Changes for the Better

MITSUBISHI ELECTRIC

MITSUBISHI CNC

EZMotion-NC E60/E68 Series

PLC ONBOARD INSTRUCTION MANUAL

IB-1500179(ENG)-A

Precautions for Safety

Always read the specifications issued by the machine maker, this manual, related manuals and enclosed documents before installation, operation, programming, maintenance or inspection to fully understand the conditions described within and to ensure correct use. Understand this numerical controller, safety items and precautions before using the unit. This manual ranks the safety precautions into "Danger", "Warning" and "Caution".

⚠ **DANGER**	When the user may be subject to imminent fatalities or major injuries if handling is mistaken.
⚠ **WARNING**	When the user may be subject to fatalities or major injuries if handling is mistaken.
⚠ **CAUTION**	When the user may be subject to injuries or when physical damage may occur if handling is mistaken.

Note that even items ranked as " ⚠ **CAUTION**", may lead to major results depending on the situation. In any case, important information that must always be observed is described.

⚠ DANGER

There are no "Danger" items in this manual.

⚠ WARNING

There are no "Warning" items in this manual.

⚠ CAUTION

1. Items related to product and manual

- ⚠ The manual issued by the machine maker has a priority over this manual regarding the items described as "restrictions" and "usable state".
- ⚠ Please interpret items not listed in this manual as "not possible".
- ⚠ This manual assumes that all option functions are provided. Confirm the specifications issued by the machine maker before using this unit.
- ⚠ Some screens and functions may differ or may not be usable depending on the NC system version.
- ⚠ Setting incorrect value may cause machine’s illegal operation or driving out of control. Pay enough attention at programming.

⚠ CAUTION

2. Items related to programming

⚠ If) 5 CONVT and INPUT are not pressed after creating, correcting, adding or inserting a ladder circuit, the created ladder circuit will be lost.

⚠ When using this function, the PLC can be put into a STOP status by setting the rotary switch NCSYS on the lower part of the control unit to No. 1 (STOP).

⚠ An emergency stop will result when the user PLC is stopped with this function, in the same manner as the method using the rotary switch NCSYS. First carry out an emergency stop using the dedicated emergency stop button, etc., then put the user PLC in an emergency stop status.

CONTENTS

1. Outline

This manual is created for development of user PLC on the control unit. PLC operation performed on the control unit is called onboard operation. The main functions of the onboard operation are listed below.

(1) Creation of new ladder files
(2) Edit of existing ladder circuits (read, write, insertion, and deletion)
(3) Ladder circuit monitor

User PLC can also be developed by using a personal computer without using the onboard unit. (Optional software will be required.)

- Mitsubishi Integrated FA Software MELSOFT GX Series "GX Developer"

The related documents are listed below.

EZMotion-NC E60/E68 Series PLC Interface Manual IB-1500176(ENG)
EZMotion-NC E60/E68 Series PLC Programming Manual (Ladder section with MELSEC tool) IB-1500178(ENG)
EZMotion-NC E60/E68 Series PLC Development Software Manual (MELSEC Tool Section) IB-1500177(ENG)

Note) PLC : Programmable Logic Controller

2. System Configuration

2.1 PLC Development Tool

In addition to the onboard, the user PLC can be developed using the development tool operated with the personal computer.

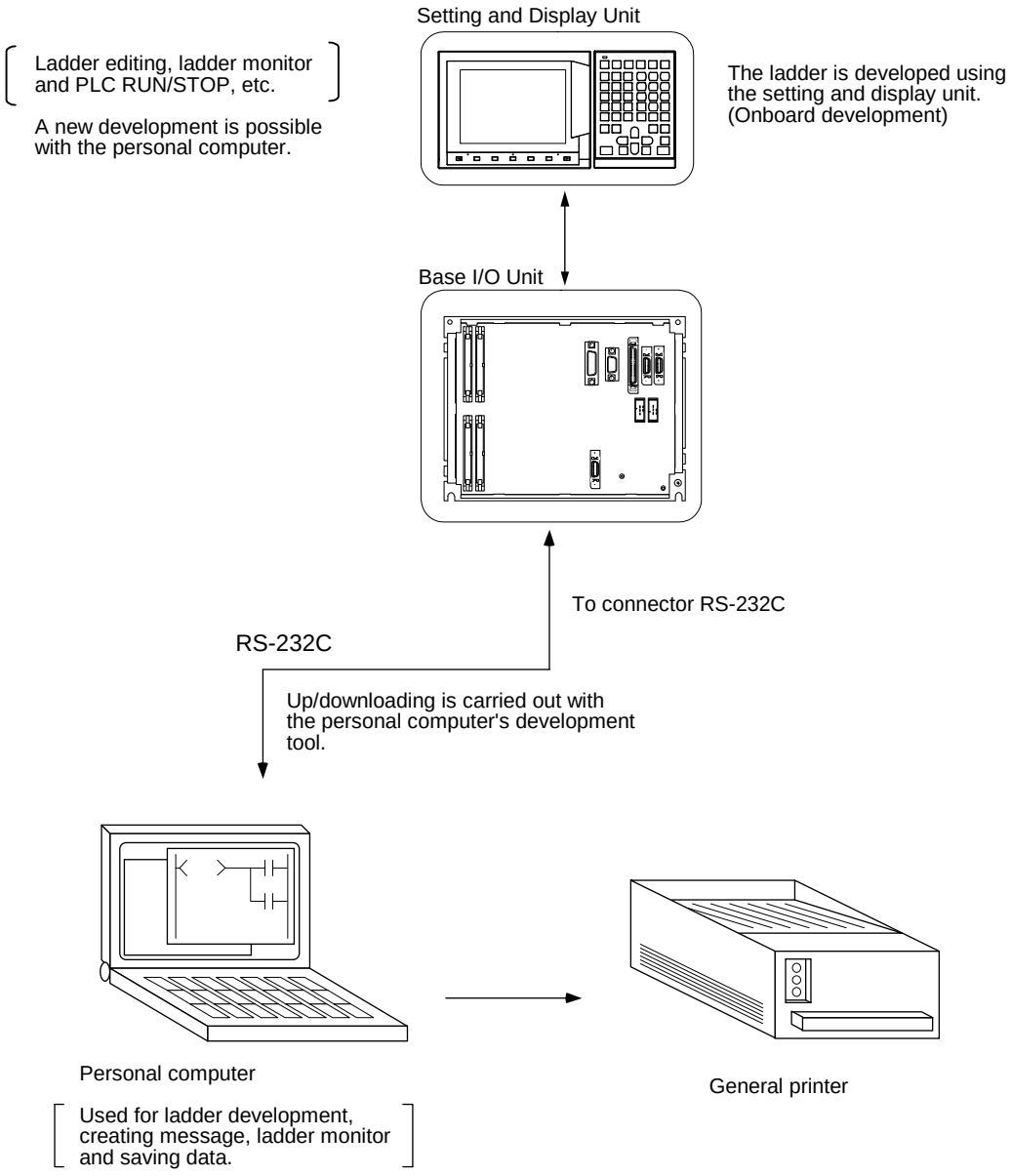
(1) MELSEC PLC Development Tool "GX Developer"

The GX Developer is a programming software package for the Programmable Controller MELSEC Series produced by Mitsubishi Electric Corporation. The User PLC Ladder for EZMotion-NC E60/E68 can be developed with the same operation as the MELSEC Series. Note that some of the MELSEC Series' specific functions cannot be used. For the details, refer to the "PLC Development Software Manual (MELSEC Tool Section) (IB-1500177(ENG))".

When creating the user PLC using the GX Developer and editing that with the onboard operation, it is necessary to set the parameter in the CNC side. For the details, refer to "2.4 System Selection".

2.2 General Configuration

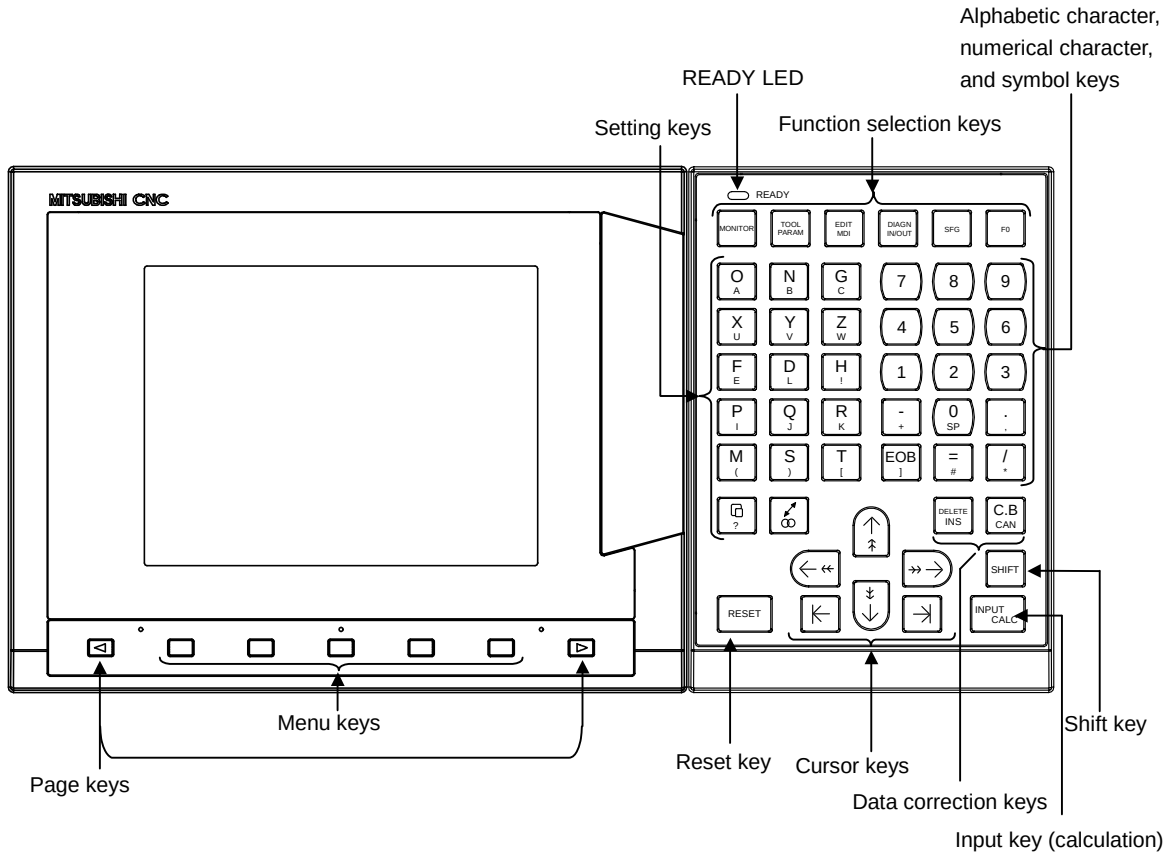
The system configuration when developing the onboard is shown below.



Note) Refer to this manual for editing using the setting and display unit (onboard editing), and refer to the "PLC Development Software Manual (MELSEC Tool Section) (IB-1500177(ENG))" for development using the personal computer.

2.3 Setting and Display Unit

The following is a representative example of a setting and display unit used onboard.



(Note 1) To input the alphabetic characters or symbols on the lower right of the alphabetic character and symbol keys, press [SHIFT] , then press the corresponding key.

(Example) "A" is input by pressing [SHIFT], [O A] .

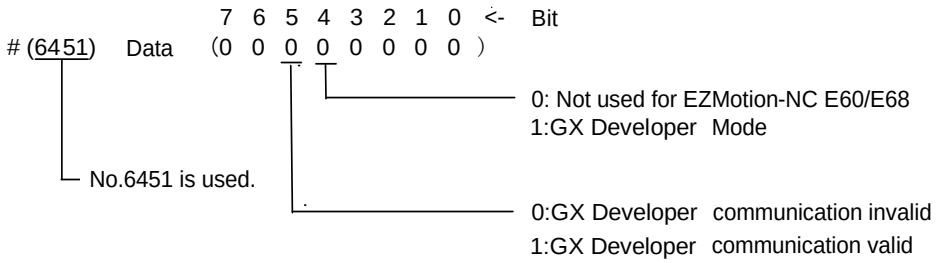
2.4 System Selection

2.4.1 Parameter setting

The parameters for user PLC development with the control unit and to operate the user PLC are explained.
The parameters are set in "SETUP PARAMETER" on the BIT SELECTION screen. Refer to the control unit instruction manual for information about the BIT SELECTION screen handling method.

(1) PLC environment selection

[BIT SELECTION PARAMETER screen]



(Note) Turn the CNC power OFF after the parameter setting. Parameters are valid after the power is turned ON again.

Depending on the setting of the bit selection #6451 bits, the operation is performed below.

(a) PLC environment selection

Choose the GX Developer mode (bit4=1).

(Note) The onboard will not start if the ladder format stored in the CNC is other than the GX Developer.

Bit 4 = 0
Not used for EZMotion-NC E60/E68.
Bit 4 = 1
The PLC development environment of the GX Developer.

(b) GX Developer communication usage selection

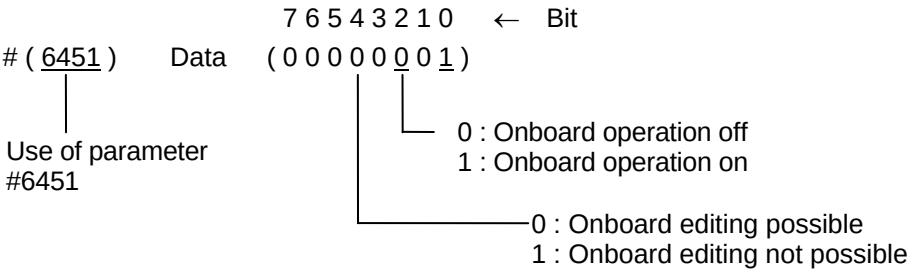
Choose to use the serial port in GX Developer or in the other functions.
Bit 5 = 0
The serial port is not used for the communication with the GX Developer.
Bit 5 = 1
The serial port is used for the communication with the GX Developer.
Note that the onboard will not start regardless of the bit 4 setting.

(c) Operation state depending on each bit selection

Bit 4	Bit 5	Operation state
0	-	Onboard does not starts.
1	0	PLC environment for GX Developer (When using the onboard)
1	1	PLC environment for GX Developer (When using communication) Onboard does not starts.

(2) Onboard operation on

[BIT SELECTION PARAMETER screen]



Operation is performed depending on how bit selection parameter # 6451 bits are set:

(a) Onboard operation on

Bit 0 = 0 : Onboard operation is off. Nothing will display even if [F0] is on.

Bit 0 = 1 : Screen is displayed for user PLC development, ladder monitor and ROM write, etc.

(b) Onboard editing validity

Bit 2 = 0 : Onboard ladder editing is possible.

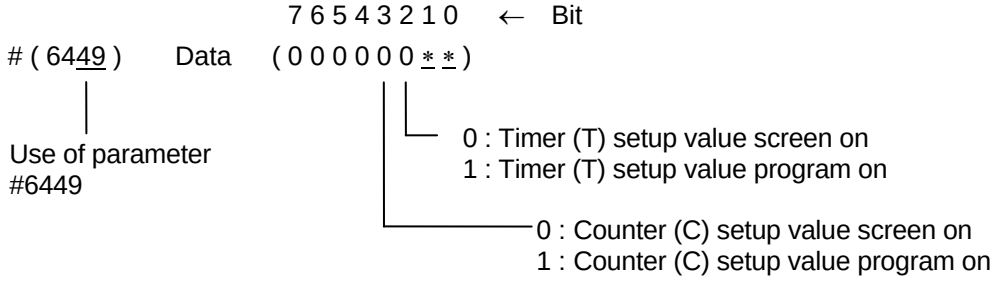
Bit 2 = 1 : Onboard ladder editing is not possible. Note that ladder monitoring is possible.

(3) PLC timer and counter screen on

Values can be set in timers (T) and counters (C) used with user PLC (ladder) on the setting and display unit for use them as variable timers or variable counters.

Note : The values of the fixed timer and fixed counter cannot be set from the setting and display unit.

[BIT SELECTION PARAMETER screen]



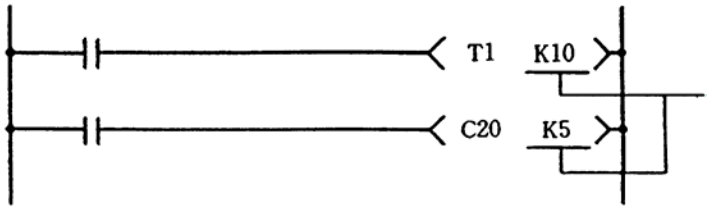
Operation is performed depending on how bit selection parameter #6449 bits 0 and 1 are set:

Bits 0 and 1 = 0

The values set in the PLC TIMER and PLC COUNTER screens SETUP PARAMETERS are used as the timer and counter setup values.

Bits 0 and 1 = 1

The programmed constant K values are used as the timer and counter setup values.
At the time, the programmed constant K values of the timers and counters are also displayed on the PLC TIMER and PLC COUNTER screens of setup parameters.
Thus, even if bits 0 and 1 are set to 11, the valid setup values can be checked on the screens in the PLC-RUN state.
However, no values can be set. If a value is set, the message "E05 NOT ACCEPTABLE" is displayed.

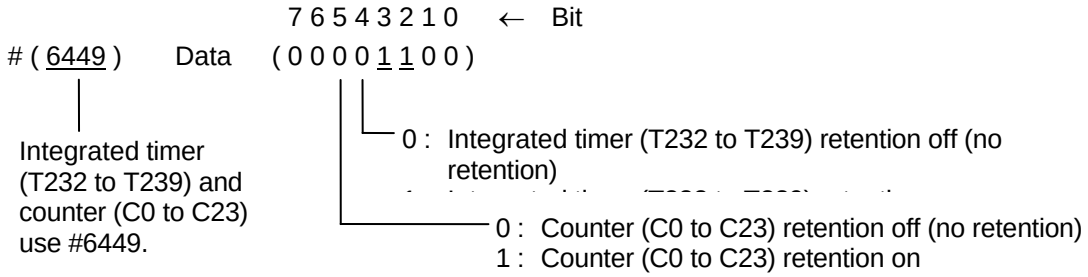


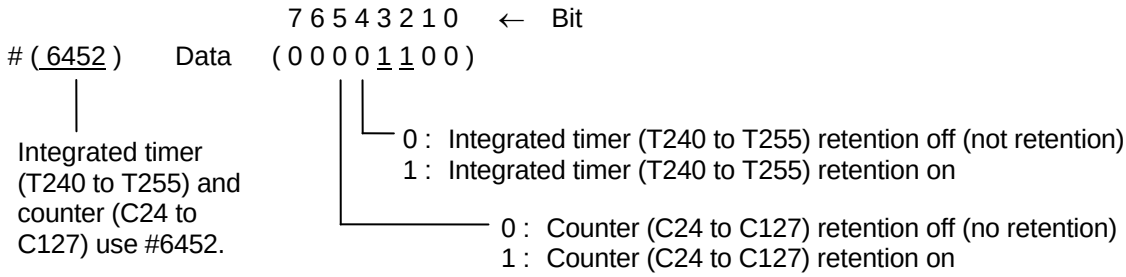
When bits 0 and 1 are set to 0, the constant K values are ignored and the values set on the screens become valid. However, since K* cannot be omitted in programming, any numeric value must be entered in K* for programming.

(4) Integrated timer retention and counter retention

This parameter is set to retain the current values of the integrated timer (T) and counter (C) even if the NC power is turned off.

[BIT SELECTION PARAMETER screen]





Bits 2 and 3 = 0

The current values of the integrated timer and the counter are reset to 0 when the NC power is turned off.

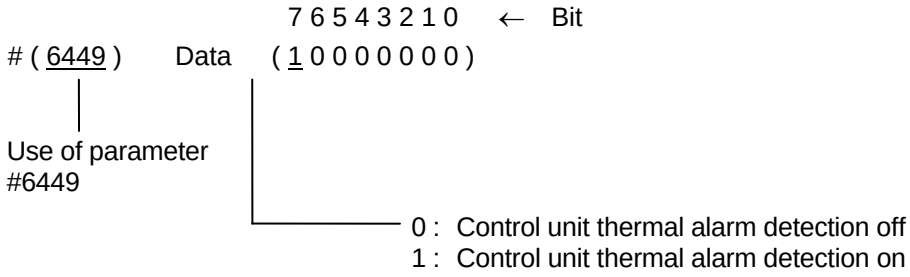
Bits 2 and 3 = 1

The current values of the integrated timer and the counter are not reset to 0 even if the NC power is turned off. The values before the power is turned off are retained.

(5) Control unit thermal alarm ON

The self-diagnostic function detects an error in the controller temperature, etc. The function can be enabled or disabled by a parameter.

[BIT SELECTION PARAMETER screen]



(a) Control unit thermal alarm ON (bit 7)

Bit 7 = 0

Overheat of the controller is neither detected nor posted (by special relay SM16) to the PLC.

Bit 7 = 1

If the abnormal temperature detector circuit in the controller operates, error message "Z53 TEMP. OVER 0001" is displayed in the setting and display unit. It prevents automatic operation start after the reset state. Also, special relay SM16 is turned on to post the error information to the PLC. The error contents can be checked by referring to file register R57.

File register R57

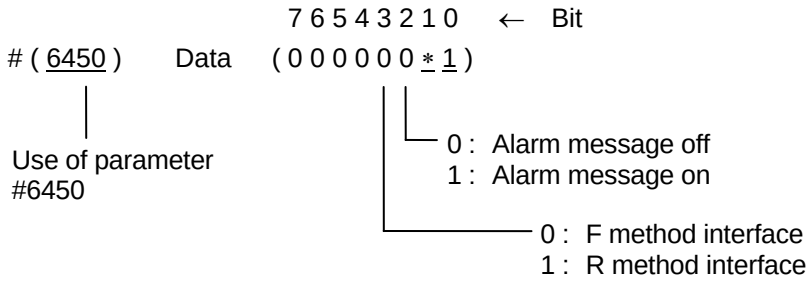
F	E	D	C	B	A	9	8
7	6	5	4	3	2	1	0

Bit 0: Controller overheat

(6) Alarm message on

This parameter is set to validate the interface of alarm message display created with user PLC.

[BIT SELECTION PARAMETER screen]

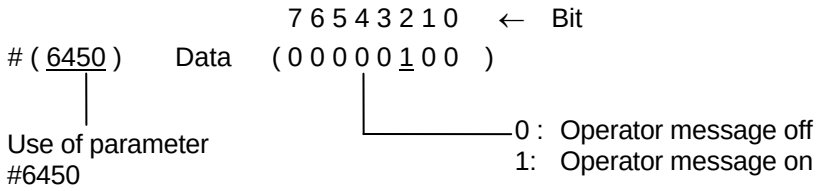


For the details on the alarm message display method, refer to the "PLC Programming Manual (Ladder section with MELSEC tool) (IB-1500178(ENG))".

(7) Operator message on

This parameter is used to validate the interface of operator message display created with user PLC.

[BIT SELECTION PARAMETER screen]

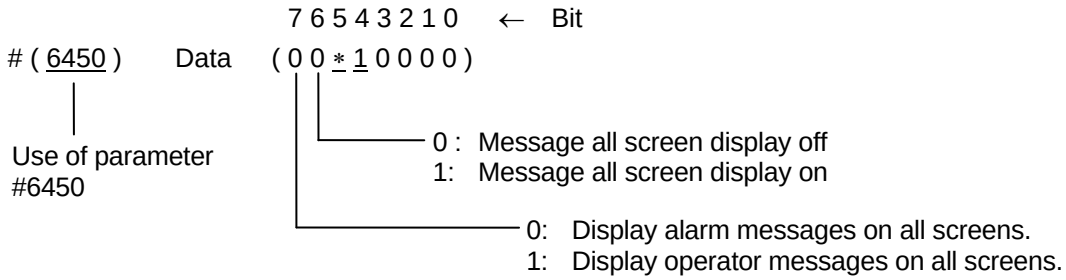


For the details on the operator message display method, refer to the "PLC Programming Manual (Ladder section with MELSEC tool) (IB-1500178(ENG))".

(8) Message display on all screens

The first 18 characters of an alarm message or operator message can be displayed in the operation status mode/alarm display area. This function enables either an alarm or operator message that is generally displayed only on the alarm diagnostic screen to be displayed on almost all screens (those with an alarm display area).

[BIT SELECTION PARAMETER screen]



Depending on the settings of bits 4 and 5 of bit selection parameter #6450, the CNC operates as follows:

Bit 4 = 0

Alarm and operator messages are displayed only on the alarm diagnostic screen but not on all screens.

Bit 4 = 1

The first 18 characters of either alarm or operator messages are displayed in the operation status mode/alarm display area. Whether alarm or operator messages are to be displayed is determined by bit 5 in #6450.
Regardless of the setting of this parameter, the alarm diagnostic screen displays alarm and operator messages in full.

Bit 5 = 0

Alarm messages are displayed when "message display on all screens" is selected.

Bit 5 = 1

Operator messages are displayed when "message display on all screens" is selected.

