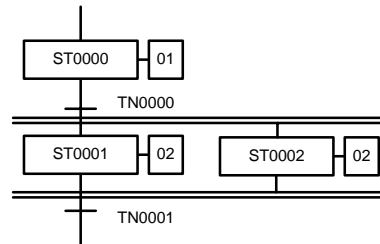
The SFC program is made up of SFC (Sequential Flow Charts) as well as action and transition programs.

SFC

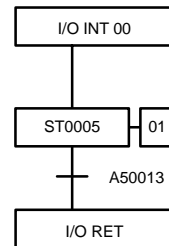
Sequential flow charts are created in units called “sheets.” A single SFC sheet is edited when programming is selected from the main menu in SFC Detail View mode. Refer to the CV500/CV1000 Operation Manual: SFC for details on SFC programming.

Main Program

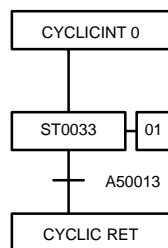
(Sheet 0)

**I/O Interrupt Program #00**

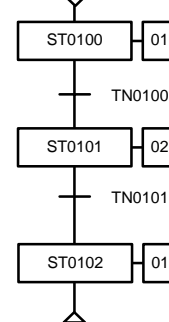
(Sheet 1)

**Scheduled Interrupt Program #0**

(Sheet 2)

**Subchart Program**

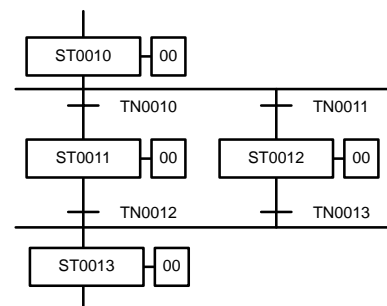
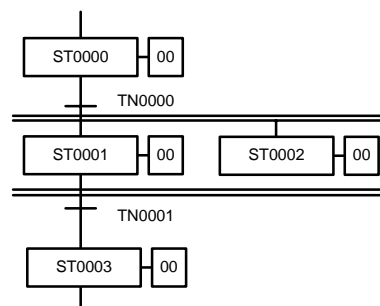
(Sheet 3)



The SFC program is composed of separate sheets with different sheet numbers, and must end with a single sheet. The separate programs can include the main program, the power OFF interrupt program, the power ON interrupt program, scheduled interrupt programs 0 and 1, I/O interrupt programs 00 to 31, and sub-chart programs.

Only the main program can be divided into more than one sheet. When the main program is divided into multiple sheets, each sheet must either contain an initial step or must be activated from another sheet using a step control instruction to be executed.

Only one program can be created within one sheet. A syntax error would occur if the programs shown in the following example were created in a single sheet.



The following table shows the maximum number of SFC parts that can be contained in a single sheet.

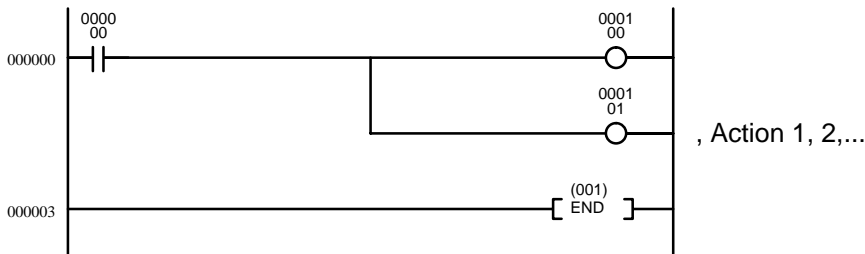
SFC part	Max. number
Actions	1,500
Initial steps	31
Steps	100
Transitions	100

When the program type has been set to “Ladder” in the System Setup so the program is input only with ladder diagrams, SFC parts are generated automatically and the user input on the ladder-diagram program. Refer to the CV500/CV1000 Operation Manual: Ladder Diagrams for details on ladder diagrams.

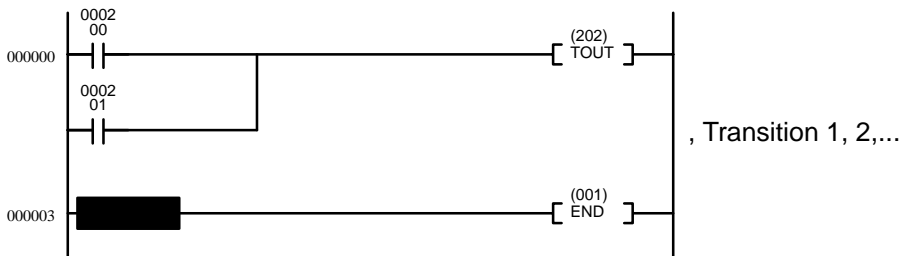
Action and Transition Programs

Programs corresponding to actions and transitions in the SFC are input as ladder diagrams or in mnemonics. Write each action and transition program by selecting programming from the main menu and then switching to SFC Program View mode.

Action 0



Transition 0



I/O Names

I/O names can be assigned to bit addresses, word addresses, step numbers, action numbers, or transition numbers. I/O names can be written into the program instead of bit and word addresses allowing the program to be completed before the I/O bit and word allocation has been decided. Refer to 4-3-3 *Later Assignment of I/O Addresses* for details.

Comments

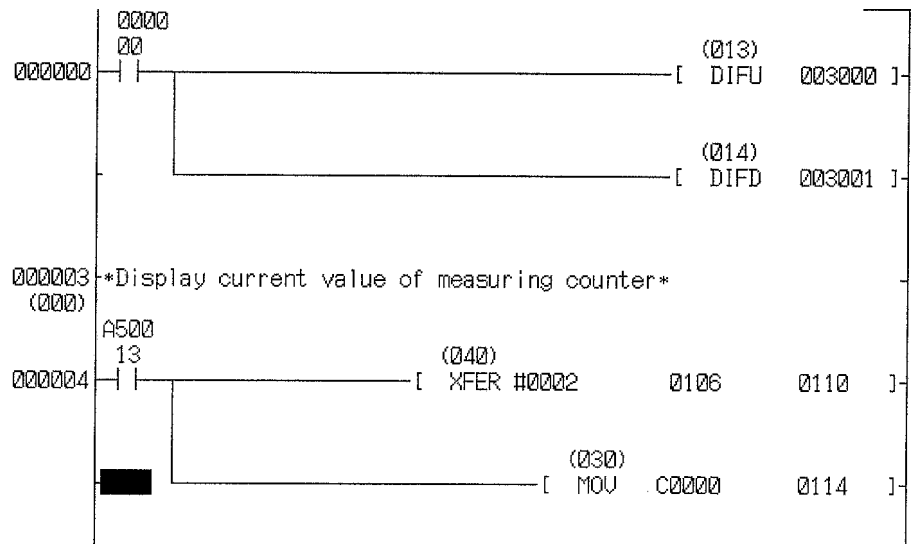
There are two kinds of comments, I/O comments and block comments. These are short sentences that can be written into the program to explain details of the program such as the operation of bits or program sections. Comments can be displayed on the CVSS display or printed out.

I/O Comments

I/O comments are used to explain the operation of I/O bits or words in the program. One I/O comment up to 30 characters long can be attached to an I/O bit or word. To create I/O comments, select the Edit I/O Comments operation from the main menu.

Block Comments

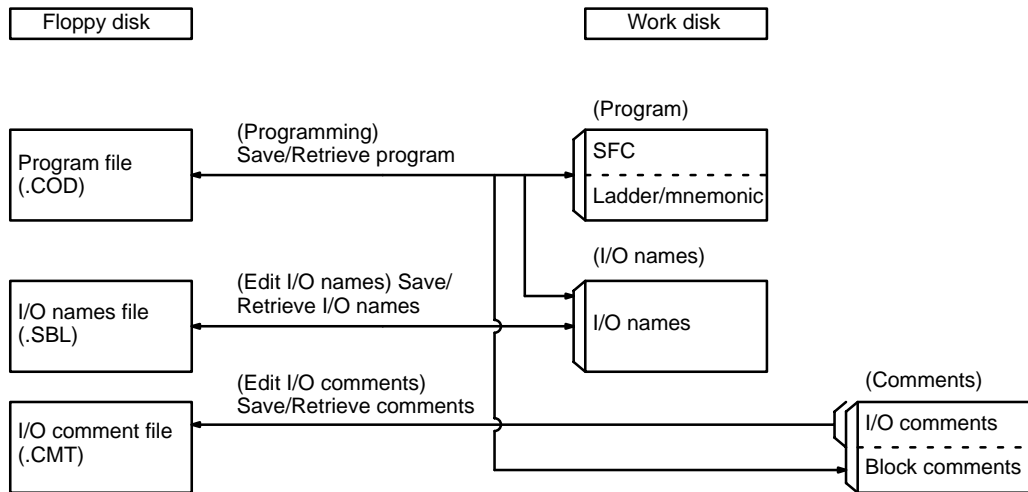
Block Comments are used to explain details about the operation of instruction blocks in ladder diagram programs.



Up to 512 block comments (total) can be contained in action and transition programs, and these 512 block comments can contain up to 65,536 characters. For example, only 327 block comments could be created if each block comment were 200 characters long.

3-6-2 Transferring Program Data to the Data Disk

The program, I/O names, and comments files described in 3-6-1 *Types of Data* are created on the computer's work disk. Each of these files can be saved to (and later retrieved from) the data disk.



In SFC Detail View mode, the Save Program and Retrieve Program operations transfer both the SFC and ladder/mnemonic parts of the program, while in SFC Program View Mode, the Save Program and Retrieve Program operations transfer only on the ladder part.

3-6-3 Transferring Program Data to the PC

Only the program itself is transferred to the PC, not the I/O names or comments. To transfer the program, select the Transfer Program & Data from the main on-line menu, and then select Computer (System work) → PC from the sub-menu. As the CVSS data is transferred, it is simultaneously converted to the machine language used by the PC.

It is possible to separate the conversion and transferral processes by following the procedure below.

- 1, 2, 3... 1. First convert the program on the data disk to machine language with the Convert UM operation in the main offline menu.
2. Transfer the file created in step 1 by selecting Transfer Program & Data from the main online menu, and then selecting Computer (Data disk) → PC from the sub-menu.

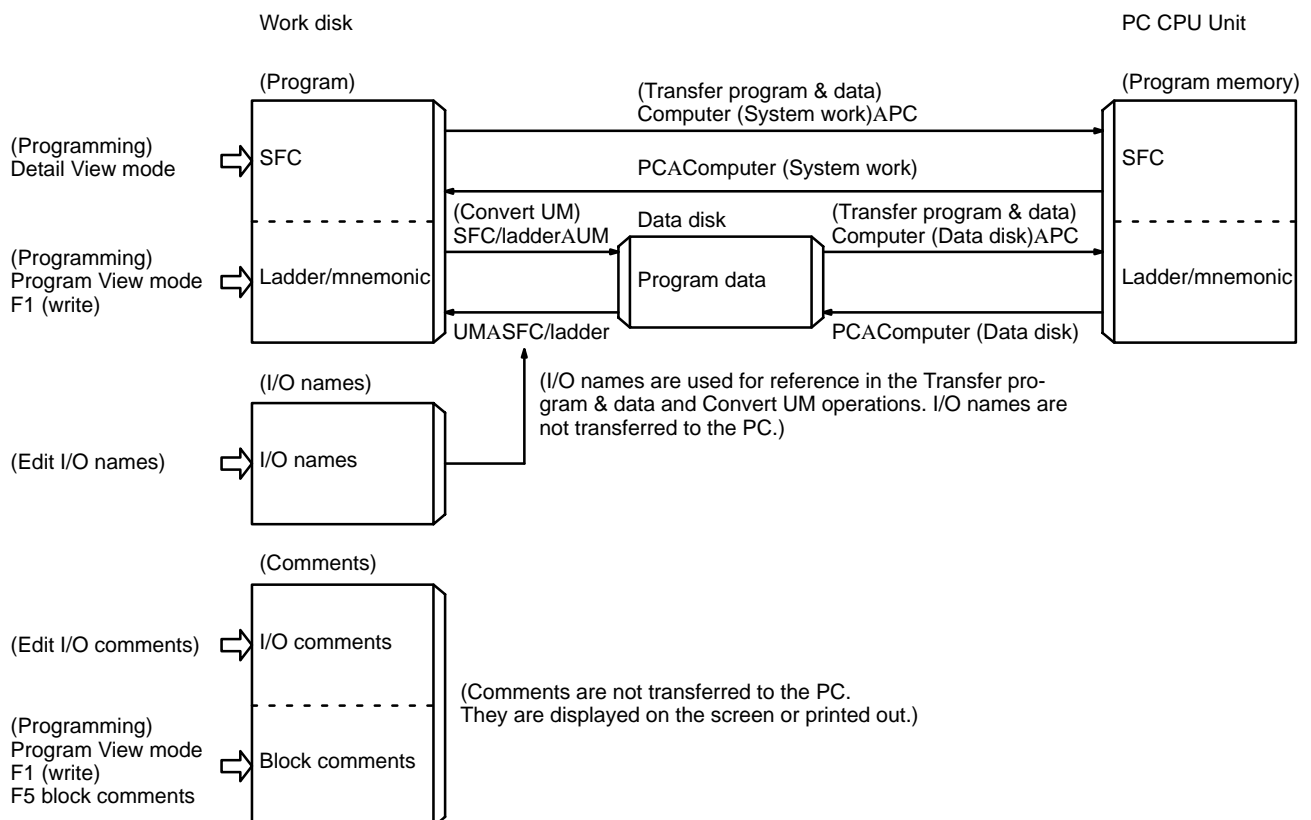
Note Do not transfer SFC programs to a CVM1 CPU Unit.

3-6-4 Transferring Program Data from the PC

To transfer the program from the PC to the CVSS, select Transfer Program & Data from the main online menu, and then select PC → Computer (System work) from the sub-menu. The data is converted from machine language as it is transferred. Follow the procedure below to separate the conversion and transferral processes.

- 1, 2, 3... 1. First transfer the program in the PC to the computer's data disk by selecting Transfer Program & Data from the main online menu, and then selecting PC → Computer (Data disk) from the sub-menu.
2. Convert the program transferred to the data disk from machine language to the language used by the CVSS with the Convert UM operation in the main offline menu.

The following diagram shows the relationship between data in the PC and data on the computer's work disk.



SECTION 4

Basic Procedures

This section provides an introduction to the procedures necessary to set up a basic PC system, write SFC and ladder programs, transfer the programs to the PC, and monitor program execution. The use of I/O names in programming is also explained briefly.

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4-1 SFC

This section provides an introduction to the procedures necessary to set up a basic PC system, write an SFC program, transfer the program to the PC, and monitor program execution. This information is provided for users not familiar with the CVSS. Details on SFC programming and monitoring are provided in the *CV Support Software Version 2 Manual: Online* and *CV Support Software Version 2 Manual: Offline*.

