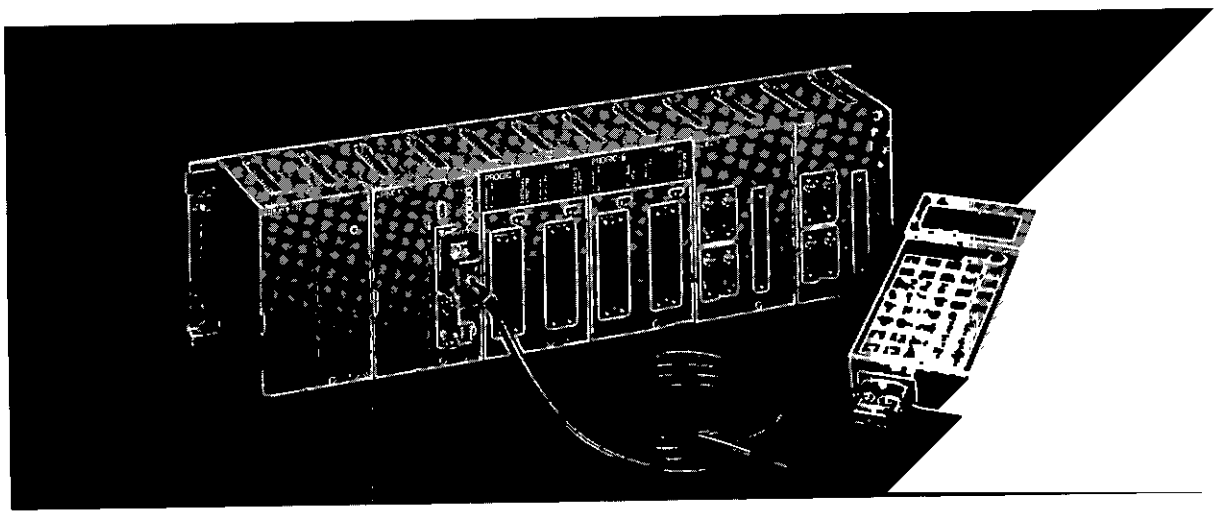
PROGIC-8

MULTIAXES MOTION CONTROLLER

INSTRUCTION MANUAL OF ADDITIONAL FUNCTIONS



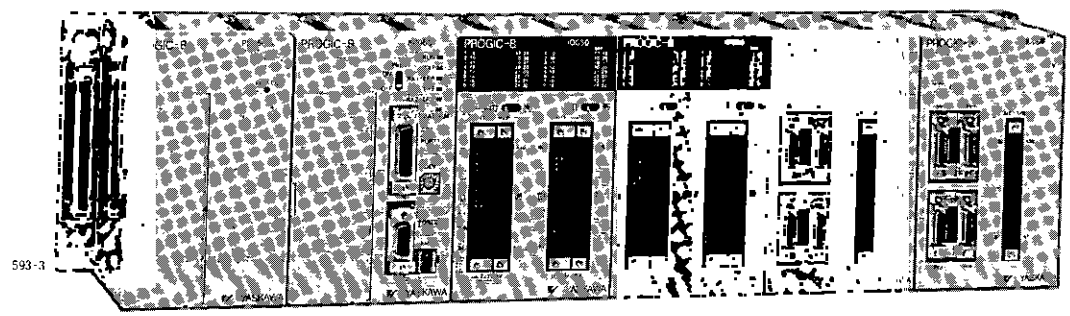
YASKAWA

CONTENT

CONTENT

CONTENT

Thank you for choosing the PROGIC-8 multiaxes motion controller.
The new PROGIC-8 has expanded the functions of conventional machine controllers to provide broader applications.
This manual explains the expanded functions. For conventional machine controllers, refer to the documents listed below.



- PROGIC-8 PROGRAMMING MANUAL FOR PLC UNIT (SIE-C888-1.1)
- PROGIC-8 PROGRAMMING MANUAL FOR MC UNIT (SIE-C888-1.2)
- PROGIC-8 SYSTEM HANDBOOK (SIE-C888-1.3)
- PROGIC-8 PROGRAMMING SYSTEM OPERATION MANUAL (SIE-C888-1.4)
- PROGIC-8 TEACH PENDANT (SIE-C888-1.6)

1. OUTLINE OF NEW MODEL TYPES

1.1 UNIT TYPES OF NEW MODELS

The following units are added to the new model.

NAME	NEW MODEL TYPE	EXISTING TYPE
(1) PLC unit	: JEPMC-PC055	← PC050
	: JEPMC-PC056	
(2) MC unit	: JEPMC-MC003	← MC002
(3) Teach pendant	: JEPMC-TB050 (new)	---
(4) ROM module	: JEPMC-MM001 (new)	---

Note : The existing power unit, the I/O unit, and the base unit are compatible with the new model.

1.2 OUTLINE OF EXPANDED FUNCTIONS

1.2.1 Expanded Functions of the MC Unit

The new MC unit (-MC003) has enhanced motion functions and the following new functions.

- Palletizing
- Point table positioning
- Skip

1.2.2 Expanded Functions of the PLC Unit

The new PLC units (-PC055, -PC056) have the following expanded specifications related to motion functions.

- Independent axis operation (MVA/MVB)
- Jog operation (JOG)
- Monitor (MON)
- Compensated value setting (VAR)

1.2.3 Absolute Value Detecting Function

Only the incremental encoder can be used with existing models. The absolute encoder is also available with the new model. This eliminates the need of return to zero-point at power-ON. The absolute encoder can also be used incrementally by switching parameters.

1.2.4 Expanded I/O

If the standard I/O unit is insufficient to implement necessary I/O specifications, expanded I/O function is available by the use of the new PLC unit (-PC056). This makes it possible to connect the 2000 series expanded I/O units provided for Yaskawa GL series sequencers. With the use of these components, not only the number of inputs and outputs can be increased but counter and analog modules can be used.

Note : For the specifications of the expended I/O, refer to the "PROGIC-8 System Handbook" (SIE-888-1.3).

1.2.5 Addition of Teach Pendant / Communication Port

The existing PLC unit has a single communication port (D-sub-9 pin). The new units (-PC055, -PC056) have an additional communication port (D-sub-15 pin) through which the teach pendant (JEP MC-TB050) can be connected.
The teach pendant has many functions. Especially the motion program editing function by easy position teaching makes programming easy.

Note : For an explanation of operations of the teach pendant, refer to the separate "Teach Pendant (SIE-C888-1.6)."

1.3 COMBINATION OF UNITS

Select a combination of major components from the following table. New and existing models cannot be mixed.

PLC Unit	MC Unit		Teach Pendant	
	JEPMC-MC002	JEPMC-MC003	JEPMC-TB050	
JEPMC-PC050	○	×	×	
JEPMC-PC055	×	○	○	← Without expanded I/O
JEPMC-PC056	×	○	○	← Correspond to expanded I/O

○ : Possible
× : Not possible

Note : The following components are common to both new and existing models.

- Base unit ··· JEPMC-MB041, -MB051, MB052, -MB062
- Power unit ··· JEPMC-PS050
- I/O unit ··· JEPMC-IO050

2. EXPANDED FUNCTIONS OF MC UNIT

Outline

(1) The MC unit (MC003) has the following new functions.

(A) Palletizing command : Positioning to grid points stored in advance.

(B) Point table positioning command : Positioning to a stored position (X, Y, Z, S).

(C) Skip command : Turning ON the skip signal changes the path of traveling.

(2) Some specifications of conventional functions have been enhanced.
This section explains details of the above added and expanded functions.

2. EXPANDED FUNCTIONS OF MC UNIT

2.1 PALLETIZING COMMAND (PMV)

(1) Outline

Preset positions on a pallet as grid points by the matrix setup instruction and execute them in advance to store basic data of the positions. Then specify a grid point number and the pallet in a move command to calculate the position from the stored data and move to that grid point.

(2) Specifying grid point positions

Format : PMV P... C...;

Where, P : Pallet number (1 to 199)

C : Grid point number (1 to 199 × 199)

The above commands perform positioning by fast traverse to the point specified by grid point number C on the pallet specified by pallet number P. Feed rate 1 (specified for PA04) is used for the positioning, therefore the path is not necessarily a straight line.

The position of the grid point is calculated using the basic data stored in advance by the matrix setup command.

(3) Specifying matrix setup command

Before executing the above PMV command, this matrix setup command must be specified. Otherwise, an alarm is issued.

Format :

```
PST PXY  P_ X_Y_  I_ J_  U_ V _ ;  XY-plane matrix
PST PZX  P_ X_Z_  I_ K_  U_ W_ ;  ZX-plane matrix
PST PXS  P_ X_S_  I_ L_  U_ T _ ;  XS-plane matrix
PST PYZ  P_ Y_Z_  J_ K_  V_ W_ ;  YZ-plane matrix
PST PYS  P_ Y_S_  J_ L_  V_ T _ ;  YS-plane matrix
PST PZS  P_ Z_S_  K_L_  W_T _ ;  ZS-plane matrix
    ↑
```

Specification of matrix plane

Where, P : Pallet number (1 to 199)

X, Y, Z, S : Basic coordinates on the corresponding axes

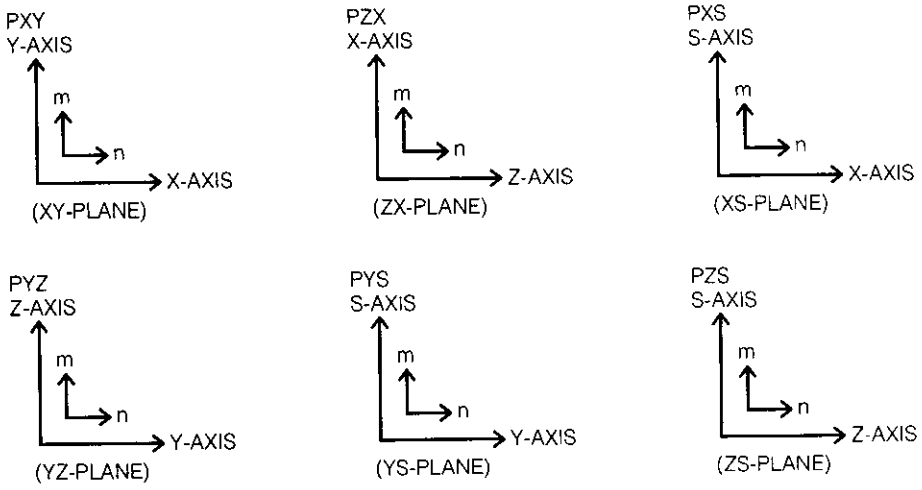
I, J, K, L : Number of grid points on the individual axes (1 to 199)
I ··· X-axis, J ··· Y-axis, K ··· Z-axis, L ··· S-axis,