<Example of parameter setting>

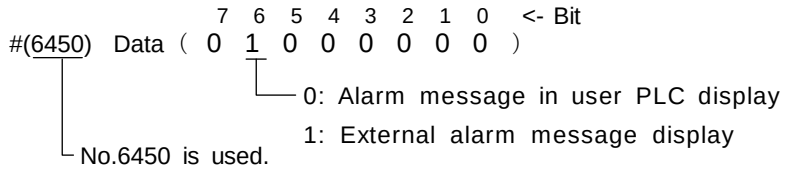
	7	6	5	4	3	2	1	0 ← Bit
Display alarm messages on all screens.	—	—	0	1	—	0/1	0/1	1
Display operator messages on all screens.	—	—	1	1	—	1	0/1	0/1

(9) Alarm message selection

The one of the following two data can be selected and displayed for the message data.

- Data created with the user PLC (stored in the user PLC area)
- External alarm message data input with the text format (stored in the area different from the user PLC)

[BIT SELECTION PARAMETER screen]



Depending on the setting of bit selection #6450 bits, the operation is performed below.

Bit 6 = 0

The PLC alarm message in the user PLC is displayed.

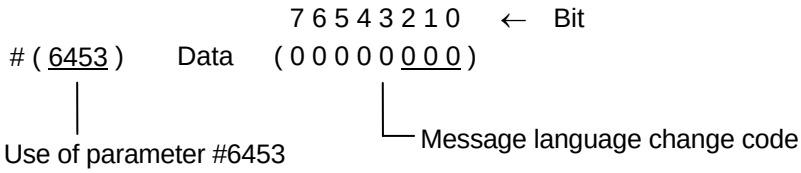
Bit 6 = 1

The external alarm message input with the text format is displayed.

(10) Message language change code

This parameter is set to change display language (message division) when message data is displayed on the screen.

[BIT SELECTION PARAMETER screen]



No.	Bit			Remarks
	2	1	0	
#6453	0	0	0	Language 1 is displayed.
	0	0	1	Language 2 is displayed.
	0	1	0	Language 3 is displayed.
	0	1	1	Language 4 is displayed.
	1	0	0	Language 5 is displayed.
	1	0	1	Language 6 is displayed.
	1	1	0	Language 7 is displayed.
	1	1	1	Language 8 is displayed.

(11) High-speed input and output specification

These parameters are set to specify input/output signals required for input/output processing synchronized with high-speed processing when high-speed processing of user PLC is performed.

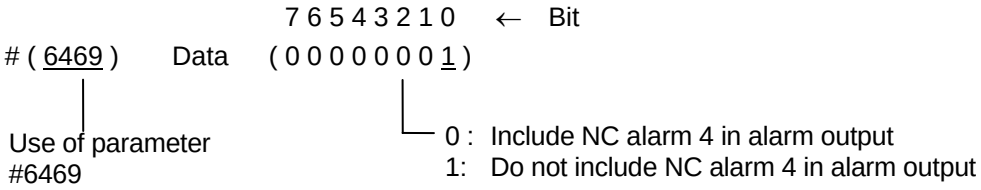
The input signals are specified in bit selection parameters #6457 and #6458 and the output signals are specified in #6460 and #6461.

Refer to the "PLC Programming Manual (Ladder section with MELSEC tool) (IB-1500178(ENG))" for details of correspondence between the parameters and input/output devices X and Y, etc.

(12) NC alarm 4 output invalid (parameter for standard PLC)

This parameter selects whether to include the NC alarm 4 in the NC alarm output 1 during the standard PLC specifications.

[BIT SELECTION PARAMETER screen]



Bit 0 = 0

When using the standard PLC specifications without the additional remote IO, there is no output point for the NC alarms 2, 3 and 4. Thus, when the additional DIO card is not used, the logical sum of NC alarm 1, 2, 3 and 4 are output in NC alarm 1 output. This parameter selects whether the NC alarm 4 that indicates an operation alarm is included at that time. (Bit 0 = 0 includes the NC alarm 4.)

Bit 0 = 1

The operation error NC alarm 4 is not included in the NC alarm 1 output explained in Bit 0 = 0.

Table: "Contents of bit selection parameters #6449 to #6496"

	Symbol name	7	6	5	4	3	2	1	0
0	#6449 R2924 L	Controller thermal alarm on	Reserved	-		Counter C retention	Integrated timer T retention	PLC counter program on	PLC counter program on
1	#6450 R2924 H		External alarm message display	Alarm/ operator change	Full screen display of message	-	Operator message on	1: R method / 0: F method	Alarm message on
2	#6451 R2925 L	-	-	GX Developer communi-cation on	PLC development environment selection		Onboard editing not possible	-	Onboard on
3	#6452 R2925 H	-				Counter (fixed) retention	Integrated timer (fixed) retention		-
4	#6453 R2926 L	-	-	-	-	-	Message language change code		
5	#6454 R2926 H								
6	#6455 R2927 L	-	-	-	-	-	-	-	-
7	#6456 R2927 H	-	-	-	-	-	-	-	-
8	#6457 R2928 L	High-speed input specification 1							
9	#6458 R2928 H	High-speed input specification 2							
A	#6459 R2929 L	High-speed input specification 3 (Spare)							
B	#6460 R2929 H	High-speed input specification 4 (Spare)							
C	#6461 R2930 L	High-speed output specification 1							
D	#6462 R2930 H	High-speed output specification 2							
E	#6463 R2931 L	High-speed output specification 3 (Spare)							
F	#6464 R2931 H	High-speed output specification 4 (Spare)							

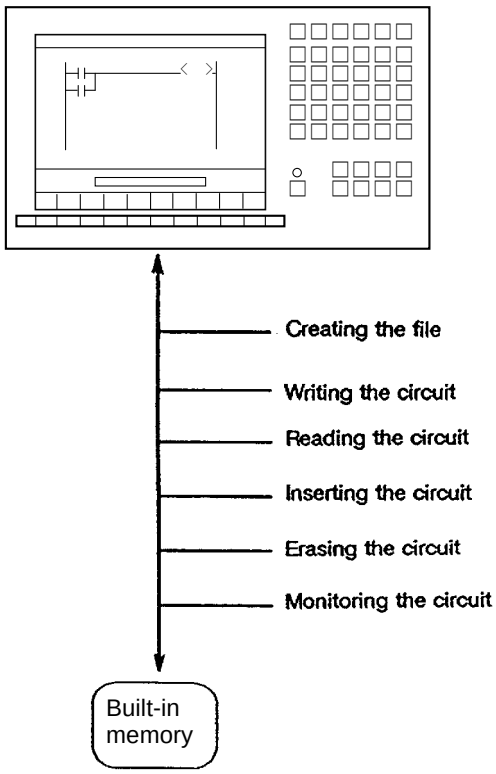
	Symbol name	7	6	5	4	3	2	1	0
0	#6465 R2932 L	-	-	-	-	-	-	-	-
1	#6466 R2932 H	-	-	-	-	-	-	-	-
2	#6467 R2933 L	-	-	-	-	-	-	-	-
3	#6468 R2933 H								
4	#6469 R2934 L			Standard PLC parameter				_	NC alarm 4 output off
5	#6470 R2934 H								
6	#6471 R2935 L	-	-	-	-	-	-	-	-
7	#6472 R2935 H	-	-	-	-	-	-	-	-
8	#6473 R2936 L	-							-
9	#6474 R2936 H								
A	#6475 R2937 L								
B	#6476 R2937 H								
C	#6477 R2938 L								
D	#6478 R2938 H								
E	#6479 R2939 L								
F	#6480 R2939 H								

(Note 1) Be sure to set the bits indicated - and blanks to 0.

(Note 2) Parameters #6481 to #6496 are reserved for debugging by Mitsubishi.

3. Creating Ladder Circuit and Monitor Operation

A ladder circuit can be created on board and further the created ladder circuit can be edited on board. The operation state of the sequence circuit in operation can also be monitored.



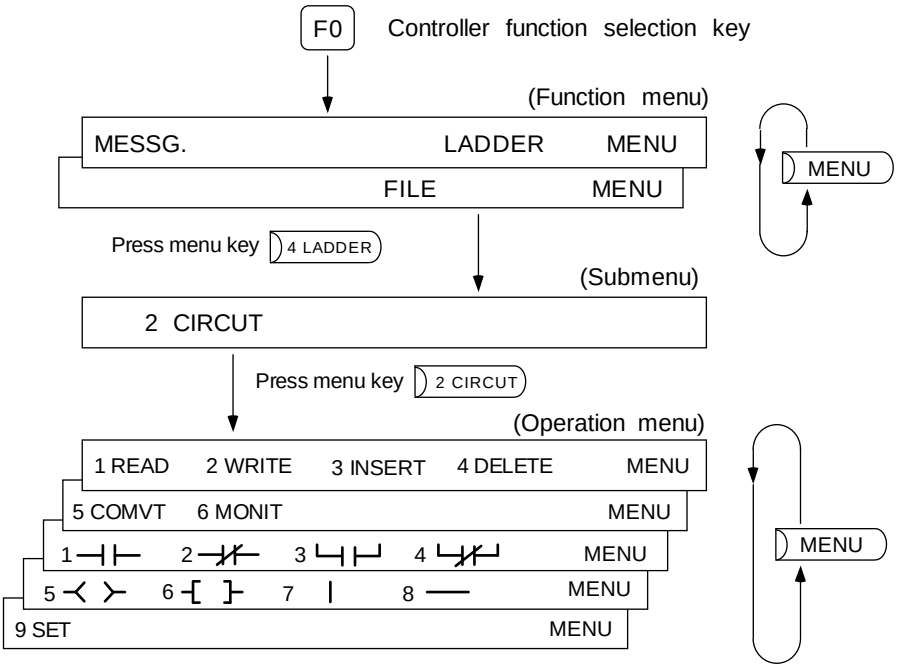
Note :
To edit or create ladder circuits, stop the user PLC. For the operation procedure, see the section "3.1.2 User PLC RUN/STOP by setting and display unit operation."

The table below lists the items to be explained in this section:

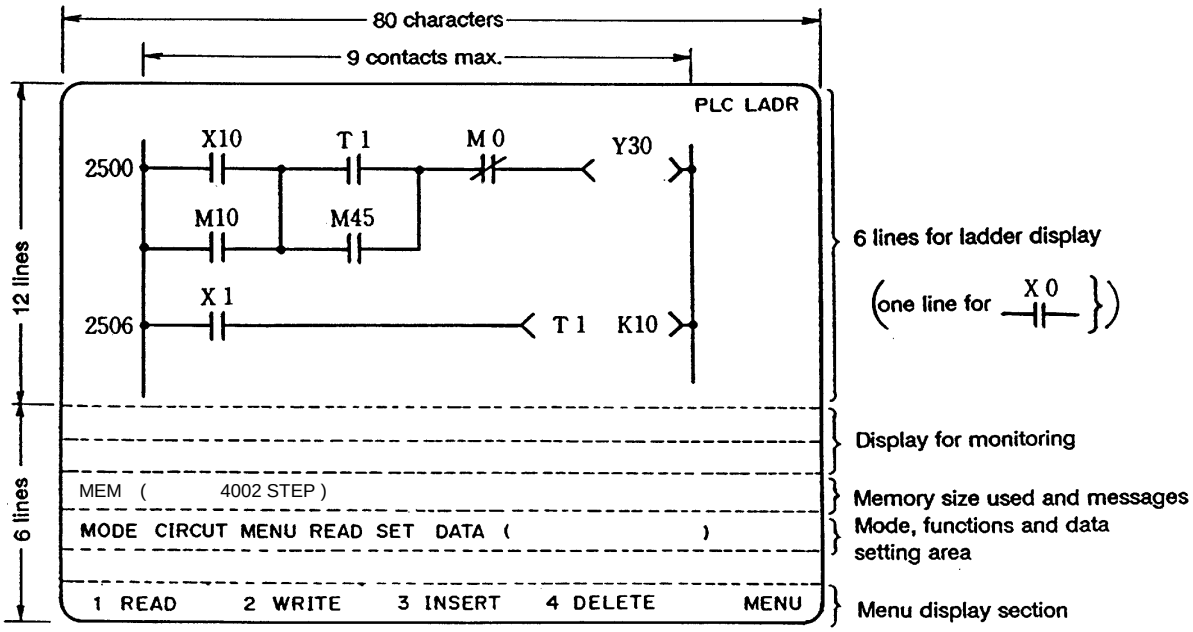
Mode	Function item	
File specifica-tion mode	Creating the file	Registers an edit file.
		User PLC RUN/STOP
Circuit mode	Writing the circuit	Creates a circuit. (Not usable)
		Modifies an existing circuit.
		Adds circuit blocks.
	Reading the circuit	Reads a circuit by step number.
		Reads a circuit by device number.
		Reads a circuit by contact or coil number.
		Reads a circuit by an instruction.
		Reads the last circuit by the END instruction.
	Inserting the circuit	Inserts circuit symbols.
	Erasing the circuit	Erases circuit blocks.
		Erases circuit symbols.
	Monitoring the ladder circuit.	Monitors the circuit.
		Freezes the screen at monitor stop trigger point.
		Monitors registration.
		Monitors the current value (Decimal ↔ Hexadecimal)

The modes and function items above are explained in order.

(1) Menu operation



(2) Circuit mode display screen

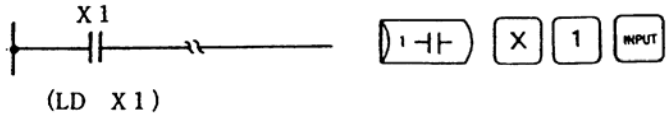


(3) Basic key operation

(a) The following basic five instruction input patterns are available:

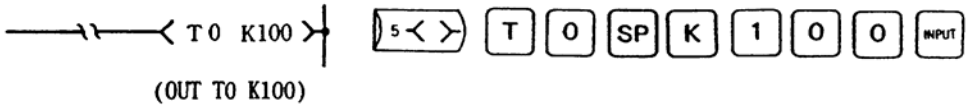
1) Circuit symbol + device number

(Example)



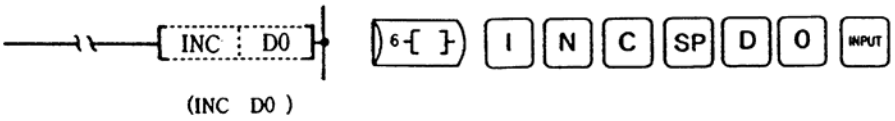
2) Circuit symbol + device number + device number

(Example)



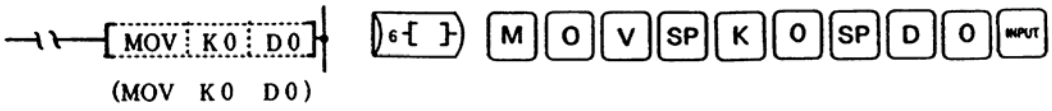
3) Circuit symbol + instruction + device number

(Example)



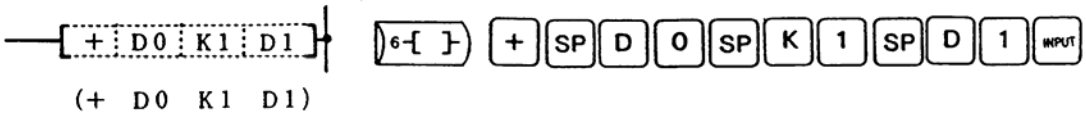
4) Circuit symbol + instruction + device number + device number

(Example)



5) Circuit symbol + instruction + device number + device number + device number

(Example)



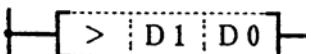
(b) Caution on key operation

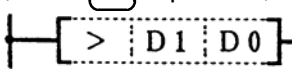
1) Some symbols used as commands in the setting display unit of the control unit do not have corresponding keys such as [<] and [>]. In that case, operation is carried out using the alternative keys shown in the following table. The alternative keys can also be used even if there are keys corresponding to commands. The following table shows the basic keys such as [<] and [>] and the alternative keys.

Note) The actual key for the [INPUT] key is [INPUT CALC], but is shown as [INPUT] in this manual.

Basic key and alternate key operation in programming

Instruction	Basic key operation	Alternative key operation	Instruction	Basic key operation	Alternative key operation
+	[+]	[A][D]	LD>	[>]	[G][T]
D+	[D][+]	[D][A][D]	AND>	[>]	[G][T]
–	[—]	[S][U][B]	OR>	[>]	[G][T]
D–	[D][—]	[D][S][U][B]	LDD>	[D][>]	[D][G][T]
.	[*]	[M][U][L]	ANDD>	[D][>]	[D][G][T]
D.	[D][*]	[D][M][U][L]	ORD>	[D][>]	[D][G][T]
/	[/]	[D][I][V]	LD<	[<]	[L][T]
D/	[D][/]	[D][D][I][V]	AND<	[<]	[L][T]
LD=	[=]	[E][Q]	OR<	[<]	[L][T]
AND=	[=]	[E][Q]	LDD<	[D][<]	[D][L][T]
OR=	[=]	[E][Q]	ANDD<	[D][<]	[D][L][T]
LDD=	[D][=]	[D][E][Q]	ORD<	[D][<]	[D][L][T]
ANDD=	[D][=]	[D][E][Q]	SPACE	[SP]	[,]
ORD=	[D][=]	[D]	————	————	————

(Example) To program 

enter the key sequence
[⊣[ ]⊢][G][T][SP][D][1][SP][D][0][INPUT].
It is displayed in the setting area as the key sequence is entered during operation. However, when [INPUT] is pressed, the program (circuit) is displayed in the ladder display area as 

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(4) Terms

(a) Device and device No.

The device is the address signal used to classify the signals handled by the PLC, and the device No. is a serial No. assigned to that device. The device Nos. for device X, Y, M and H are hexadecimal, and all others are decimals.

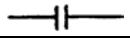
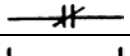
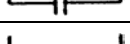
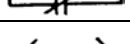
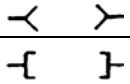
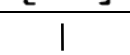
(b) Device list

Device	Device number		Unit	Contents
X *	X0 to XABF	(2752)	1 bit	Input signal to PLC, such as machine input
Y *	Y0 to YDFF	(3584)	1 bit	Output signal from PLC, such as machine output
M	M0 to M8191	(8192)	1 bit	Temporary storage
F	F0 to F127	(128)	1 bit	Temporary storage, alarm message interface
L	L0 to L255	(256)	1 bit	Latch relay (backup memory)
SM *	SM0 to SM127	(128)	1 bit	Special relay
T	T0 to T15	(16)	1 bit/16 bits	10 ms unit timer
	T16 to T55	(40)	1 bit/16 bits	10 ms unit timer (fixed timer)
	T56 to T135	(80)	1 bit/16 bits	100 ms unit timer
	T136 to T231	(96)	1 bit/16 bits	100 ms unit timer (fixed timer)
	T232 to T239	(8)	1 bit/16 bits	100 ms unit integrated timer
	T240 to T255	(16)	1 bit/16 bits	100 ms unit integrated timer(fixed timer)
C	C0 to C23	(24)	1 bit/16 bits	Counter
	C24 to C127	(104)	1 bit/16 bits	Counter (fixed counter)
D	D0 to D1023	(1024)	16 bits/32 bits	Data register, operation register
R *	R0 to R8191	(8192)	16 bits/32 bits	File register, PLC-NC interface The user released registers are R500 to R549 and R1900 to R2799. R1900 to R2799 are backed up by the battery.
Z	Z0 to Z1	(2)	16 bits	Index of D or R address (±n)
N	N0 to N7	(8)	—	Master control nesting level
P *	P0 to P255	(256)	—	Label of conditional jump and subroutine call.
K	K-32768 to K32767		—	Decimal constant for 16-bit instructions
	K-2147483648 to K2147483647		—	Decimal constant for 32-bit instructions
H	H0 to HFFFF		—	Hexadecimal constant for 16-bit instructions
	H0 to HFFFFFFFF		—	Hexadecimal constant for 32-bit instructions

Note 1) The application of devices indicated by a * in the "Device" column is determined. Do not use undefined device Nos., even when blank.

(c) Circuit symbols

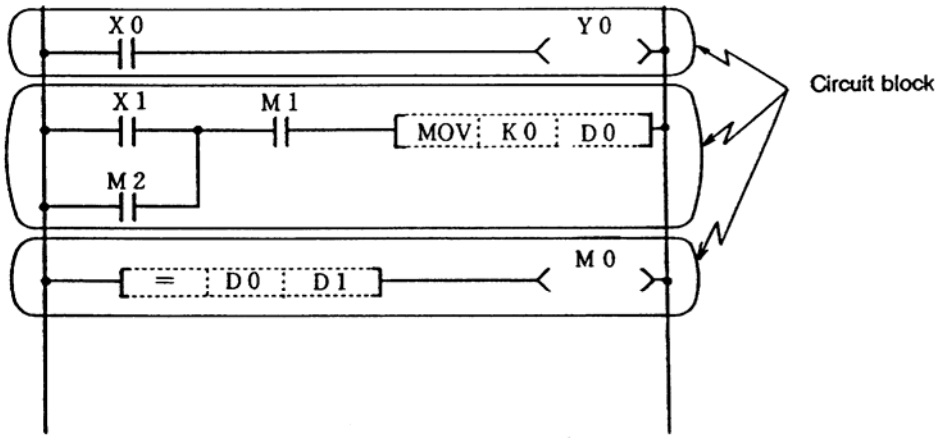
The eight symbols listed in the table below are used in the circuit:

Circuit symbol	Contents
	Used in the A-contact circuit.
	Used in the B-contact circuit.
	Used in the A-contact OR circuit.
	Used in the B-contact OR circuit.
	Used for a coil, (Y, M, F, L, SM, T, C)
	Used for programming a functional instruction.
	Used to connect circuit symbols.
	Used to connect circuit symbols.

(d) Circuit block

The circuit block is a circuit closed by the ≺ ≻ or ⊏ ⊐ symbol.

(Example)

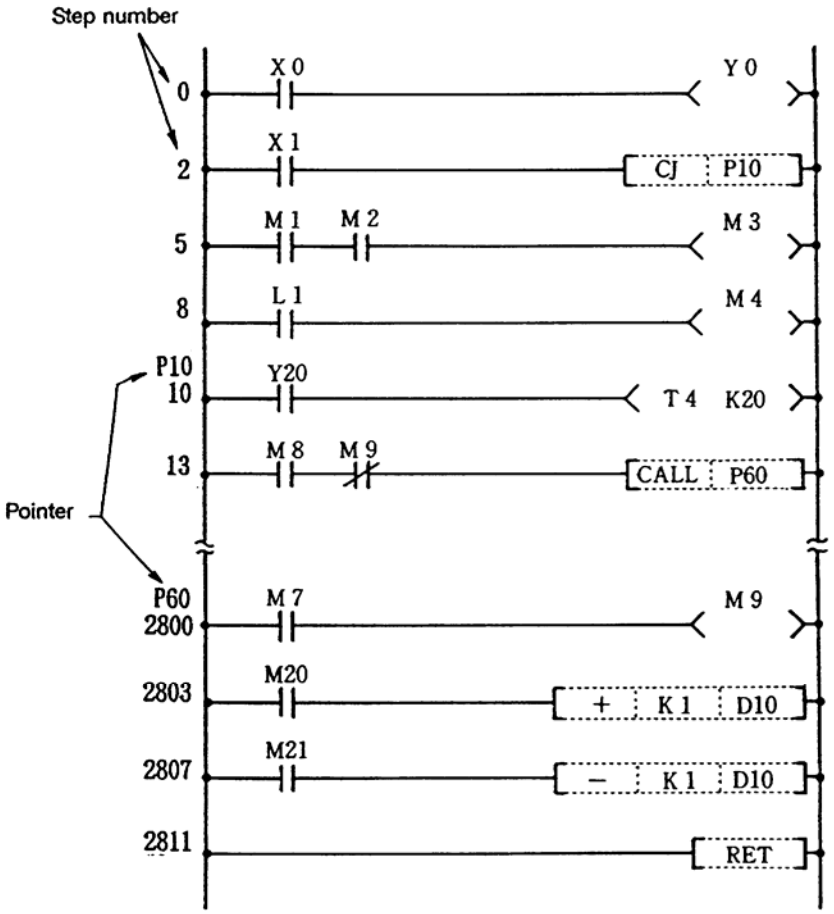


(e) Step number and pointer (P)

Step numbers are sequentially assigned to the programmed circuits. They change automatically when the circuit are edited.
A pointer (P) is a label which indicates the destination to go when a conditional jump occurs or when a subroutine call is issued. some pointers are used for special purposes as follows:

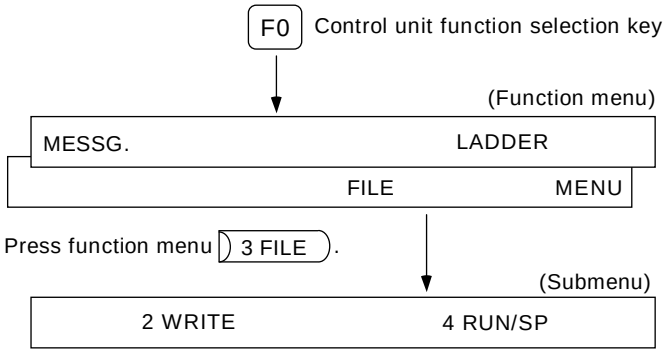
P128 to P159 : These pointers can be used the same way as P0 to P127. In addition, these can be used as the page feed symbols when the ladder circuit is printed out.

P250 to P255 : These pointers are used to delimit the PLC programming levels.