Note The CMV1 CPU Units do not support SFC programming.

4-1-1 Overview

The overall procedure for starting the CVSS and programming and monitoring the SFC program is given below. Further details on each step are provided in the remainder of this section. The following represent the minimum settings required and are not intended to be complete operating instructions.

- 1, 2, 3...
 1. Start the CVSS. If you have started the CVSS before, it is only necessary to turn on your computer and run the CVSS program. Refer to the sections on installing and starting CVSS earlier in this manual for details.
 - a) Back up the system disks containing the CVSS program.
 - b) Install the CVSS onto the hard disk.
 - c) Run the CVSS program.
 2. Set the CVSS operating environment from the System Setup display.
 - a) Set the program type to SFC and ladder to enable usage of SFC.
 - b) Set the PC model for the program check.
 3. Create the steps and transitions of the SFC program using the detail view in offline mode.
 - a) Clear the entire user program area from the work disk.
 - b) Create the steps and transitions of the SFC program. These steps and transitions will determine the overall flow of the program.
 - c) Create an action block for each step.
 - d) Check the SFC program.
 - e) When each SFC program has been finished, write the sheet to the work disk.
 4. Create the action programs and transition programs in offline mode.
 - a) Switch to the program view. You have to be in program view to write action and transition programs.
 - b) Specify and write an action or transition program using a ladder diagram.
 - c) Save the ladder-diagram program to your work disk whenever 22 lines have been written.
 - d) When an entire ladder-diagram program has been written, save any part that has not been saved to the work disk and check it to be sure that there are no programming errors.
 5. Back up the completed SFC program on a data disk. The floppy disk must be formatted in advance.
 6. Connect the PC.
 - a) Install the PC, mounting all I/O Units and connecting the proper power supplies.
 - b) Connect your computer to the PC using the host link interface on the PC.
 7. Go online with the PC.
 - a) Set the host link interface specifications. Select ASCII communications mode from the system setup menu.

- b) Turn on the power supply to the PC.
 - c) With the main offline menu showing, press the Shift+F1 Keys to go on-line.
8. Register the I/O table.
9. Transfer the program to the PC.
10. Switch the PC to MONITOR Mode and monitor program execution from the CVSS.

4-1-2 General Guidelines

To select operations and settings in the following procedures either you can move the cursor with the cursor keys and press the Enter Key when the desired item is in reverse video or you can press the letter given at the left of the item or setting.

To return to the previous display, press the Esc Key. To return to the beginning of the current operation, press the Shift+Esc Keys.

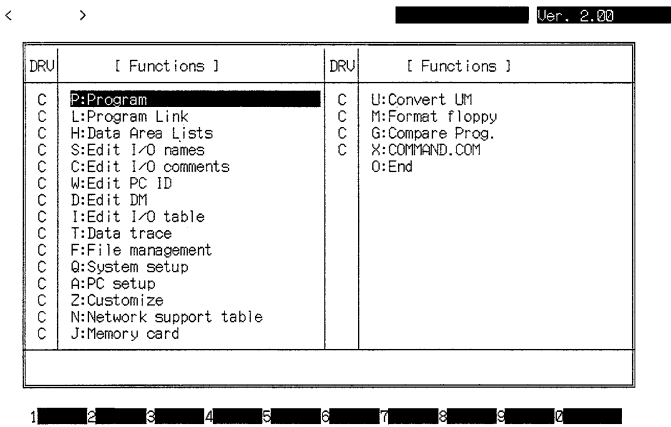
When using the Shift Key in combination with another key, always press the other key while holding down the Shift Key.

Typing mistakes in input fields can be deleted with the Backspace Key to delete one character at a time or with the Home Key to return the entire field to its original value. If you have already completed and confirmed an incorrect input, repeat the steps leading up to that input to correct the mistake.

4-1-3 Procedures

Starting the CVSS

If you have not installed the CVSS, refer to the procedures given earlier in this manual. Once the CVSS has been installed, type “CVSS” at the DOS prompt. This will start the program and the main offline menu will appear as shown below.



Setting the CVSS Operating Environment

If you have not previously set the program type and PC model, use the following procedure to do so. If the current settings are okay, you can go directly to the next step, creating the steps and transitions.

- 1, 2, 3... 1. Select "Q:System setup" from the menu. The current settings of the CVSS operating environment will appear.

```

[ System Setup ]
N:Dest network addr (Net:000 Node:000 PC ID:      )
C:Comm use          (COM1) (Ascii )
R:Memory card writer (COM1)
T:Program type       (SFC+ladd)
P:Printer type       (WIDE CARRIAGE GRAPHICS)
K:Program check PC   (CV1000-CPU01)
M:Message #          ( 0 )
  
```

2. Select "T:Program type." The following setting will appear.

```

[ Program ]
L:Ladder
S:SFC + Ladder
  
```

3. Select "S:SFC + Ladder." This will enable programming with SFC. Ladder diagrams will be used within SFC for action and transition programs.
4. When the environment setting returns, select "K:Program check PC." The following setting will appear.

```

[ Prog Check PC ]
A:CU01-CPU01
B:CU01-CPU11
C:CU500-CPU01
D:CU1000-CPU01
E:CU2000-CPU01
  
```

5. Specify the PC for which the program check is to be made. In the rest of this section we will assume that a program is being written for the CV1000.
6. Press the Shift+Esc Keys to return to the main offline menu.

Creating the SFC

To write an SFC program, the steps and transitions of the SFC are first written to determine the overall flow of the program.

- 1, 2, 3... 1. Select "P:Program" from the main offline menu. The SFC detail view program display will appear.

```

< > < >
[ Detail view ]
(00,000)
  
```

```

[ # : ] [ Name : ] [ Com : ]
1 jump 2 find SOUR UM4PRG UM4P del $ 7 $ $ init @subCHT
  
```

2. Press the End Key to access the following menu.

```
[ Program ]
A:Edit action
E:Edit step/trans
W:Write sheet
R:Read sheet
S:Save program
L:Retrieve program
H:Change SFC settings
M:Memory map
C:Clear memory
P:Print SFC sheet
K:Check program (SFC)
```

3. Select "C:Clear memory." The following display will appear.

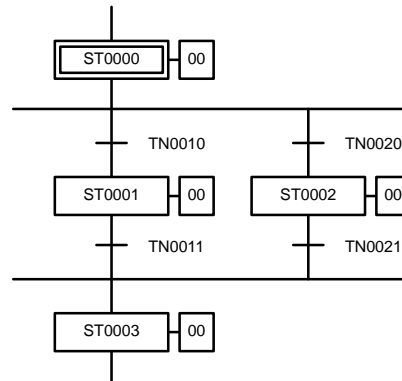
```
[ Program ]
A
E [ Clear Memory ]
W Z:All program
R S:SFC only
S P:Specified sheet
L
H:Change SFC settings
M:Memory map
C:Clear memory
P:Print SFC sheet
K:Check program (SFC)
```

4. Select "Z:All program." A confirmation message will appear.
5. Input Y and press the Enter Key to confirm. All of the user program area in the work disk will be cleared, including I/O names and all program comments. The SFC detail view program display will return.

```
< > < >
[ Detail view ]
(00,000)
```

```
[ # : ] [ Name : ] [ Com : ]
1 jump 2 find 3OUR U4PRG U5EP del 3 4 5 6 7 8 9 init 0subCHT
```

The next portion of this procedure shows how to input the following SFC program.

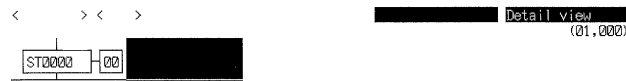


6. Press the Shift+F1 Keys and then press the Enter Key to create the first step. Then press the F6 Key, input the step number (here, 0), and then press the Enter Key again. The first step will appear as shown below.

Although the step number can be input immediately without pressing the F6 Key, leading zeros may be omitted if the F6 Key is used.



7. Press the Shift+F3 Keys and then the Enter Key to create the first part of the conditional branch. A line will appear under the step or transition indicated by the cursor. Press the Right Key to move the cursor and then press the Shift+F3 Keys and then the Enter Key again to extend the conditional branch line. The display should now appear as shown below.



8. Move the cursor to below the first step and then press the Shift+F2 Keys followed by the Enter Key to create the first condition. Then press the F5 Key, input the transition number (here, 10), and then press the Enter Key again. The first transition will appear as shown in the following.

Although the transition number can be input immediately without pressing the F5 Key, the prefix and leading zeros may be omitted if the F5 Key is used.



9. Input the rest of the SFC using the following key sequences:

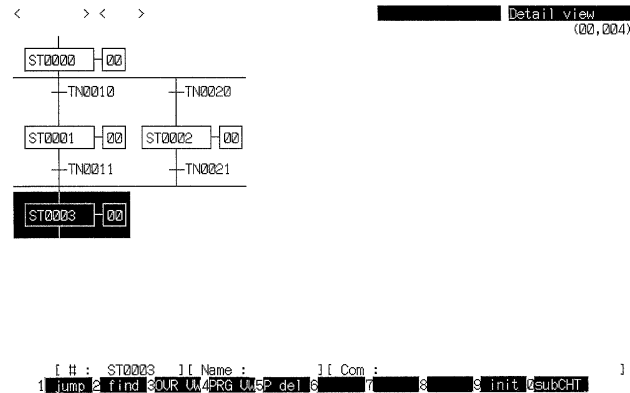
Move the cursor:

Down one
Down one
Right one, up two
Down one
Down one
Left one
Down one

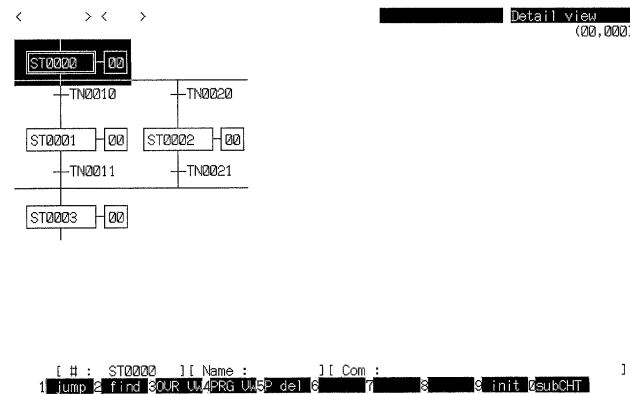
And press:

Shift+F1, Enter, F6, 1, and Enter
Shift+F2, Enter, F5, 1, 1, and Enter
Shift+F2, Enter, F5, 2, 0, and Enter
Shift+F1, Enter, F6, 2, and Enter
Shift+F2, Enter, F5, 2, 1, Enter, Shift+F3, and Enter
Shift+F3 and Enter
Shift+F1, Enter, F6, 3, and Enter

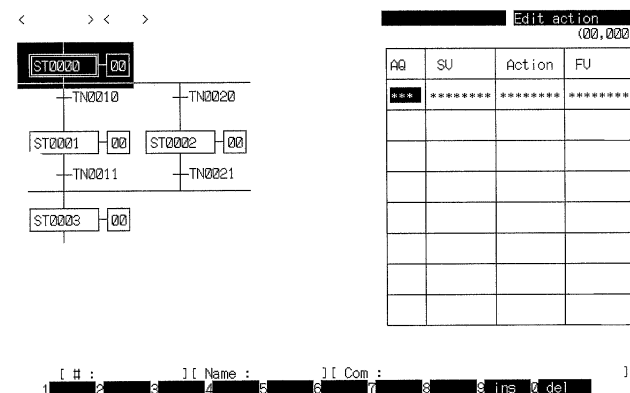
The program should now appear as shown below.



10. Move the cursor to step ST0000 and press the F9 Key to designate this step as an initial step. The step will toggle between a normal step and an initial step each time the F9 Key is pressed. The final form of the SFC should appear as shown below.

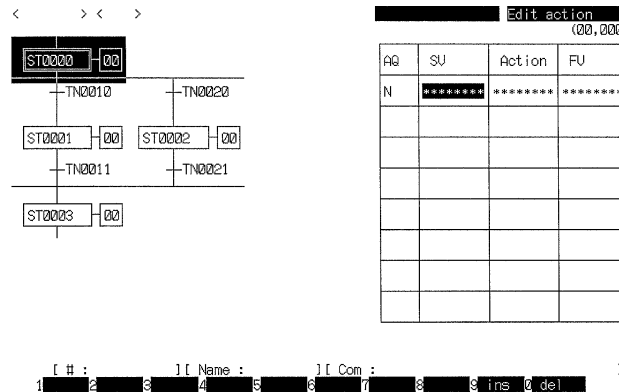


11. Press the End Key to access the menu and then select "A:Edit action" to create an action block.
12. Move the cursor to the step for which an action block is to be created and press the Enter Key. The following display will appear if ST0000 is specified.



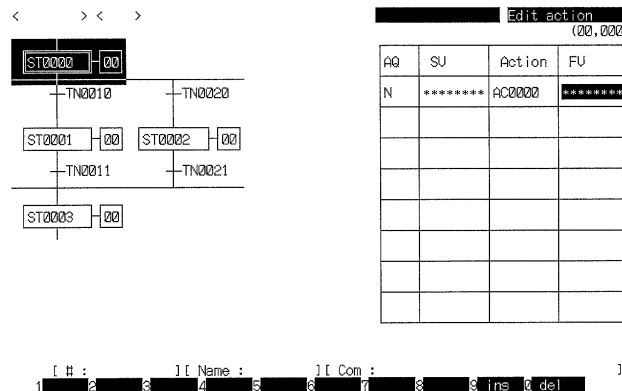
13. Move the cursor to the AQ column and press the Enter Key. A list of action qualifiers will appear.

14. Move the cursor to the desired action qualifier and press the Enter Key again. The specified action qualifier will be displayed and the cursor will move to the next column, as shown below.



15. Press the Right Key to move the cursor to the next column. (A set value is not required for the N action qualifier used in this example.)
16. Press the Enter Key and the F7 Key to specify an action program, and then input the action number followed by the Enter Key. The specified action number will be displayed and the cursor will move to the next column, as shown below.

Although the action number can be input immediately without pressing the F7 Key, the prefix and leading zeros may be omitted if the F7 Key is used.



17. Move the cursor to the left of the next line in the action block and press the F9 Key to insert a new action. (The feedback variables will be omitted in this example.)
18. Repeat the above procedure to input the action, but input a bit to define the action. To input a bit, press the Enter Key, type "001000" and then press the Enter Key again. The display should appear as shown below.

All prefixes (if required) and leading zeros must be input when designating a bit address.