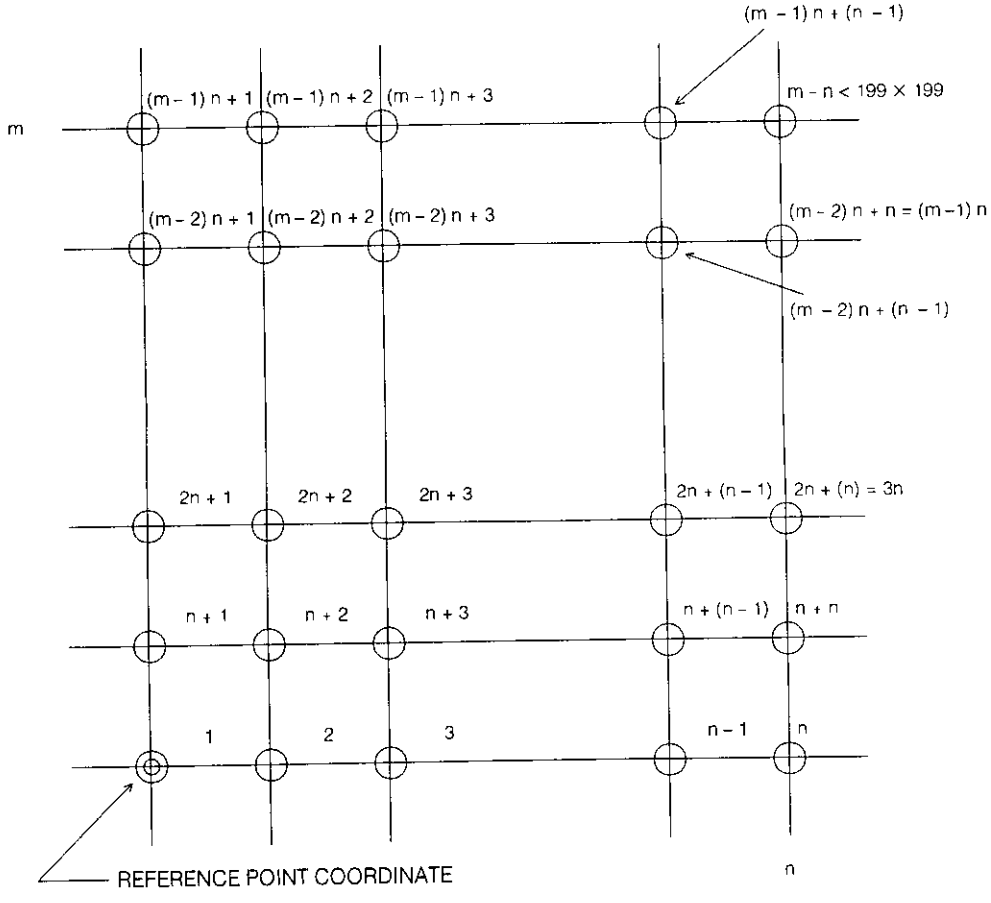
U, V, W, T : Pitch between grid points on the individual axes (0 to ±99999999)
U ··· X-axis, V ··· Y-axis, W ··· Z-axis, T ··· S-axis,

Execute the above program to store the matrix basic data to the MC unit. Any numeric value used in the program can be replaced by a variable (#1 to #199) or an compensated value (H1 to H8). If a matrix plane specification command (PXY, PZX, ..., PZS) is not in the same block with the PST command, the plane specified in the previous PST command is used. However, if there has been no plane specification command in the same block with PST command after power-ON, an alarm is issued.

(4) Numbering grid points

Assign numbers to grid points on each plane as shown in the figure below.





2. EXPANDED FUNCTIONS OF MC UNIT

2.2 POINT TABLE POSITIONING COMMAND (#E)

(1) Outline

Prepare 4 axes position data settings and store them in the point table in advance. Specifying a point number together with a move command in a motion program performs the same operation as specifying the position of the axes in the program.

(2) Specifying a point number

Format : MOV #E ··· ;

Where, #E : Point number in the point table (1 to 500)

MOV : An example of axis move command. Linear interpolation (MVS) and circular interpolation (MCW and MCC) can also be used.

The above command performs moving to the position assigned to the point number specified by #E. The position is determined by 4 axes coordinates (X, Y, Z, S) which are the data settings stored in advance.

(3) Point table

Before executing the above #E... command, prepare the point table. The point table can contain data of up to 500 points as shown below.

Point Table and Max. Value

No.	X-axis	Y-axis	Z-axis	S-axis
E001	±99999999	±99999999	±99999999	±99999999
E002	±99999999	±99999999	±99999999	±99999999
E003	±99999999	±99999999	±99999999	±99999999
E004	±99999999	±99999999	±99999999	±99999999
• •	• •	• •	• •	• •
E499	±99999999	±99999999	±99999999	±99999999
E500	±99999999	±99999999	±99999999	±99999999

- Axis names are defined by parameters P001 to P004.
- For each point number, position data of the axes are stored in the order of the axis number.

Preparing point table data

Point table position data can be prepared in any of the following three ways.

① Operation on the teach pendant

Select point table edit mode on the teach pendant. Actually move the axes to the aimed position, then depress the teach key to fetch the position data.

② Operation with the personal computer programmer

Input position data directly on the point table editing menu of the personal computer programmer to create the point table file. (See Par. 5.3.) Then transfer the file to the MC unit.

③ Execution of VAR command

Using the compensated value setting (VAR) command on the PLC, transfer position data from registers to the specified point number(s) to create the point table.

(4) Program example

Assume the point table contains data shown below. (P005 = 3)

No.	X-axis	Y-axis	Z-axis	S-axis
E001	100000	100000	150000	200000
E002	150000	120000	100000	150000
E003	200000	120000	100000	150000
E004	100000	120000	150000	200000
E005	0	0	0	10000

Example ① MOV #E001 ; is equivalent to
MOV X100. Y100. Z150. S200.;

Example ② MVS X#E005 Y120. Z200. S#E005 F2000 ; is equivalent to
MVS X0. Y120. Z200. S10. F2000 ;

A point number can be specified instead of all axes names and position data in a move command block to move to the aimed position. (See example ①.)
A point number can also be used instead of the position data of a specific axis. (See example ②.)

(5) Assigning to variables

Position data in the point table can be assigned to variables.

Example ① #100 = X#E002 ;
MOV X#100 ; is equivalent to
MOV X150.;

Example ② MOV #E#100 ; is equivalent to
MOV #E010 ; if #100 contains 10.

2. EXPANDED FUNCTIONS OF MC UNIT

2.3 SKIP COMMAND (SKP)

(1) Outline

If the skip external signal is turned ON while the axis is moving in a skip command block, axis motion decelerates and stops. Remaining motion in the block is canceled and the next block is started. The unit automatically stores the position where the skip signal is turned ON. The skip function makes motion control adaptable to external conditions.

(2) Format

Format : SKP X ··· Y ··· Z ··· F ··· ;
The above command moves the specified axis to perform interpolating motion at the speed specified by F. If the skip signal goes ON during the motion, axes positions then are stored and the moving axes coast to a stop. Command for the remaining motion in the block is canceled and the next block is executed.
Skip command can be specified for up to three of the four axes.
Skip signal is one of the I/O signals of the MC unit.

(3) Specifications of skip signals

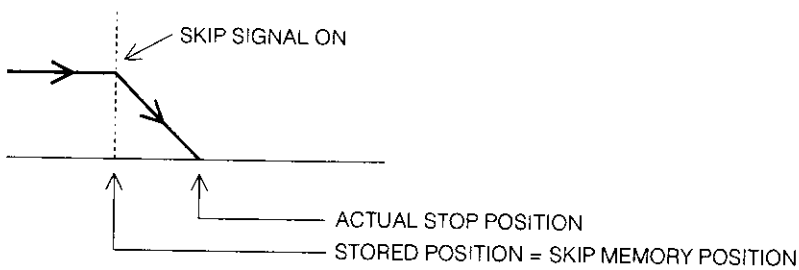
① Location : MC unit-MC I/O

<Pin No.> <Signal name>
B6 ------- SKIP1 = The 1st axis skip signal (NC contact)
A6 ------- SKIP2 = The 2nd axis skip signal (NC contact)
B5 ------- SKIP3 = The 3rd axis skip signal (NC contact)
A6 ------- SKIP4 = The 4th axis skip signal (NC contact)
B7, A7 ------- COMMON3 = COMMON power supply line

② Whether the signal takes effect at the rising edge or falling edge is determined by parameter PA56.
③ Select either of the following modes using parameter P013.
1 : The skip signals take effect only on the corresponding axis.
0 : The four skip signals are OR'ed, so that when any one of them goes ON, it takes effect on all the axes.

(4) Storing skip position

When the skip signal goes ON, the current position at that time is stored in the MC unit. The data are stored as system variables so that they can then be fetched in the motion program. The data are called the (skip) memory position.
After the skip signal goes ON, moving axes coast to a stop, so they stop at different positions from the stored current positions.
If the skip signal goes ON when the skip command is not being executed, only the memory position is stored and the axes move on.