3.1 Creating the File

(1) Menu operation



3.1.1 Registering the edit file

When creating a ladder circuit, the file name and size expected to be used must be registered.
(Already registered items need not be registered.)

(Note) In the PLC development environment of the GX Developer, a new circuit cannot be created, so this operation is not necessary.

3.1.2 User PLC RUN/STOP by setting and display unit operation

To create or update the ladder circuits or message data, the user PLC must be stopped.

[Basic operation]

(1) Stop the user PLC as follows:

F0 → 3 FILE → 4 RUN/SP → 1 → INPUT

(2) Run the user PLC as follows:

F0 → 3 FILE → 4 RUN/SP → 0 → INPUT

[Operation procedure]

(1) Press F0 and 3 FILE to display the PLC edit file registration screen.

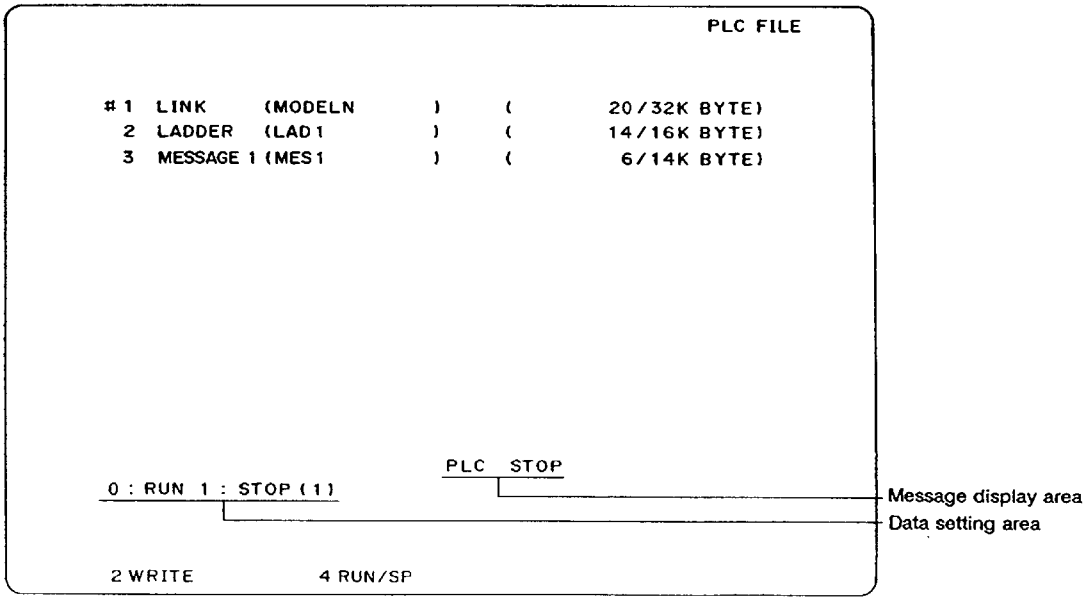
(2) Press 4 RUN/SP to display the setting area. The message display area display "PLC RUN" if the user PLC is running, or "PLC STOP" if it is in the stop state.

(3) To stop the user PLC, press 1 and then INPUT. To run the user PLC, press 0 and then INPUT. The message display area displays "PLC STOP" or "PLC RUN".

⚠ CAUTION

(1) The PLC can be put into a STOP status by setting the rotary switch NCSYS on the lower part of the control unit to No. 1 (STOP).

(2) An emergency stop will result when the user PLC is stopped with this function, in the same manner as the method using the rotary switch NCSYS. First carry out an emergency stop using the dedicated emergency stop button, etc., then put the user PLC in an emergency stop status.



3.2 Writing the Circuit

3.2.1 Creating the circuit

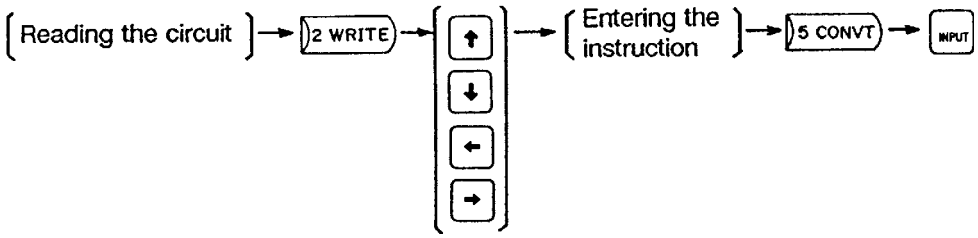
This operation creates a new ladder circuit or completely erases existing ladder circuits.

(Note) In the PLC development environment of the GX Developer, a new circuit cannot be created.

3.2.2 Modifying the existing circuit

This operation modifies the existing sequential circuits.

[Basic operation]



[Operation procedure]

(1) According to the read operation, read the circuit block to be modified.

(2) Pressing 2 WRITE erases all circuit blocks from the screen, only leaving the circuit block at the cursor position.
- When modifying the circuit block other than the one displayed on the top of the screen, move the cursor to the beginning of the target block and then press 2 WRITE : the specified circuit block moves to the top of the screen and the other blocks disappear.

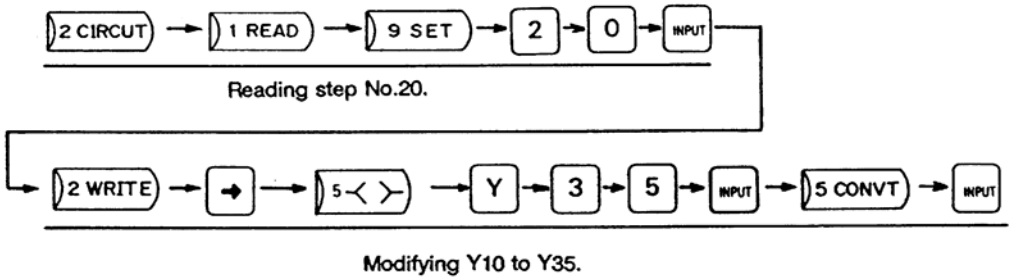
(3) Using the ↑ ↓ ← → keys, move the cursor to the position where the circuit is to be modified and then enter the necessary instruction and data.

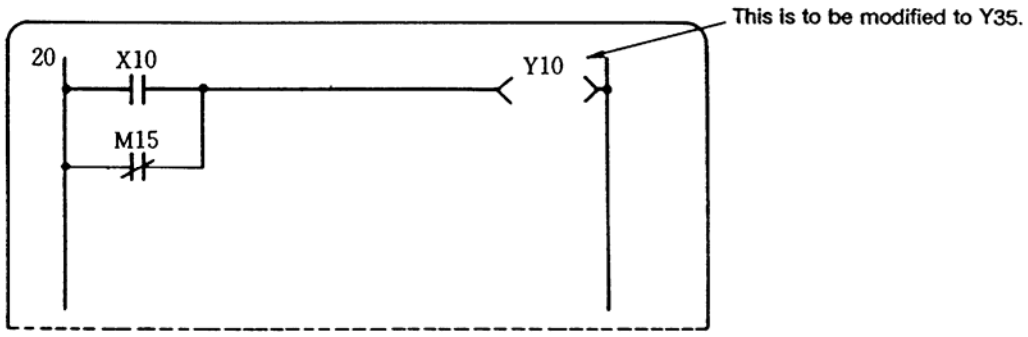
(4) Be sure to press 5 CONVT and INPUT after modifying the circuit.
- Pressing the two keys displays the message COMPLETED in the message display area and, at the same time, displays the modified circuit.

Point

(1) If the circuit modification involves the change of a step number, the succeeding program step numbers and conditional jump (CJ) destination labels are also accordingly changed.

(Example) Modify coil Y10 to Y35.

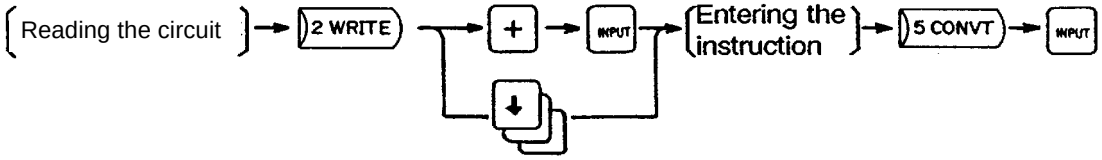




3.2.3 Adding the circuit block

This operation adds a circuit block to the existing sequential circuits.

[Basic operation]



[Operation procedure]

(1) According to the read operation, read the circuit steps where a circuit block is to be added to.

(2) Pressing 2 WRITE erases all circuit blocks from the screen, only leaving the circuit block at the cursor position.

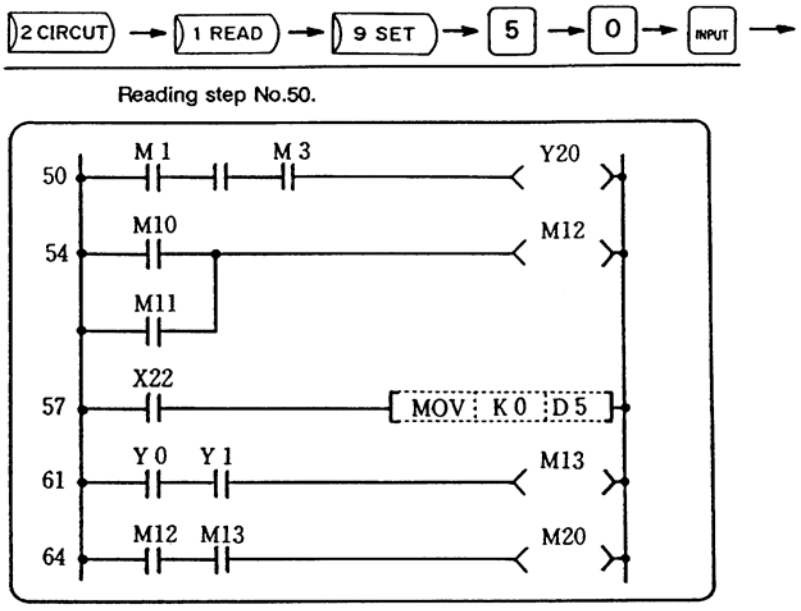
- When adding the circuit block to the one other than that displayed on the top of the screen, move the cursor to the beginning of the target block and then press 2 WRITE : the specified circuit block moves to the top of the screen and the other blocks disappear.

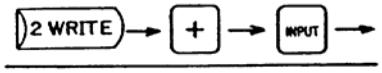
(3) Pressing + and INPUT erases the circuit block on the top of the screen and displays the next step number and two vertical base lines.

(4) Write an additional circuit block by entering necessary instructions and data.

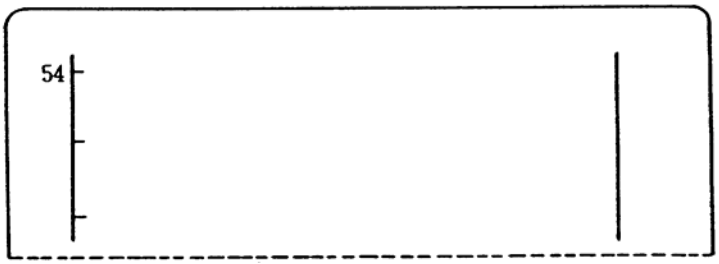
(5) Be sure to press 5 CONVT and INPUT after adding the circuit.

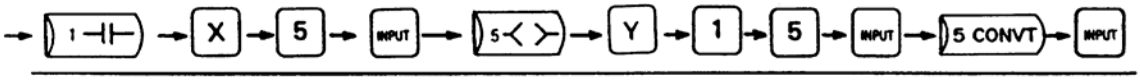
(Example) Add the circuit block containing devices X5 and Y15 to step No.50.



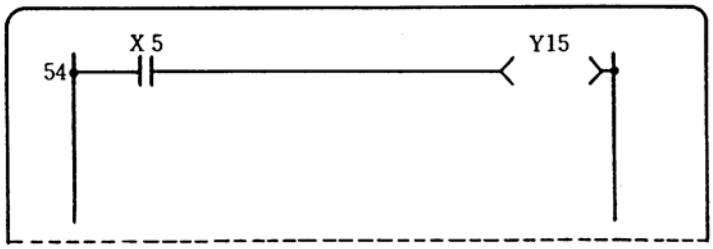


Set the write area after the circuit block read.





Writing X5 and Y15.



Point

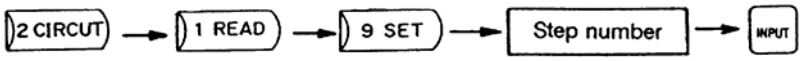
(1) Inserting or adding a circuit block automatically changes the succeeding program step numbers and CJ destination labels.

3.3 Reading the Circuit

3.3.1 Reading the circuit by step number

This operation reads the circuit blocks by specifying a step number.

[Basic operation]



[Operation procedure]

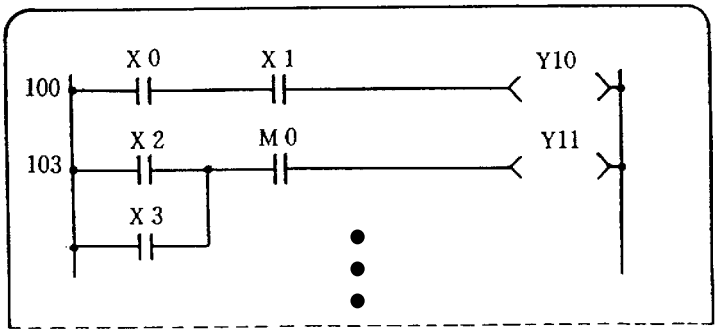
(1) Press 2 CIRCUIT , 1 READ , and 9 SET , enter the step number, then press INPUT . This displays the circuit blocks starting from the one whose step number is specified on the screen.
- If the number of an intermediate step of a circuit block is specified, the step numbers are displayed from the first step of the block.

(2) Pressing — and INPUT displays the circuit on the previous screen (scrolling one screen up) while pressing + and INPUT displays the circuit on the next screen (scrolling one screen down).
Pressing INPUT successively scrolls another screen down. when the screen is scrolled down to the last circuit block, LADDER END is displayed in the message display area.
Pressing — after pressing INPUT and INPUT works the same as above.

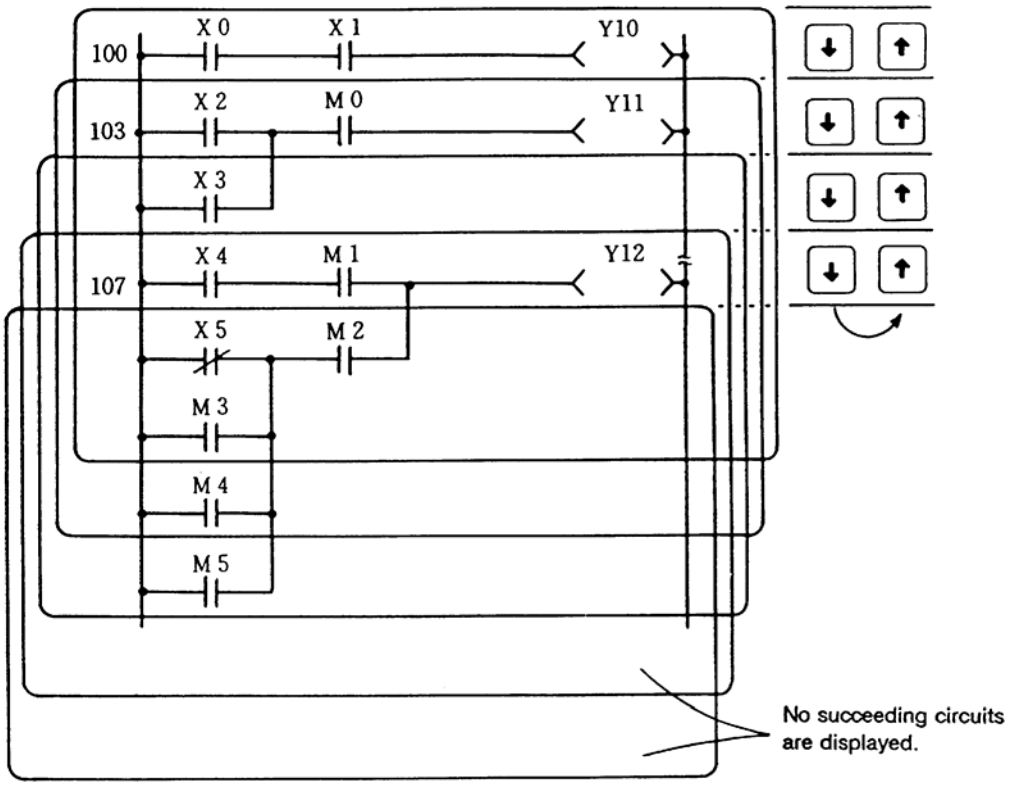
Note) It takes time to display another screen by pressing — and INPUT three times more than by pressing + and INPUT .

(3) If one circuit block is divided in two screens, use the cursor key ↑ or ↓ to move the cursor to the top or bottom of the screen and further press the cursor key to scroll the screen one line. Continue to press the cursor key until the whole block appears on the screen.
Even when the circuit block is not divided in two screens, pressing the cursor key ↑ or ↓ can scroll the screen. Note that, however, pressing the cursor key ↓ can scroll the screen but cannot display the next circuit.

(Example 1) Read the program with step No.100.



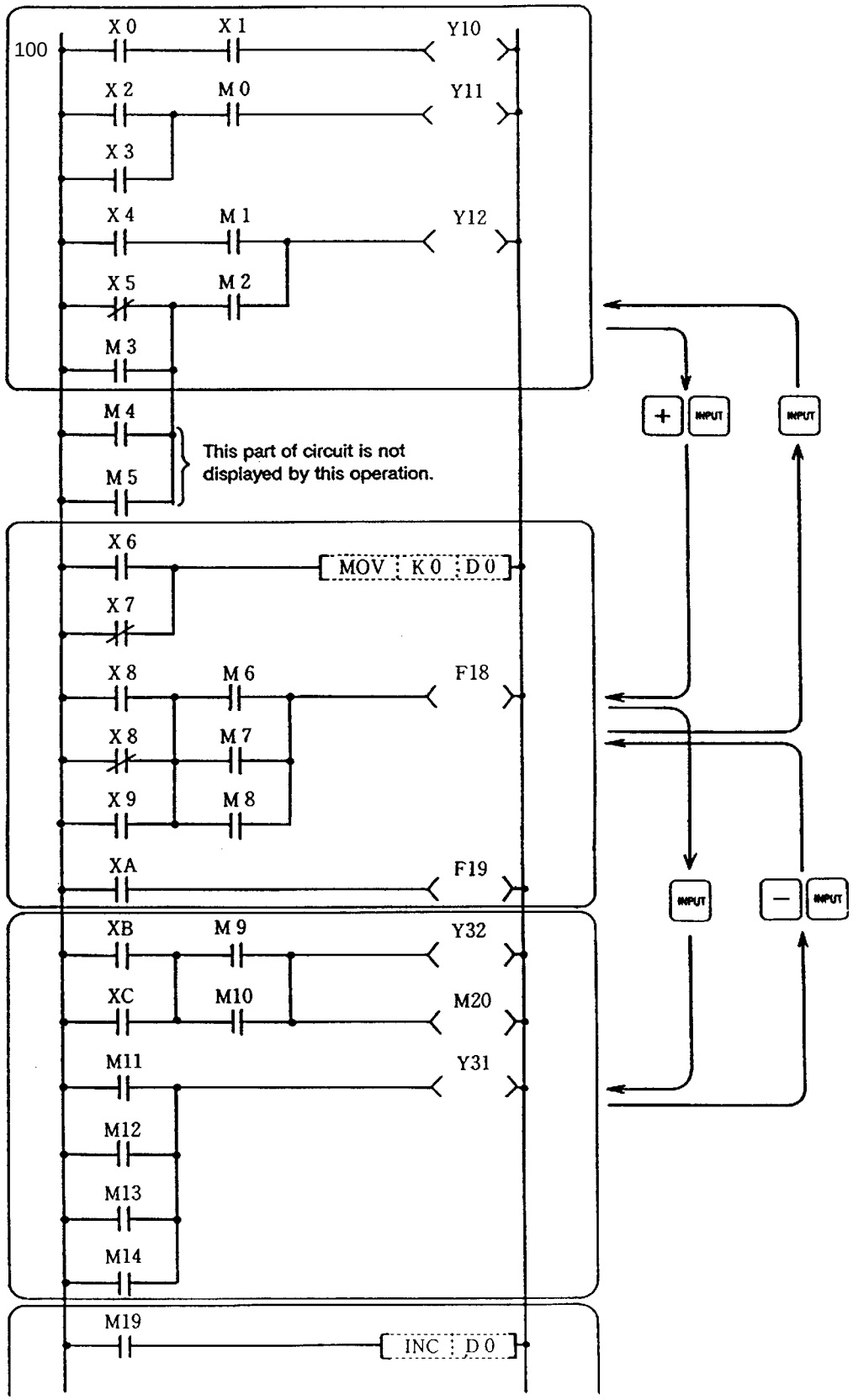
(Example 2) After reading the program with step No.100, move the cursor key [↓] to the bottom of the screen, then press [↓] four times then [↑] four times.



Note) If part of the circuit block displayed on the bottom of the screen is hidden on the next screen, it can be displayed on the current screen by moving the cursor beyond the bottom of the screen. Pressing the cursor key [↓] further cannot display the next circuit block.

Similarly, pressing the cursor key [↑] cannot display the circuit blocks before the step read out, step No. 100 in the above example.

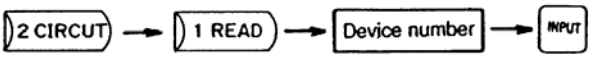
(Example 3) After reading the program with step No.100, operate the [+], [INPUT], [INPUT], [−], [INPUT], and then [INPUT] keys.



3.3.2 Reading the circuit by device number

This operation reads the circuit block containing the specified device number.

[Basic operation]



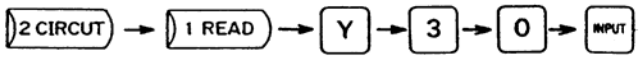
[Operation procedure]

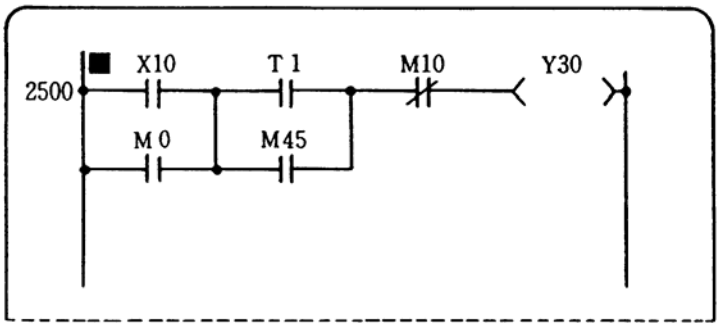
(1) Press 2 CIRCUIT and 1 READ , enter the device number, then press INPUT .
The circuit block containing the specified device number is displayed.
If several circuit blocks contain the specified device number, the circuit block with the smallest step number is first displayed. Pressing INPUT , displays the circuit with the second smallest step number under the circuit block currently displayed.
When the screen is full of circuit blocks, pressing INPUT pushes the first circuit block out of the screen and adds another circuit block on the bottom.

(2) If another device number is specified during the operation, the circuit block containing the specified device number is displayed under the one previously displayed.

(3) After all target blocks have been read, an attempt to read another circuit block causes PROG. NOT FOUND to be displayed in the message display area.

(Example) Read the circuit block containing Y30.

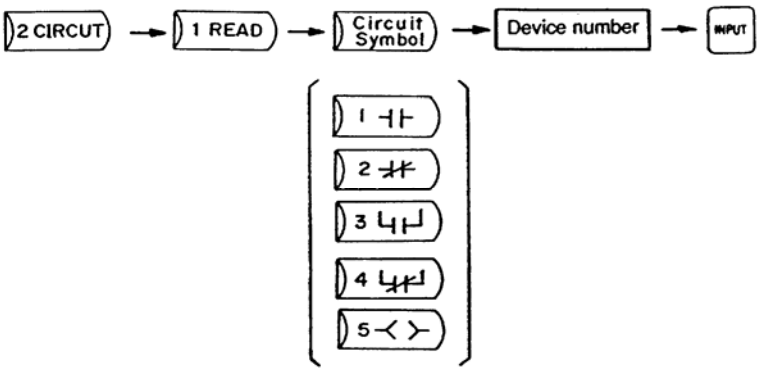




3.3.3 Reading the circuit by contact or coil number

This operation reads the circuit block containing the specified contact or coil number.

[Basic operation]



[Operation procedure]

(1) Press 2 CIRCUIT , 1 READ , and a circuit symbol key (1 , 2 , 3 , 4 , or 5), enter the device number, then press INPUT . The circuit block containing the specified contact or coil number is displayed.
If several circuit blocks contain the specified contact or coil number, the circuit block with the smallest step number is first displayed. Pressing INPUT displays the circuit with the second smallest step number under the circuit block currently displayed. When the screen is full of circuit blocks, pressing INPUT pushes the first circuit block out of the screen and adds another circuit block on the bottom.