< > < >

ST0000-00

TN0010

TN0020

ST0001-00

ST0002-00

TN0011

TN0021

ST0003-00

Edit action

(00,002)

AQ	SU	Action	FU
N	*****	AC0000	*****
N	*****	001000	*****

[# :] [Name :] [Com :]
1 2 3 4 5 6 7 8 9 ins 0 del

19. When the action block has been completed, press the Shift+Left Keys, move the cursor to the next step for which an action block is to be created, and press the Enter Key. (Here, the Enter Key can be replaced with the Shift+Right Keys.) The action block will appear.

< > < >

ST0000-00

TN0010

TN0020

ST0001-00

ST0002-00

TN0011

TN0021

ST0003-00

Edit action

(00,002)

AQ	SU	Action	FU
***	*****	*****	*****

[# :] [Name :] [Com :]
1 2 3 4 5 6 7 8 9 ins 0 del

The following key sequences show how to create an action block for the remaining steps in the example program.

20. Step ST0001
- Move the cursor:
To ST0001
Right one

And press:
Enter, Enter
Enter, F7, 1, Enter

< > < >

ST0000-00

TN0010

TN0020

ST0001-00

ST0002-00

TN0011

TN0021

ST0003-00

Edit action

(00,002)

AQ	SU	Action	FU
N	*****	AC0001	*****

[# :] [Name :] [Com :]
1 2 3 4 5 6 7 8 9 ins 0 del

21. Step ST0002
- Move the cursor:

And press:

Right one

Shift+Left

Right one

Enter, Enter, Enter

Right one

Enter, F7, 2, Enter

< > < >

ST0000-02

TN0010

ST0001-01

TN0011

ST0003-00

TN0020

ST0002-00

TN0021

Edit action

(01,002)

AO	SU	Action	FU
N	*****	AC0002	*****

[# :] [Name :] [Com :]
1 2 3 4 5 6 7 8 9 ins 0 del]

22. Step ST0003
- Move the cursor:

And press:

Left one, down two

Shift+Left

Right one

Enter, Enter, Enter

Left one

Enter, F7, 3, Enter

Left three, down one

F9, Enter, Enter

Right one

Enter, 001001, Enter

< > < >

ST0000-02

TN0010

ST0001-01

TN0011

ST0003-00

TN0020

ST0002-01

TN0021

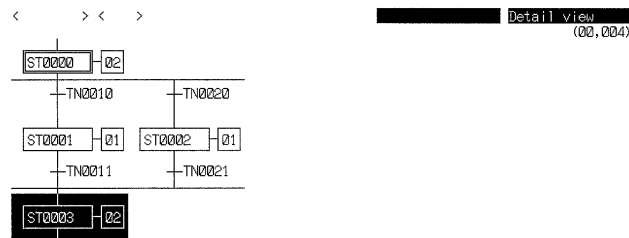
Edit action

(00,004)

AO	SU	Action	FU
N	*****	AC0003	*****
N	*****	001001	*****

[# :] [Name :] [Com :]
1 2 3 4 5 6 7 8 9 ins 0 del]

23. Press the Shift+Esc Keys to end action editing. The SFC detail view programming display will return and the number of actions created for each step will be displayed in the small boxes to the right of the step boxes.



```
[ # : ST0003 ] [ Name : ] [ Com : ]
1 jump 2 find 3 OUR UL4PRG UL5P del 6 7 8 9 init 0 subCHT ]
```

24. Press the End Key to access the menu and select "K:Check program (SFC)." The following display will appear.

```
[ Program ]
A
E [ Check ]
W Will check current SFC sheet.
R Select check level and press enter key.
S
L 1:A, B, & C
H 2:A & B
M 3:A
C
P:Print SFC sheet
K:Check program (SFC)
```

25. Press the 1 Key to select a check for all levels. The program check display will appear and a message will flash to indicated that the program is being checked. When the check is finished, the locations and types of errors found will be displayed. If the program contains no programming errors, the following display will appear.

Check program (00,004)

C	R	Addr	I/Oname	Error

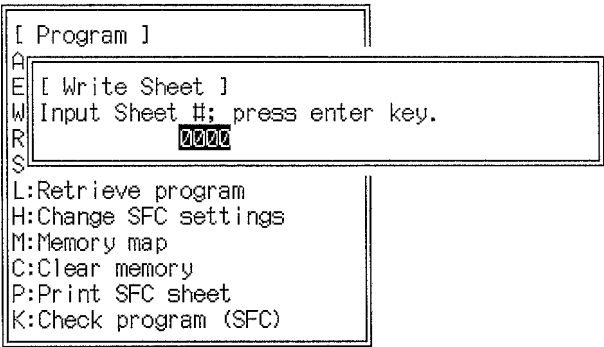
No errors

```
[ # : ST0003 ] [ Name : ] [ Com : ]
1 jump 2 find 3 OUR UL4PRG UL5P del 6 7 8 9 init 0 subCHT ]
```

26. If errors are displayed, the program will need correction before it can be executed. If no errors are displayed, press the Shift+Esc Keys to exit from the check and return to the SFC detail view programming display.

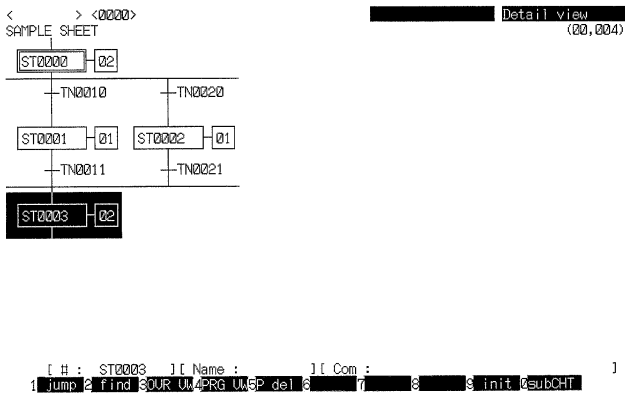
This completes the SFC program. The SFC program that has been input up to this point, however, exits only in the display buffer and must be written to the work disk before proceeding. If you leave the SFC detail view programming display or turn off the power supply, the program will be lost.

27. To save the program, press the End Key to access the menu and then select “W:Write sheet.” The following display will appear.



28. Input the sheet number, press the Enter Key, input a heading for the sheet and press the Enter Key again. The SFC sheet will be written to the work disk and, when the write is completed, the program will again be displayed in detail view showing the specified number and heading.

In this example, the sheet number is input as 0000 and the heading as SAMPLE SHEET. The heading can be up to 30 characters long.

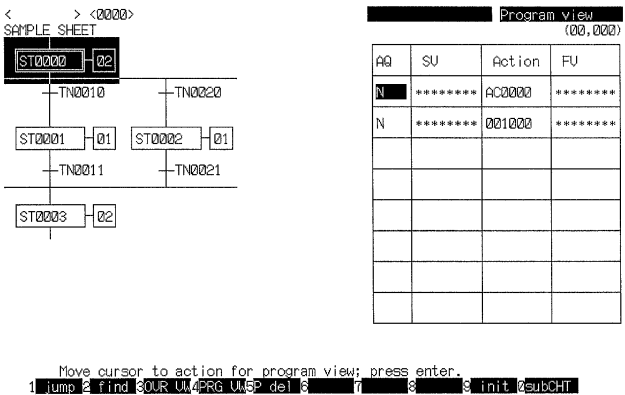


Creating the Action and Transition Programs

Once the overall structure of the SFC program has been input, ladder diagrams must be created for all action and transition programs using the following procedure.

- 1, 2, 3...
1.

Move the cursor to ST0000 and press F4 to switch to program view. The action block for ST0000 will appear and a message will ask you to specify the action for which the action program is to be input.



2. Move the cursor to the desired action and press the Enter Key. The ladder diagram program view display will appear for the specified action (here AC0000), and the program can be input.



4. Press the F7 Key to designate the first NO (normally open) condition, input the address of the operand bit, and then press the Enter Key. The specified condition will be displayed and the cursor will move one column to the right. Leading zeros may be omitted from the bit address.

To correct a mistake in the bit address after the Enter Key has been pressed, move the cursor back to the condition, press the Enter Key, and reinput the bit address.

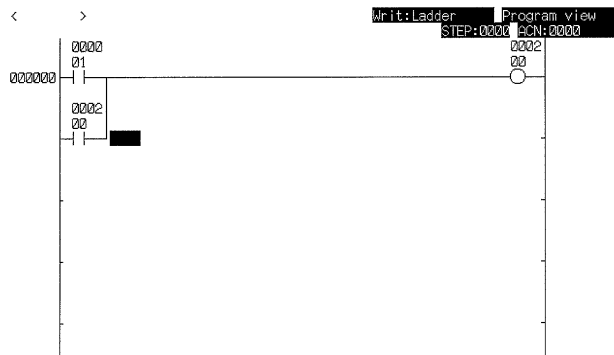


5. Press the F9 Key to designate the OUTPUT instruction, input the address of the output bit, and then press the Enter Key. The OUTPUT instruction will be displayed and the cursor will move to the next line.

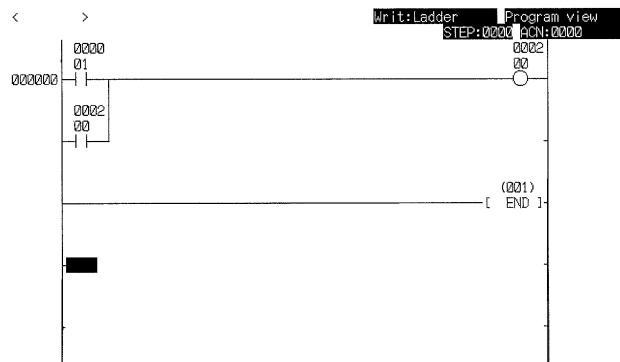
Again, leading zeros may be omitted from the bit address.



6. Press the F8 Key to designate the OR instruction, input the address of the operand bit, and then press the Enter Key.



7. Next we will input the END instruction using its function code. Move the cursor to the beginning of the next line, press the F10 Key, input the function code, and then press the Enter Key. All leading zeros must be input for function codes.

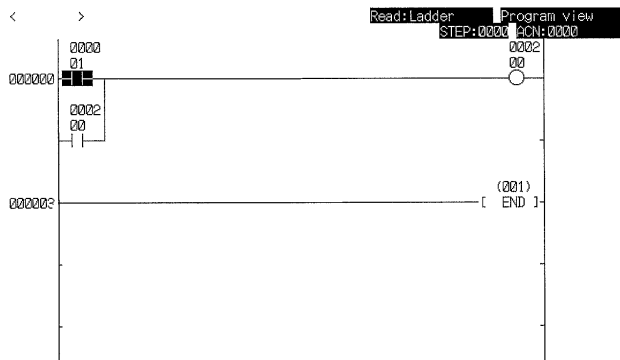


This completes the action program for AC0000. The program, however, exists only in the display buffer and it must be saved on the work disk before proceeding. If you leave the program view display or the power is turned off, the action program will be lost.

8. To save the action program, press the F3 Key and the Enter Key. A display will appear to indicate that the program is being saved. When the program has been saved, the program view display will return and the next program address will be displayed.



9. You can check the program that was saved by pressing the F1 Key to read out the program from the work disk and then using the PgUp Key to scroll through the program.



10. Once the program has been finished, it should be checked for programming errors. Press the End Key to access the menu and then select "K:Check Program (SFC)." The following display will appear.

```
[ Check Program ]
A:All actions and transitions
B:Current actions and transitions
```

11. Specify whether only the current program or all action/transition programs are to be checked and press the Enter Key. The following display will appear. Here, only the current program is checked.

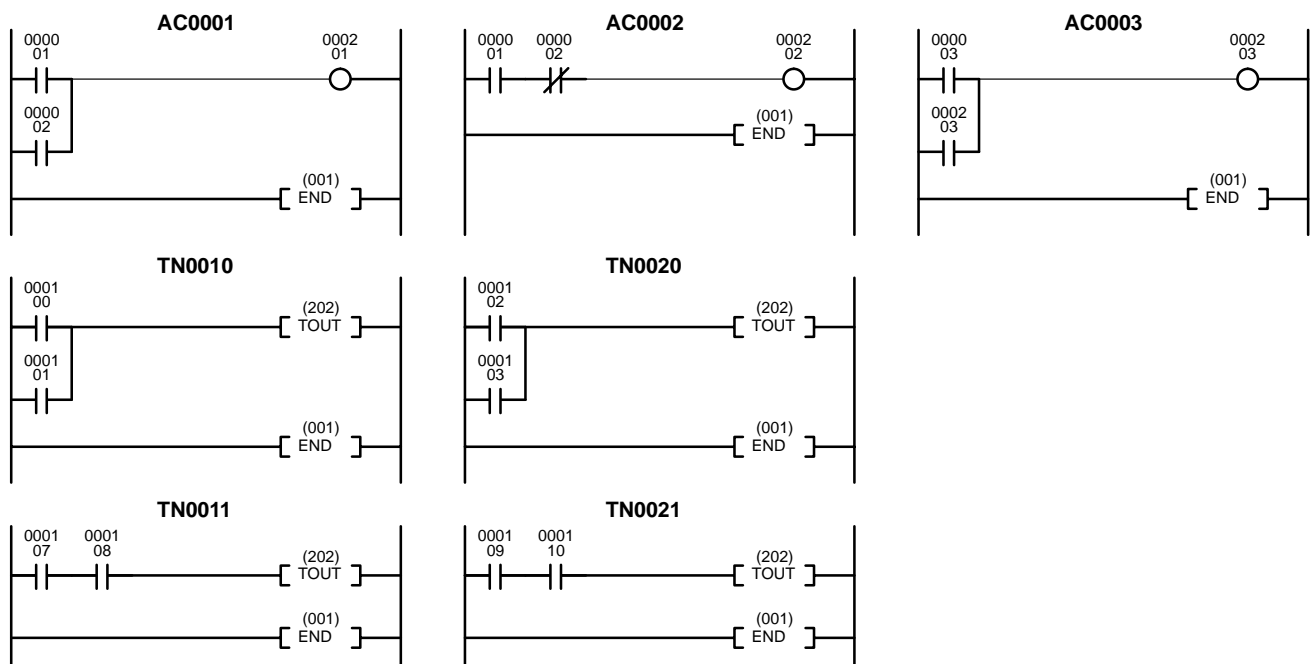
```
[ Check Program ]
A:
B:[ Current Actions and Transitions ]
  PC model: CU1000
  Check level ?
  0:Rank A, B and C
  1:Rank A and B
  2:Rank A
```

12. Specify the desired check level(s). Here all levels are selected by pressing the 0 Key and then the Enter Key.

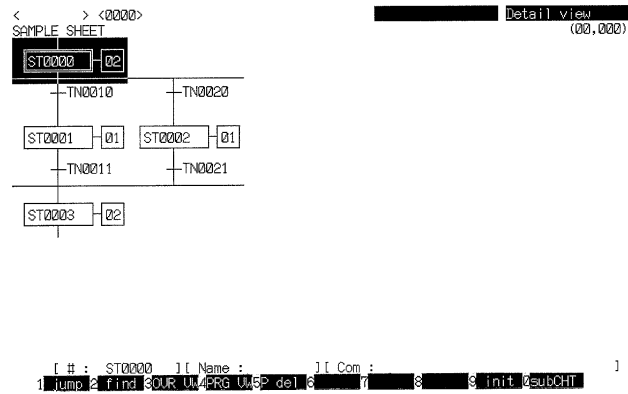
The program check display will appear and a message will flash to indicate that the program is being checked. When the check is finished, the locations and types of errors found will be displayed. If the program contains no programming errors, a message indicating so will appear at the bottom of the display.