(5) Fetching skip memory position and current position

Memory position data are stored in variables #1005-#1008. Apart from the memory position, the current position data at the time are stored in variables #1001-#1004. The current position data are updated continuously.
These data can be fetched in the motion program by using the assigned variables. Correspondence between variable names and data items are shown below.

#1001 : The 1st axis current position
#1002 : The 2nd axis current position
#1003 : The 3rd axis current position
#1004 : The 4th axis current position

#1005 : The 1st axis memory position
#1006 : The 2nd axis memory position
#1007 : The 3rd axis memory position
#1008 : The 4th axis memory position

Example
#10 = #1001 fetches the current position of the 1st axis.
#20 = #1005 fetches the memory position of the 1st axis.

Note : These variables cannot be used on the left side of an expression, such as #1001 = #10 and #1001 = 999.

2. EXPANDED FUNCTIONS OF MC UNIT

2.4 EXPANDED SPECIFICATIONS

Outline

The new MC unit (-MC003) has partially expanded specifications of the following conventional functions.

(A) Modes of operation : Teach pendant editing mode has been added.
(B) Use of compensated values : Additional compensated values have been added.
(C) Variables : System variables have been added.

In the following, descriptions of the expanded specifications are underlined with or enclosed in dotted lines.

2.4.1 Modes of Operation --- (Par. 2.1 of "Programming Manual for MC Unit" (SIE-C888-1.2))

The MC unit supports the following five modes of operation.

① Editing mode (EDIT)
② Manual mode (MANUAL)
③ Auto mode (AUTO)
④ On-line editing mode (ONLINE EDIT)
⑤ Teach pendant editing mode (T-BOX EDIT)

To select the modes, use the MOD command on the PLC unit.
Switching to the T-box edit mode can be performed only from the teach pendant in on-line editing mode.

(1) Editing mode

In this mode, motion programs and parameters are saved and loaded to or from memory of the MC unit. Parameters must be loaded or saved individually. Programs can be loaded or saved in a batch or in units of the program number.

(2) Manual mode

In this mode, jogging and return to zero-point are performed. To use the JOG or ZRN command on the PLC unit, enter manual mode by the MOD command.

(3) Auto mode

In this mode, a motion program stored in memory is executed. Use the MOD command on the PLC unit to enter auto mode. Use the MRS command on the PLC unit to specify the program number and the starting block number. Use the MVL command to start the motion program.

(4) Online editing mode

In this mode, current position data of the axes can be fetched from the MC unit to create a program on a personal computer. In this mode, motion by JOG command on the PLC unit and single-block operation by commands from the personal computer are available. Use the MOD command on the PLC unit to enter on-line editing mode.

(5) Teach pendant editing mode

Depressing "TEACH MODE" on the teach pendant in on-line editing mode enters to teach pendant editing mode, where commands from the teach pendant are accepted.
In this mode, motion by JOG command and single-block and multi-block operations by the motion program are available by using the teach pendant. Motion program editing, I/O monitoring, and variable rewriting are also possible.

2.4.2 Use of compensated values --- (Par. 4.4.16 of "Programming Manual for MC Unit" (SIE-C888-1.2))

(1) Compensated values can be used for position data and speed data.
Example : MOV XH_1 YH_2 ZH_3 FH_4 ;

(2) Up to eight compensated values from H1 to H8 are available.

(3) Set up compensated values by VAR command on the PLC unit before starting execution of the program. Otherwise, compensated value data used in the preceding operation are used. (Refer to "Programming Manual for PLC Unit" (SIE-C888-1.1).)
Factory setting is H1 = H2 = ... = H8 = 0. Once different values are set up, they are backed up by the battery.

(4) Compensated values can be used in a program as many times as needed.

(5) The compensated values can be assigned to common variables.
#1 = H1

(6) Two compensated values cannot be used in combination such as : MOV $XH_1 + H_2$;
Only value assignment is possible with H1 to H8: They cannot be used for calculations such as #1 = $H_1 + H_2$ or #1 = H_1 + 100.

2. EXPANDED FUNCTIONS OF MC UNIT

2.4.3 Variables--- (Par. 4.4.24 of "Programming Manual for MC Unit" (SIE-C888-1.2))

Instead of a direct value, a variable can be specified. When the variable is called during execution of the program, the value stored in the variable area is fetched.
To specify a variable, use the variable number with "#" as a prefix.
Types of variables are listed below.

- Common valiables (# nnn)
- Input valiables
- Output valiables
- System valiables

} Refer to "Programming Manual for MC Unit" (SIE-C888-1.2)

(1) Format

#1001 to #1008

(2) Explanation

The current position updated continuously and the memory position stored by the skip function can be fetched as system variables.

<Current position>	<Skip memory position>
#1001 : The 1st axis current position	#1005 : The 1st axis memory position
#1002 : The 2nd axis current position	#1006 : The 2nd axis memory position
#1003 : The 3rd axis current position	#1007 : The 3rd axis memory position
#1004 : The 4th axis current position	#1008 : The 4th axis memory position

(3) Using system variables

```
#1 = #1005 ;        ··· Fetch (skip) memory position of the 1st axis.
#1 = #1+1000 ;
MOV  X#1 ;          } Position to "skip memory position" + 1000.
#2 = #1001 ;        ··· Fetch the current position of the 1st axis.
#2 = #2-1000 ;
MOV  Y#2 ;          } Position to "current position" – 1000.
```

Note : These variables cannot be used on the left side of an expression, such as #1001 = #10 and #1001 = 999.

The above variables are listed in the table.

Variables List

Variables	Format	Explanation
Common Variables	#1 to #199	These variables can be used in the program. (32 bits) To perform calculations in a program, these variables can be used as temporary memory. The result of calculation is stored after power is turned OFF.
Input Variables	#I1 to #I256	These variables enable reading MC unit coil signals on the PLC unit and (assigned) external inputs. Y1 to Y256 → #1 to #I256 I1 to I40 (assigned) → #I185 to #I224 (MC unit 1) Y257 to Y512 → #I1 to #I256 I41 to I80 (assigned) → #I185 to #I224 (MC unit 2)
Output Variables	#O1 to #O256	These variables enable outputing signals to MC unit relays on the PLC unit and external outputs #O1 to #O256 → X1 to X256 #O201 to #O224 → O1 to O24 (assigned) (MC unit 1) #O1 to #O256 → X257 to X512 #O201 to #O224 → O25 to O48 (assigned) (MC unit 2)
System Variables	#1000 to #1008	These variables fetch current position and (skip) memory position data.

3. EXPANDED COMMANDS OF PLC UNIT

Outline

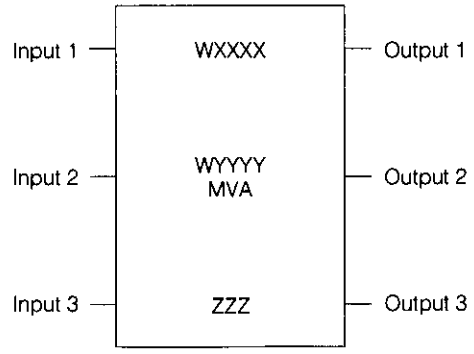
The new PLC units (-PC055, -PC056) have partially expanded specifications of the following conventional functions.

(1) Independent axis operation (MVA/MVB)
(2) Jog operation (JOG)
(3) Monitor (MON)
(4) Variable setting (VAR)

This section explains details of these expanded specifications.
Descriptions of the expanded specifications are underlined with or enclosed in dotted lines.

3.1 INDEPENDENT AXIS OPERATION (MVA / MVB) --- (Par. 8.2.3 of "Programming Manual for PLC Unit" (SIE-C888-1.1))

If the servo motor axes are designated as axis A and/or axis B, use MVA and MVB commands to move the corresponding axes. If the servo motor axes are designated as axis A and/or axis B, they cannot be operated by the motion program in the MC unit.



Entering START command (input 1) moves the axes to the positions specified by one register at the speed specified by another register.

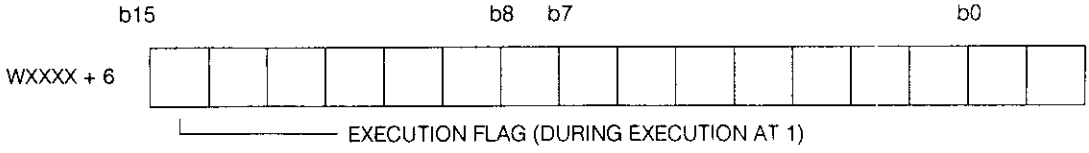
If input 1 is turned ON when input 2 is ON, the axes move to the target position in the specified point table at the speed specified by the register.

Note : Set any value from 1 to 999 for ZZZ.

● Data to be set

WXXXX	UNIT NO.	MC unit No. : 1 to 2
WXXXX + 1	COMMAND MODE	Aimed position data type 0 = absolute value; 1 = relative value
WXXXX + 2	AIMED POSITION-H	Aimed position (command unit)
WXXXX + 3	AIMED POSITION-L	
WXXXX + 4	SPEED-H	Feed rate (× 1000 command units)
WXXXX + 5	SPEED-L	
WXXXX + 6	SYSTEM USE	Used as an execution flag in system.

• System execution flag



• To specify a point table, write the point number at the target position register.

WXXXX	UNIT NO.	MC unit No. : 1 to 2
WXXXX + 1	COMMAND MODE	Aimed position data type : 0 = absolute value; 1 = relative value
WXXXX + 2	POINT NO.	Aimed position (command unit)
WXXXX + 3	NOT USED	
WXXXX + 4	SPEDD-H	Feed rate (× 1000 command units)
WXXXX + 5	SPEED-L	
WXXXX + 6	SYSTEM USE	Used as an execution flag in system.

3. EXPANDED COMMANDS OF PLC UNIT

● Data to be monitored

The current position and error status are displayed (in absolute values regardless of the mode of command).

WYYYY	CURRENT VALUE-H
WYYYY + 1	CURRENT VALUE-L
WYYYY + 2	STATUS

0 to ± 9999 : WYYYY

9999 : WYYYY+1

For the status after starting, refer to Par 8.2.15 of "Programming Manual for PLC Unit" (SIE-C888-1.1).