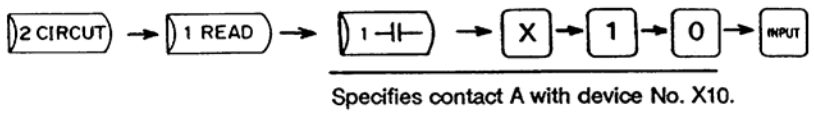
(2) If another contact or coil number is specified during the operation, the circuit block containing the specified contact or coil number is displayed under the one previously displayed.

(3) After all target blocks have been read, an attempt to read another circuit block causes PROG. NOT FOUND to be displayed in the message display area.

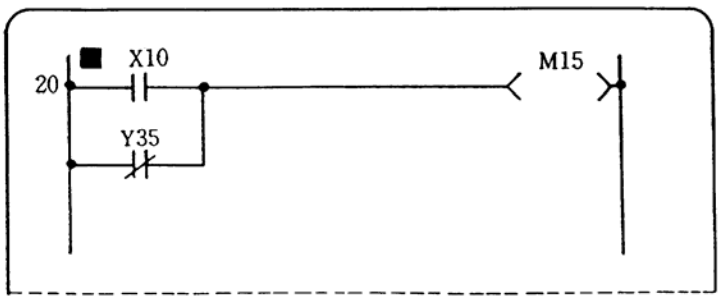
(4) When reading the circuit block by contact, pressing 1 and entering a device number reads contact A while pressing 2 and entering a device number reads contact B.

(5) Pressing 5 and entering a device number reads the OUT instruction.

(Example) Read the circuit block containing contact A with device No. X10.



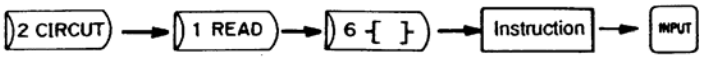
Specifies contact A with device No. X10.



3.3.4 Reading the circuit by instruction

This operation reads the circuit block containing the specified instruction.

[Basic operation]



[Operation procedure]

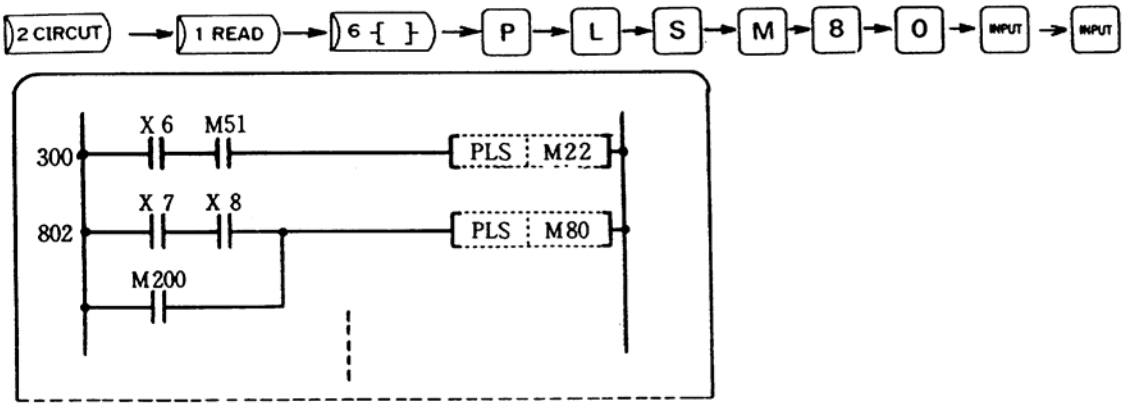
(1) Press 2 CIRCUIT, 1 READ, and 6 -[ ]-, specify the instruction, and then press INPUT. The circuit block containing the specified instruction is displayed.
If several circuit blocks contain the specified instruction, the circuit block with the smallest step number is first displayed. Pressing INPUT displays the circuit with the second smallest step number under the circuit block currently displayed. Specification of a device number is ignored.

(2) If another instruction is specified during the operation, the circuit block containing the specified instruction is displayed under the one previously displayed.

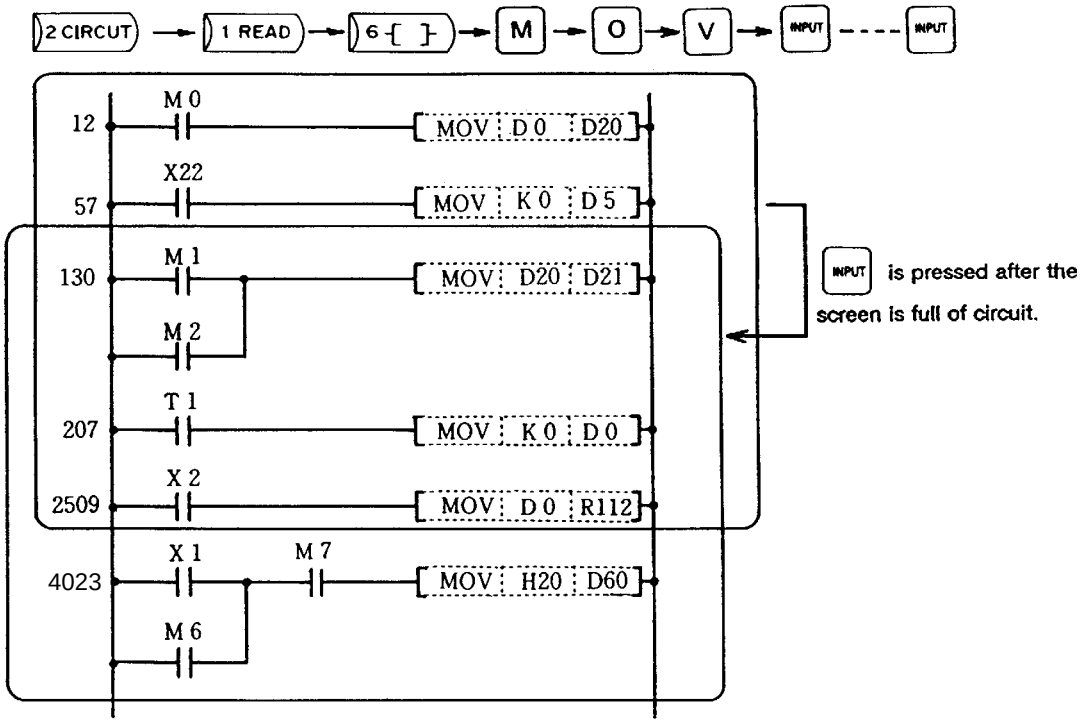
(3) When the screen is full of circuit blocks, pressing INPUT pushes the first circuit block out of the screen and adds another circuit block on the bottom. (See example 2.)

(4) After all target blocks have been read, an attempt to read another circuit block causes PROG. NOT FOUND to be displayed in the message display area.

(Example 1) Read the circuit block containing the PLS M80 instruction. (here, M80 is insignificant.)



(Example 2) Read the circuit block containing the MOV instruction.



3.3.5 Reading the circuit by END instruction

This operation reads the circuit block immediately before the block containing the END instruction.

[Basic operation]

2 CIRCUT → 1 READ → 6 -[ ]- → E → N → D → INPUT

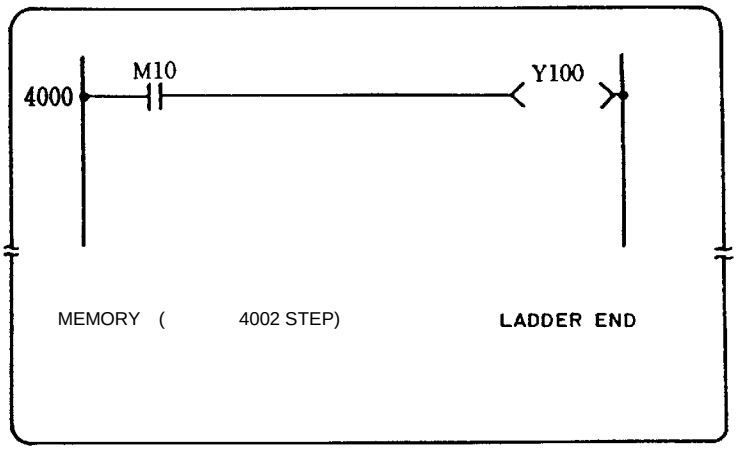
[Operation procedure]

(1) Press 2 CIRCUIT , 1 READ , and 6 -[ ]- , type E N D , and then press INPUT . The circuit block immediately before the one containing the END instruction is displayed.

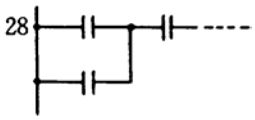
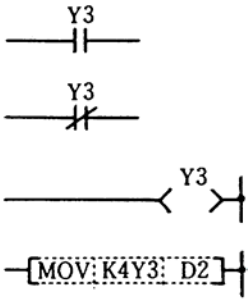
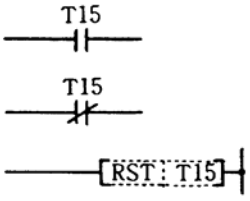
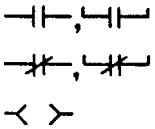
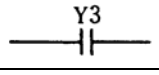
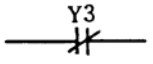
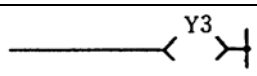
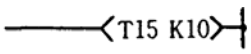
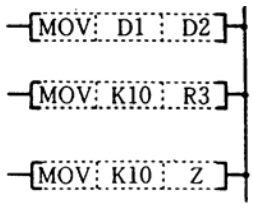
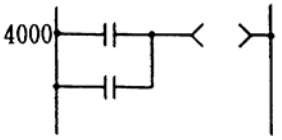
(Example) Read the last circuit block.

2 CIRCUT → 1 READ → 6 -[ ]- → E → N → D → INPUT

The message display area displays LADDER END.



3.3.6 Circuit read function

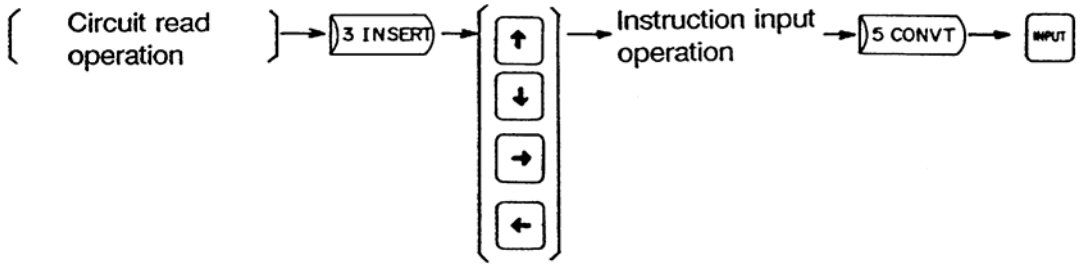
Read object	Example of operation	Example of displayed circuit	Remarks
Step number	9 SET 2 8 INPUT		Reads the circuit blocks of the specified step and succeeding steps.
Device number	Y 3 INPUT (M 1 0 INPUT P 1 0 INPUT ⋮)		Reads the circuit block containing the specified device number disregarding the types of symbols.
	T 1 5 INPUT (C 3 INPUT)		When reading a circuit block specifying device T or C, the device indicated by circuit symbol "-| < > |-" cannot by read. For example, -| < T15 K5 > |- cannot be read.
Circuit symbol  and device.	1 -| |- Y 3 INPUT		Reads each circuit symbol separately. The combination of circuit symbol "-[ ]-" and device number cannot be used for reading.
	2 -|/|- Y 3 INPUT		
	5 -< > Y 3 INPUT		
	5 -< > T 1 5 INPUT		Reads the circuit blocks of the specified timer or counter coil.
Circuit symbol -[ ]- with instruction code.	6 -[ ]- M O V INPUT		Reads the blocks containing the MOV instruction disregarding device numbers.
	6 -[ ]- E N D INPUT		Reads the last circuit block of the sequence circuit.

3.4 Inserting the Circuit

3.4.1 Inserting the circuit symbol

This operation inserts the circuit in units of circuit symbols.

[Basic operation]



[Operation procedure]

(1) According to the circuit read operation, display the circuit block into which a circuit symbol is to be inserted.

(2) Pressing 3 INSERT erases all circuit blocks except for the one at the cursor position.

- When inserting a circuit symbol into the circuit block other than the one displayed on the top of the screen, move the cursor to the beginning of the target block and then press 3 INSERT : the specified circuit block moves to the top of the screen and the other blocks disappear.

(3) Using the cursor keys, move the cursor to the position where a symbol is to be inserted and perform the instruction input operation. Note that, depending on the system, data insertion may be not allowed at the top of the screen. with such system, an attempt to insert a circuit symbol results in an operation error, displaying OPERATION ERROR in the message display area.

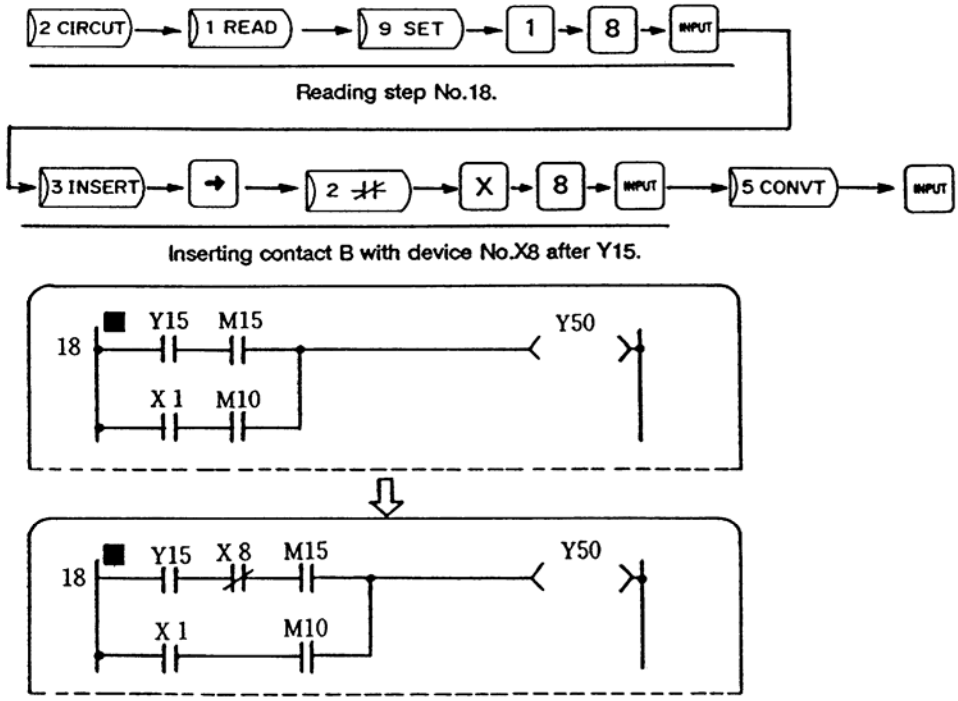
(4) After insertion of a circuit, be sure to press 5 CONVT and INPUT .

When INPUT is pressed, COMPLETED is displayed in the message display area and the updated circuit is displayed.

Point

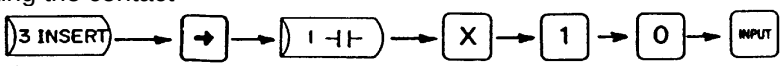
Inserting or adding a circuit changes automatically the succeeding program step numbers and CJ destination labels.

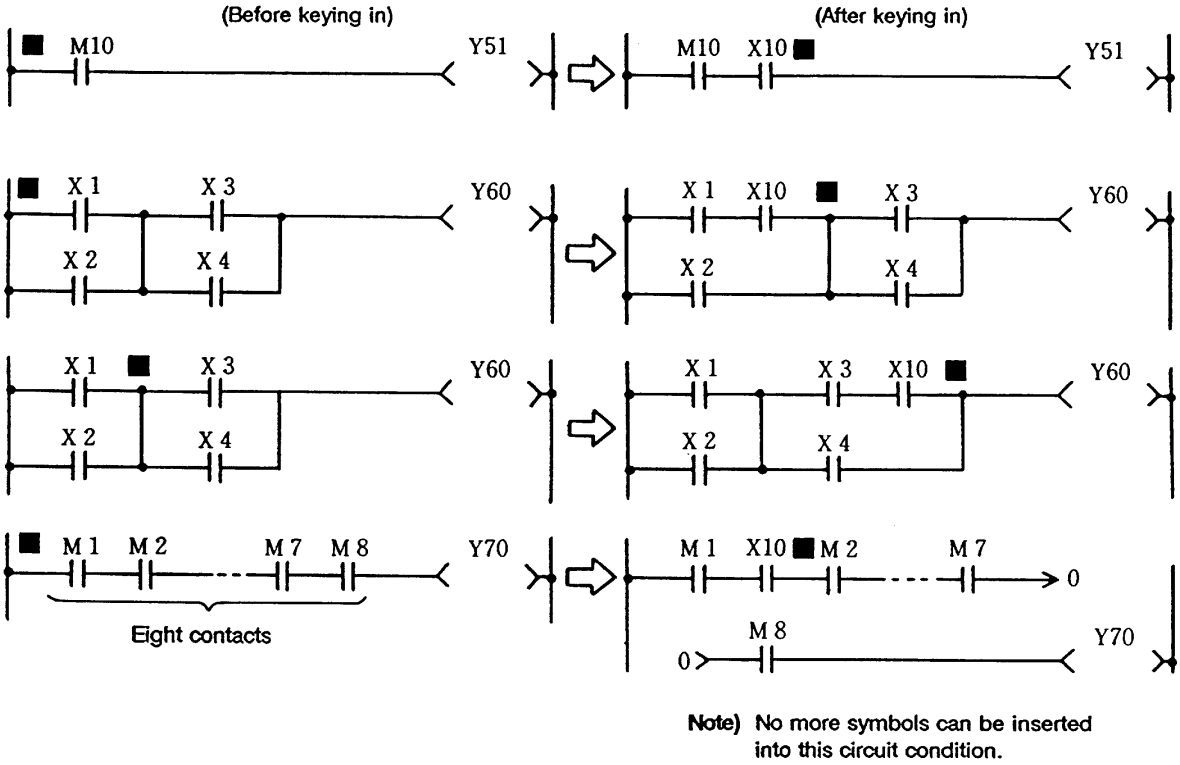
(Example) Read step No.18 and insert contact B with device No.X8 as an AND circuit after the contact with device No. Y15.



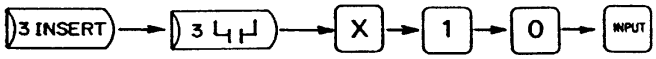
The following shows the examples of insertion/addition of other circuit symbols.

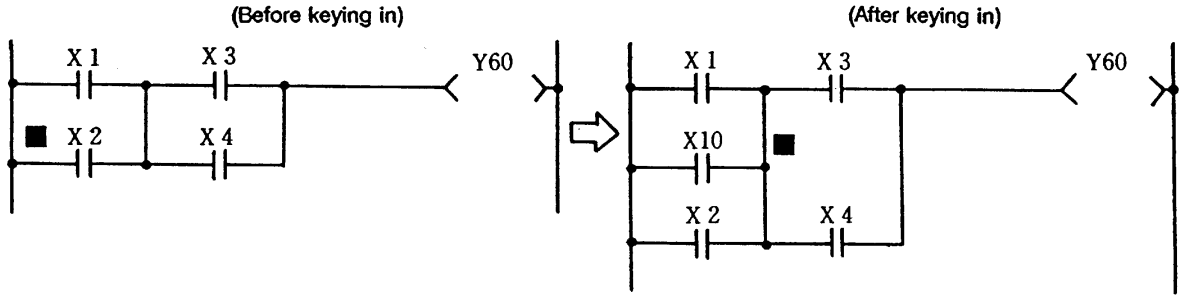
(a) Inserting the contact

(i) 

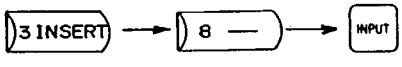


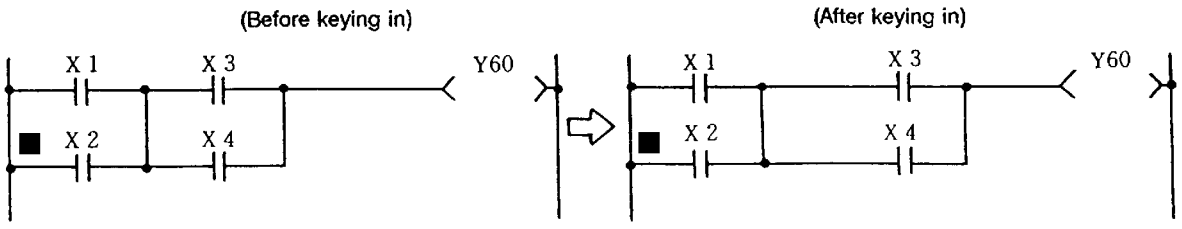
Note) No more symbols can be inserted into this circuit condition.

(ii) 

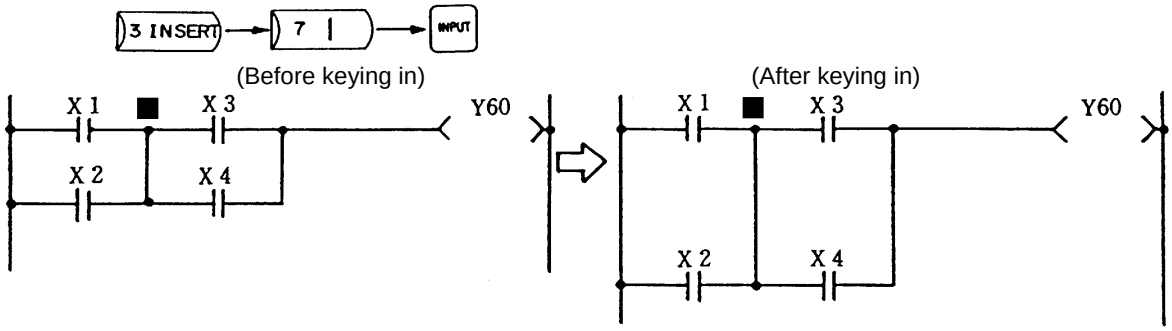


(b) Inserting the horizontal bar





(c) Inserting the vertical bar

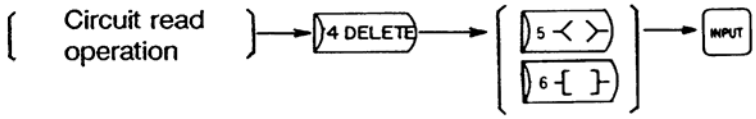


3.5 Deleting the Circuit

3.5.1 Deleting the circuit block

This operation can delete circuit blocks one by one.

[Basic operation]



[Operation procedure]

(1) According to the circuit read operation, display the circuit block to be deleted.

(2) Pressing 4 DELETE erases all circuit blocks except for the one at the cursor position.

- When deleting the circuit block other than the one displayed on the top of the screen, move the cursor to the beginning of the target block and then press 4 DELETE : the specified circuit block moves to the top of the screen.

(3) Press 5 or 6 . DELETE 1-CIRCUIT is displayed in the message display area. Pressing the INPUT key again deletes the specified block.

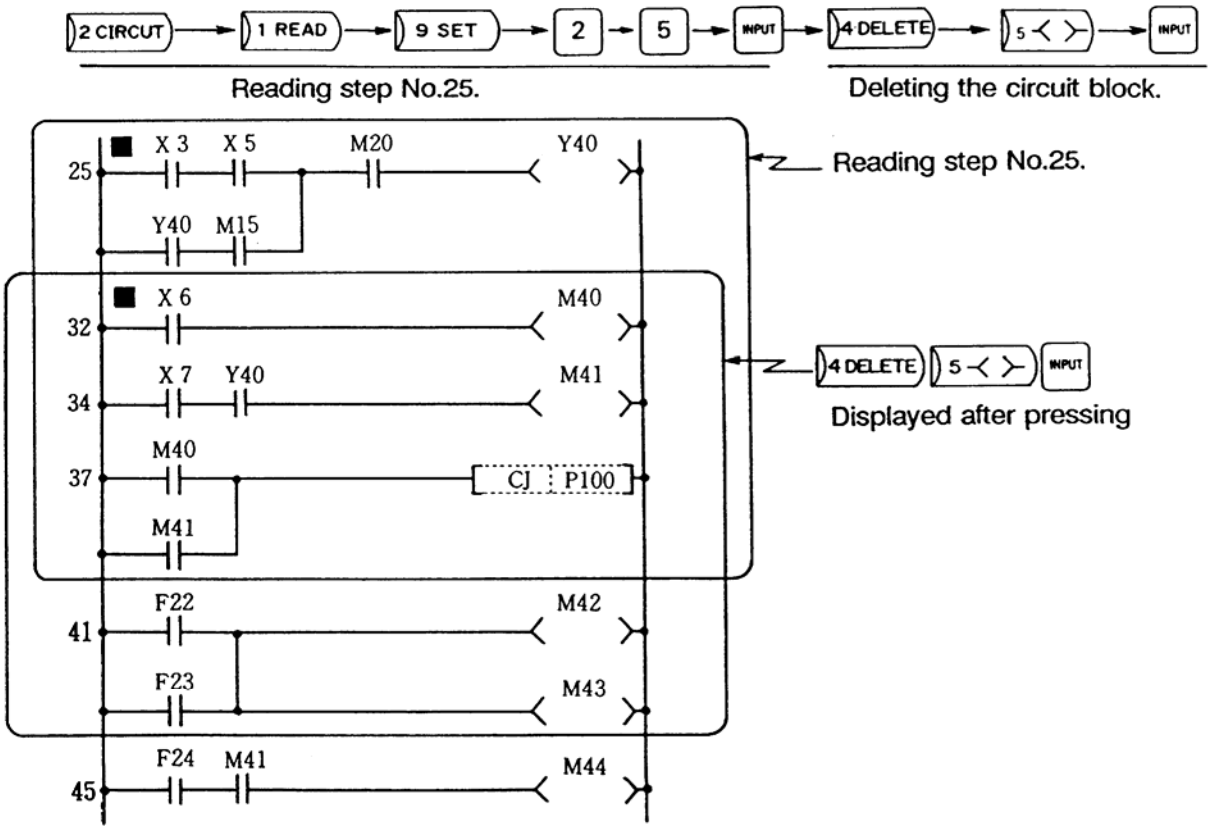
- Even when the target circuit block contains the data instruction for the output device, pressing 4 DELETE and 5 or 6 , and INPUT can delete the block.