If errors are found in the program, it will need to be corrected, stored, and then checked again.

13. If there are no errors in the program, press the Shift+Esc Keys to end the program check and return to the program view.
14. Move the cursor to the other steps and to each transition that requires a program and repeat the above steps to create, store, and check the ladder diagram for each. The following programs are used in this example.



15. Press the Shift+Esc Keys to return to the SFC detail view programming display.



Backing up the Program

Once the entire program has been written and saved onto the work disk, it should be backed up onto a floppy disk using the following procedure.

- 1, 2, 3... 1. Select "M:Format floppy" from the main offline menu. The following display will appear.

```
[ Formatting ]
Format floppy disk?
Warning : Format will erase all data
          on the disk.
          Do not format the Hard Disk!
Are you sure you want to format?(Y/N)
N
```

2. Insert a floppy disk into the drive. Be sure that the disk is not write-protected.
3. A confirmation message is displayed on the screen (initial display). Press the Y and Enter Keys.

```
[ Formatting ]

[ Format Command ]
Input the drive number and the disk media
Parameter.

Format
```

4. Input the drive number and the disk media parameter. The following is an formatting example when you use a 3.5-inch (720 kb) disk.

```
[ Formatting ]

[ Format Command ]
Input the drive number and the disk media
Parameter.

Format A:/N:9 /T:80
```

The parameter varies with the computer. For details, refer 6-1 *Initialization of CV Support Software Version 2: Offline* or the MS-DOS manual provided with your computer.

5. Press the Enter Key. A message will appear indicating that the disk is being formatted. It will take 1 to 2 minutes to complete formatting the disk.
6. When formatting has been completed, press the N and Enter Keys.
7. The screen will return to the initial display. Press the Esc Key to return to the main offline menu.
8. Select "P:Program" and then press the End Key to access the programming menu.
9. Select "S:Save Program." The following display will appear.

[Program]

[Save Program]
 Input file name to save.
 A:\

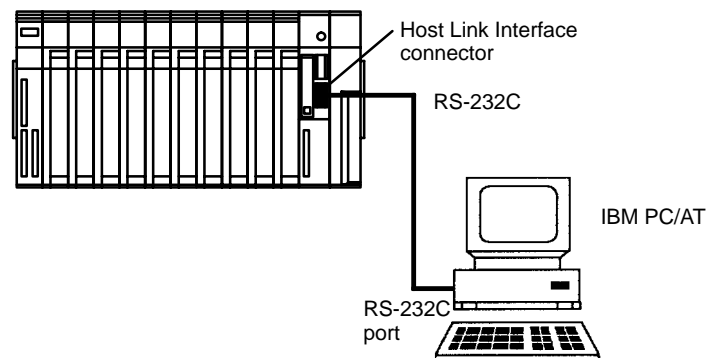
L:Retrieve program
 H:Change SFC settings
 M:Memory map
 C:Clear memory
 P:Print SFC sheet
 K:Check program (SFC)

10. Input a file name in which to save the program and then press the Enter Key. The file name can be up to 8 characters long. When the Enter Key is pressed, a .COD extension will be added to the file name, which will automatically be displayed in all-caps, and a message will ask for a heading for the file.
11. Input the file heading and press the Enter Key. The heading can be up to 30 characters long and is case sensitive. Messages will indicate that the file is being saved and when the save is finished.
12. When the save is finished, remove the floppy disk and turn off the computer.

Connecting the PC

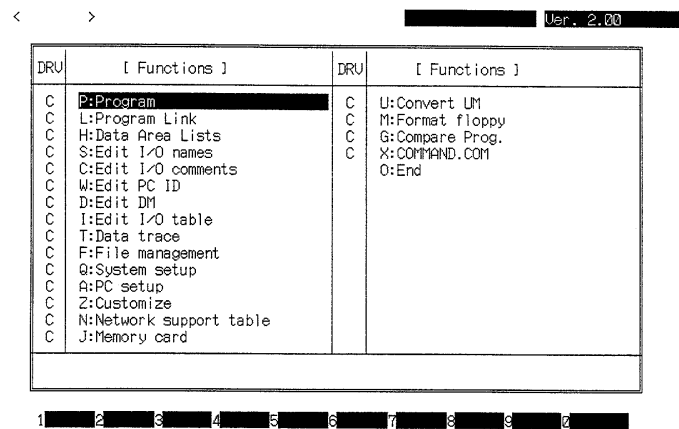
Next, the PC must be set up and connected to the computer running CVSS using the following procedure.

- 1, 2, 3... 1. Set up the PC, mounting all I/O Units according to desired I/O word allocations and wire power supplies.
2. Connect the computer running CVSS to the host link interface on the PC's CPU Unit as shown in the following diagram, being sure that connect screws are tightened properly.



3. Turn on power to both the computer and the PC.

4. Restart the CVSS. The main offline menu will appear.

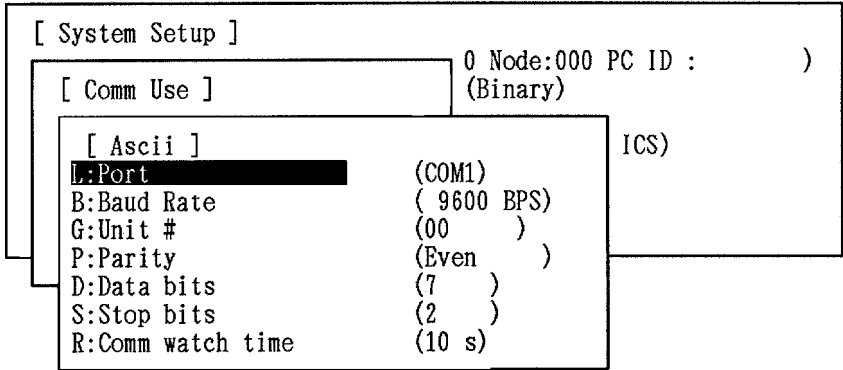


Going Online Use the following operation to place the CVSS online with the PC.

- 1, 2, 3...
1. Select “Q:System setup” from the main offline menu.

2. Here, you can set the necessary specifications so that the PC is connected to the host computer via the host link interface. If you plan to use the tool bus interface, refer to *CV Support Software Version 2: Offline, 7-1 System Set-up*.

If you have not already set the communications specifications for the host link interface, select “C:Comm use” from the next menu. The following display will appear. Press the A Key to select ASCII.

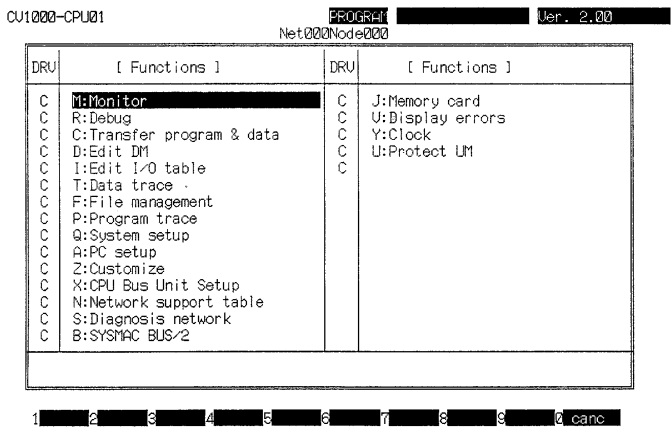


3. Set the port, baud rate, PC unit number, parity, data length, number of stop bits, and the communication monitoring time for the computer. These settings must match those of the PC.

4. Press the Shift+Esc and Esc Keys to return to the main offline menu.

5. Press the Shift+F1 Keys to place the CVSS online with the PC. The main online menu will appear as shown below.

You can place the CVSS online only when the main offline menu is displayed. Also, you can take the CVSS offline only when the main online menu is displayed.



Note Do not remove the connecting cable between the computer and the PC while the CVSS is online with the PC. Always take the CVSS offline before removing the connecting cable.

Registering the I/O Table

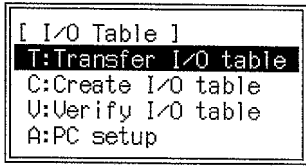
An I/O table must be registered in order for the PC to properly access an I/O point. The following procedure can be used to automatically generate an I/O table according to the Units actually mounted to PC Racks.

- 1, 2, 3...
1.

Press the Shift+F10 Keys switch the PC to PROGRAM Mode.
2.

Select "I:Edit I/O table." The current registered I/O table will be displayed.
3.

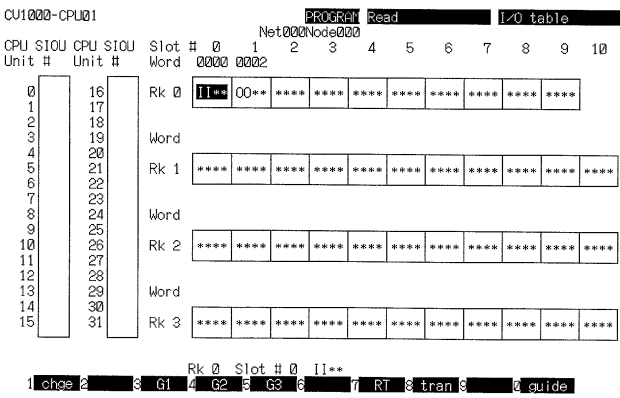
Press the End Key to access the following menu.



4.

Select "C:Create I/O table" and then press the Enter Key to confirm. The I/O table will be generated.
5.

When a message appears indicating that the I/O table has been created, press the Enter Key and the I/O table will be displayed. The one being used in this example is shown below.



6.

Press the Esc Key to return to the main online menu.

Transferring the Program

Now that the PC is ready, the program can be transferred for trial operation.

- 1, 2, 3...
1. Press the Shift+F10 Keys to shift the PC to PROGRAM Mode if it is not already in PROGRAM Mode. Program transfer is not possible if the PC is in any other mode.
 2. Select "C:Transfer program & data." The following display will appear.

```

[ Transfer ]
F:PC->Computer (System work)
P:Computer (System work)->PC
C:Compare Prog.
S:PC->Computer (Data disk)
L:Computer (Data disk)->PC

```

3. Select "P:Computer (System work) -> PC." The following display will appear showing the items that will be transferred.

```

[ Transfer ]
[ Computer->PC ]
Transfer following dat
Data not to transfer:
P:Program
S:I/O name
D:DM
E:EM
I:I/O table
F:PC settings
J:Transfer

```

4. Delete all items from the display that are not to be transferred. You can delete items by using the cursor key and Enter Key or by pressing the letter at the left of each item. Here, only the program is being transferred, so delete all other items from the display.
5. When all items have been deleted, select "J:Transfer" from the bottom of the display. Transfer parameters will be displayed as shown below.

```

[ Transfer ]
[ Computer->PC ]
[ Set Run Cond ]
Program transfer conditions :
S:Max. step/transitions      (Stan)
A:Max. actions                (Stan)
O:Space for SFC online edt   (No)
P:Protect                    (No)
OK ?                        (Y/N)

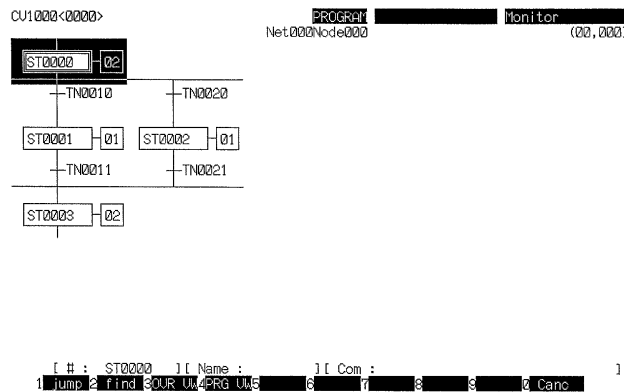
```

6. To confirm the transfer with the displayed parameters, press the Enter Key. A bar graph display will appear to indicate the progress of the transfer and a message will appear when the transfer has been completed.
7. Press the Shift+Esc and Esc Keys to return to the main online menu.

Monitoring the SFC

Now that the program has been transferred to the PC, the PC can be switched to MONITOR Mode so that the program can be tested. I/O monitoring can be used to check the operation of the program by artificially controlling the status of I/O bits after the program has been transferred to the PC and I/O points have been wired.

- 1, 2, 3... 1. Select "M:Monitor" from the main online menu. The SFC detail view monitor display will appear.



2. Press the End Key to access the menu and select "T:Trans sheet (PC → Comp)." The following display will appear.

[Monitor]

A [Trans Sheet (PC→Comp)]

T Input Sheet #: press enter key.

H 0000

M

D

B:Part I/O monitor

S:Step status

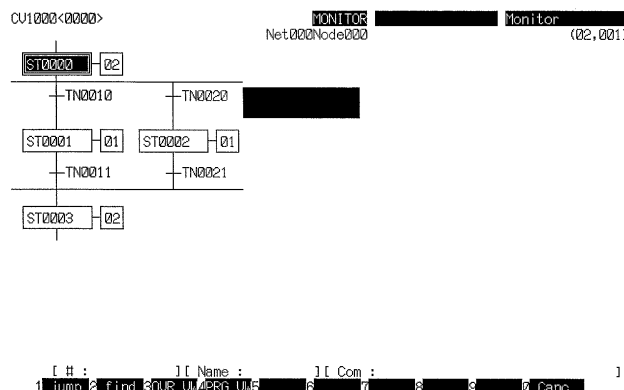
Q:SFC online edit

X:Cross-reference

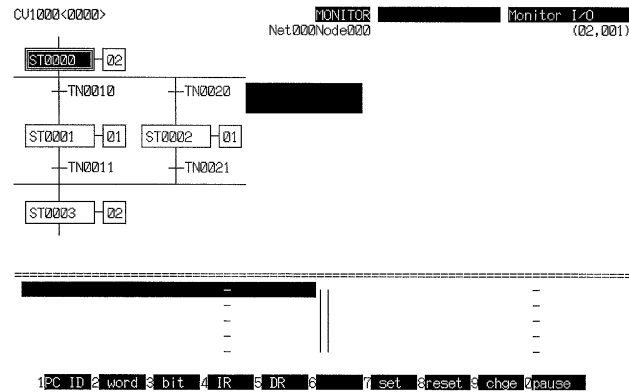
R:Read cycle time

C:Clear data&program

3. Input the sheet number (here, 0) and press the Enter Key. A bar graph will appear to indicate the progress of the transfer.
- Leading zeros may be omitted from the sheet number.
- When the transfer has been completed, the monitor display will appear and the sheet that was just transferred will be displayed.
4. Press the Shift+F8 Keys to place the PC into MONITOR Mode.
5. Move the cursor to a blank area of the display so that you can clearly see the program. Active steps will be displayed in reverse video.