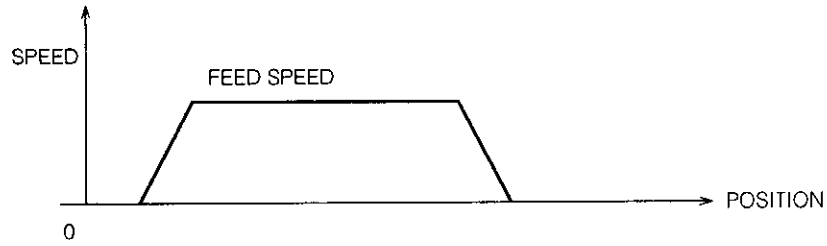
● Description of operation

Input 1	• START: Execution command Use start-up differential (—| ↑ |—) for the command. If the command goes ON or OFF during execution, it is disregarded. The command is also disregarded if input 3 goes ON in advance.
Input 2	• POINT TABLE: Point table specification Turn ON this signal and input START to use the aimed position in the point table.
Input 3	• FEED HOLD: Stop command While this signal is ON, operation is halted temporarily This command is accepted only when output 1 is ON.
Output 1	• RUN: During running This signal is goes ON while a command is being executed. The signal goes OFF when the execution is completed.
Output 2	• ERROR: Error This signal goes ON for a single scan after execution is terminated by an error.
Output 3	• DONE: Completion This signal goes ON for a single scan after execution terminates normally.

○ Typical operation

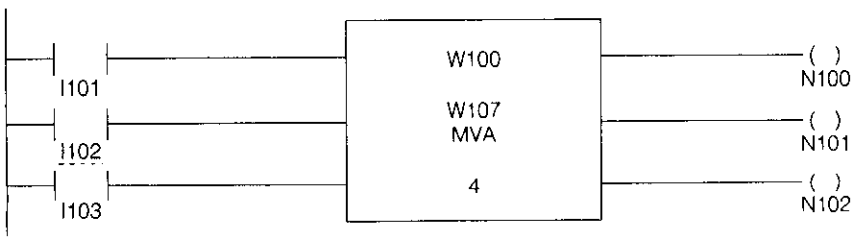
(i) Operation and sequence program

Axis A of the SERVOMOTOR is operated.

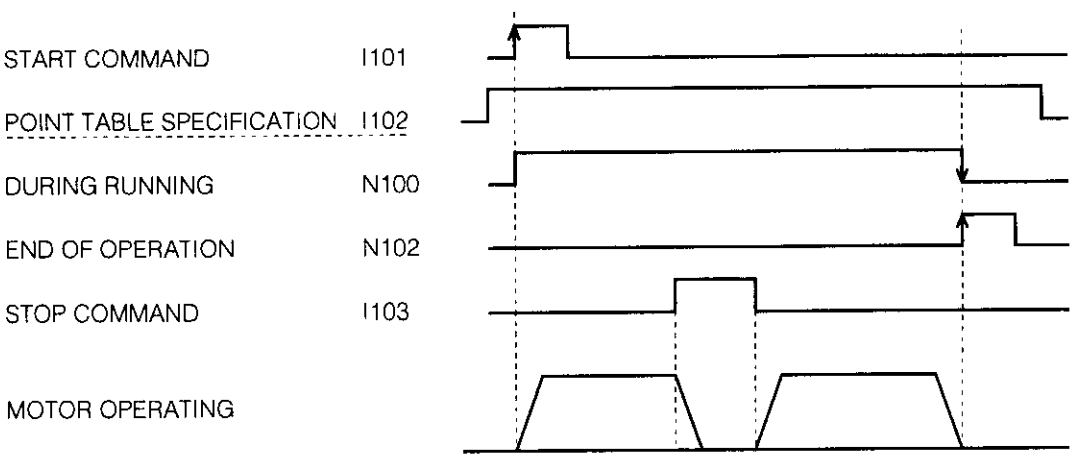


(ii) Sequence ladder circuit

W100	1	Set 1 to unit No.
W101	0	Aimed position is specified with absolute values.
W102	10	Point No.10 (#E010)
W103	0	
W104	0000	Speed : 1000
W105	1000	
W106		
W107		Monitor data holding registor
W108		
W109		



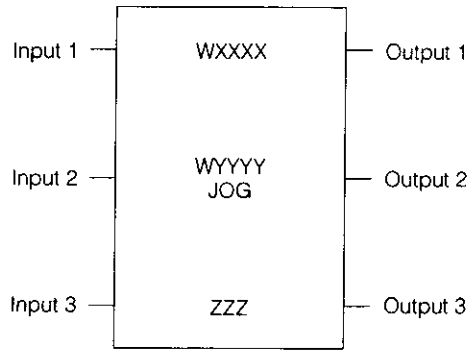
(iii) I/O timing



3. EXPANDED COMMANDS OF PLC UNIT

3.2 JOG OPERATION (JOG) --- (Par. 8.2.5 of "Programming Manual for PLC Unit" (SIE-C888-1.1))

Use JOG command to move the machine manually and continuously. The jog feed rate is determined by multiplying the first feed rate (specified by PA04) by the override selected by the speed number. If speed number 0 is specified, the speed set for the second feed rate (specified by PA31) is used.
If more than one command is started at the same time with different speed numbers, the speed number for the last started command is used.



While the START command (input 1) is ON, jog operation is performed in the direction specified by input 3 at the selected speed.
When input 2 is ON, step operation is possible. In this mode, the machine moves at the rising edge of input 1 for the amount of travel length set for the step feed length, then stops.

* Set any number from 1 to 999 for ZZZ.

● Data to be set

WXXXX	UNIT NO	MC unit No. : 1 to 2
WXXXX + 1	AXIS NO.	MC unit axis No. : 1 to lower digit byte bit
WXXXX + 2	SPEED NO.	Feed speed number : 0 to 15 (override number)
WXXXX + 3	STEP FEED LENGTH-H	Relative length of travel for step operation : 1 to 9999 (command units) (*1)
WXXXX + 4	STEP FEED LENGTH-L	
WXXXX + 5	SYSTEM USE	Used as an execution flag in system.

*1 : This register is necessary but value does not need to be set when step operation is not to be performed.

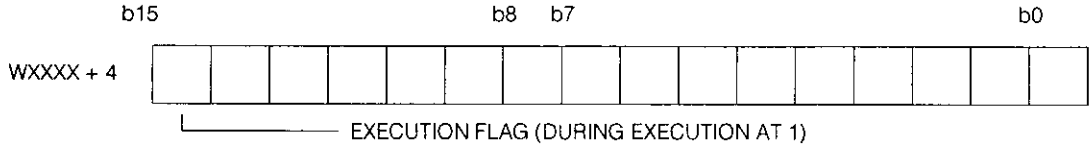
• MC unit axis number : Set 1 for bit 0 to 3 corresponding to the axis to be selected. Two or more axes cannot be specified at the same time.

	b15						b8	b7								b0
WXXXX + 1	0	0	0	0	0	0	0	0	0	0	0	0	4	3	2	1
														AXIS NO.		

• Speed Nos. and override values

No.	Override Value	No.	Override Value	No.	Override Value	No.	Override Value
0	The 2nd feed speed	4	6%	8	30%	12	70%
1	1%	5	8%	9	40%	13	80%
2	2%	6	10%	10	50%	14	90%
3	4%	7	20%	11	60%	15	100%

• System execution flag



● Data to be monitored

Display the current value and the error status

WYYYY	CURRENT VALUE-H	0 to ± 9999 9999
WYYYY + 1	CURRENT VALUE-L	WYYYY WYYYY+1
WYYYY + 2	STATUS	

For the status after starting, refer to Par. 8.2.15 of "Programming Manual for PLC Unit" (SIE-C888-1.1).

● Description of operation

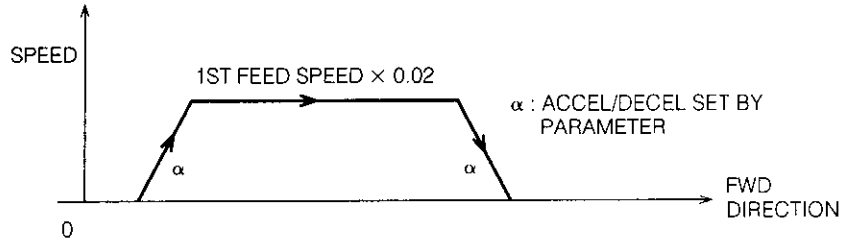
Input 1	• START: Execution command Use NO contact (⊣ ⊢) for the command. Job operation is executed while the command is ON ; it stops when OFF.
Input 2	• STEP: Step/jog select When this input is OFF, jog operation is possible. When it is ON, step operation is possible. Input 2 must be input before input 1 goes ON.
Input 3	• REVERSE: Reverse run command This input specifies the direction of rotation. OFF commands the forward rotation, ON reverse rotation The input takes effect only when an execution command is input
Output 1	• RUN: During running This output goes ON while an command is being executed. It goes OFF when the operation or STOP command is completed.
Output 2	• ERROR: Error This output goes ON for a single scan after operation terminates with an error
Output 3	• DONE: Completion This output goes ON for a single scan after operation terminates normally.