Note) After deleting the circuit block, there is no need to press 5 CONVT and INPUT .

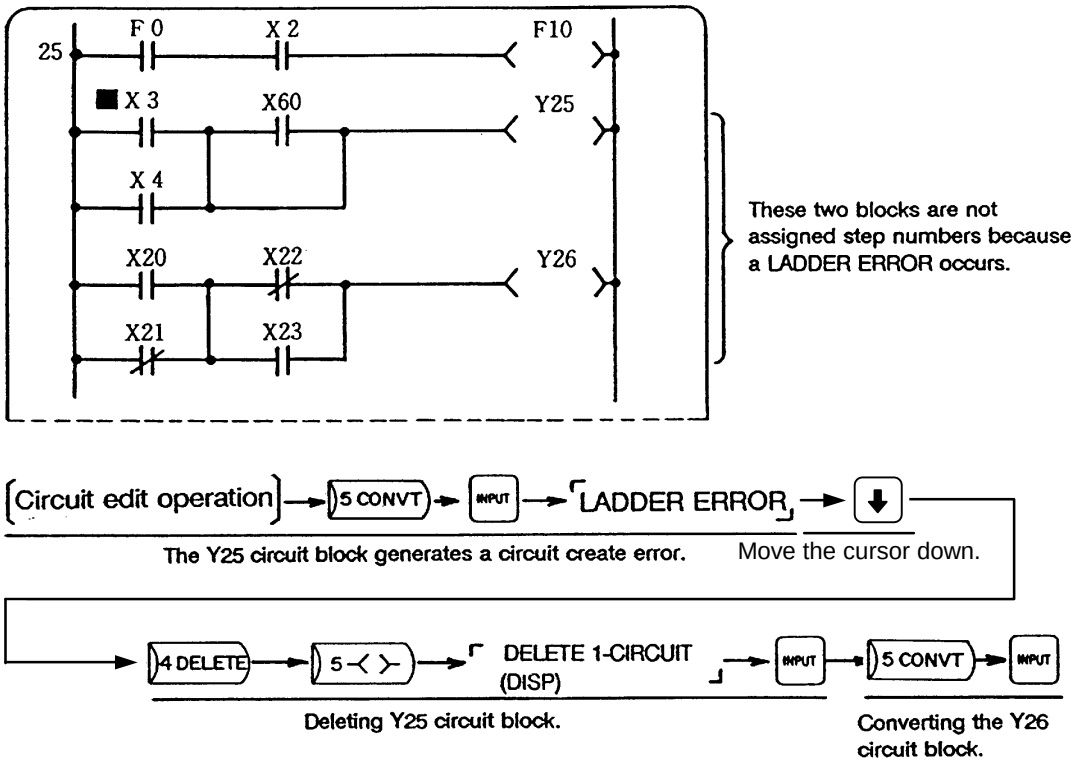
Point

Deleting a circuit changes automatically the succeeding program step numbers and CJ destination labels.

(Example) Read step No.25 and delete the circuit block containing it.



(Example) When an attempt to press [5 CONVT] and [INPUT] after creating the circuit causes a LADDER ERROR, delete the faulty circuit block. Or, delete a circuit block before pressing [5 CONVT] and [INPUT] .

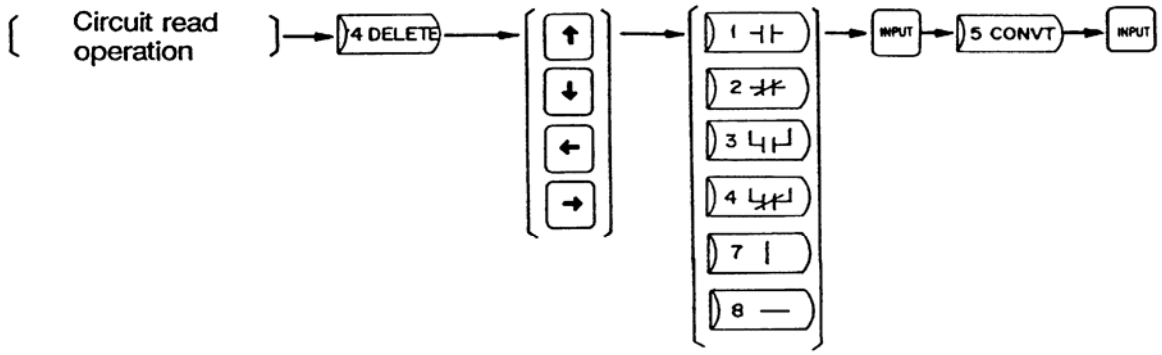


When a normal circuit block is deleted, DELETE 1-CIRCUIT is displayed in the message display area. when a circuit block with no step number assigned is deleted, DELETE 1-CIRCUIT (DISP) is displayed.

3.5.2 Deleting the circuit symbol

This operation can delete a sequence circuit in units of circuit symbols.

[Basic operation]



[Operation procedure]

(1) According to the circuit read operation, display the circuit block containing the circuit symbol to be deleted.

(2) Pressing 4 DELETE erases all circuit blocks except for the one at the cursor position.

- When deleting the circuit block other than the one displayed on the top of the screen, move the cursor to the beginning of the target block and then press 4 DELETE : the specified circuit block moves to the top of the screen.

(3) Using the cursor keys, move the cursor to the circuit symbol to be deleted, and press 1 , 2 , 3 , 4 , 7 , or 8 then press INPUT to delete it.

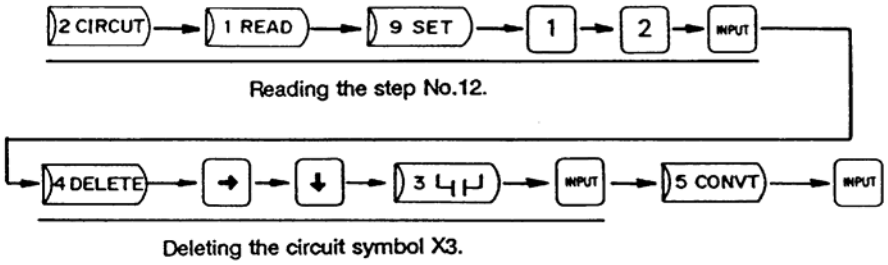
(4) After deleting the circuit, be sure to press 5 CONVT and INPUT .

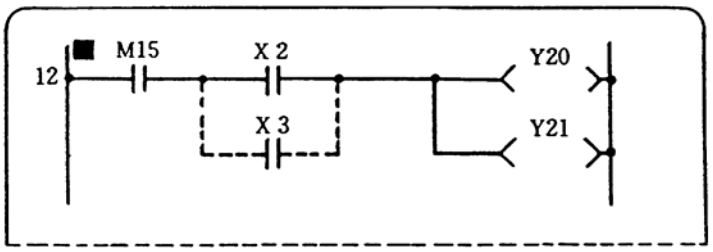
When the INPUT key is pressed, COMPLETED is displayed in the message display area and the updated circuit is displayed.

Point

Deleting a circuit symbol and conversion change automatically the succeeding program step numbers and CJ destination labels.

(Example) Read step No.12 and delete X3.

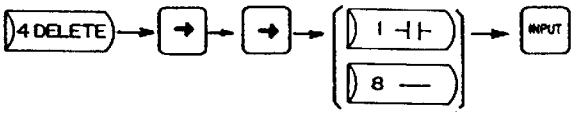


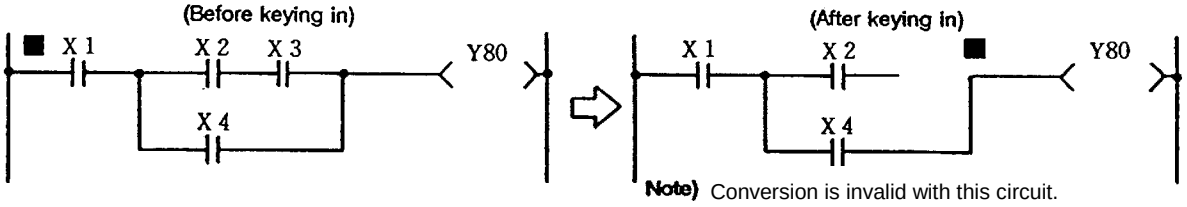


The following shows examples of deletion of other circuit symbols.

(a) Deleting the contact

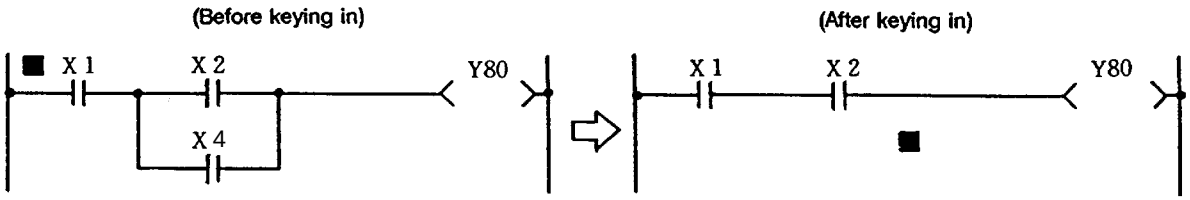
(i) 

or 

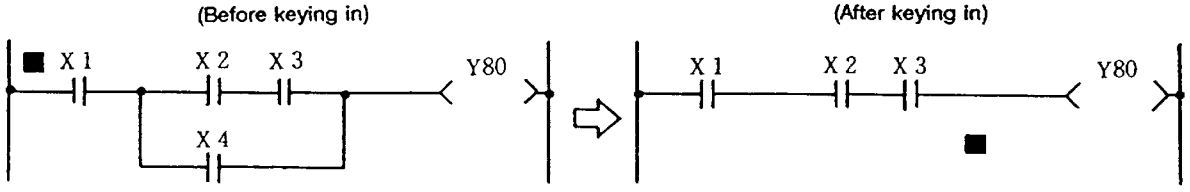


Note) Conversion is invalid with this circuit.

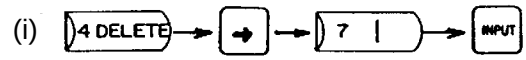
(ii) 

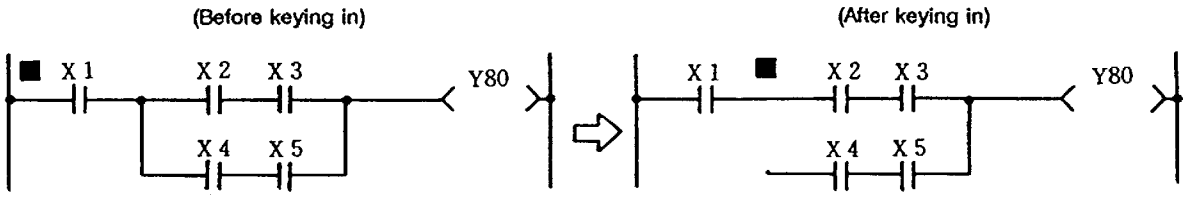


(iii) 



(b) Deleting the vertical bar

(i) 



Note) Conversion is invalid with this circuit.

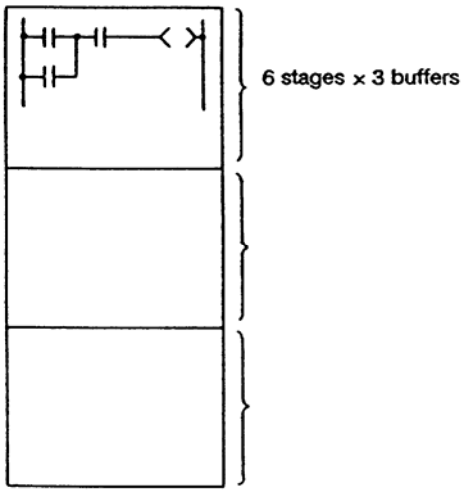
3.6 Circuit Extension Function

The circuit extension function is used to create an M300 series ladder circuit which is wider than eight contacts and one coil (equivalent to nine contacts). The circuit extension function operation method and specifications are explained.

Caution

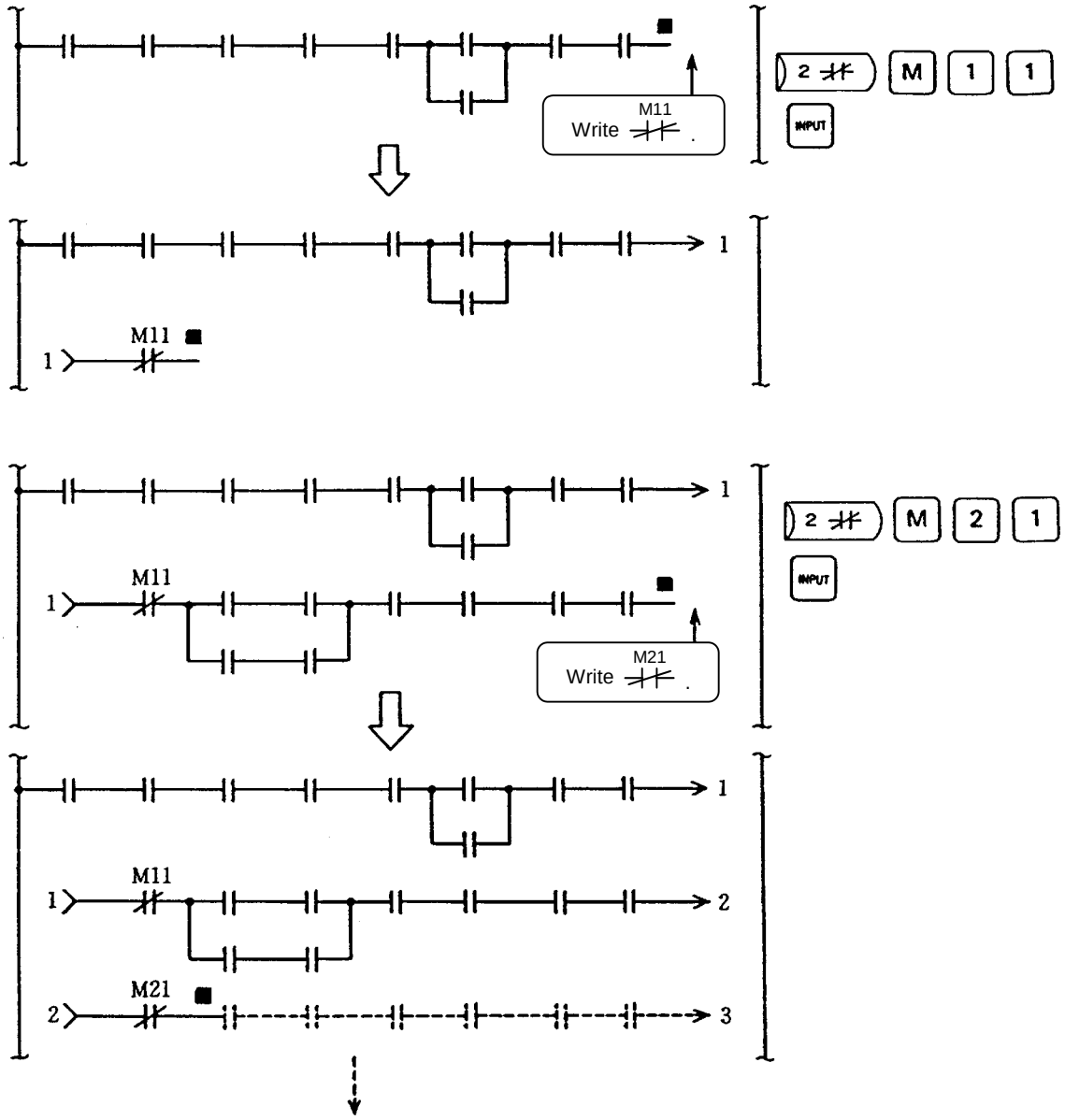
(1) When) 2 WRITE is pressed, a maximum of six returns can be made if the number of extended lines is one; when) 3 INSERT is pressed, the number of returns is up to one.

Ladder circuit display buffers consist of 18 stages long and nine contacts (containing a coil) wide. Six stages are displayed on the screen. The section not displayed on the screens displayed by using ↑ ↓ .



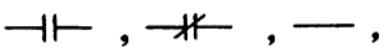
3.6.1 Extension circuit operation examples

(1) Write example of a single return

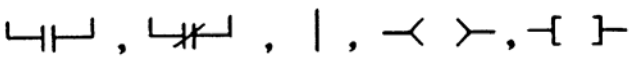


Likewise, a maximum of six returns can be made if the number of extended lines is one.

- Circuit symbols to enable an extension during write

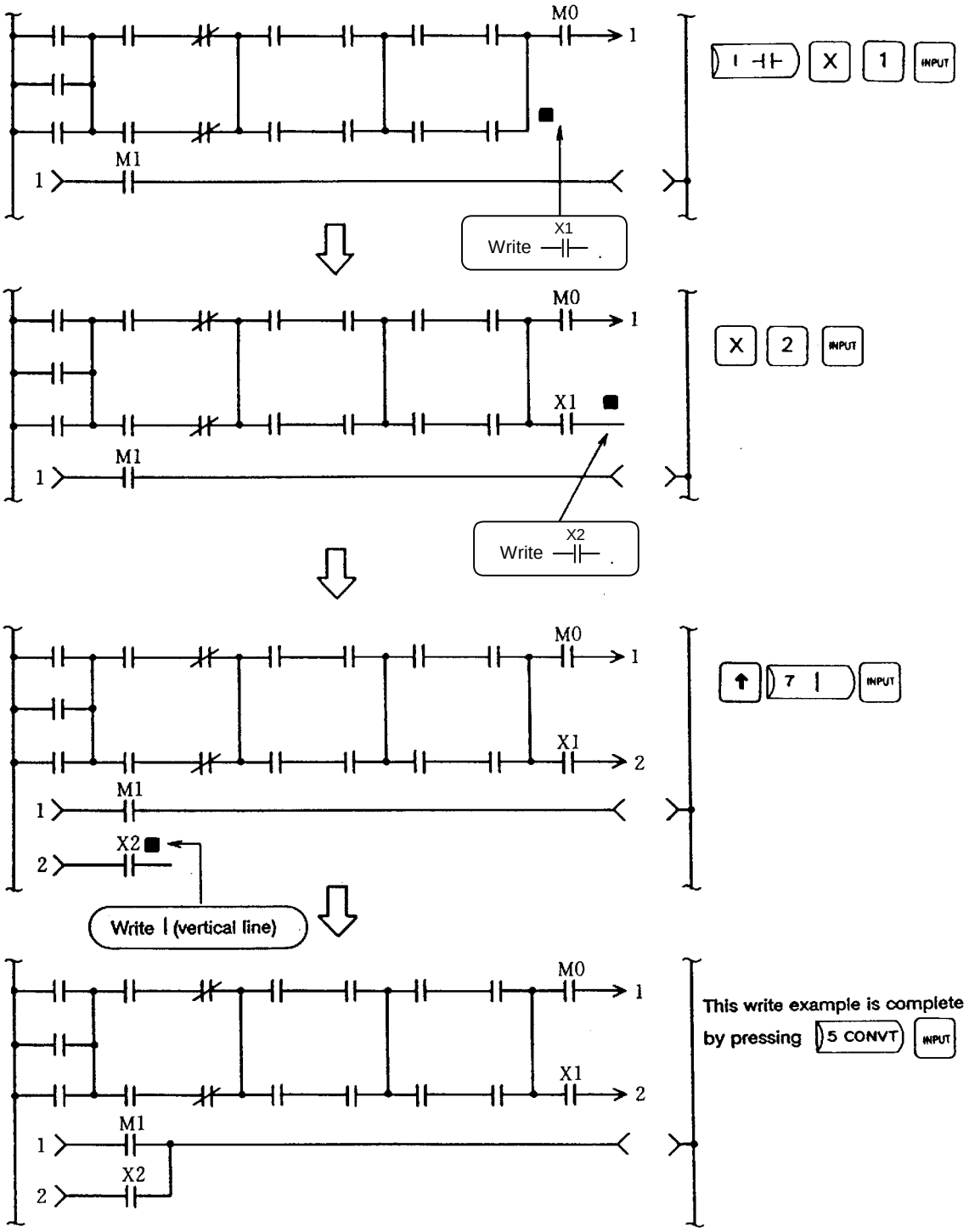


- Circuit symbols to disable an extension during write

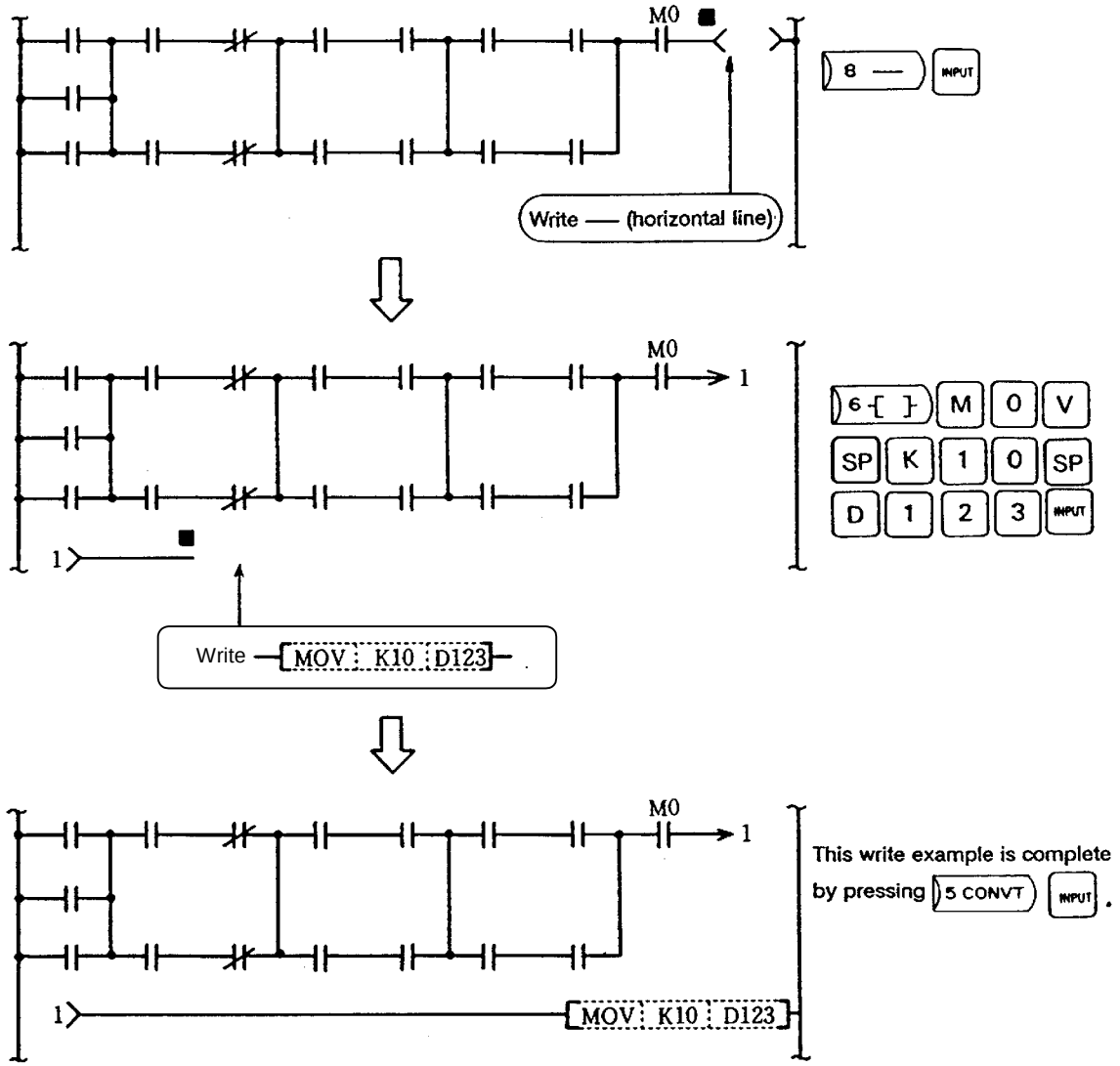


If any of the symbols is used, an "OPERATION ERROR" occurs when INPUT is pressed.