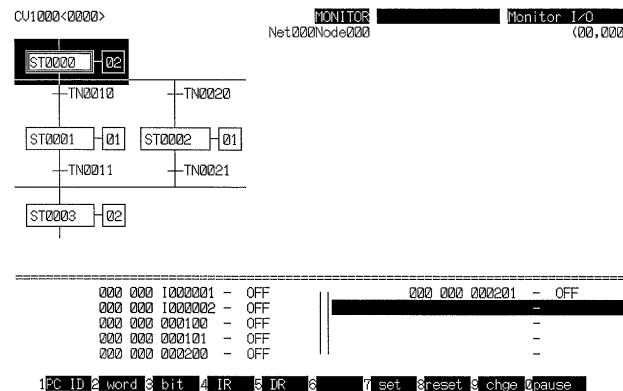
6. To monitor the status of specific I/O bits or words, press the End Key to access the menu and select "B:Part I/O monitor." The bottom of the display will change as shown below.



7. Specify the I/O bits and words to be monitored. The status of the specified bits will be displayed.

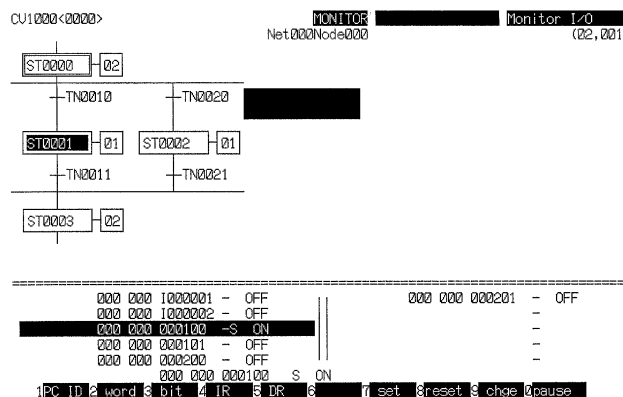
The following display shows the how the display will appear if the following inputs are made. (Here, the Enter Key can be pressed repeatedly to specify consecutive bits.)

F3, 1, Enter, Enter, F3, 100, Enter, Enter, F3, 200, Enter, Enter

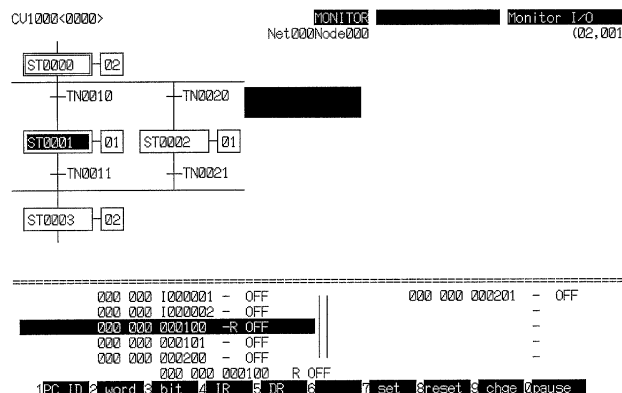


8. To artificially control the status of a bit, move the cursor to the desired bit and press the F7 Key to turn ON the bit and the F8 Key to turn OFF the bit.

The following display shows how active status moves from ST0000 to ST0001 when CIO 000100 is forced ON by pressing the F7 Key. This is because the condition for TN0010 is met when CIO 000100 turns ON.



The following display shows what happens when CIO 000100 is forced OFF by pressing the F8 Key. Although the status of CIO 000100 is changed, ST0001 remains active.



9. Press the Shift+F4 Keys to release the forced status of any bits that have been artificially set.
10. Press the Shift+Esc Keys once to return to the monitor display and then again to return to the main online menu.

This completes the basic SFC programming and monitoring procedure. When you have finished, always take the CVSS offline by pressing the Shift+F1 Keys from the main online menu, remove any floppy disks, and turn off power to the computer and PC.

4-2 Ladder

This section provides an introduction to the procedures necessary to set up a basic PC system, write a program using ladder diagrams, transfer the program to the PC, and monitor program execution. This information is provided for users not familiar with the CVSS. Details on ladder programming and monitoring are provided in the *CV Support Software Version 2 Manual: Online* and *CV Support Software Version 2 Manual: Offline*.

4-2-1 Overview

The overall procedure for starting the CVSS and programming and monitoring the ladder program is given below. Further details on each step are provided in the remainder of this section. The following represent the minimum settings required and are not intended to be complete operating instructions.

- 1, 2, 3...
 1. Start the CVSS. If you have started the CVSS before, it is only necessary to turn on your computer and run the CVSS program. Refer to the sections on installing and starting CVSS earlier in this manual for details.
 - a) Back up the system disks containing the CVSS program.
 - b) Install the CVSS onto the hard disk.
 - c) Run the CVSS program.
 2. Set the CVSS operating environment from the System Setup display.
 - a) Set the program type to Ladder.
 - b) Set the PC model for the program check.
 3. This section explains how to input a ladder program without I/O comments and block comments. Before beginning to input a program, prepare the I/O bit and word allocations, program coding, etc.
 - a) Clear the entire user program area from the work disk.
 - b) Write the ladder diagram on the CVSS display.

- c) Save the ladder-diagram program from the display buffer to your work disk with the Store operation (the F3 key). The display buffer can hold 22 lines at most, so the ladder-diagram program must be saved when 22 lines have been written.
 - d) When an entire ladder-diagram program has been written, save any part that has not been saved to the work disk and check it to be sure that there are no programming errors.
4. Back up the completed ladder program on a data disk. The floppy disk must be formatted in advance.
5. Connect the PC.
 - a) Install the PC, mounting all I/O Units and connecting the proper power supplies.
 - b) Connect your computer to the PC using the host link interface on the PC.
6. Go online with the PC.
 - a) Set the host link interface or peripheral interface specifications.
 - b) Turn on the power supply to the PC.
 - c) With the main offline menu showing, press the Shift+F1 Keys to go on-line.
7. Register the I/O table.
8. Transfer the program to the PC.
9. Switch the PC to MONITOR mode and monitor program execution from the CVSS.

4-2-2 General Guidelines

To select operations and settings in the following procedures either you can move the cursor with the cursor keys and press the Enter Key when the desired item is in reverse video or you can press the letter given at the left of the item or setting.

To return to the previous display, press the Esc Key. To return to the beginning of the current operation, press the Shift+Esc Keys.

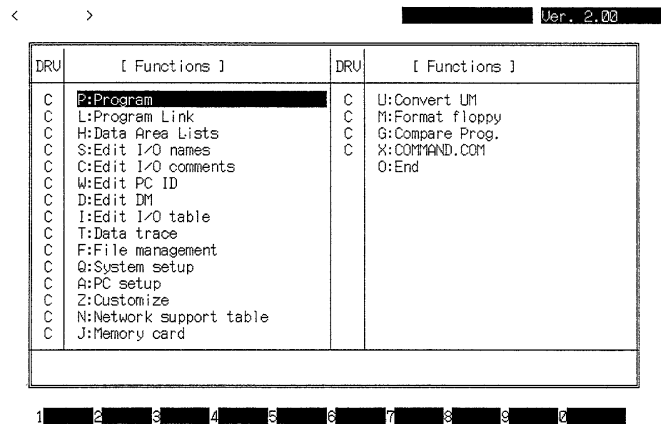
When using the Shift Key in combination with another key, always press the other key while holding down the Shift Key.

Typing mistakes in input fields can be deleted with the Backspace Key to delete one character at a time or with the Home Key to return the entire field to its original value. If you have already completed and confirmed an incorrect input, repeat the steps leading up to that input to correct the mistake.

4-2-3 Procedures

Starting the CVSS

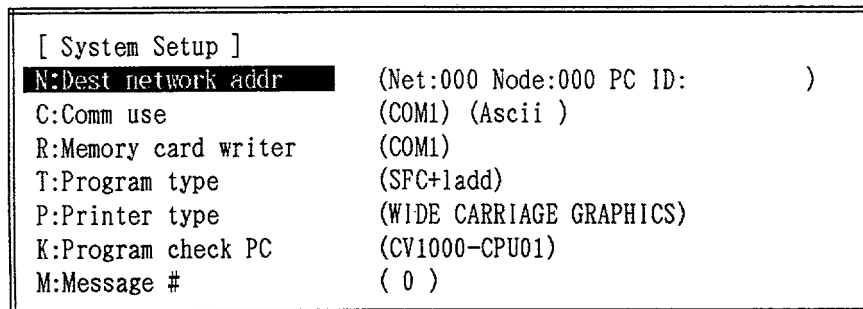
If you have not installed the CVSS, refer to the procedures given earlier in this manual. Once the CVSS has been installed, type "CVSS" at the DOS prompt. This will start the program and the main offline menu will appear as shown below.



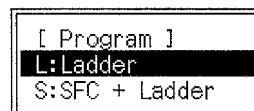
Setting the CVSS Operating Environment

If you have not previously set the program type and PC model, use the following procedure to do so. If the current settings are okay, you can go directly to the next step, creating the ladder program.

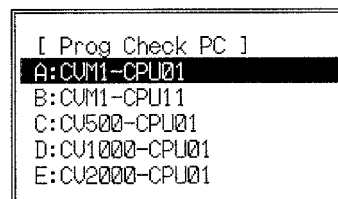
- 1, 2, 3... 1. Select "Q:System setup" from the menu. The current settings of the CVSS operating environment will appear.



2. Select "T:Program type." The following setting will appear.



3. Select "L:Ladder." This will disable SFC programming. The program will be input with ladder diagrams or mnemonics only.
4. When the environment setting returns, select "K:Prog check PC." The following setting will appear.

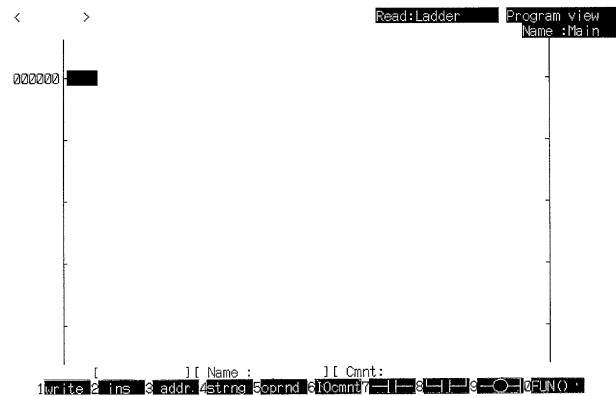


5. Specify the PC for which the program check is to be made. In the rest of this section we will assume that a program is being written for the CV1000.

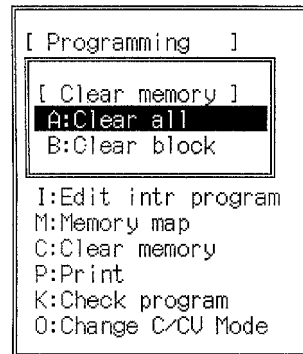
6. Press the Shift+Esc Keys to return to the main offline menu.

Creating the Ladder Diagram Prepare I/O bit and word allocations and program coding sheets before beginning to input a ladder diagram program. (If I/O names are used in the program instead of bit and word addresses, the I/O bit and word allocations can be decided after the program is entered.)

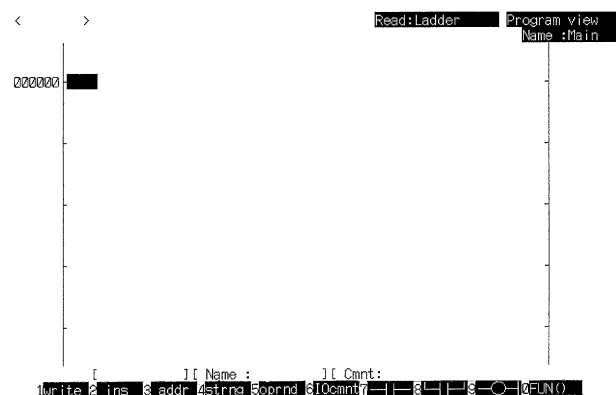
- 1, 2, 3...** 1. Select "P:Program" from the main offline menu. The ladder diagram program display will appear.



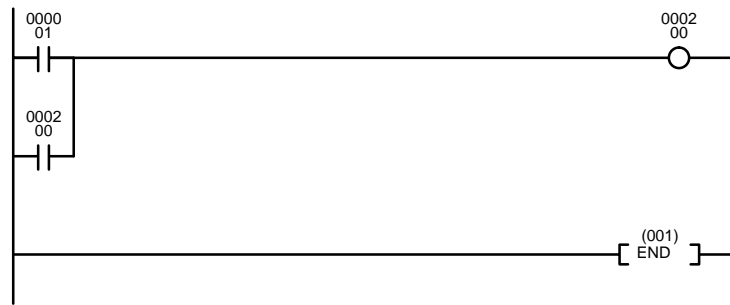
2. Press the End Key to access the Program menu and select "C:Clear memory." The following display will appear.



3. Select "A:Clear all." A confirmation message will appear.
4. Input Y and press the Enter Key to confirm. All of the user program area in the work disk will be cleared, including I/O names and all program comments. The ladder diagram program display will appear again.



The next portion of this procedure shows how to input the following ladder diagram.



- Press the F1 Key to enter the input mode. The cursor will move to the first column by program address 00000 and the program input can then proceed according to the above ladder diagram.



- Press the F7 Key to designate the first NO (normally open) condition, input the address of the operand bit, and then press the Enter Key. (The F7 Key is not necessary in C input mode.) The specified condition will be displayed and the cursor will move one column to the right.

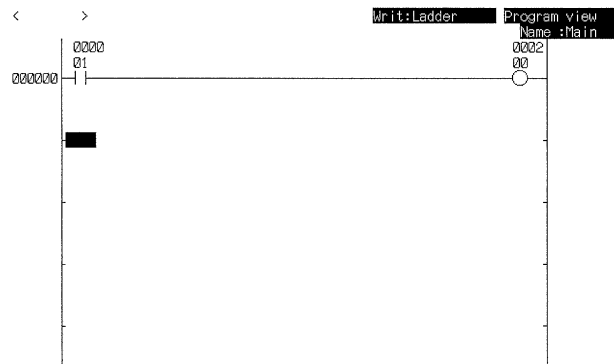
Leading zeros may be omitted from the bit address.