3. EXPANDED COMMANDS OF PLC UNIT

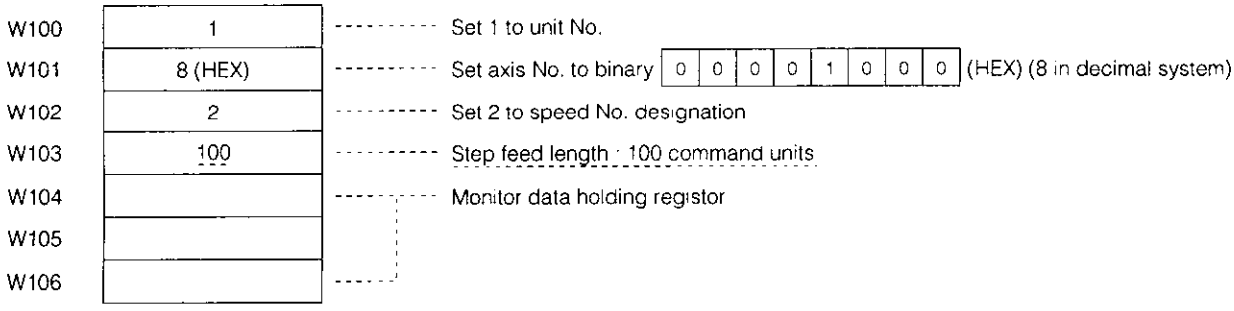
○ Typical Operation

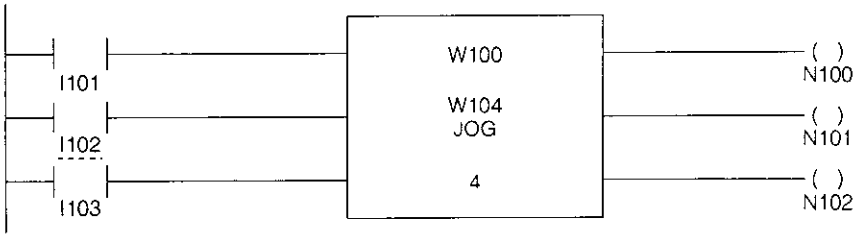
(i) Operation and sequence program

Axis number 4 of the servomotor jogs in the forward rotation direction at a speed of 2% of the 1st feed rate.

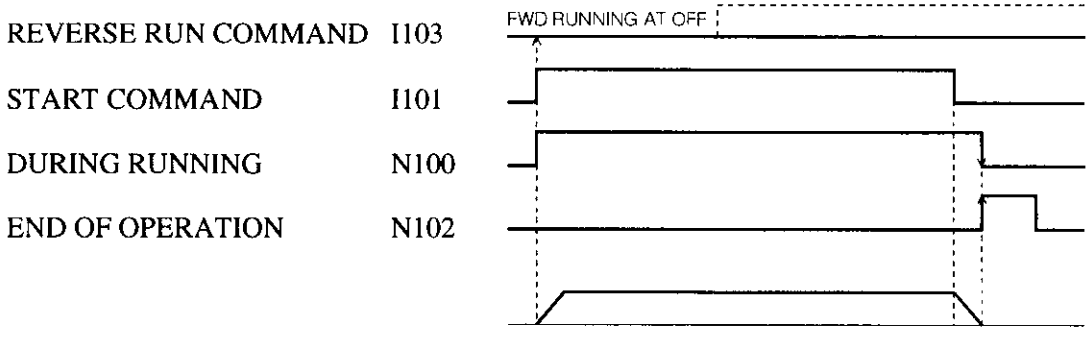


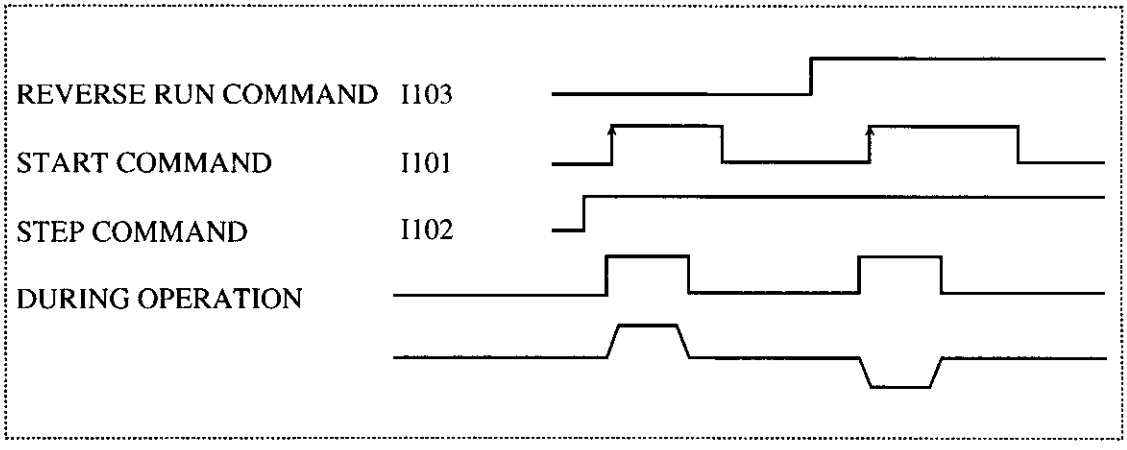
(ii) Sequence ladder circuit





(iii) I/O timing

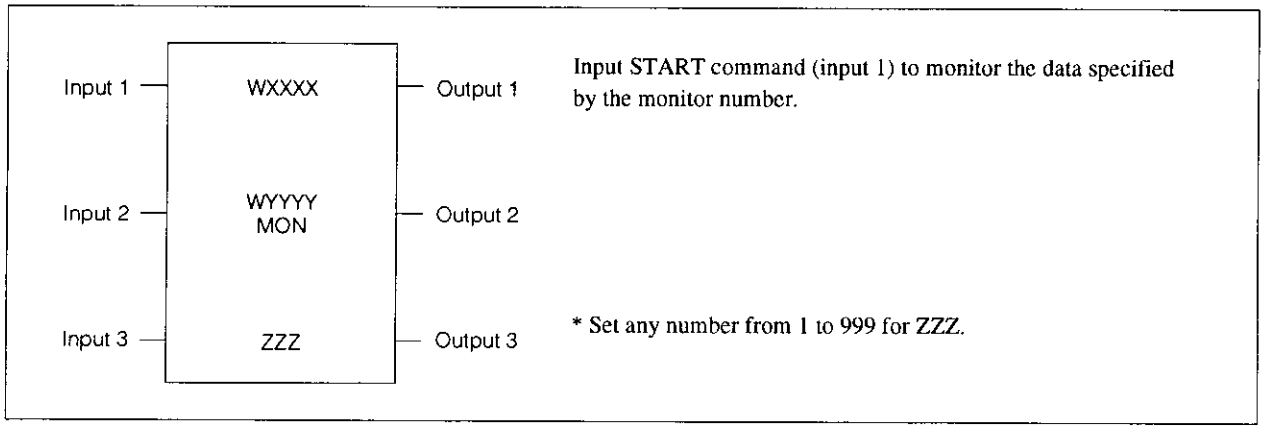




3. EXPANDED COMMANDS OF PLC UNIT

3.3 MONITOR (MON) --- (Par. 8.2.6 of "Programming Manual for PLC Unit" (SIE-C888-1.1))

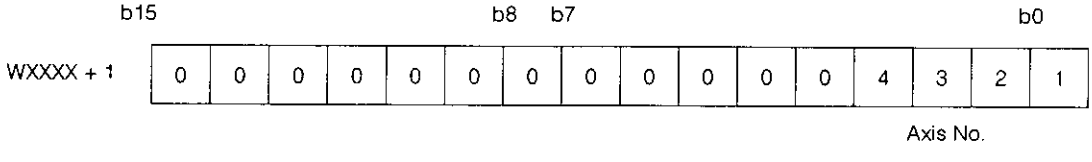
Use the monitor command to monitor the state of the specified axis.



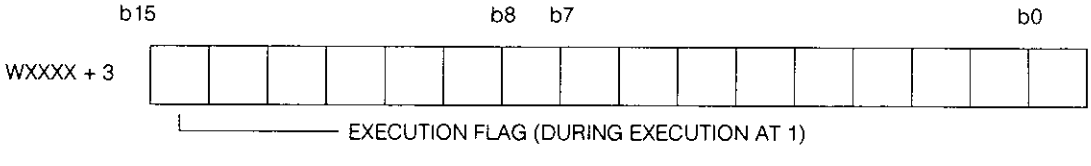
● Data to be set

WXXXX	UNIT NO.	MC unit No. : 1 to 2
WXXXX + 1	AXIS NO.	MC unit axis No. : 1 to lower digit byte bit
WXXXX + 2	MONITOR NO.	Monitor No. : Specifies contents to be monitored.
WXXXX + 3	SYSTEM USE	Used as execution flag in the system

• MC unit axis number : Set 1 for bit 0 to 3 corresponding to the axis to be selected. Two or more axes cannot be specified at the same time.



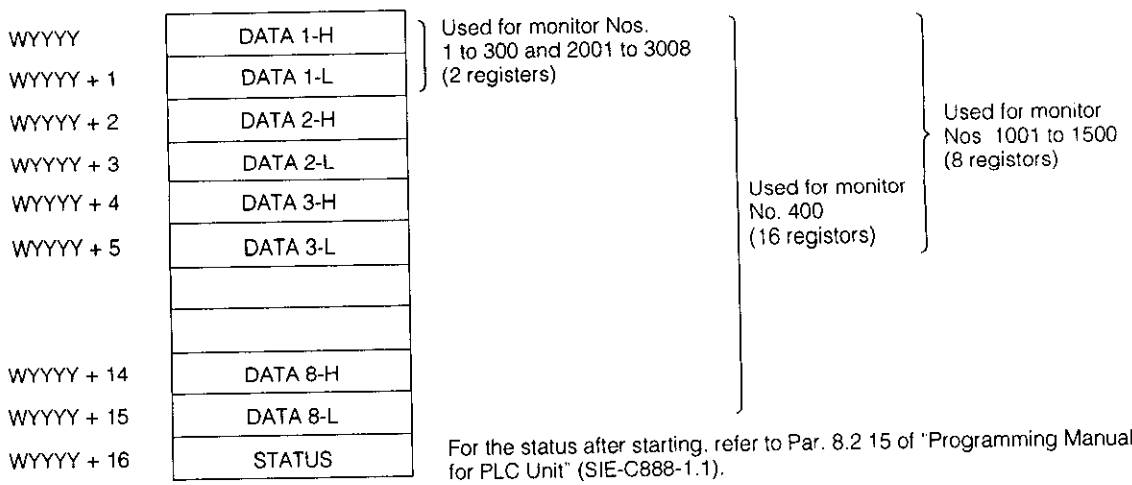
• System execution flag



• Monitor number
Specify the data to be monitored.