(2) Write example of two or more extended lines

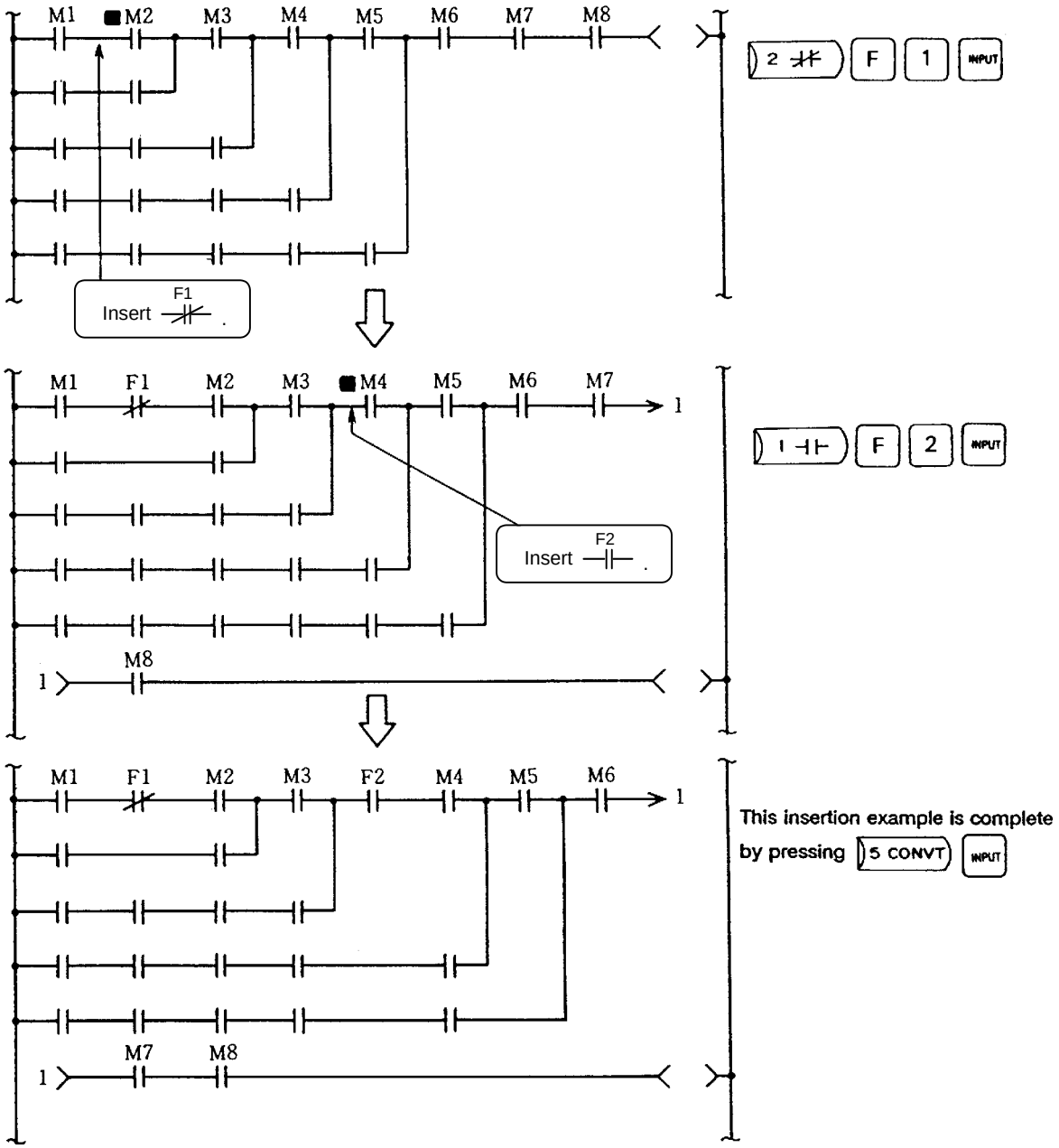


(3) Write example of function instruction into return part



To write a function instruction into the return part, once extend by writing — (horizontal line) before writing the function instruction. If the function instruction is directly written, an "OPERATION ERROR" occurs.

(4) Insertion example 1 of a single extended line



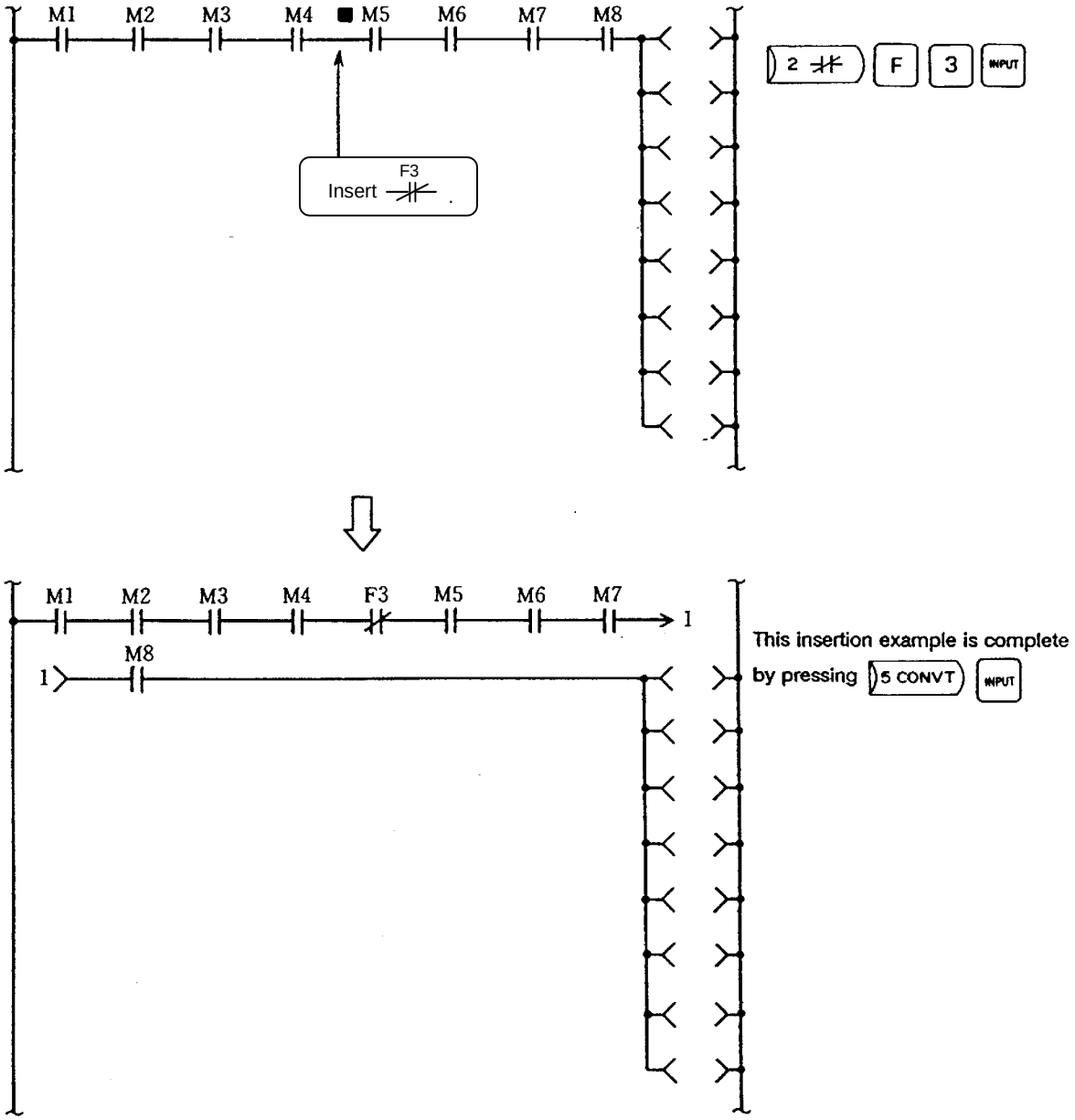
- The insertion function inserts a contact ⊣⊢ , ⊣/⊢ , —— , etc., in the cursor position.
  If nine contacts (containing a coil) are exceeded, the line is extended as shown above. However, only one return can be made in insertion operation.
- Circuit symbols to enable an extension during insertion

  ⊣⊢ , ⊣/⊢ , —— ,
- Circuit symbols to disable an extension during insertion

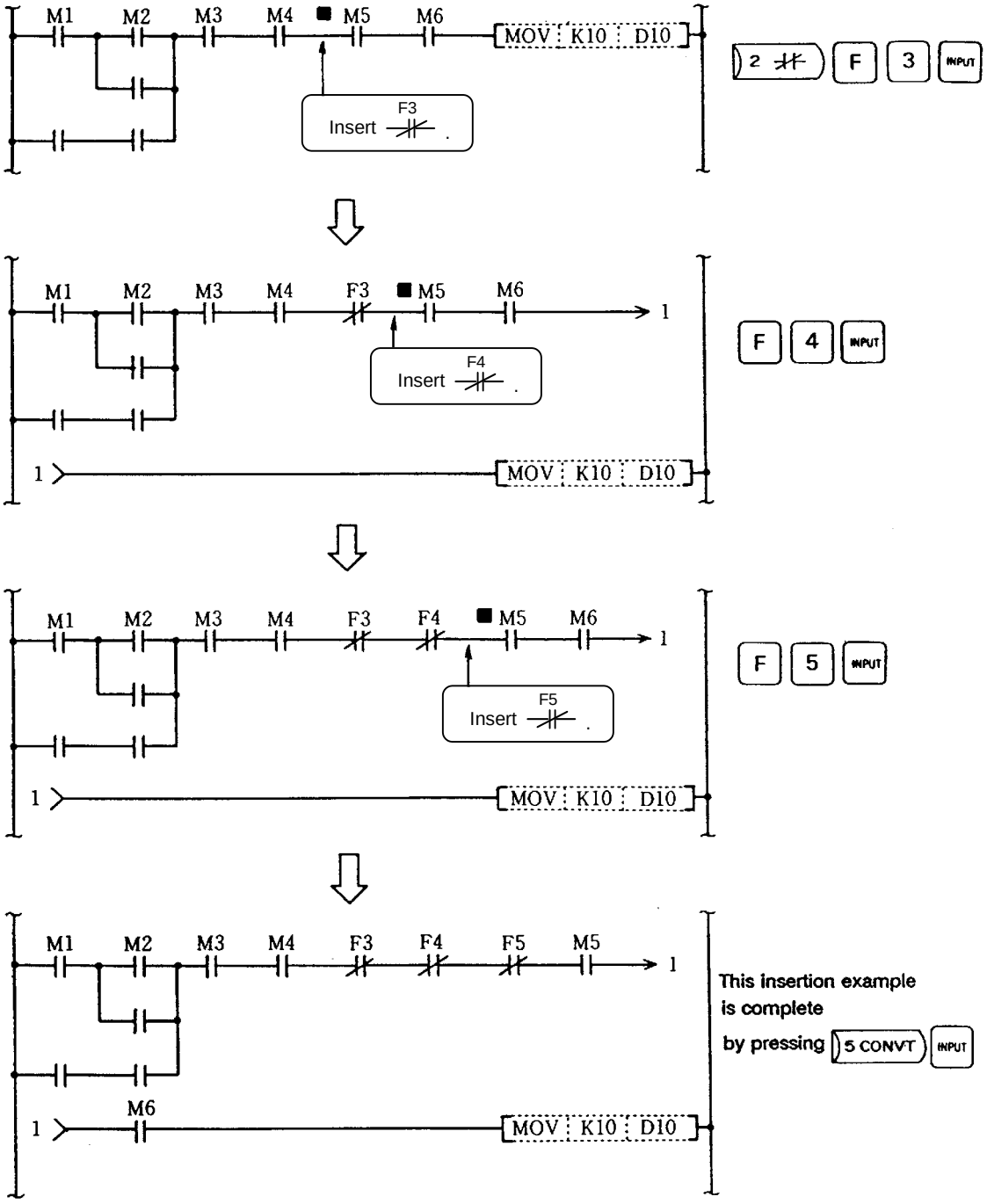
  ⊣↓⊢ , ⊣/↓⊢ , | , ─< >─ , ─[ ]─

  If any of the circuit symbols is used, an "OPERATION ERROR" occurs when INPUT is pressed.

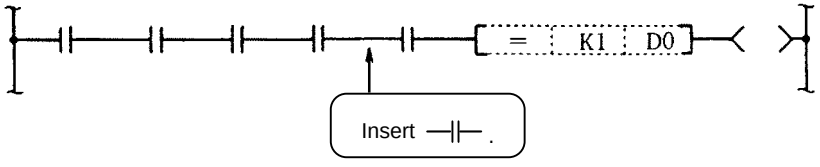
(5) Insertion example 2 of a single extended line (when more than one coil exists)



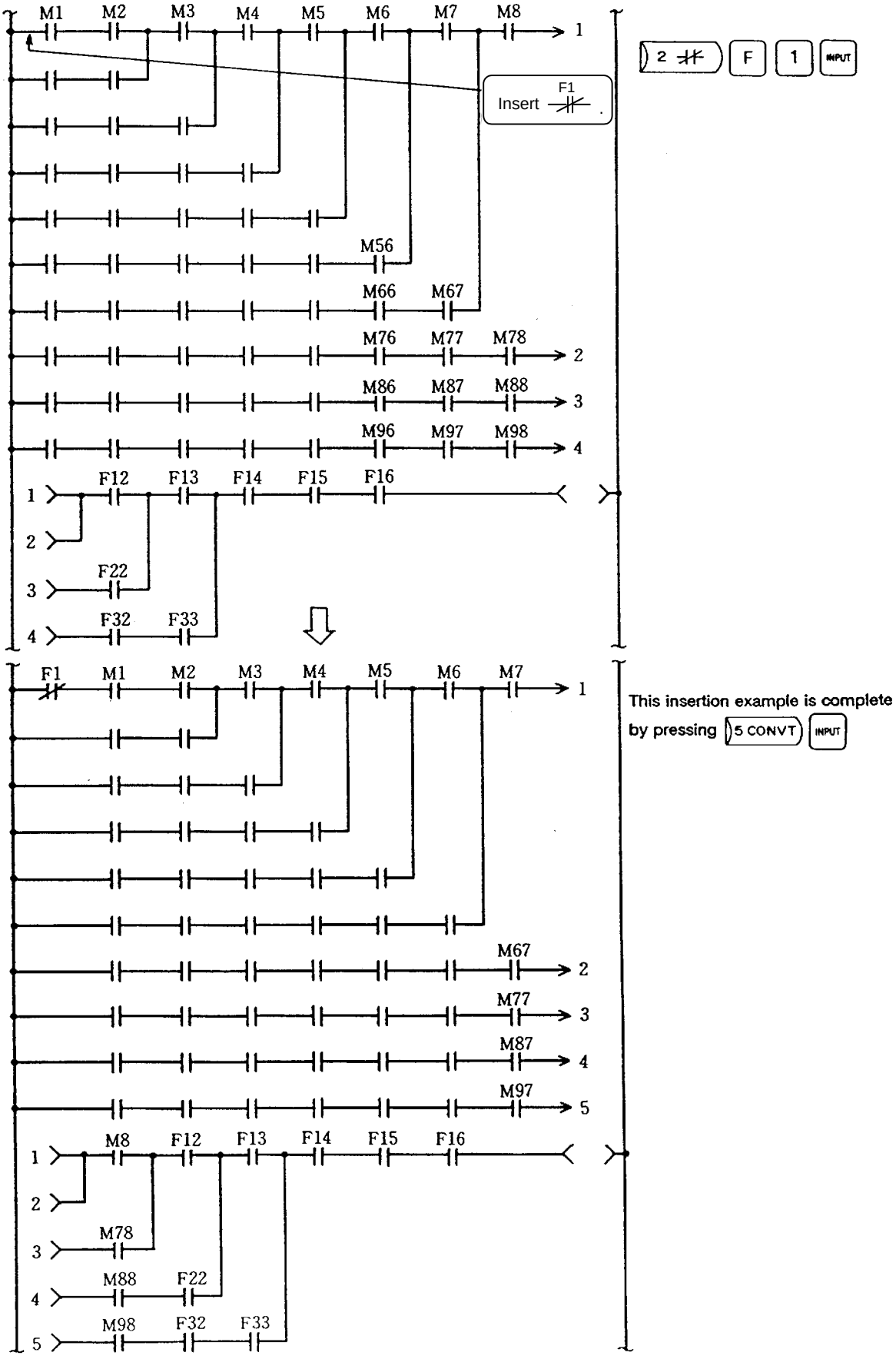
(6) Insertion example when function instruction exists in coil part



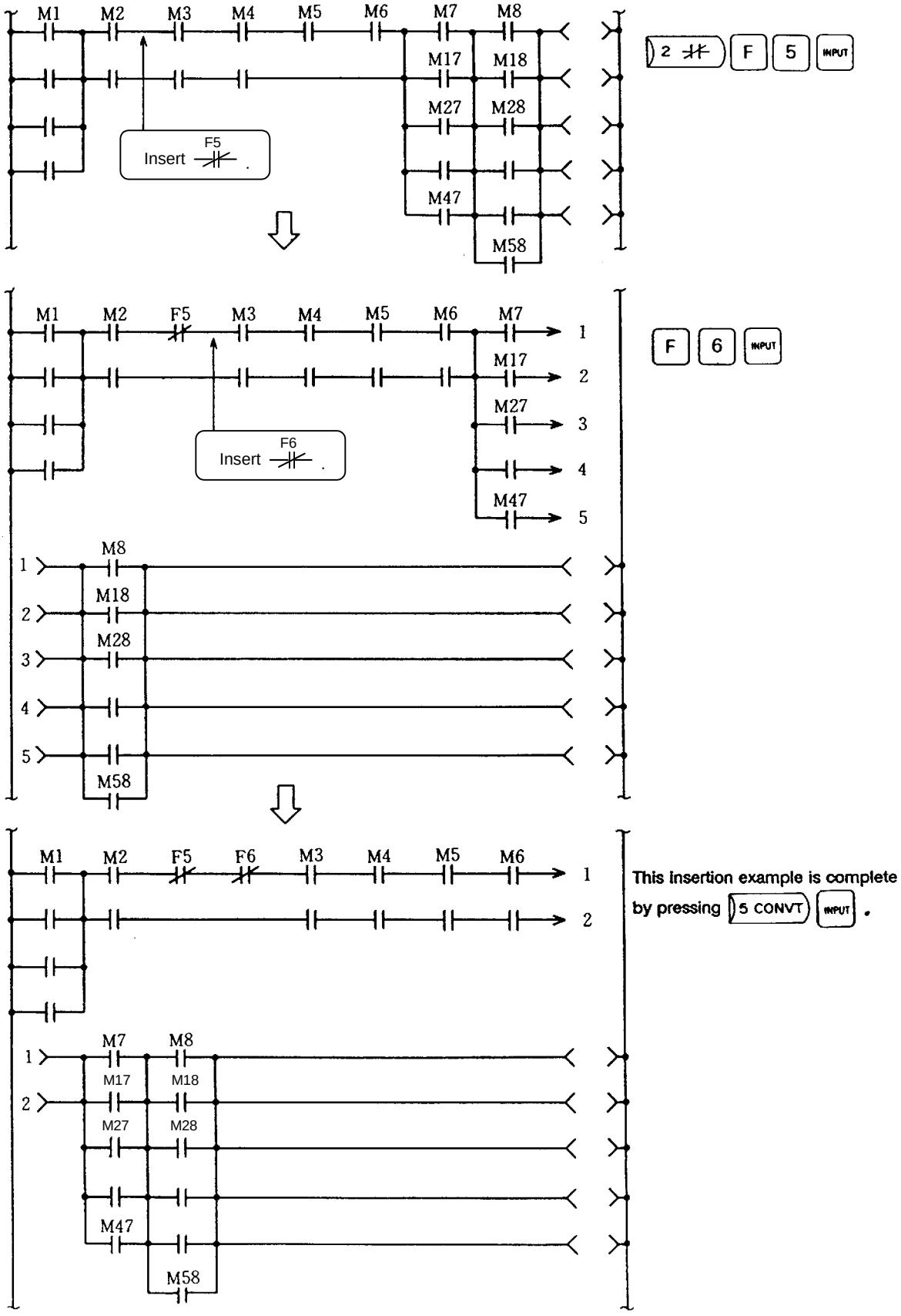
Note) If a function instruction handled as a contact, such as =, >, or < exists in the return part, no insertion can be made. If insertion is made, an "OPERATION ERROR" occurs.



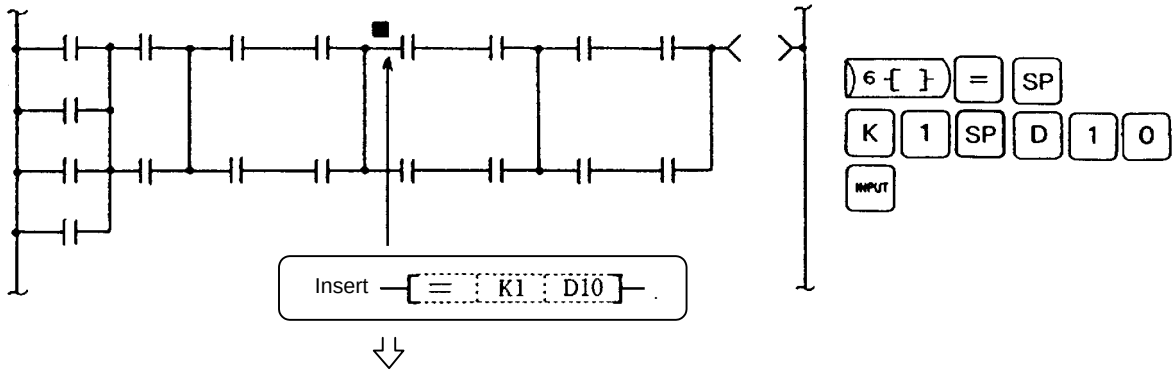
(7) Insertion example 1 when two or more lines are extended



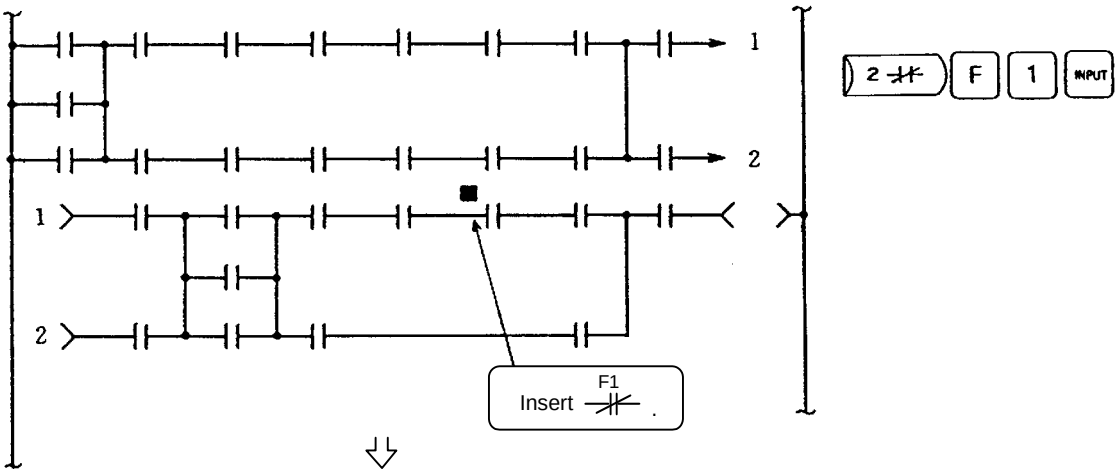
(8) Insertion example 2 when two or more lines are extended



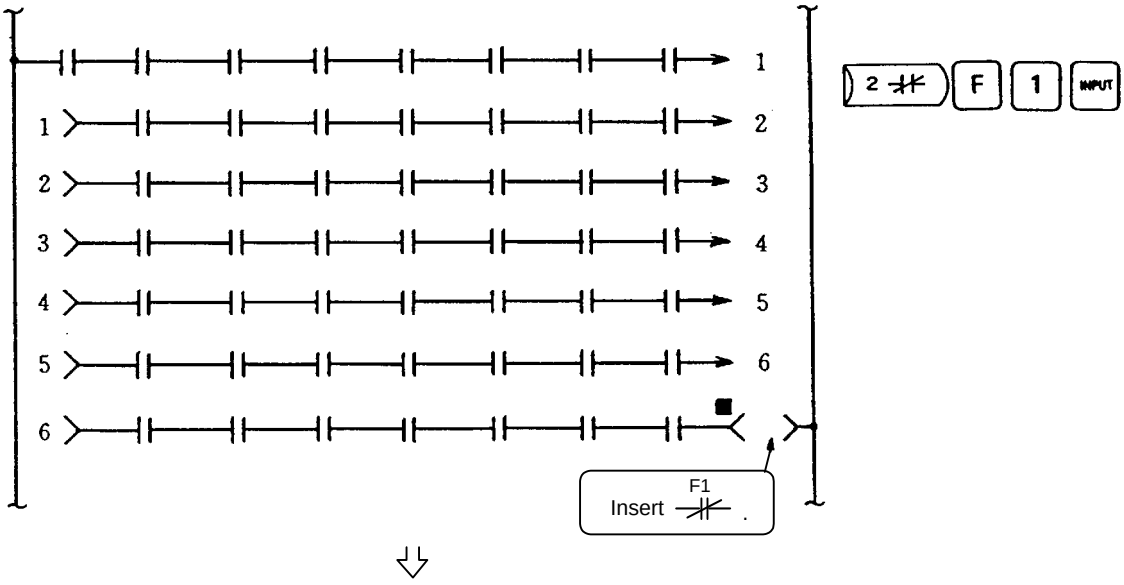
3.6.2 Error message



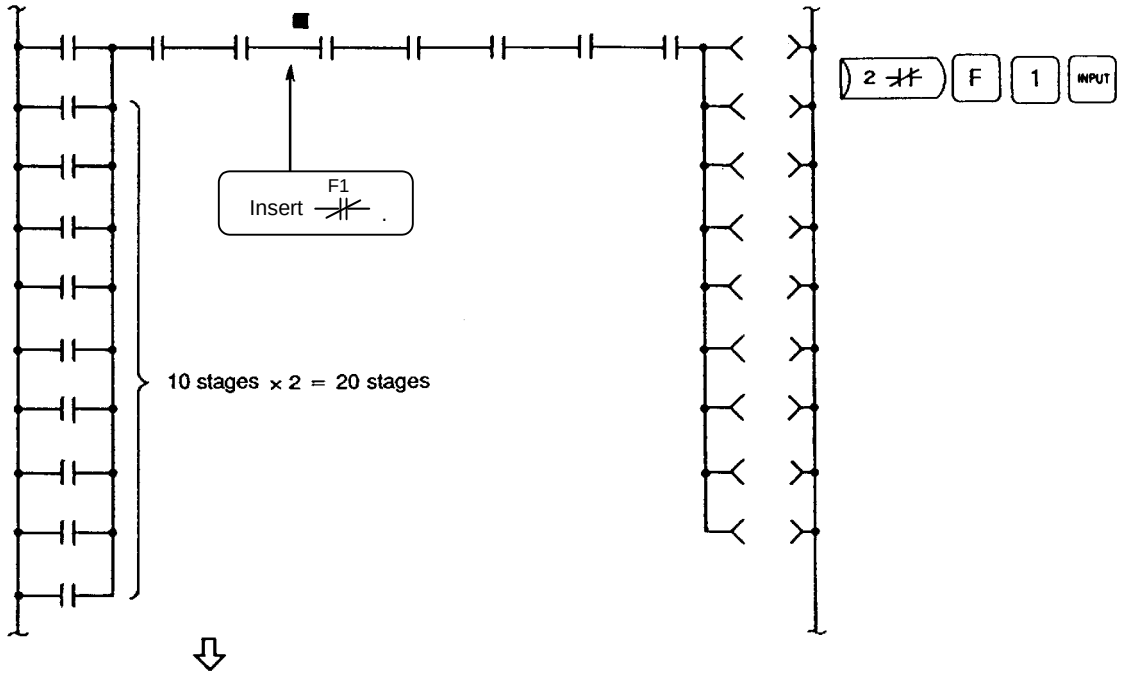
An "OPERATION ERROR" occurs.



