MITSUBISHI

GPP Function software for Windows SW4D5C-GPPW-E(V)

OPERATING MANUAL

Operating Manual (SFC)

MELSEC

Mitsubishi Programmable Logic Controller

● SAFETY INSTRUCTIONS ●

(Always read these instructions before using this equipment.)

Before using this product, please read this manual and the relevant manuals introduced in this manual carefully and pay full attention to safety to handle the product correctly.
The instructions given in this manual are concerned with this product. For the safety instructions of the programmable controller system, please read the CPU module user's manual.
In this manual, the safety instructions are ranked as "DANGER" and "CAUTION".

◇! DANGER	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
△! CAUTION	Indicates that incorrect handling may cause hazardous conditions, resulting in medium or slight personal injury or physical damage.

Note that the △!CAUTION level may lead to a serious consequence according to the circumstances. Always follow the instructions of both levels because they are important to personal safety.

Please save this manual to make it accessible when required and always forward it to the end user.

[Design Instructions]

◇! DANGER

● When data change, program change or status control is to be made from a peripheral device to the running PLC, configure up an interlock circuit in the outside of the PLC system to ensure that the whole system will always operate safely.
Also, determine corrective actions to be taken for the system when a communication error occurs due to a cable connection fault or the like in online operation performed from the peripheral device to the PLC CPU.

△! CAUTION

● Online operation performed with a peripheral device connected to the running CPU module (especially program change, forced output or operating status change) should be started after carefully reading the manual and fully ensuring safety.
Not doing so can cause machine damage or accident due to miss operation.

REVISIONS

* The manual number is given on the bottom left of the back cover.

Print Date	* Manual Number	Revision
Sep.,1999	SH(NA)-080033-A	

INTRODUCTION

Thank you for choosing the Mitsubishi MELSEC Series General-Purpose Programmable Controller.
Before using the equipment, please read this manual carefully to use the product to its optimum.
A copy of this manual should be forwarded to the end user.

CONTENTS

About Manuals

The following manuals are also related to this product.
In necessary, order them by quoting the details in the tables below.

Related Manuals

Manual Name	Manual Number (Model Code)
GPP Function Software for Windows SW4D5C-GPPW-E(V) SW4D5C-LLT-E(V) Operating Manual (Start-up) Describes the system configuration, installation method and starting method of SW4D5C -GPPW-E(V) and SW4D5C -LLT-E(V). (Packed with the product)	IB-0800056 (13J962)
GPP Function Software for Windows SW4D5C-GPPW-E(V) Operating Manual Explains the functions of the programming, printout, monitoring and debugging methods and so on SW4D5C -GPPW-E(V). (Packed with the product)	SH-080032 (13J963)
GPP Function Software for Windows SW4D5C-GPPW-E(V) SW4D5C-LLT-E(V) Starting GPPW(Guidebook) Provides an SW4D5C –GPPW-E(V)/SW4D5C –LLT-E(V) beginner the illustrated information ranging from the installation method, starting method, basic knowledge and ladder creation to the editing, print-out, monitoring and debugging methods. (Option)	IB-0800057 (13J966)
MELSAP-II (SFC) Programming Manual Contains information required for creating SFC programs, e.g. programming method, specifications and functions. (Option)	IB-66361 (13JF40)
QnA CPU Programming Manual (SFC) Describes the programming method, specifications, functions and so on required for creating SFC programs. (Option)	IB-66619 (13JF51)

MEMO

1. OVERVIEW

1.1 Product Overview and Features

Overview

This manual describes the editing and monitoring operations of the SFC functions among the functions of Type SW4D5C-GPPW-E(V) GPP Function Software Package (hereafter referred to as "GPPW").
For the functions other than the SFC functions and the specifications related to SFC programs, refer to the corresponding manuals given in "Related Manuals".

The following SFC functions are supported by GPPW.

	CPU Compatible	
MELSAP-II	• ACPU • Motion controller* • Qn(H)CPU-A (A mode)	If the CPU type (series) differs, the specifications and functions are the same.
MELSAP3	• QnACPU • Qn(H)CPU (Q mode)	If the CPU type (series) differs, the specifications and functions are the same.
FX series SFC	(Not supported)	

*The motion controller can use the SFC functions like the ACPU, with the exception of the SFC symbol SV. SV

Features

GPPW-supported SFC (MELSAP II/MELSAP3) has the following features.

SFC is one of the methods that can be used for programming the A series and QCPU QnA series CPUs and it stands for S equential F unction C hart.
By clearly representing the operating sequence of machinery/equipment controlled by the CPU, this new language makes it easy to grasp the system as a whole, and makes programming easier. (Conforms to IEC-1131-3 Standard.)
In contract to the case where a program represented by ladders is entirely executed every scan, only the minimum required part of a program may be run if it is written in the SFC format.

1. Many useful editing functions
   (1) The function keys, tool buttons, menu bar and so on improve programming operations.
   (2) You can easily cut and paste your SFC diagrams between two or more windows.

2. A wealth of monitoring functions
   (1) Monitoring an SFC diagram for the active steps of an SFC program.
   (2) Monitoring a ladder diagram for the active devices of operation outputs and transition conditions.
   (3) Displaying a list of all blocks and batch-monitoring the active states of the blocks.
   (4) Automatic scrolling enables the track monitoring of the active step.

3. Many useful test functions
   (1) Ease of forced ON/OFF and present value changing of the specified devices
   (2) Forced start/stop and temporary stop of the specified blocks

4. Comment editing and printing choices
   (1) Comments can be written to each step of each SFC diagram.
   (2) You can select printing according to your application, e.g. SFC diagram with operation outputs and transition conditions appended, with SFC comments appended, or just the diagram itself.

1.2 Abbreviations and Generic Names Used in This Manual

In this manual, the GPP Function Software Packages and PLC CPU modules are represented by the following generic names and abbreviations.
When the corresponding type must be specified, its module type is provided.

Abbreviation/Generic Name	Description/Corresponding Module
QCPU	Generic name for PLC CPUs of MELSEC-Qn(H)CPU (Q mode) which allow SFC programs to be edited
Qn(H)CPU-A	Generic name for PLC CPUs of MELSEC-Qn(H)CPU-A (A mode) which allow SFC programs to be edited Described as the ACPU in this manual.
ACPU	Generic name for PLC CPUs usable with the MELSEC-A. In this manual, the Qn(H)CPU-A (A mode) and motion controller are also included. (Note that GPPW does not support the A1, A2, A3, A3H, A3M, A52G, A73 and A0J2.)
QnACPU	Generic name for PLC CPUs usable with the MELSEC-QnA.
GPPA	SW□SRXV-GPPA SW□IVD-GPPA
GPPQ	SW□IVD-GPPQ
GPPW	SW4D5C-GPPW
SFC	Generic name for MELSAP-II and MELSAP3.
Software package for motion controller	Generic name for software packages for motion controller which allow SFC programs to be edited

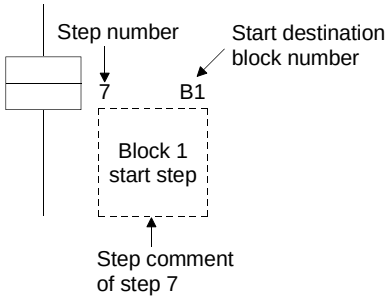
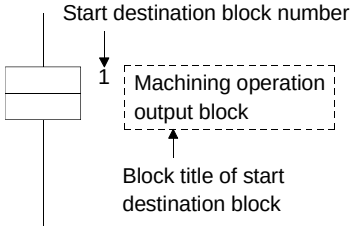
MEMO

2. PRECAUTIONS FOR CREATING SFC PROGRAMS

This chapter gives precautions for creating SFC programs with GPPW.

2.1 Precautions for Use of the ACPU

A	Q/QnA	FX
○	×	×

Item	GPPW	GPPA
User microcomputer program	• Cannot be created. • Erased if another format file that is read includes a microcomputer program other than an SFC program.	• The A0J2H, AnS, AnSH and AnNCPUs allow SFC and microcomputer programs to exist together.
SFC capacity	• The parameter setting of the microcomputer capacity must be made. However, since the capacity is not checked at the time of creation, checking operation is needed to make sure that the SFC capacity is within the microcomputer capacity range. (Refer to POINT.)	• A program can be created within the parameter-set "microcomputer capacity" and SFC-set "block count" ranges.
Maximum block count setting	• A program can be created as desired within the maximum number of blocks (256 blocks). • For another format write or PLC write, write up to the largest existing block number as a set value. However, write "32" when the existing blocks are within 32.	• Up to which block of the maximum number of blocks (256 blocks) will be created must be set on the SFC diagram editing screen. (Default value: 32)
CPU type change (QnA→ACPU)	• As the CPU type is changed with the parameter setting of the microcomputer capacity remaining unchanged from "0k bytes"; the microcomputer capacity setting must be changed after CPU type changing.	(Without QnA→ACPU conversion function for SFC program)
Hold step	• Representation of hold step SC	• Representation of hold step S
	＊Different in only representation method and identical in function.	
Block start step	A block start step is also handled as a single step and a step comment appears when SFC comment indication is given. 	The comment displayed at the block start step is the block title of the start destination block. 
	＊A program printed is as displayed on the screen.	

Item	GPPW	GPPA
SFC comment creation	• SFC comments may either be created simultaneously with SFC diagram creation or during comment editing. • SFC comments are handled as common comments, and device comments can be created with a block title specified as "BLm", a step comment as "BLm\Sn", and a transition comment as "BLm\TRn".	• SFC comments are created in the SFC diagram writes mode. • As SFC comments are handled in SFC diagrams only; they cannot be handled as device comments.
Block title	• Can be edited up to 32 characters. • When the block title is reread after another format write or PC write, a character string of more than 24 characters are erased. • The block title is not read if the file stored without SFC comment copying being performed for a renaming or copying operation on GPPA is read in another format. (The block title is read if it is read in another format after making re-conversion on GPPA.)	• Can be edited up to 24 characters.
Note for operation output	• Each coil instruction of an operation output can be annotated. • When written to GPPA in another format, the note for operation output is not written.	• An operation output cannot be annotated.

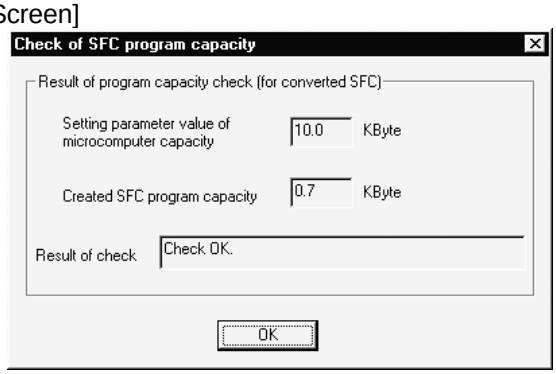
POINT

After creating an SFC diagram and performing a conversion operation, perform the following operation to check that the existing SFC program capacity is within the preset microcomputer capacity.

[Operating procedure]

[Tools]→[Set SFC information]→[Program capacity check]

[Screen]



If "SFC program capacity is beyond the microcomputer cap." appears on the right of Result of check, PLC write or another format write cannot be performed as it will result in an error.

Change the microcomputer capacity setting to a value equal to or greater than the "Created SFC program capacity".

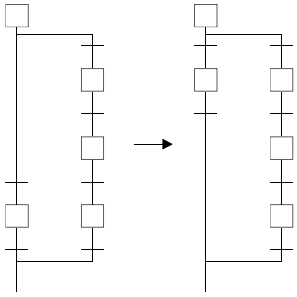
2.2 Precautions for Use of the Motion Controller

A	Q/QnA	FX
○	×	×

Item	GPPW	Software Package for Motion Controller
Step attribute SV	• Since the step attribute is not supported, a step read in another format is an ordinary step (□). However, since an operation output program is read intact, no influence is given to its operations. • Since an operation output program cannot be created automatically in the system, an equivalent program must be created by the user.	• Supported.
Others	With the exception of the step attribute (SV), the precautions are the same as those for use of the ACPU.	

2.3 Precautions for Use of the QnACPU

A	Q/QnA	FX
×	○	×

Item	GPPW	Software Package for Motion Controller
SFC comments	• SFC comments are handled as common comments.	• SFC comments are handled as program-by-program comments.
	• When another format file write is performed from GPPW to GPPQ, the file is divided into a program file and a comment file and therefore renaming and other operations are needed on GPPQ.	
SFC diagram pattern	• If an SFC diagram created is redisplayed in a different pattern, verifying that diagram may result in a mismatch. Example: Created Redisplayed  A mismatch occurs if the above SFC diagram is redisplayed or project-read, "converted", and verified. • A mismatch occurs if the above SFC diagram is redisplayed or project-read, and "converted", and verified.	• Same specifications as those of GPPW.

2.4 Precautions for Use of the Qn(H)CPU

A	Q/QnA	FX
×	○	×

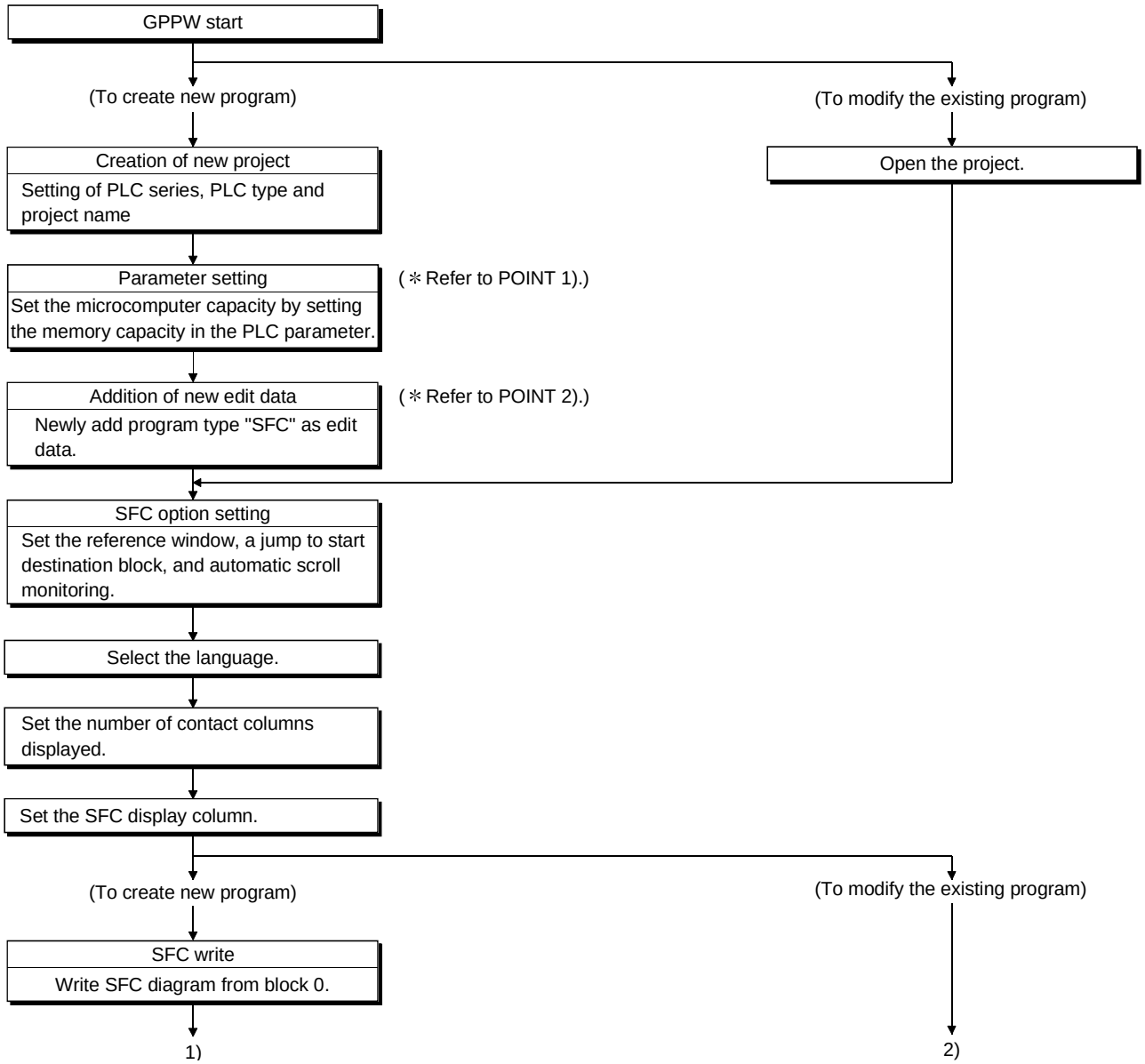
There are no specific precautional restrictions since the SFC program editing of the QnCPU is made only with GPPW.

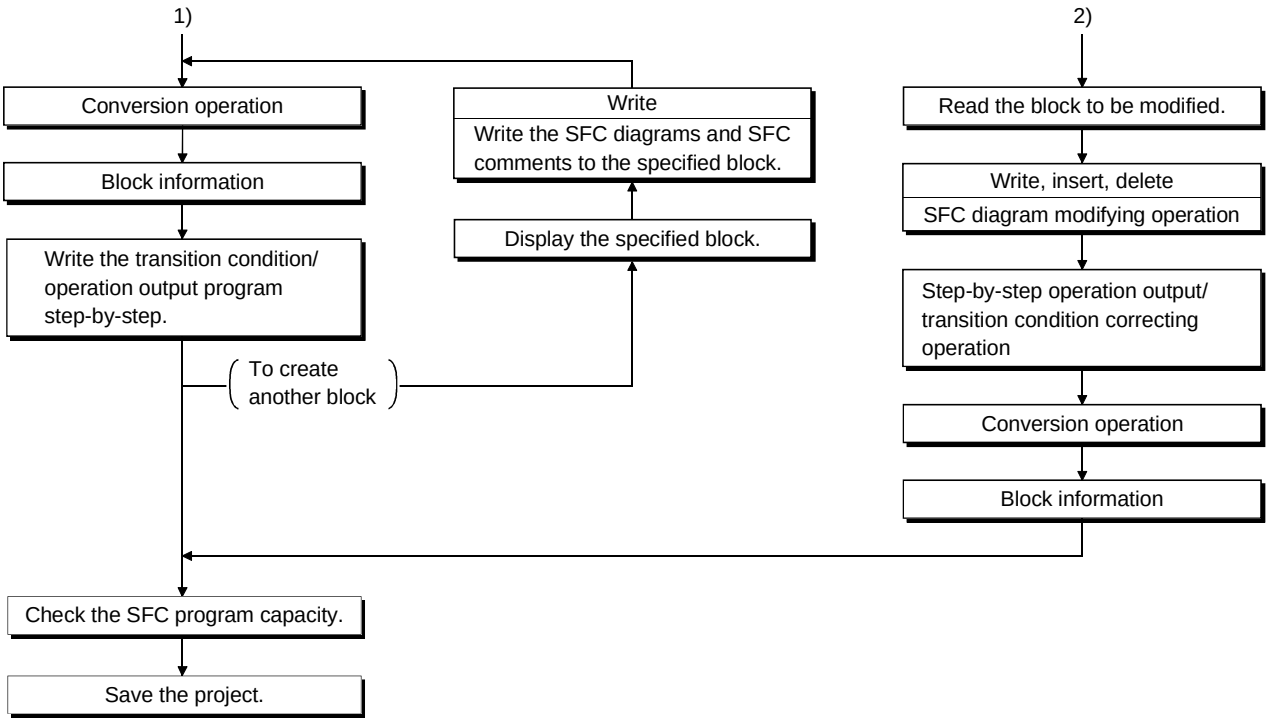
3. SFC PROGRAM EDITING

3.1 SFC Program Editing Outline Procedure

3.1.1 SFC Program Editing Outline Procedure (for ACPU)

A	Q/QnA	FX
○	×	×

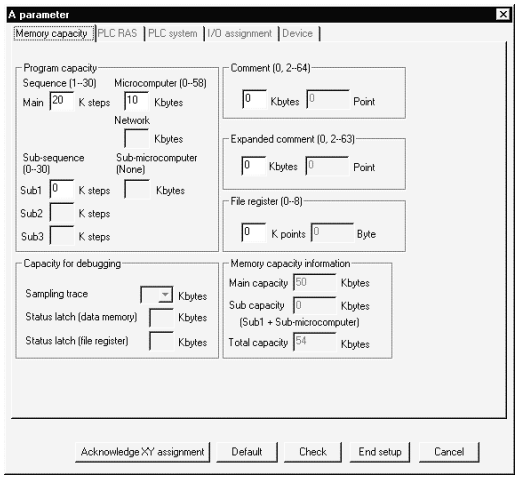



1)
Conversion operation
Block information
Write the transition condition/ operation output program step-by-step.
To create another block
Write
Write the SFC diagrams and SFC comments to the specified block.
Display the specified block.
2)
Read the block to be modified.
Write, insert, delete
SFC diagram modifying operation
Step-by-step operation output/ transition condition correcting operation
Conversion operation
Block information
Check the SFC program capacity.
Save the project.