No.	N		Possible to activate
000N	1	Current position	○
	2	Position deviation	○
	3	Command speed	○
	4	Command speed	○
001N	0 to 9	0 : Current alarm 1 to 9 : Previous alarm of the specified number of times before	
0020		MC unit external input status (8 points)	
0030		MC unit external output status (4 points)	
01NN	1 to 99	Common servo parameter reference	
02NN	1 to 99	Corresponding axis servo parameter reference	○
0300		Program No. being executed	
0400		Data of compensated values H1 to H8	
1NNN	1 to 500	Table data	
2NNN	# 1 to # 199	Variables 1 to 199	
3NNN	# 1001 to # 1008	System variables 1 to 8	

● Data to be monitored
Display the data and the error status.



For the status after starting, refer to Par. 8.2 15 of "Programming Manual for PLC Unit" (SIE-C888-1.1).

Monitor numbers 1 to 300 use data 1-H and -L. If the data value is negative, 1 is set for the most significant bit (MSB) of data 1-H.

3. EXPANDED COMMANDS OF PLC UNIT

● Description of operation

Input 1	• START : Execution command Use start-up differential (—┤↑├—) for the command. If the command goes ON or OFF during execution, it is disregarded.
Input 2	• NONE · Not used
Input 3	• NONE : Not used
Output 1	• BUSY : During execution This signal is ON while a command is executed. The signal goes OFF when the execution is completed.
Output 2	• ERROR : Error This signal goes ON for a single scan after execution is terminated by an error.
Output 3	• DONE : Completion This signal goes ON for a single scan after execution terminates normally.

● Detailed monitor contents

(i) Monitor No.

No.	Contents	Data Display	Unit
01	Current position	0 to ±99999999	Command units
02	Position deviation	0 to ±99999999	Pulse ×4 conversion value of PG pulse
03	Current speed (Motor rotating speed)	0 to ±999999	r / min
04	Command speed	0 to ±99999999	× 1000 command units / min

(ii) Alarm monitor

In the MC unit, up to 9 alarms that occur at the same time can be stored.

No.		Contents
10	Alarm status	Alarm that occurred last
11 to 19		Alarm stored in the occurring order

Alarm Code List

	Code	Message
Alarm 1	001	Program capacity over.
	002	Program character max over.
	003	Nothing program number.
	004	Command argument error.
	005	Numerical or decimal point error.
	006	Character error.
	007	Data over flow
	008	Command error. (SYNTAX)
	009	Command error. (Duplicate)
	010	"F" command error.
	011	Circular interval radius none.
	012	Circular interval another area.
	013	Program number out of range.
	014	Notch command error.
	015	
	016	Command error. (interval, plane, terminal)
	017	Invalid offset number.
	018	Nothing subprogram number.
	019	Nothing subprogram .
	020	Subprogram error. (NOT "RET")
	021	Multi subprogram call
	022	Program error. (NOT "END")
	023	Time set error. (wait command)
	024	Axis undefined.
	025	Divide by zero.
	026	Overflow
	027	Branch command error.
	028	Repeat command error.
	029	
	030	

Alarm Code List (Cont'd)

	Code	Message
	071	MC unit breakdown (1) RAM.
	072	MC unit breakdown (2) RAM.
	073	MC unit breakdown (3) RAM.
	074	MC unit breakdown (4) RAM.
	075	MC unit breakdown (1) ROM.
	076	MC unit breakdown (2) ROM.
Alarm 2	077	MC unit breakdown (3) ROM.
	078	MC unit breakdown (4) ROM.
	079	Parameter broken.
	080	Axis nume duplicate.
	081	Emergency stop.
	082	
	A01	Servoamp abnormal.
	A02	"+" direction over travel.
	A03	"-" direction over travel.
	A04	Excessively deviation.
	A05	"+" direction soft over travel.
	A06	"-" direction soft over travel.
	A07	Invalid position
	A08	(reserve.)
	A09	(reserve.)
Alarm 3	A10	PG broken wire.
	A11	Detect overrun.
	A12	
	A13	
	A14	
	A15	
	A16	

Note : A : Axis Nos.: 1 to 4

(iii) Monitor of MC unit input signals

No.	Contents							
	b7	b6	b5	b4	b3	b2	b1	b0
21	ZERO2	DEC2	N-OT2	P-OT2	ZERO1	DEC1	N-OT1	P-OT1
22	ZERO4	DEC4	N-OT4	P-OT4	ZERO3	DEC3	N-OT3	P-OT3
23						PG Pulse 1		
						ORG	PB	PA
24						PG Pulse 2		
						ORG	PB	PA
25						PG Pulse 3		
						ORG	PB	PA
26						PG Pulse 4		
						PA	PB	PC
27								
	"1" or "0" is set to b0 to b7 Contact : [Closed : 0; Open : 1] Pulse : [H-level :1; L-level : 0]							

(iv) Monitor of MC unit output signals

No.	Contents							
	b7	b6	b5	b4	b3	b2	b1	b0
31					BRAKE4	BRAKE3	BRAKE2	BRAKE1
32								
33								
34								
	"1" or "0" is set to b0 to b7 Output : [ON : 0; OFF : 1]							

(v) Parameter value monitor

No.	Contents
100 to 199	Stores the set common parameter data to the MC unit. Monitor number 100 corresponds to parameter number 0 (P000) and 199 to parameter number 99 (P099), and the corresponding data are stored respectively. See the parameter list.
201 to 299	Stores the set each axis parameter data to the MC unit Monitor number 201 corresponds to parameter number 1 (PA01) and 299 to parameter number 99 (PA99), and the corresponding data are stored respectively. See the parameter list.

(vi) Motion program No. monitor

No.	Contents
300	DATA 1 — H ··· No O (Motion program No.) DATA 1 — L ··· No.B (Sequence block No.)

(vii) Compensated value monitor

No.	Contents	Data display
400	Compen-sation	Data 1 : H1 0 to ±99999999 Data 2 : H2 0 to ±99999999 Data 3 : H3 0 to ±99999999 Data 4 : H4 0 to ±99999999 Data 5 : H5 0 to ±99999999 Data 6 : H6 0 to ±99999999 Data 7 : H7 0 to ±99999999 Data 8 : H8 0 to ±99999999

(viii) Point table monitor

No.	Content
1001 to 1500	Stores data of four axes at the specified point in the point table.

(ix) Common variables monitor

No.	Content
2001 to 2199	Stores the specified common variables.

(x) System variables monitor

No.	Content
3001 to 3008	Store the specified system variables.

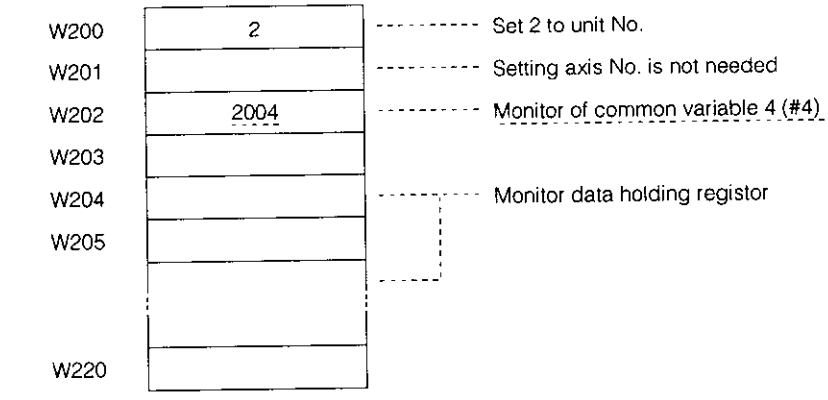
3. EXPANDED COMMANDS OF PLC UNIT

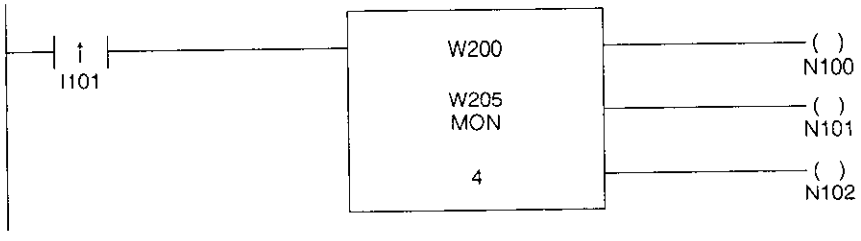
○ Typical operation

(i) Operation

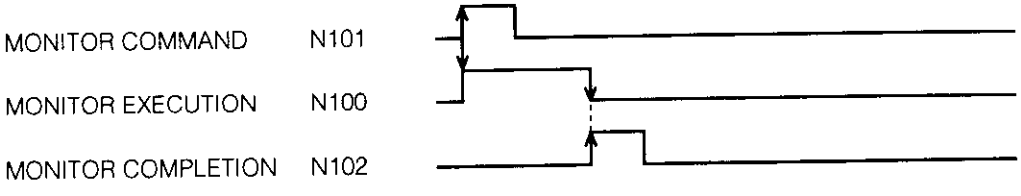
Monitors (reads) common variable 4 (#4) in MC unit 2.