To correct a mistake in the bit address after the Enter Key has been pressed, move the cursor back to the condition, press the Enter Key, and reinput the bit address.

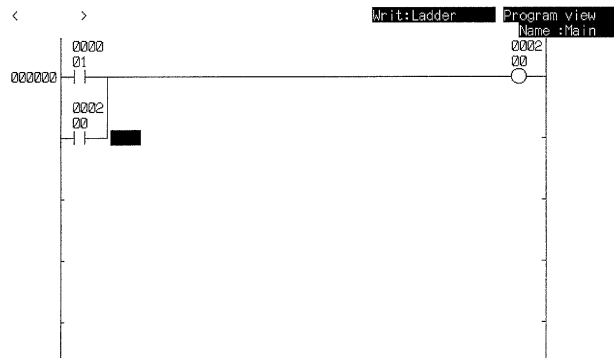


- Press the F9 Key to designate the OUTPUT instruction, input the address of the operand bit, and then press the Enter Key. The OUTPUT instruction will be displayed and the cursor will move to the next line.

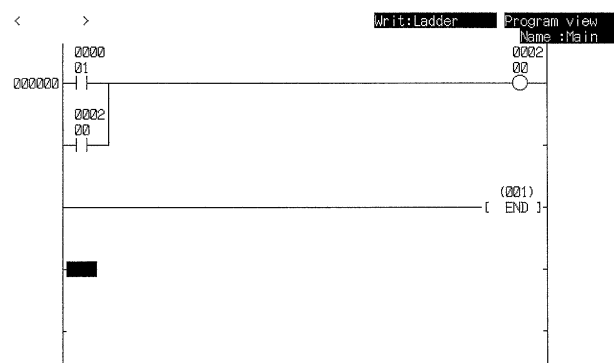
Again, leading zeros may be omitted from the bit address.



8. Press the F8 Key to designate the OR instruction, input the address of the operand bit, and then press the Enter Key.



9. Next we will input the END instruction using its function code. Move the cursor to the beginning of the next line, press the F10 Key, input the function code, and then press the Enter Key. All leading zeros must be input for function codes.

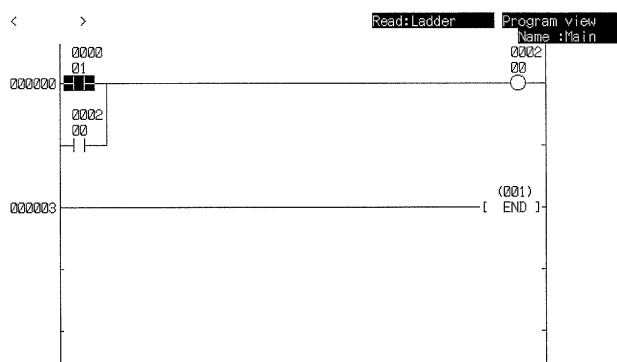


This completes the ladder program. The program, however, exists only in the display buffer and it must be saved on the work disk before proceeding. If you leave the ladder program display or the power is turned off, the program will be lost.

10. To save the program, press the F3 Key and the Enter Key. A display will appear to indicate that the program is being saved. When the program has been saved, the ladder program display will return and the next program address will be displayed.



11. You can check the program that was saved by pressing the F1 Key to read out the program from the work disk and then using the PgUp Key to scroll through the program.



12. Once the program has been finished, it should be checked for programming errors. Press the End Key to access the menu and then select "K:Check program." The following sub-menu will appear.

```

[ Check Program ]
PC model: CU1000
Check level ?
0:Rank A, B and C
1:Rank A and B
2:Rank A
  
```

13. Specify the desired check level(s). Here all levels are selected by pressing the 0 Key or the Enter Key.

The program check display will appear and a message will flash to indicate that the program is being checked. When the check is finished, the locations and types of errors found will be displayed. If the program contains no programming errors, a message indicating so will appear at the bottom of the display.

If errors are found in the program, it will need to be corrected, stored, and then checked again.

14. If there are no errors in the program, press the Shift+Esc Keys to end the program check and return to the ladder diagram program display.

Backing up the Program

Once the entire program has been written and saved onto the work disk, it should be backed up onto a floppy disk using the following procedure.

- 1, 2, 3... 1. Select "M:Format floppy" from the main offline menu. The following display will appear.

```
[ Formatting ]
Format floppy disk?
Warning : Format will erase all data
          on the disk.
          Do not format the Hard Disk!
Are you sure you want to format?(Y/N)
                                     N
```

2. Insert a floppy disk into the drive. Be sure that the disk is not write-protected.
3. A confirmation message is displayed on the screen (initial display). Press the Y and Enter Keys.

```
[ Formatting ]
[ Format Command ]
Input the drive number and the disk media
Parameter.
Format
```

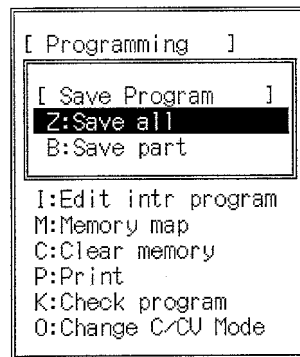
4. Input the drive number and the disk media parameter. The following is an formatting example when you use a 3.5-inch (720 kb) disk.

```
[ Formatting ]
[ Format Command ]
Input the drive number and the disk media
Parameter.
Format A:/N:9 /T:80
```

The parameter varies with the computer. For details, refer *6-1 Initialization of CV Support Software Version 2: Offline* or the MS-DOS manual provided with your computer.

5. Press the Enter Key. A message will appear indicating that the disk is being formatted. It will take 1 to 2 minutes to complete formatting the disk.
6. When formatting has been completed, press the N and Enter Keys.
7. The screen will return to the initial display. Press the Esc Key to return to the main offline menu.
8. Select "P:Program" and then press the End Key to access the programming menu.

9. Select "S:Save Program." The following sub-menu will appear.



10. Select "Z:Save all." A prompt to input the file name will appear.
11. Input a file name in which to save the program and then press the Enter Key. The file name can be up to 8 characters long. When the Enter Key is pressed, a .COD extension will be added to the file name, which will automatically be displayed in all-caps, and a message will ask for a heading for the file.
12. Input the file heading and press the Enter Key. The heading can be up to 30 characters long and is case sensitive. Messages will indicate that the file is being saved and when the save is finished.
13. When the save is finished, remove the floppy disk.

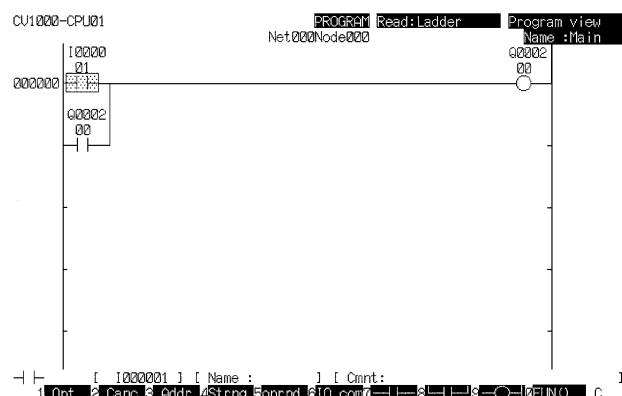
Connecting the PC

Next, the PC must be set up and connected to the computer running CVSS. Follow the procedures for connecting to the PC, shifting to online mode, registering the I/O table, and transferring the program that are described in this manual beginning on page 64.

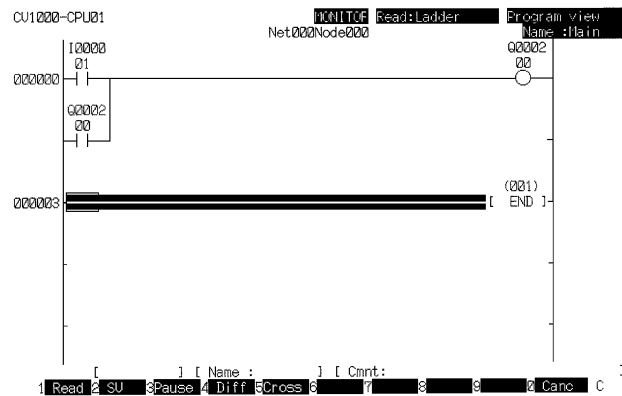
Monitoring the Program

Now that the program has been transferred to the PC, the PC can be switched to MONITOR mode so that the program can be tested. I/O monitoring can be used to check the operation of the program by artificially controlling the status of I/O bits after the program has been transferred to the PC and I/O points have been wired.

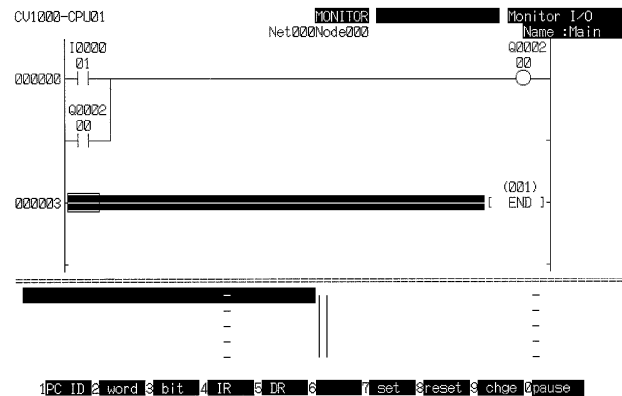
- 1, 2, 3... 1. Select "M:Monitor" from the main online menu. The monitor display will appear.



- Press the F1 Key and then the Shift+F8 Keys to place the PC into MONITOR mode.



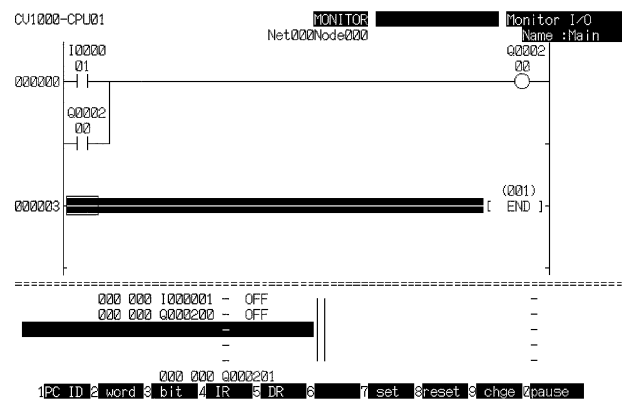
- To monitor the status of specific I/O bits or words, press the End Key to access the menu and select "B:Monitor part I/O." The bottom of the display will change as shown below.



- Specify the I/O bits and words to be monitored. The status of the specified bits will be displayed.

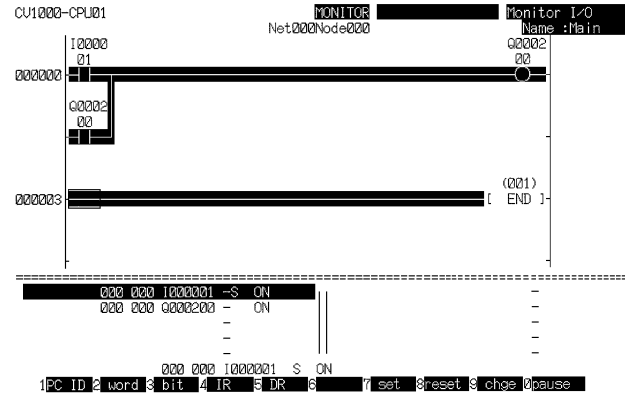
The following display shows how the display will appear if the following inputs are made. (The Enter Key can be pressed repeatedly to specify consecutive bits.)

F3, 1, Enter, F3, 200, Enter

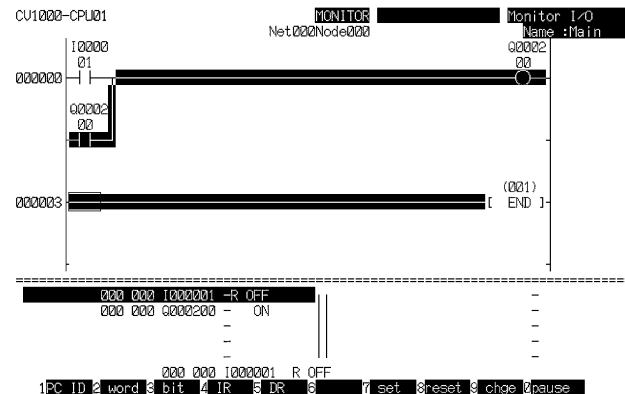


5. To artificially control the status of a bit, move the cursor to the desired bit and press the F7 Key to turn ON the bit and the F8 Key to turn OFF the bit.

The following display shows how CIO 000200 turns ON when CIO 000001 is forced ON by pressing the F7 Key. The reverse video indicates that the execution condition for that part of the program is met when CIO 000001 turns ON.



The following display shows what happens when CIO 000001 is forced OFF by pressing the F8 Key. Although the status of CIO 000001 is changed, CIO 000200 remains ON because it is a self-maintaining bit. The reverse video indicates that the execution condition for that part of the program is still met.



6. Press the Shift+F4 Keys to release the forced status of any bits that have been artificially set.
7. Press the Shift+Esc Keys once to return to the monitor display and then again to return to the main online menu.

This completes the basic ladder programming and monitoring procedure. When you have finished, always take the CVSS offline by pressing the Shift+F1 Keys from the main online menu, remove any floppy disks, and turn off power to the computer and PC.

4-3 Using I/O Names

I/O names can be assigned to bit addresses, word addresses, step numbers, action numbers, or transition numbers with the Edit I/O Names operation. During programming, I/O names can be input into the program instead of bit and word addresses.

I/O names will not be displayed if bit and word addresses are input when the program is created. The PC does not use I/O names and I/O names are converted to bit and word addresses when the program is downloaded to the PC. When the program is later uploaded to the CVSS, it will not contain I/O names. I/O names can be displayed in the program again by performing the Link I/O Names to Program operation (in the Edit I/O Names operation) or loading the I/O names file from a data disk to the work disk.

4-3-1 Assigning I/O Names

I/O names are assigned using the following procedure. In this example the I/O name "START" will be assigned to an input bit CIO 000100 and "LAMP" will be assigned to an output bit CIO 000200.

- 1, 2, 3...** 1. Select "S:Edit I/O names" from the main offline menu. The I/O names list will appear and the cursor will be in the address input area at the bottom of the display.