POINTS

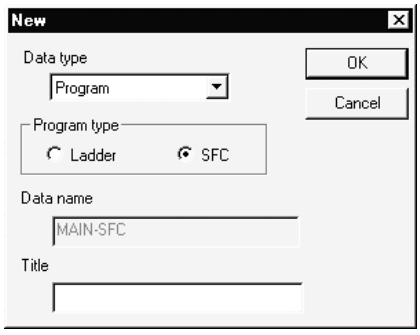
• When creating a new SFC program, you need to make the parameter setting of the microcomputer capacity and perform a new edit data adding operation. Perform the following operation before SFC diagram editing.

1) Parameter setting of microcomputer capacity
[Parameter of Project data list]→[PLC parameter] →Memory capacity

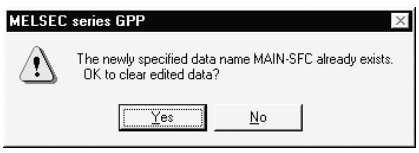


Set the microcomputer capacity and perform the operation of [Check]→ [OK] →[End setup].

2) Addition of new edit data
[Project]→[Edit data]→[New]



Choose Program at Data type, change Program type to "SFC", and click the [OK] button. The following window then appears.



Choosing [Yes] enables an SFC diagram to be edited under the data name of "MAIN-SFC".

3.1.2 SFC Program Editing Procedure Outline (for Q/QnACPU)

A	Q/QnA	FX
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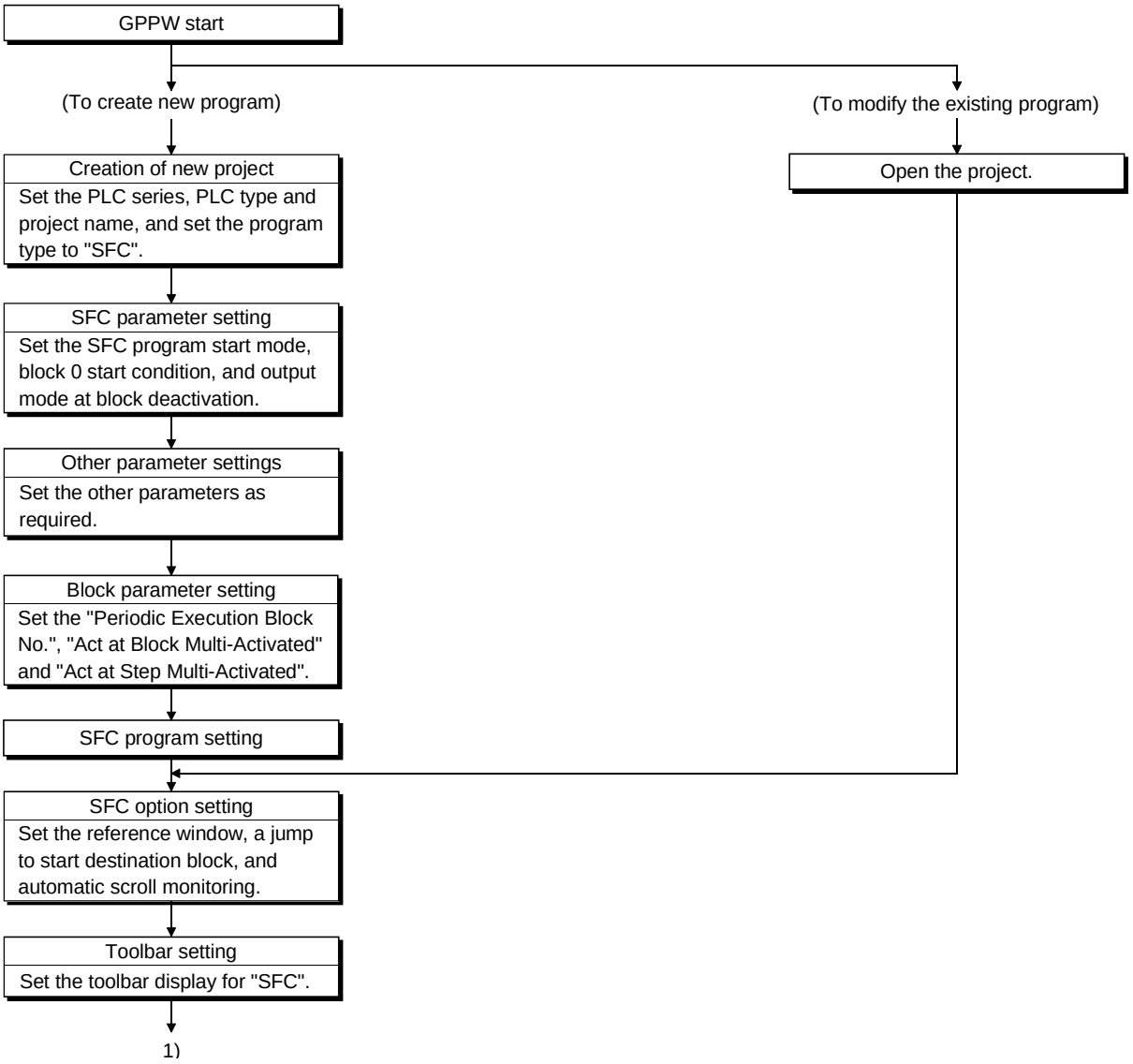
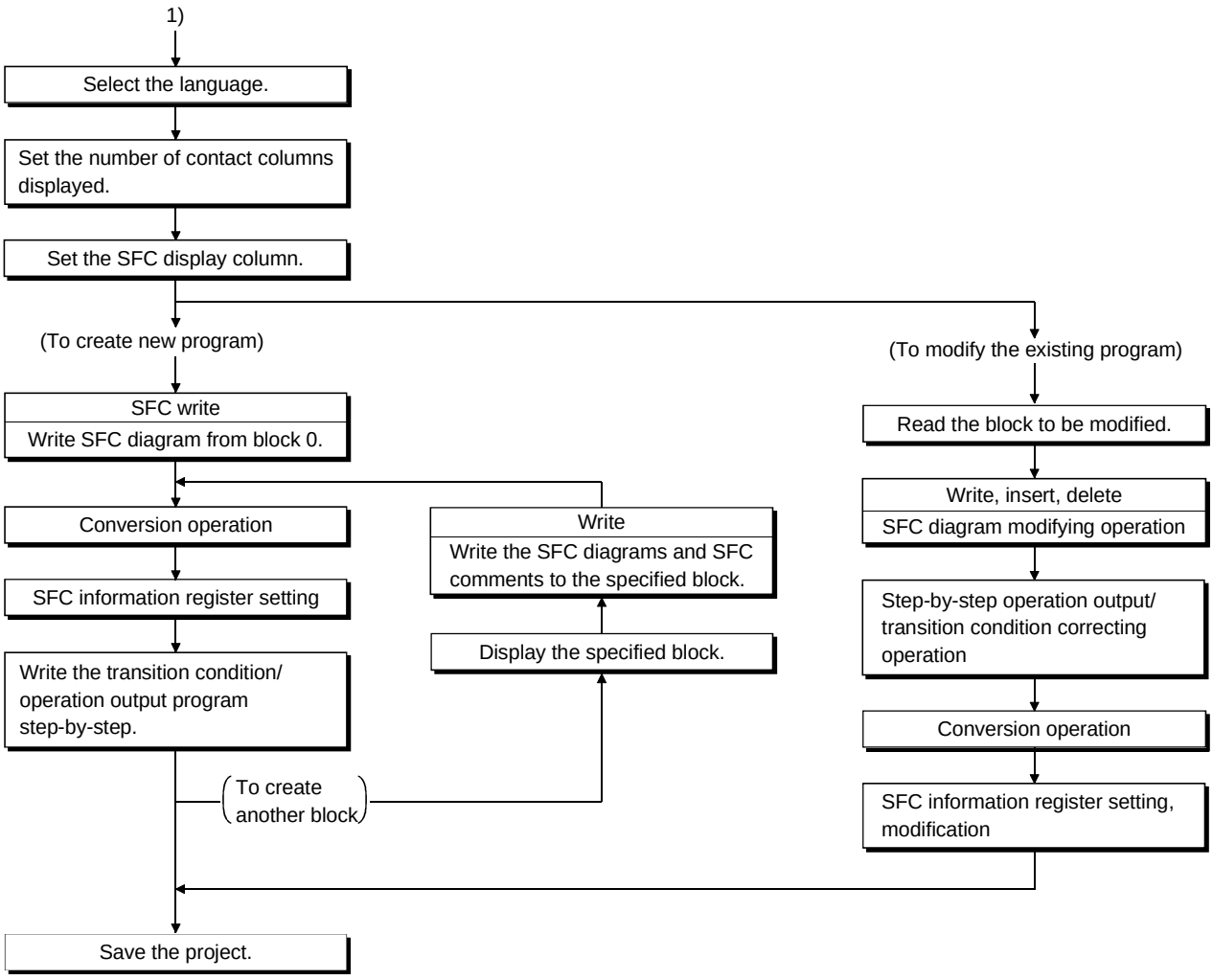




POINT
This outline procedure is given for your reference. You can perform the operations in any order without following the above procedure.

3.2 SFC Diagram Symbol List

A	Q/QnA	FX
○	○	×

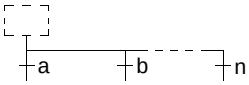
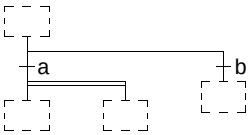
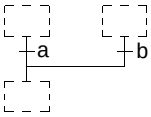
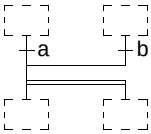
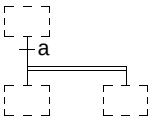
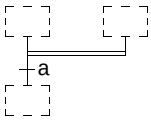
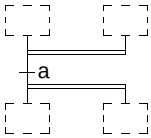
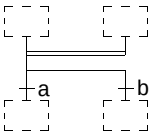
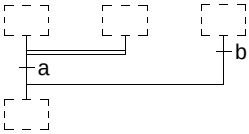
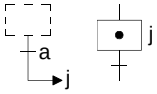
The following table lists symbols used in SFC programs.
A block is an operation sequence, which starts at an initial step and ends at an end step.
The smallest units of operations are steps and transitions.
Further, transition conditions and operation outputs are represented in ladder diagrams using the zoom of the display function or in instruction lists.

[A series SFC diagram symbol list]

Class	Name	Symbol	Quantity
Step	Initial step	0 / SC 0	One step in each block
	Step	i / ? i / SC i /	Max. 254 steps. in each block (i=1 to 254)
	Block start step	i Bm (m=start block number)	Number of steps in each block (more than one step may be provided for the same block)
	END step		More than one step may be provided in each block.
Transition	Series transition	?	
	Selective branch	(Left end) (Middle) (Right end)	
	Selective coupling	(Left end) (Middle) (Right end)	
	Parallel branch	(Left end) (Middle) (Right end)	
	Parallel coupling	(Left end) (Middle) (Right end)	
	Jump transition	i j j (i=jump destination step)	

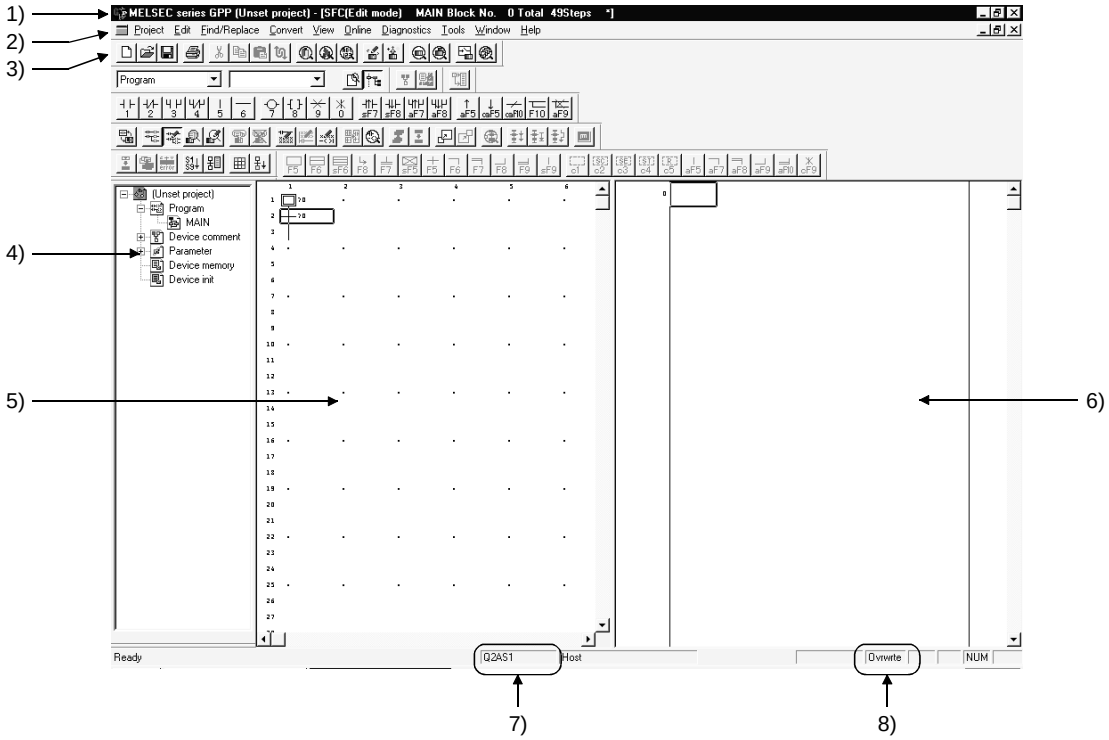
[QnA series SFC diagram symbol list]

Class	Name		SFC Diagram Symbol	Quantity
Step	Initial step	At step 0	□ 0	Any one of these steps in one block
	Dummy initial step		□ 0	
	Coil hold initial step		SC 0	
	Operation hold step (without transition check) initial step		SE 0	
	Operation hold step (with transition check) initial step		ST 0	
	Reset initial step		R j Sn	
	Initial step	At initial step other than step 0	□ j	Up to a total of 31 steps. in one block
	Dummy initial step		☒ j	
	Coil hold initial step		SC j	
	Operation hold step (without transition check) initial step		SE j	
	Operation hold step (with transition check) initial step		ST j	
	Reset initial step		R j Sn	
	Step	Other than initial step	□ i	Including initial step, max. 512 steps in one block
	Dummy step		☒ i	
	Coil hold step		SC i	
	Operation hold step (without transition check)		SE i	
	Operation hold step (with transition check)		ST i	
	Reset step		R i Sn	
	Block start step (with end check)		⊟ i Bm	
	Block start step (without end check)		⊟ i Bm	

Class	Name	SFC Diagram Symbol	Quantity
Transition	Series transition		
	Selective branch		
	Selective branch-parallel branch		
	Selective coupling		
	Selective coupling-parallel branch		
	Parallel branch		
	Parallel coupling		
	Parallel coupling-parallel branch		
	Parallel coupling-selective branch		
	Parallel coupling-selective coupling		
	Jump		
Block end	Block end		More than one block end may be provided in one block.

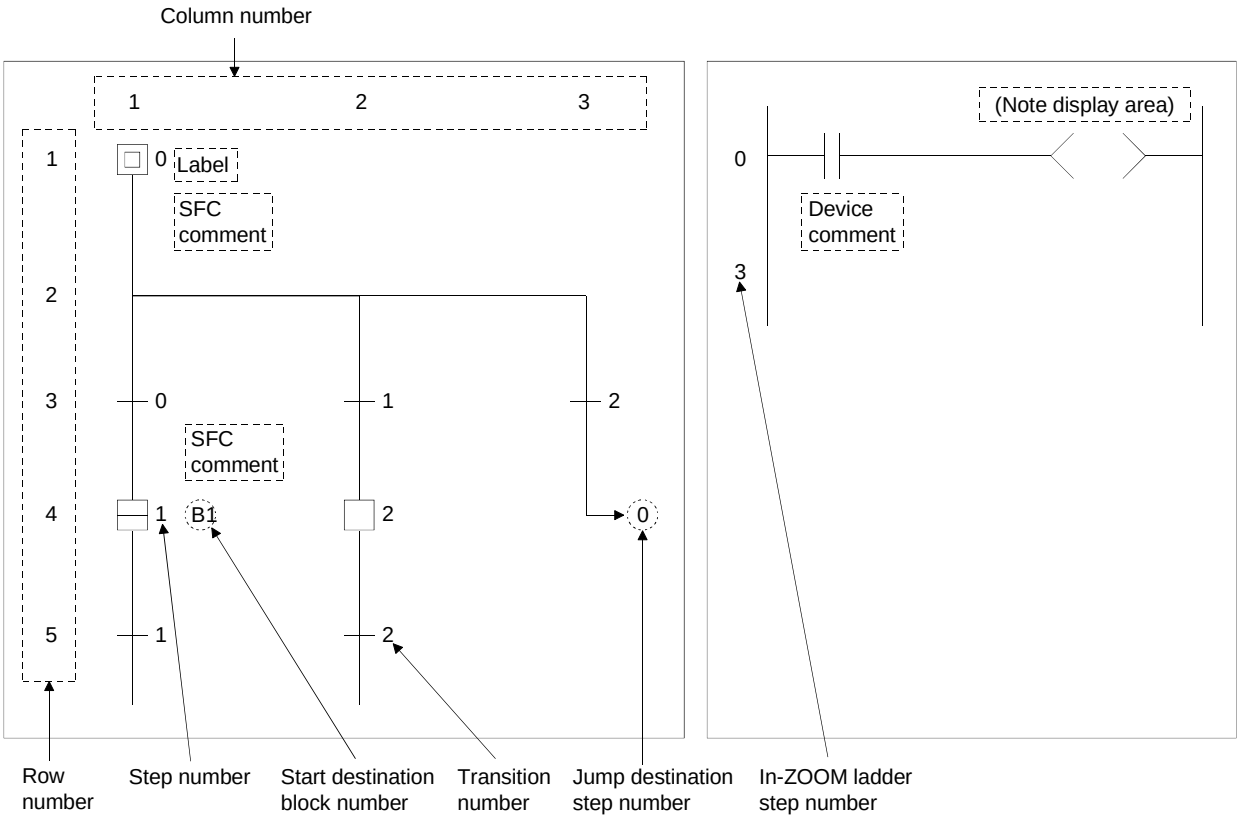
3.3 SFC Diagram Editing Basic Screen

(1) Whole screen make-up



1) Area for displaying the project name being edited, the number of steps used, the block number being displayed and so on
2) Menu names on the menu bar
3) Icons on the toolbar
4) Project list display
5) SFC diagram editing area
6) Operation output/transition condition program editing area (Zoom side)
7) Edited CPU type
8) Edit mode (overwrite/insert)

(2) SFC diagram editing screen make-up



POINTS

- The Zoom-side display shows the operation output/transition condition at the cursor position in the SFC diagram.
- Some menus that may be selected/operated change depending on whether the cursor is on the SFC diagram side or on the Zoom side.