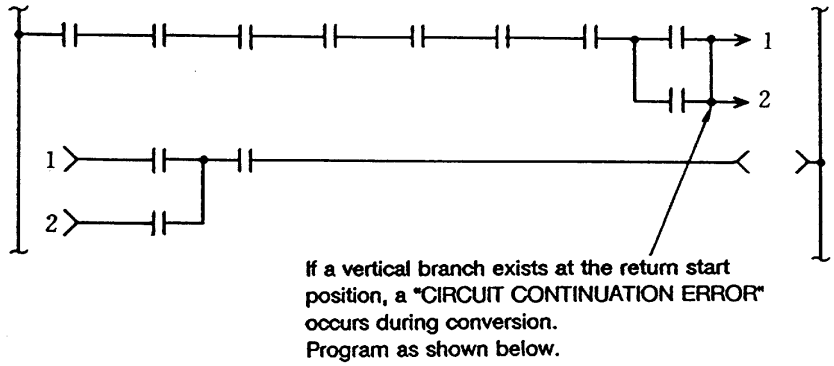
A "CIRCUIT CONTINUATION ERROR" or "OPERATION ERROR" occurs.
If two or more lines are extended, only one return can be made.



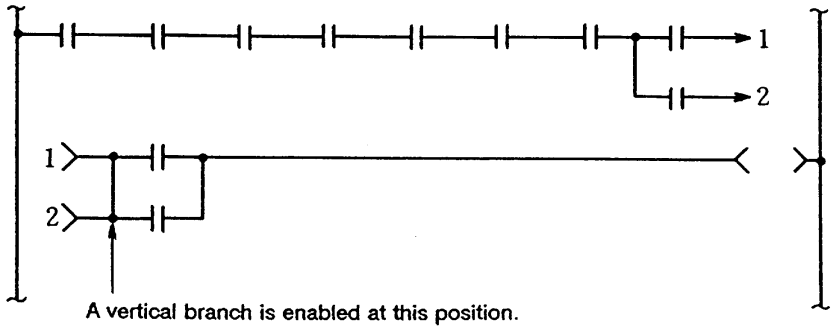
"CIRCUIT CONTINUATIVE SIZE OVER" occurs.
The number of returns is maximum six.



"LADDER OVER FLOW" occurs. The maximum number of stages as a result of extension is 18.



If a vertical branch exists at the return start position, a "CIRCUIT CONTINUATION ERROR" occurs during conversion.
Program as shown below.



A vertical branch is enabled at this position.

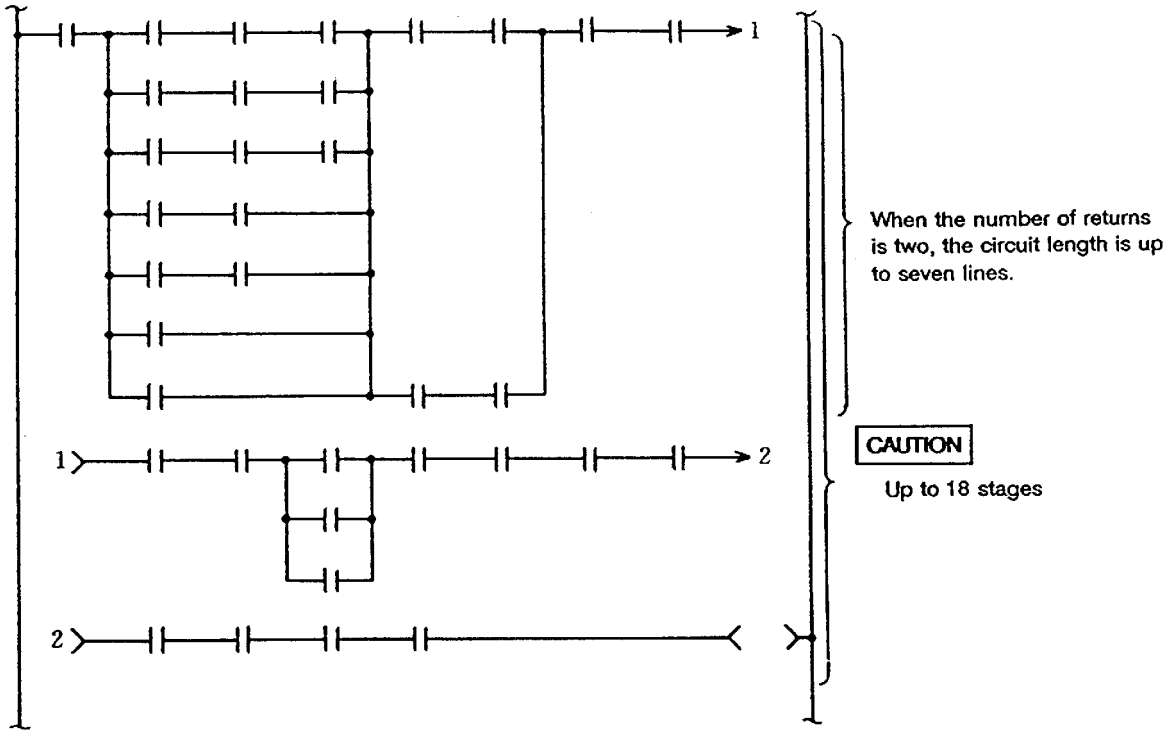
3.6.3 Relationship between number of returns and circuit length

The relationship between the number of returns and the maximum length of circuit that can be created at the time is as listed below:

Number of returns (times)	0	1	2	3	4	5	6	7	8
Circuit length (stages)	18	11	7	5	4	3	3	2	2

When the limits are exceeded, a "CIRCUIT CREATION ERROR" occurs.

(Example)

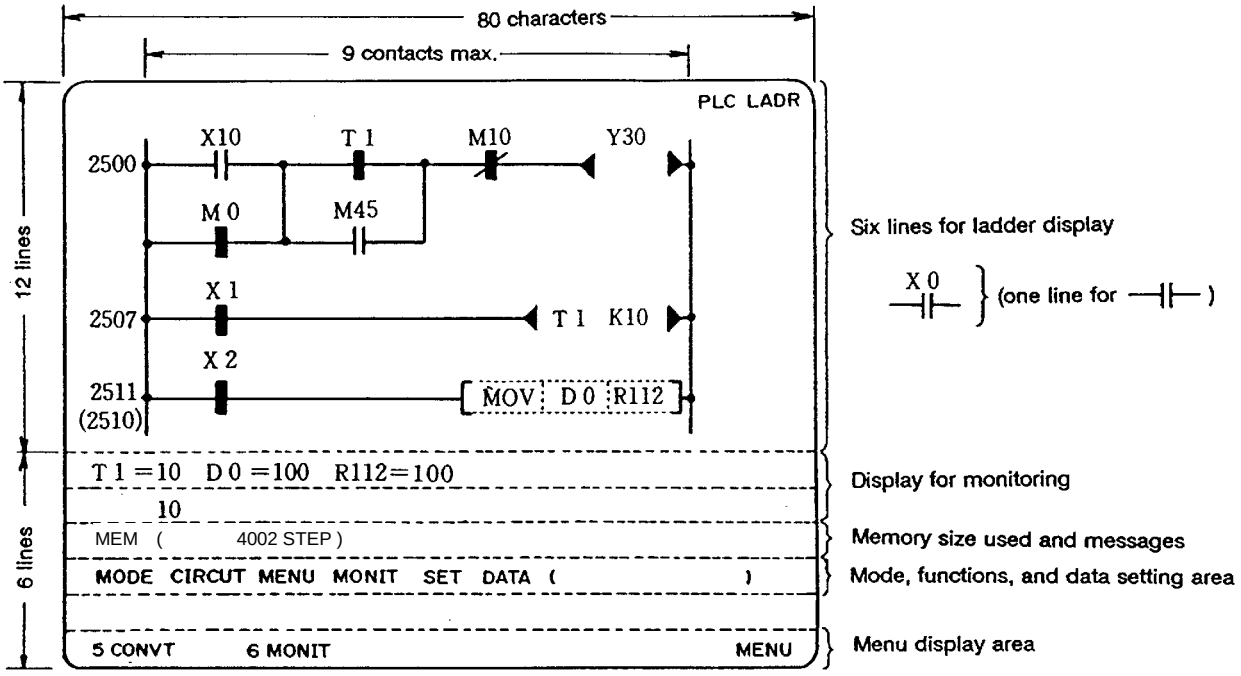


3.7 Monitoring the Ladder Circuit

The operation state of the sequence circuits can be monitored. The following monitoring functions are available:

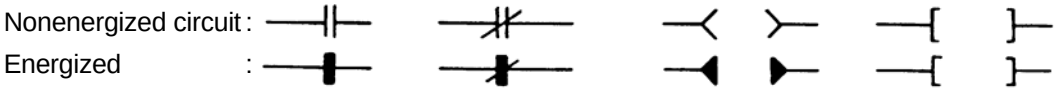
1. Circuit monitoring function
2. Screen freezing function at monitor stop trigger point
3. Registered device monitoring function
4. Decimal/hexadecimal current value monitoring function

(1) Screen display structure during monitoring



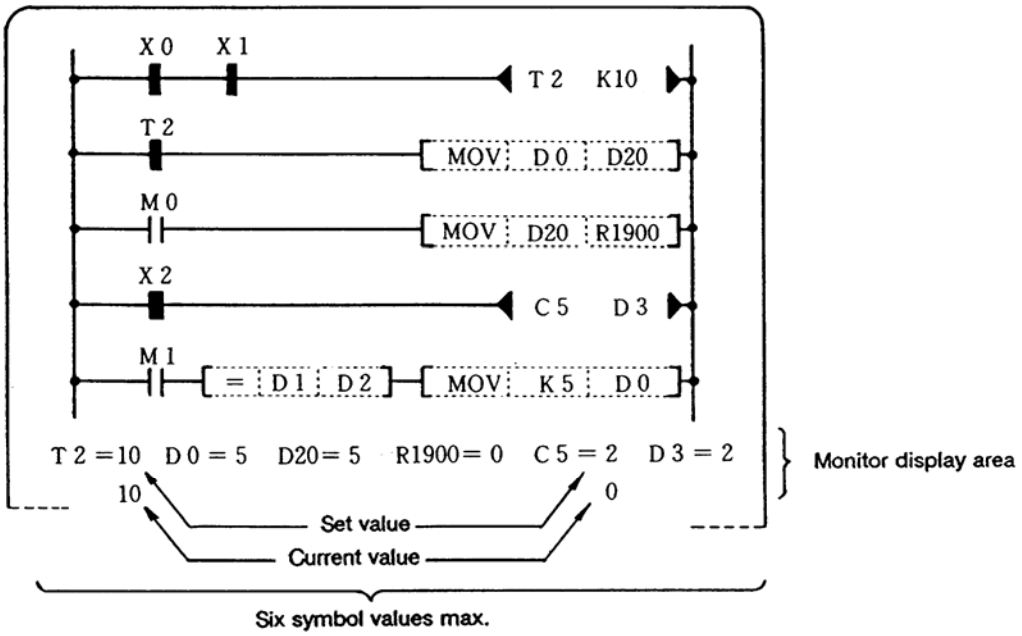
(2) Monitor screen display method

(a) An energized circuit and nonenergized circuit are displayed as follows:



(b) The monitor screen displays not only the ON/OFF states of the circuits but also the set values and current values of the timer (T), counter (C), data register (D), and file register (R) contained in the circuits displayed. Up to six values of such symbols from the above of the circuits are displayed in order from left to right in the monitor display section.

(Example)



Note 1) The set and current values of the timer and counter are monitored disregarding whether the circuit symbols are contacts (⊣⊢ , ⫤⊨) or coils (≺ ≻). If the set value is not a constant but the data register value, the contents of the data register are monitored as the set value.
The values set not by a program but by the "SETUP PARAMETERS" on the PLC TIMER screen and PLC COUNTER screen can be used as the set values of the timer (T) and counter (C), in which case the values set by the screens are displayed as the set values.

BIT SELECT Parameter #6449		Setting method
BIT0	OFF	The timer value set in PLC TIMER screen is valid.
	ON	The timer value set in program is valid.
BIT1	OFF	The counter value set in PLC COUNTER screen is valid.
	ON	The counter value set in program is valid.

Note 2) When data in the data register and file register is displayed for monitoring, the system converts the data stored in a binary form from 0 to 65535 to decimal number. Therefore, if the contents are BCD data, different figures are displayed.

(Example)

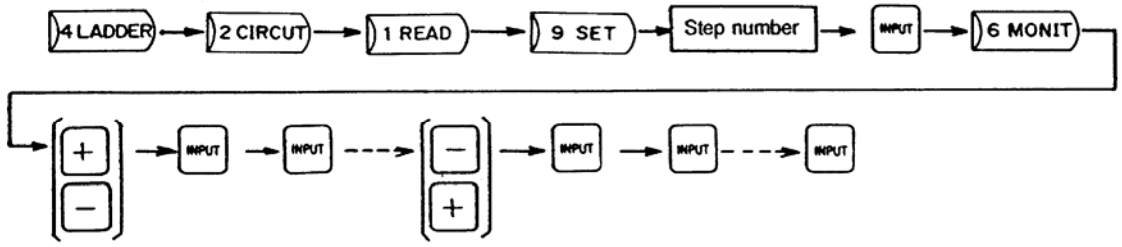
- When D0 in the ⊣[MOV | K99 | D0]⊢ circuit is monitored, D0=99 is displayed.
- When D0 in the ⊣[BCD | K99 | D0]⊢ circuit is monitored, D0=153 is displayed.

(c) The MCR instruction and function instructions are always displayed in the form of ⊣[ ]⊢ regardless of the operation states. These are never displayed in ⊣ ⊢ .

3.7.1 Monitoring the circuit

This operation monitors the operation states of the sequence circuits dynamically.

[Basic operation]



[Operation procedure]

(1) According to the circuit read operation, read the circuit block to be monitored.

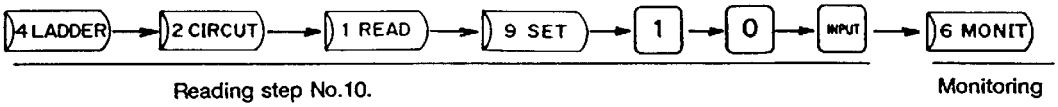
(2) Pressing [6 MONIT] displays the operation state of the sequence circuit and the set and current values of the timer, counter, data register, and file register for monitoring.

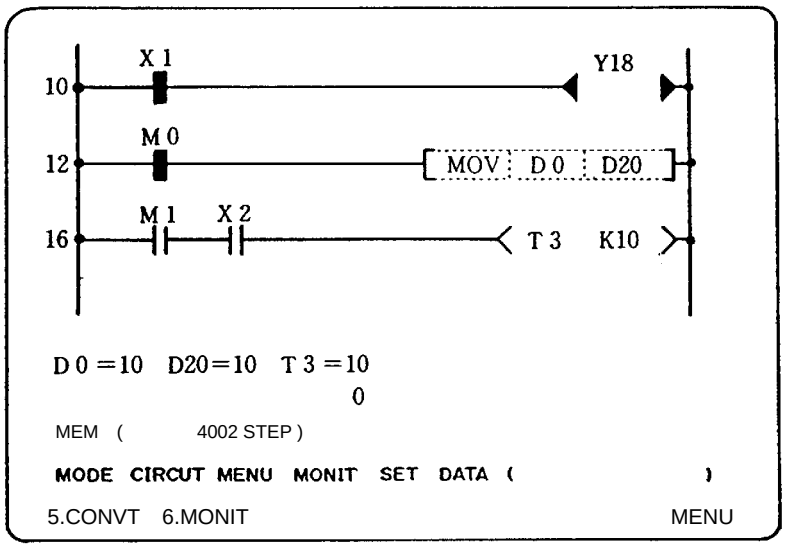
- Successively pressing the [+] and [INPUT] keys enables monitoring the succeeding circuit.
- To monitor the circuit preceding the one currently displayed, press the [−] and [INPUT] keys.

  After this, the circuit preceding the current one can be monitored sequentially each time [INPUT] is pressed.

  After pressing the [−] and [INPUT] keys, pressing the [+] and [INPUT] keys returns to the previous circuit. After this, the succeeding circuit can be monitored sequentially each time [INPUT] is pressed.

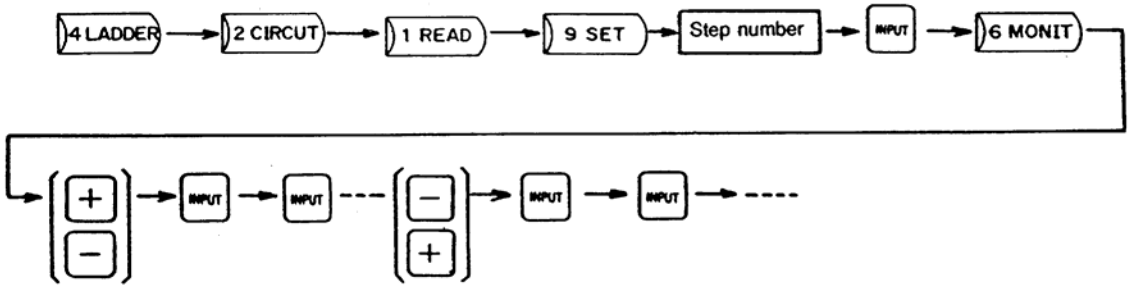
(Example) Read and monitor step No.10.



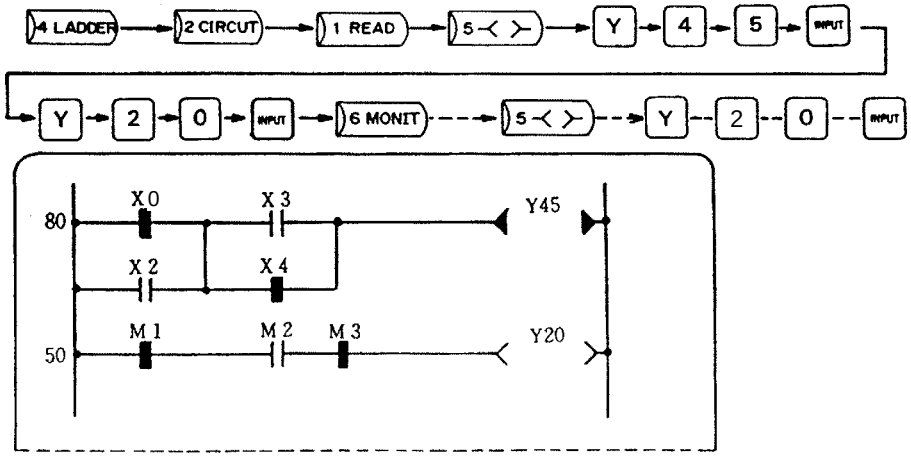


(3) Operations no monitoring

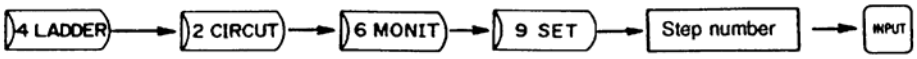
(a) Read the target circuit by step number and enter monitor mode, then switch the monitor screens by pressing the + or − and INPUT keys.



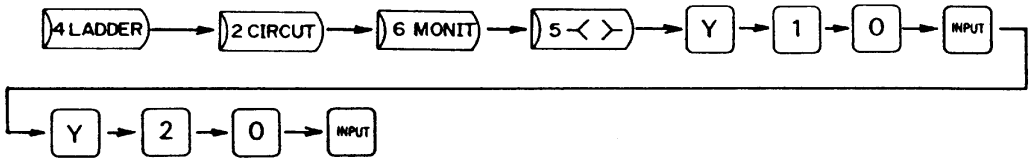
(b) Read the target circuit block by contact, coil number, or instruction, and then enter monitor mode. **(Note 1)**

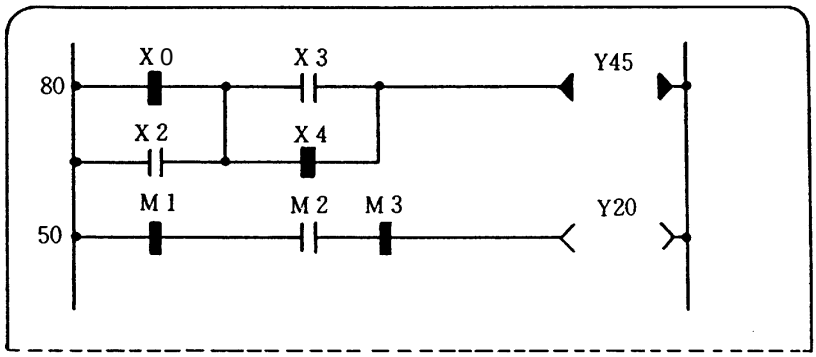


(c) After entering monitor mode, read the target circuit block by step number and then monitor it.



(d) After entering monitor mode, read the target circuit by contact, coil number, or instruction and then monitor it. (Note 1)



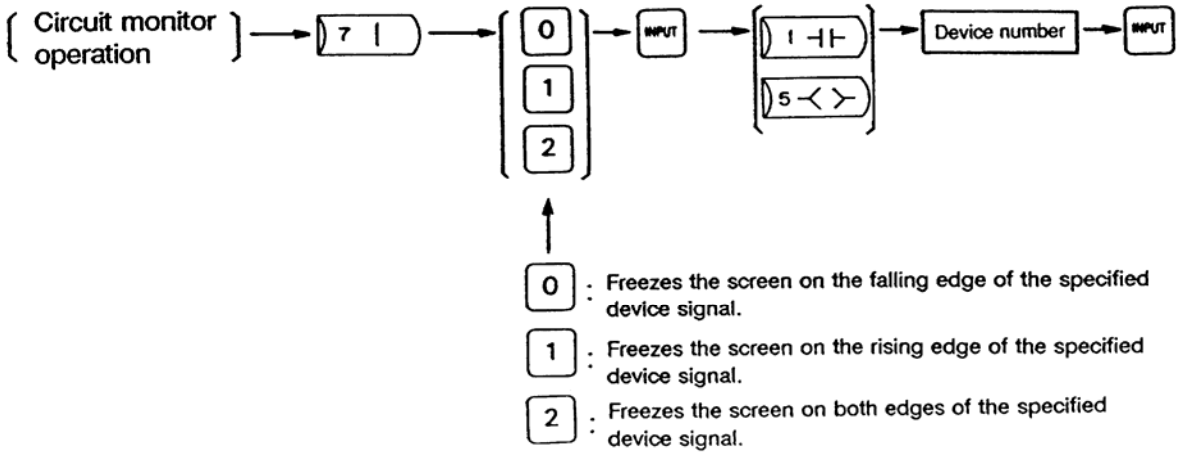


Note 1) When monitor mode is entered in this way, the screen cannot be switched by pressing the [+] or [—] and [INPUT] keys.