Edit I/O name

#	address	I/Oname	I / O comment
00001			
00002			
00003			
00004			
00005			
00006			
00007			
00008			
00009			
00010			
00011			
00012			
00013			
00014			
00015			
00016			

address []
1 2 Wd 3 bit 4first 5 last 6 R # 7range 8 copy 9 cut 0paste

2. Press F3 for a bit address (F2 for a word address), type 100, and press the Enter Key. The cursor will automatically move to the I/O name input area. (Leading zeros may be omitted from the bit or word address.)

Edit I/O name

#	address	I/Oname	I / O comment
00001			
00002			
00003			
00004			
00005			
00006			
00007			
00008			
00009			
00010			
00011			
00012			
00013			
00014			
00015			
00016			

address [000100] I/O name []
1 2 Wd 3 bit 4first 5 last 6 R # 7range 8 copy 9 cut 0paste

3. Type START (the I/O name) and press the Enter Key. The cursor will move to the next line, and the input area at the bottom of the display will be reset.

The I/O name can be 2 to 8 characters long and is case sensitive. The first 2 characters must be letters, but the remaining characters can be letters or numbers. Data Area prefixes TR, ST, AC, TN, and any prefixes set with the Customize operation cannot be assigned as I/O names.

Only one I/O name can be assigned to any one bit or word, and the same I/O name cannot be assigned to more than one bit or word.

<

>

Edit

Edit I/O name

#	address	I/Oname	I / O comment
00001	I000100	START	
00002			
00003			
00004			
00005			
00006			
00007			
00008			
00009			
00010			
00011			
00012			
00013			
00014			
00015			
00016			

address []
1 2 Wd 3 bit 4first 5 last 6 R # 7range 8 copy 9 out 0paste

4. Follow the same procedure in steps 2 and 3 to assign the I/O name LAMP to CIO 000200.

<

>

Edit

Edit I/O name

#	address	I/Oname	I / O comment
00001	I000100	START	
00002	C000200	LAMP	
00003			
00004			
00005			
00006			
00007			
00008			
00009			
00010			
00011			
00012			
00013			
00014			
00015			
00016			

address []
1 2 Wd 3 bit 4first 5 last 6 R # 7range 8 copy 9 out 0paste

5. Press the Esc Key to return to the main offline menu. This completes the assignment of I/O names START and LAMP.

4-3-2 Writing a Program with I/O Names

I/O names are used in the program just like bit and word addresses in both ladder and mnemonic programming. The use of I/O names in ladder programming is demonstrated here with the main ladder diagram, but the procedure is the same for any ladder diagram program.

- 1, 2, 3...
1. With the ladder diagram program view display on the display, press the F1 Key to enter the input mode.

<

>

Writ:Ladder

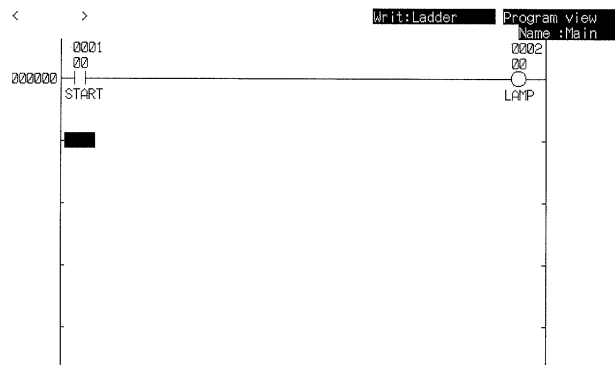
Program view
Name :Main

000000

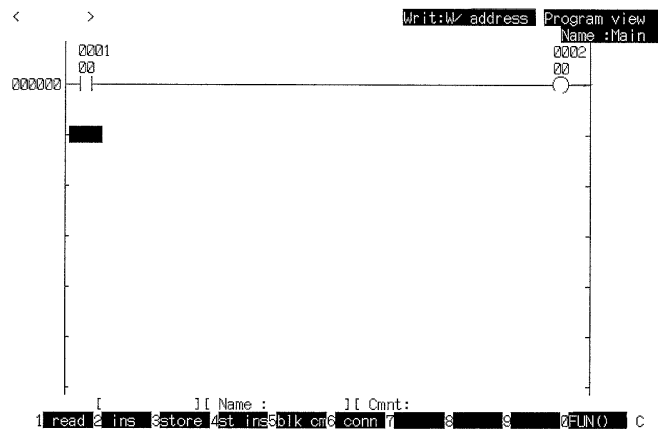
[]

1 Name : 1 Comment:
1 read 2 ins 3store 4st ins 5blk cm6 conn fr 7 8 9 0 10FUN()

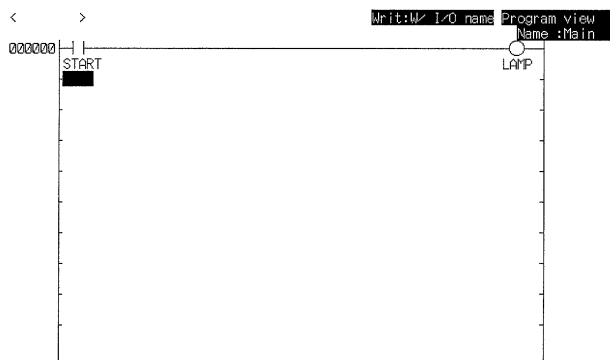
2. Press the F7 Key to designate the first NO (normally open) condition, input the I/O name of the operand bit (START), and then press the Enter Key. (The F7 Key input is not necessary in the C input mode.) Press the F9 Key to designate the OUTPUT instruction, input the I/O name of the operand bit (LAMP), and then press the Enter Key.
 - a) If the display is set to "Ladder (Addr, I/O name)," the I/O bit addresses will appear above and the I/O names will appear below the ladder symbols. Up to 5 characters of each I/O name will be displayed.



- b) If the display is set to "Ladder (Addr)," just the I/O addresses will appear.



- c) If the display is set to "Ladder (I/O name)," just the I/O names will appear.
- Up to 5 characters of each I/O name will be displayed.



- d) If the display is set to "Ladder (I/O comment 2)" or "Ladder (I/O comment 4)," I/O names will not be displayed.

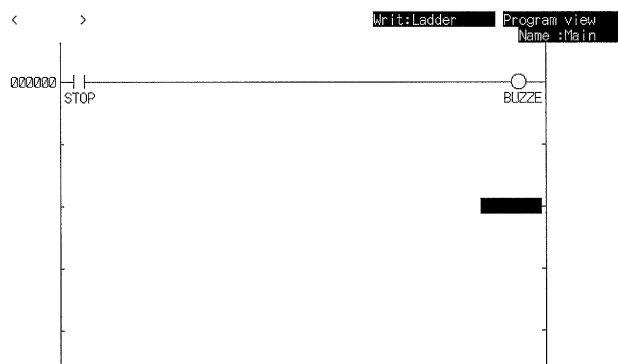
4-3-3 Later Assignment of I/O Addresses

By using I/O names in the program, the program can be completed before I/O bit and word address allocations have been decided. I/O bit and word addresses can then be added or changed later. I/O names are used in the program just like bit and word addresses in both ladder and mnemonic programming.

The procedure for writing the program and later assigning I/O names is given below.

- 1, 2, 3...** 1. First the program is written with I/O names as bit operands. This procedure is described in 4-3-2 *Writing a Program with I/O Names*. In this example, the I/O names STOP and BUZZER were used.

If the display is set to "Ladder diagram (I/O No., I/O names)," the first five characters of the I/O names will appear below the ladder symbols, but I/O bit addresses will not appear above the ladder symbols until bit addresses have been assigned. Store the ladder diagram that you made. At this point the program is not complete because I/O addresses have not been assigned.



2. Assign bit addresses to the I/O names. This procedure is described in 4-3-1 *Assigning I/O Names*.

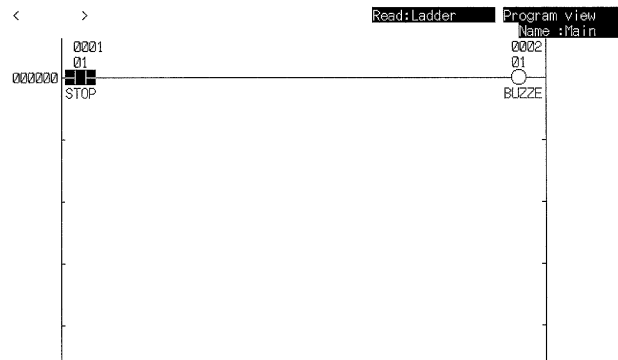
Move the cursor to the line where the I/O name STOP is listed. Type in the bit address and press the Enter Key twice. In this case, the STOP was assigned CIO 000101 and BUZZER was assigned CIO 000201.

Edit Edit I/O name

#	address	I/Oname	I/O comment
000001	000101	STOP	
000002	000201	BUZZER	
000003			
000004			
000005			
000006			
000007			
000008			
000009			
000010			
000011			
000012			
000013			
000014			
000015			
000016			

address []
1 2 Wd 8 bit 4 first 8 last 8 R # range 8 copy 8 cut 8 paste

3. The program is completed when all I/O names have been assigned I/O addresses. If you return to the ladder diagram display, both the I/O names and I/O bit addresses will be displayed, as shown below.



Display of I/O Names and I/O Addresses

The following tables show whether or not I/O names and/or I/O addresses will be displayed and printed. The four factors affecting the display are listed below.

- 1, 2, 3...**
1. Has the program just been created (first table), or has the Link I/O Names to Program or I/O Names Retrieve operation been performed (second table)?
 2. What display setting has been selected?
 3. Was an I/O address or I/O name input in the program?
 4. Has the I/O name or address been assigned in the I/O names list?

After Creating the Program

Program input	I/O names	Display setting		
		(I/O names, I/O No.)	(I/O No.)	(I/O names)
I/O address	Unassigned	I/O addresses only	I/O addresses only	Neither
	Assigned	I/O addresses only	I/O addresses only	Neither
I/O name	Unassigned	I/O names only	Neither	I/O names only
	Assigned	Both	I/O addresses only	I/O names only

After Link I/O Names to Program or I/O Names Retrieve Operation

Program input	I/O names	Display setting		
		(I/O names, I/O No.)	(I/O No.)	(I/O names)
I/O address	Unassigned	I/O addresses only	I/O addresses only	Neither
	Assigned	Both	Neither	I/O names only
I/O name	Unassigned	Neither	Neither	Neither
	Assigned	Both	I/O addresses only	I/O names only

- Note**
1. An assigned I/O address means that an I/O number has been assigned to the I/O address using the Edit I/O Names operation.
 2. The Ladder (Mnemonic) display setting behaves the same as the Ladder (I/O names, I/O No.) display setting. In SFC, either I/O Names or I/O No. must be selected with the Switch Display operation or printer settings.

SECTION 5

Error Processing

This section provides a list of error messages and probable causes of errors that can occur with CVSS.

Error Messages

The following table lists the error messages and probable causes of errors that can occur with CVSS.

Error message	Probable cause	Possible correction
1st page	The displayed page is the first one.	There are no pages before this one.
Action # over max.	An action number exceeds the set max.	Set the action number below the max.
Address range err	Bit or word addresses have been specified incorrectly.	Verify that the bit or word addresses are compatible with the PC model and reenter.
Address too high	The search address is higher than the highest address in the program.	Check the address that was entered and reenter it correctly.
Already registered	The new data area prefix assigned in the Change Data Area Abbreviation operation has already been assigned.	Assign another prefix.
Batt low	The battery isn't connected or it has expired.	Check the battery and replace it if necessary.
Blk comment file error	The block comment data on the data disk has been damaged.	Check the data disk and program and correct if necessary.
Cannot execute for ladd only	The PC contains only ladder-diagram programs.	Do not attempt to use the debug operations for SFC programs for ladder-only programming. This operation is not supported for CVM1 CPU Units.
Can't change operand	An incorrect operand has been used in a ladder program change.	Check the program.
Can't write	The specified data area is read only.	Check the data area specification.
Can't write trace data	The data trace file on the work disk is damaged.	Create a new data trace file or load it from the data disk.
Change error	More than one error has occurred during a change.	Check the program.
Comm err	An error has occurred in communications between the PC and CVSS computer.	Check that cable connections are correct, the PC is ON, the System Setup is correct, etc.
CPU bus err	An error has occurred at the CPU Unit bus.	Check the CPU Unit bus.
CPU wait	The start input terminals on the PC aren't connected.	Connect the start input terminals.
Cycle time over	The cycle time has exceeded the maximum cycle time (cycle monitor time) set in the PC Setup.	Check the program.
Data link active can't run	Can't execute because the data link is in operation.	Stop the data link.
Data link internal setting	Automatic data link area settings have been selected.	Select the manual data link area settings.
Data link stopped can't run	Can't execute because the data link is stopped.	Start the data link.
Data link table err—can't run	Can't execute because data link tables aren't registered.	Register the data link tables.
DM addr BCD error	An indirect DM address that is not in BCD has occurred during program execution.	Check the data.
Drive device err	The indicated disk drive doesn't exist.	Check the floppy disk drive name.
Dup comment address	An I/O comment address has been duplicated.	Eliminate I/O address duplication.
Dup defi	The indicated I/O address or I/O name already exists.	Assign another I/O address or I/O name.
Dup err	The new function code assigned in the Change Function Code operation already exists.	Assign another function code.
Dup I/O name address	More than one I/O address has been assigned to a single I/O name.	Eliminate duplicate I/O name assignments.