3.4 Creating/Modifying the SFC Diagram

3.4.1 (1) Writing an SFC Diagram

A	Q/QnA	FX
○	○	×

An SFC diagram may be created in any of the following four methods.

1. Starting from the tool button on the toolbar
2. Starting from the function key
3. Starting from the menu on the toolbar
4. Starting from pressing the Enter key

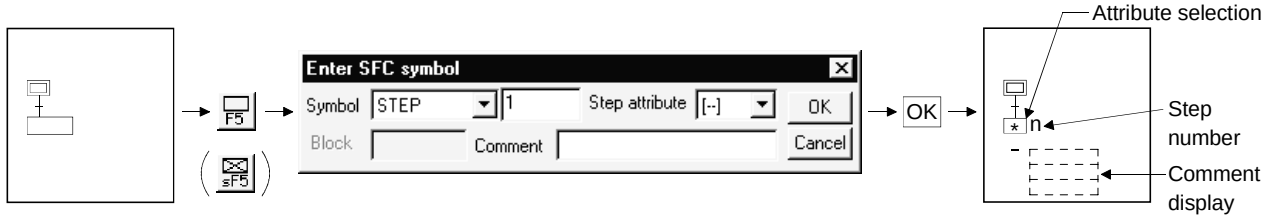
Performing any of the above operations shows the, Enter SFC symbol window.

Enter data by the operations given on the pages that follow.

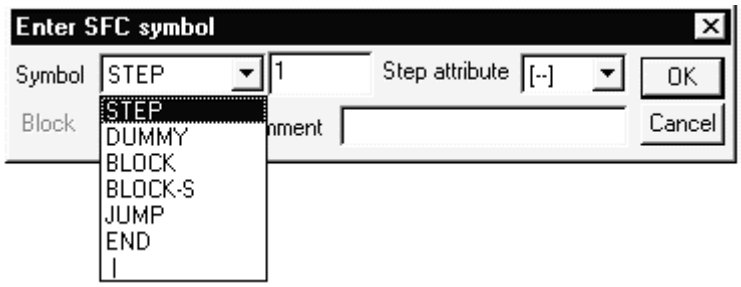
(1) Operation starting from the tool button

Write (overwrite) operation example

1) Step (□) / (⊠)

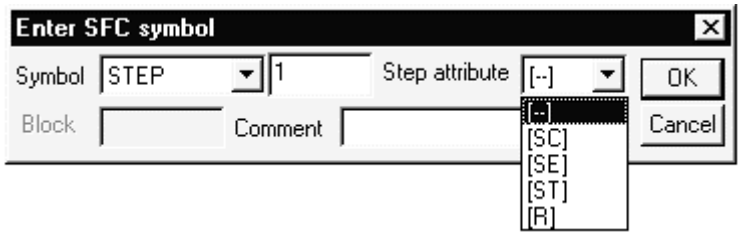


• Diagram symbol
The diagram symbol name selected appears.
To change the diagram symbol selected, click ▼ and choose a new diagram symbol.



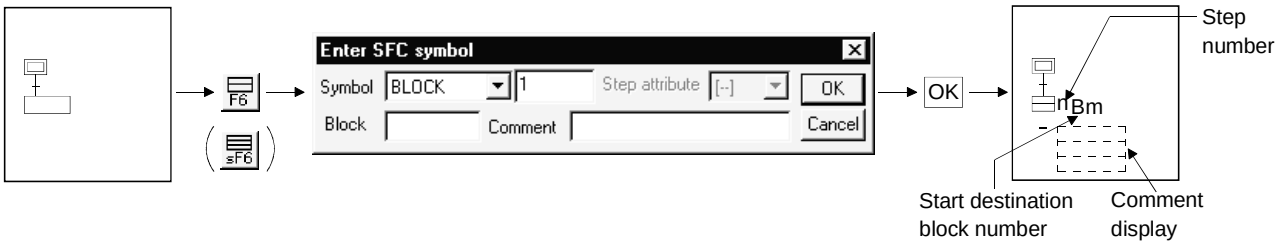
• Step number
The system automatically assigns lower to higher step numbers in the order of entry.
When you will use the step numbers automatically assigned by the system, you can omit the "step number" input operation.
At a dummy step, you can create an operation output program if it is marked " ⊠ ", which will change to " □ " automatically after the program is created.

• Step attribute
When adding a step attribute, click ▼ and choose the attribute you want to add.
When you chose the reset step (R) as a step attribute, enter the reset destination step number after making selection.

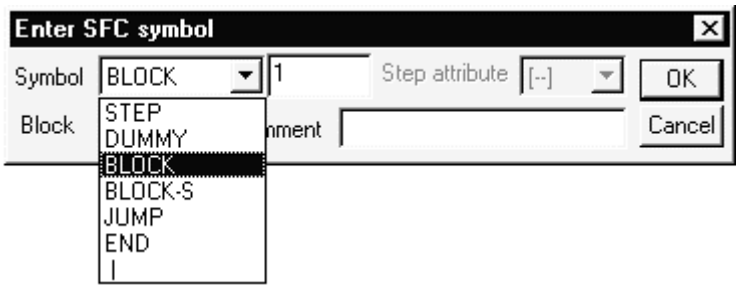


• Comment creation
You can enter a comment of up to 32 characters.
The comment created can be displayed by "step/transition comment display" operation in the display menu.

2) Block start step (,)



• Diagram symbol
The diagram symbol name selected appears.
To change the diagram symbol selected, click and choose a new diagram symbol.

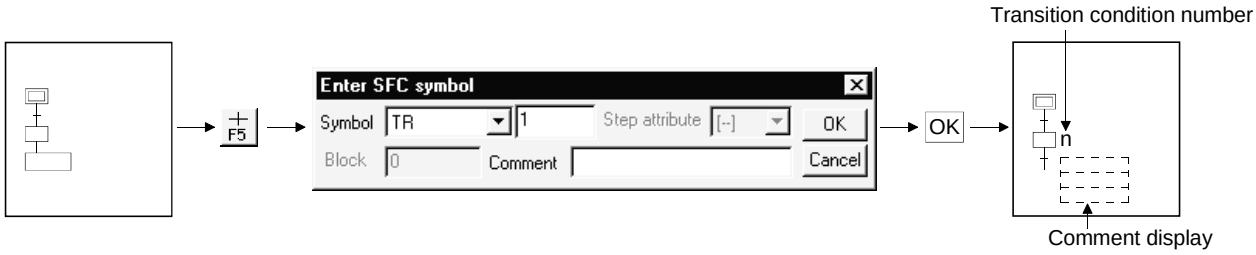


• Start destination block number
Enter the start destination block number.

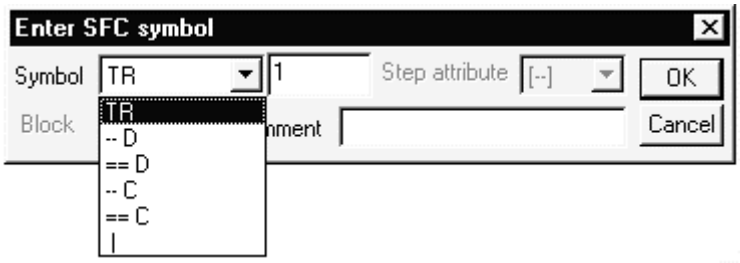
• Step number
The system automatically assigns lower to higher step numbers in the order of entry.
When you will use the step numbers automatically assigned by the system, you can omit the "step number" input operation.

• Comment creation
You can enter a comment of up to 32 characters.
The comment created can be displayed by "step/transition comment display" operation in the display menu.

3) Series transition (┼)



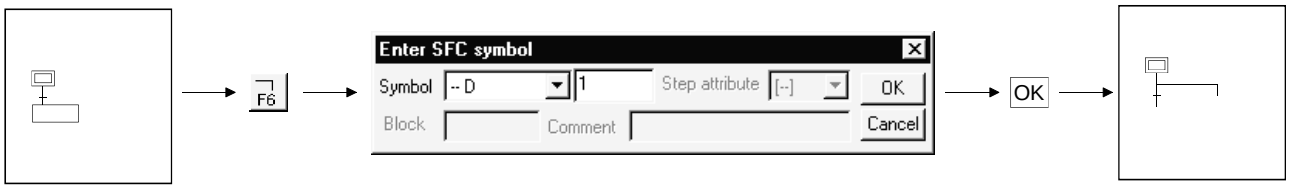
• Diagram symbol
The diagram symbol name selected appears.
To change the diagram symbol selected, click ▼ and choose a new diagram symbol.



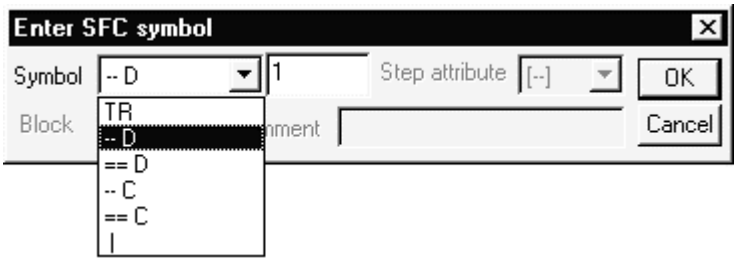
• Transition condition number
The system automatically assigns lower to higher transition condition numbers in the order of entry.
When you will use the transition condition numbers automatically assigned by the system, you can omit the "transition condition number" input operation.

• Comment creation
You can enter a comment of up to 32 characters.
The comment created can be displayed by "step/transition comment display" operation in the display menu.

4) Selective branch (⌐)

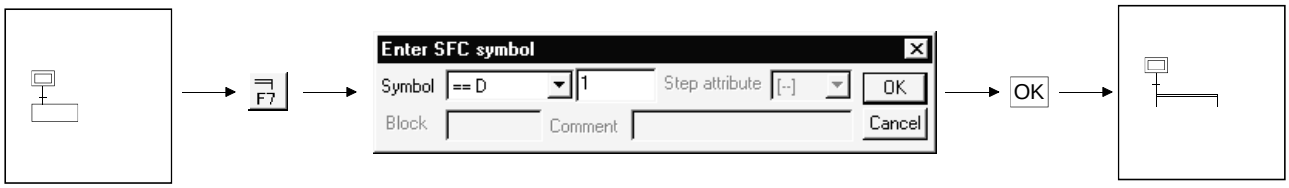


• Diagram symbol
The diagram symbol name selected appears.
To change the diagram symbol selected, click ▼ and choose a new diagram symbol.

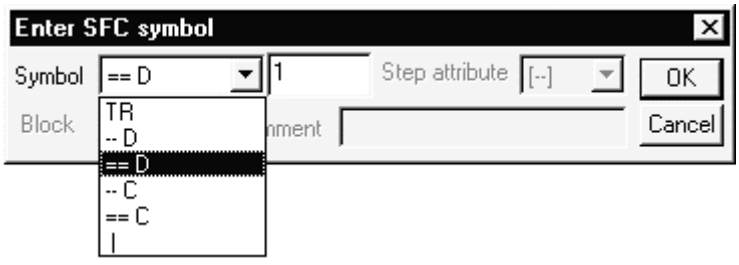


• Number of branches
Enter the number of branch line columns.
If it is "1", you can omit the input operation.

5) Parallel branch (⌐)

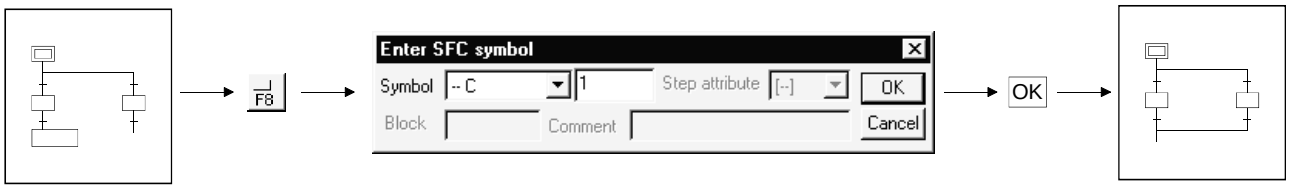


• Diagram symbol
The diagram symbol name selected appears.
To change the diagram symbol selected, click ▼ and choose a new diagram symbol.

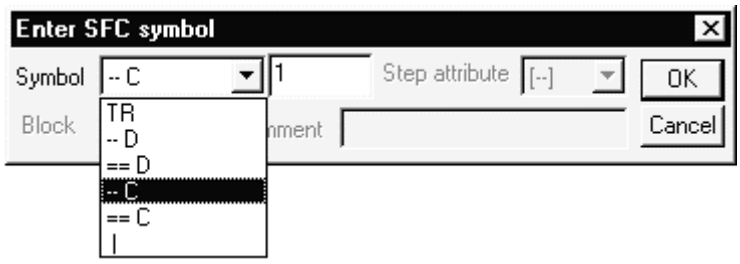


• Number of branches
Enter the number of branch line columns.
If it is "1", you can omit the input operation.

6) Selective coupling ( )



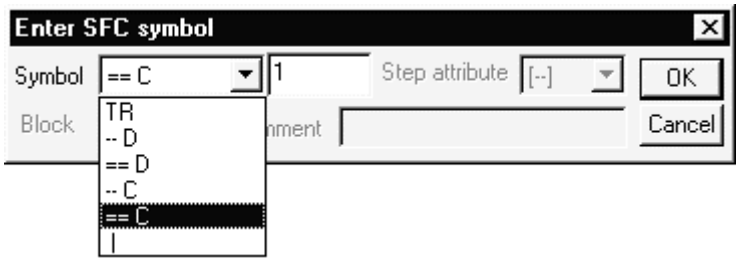
• Diagram symbol
The diagram symbol name selected appears.
To change the diagram symbol selected, click and choose a new diagram symbol.



• Number of couplings
Enter the number of coupling line columns.
If it is "1", you can omit the input operation.

7) Parallel coupling ( )

• Diagram symbol
The diagram symbol name selected appears.
To change the diagram symbol selected, click and choose a new diagram symbol.



• Number of couplings
Enter the number of coupling line columns.
If it is "1", you can omit the input operation.

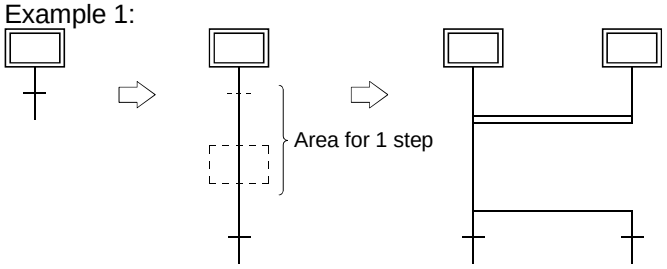
POINTS

• Input method used when a branch and a coupling are used together in a single transition condition

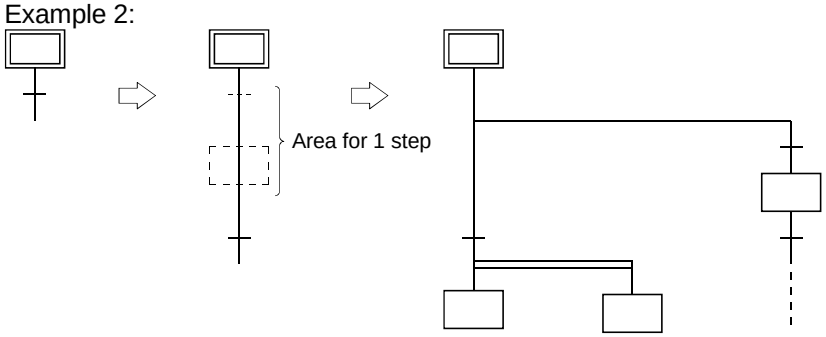
1) For Q/QnACPU

When a branch and a coupling are used together in a single transition condition, reserve an area for one step using "|" (vertical line) and then enter the branch and coupling symbols.

Example 1:



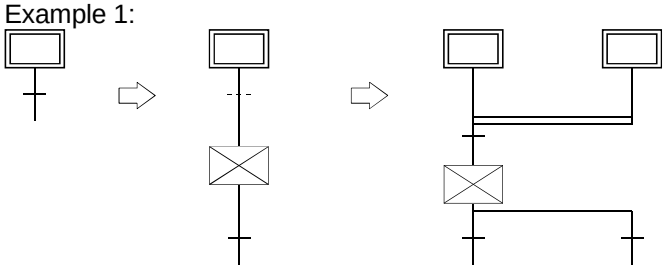
Example 2:



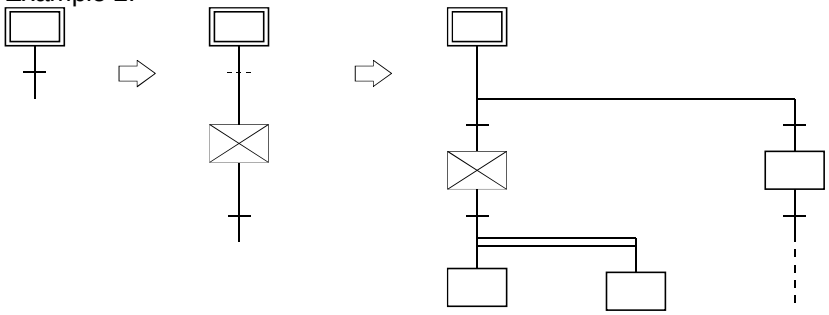
2) For ACPU

As a branch and a coupling cannot be used together in a single transition condition, enter a dummy step.

Example 1:



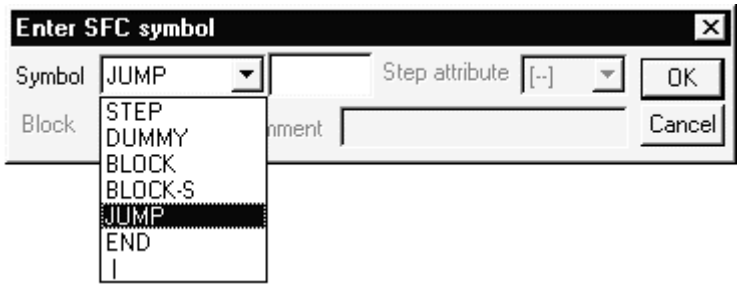
Example 2:



• For branch/coupling line entry, entering the number of branches/couplings as "-n" creates them from right to left.

8) Jump transition ( )

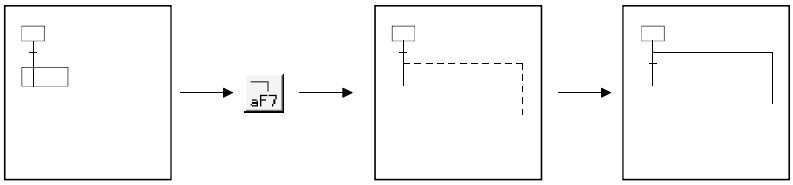
• Diagram symbol
The diagram symbol name selected appears.
To change the diagram symbol selected, click and choose a new diagram symbol.



• Jump destination step number
Enter the jump destination step number.
Clicking the OK button changes the indication of the step specified as the jump destination from ( ) to ( ).