(ii) Sequence ladder circuit





(iii) I/O timing



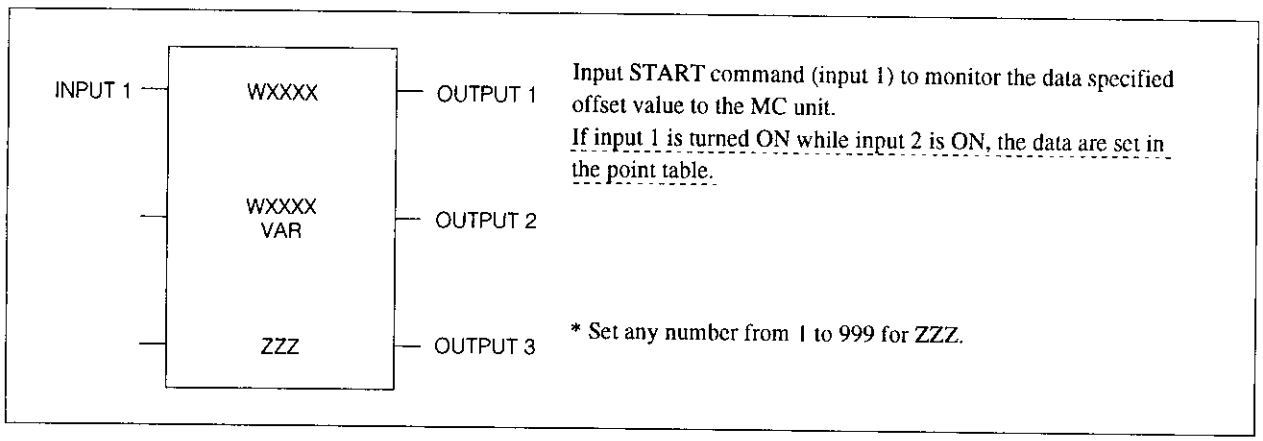
W205	W206
DATA 1-H	DATA 1-L

Stores the set value of common variable 4 (#4) to these data registers.
Contents of registers W207 to W220 are not determined.

3.4 COMPENSATED VALUE SETTING (VAR) --- (Par. 8.2.9 of "Programming Manual for PLC Unit" (SIE-C888-1.1))

Compensated value set up for H1 to H8 can be used to create a motion program. VAR command sets these compensated values.

Example : MVS XH1 YH2 FH3 ;



Once compensated values are set up, they are retained in the MC unit. The compensated values can be only referred to, but cannot be used for operation.

Example : MV2 XH1+H2 ; (This is not possible.)

3. EXPANDED COMMANDS OF PLC UNIT

● Data to be set

WXXXX	UNIT NO.
WXXXX + 1	DATA 1-H
WXXXX + 2	DATA 1-L
WXXXX + 3	DATA 2-H
WXXXX + 4	DATA 2-L
WXXXX + 5	DATA 3-H
WXXXX + 6	DATA 3-L
WXXXX + 15	DATA 8-L
WXXXX + 16	DATA 8-L
WXXXX + 17	SYSTEM USE

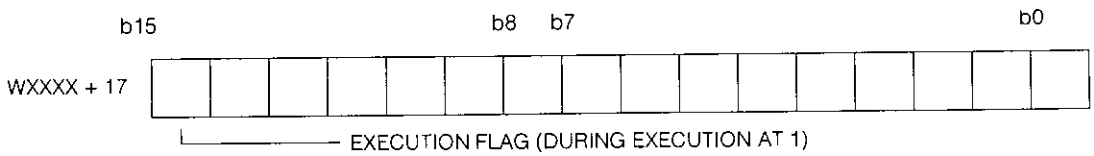
MC unit No. : 1 to 2

0 to ± 9999 9999

Data-H | Data-L

Used as execution flag in system

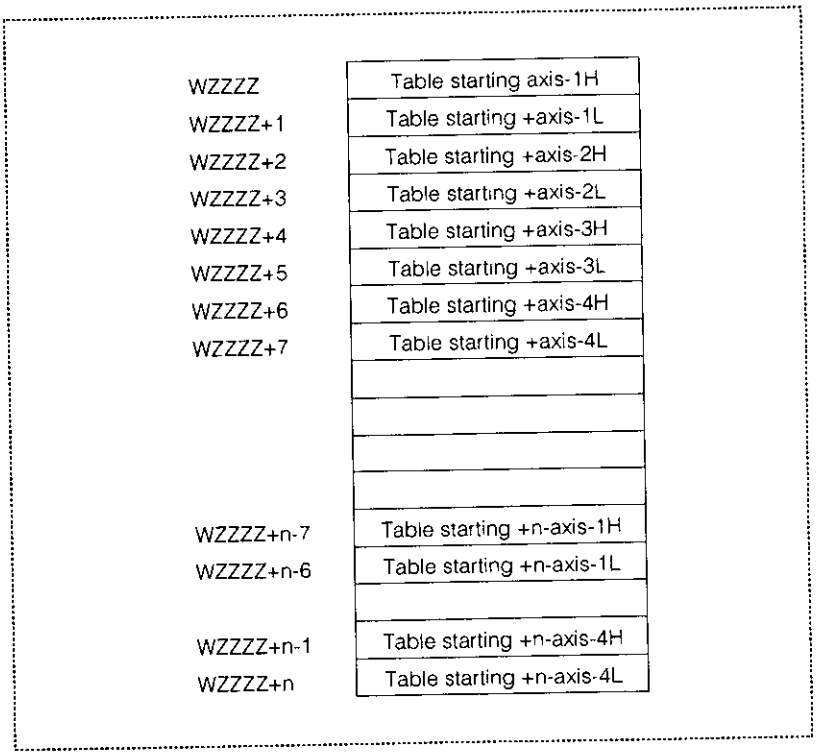
• System execution flag



• Data contents when the point table is set.

WXXXX	UNIT NO.	MC unit No. : 1 to 2
WXXXX + 1	REGISTER STARTING REFERENCE	Source register starting reference number : W1 to W2048
WXXXX + 2	TABLE STARTING REFERENCE	Destination table starting reference number : 1 to 500
WXXXX + 3	SIZE	Size (number of tables) : 1 to 128
WXXXX + 4	NOT USED	
WXXXX + 16	•	
WXXXX + 17	•	
WXXXX	NOT USED	
	SYSTEM USE	
	STATUS	

• Source register starting reference



● Data to be monitored

Display the current value and the error status.

WYYYY [Status] For the status after starting, refer to Par. 8.2.15 of "Programming Manual for PLC Unit" (SIE-C888-1.1).

● Description of operation

Input 1	• START : Execution command Use start-up differential (—┤ ↑ ├—) for the command. If the command goes ON or OFF during execution, it is disregarded
Input 2	• POINT TABLE : When this input is OFF, variable write-in is enabled. When this input is ON, write-in to a point table is enabled.
Input 3	• NONE : Not used
Output 1	• BUSY : During execution This signal is ON while a command is executed. The signal goes OFF when the execution is completed.
Output 2	• ERROR : Error This signal goes ON for a single scan after execution is terminated by an error.
Output 3	• DONE : Completion This signal goes ON for a single scan after execution terminates normally.

○ Typical operation : Writing H1 to H8

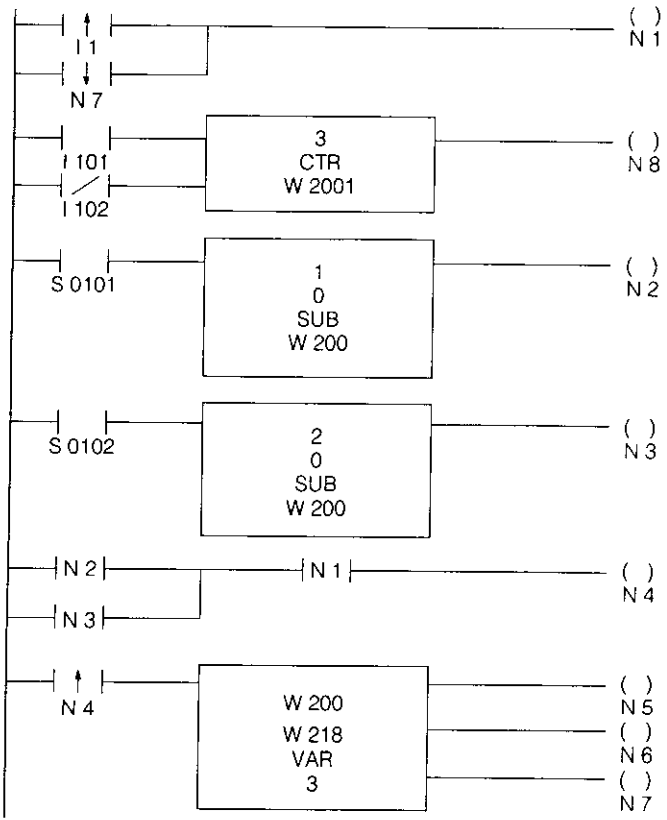
(i) Operation

For a motion program of interpolation with servomotor axis 1 (X) and 2 (Y), set H1 = 11000, H2 = 22000, and H3 = 1000.

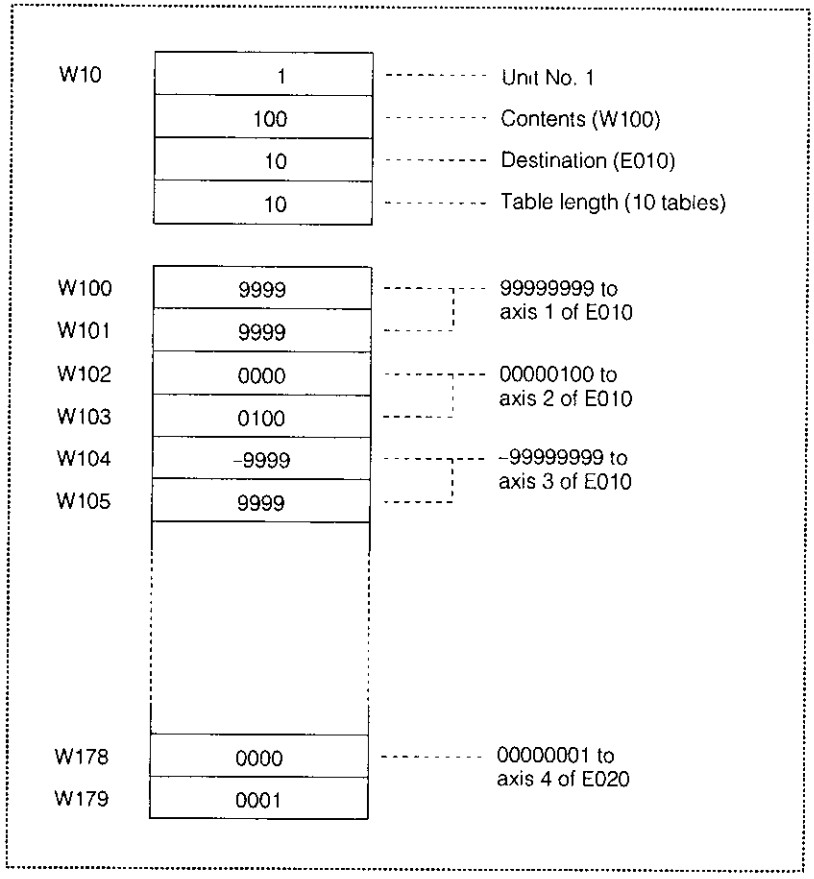
MVS XH1 YH2 FH3 ;