3.7.2 Freezing the screen at monitor stop trigger point

During circuit monitoring, this operation can freeze the monitor screen at the monitor stop trigger point regardless of the PLC operation.

[Basic operation]



[Operation procedure]

(1) According to the circuit monitor operation, monitor the screen to be stopped at the trigger point.

(2) Press the [7 |], [0 ~ 2], [INPUT], [Circuit Symbol], or [1 ⊣⊢] or [5 ≺≻] keys, enter the device number, and then press [INPUT]. when the specified device changes, the monitor screen is frozen with the current display kept.

(3) To release the frozen screen, press [6 MONIT] again.

<Operation conditions>

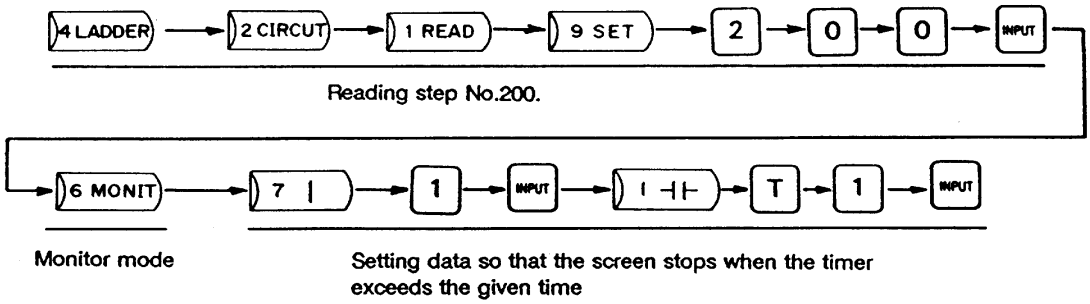
(1) Only one trigger point can be specified. If two or more trigger points are specified, the one specified last is assumed.

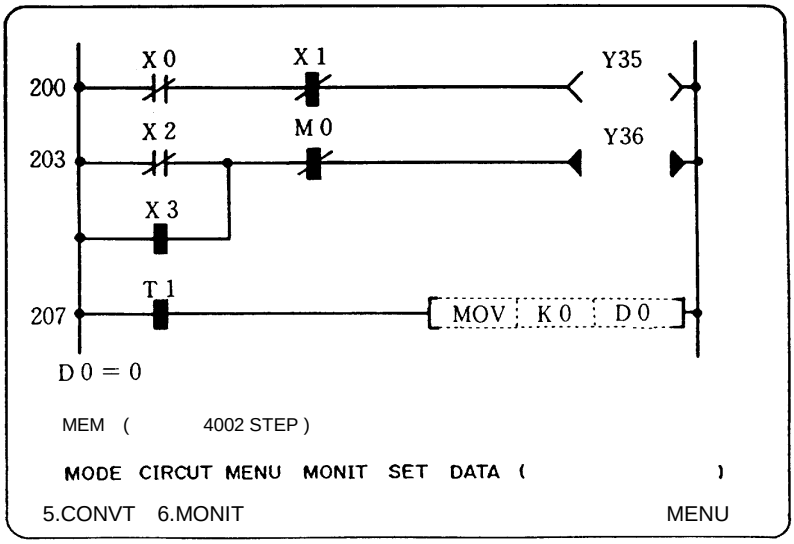
(2) Only the devices used in the OUT or contact instruction can be specified as the trigger point. The trigger point need not be the device displayed on the current monitor screen.

If a data register (D) or file register (R) is specified as the trigger point, OPERATION ERROR is displayed in the message display area.

(3) The screen may not be frozen if the specified trigger point is included in a high-speed processing circuit such as the one including a pulse instruction.

(Example) Monitor the circuit according to the circuit monitor operation, then stop the screen when the timer T1 exceeds the given time.

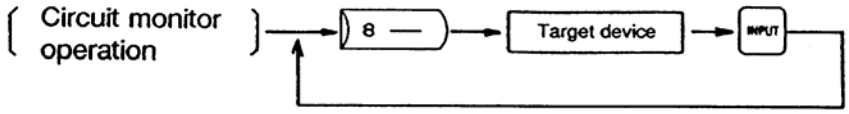




3.7.3 Monitoring the registered device

This operation can monitor a maximum of six devices by registering the device types and numbers.

[Basic operation]



[Operation procedure]

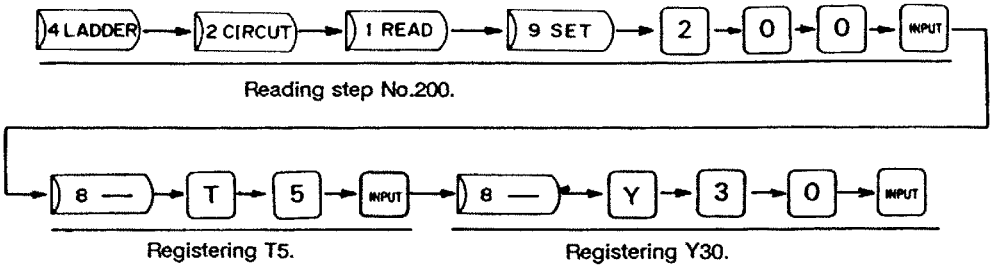
(1) Enter monitor mode with circuit monitor operation.

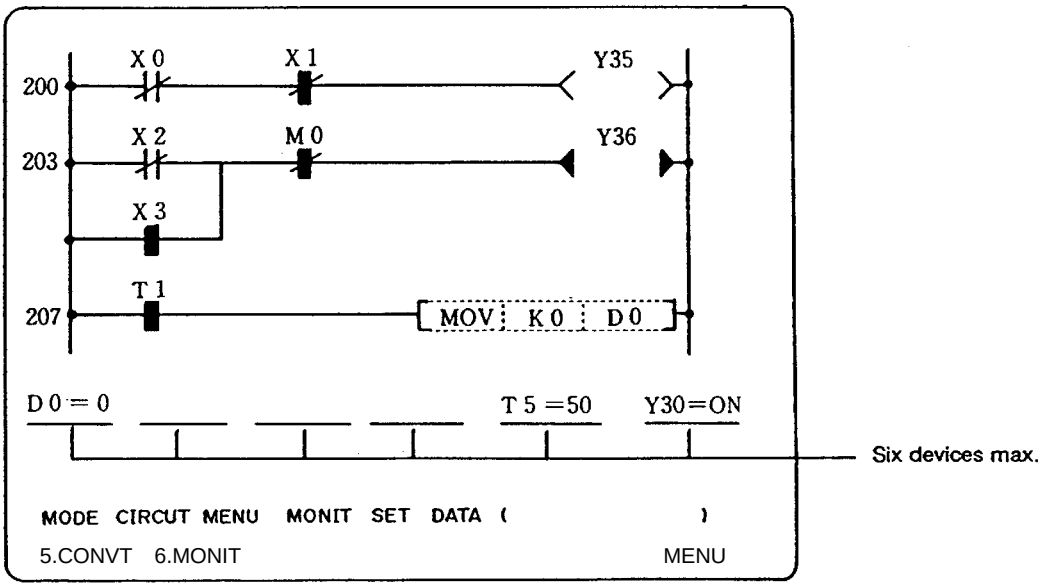
(2) To monitor devices other than those displayed on the current monitor screen, press 8 —, register the target device, then press INPUT. The registered device is displayed on the right of the monitor display area.

- When several devices are registered, repeat the procedure of specifying 8 —, the target device, and INPUT for each device
- When several devices are registered, they are displayed sequentially from the right to left in the monitor display area.
  Up to six devices can be registered at a time. If more than six devices are specified, the first six devices are registered. If the registration monitoring falls on the normal monitoring of the timer (T), counter (C), data register (D), or file register (R), the former is given priority.
- For devices T, C, D, R, and index register (Z), the current values are displayed while for bit devices X, Y, L, F, and M, ON/OFF states are displayed.

(3) To release the registration monitoring, press 6 MONIT again, or display the previous or next screen to change the display in the ladder display area.

(Example) According to the circuit monitor operation, display the screen to monitor, and register T5 and Y30 for registration monitoring.

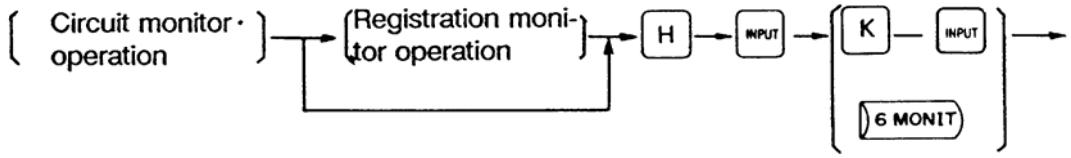




3.7.4 Monitoring the current value in decimal hexadecimal notation

During circuit monitoring and registration monitoring, the values of T, C, D, R and Z are normally displayed in decimal notation. They can be displayed in hexadecimal notation by the switching operation.

[Basic operation]



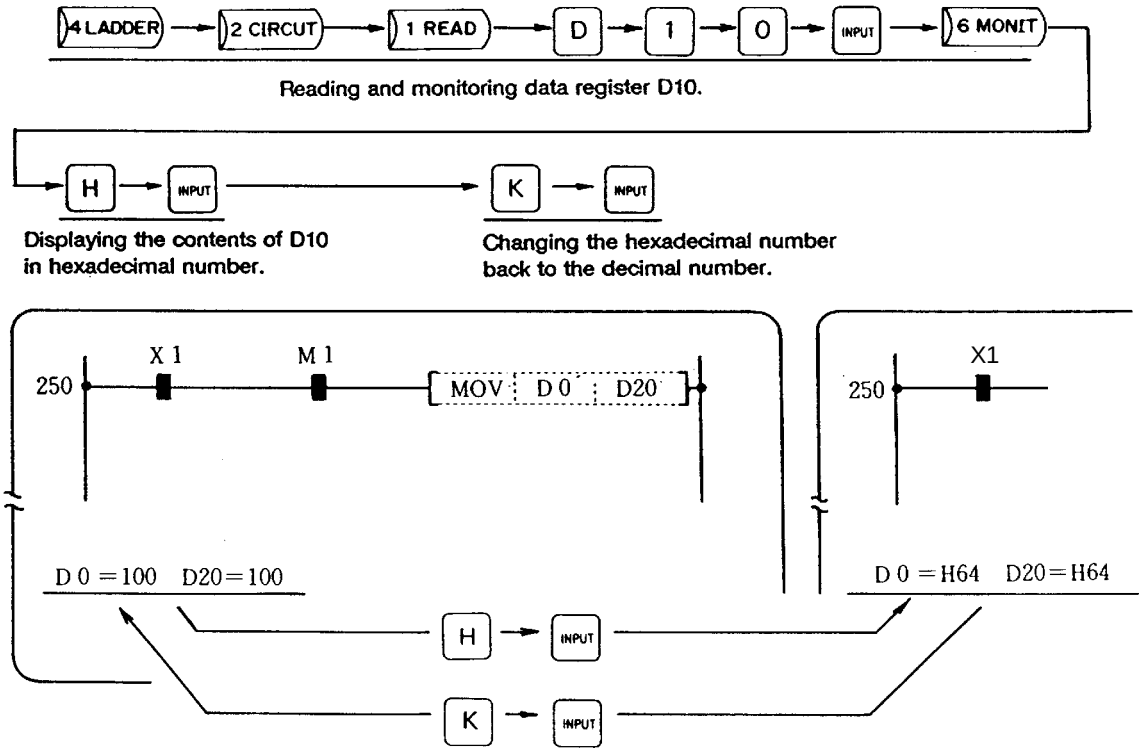
[Operation procedure]

(1) According to the circuit monitor operation, display the circuit to be monitored.

(2) Press [H], and [INPUT]: the decimal values of T, C, D, R and Z displayed in the circuit or registration monitor screen are changed to the hexadecimal values. while the values are displayed in hexadecimal notation, H is prefixed to each number.

(3) To change the hexadecimal value back to the decimal value, press [K] and [INPUT], or [6 MONIT].

(Example) Reading data register D10 and displaying the contents in hexadecimal number.



4. Precautions for PLC Development Environment of GX Developer

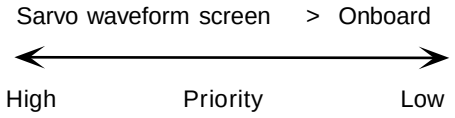
4.1 Starting

The conditions shown below must be satisfied to start the onboard operation by pressing the function selection key [F0].

Items	Conditions
Ladder format stored in the CNC	GX Developer format (Note 1)
Onboard operation valid parameter (Bit selection parameter #6451 bit 0)	1: ON
PLC environment selection parameter (Bit selection parameter #6451 bit 4)	1: ON (Note1)
GX Developer communication usage selection parameter (Bit selection parameter #6451 bit 5)	0: OFF (Note1)
Waveform display valid parameter (#1222 bit 2)	0: OFF

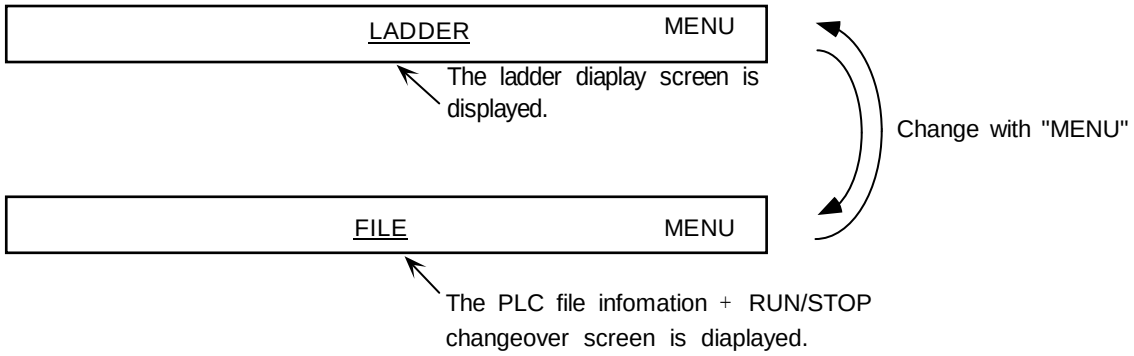
Note1) If the contents are changed, the power must be turned ON again.

When the conditions described above are not satisfied, the other function screen is displayed following to the priority below, or a blank screen is displayed.



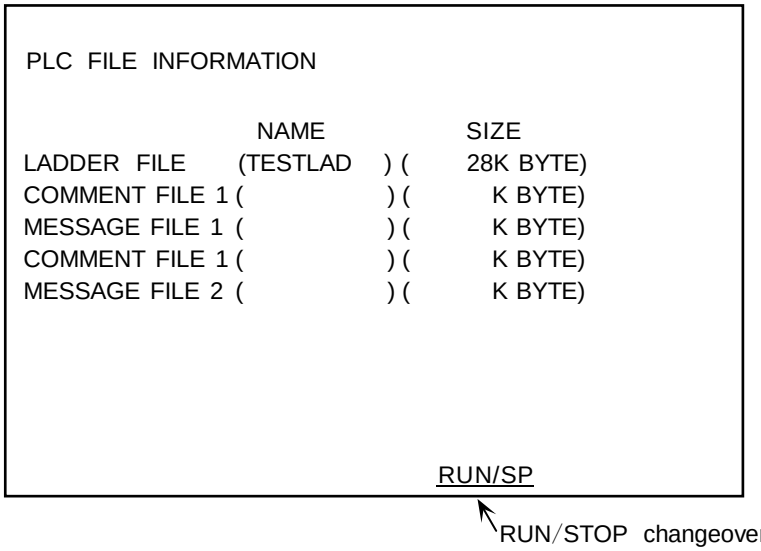
4.2 Onboard Initial Menu

The initial screen menu configuration and shift immediately after starting is shown below.

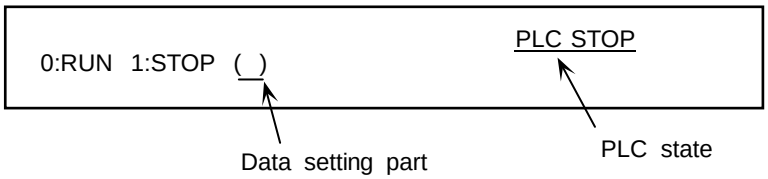


4.3 PLC File Information + RUN/STOP Changeover Screen

By pressing the "FILE" menu, the PLC file information + RUN/STOP changeover screen is displayed. The name and size of the file related to the ladder created with the GX Developer and transferred are displayed.



By pressing the "RUN/SP" menu, the current PLC state and data setting area are displayed on the lower part of the screen.



Input "0" or "1" to the ( ), and press the "INPUT".

4.4 Restrictions for Circuit Display

With the GX Developer and the onboard, their restriction specifications for the circuit display and editing are different. The restriction specification of the onboard is narrower than that of the GX Developer, so pay attention when creating a circuit in the GX Developer side.

(1) Restriction specification

		Onboard	GX Developer
Display specification for 1 screen	No. of contacts	8 contacts, 1 coil	11 contacts, 1 coil
	No. of stages	9 stages	Window size depending on the screen reduction rate
Restriction specification for 1 circuit		18 stages (No. of returns: 0) (Note1)	200 or more series contacts, 24 stages

(Note) For the relationship between the number of the returns and the number of stages of the circuit, refer to the section "3.6.3 Relationship between number of returns and circuit length".

(2) Process of circuit over restriction specification

When the circuit over the onboard circuit restriction specification is created in the GX Developer side, the following messages are displayed.

Operation	Message	Process
The circuit is displayed with the "READ" or "MONIT" function.	"DISPLAY OVER FLOW"	The circuit is not displayed. (Only mother line is displayed.)
The "WRITE", "INSERT" "DELETE" or "CONVT" function is selected.	"NOT WRITE"	Editing operation is prohibited.

(3) Difference of the number of steps

With the GX Developer and the onboard, their numbers of steps are different, so the step number displayed in the same circuit may be different.

5. Messages

During operation onboard, messages are displayed on the screen.
There are two types of messages: error messages and function messages.

(1) Error messages

An error message is displayed when the operator operates the E3 unit incorrectly or defines invalid data.

Error message	Meaning	Action to be taken
OPERATION ERROR	The unit is operated incorrectly.	Operate the unit correctly.
SETTING ERROR	Invalid data is input in the data setting area.	Input correct data.
PROG NOT FOUND	(1) When an attempt was made to search a device, instruction, or coil in read mode, the specified device, instruction, or coil was not found. (2) When an attempt was made to print a ladder or message, the specified ladder or message data was not found.	(1) Specify a device, instruction, or coil used in the ladder circuit. (2) Specify an existing program.
COMMAND CODE ERROR	In write mode, the specified sequence instruction is invalid.	Specify the sequence instruction correctly.
DEVICE NO. ERROR	In write mode, an invalid device number is specified.	Specify a valid device number.
COIL ALREADY USED	In write mode, the same name as the existing coil is specified.	Although the message is displayed, the specified data is written.
LADDER ERROR	There is a circuit that cannot be converted in convert mode.	Delete or recreate the circuit.
PROGRAM SIZE OVER	(1) In convert mode, the circuit size exceeds the registered size. (2) The No. of messages set for the No. of used messages registration exceeded the max. No. of usage messages.	(1) Using the file function, increase the registered size. (2) Set the No. of used messages to below the max. No. of usage messages.
PLC RUN	An attempt is made to edit the user PLC program while it is running. (An attempt is made to perform some operation inhibited while the user PLC is running.)	Stop the user PLC by setting system selection switch No.2 to on or by operation as described under section 3.1.2.
NOT WRITE	An attempt is made to write data without a read operation such as a step search or coil search.	Perform a necessary read operation.
CIRCUIT CONTINUATIVE SIZE OVER	When an attempt is made to create a ladder circuit with six or more returns.	Change the ladder circuit to up to six returns.
LADDER OVER FLOW	When the created circuit exceeds 18 stages after return.	Change the circuit to up to 18 stages after return.

Error message	Meaning	Action to be taken
CIRCUIT CONTINUATION ERROR	(1) When a vertical line exists at the return start position in an extended circuit. (2) When an attempt is made to perform two or more returns in a circuit having two or more extended lines.	(1) Place a vertical line at a position after return. (2) Extension operation cannot be performed. Create a new circuit by write operation, etc.
SETTING ERROR	(1) Invalid key data is entered. (2) An attempt is made to read messages exceeding the number of registered messages.	Enter valid key data.
MESSAGE LINK ERROR	Message size cannot be judged correctly.	Register it on message initial.

(2) Function messages

The function messages are displayed to give operation instructions or report processing states.

Function message	Description
SELECT FUNCTION	Displayed when function selection is needed.
DISPLAY OVER FLOW	Displayed when an attempt is made to move the cursor two screens or more with the down cursor key [↓]. Pressing the [↑] key cannot scroll the screen any more.
LADDER END	Displayed when the last program is read in read mode.
DELETE 1-CIRCUIT	Displayed when deletion of one circuit is specified in delete mode.
COMPLETED	Displayed when execution of the specified command ends.
PRESS <CNV>	Displayed when an attempt is made to read the user PLC Program after editing (writing, inserting, or deleting) it but before conversion.
DELETE 1-CIRCUIT (DISP)	Displayed when deletion of a circuit block in the buffer (not yet converted) of the screen is specified in delete mode.
EXECUTION	Displayed while the specified command is being executed.
SELECT FILE!	Displayed when an attempt is made to write ladder circuit or perform message operation without registering edit file.

6. Alarm Messages Related to PLC

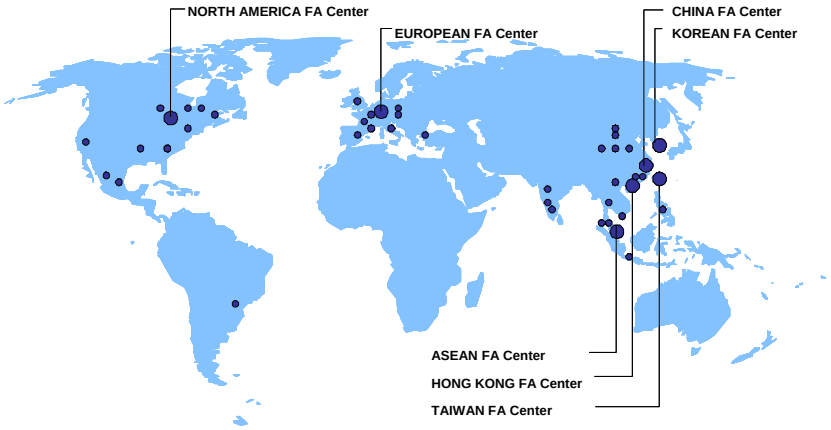
The alarm messages related to the execution of the PLC are shown below.

Alarm No.	Message	Sub-status		Details	State	Remedy
		1	2			
U01	No PLC			The ladder is not a GX Developer ladder format.	EMG will be applied.	•Set "1" to the PLC environment selection parameter (BIT SELECT #6451/bit4). •Download the GX Developer format ladder. •Then, turn the CNC power ON again.
U10	Illegal PLC	0x0010		Scan time error (The scan time is 1 second or longer.)	Only alarm display	Edit the ladder size to a smaller size.
		0x0040		Ladder operation mode illegal •A ladder different from the designated mode was downloaded.	EMG will be applied.	•Set "1" to the PLC environment selection parameter (BIT SELECT #6451/bit4). •Download the GX Developer format ladder. •Then, turn the CNC power ON again.
		0x0080		GX Developer ladder code error	EMG will be applied.	Download the correct GX Developer format ladder.
		0x008□		The ladder format is illegal.	EMG will be applied.	•Set "1" to the PLC environment selection parameter (BIT SELECT #6451/bit4). •Download the GX Developer format ladder. •Then, turn the CNC power ON again.
		0x0400	Number of ladder steps	Software exceptional interrupt •The ladder process stopped abnormally due to a S/W command code illegal, etc.	EMG will be applied.	Turn the power ON again. (If the error is not reset, download the correct ladder.)
		0x800□	Number of ladder steps	Software exceptional interrupt •The ladder process stopped abnormally due to a bus error, etc. Bit 0: BIN command operation error Bit 1: BCD command operation error Bit6: CALL/CALLS/RET command error Bit7: IRET command execution error	BIN and BCD error Only alarm display	BCD, BIN error Refer to the methods for using the BCD and BIN function commands.
					EMG will be applied for other than BIN and BCD.	Other than BCD and BIN Turn the power ON again. (If the error is not reset, download the correct ladder.)
U50	Stop PLC			The ladder is stopped. (The user ladder does not run.)		Start the ladder.

Revision History

Date of revision	Manual No.	Revision details
June.2008	IB(NA)1500179-A	First edition created.

Global service network



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Notice

Every effort has been made to keep up with software and hardware revisions in the contents described in this manual. However, please understand that in some unavoidable cases simultaneous revision is not possible.
Please contact your Mitsubishi Electric dealer with any questions or comments regarding the use of this product.

Duplication Prohibited

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MODEL	EZMotion-NC E60/E68 Series
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Manual No.	IB-1500179(ENG)-A

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