9) End step ( )

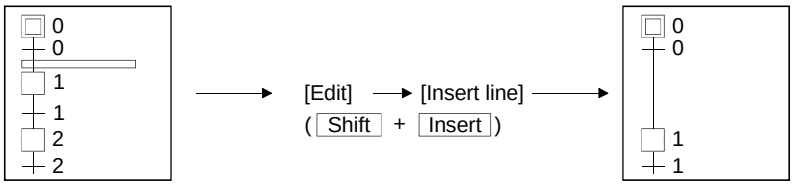
10) Rule write



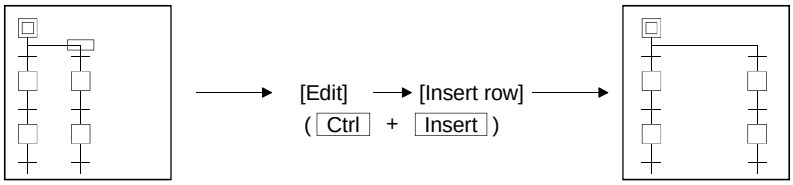
• To write a rule, click aF7 / aF8 / aF9 / aF10 and drag from the first position to the last position of the rule entry.

POINT
If you write a rule over the existing step/transition, the step/transition symbol and operation output/transition condition sequence program are not erased.

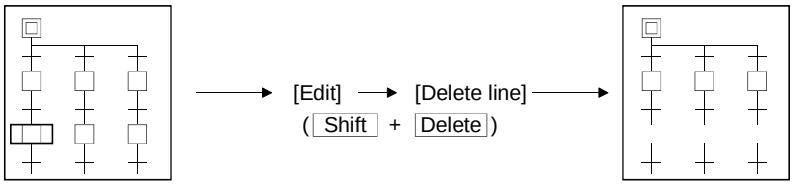
11) Row insert



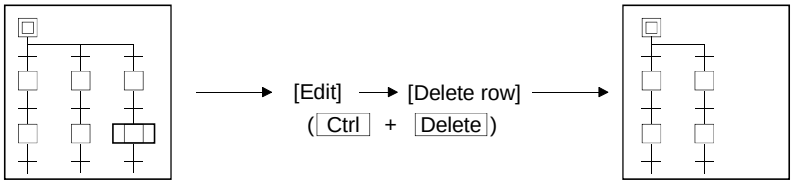
12) Column insert



13) Row delete



14) Column delete



Write (insert) operation example

When an SFC diagram is created by a write (insert) operation, insertion results are as described below on an SFC diagram symbol basis.
Note that step/transition condition number changing, simultaneous SFC comment creation and so on can be performed as in the write (overwrite) operation.

1) Step (□)

- Point the cursor to a desired position and click the SFC symbol (step) to insert a step in the cursor position.
  When you insert a step over " | " (vertical line) without changing the step number, the lowest free number of the existing SFC diagram is assigned.

- When the insert position is within a branch ladder, "|" (vertical line) is automatically inserted into another branch.

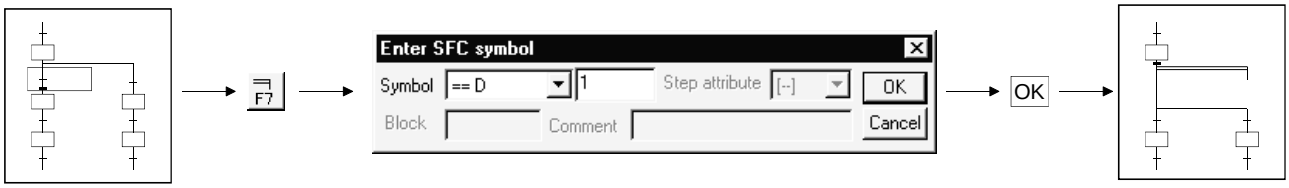
2) Series transition (⫞)

- Point the cursor to a desired position and click F5 to insert a transition in the cursor position.
  When you insert a transition over " | " (vertical line) without changing the transition condition number, the lowest free number of the existing SFC diagram is assigned.

- When the insert position is within a branch ladder, "|" (vertical line) is automatically inserted into another branch.

3) Selective branch (⌐)

4) Parallel branch (⌐)

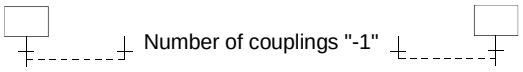


5) Selective coupling

6) Parallel coupling

POINTS

- Entering "-n" as the number of branches/couplings enters them from right to left.
  Example: Number of couplings "1"



- Inserting a branch/coupling may generate an SFC diagram that cannot be converted.
  In this case, correct the SFC diagram with the edit function (cut and paste) and then perform a conversion operation.

(2) Operation starting from the function key

1) The SFC symbols are assigned to the following function keys.

[Step]

SFC symbol	□ / □	⊟	⊟	⊢▶	⊥	⊠
Function key	F5	F6	Shift + F6	F8	F7	Shift + F5
Remarks			QnACPU only			

[Transition or branch/coupling]

SFC symbol	┼	┐	═	┘	═	|
Function key	F5	F6	F7	F8	F9	Shift + F9
Remarks						

[Rule entry]

SFC symbol	|	┐	═	┘	═
Function key	Alt + F5	Alt + F7	Alt + F8	Alt + F9	Alt + F10
Remarks					

2) Operation procedure

• Step/transition/branch/coupling entry

1) Press the function key.

↓

2) Since the window as was shown when the tool button was clicked appears, refer to the tool button operation procedure and enter the required items.

↓

3) Press the [Enter] key.

• Rule entry

1) Press the function key.

↓

2) Using the arrow keys, move the cursor to the first position of a branch/coupling.

↓

3) Hold down the [Shift] key and move the cursor with the arrow keys.

↓

4) Move the cursor to the last position of the branch/coupling and release your hand from the key.

(3) Operation starting from the menu on the toolbar

• Step/transition/branch/coupling entry

1) Click [Edit] on the toolbar.

↓

2) Move the cursor to [SFC symbol] in the edit menu.

↓

3) Click the SFC symbol to be entered.

↓

4) Since the window as was shown when the tool button was clicked appears, refer to the tool button operation procedure and enter the required items.

↓

5) Press the Enter key.

• Rule entry

1) Click [Edit] on the toolbar.

↓

2) Move the cursor to [Edit the line] in the edit menu.

↓

3) Click the branch/coupling line to be entered.

↓

4) Drag from the first position to the last position of the entry.

(4) Operation starting from the Enter key

1) Press the Enter key.

↓

2) Since the window as was shown when the tool button was clicked appears, refer to the tool button operation procedure and enter the required items.

↓

3) Press the Enter key.

POINT
Operation starting from the Enter key is a method useful for entry of steps (□) and transitions (⊣⊢) consecutively in the column direction.

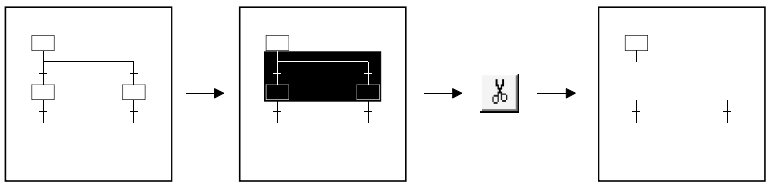
3.4.1 (2) Deleting the SFC Diagram

A	Q/QnA	FX
○	○	×

This section explains how to delete the existing SFC diagram symbols.

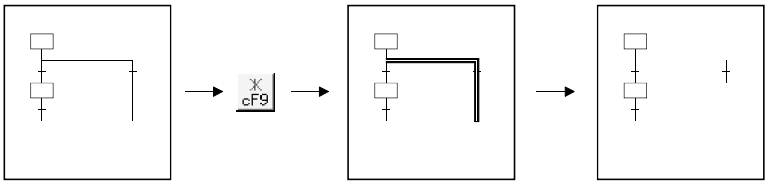
(1) Operation using the tool button to delete

1) Specifying the area and making deletion



(Drag)

2) Deleting the branch/coupling/vertical line only



(Drag)

(2) Operation using the function key to delete

• Hold down the Shift key and choose the deletion area with the arrow keys.

↓

• Press the Delete key.

(3) Operation to delete from the menu on the toolbar

• With the mouse, drag over the area to be deleted.

↓

• Click [Cut] in the edit menu.

POINT

Performing the [Undo] operation after making a deletion returns to the status immediately prior to the deletion.

• Tool button : Click

• Function key : Ctrl + Z

• Menu : Click [Undo] in the edit menu.

3.4.1 (3) Changing the Step Attribute

A	Q/QnA	FX
○	○	×

This section describes how to change the step attribute in the existing SFC diagram. The step attribute can be changed by any of the following tool button clicking, menu operation and key pressing.

Tool Button	Key Pressing	Menu	Description	Remarks
	Ctrl + 1	1) Editing ↓ 2) Step attribute setting ↓ 3) Choose a new attribute.	• Makes the preset step attribute invalid.	
	Ctrl + 2		• Changes the preset step attribute to [SC].	
	Ctrl + 3		• Changes the preset step attribute to [SE].	Q/QnACPU only
	Ctrl + 4		• Changes the preset step attribute to [ST].	Q/QnACPU only
	Ctrl + 5		• Changes the preset step attribute to [R] and sets the reset destination step No. • When it has already been set to [R], changes the reset destination step No.	Q/QnACPU only

POINT

If the step attribute has been changed, the existing operation output sequence program remains unchanged.

3.4.2 Cutting/Copying and Pasting the SFC Diagram

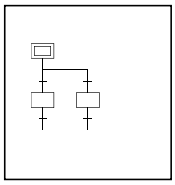
A	Q/QnA	FX
○	○	×

This section provides the operation to cut/copy and paste the SFC diagram.

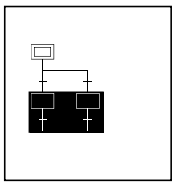
(1) Specifying the area, cutting or copying the SFC diagram, and pasting it

[Operation procedure]

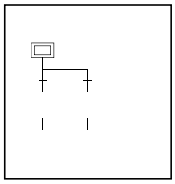
1. Choose [Edit]→[Write mode] or (F2).
2. Click the first position of the SFC diagram to be cut, and move the cursor.



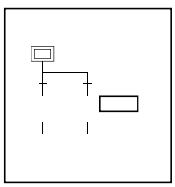
3. Drag over the area to be cut or copied.
   The specified area is highlighted.



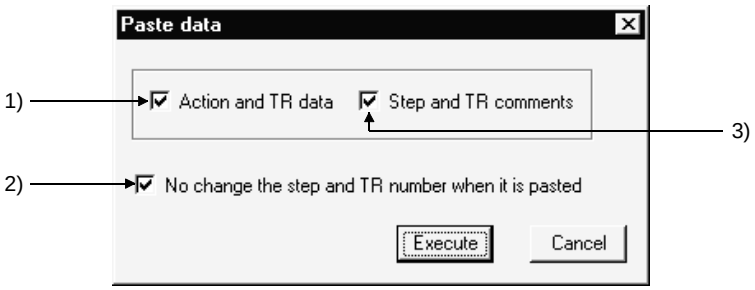
4. When cutting, choose [Edit] → [Cut] or (Ctrl+X), or when copying, choose [Edit] → [Copy] or (Ctrl+C) to cut the ladder in the specified area.



5. Click the position where the cut (copied) SFC diagram will be applied, and move the cursor.



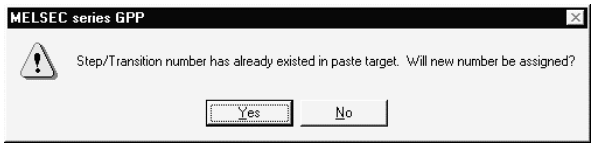
6. When you choose [Edit] → [Paste] or (Ctrl + V), the Paste data window appears. Make pasting choices.



1) Selection of whether or not the operation output/transition condition sequence program is also pasted simultaneously.
2) Selection of whether or not the original step/transition condition number is changed.
3) Selection of whether or not the step/transition comment is also pasted simultaneously.

POINT
"Not changing" the original step/transition condition number is useful for a moving operation.

7. When you selected "not to" change the original step/transition condition number but the pasting destination already has the same step/transition condition number, the following window appears.

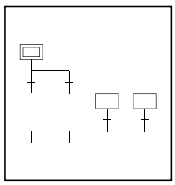


Choosing Yes executes pasting after the system has assigned a new number by reassigning lower to higher free numbers to the step/transition condition numbers of the pasting destination SFC diagram.
Choosing No suspends pasting.

8. When the first position of the cut or copied SFC diagram is a step and its pasting position is a transition position, or vice versa, the following window appears.

When this window has appeared, click the OK button, move the pasting position one row higher or lower, then perform a pasting operation again.

9. After the pasting operation is over, make conversion.
Note that a conversion error occurs if a branch/coupling is incorrect after pasting. Therefore, make conversion after performing the SFC diagram editing operation.



POINTS

- Cutting/copying and pasting between different blocks in the same program can be executed by displaying the corresponding blocks by performing [Window] → [Tile vertically] or [Tile horizontally] operation.
- Cutting/copying and pasting between different projects can be executed after opening the corresponding projects by performing [Project] → [Start new GPPW session] operation.
- Copying of an operation output/transition condition sequence program should be done within approx. 2k steps.

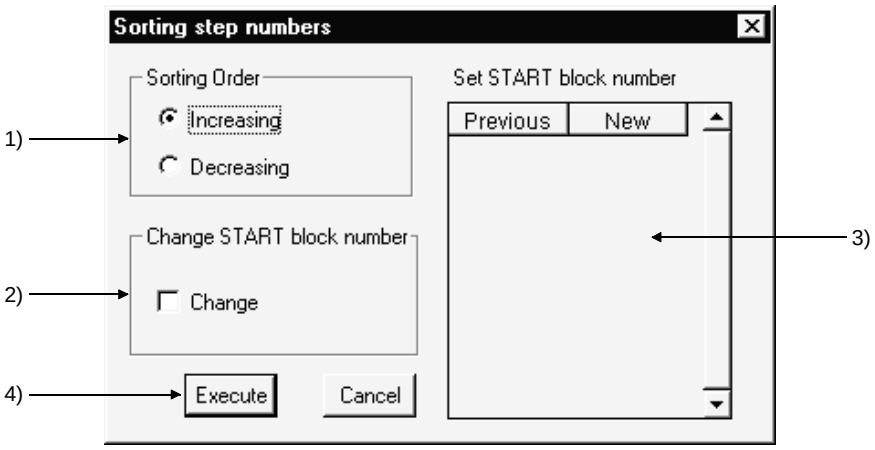
3.4.3 Sorting the SFC Diagram

A	Q/QnA	FX
○	○	×

This operation reassigns the step/transition numbers of the created SFC diagram.

[Operation procedure]
[Tools] → [Sort] or 

[Setting screen]



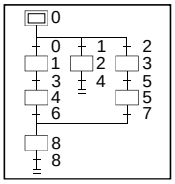
[Setting items]

1) Sorting Order
   Specify whether the step/transition numbers are in an ascending or descending order.
2) Change START block number
   Specify whether the start destination block number is to be changed or not.
3) Set START block number
   When you have selected "Change", enter a new block number.
4) Execute button
   Executes sorting as set on the above screen.

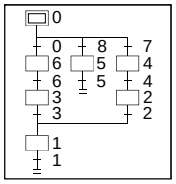
POINTS

- The result of executing sorting by specifying an ascending or descending order is as follows.

(When ascending order is specified)



(When descending order is specified)



* Immediately after sorting, a "Undo" operation can be performed only once.
* □ is step "0" if you specify either the ascending or descending order.

- The SFC comments do not move and remain attached to the step and transition numbers. After sorting, corrections must be made by cutting and pasting the SFC comments.
- The SFC devices (e.g. BLm\Sn, BLn\TRn) used with the operation outputs/transition conditions are not the objects of sorting.
  Sort them by performing a device number changing operation or the like.

3.4.4 Redisplaying the SFC Diagram

A	Q/QnA	FX
○	○	×

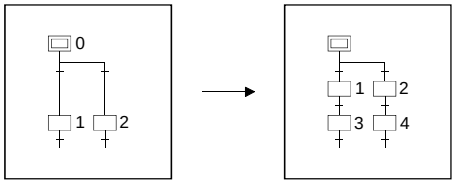
[Setting purpose]

This operation is performed to return the unconverted SFC diagram being edited to the status immediately prior to editing, or to top-shift or left-shift the freed row or column of the "|" (vertical line)/branch/coupling line.

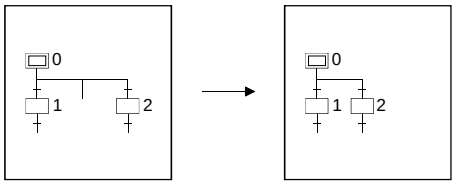
[Operation procedure]

[View]→ [Review SFC]

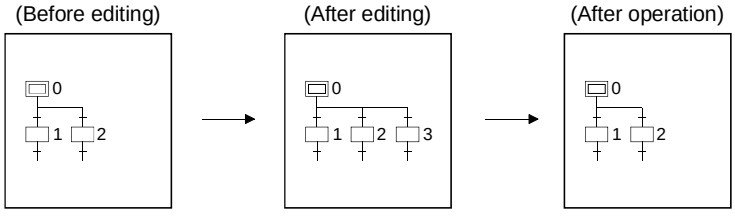
1) Top-shift redisplaying example



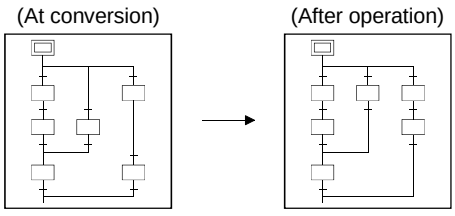
2) Left-shift redisplaying example



3) Unconverted SFC diagram redisplaying example



4) After-conversion SFC diagram optimizing display



3.5 Creating the Operation Outputs/Transition Conditions

A	Q/QnA	FX
○	○	×

When creating an operation output/transition condition program, move the cursor to the corresponding step/transition in the SFC diagram and click the Zoom side.
The subsequent operations are the same as in the ladder or list creating method.
For detailed operations, refer to the SW4D5C-GPPW-E(V) Operating Manual.

POINTS

- There are instructions which cannot be used with operation outputs/transition conditions.
  For more information, refer to the "MELSAP II (SFC) Programming Manual" for the ACPU or to the "QCPU(Qmode)/QnACPU Programming Manual (SFC)" for the QCPU and QnACPU.
- As a transition condition, only one dummy coil (⊣[Tran]⊢) may be entered for the coil instruction.
  To enter it, click F7 or F8 and click the OK button.
  ⊣[Tran]⊢ is entered automatically.
  For entry in list representation, enter only the contact instruction and the dummy coil (⊣[Tran]⊢) need not be entered.

3.6 Creating the SFC Comments

An SFC comment is a generic name for a "step comment" attached to each step of the created SFC diagram and a "transition comment" attached to each transition.
In addition, a "block title" is available as a comment related to SFC diagrams.
This section explains how to create and correct SFC comments and block titles.

3.6.1 Creating SFC Comments

A	Q/QnA	FX
○	○	×

You can create an SFC comment when entering an SFC symbol.
Also, you can create a block title when converting the SFC diagram.
This section describes how to create/correct only comment data after SFC diagram creation.

(1) Performing operation on the SFC diagram editing screen

[Operation procedure]

[Edit] → [Documentation] → [Comment] → Move the cursor to the editing position → Enter

Alternatively, → Right-double-click at the editing position.