Error message	Probable cause	Possible correction
Dup interrupt #	The indicated interrupt number already exists in SFC.	Eliminate interrupt number duplication.
Dup JME #	There are two or more JME(005) instructions with the same jump number in an action or transition program.	Eliminate jump number duplication in JME(005) instructions.
Dup range err	The custom areas assigned in the "Word grouping" operation overlap.	Eliminate overlapping in the custom areas.
Dup sheet #	The indicated sheet number already exists.	Eliminate sheet number duplication.
Dup step #	The indicated step number already exists.	Eliminate step number duplication.
Dup transition #	The indicated transition number already exists in SFC.	Eliminate transition number duplication.
EEPROM error	The contents of the EEPROM in a SYSMAC LINK Unit have been damaged.	Reset the data link table and network parameters.
Executing—Can't run	The PC is in MONITOR or RUN mode.	Switch the PC to PROGRAM mode.
FAT is destroyed	The floppy disk is damaged.	Replace the floppy disk.
File access error	The file couldn't be accessed (read/write).	Recreate the read/write data
File does not exist	A file with the indicated file name doesn't exist on the data disk.	Press the End Key to display a file directory and verify the file name.
File error	An error has occurred in the floppy disk.	Format and use a new floppy disk.
Floppy not loaded	There isn't a floppy disk in the indicated floppy disk drive.	Insert a floppy disk into the indicated floppy disk drive.
IC card not loaded	The Memory Card isn't installed in the CPU Unit or Memory Card power is OFF.	Verify that a Memory Card is installed and the power is ON.
I/O bus err	An error has occurred at the I/O bus.	Check connections between the CPU Unit and I/O Units.
I/O comp err	The registered I/O table doesn't agree with the actual I/O Units installed. Some planned I/O Units might not be installed yet.	Create the I/O table offline, then transfer the I/O table online. After verifying the I/O table online, either edit it or create it.
I/O name file error	The I/O name file on the work disk has been damaged.	Reload the I/O name file using the Edit I/O Names operation.
I/O setting err	The registered I/O table doesn't agree with the actual I/O Units installed. Input and Output Units might be mixed, Remote I/O Masters used incorrectly, or Optical I/O Units duplicated.	Create the I/O table offline, then transfer the I/O table online. After verifying the I/O table online, either edit it or create it.
Insuff disk capacity	The capacity of the data disk has been exceeded.	Use another floppy disk.
Inter node comm err	There is some obstacle in network communications.	Check the network.
Invalid table	The data link table hasn't been set.	Set the data link table correctly.
JMP error	A jump destination is missing.	Check the program.
Ladder convt err	An error has occurred during program conversion with the Convert UM operation.	Check the ladder diagram program.
Ladder err	The ladder diagram can't be saved with the Store operation. An instruction block with more than 22 lines can't be saved as a ladder diagram.	Check the ladder diagram and correct it if necessary. If an instruction block exceeds 22 lines, it must be entered in mnemonics.
Last page	The displayed page is the last one.	There are no pages beyond this one.
Mem overflow	The operation cannot be performed because of insufficient memory.	First cancel the operation and then repeat again.

Error message	Probable cause	Possible correction
Memory err	There is an error in the program. There is an error in internal PC memory. There is an error in the installed Memory Card.	Identify errant addresses in the program with the Program Check operation, correct the errors, and transfer the corrected program to the PC. Correct the data in the relevant memory locations. Verify that the Memory Card is properly installed. Correct the data in the relevant memory locations if necessary. (Error locations can be identified by listing errors. Select Error Dir from the Read Errors sub-menu.)
More than 32 initial steps	The number of initial steps being used exceeds the maximum.	Reduce the number of initial steps to 32 or fewer per sheet.
Network does not exist	The indicated network doesn't exist.	Check the network that was indicated and reenter it correctly.
No comment	The indicated comment doesn't exist.	Check the comment that was indicated and reenter it correctly.
No data link table—can't run	Can't execute because the data link table isn't registered.	Register the data link table.
No drive	There isn't a floppy disk in the indicated floppy disk drive.	Insert a floppy disk into the indicated floppy disk drive.
No EM	Can't execute because no EM Unit is installed.	Install an EM Unit in the PC.
No END instr	The END(001) instruction is missing from the end of a ladder program.	Write an END(001) instruction at the end of the program and save the new program.
No file drive	There isn't a Memory Card in the CPU Unit.	Insert a Memory Card into the CPU Unit.
No program	The indicated program section doesn't exist.	Check the program section that was indicated and reenter it correctly.
No sheet	There are no SFC sheets at all.	Create the SFC sheets.
No space	Can't save file because of insufficient free space on the data disk.	Eliminate unneeded files from the data disk, or use a disk with enough free space.
No such data	The indicated search data doesn't exist. The specified words are not being used.	Input the correct search data. Specify a range of memory containing words that are being used.
No such I/O name	The character string that was entered isn't registered as an I/O name.	Check the I/O name with the I/O name file on the work disk.
No such PC ID	The PC name that was entered doesn't exist.	Check the PC name with the PC name file on the work disk.
No such PC name	The indicated PC name doesn't exist.	Check the PC name that was indicated and reenter it correctly.
Not master unit can't run	The indicated node can't be used because it isn't the master unit.	Check the nodes in the network.
No trace data	The data trace data on the work disk contains incorrect data.	Load the data trace data from the data disk.
No unit	The indicated Unit doesn't exist.	Check the I/O Unit and network configurations.
No vector table—can't store	Can't store because there is no vector table on the work disk.	Reinstall CVSS.
Node number err	A link node number in the SYSMAC NET Link data link table is incorrect.	Set the correct link node number.
Not CV series can't run	Can't execute because the indicated node is not a CV-series PC.	Check nodes in the network.
Not in network	The indicated node isn't in the network.	Check the nodes in the network.
Not initialized	The floppy disk hasn't been formatted.	Save the file after formatting the floppy disk with the Format Floppy operation.

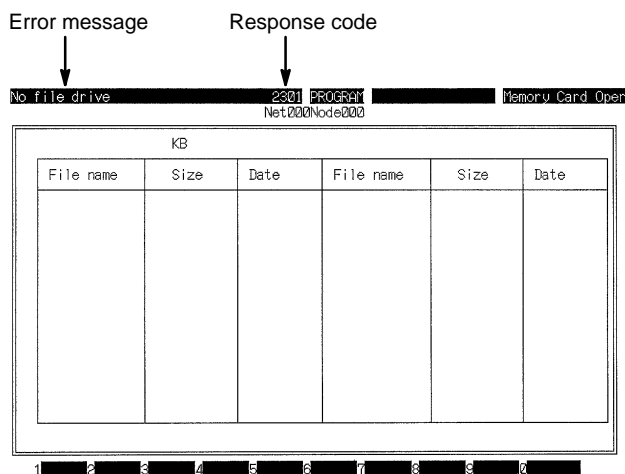
Error message	Probable cause	Possible correction
Not part of data link	The indicated node is not included in the data link.	Check which nodes are included in the data link.
Not polling unit can't run	The indicated node can't be used because it isn't a polling unit.	Check the nodes in the network.
Out of paper	The printer is out of paper.	Supply the printer with paper.
Out of range	The indicated bit or word address exceeds the acceptable range.	Reenter the data correctly.
Page out of range	The capacity of the edit display has been exceeded. A single instruction block can be up to 22 lines long.	Check the program.
Parameter error	The parameters entered are incorrect.	Enter the correct parameters.
Parity/sum check error	A parity/sum check error has occurred in internal PC memory.	Rewrite the program and PC Setup.
Password wrong	The password required to clear UM is incorrect.	Enter the correct password.
PC model err	There is a PC in the system that isn't a CV500 or CV1000 or the PC model is set incorrectly.	Use CV500 and CV1000 PCs. Set the PC model correctly.
PC model error	The system contains a non-CV-series PC.	Use only CV-series PCs.
Printer err	There is an error with the printer or printer cable or the computer and printer aren't connected properly. The printer hasn't been started. The printer is not turned on or is not connected properly.	Check the printer and printer cable. Press the Esc Key and verify that the computer and printer are connected properly. Verify that the printer has started properly. Check printer connections and power supply.
Program error	PC cannot operate because an error has occurred in the ladder program. A fatal error exists in a ladder diagram or an SFC program was downloaded to a CVM1 CPU Unit.	Check the program. Check the ladder diagrams. If you are using an CVM1 CPU Unit, make sure an SFC program was not transferred to it.
Protected	UM is protected.	Release UM protection.
Range err	The specified range is incorrect.	Enter an acceptable range.
Range error	The first word is higher than the last in a custom area assigned in the Word Grouping operation.	Reenter the settings so that the first word is lower than the last.
Refresh node number err	A link node number in the SYSMAC LINK data link table is incorrect.	Set the correct link node number.
Relay err Netwk (???) Node (???)	An error has occurred in the PC that relays the transmission.	Check the relay PC.
Response time out	A response has not been returned within the response interval during network communications.	Check the destination unit.
Routing table error	The routing table settings are incorrect.	Check the routing table.
Same as grouping ID	The custom data area prefix assigned in the Change Data Area Abbreviation operation has already been assigned in the Word Grouping operation.	Assign another prefix.
SFC convt err	An error has occurred during program conversion with the Convert UM operation.	Check the SFC program.
SFC stop error	Program can't be executed because an error has occurred in the SFC program.	Check the SFC program.
Step # over max.	The step number exceeds the maximum.	Set the step number below the maximum.
Sys FAL	An FAL(006) instruction has been executed in the program. PC operation will continue.	Check the program for the cause of the FAL(006) execution.

Error message	Probable cause	Possible correction
Sys FALS	An FALS(007) instruction has been executed in the program. PC will stop.	Check the program for the cause of the FALS(007) execution.
SYSBUS err	An error has occurred in transmissions between a SYSMAC BUS System and the PC.	Check for problems such as loose cables.
SYSMAC BUS/2 err	An error has occurred in transmissions between a SYSMAC BUS/2 System and the PC.	Check for problems such as loose cables.
That name exists	A file with that file name already exists on the data disk. File names are not case sensitive, i.e. "lan" and "LAN" indicate the same file.	Choose another file name or save the file on another disk.
Too many blk comments	The number of line comments has exceeded the maximum of 512, or the total number of characters in line comments has exceeded the maximum of 65, 535.	Reduce the number of line comments or characters below the maximums.
Too many files	The file can't be saved because the maximum number of files has been exceeded in the floppy disk directory. The indicated number of files has exceeded the maximum (100).	Save the files on another floppy disk or create a subdirectory and save the files in the subdirectory. Eliminate unneeded files.
Too many I/O names	The number of I/O names has exceeded the maximum number set during CVSS installation (0 to 10,000).	Eliminate unneeded I/O names. With a CV1000 it is possible to install a RAM board to increase I/O name capacity to 10,000.
Too many steps	The maximum number of steps per sheet (100) has been exceeded.	Check the program.
Too many Units	The number of I/O Units has exceeded the maximum number allowed.	Reduce the number of I/O Units used below the maximum.
Transfer not possible with SFC prog	An SFC program was downloaded to a CVM1 CPU Unit.	Transfer only ladder diagrams to CVM1 CPU Units.
Transition # over max.	The transition number exceeds the maximum.	Set the transition number below the maximum.
UM too large	The program is too large for the specified PC.	Use a different model PC. Eliminate unnecessary programs or parts of programs.
WDT error	A watchdog timer error has occurred due to noise or some other cause.	After eliminating the cause, turn the PC OFF and then ON.
Write protected	The data disk is write-protected.	Slide the write-protect tab on the floppy disk to its OFF position.
Writing from other device	Data cannot be written because data is being written from another device.	Write data when the other device has completed writing.
Wrong delay	The entered delay is outside the acceptable range.	Enter the correct delay.
Wrong drive	The indicated drive name is incorrect.	Check the floppy disk drive name.
Wrong edit mode	The Write I/O Comments operation has been selected in a mode other than Ladder (I/O No., I/O Names). You are in a mode that does not support inputting block comments.	Switch to Ladder (I/O No., I/O Names) mode with the Switch Display operation. Change to one of the following three ladder-diagram modes: Addresses, I/O names; Addresses, I/O comments 2; or Addresses, I/O comments 4)
Wrong file name	The file name entered is incorrect.	Check the file name and file name extension and reenter.
Wrong key	The data input is incorrect or the wrong key has been pressed.	Input the correct data or press the correct key.
Wrong medium	The floppy disk is not of the selected size.	Select the correct size.

Error message	Probable cause	Possible correction
Wrong netwk number	The network address set in the routing table is incorrect.	Correct the network address in the routing table.
Wrong network type	Can't execute because the indicated network is of the wrong type.	Check the network.
Wrong path	The indicated path name is incorrect.	Check the path name and reenter.
Wrong PC mode	The PC mode (RUN, MONITOR, or PROGRAM) is incorrect.	Set the correct PC mode.
Wrong position	The cursor is in the wrong position.	Reposition the cursor.
Wrong RAM disk data	The program on the work disk is damaged.	Reinstall CVSS.
Wrong setting	An incorrect setting has been entered.	Enter the correct setting.
Wrong trace data	The trace data contains data that isn't from a data trace.	Create new data trace data or load it from the data disk.

FINS Command Response Codes

Error messages and response codes for FINS commands from Host Link Systems, SYSMAC NET Link Systems, and SYSMAC LINK Systems are displayed simultaneously in the upper left part of the display. Refer to the relevant Operation Manual for details on response codes.



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 Unit 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 <i>action qualifier</i> .
area	See <i>data area</i> and <i>memory area</i> .
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 <i>advanced instruction</i> .
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 <i>logic block</i> and <i>instruction block</i> .
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 <i>conditional branch</i> and <i>parallel branch</i> .
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 <i>word</i> .
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 <i>refresh parameter table</i> .
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 <i>central processing unit</i> .
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 <i>C-mode</i> .
CV-series PC	Any of the following PCs: CV500, CV1000, CV2000, or CVM1
CVSS	See <i>CV Support Software</i> .
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 <i>scheduled interrupt</i> .
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 than 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 <i>data register</i> .
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 prefixed 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 <i>parity</i> .

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 <i>frame checksum</i> .
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. <code>BAS</code> indicates files containing BASIC programs, and <code>DAT</code> indicates files containing data).
FINS	See <i>CV-mode</i> .
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 <i>feedback variable</i> .
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 <i>normally closed condition</i> .
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 <i>rightmost (bit/word)</i> .
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 <i>common link parameter table</i> .
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 <i>leftmost (bit/word)</i> .
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 <i>normally open condition</i> .
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 <i>source code</i> .
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 <i>parity</i> .
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 <i>negative loop</i> .
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 of 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 <i>present value</i> .
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 <i>common link parameter table</i> .
Register Area	A memory area 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 <i>terminal instruction</i> .
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 <i>local network table</i> and <i>relay network table</i> .
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 <i>instruction line</i> .
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 <i>Special I/O Unit</i> .
Slave	See <i>Remote I/O Slave Unit</i> .
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 <i>memory switch</i> .

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 <i>subroutine</i> .
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, <code>LET A=B+B</code> and <code>LET A=B*2</code> 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 <i>masked bit</i> .
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 Device 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>I/O verification error</i> .
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 <i>watchdog timer</i> .
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 <i>custom data area</i> .
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

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Revision History

A manual revision code appears as a suffix to the catalog number on the front cover of the manual.

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↑
Revision code

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	<p>The manual was revised accompany release of version 2 of the software. Major changes are outlined on page 3 of the manual. Other changes are as follows:</p> <p>Page 5: Note added to Memory Map description saying it is not supported in SFC program view mode.</p> <p>Page 7: Block Transfer changed to Transfer Program and Data.</p> <p>Page 19: Pin numbers corrected for 25-pin RS-232C connector for MCW.</p> <p>Page 84: Bottom rows in both tables corrected under "(I/O No.)" column.</p>
2A	September 1998	<p>Page 25: SPDWADRV.SYS and SPDTLDRV.SYS file names have been corrected to SPDWADRV.DEV and SPDTLDRV.DEV.</p>