[Setting screen]

POINTS

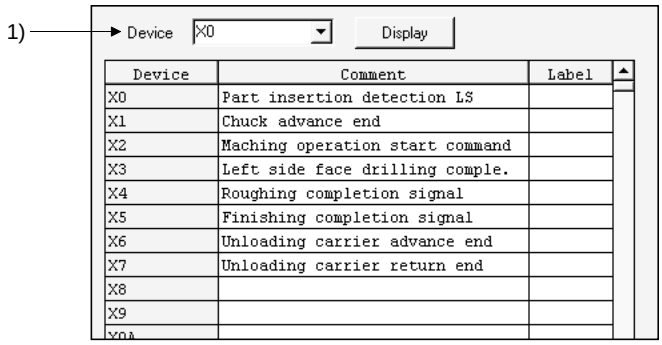
- Select an SFC diagram symbol in the SFC diagram to perform SFC comment creation/correction.
  Select a ladder symbol on the Zoom side to perform device comment creation/correction.
- In this operation, a block title cannot be created/corrected.
- About block comments
  SAP3
  When performing file write (write to GPPW format or other format file) and then PLC write, data will disappear unless a comment file is written.
  SAP2
  When performing write to other format, data will disappear unless a comment file is written.
- If you have created a block title of 25 or more characters on SAP2, performing PLC write or write to other format file will delete the 25th and latter characters.

(2) Performing operation on the device comment editing screen

[Operation procedure]

Device comment in project data list → COMMENT

[Setting screen]



1) Device name

Specify the device which will be commented.

When creating an SFC comment, specify the device name as indicated below.

Block title : BLm

Step comment : BLm\Sn

Transition comment : BLm\TRn

m: Block number

n: Step/transition number

3.6.2 Editing the Note for Operation Output

A	Q/QnA	FX
○	○	×

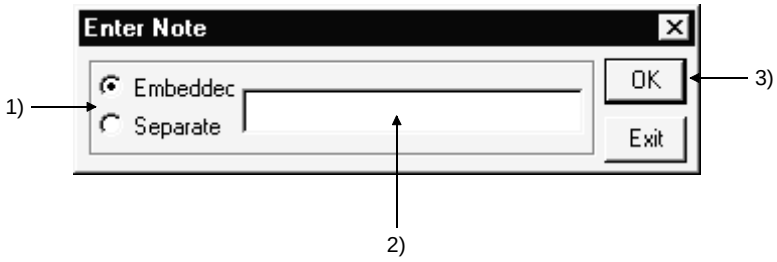
This section provides the operation performed to annotate an operation output ladder.
For full information on notes, refer to THE SW4D5C-GPPW-E(V) Operating Manual.

[Operation procedure]

[Edit] → [Documentation] → [Note] → Move the cursor to the editing position → Enter

Alternatively, → Right-double-click at the editing position.

[Setting screen]



[Item explanation]

1) Select Embeddec note or Separate note.
   For the ACPU, only separate note is available.
2) Note editing area
3) OK button
   Determines the entered note.

POINTS

- When creating a note on the ACPU and writing it in another format, that note is not written to the GPPA.
- After editing a note, always perform a conversion operation.
  The data created will not remain if you do not make conversion.

3.7 Setting the Block Information

A	Q/QnA	FX
○	○	×

[Setting purpose]

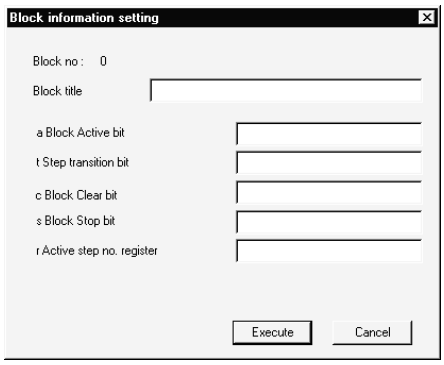
This operation is performed to set the block information of the corresponding block at the time of a conversion operation after creation of an SFC diagram.

[Operation procedure]

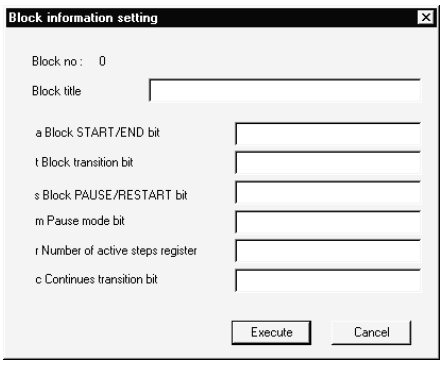
- SFC diagram creation → (F4)
- [Edit] → [Block information] or

[Setting screen]

For ACPU



For QnACPU



Enter a device into each item.
No device may be entered into an unnecessary item.

POINTS

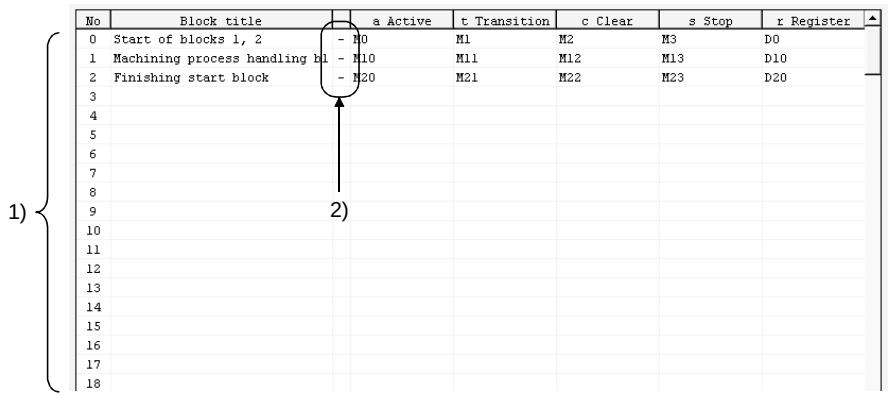
- For the function and operation of each item, refer to the "MELSAP II (SFC) Programming Manual" for the ACPU or to the "QCPU(Qmode)/QnACPU Programming Manual (SFC)" for the Q/QnACPU.
- A block equipment name can be created by entering a device name "BLm" during device comment editing.
  Also, a block title can be created/changed by the same operation as a device comment of BLm.

3.8 Displaying the Block List

A	Q/QnA	FX
○	○	×

Show the currently edited SFC program in a list form to monitor it or to perform block-by-block editing, e.g. cut and paste.

[Operation procedure]
[View] → [Display block list]
[Block list screen]



1) One screen displays 32 blocks.
Using the scroll bar, Page Up / Page Down or ↑ / ↓ key, you can change the displayed blocks.
2) Indicates whether the corresponding blocks have been converted or not.
－: Already converted
＊: Not yet converted

POINTS

In the SFC block list, you can perform the following.
1) Block information setting/correction
2) Batch copy between blocks
3) Jump to SFC diagram display in the specified block
4) SFC monitoring in the block list
5) (Batch) Conversion of unconverted blocks

3.9 SFC-Related Parameter Settings

Among the parameter settings made for operating the Q/QnACPU, this section explains the setting of parameters related to SFC programs.

3.9.1 SFC Setting in PLC Parameters

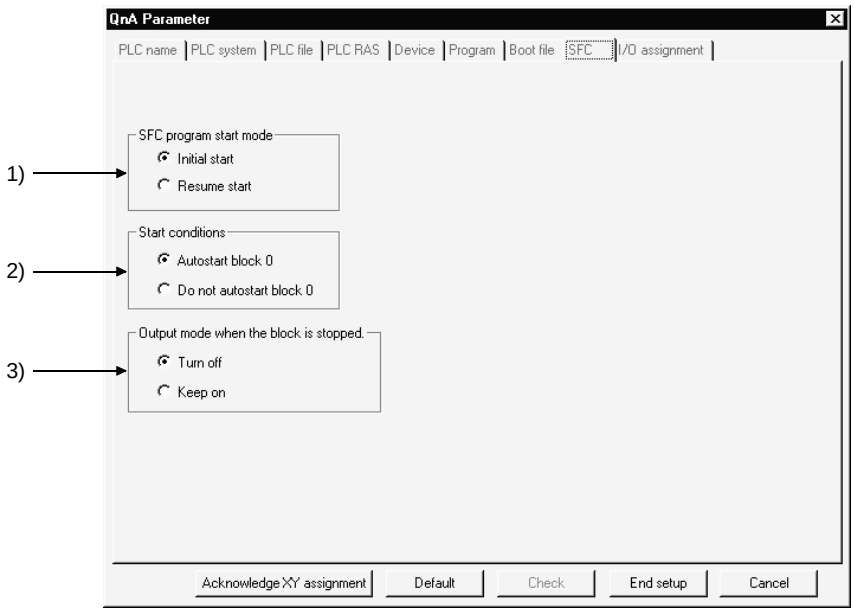
A	Q/QnA	FX
×	○	×

This section gives the operation performed to set the SFC-related parameters using the PLC parameters.

[Operation procedure]

PLC parameters in project data list → SFC setting of QnA parameter settings

[Setting screen]



[Item explanation]

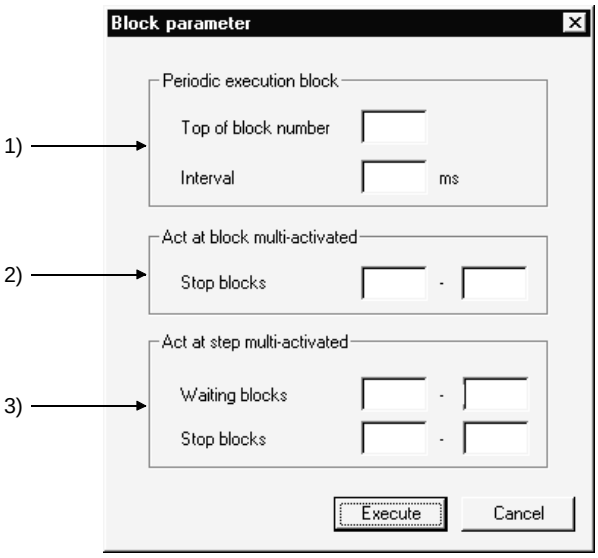
1) SFC program start mode
   Set an initial start or resume start to start the SFC program.
2) Start conditions
   Set autostart block 0/do not autostart block 0 at the initial start of the SFC program.
3) Output mode when the block is stopped
   Set whether a stop is made by turning off the coil outputs which were turned on by the OUT instruction or by keeping them on (latched) when a stop request is sent to any block.

3.9.2 Setting the Block Parameters

A	Q/QnA	FX
×	○	×

This section provides how to set the block parameters.

[Operation procedure]
[Tools] → [Set SFC information] → [Block parameter]
[Setting screen]



[Item explanation]

1) Periodic execution block
   All blocks from the set block number onward are periodic execution blocks.
   To process all blocks every scan, leave the input area blank.
   Enter the execution interval within the range 1 to 65535 (ms) in 1ms increments.
2) Act at block multi-activated
   If a start request is made from another block while a block in the designated range is active, an error occurs and CPU operation stops.
   The operation mode in the event of a double start for blocks outside the designated range is "Wait".
   To set "Wait" for all blocks, leave the first and last input areas blank.
3) Act at step multi-activated
   If a double start occurs with respect to any step in the range for which "Waiting blocks" is designated, operation is suspended until the corresponding step becomes inactive.
   If a double start occurs with respect to any step in the range for which "Stop blocks" is designated, an error occurs and CPU operation stops.
   If a double start occurs with respect to a step outside the specified range, a forced transition is executed.

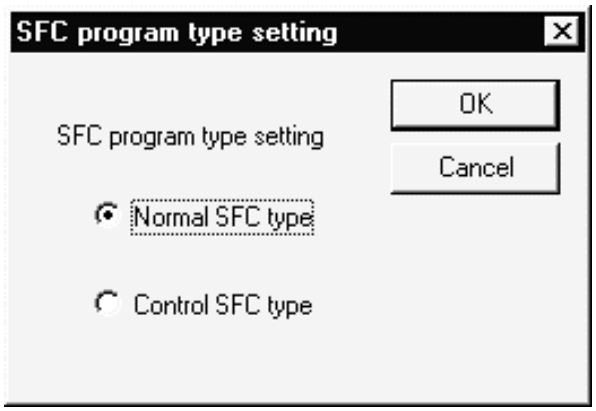
POINT
The block parameter settings are common to all blocks. They cannot be set for individual blocks.

3.9.3 SFC Program Setting

A	Q/QnA	FX
×	○	×

Set whether the SFC program file being edited is to be a "Normal SFC Program" or a "Control SFC program".

[Operation procedure]
[Tools] → [Set SFC information] → [SFC type]
[Setting screen]



[Item explanation]
When Control SFC program is selected, an SFC program can be created for block 0 only.
Note that if a block start step (,) is designated in block 0, an error occurs when the program is executed and CPU operation stops.

3.10 Conversion Operation

A	Q/QnA	FX
○	○	×

The following types of conversions are available according to SFC diagram editing and operation output/transition condition editing.

Item	SFC Diagram Editing	Operation Output/Transition Condition Editing	Conversion Definition
Conversion (F4)	———	○	• Only one operation output/transition condition being edited is converted.
Conversion (All programs being edited)	○	○	• All programs being edited are batch-converted.
Conversion writing during RUN	———	○	• The operation output/transition condition being edited is written during RUN.
Block conversion (F4)	○	———	• Only one SFC diagram block being edited is converted.
Block conversion (F4)	○	———	• All SFC diagram blocks being edited are batch-converted.
Block conversion error	○	○	• The block No.'s in SFC diagram conversion error and the number of errors are displayed. • A detailed error is displayed per block specified.

POINT

For the ACPU, make an "SFC program capacity check" after conversion operation to make sure that the existing SFC program is within the microcomputer capacity. For full information, refer to Section 2.1.

3.11 Instructions for Online SFC Program Writing

A	Q/QnA	FX
○	○	×

This section provides instructions for writing the operation outputs/transition conditions of an SFC program to the CPU during RUN.

(1) Two or more operation outputs/transition conditions cannot be written during RUN at the same time.
Perform an online writing operation every time a correction has been made.

(2) An SFC diagram cannot be written during RUN.
After creating or modifying an SFC diagram, STOP the CPU and write the diagram using "Write" in the online menu.

POINT

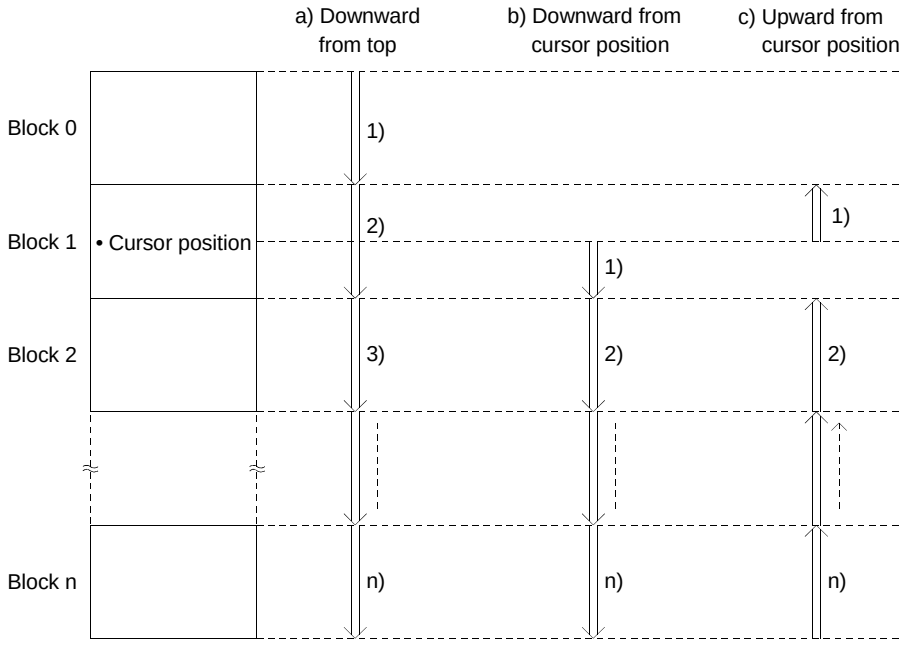
The way to perform operation to write an operation output/transition condition during RUN is the same as in the online ladder writing operation.
For more information on the operation, refer to the SW4D5C-GPPW-E(V) Operating Manual.

3.12 Making Searches/Replacements

A	Q/QnA	FX
○	○	×

POINT

For a search/replacement made in an SFC program, the object area changes with the "searching direction" specified.



* When a search/replacement is to be performed in an SFC program after a search has been made in another program, all blocks will be searched.
When making searches/replacements in an SFC program within the "specified range (step range)", specify the step numbers (e.g. □ ⊟) of the SFC diagram.

3.12.1 Searching for a Device

A	Q/QnA	FX
○	○	×

This operation searches for the specified device to find the operation output/transition condition of the corresponding block it is used.
The cursor moves to the step or transition in the SFC diagram being used, and at the same time, the operation output/transition condition sequence program appears.
The operation method is the same as in the ladder mode.
For details of the operation method, refer to the SW4D5C-GPPW-E(V) Operating Manual.

3.12.2 Searching for an Instruction

A	Q/QnA	FX
○	○	×

This operation searches for the specified instruction to find the operation output/transition condition of the corresponding block it is used.
The cursor moves to the step or transition in the SFC diagram being used, and at the same time, the operation output/transition condition sequence program appears.
The operation method is the same as in the ladder mode.
For details of the operation method, refer to the SW4D5C-GPPW-E(V) Operating Manual.

3.12.3 Searching for a Character String

A	Q/QnA	FX
○	○	×

This operation searches for the specified character string to find it is used as an SFC comment or an operation output note. (A device comment will not be searched for.)
The cursor moves to the step or transition in the SFC diagram being used, and at the same time, the operation output/transition condition sequence program appears.
The operation method is the same as in the ladder mode.
For details of the operation method, refer to the SW4D5C-GPPW-E(V) Operating Manual.

3.12.4 (1) Searching for the Step No./Block No. (SFC Diagram)

A	Q/QnA	FX
○	○	×

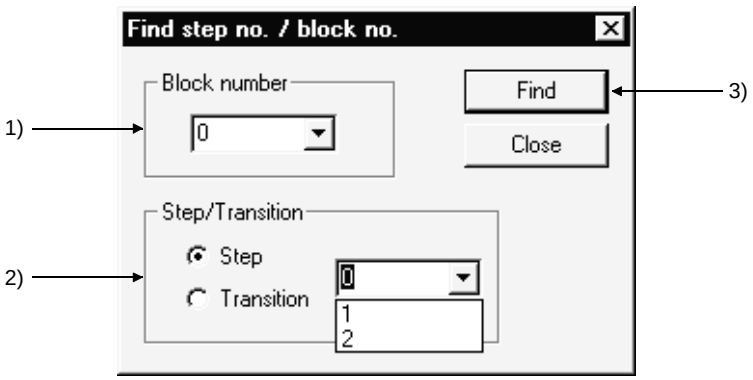
[Setting purpose]

This operation is performed to show the specified block on the screen by specifying the block No. and step No./transition No. when the cursor is in the SFC diagram.

[Operation procedure]

[Find/Replace] → [Find step no./block no.]

[Setting screen]



[Item explanation]

1) Block number

Enter the block No. to be searched for.

2) Step/Transition

Specify the cursor position after a search is over.

3) Find button

Click this button to show the SFC diagram in the specified block.

POINTS

- This operation is valid only when the cursor is on the SFC diagram side.
- When the cursor is in the SFC diagram, pressing any "number" key shows the following window.

Clicking the OK button or pressing the Enter key allows the cursor to move to the specified step in the SFC diagram currently displayed.
Also, turning on the block no. radio button enables a block search.

3.12.4 (2) Searching for the Step No./Block No. (Zoom)

A	Q/QnA	FX
○	○	×

[Setting purpose]

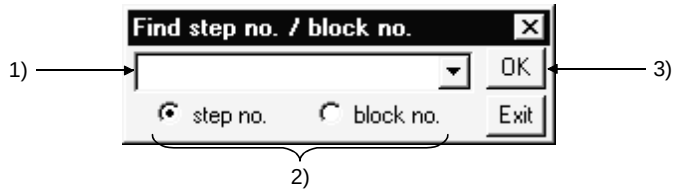
This operation is performed to search for the step No. in the operation output/transition condition sequence program being displayed when the cursor is on the Zoom side.

Alternatively, the specified block

[Operation procedure]

[Find/Replace] → [Find step no./block no.]

[Setting screen]



[Item explanation]

1) Step No./block No. input box

Enter the step No. or block No. to be searched for.

2) Search destination

Select the displayed operation output/transition condition or block as a search destination.

3) OK button

Click this button to show the ladder of the specified sequence program step No. when the step No. is specified.

When the block is specified, the SFC diagram in the specified block appears.

3.12.5 Replacing the Devices

A	Q/QnA	FX
○	○	×

This operation replaces the devices and character string constants used in the operation outputs/transition conditions.
Note that when you specified "Include SFC block information find targets", the devices used in the block information of the corresponding block are also replaced.
The operation method is the same as in the ladder mode.
For details of the operation method, refer to the SW4D5C-GPPW-E(V) Operating Manual.

3.12.6 Replacing the Instructions

A	Q/QnA	FX
○	○	×

This operation replaces the instructions used in the operation outputs/transition conditions of the corresponding block.
The operation method is the same as in the ladder mode.
For details of the operation method, refer to the SW4D5C -GPPW-E(V) Operating Manual.

3.12.7 Changing the Open/Close Contacts

A	Q/QnA	FX
○	○	×

This operation replaces the open contacts of the devices used in the operation outputs/transition conditions of the corresponding block with close contacts and the close contacts with open contacts.
The operation method is the same as in the ladder mode.
For details of the operation method, refer to the SW4D5C -GPPW-E(V) Operating Manual.

3.12.8 Replacing the Character String

A	Q/QnA	FX
○	○	×

This operation replaces the character string of an SFC comment or a note created for operation output.
The operation method is the same as in the ladder mode.
For details of the operation method, refer to the SW4D5C -GPPW-E(V) Operating Manual.

3.12.9 Replacing the Step No.

A	Q/QnA	FX
○	○	×

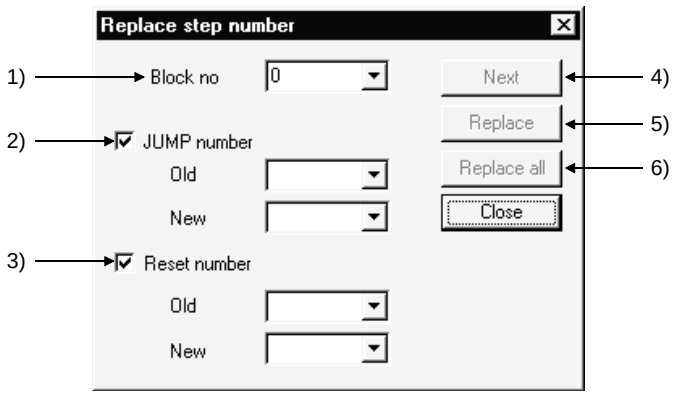
[Setting purpose]

This operation is performed to replace the jump designation step number in the corresponding block or the step number at the hold step reset destination.

[Operation procedure]

[Find/Replace] → [Replace step no.]

[Setting screen]



[Item explanation]

1) Block no.

Enter the first block No. to be replaced.

2) JUMP number

Specify whether the jump destination number is to be replaced or not, and if it is to be replaced, enter the old and new step numbers.

3) Reset number (Only for Q/QnACPU)

Specify whether the step number at the hold step reset destination is to be replaced or not, and if it is to be replaced, enter the old and new step numbers.

4) [Next] button

Searches for the next target instruction without replacing the step on the cursor.

5) [Replace] button

Replaces the step on the cursor and searches for the next target instruction.

6) [Replace all] button

Replaces all target steps in the search range.

POINT
After replacement, always perform a conversion operation because the step number is in an unconverted status. An error check is also made at the time of conversion.

3.12.10 Changing the Note Type

A	Q/QnA	FX
○	○	×

This operation replaces the type of the note created for the operation output with "Embeddec" or "Separate".
For the ACPU, you cannot change the note type since it is fixed to "Peripheral".
The operation method is the same as in the ladder mode.
For details of the operation method, refer to the SW4D5C-GPPW-E(V) Operating Manual.

3.12.11 Searching for Contacts/Coils

A	Q/QnA	FX
○	○	×

This operation lists where the specified devices are used in the operation outputs/transition conditions and block information.
The symbols displayed represent the following.

◎ Step field
- S : Step
- TR : Transition

◎ Sequence step field
- a : Block Active bit (for ACPU)
  Block START/END bit (for QnACPU)
- t : Step transition bit
- c : Block clear bit (for ACPU)
  Continues transition bit (for QnACPU)
- s : Block stop bit (for ACPU)
  Block PAUSE/RSTARA bit (for QnACPU)
- m : PAUSE mode bit (for QnACPU)
- r : Active step number register (for ACPU)
  Number of active steps register (for QnACPU)

The operation method is the same as in the ladder mode.
For details of the operation method, refer to the SW4D5C-GPPW-E(V) Operating Manual.

3.12.12 Searching for the Device Use Status

A	Q/QnA	FX
○	○	×

This operation lists how the devices are used device-by-device (e.g. X, Y, M, D).
A device search also covers devices used in the block information, and if they are used in the block information alone, they are shown as being used as contacts.
The operation method is the same as in the ladder mode.
For details of the operation method, refer to the SW4D5C-GPPW-E(V) Operating Manual.

3.12.13 Changing the T/C Set Values

A	Q/QnA	FX
○	○	×

This operation changes the set values of the timers/counters used in the operation outputs inside the block being displayed. (The T/C set values in different blocks cannot be changed at the same time.)
The operation method is the same as in the ladder mode.
For details of the operation method, refer to the SW4D5C-GPPW-E(V) Operating Manual.

3.13 Providing Displays

3.13.1 Displaying the Step/Transition Comments

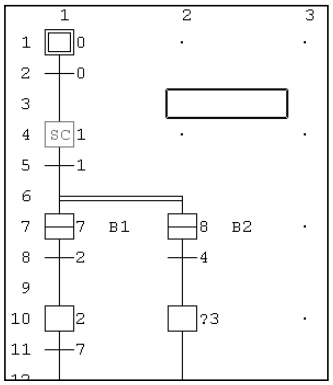
A	Q/QnA	FX
○	○	×

[Setting purpose]

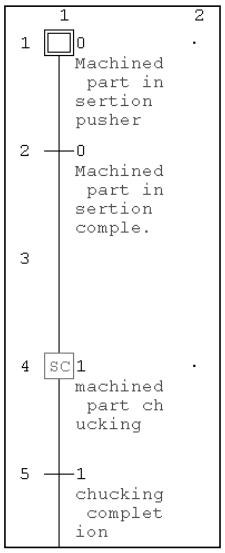
This operation is performed to show the created SFC diagram with SFC comments.

[Operation procedure]

1. Choose [View] → [Display comment of step and TR] (Ctrl + F5).



2. The SFC comments appear on the screen.



3. When the SFC comments are being shown, choosing [View] → [Display comment of step and TR] (Ctrl + F5) hides the SFC comments.

POINT
This operation is valid only when the cursor is on the SFC diagram side.

3.13.2 Displaying the Label in the SFC Diagram

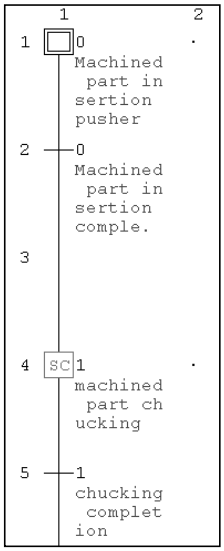
A	Q/QnA	FX
○	○	×

[Setting purpose]

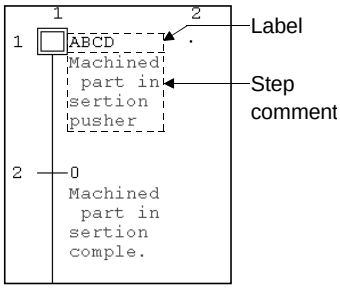
This operation is performed to show the created label on the SFC diagram creation screen.

[Operation procedure]

1. Choose [View] → [Display label of step and TR] (Alt + Ctrl + F6).



2. The Label in the SFC diagram appear on the screen.



3. When the label are being shown, choosing [View] → [Display label of step and TR] (Alt + Ctrl + F6) hides the label.

POINTS

- Create label on the device comment-editing screen.
  Labels are not written if they are created on the ACPU and written to a GPPA format file.
- This operation is valid only when the cursor is on the SFC diagram side.

3.13.3 Displaying the Device Comments

A	Q/QnA	FX
○	○	×

This operation shows the operation output/transition condition sequence program with device comments.
This operation is valid only when the cursor is on the Zoom side (operation output/transition condition side).
The operation method is the same as in the ladder mode.
For details of the operation method, refer to the SW4D5C-GPPW-E(V) Operating Manual.

3.13.4 Displaying Notes

A	Q/QnA	FX
○	○	×

This operation shows the operation output/transition condition sequence program with notes.
The operation method is the same as in the ladder mode.
This operation is valid only when the cursor is on the Zoom side (operation output/transition condition side).
For details of the operation method, refer to the SW4D5C-GPPW-E(V) Operating Manual.

3.13.5 Displaying the Label for Devices

A	Q/QnA	FX
○	○	×

This operation changes the devices in the operation output/transition condition sequence program to labels.
This operation is valid only when the cursor is on the Zoom side (operation output/transition condition side).
The operation method is the same as in the ladder mode.
For details of the operation method, refer to the SW4D5C-GPPW-E(V) Operating Manual.

3.13.6 Changing the Operation Outputs/Transition Conditions to the Ladder Mode/List Mode

A	Q/QnA	FX
○	○	×

This operation changes the edit mode of the operation output/transition condition sequence program.
This operation is valid only when the cursor is on the Zoom side (operation output/transition condition side).
The operation method is the same as in the ladder mode.
For details of the operation method, refer to the SW4D5C-GPPW-E(V) Operating Manual.

3.13.7 Opening multiple Windows

A	Q/QnA	FX
○	○	×

[Setting purpose]

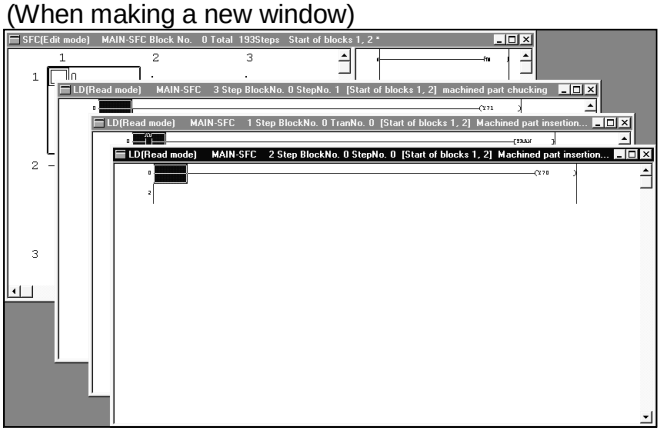
This operation is performed to tile two or more different operation outputs/transition conditions to check or monitor the program.

[Operation procedure]

Hold down Ctrl and double-click the step or transition of the SFC diagram whose window will be opened.

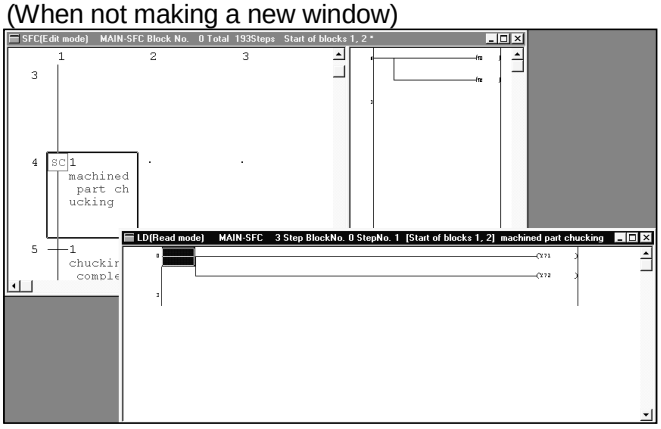
[Screen]

(When making a new window)



A new window appears every time operation is performed.

(When not making a new window)



The display is changed within a single window.

POINT
Set whether a new window is made or not in the "Reference window" of [Tools] → [Set SFC information] → [Option].

3.14 Setting the SFC Diagram Display

3.14.1 Setting the SFC Diagram Display

A	Q/QnA	FX
○	○	×

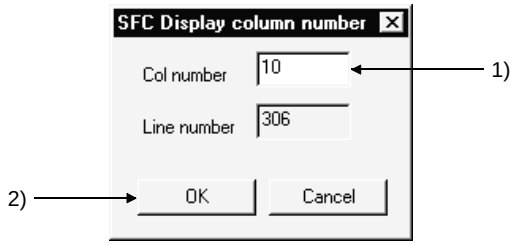
[Setting purpose]

This operation is performed to set the number of branches that can be edited/displayed when the SFC diagram is edited/read.

[Operation procedure]

[View] → [Raw of SFC]

[Setting screen]



[Item explanation]

1) Col number

Enter the number of columns (number of branches).

The number that may be input is any of 1 to 22 for the ACPU or any of 1 to 32 for the QnACPU.

Entering the number of columns automatically shows the number of rows that may be entered.

2) OK button

Click this button when the setting is complete.

POINT
This operation is valid only when the cursor is in the SFC diagram.

3.14.2 Setting the Zoom Partition

A	Q/QnA	FX
○	○	×

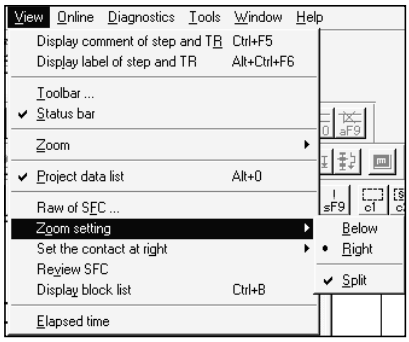
[Setting purpose]

This operation is performed to set how to split the operation output/transition condition ladder displayed.

[Operation procedure]

[View] → [Zoom setting]

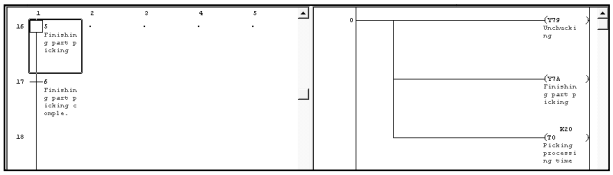
[Setting screen]



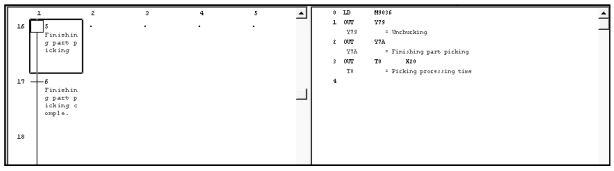
Choosing vertical partition or horizontal partition provides the corresponding one of the following displays.

Note that when operation outputs/transition conditions are being displayed, clicking the partition display shows only the SFC diagram.

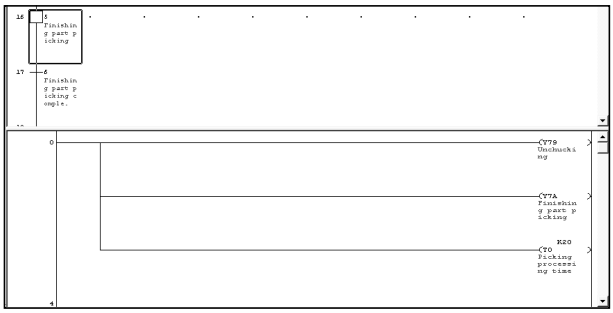
• Horizontal partition (ladder)



• Horizontal partition (list)



• Vertical partition (ladder)



• Vertical partition (list)

3.14.3 Setting the Number of Contacts for Horizontal Partition

A	Q/QnA	FX
○	○	×

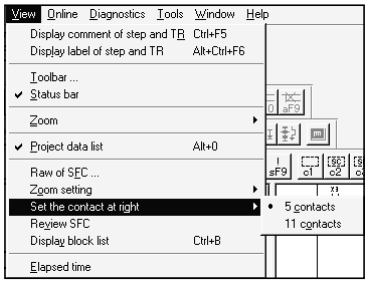
[Setting purpose]

This operation is performed to set the number of contacts displayed in the operation output/transition condition ladder which has appeared on the right of the SFC diagram.

[Operation procedure]

[View] → [Set the contact at right]

[Setting screen]



POINTS

- This operation is valid only when "Right" is specified for Zoom partition setting.
- When "Below" is specified for Zoom partition, the number of contacts displayed is fixed to "11 contacts".

3.14.4 Setting the SFC Setting Options

A	Q/QnA	FX
○	○	×

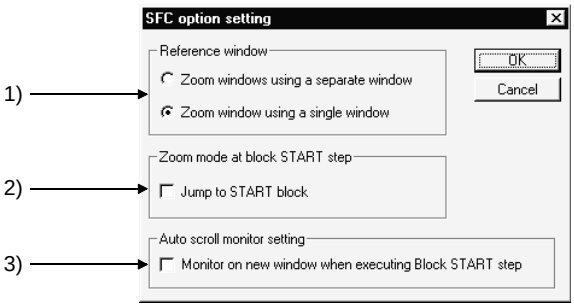
[Setting purpose]

This operation is performed to set how to open windows during SFC program editing or for monitoring.

[Operation procedure]

[Tools] → [Set SFC information] → [Option]

[Setting screen]



[Item explanation]

1) Reference window

Set whether or not the operation output/transition condition sequence program windows will be tiled.

2) Zoom mode at block START step

Set whether or not a jump will be made to the start destination block when the cursor moves to the block start step.

3) Auto scroll monitor setting

Set whether or not the window of the start destination block will be opened for monitoring when the active step transits to the block start step during SFC diagram monitoring.

4. MONITORING

4.1 SFC Diagram Monitor

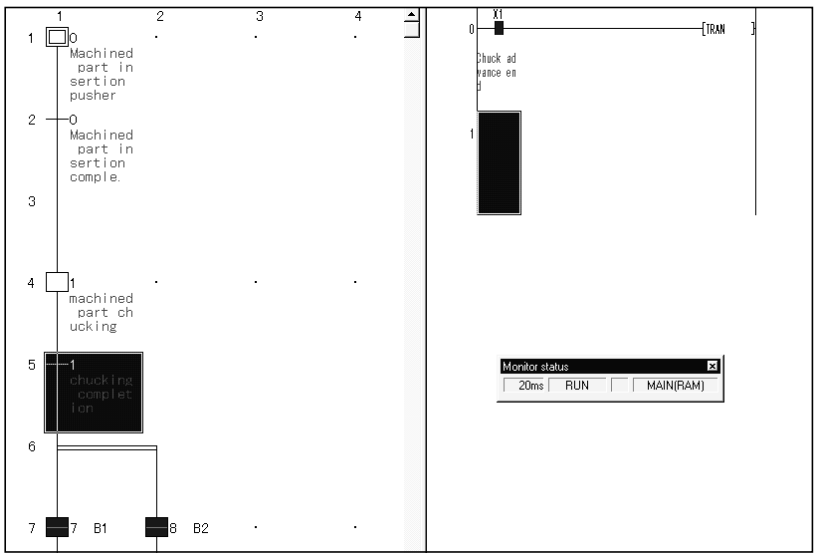
A	Q/QnA	FX
○	○	×

This operation is used to monitor the operation and control status of the PLC CPU with SFC diagrams and to conduct test operations.

[Operation procedure]

- When monitoring
  [Online] → [Monitor] → [Monitor mode] or (F3)
- When stopping monitoring
  [Online] → [Monitor] → [Stop monitor] or (Alt + F3)
- When resuming monitoring
  [Online] → [Monitor] → [Start monitor] or (F3)

[Screen]



1) During SFC diagram monitoring, steps are shown as follows.
   (blue) : Active step
   SC (yellow) : Step specified as a hold step and being in a hold status
   (For the Q/QnACPU only. Shown as an inactive step for the ACPU.)
   : Inactive step
2) Shown on the Zoom side is the operation output/transition condition ladder of the step or transition at the cursor position on the SFC diagram side.

3) When there is a block start step, the monitor destination block can be changed by moving the cursor to the block start step and pressing the space key.
To monitor a block which has no block start step, show the block list and double-click the monitor destination block No. field.
Alternatively, type the monitor destination block No., show the "Find step no. / block no." window, and make a block search.

POINTS

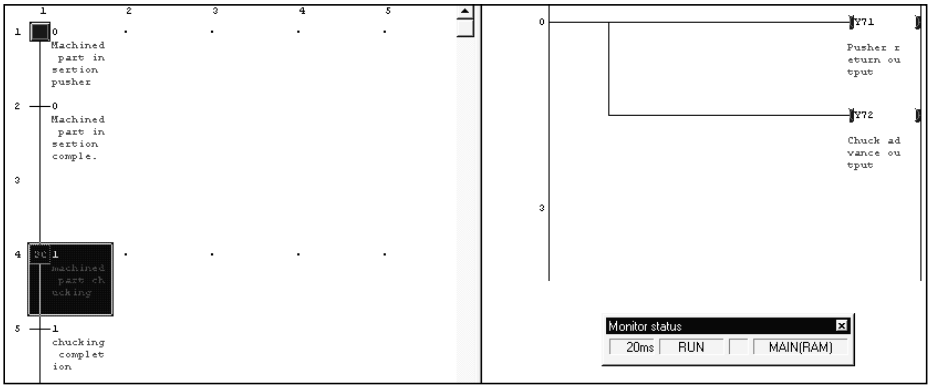
- Automatic scroll monitoring
  When the active step has gone off the screen, redisplay it on the screen by automatic scrolling.
  To perform automatic scrolling, click  or choose [Online] → [Monitor] → [Auto scroll monitor].
- Automatic scroll monitoring of multiple steps active in series due to operation hold steps, for example, shows the active step closest to the initial step.
- During monitoring, you cannot edit SFC diagrams.
- During editing, you cannot monitor SFC diagrams.
- If you open the write or monitoring write screen during automatic scrolling, automatic scroll monitoring stops. When you resume monitoring, automatic scroll monitoring also resumes.

4.2 Transition Condition and Operation Output Ladder Monitor

A	Q/QnA	FX
○	○	×

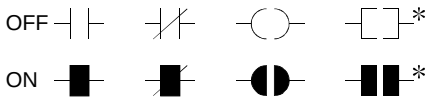
This operation is used to monitor a ladder for the step or transition condition at the cursor position in an SFC diagram.

[Screen]



1) Ladder monitor

During monitoring, ON/OFF of a contact or coil or the present value of a device is shown and it changes with the PLC operating status.
The ON and OFF states of a ladder are as shown below.



*: Only the contact-equivalent compare instructions and coil-equivalent SET, RST, PLS, PLF, SFT, SFTP, MC, FF, DELTA and DELTAP are supported. (FF, DELTA and DELTAP are the instructions of the QnA series.)

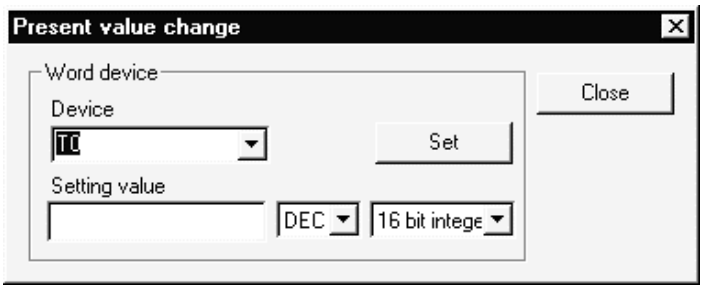
Note that the display is held at a stop of monitoring and is updated on resumption of monitoring.

2) Present value

The present value of a word device appears.
The present value can be changed between decimal and hexadecimal.
This change can be made by performing [Online] → [Monitor] → [Change current value monitor] operation.
If a double word monitored is 10 or more characters, it is shown in a smaller character size.
The present value can be displayed as a double word or real number according to the data type used in the instruction.

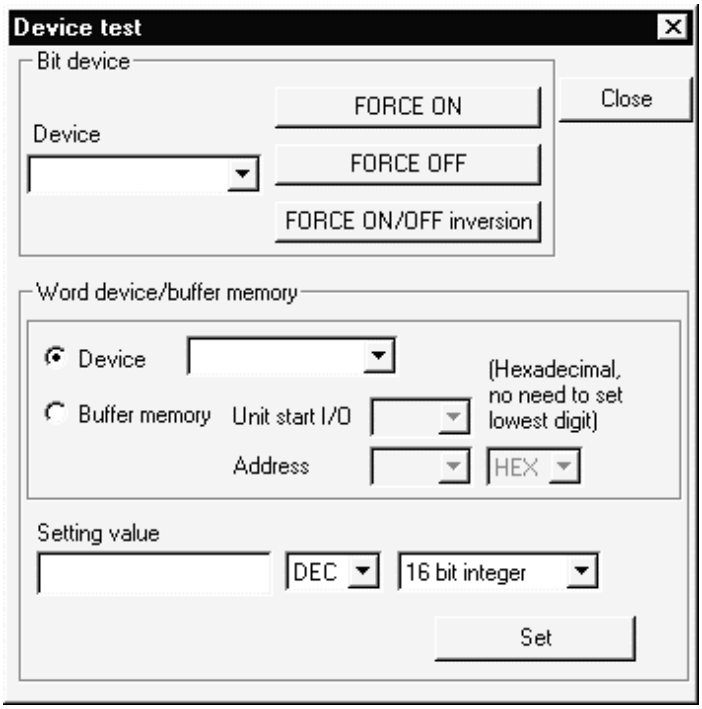
3) Device test

- Holding down Shift and double clicking (Enter) a contact on the ladder monitor screen forces ON/OFF to change to the opposite status.
- olding down Shift and double-clicking (Enter) a word device being monitored shows the following Present value change dialog box.



After entering a new value, click the Set button.

- The present value of the double word instruction (e.g. DMOV, DFRO) is displayed as a double word.
  Confirm the value of a double word by device batch monitor or device registration monitor.
- When the cursor is on the Zoom side, right-clicking the mouse shows the device test or device registration monitor menu.
  Perform a test or registration monitor operation for the device which is not on the window being displayed.

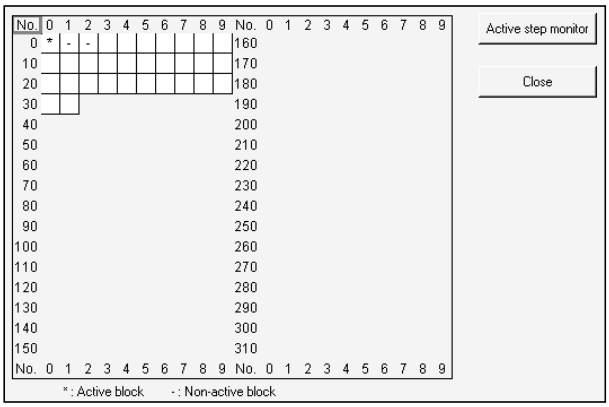


4.3 All Block Batch Monitor and Active Step Monitor

A	Q/QnA	FX
○	○	×

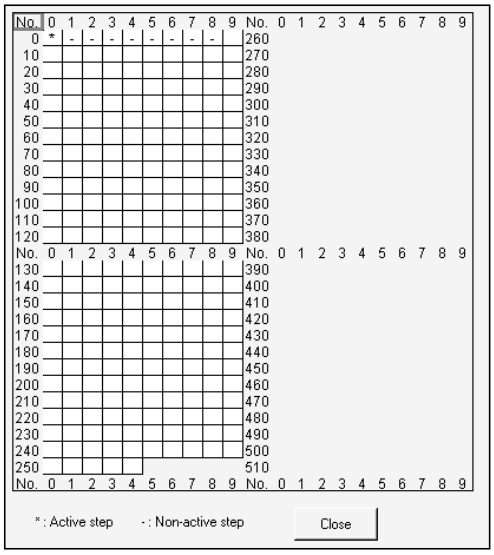
This operation is used to monitor the active/inactive states of all blocks in a list form and to monitor the step active/inactive states of the specified block from the block list in a list form.

[Operation procedure]
[Online] → [Monitor] → [All block batch monitor]
[Screen]



* indication: The corresponding block is active.
－ indication: The corresponding block is inactive.

To monitor the specified block for step active/inactive states, click the field of the block to be monitored, and click the [Active step monitor] button.



* indication: The corresponding step is active.
－ indication: The corresponding step is inactive.

4.4 Block List Monitor

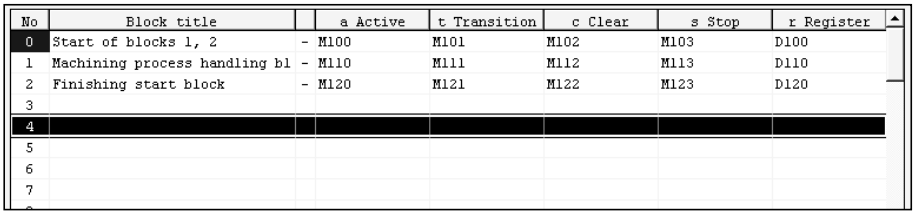
A	Q/QnA	FX
○	○	×

This operation is used to show and monitor a block list.

[Operation procedure]

[View] → [Display block list] → (F3)

[Screen]



No	Block title		a Active	t Transition	c Clear	s Stop	r Register
0	Start of blocks 1, 2	-	M100	M101	M102	M103	D100
1	Machining process handling bl	-	M110	M111	M112	M113	D110
2	Finishing start block	-	M120	M121	M122	M123	D120
3							
4							
5							
6							
7							

- The block No. fields of active blocks are highlighted.
  When block information has been set, the status of the corresponding block can be confirmed in the block information.
- To switch the specified block to SFC diagram monitor during monitoring, double-clicking in the field of the corresponding block switches to the SFC diagram display of the specified block.

POINT
Active registers cannot be monitored.

5. DEBUGGING (STEP RUN)

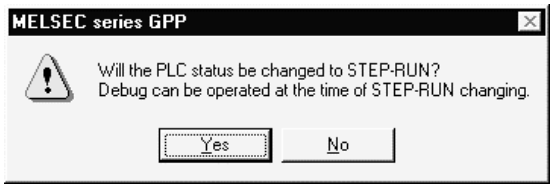
A	Q/QnA	FX
○	○	×

This chapter explains debugging to step-run an SFC program.

[Operation procedure]

[Online] → [Debug] → [Debug] → Change CPU to "STEP-RUN" → [Each item operation]

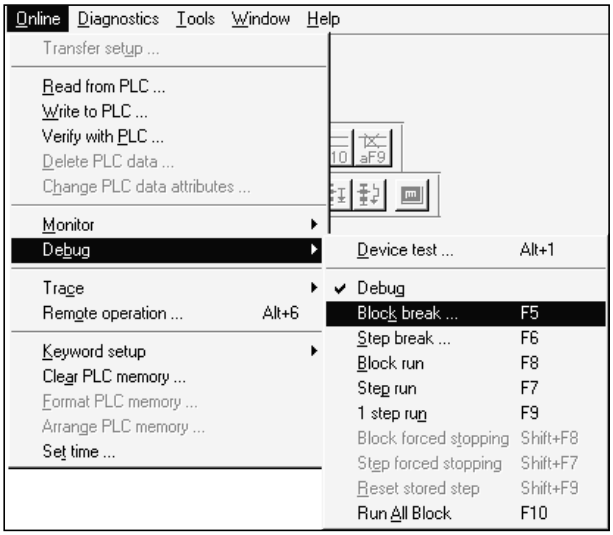
Choosing debug shows the following window.



Choosing Yes places the CPU in the "STEP-RUN" status and you can start any item operation of debugging.

To cancel debugging and return to "RUN", click [Debug] during debugging.

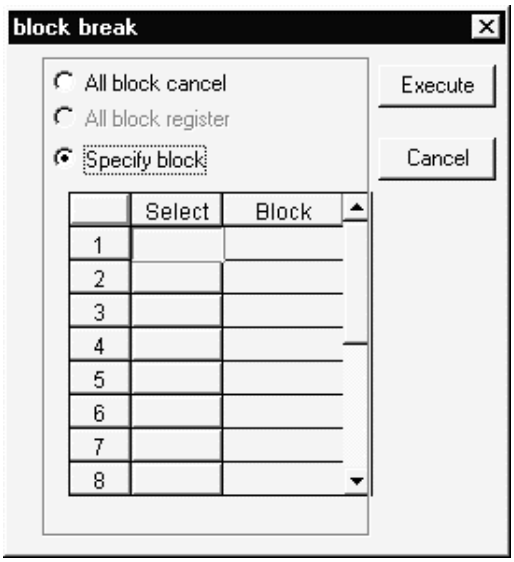
[Screen]



[Item explanation]

● Block break

This operation forces an active block into a break.



- All block cancel
  The specified break points registered to the CPU are canceled.
- All block register (Q/QnACPU only)
  When all blocks have been specified to be registered, all active blocks are batch-placed into a break.
- Specify block
  When blocks are specified, the specified blocks are forced into a break.
  You can specify up to 16 blocks for the ACPU or up to 64 blocks for the QnACPU.
  Click "○" in the select field to change it to "●", and enter the block number.
  If you change "●" to "○" after block number entry, that block will not be the object of break.

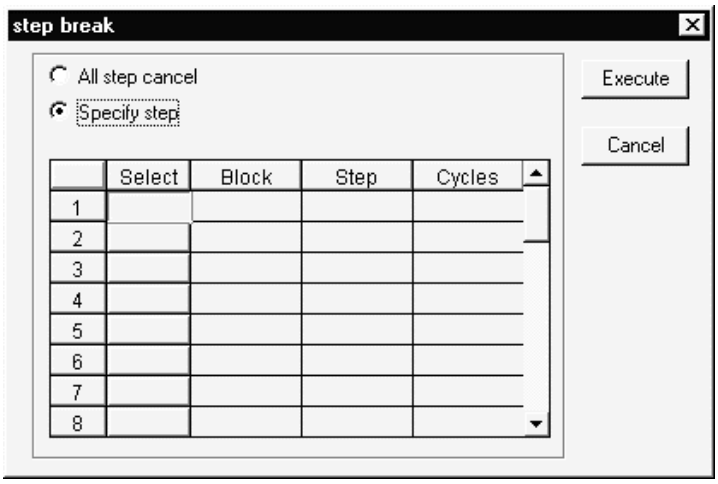
POINTS

- When a break is established for the specified block, the following window appears.

- When break points have been set for the Q/QnACPU, executing the end step automatically places the blocks into a break.
  Note that no message is given to indicate that a break is established.

● Step break

This operation specifies the block number and step number to end a single step run for test (step) operation.



• All step cancel
  The specified break points registered to the CPU are canceled.
• Specify step
  Enter the block number and step number to be set as a break point and the number of cycles (times).
  Set the number of cycles in the range 1 to 255.
  When the preset step of the block is activated the number of times specified as the number of cycles during step run, a single step run ends and the step is put into a break.

POINT

When a break is established for the specified block, the following window appears.

● Block run

• The block currently being displayed is forced to be active.
• When the corresponding block is in a break status, the run resumes from the step in a break status.
• When the corresponding block is inactive, the block is forced to start and the run starts from the initial step.

● Step run
- Moving the cursor to the step to be started and choosing "step run" forces steps from the specified step on to be active.
- Independently of whether the corresponding block is active or inactive, a forced run starts from the specified step.
- When the specified step is in a break, the break is canceled and the forced run starts.

● 1 step run
- Moving the cursor to the step to be run and choosing "1 step run" tests only the specified step.
- A single cycle ends when the specified step is run, the transition condition holds, and a transition occurs to the next step.

POINTS
- For the Q/QnACPU, any step can be run independently of whether the corresponding block is active or inactive.
- For the ACPU, only the step which was placed in a break status by a step break operation may be run.

● Block forced stopping (Q/QnACPU only)
- This operation forces the currently displayed block to be inactive.

● Step forced stopping (Q/QnACPU only)
- Moving the cursor to the step to be forced to an end and choosing "Step forced stopping" forces the specified step to end (be inactive).
- If there is no active step in the corresponding block at the forced end of the specified step, that block is ended.

● Reset stored step (Q/QnACPU only)
- In this operation, the step within the currently displayed block which has been set to coil hold, operation hold (without transition check) or operation hold (with transition check) and is in a hold status is forced to be reset and inactive.
- When the specified step is not in a hold status or is not a hold step, the operation is ignored and a forced reset is not executed.

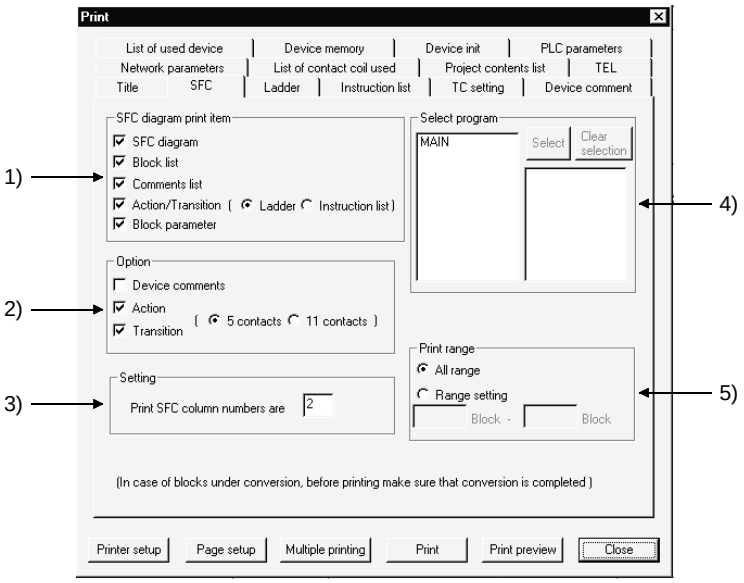
● Run all block (ACPU only)
- All blocks put in a break by a block break are activated and steps from the one in a break are forced to run.

6. PRINTING THE SFC DIAGRAMS

6.1 SFC Diagram Print Setting

A	Q/QnA	FX
○	○	×

[Operation procedure]
[Project] → [Print] → Choose "SFC"
[Setting screen]



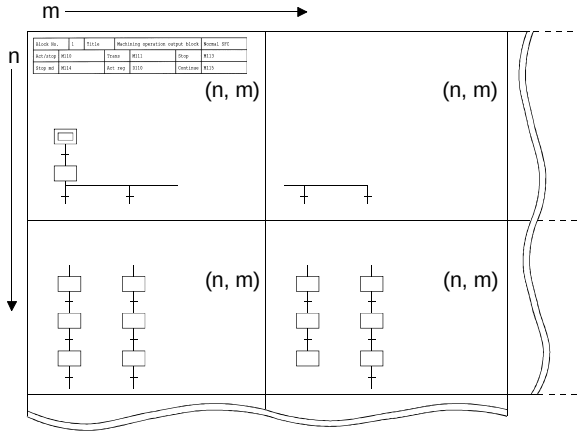
[Item explanation]

1) SFC diagram print item
   The items checked in the corresponding check boxes is printed.
2) Option
   The items checked in the corresponding check boxes is added.
   Some additional information items cannot be selected according to the print items.
3) Setting
   Set the number of print columns on a single page.
   The diagram is printed with automatic magnification/reduction specified according to the set number of columns.
4) Select program
   Choose the program name to be printed.
5) Print range
   Set all area (all blocks) or the specified blocks.

6.2 SFC Diagram Printing Examples

A	Q/QnA	FX
○	○	×

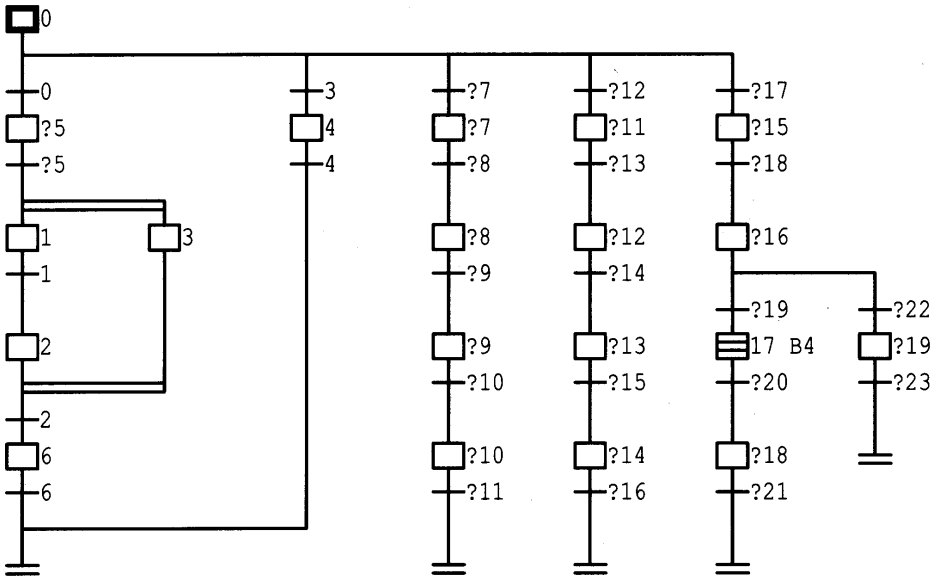
This section shows examples of SFC diagrams printed.
Note that according to the number of branches/couplings and the number of steps, an SFC diagram is printed on two or more pages with a position indicating numeral printed at top right of each page.



(1) SFC diagram printing examples
• Additional information (not selected)

Block No.	1	Title	Machining operation output block		Normal SFC
Act/stop	M110	Trans	M111	Stop	M113
Stop md	M114	Act reg	D110	Continue	M115

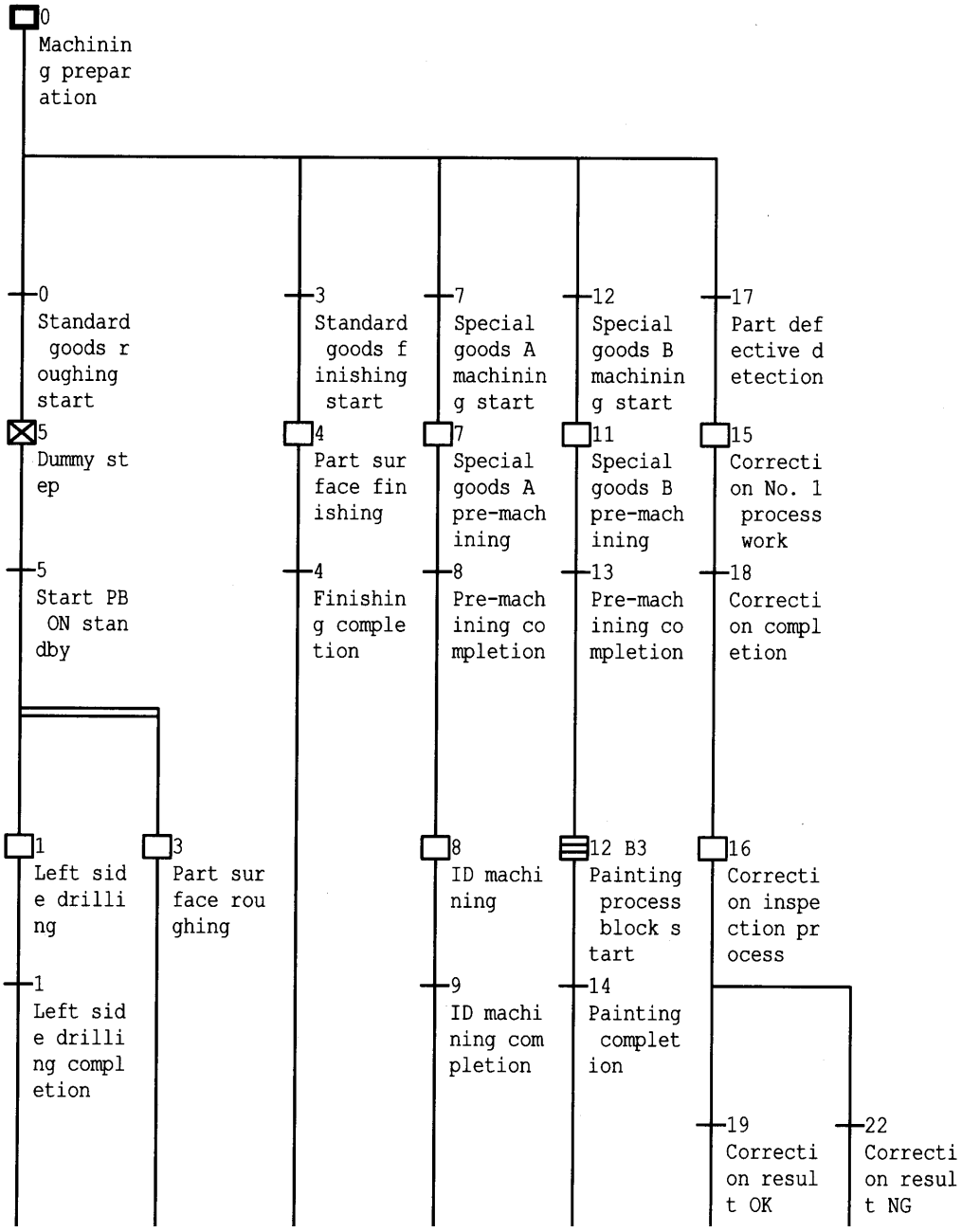
(1, 1)



• Additional information (only device comment selected)

Block No.	1	Title	Machining operation output block		Normal SFC
Start	M110	Trans	M111	Pause	M113
Pause md	M114	Active	D110	Continue	M115

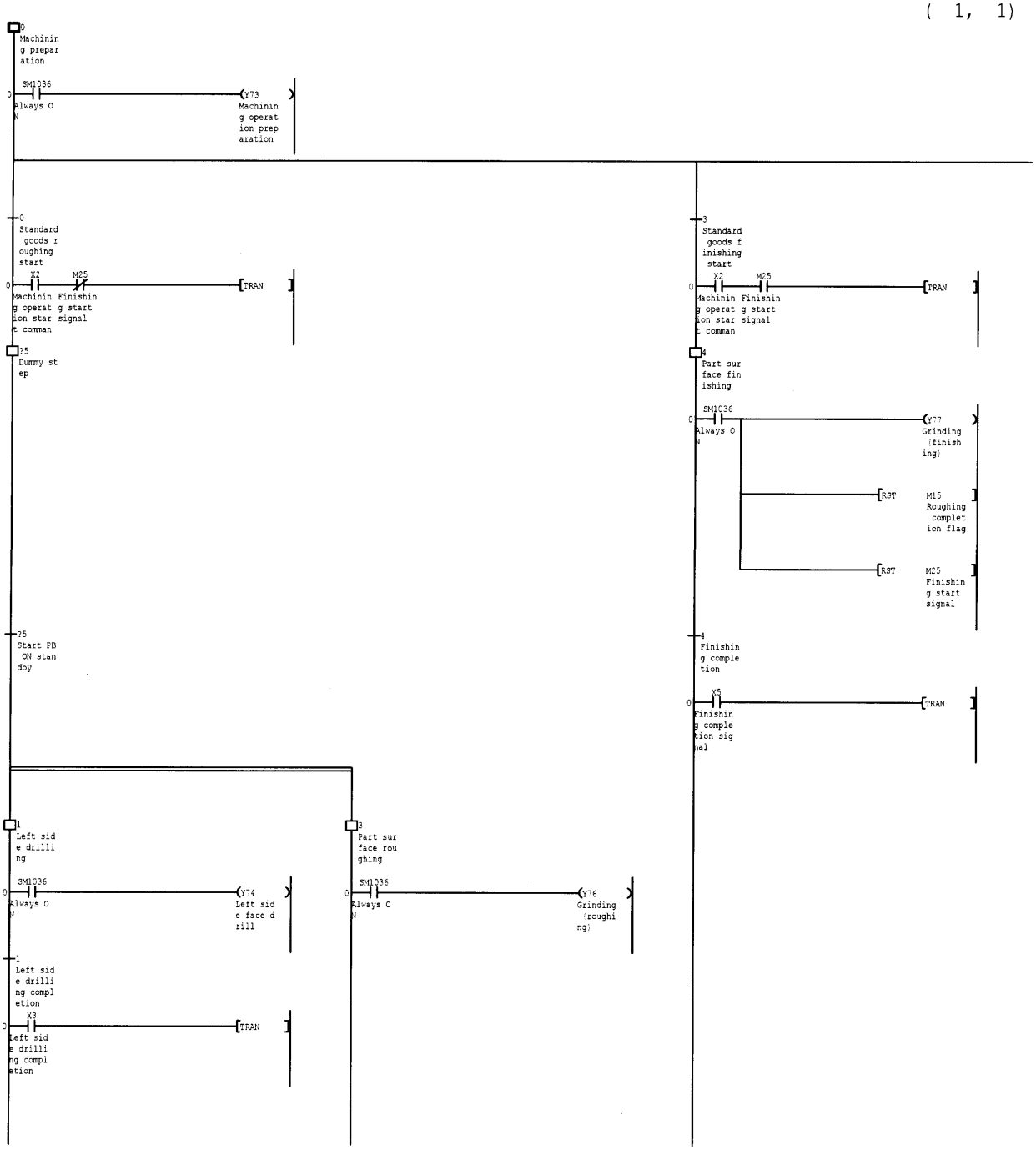
(1, 1)



• Additional information (all selected)

Block No.	1	Title	Machining operation output block		Normal SFC
Act/stop	M110	Trans	M111	Stop	M113
Stop md	M114	Act reg	D110	Continue	M115

(1, 1)



(2) Block list printing example

Block list

No.	Title/Information register				Block activation	
0	Start of blocks 1, 2				BL1	BL2
	Act	: M100	Trans	: M101		
	Clear	: M103	Stop	: M102		
	Reg	: D100				
1	Machining process handling block					
	Act	: M110	Trans	: M111		
	Clear	: M113	Stop	: M112		
	Reg	: D110				
2	Finishing start block				BL1	
	Act	: M120	Trans	: M121		
	Clear	: M123	Stop	: M122		
	Reg	: D120				

(3) Comment list printing example

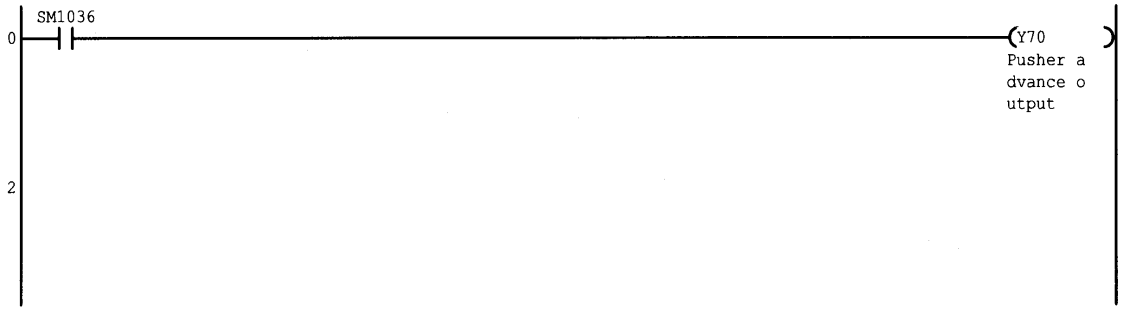
Block No.	0	Title	Start of blocks 1, 2		
Act	M100	Trans	M101	Clear	M103
Stop	M102	Register	D100		

Step	Comment	Dev Lbl
s0	Machined part insertion pusher	
s1	machined part chucking	
s2	Unloading carrier movement	
s3		
s4	Finished part unloading	
s5	Finishing part picking	
s6		
s7		
s8		

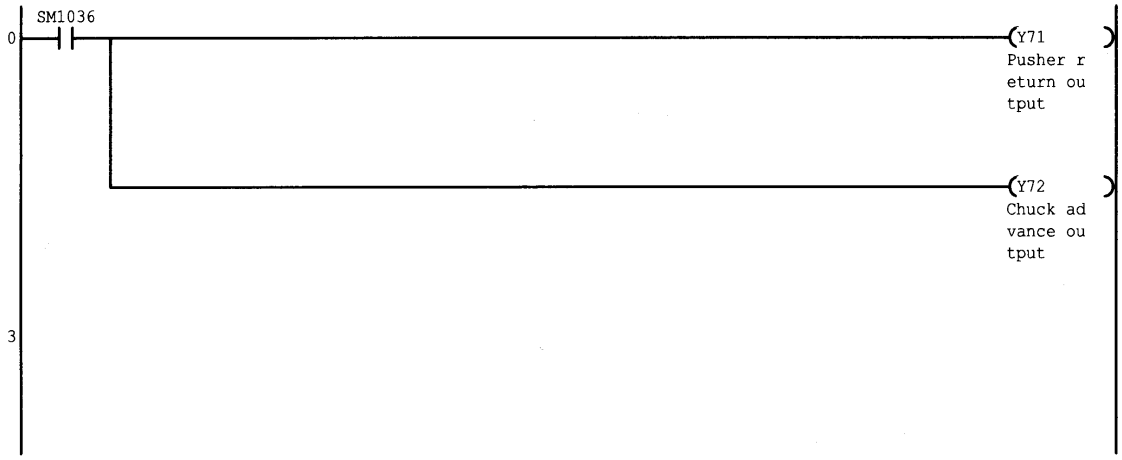
(4) Operation output/transition condition (ladder) printing example

Block No.	0	Title	Start of blocks 1, 2		Normal SFC
Act/stop	M100	Trans	M101	Stop	M103
Stop md		Act reg	D100	Continue	

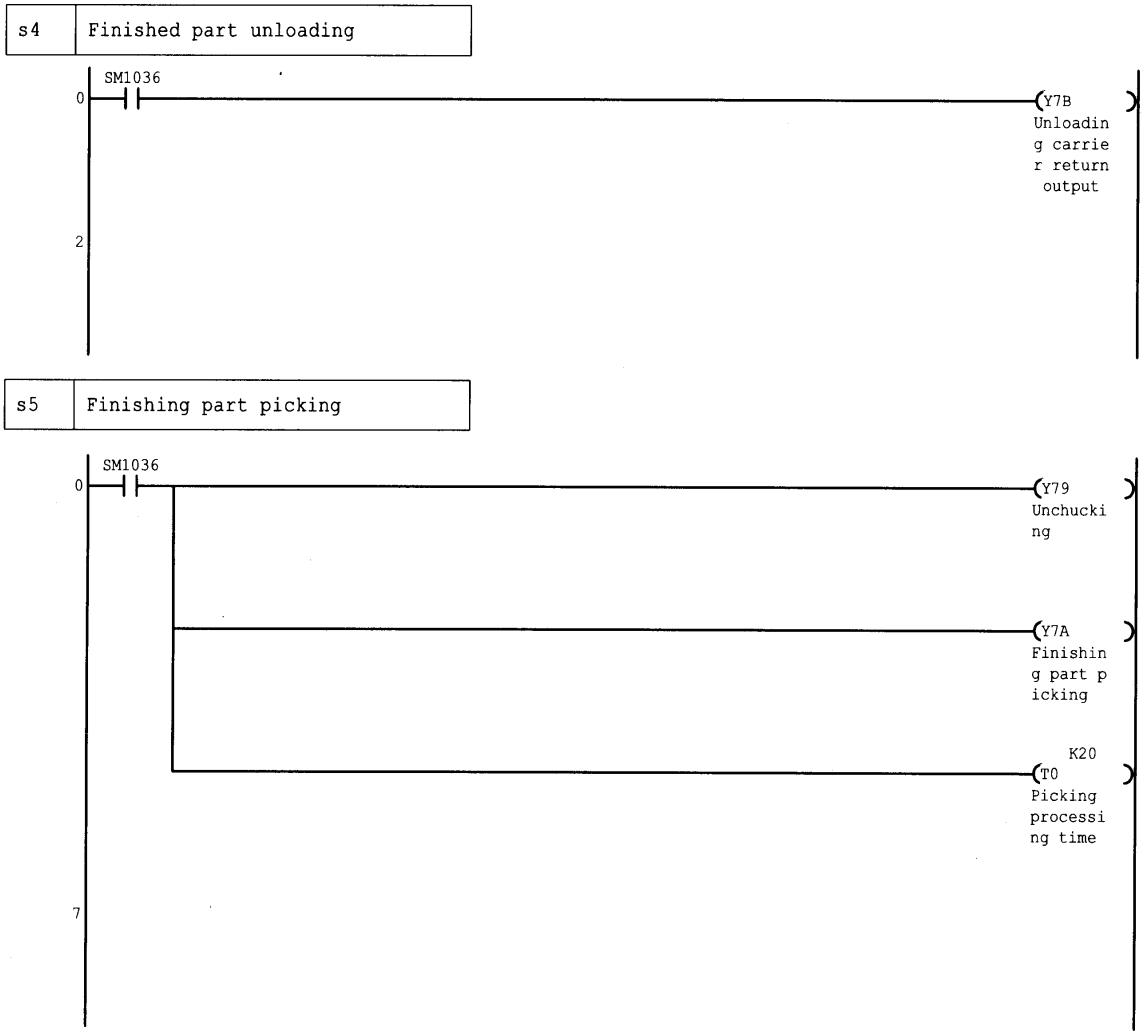
s0	Machined part insertion pusher



s1	machined part chucking



s2	Unloading carrier movement


s4
Finished part unloading
SM1036
0
Y7B
Unloadin
g carrie
r return
output
2
s5
Finishing part picking
SM1036
0
Y79
Unchucki
ng
Y7A
Finishin
g part p
icking
K20
T0
Picking
processi
ng time
7

(5) Operation output/transition condition (list) printing example

Block No.	0	Title	Start of blocks 1, 2		Normal SFC
Act/stop	M100	Trans	M101	Stop	M103
Stop md		Act reg	D100	Continue	

s0	Machined part insertion pusher

Step	Instruction	Device	Device comment
0	LD	SM1036	
1	OUT	Y70	Pusher advance output

s1	machined part chucking

Step	Instruction	Device	Device comment
0	LD	SM1036	
1	OUT	Y71	Pusher return output
2	OUT	Y72	Chuck advance output

s2	Unloading carrier movement

Step	Instruction	Device	Device comment
0	LD	SM1036	
1	OUT	Y78	Unloading carrier advance output

s4	Finished part unloading

Step	Instruction	Device	Device comment
0	LD	SM1036	
1	OUT	Y7B	Unloading carrier return output

s5	Finishing part picking

Step	Instruction	Device	Device comment
0	LD	SM1036	
1	OUT	Y79	Unchucking
2	OUT	Y7A	Finishing part picking
3	OUT	T0	Picking processing time
		K20	

(6) Block parameter printing example

Block parameter [MAIN-SFC]

Periodic exec Blk	After[ ]
Execution interval	[ ]ms
Action at BL multi-act	Stop [ ]-[ ]
Action at step Multi-activated	Waiting [ ]-[ ]
	Stop [ ]-[ ]

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