(ii) Sequence ladder circuit

W200	1	Set 1 to unit No.
W201	0001	Set H1 compensated value to 11000
W202	1000	
W203	0002	Set H2 compensated value to 22000
W204	2000	
W205	0000	Set H3 compensated value to 1000
W206	1000	
W207	0000	Set H4 compensated value to 0
W208	0000	
•	•	
•	•	
W215	0000	Set H8 compensated value to 0
W216	0000	
W217		Monitor data holding register



(iii) Writing-in to point table



4. ABSOLUTE POSITION DETECTING FUNCTIONS

4.1 OUTLINE

(1) The absolute position detecting function detects machine position even when power is OFF so that the mechanical coordinate system is automatically set without performing return to zero-point after power is turned ON again, to ready for immediate operation.

• The following features :

> ① Return to zero-point after power-ON is not necessary. This means easy and quick restarting.
> ② Stroke check function is available immediately after power-ON.
> ③ Zero-point dogs and limit switches at the ends of mechanical movable range are not necessary.

(2) This function is available with the combination of the following new model units.

<Name>	<Type>
• MC unit	JEPMC-MC003
• PLC unit	JEPMC-PC055 or -PC056

(3) Any of the following three operation systems can be used with this function by parameter setting:

① Using an absolute encoder, operation is performed by an absolute detecting system.
② Using an absolute encoder, operation is performed by an incremental detecting system.
③ Using an incremental encoder, operation is performed by an incremental detecting system.

4.2 PRINCIPLE OF ABSOLUTE POSITION DETECTION

4.2.1 General

(1) Absolute encoder

An absolute position is detected using the absolute encoder mounted on the end of the motor in a semi-closed loop. The detector consists of the encoder for detecting the position in a single rotation and the counter for counting the number of revolutions.

(2) Absolute data

Absolute data consist of N, the number of revolutions from the absolute reference position, and the position in a single rotation of the motor. After power-ON, the number of motor revolutions is read as serial data, and the position in a single rotation is read as the number of initial incremental pulses.
Operation after that is similar to an incremental encoder.
Therefore, absolute position P is determined as follows:

$$P = N * RP + P0$$

Where,

Number of revolutions	: N
Number of pulses per revolution of the motor	: RP
Count of initial incremental pulses	: P0

(3) Holding of absolute data

The absolute encoder, detecting absolute data, is always backed up by the battery even when power is OFF. The same battery also backs up program memory in the PLC unit.

- Battery type : Lithium battery
- Battery specifications : ER6V type, 3.6 V × 1 pc.
- Non-energized life : About 1 year

(4) Fetching absolute data

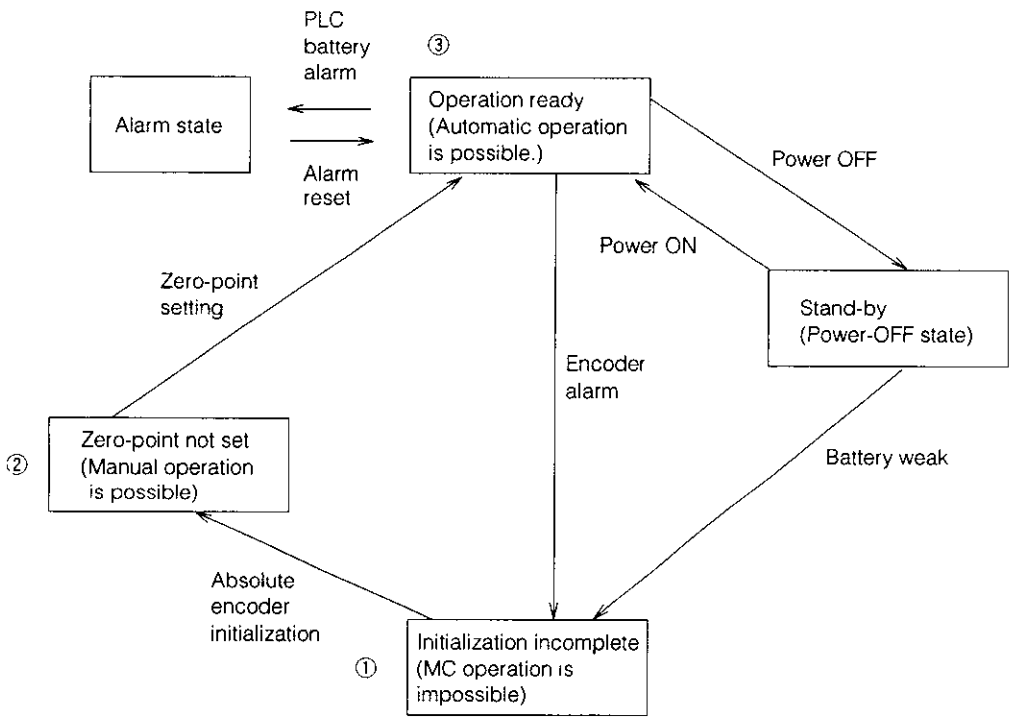
Absolute data P (P = N * RP + P0) are fetched into the MC unit at power-ON, stored as absolute position data, and the mechanical coordinate system is automatically set based on the data.
Absolute machine position is detected just after power-ON and immediate auto operation is possible.

4. ABSOLUTE POSITION DETECTING FUNCTIONS

4.2.2 Status Transition of Absolute Position Detecting System

Status transition of an absolute position detecting system is shown in the diagram below.

Absolute position detecting system status transition



① Initialization incomplete

In this state, operation of the absolute encoder is not guaranteed.
This alarm occurs when the backup battery of the encoder becomes weak or when the encoder is used for the first time. Input reset signal to the encoder to initialize it.

② Zero-point not set

No zero-point has been set up. Only manual feeding is possible.
If absolute position detecting function is not to be used, normal automatic operation is possible after setting parameters.

③ Operation ready

The zero-point has been set, absolute position detecting function is started up, and the system is ready to operate.

④ Stand-by

Motion of the machine is detected while power is OFF. The super capacitors or the battery supplies power for detection.

4.3 STARTING UP THE ABSOLUTE POSITION DETECTING SYSTEM

4.3.1 System Start-up Procedure

To start up the absolute position detecting system, the following operation procedure is needed.

① Set related parameters • • • Set parameters related to the absolute position detecting function.

↓

② Initialize the absolute encoder • • • Set the absolute encoder to the initial value.

↓

③ Set zero-point • • • Perform the zero-point setup operation to set the absolute zero-point, or the mechanical coordinate zero-point.

After procedures ① to ③ have been performed properly, the system is ready for operation.

Perform this startup procedure when :

- The absolute position detecting system is to be started up for the first time.
- The servomotor is replaced.
- An alarm related to the absolute encoder has occurred.

4.3.2 Related Parameter Setting

(1) Before starting up the absolute position detecting system, set the related parameters below.

No.	Name	Range	Unit	Initial Value
PA10	Absolute encoder tolerance	0-99999999	Pulse	30000
PA15	Absolute value selection	<Encoder> <System> 0 : Incremental-incremental detection 2 : Absolute-incremental detection 3 : Absolute-incremental detection		0
PA57	Zero point offset 1	0-99999999	Command unit	0
PA58	Zero point offset 2	0-99999999	Command unit	0

(2) Absolute encoder tolerance (PA10)

If the difference between the mechanical coordinates stored at power-OFF and that at the next power-ON is greater than the tolerance set for PA10, a power-OFF position error alarm is issued.
If 0 is set for the tolerance, this check is omitted.

<Set value at start-up>

Unless for specific purposes, leave the initial value to 30000 as it is.

(3) Absolute value selection(PA15)

Set the encoder and the detecting system to be used. Any of the following combinations can be selected.

<Parameter> <Encoder type> <Position detecting system>

- PA15 = 0 : Incremental encoder ··· Incremental detecting system
- PA15 = 2 : Absolute encoder ··· Incremental detecting system
- PA15 = 3 : Absolute encoder ··· Absolute detecting system

<Set value at start-up>

Set 3 for PA15.

Observe the following for setting.

① Display the parameter setup display. Move the cursor to "PA15," then depress the return key. The subwindow shown below appears.

Bit Position : Name	ON/OFF	Reference
B0 : System B1 : Encoder	0 0	0 : Incremental, 1 : Absolute 1 : Incremental, 1 : Absolute

② Move the cursor to "System". Enter "1".

③ Move the cursor to "Encoder". Enter "1".

Now "3" is set for PA15.

Note : "0" can not be set for both b0 and b1. That is, setting 1 for PA15 is impossible.

(4) Zero-point offsets 1 and 2 (PA57 and PA58)

The zero-point setup operation can shift the set mechanical coordinate zero-point by the sum of the amounts set for these offsets.

- PA57 : Zero-point shift amount
- PA58 : Zero-point shift fine control

Set value at start-up

Unless for specific purposes, leave the initial value of 0 as it is.

◎ After starting up the absolute position detecting system, shift the mechanical coordinate zero-point by using these parameters.

4. ABSOLUTE POSITION DETECTING FUNCTIONS

4.3.3 Initializing the Absolute Encoder

(1) Initialize the absolute encoder for the following conditions :

① When the absolute position detecting system is to be started up for the first time.
② When the number of revolutions counted from the absolute reference position, stored in the absolute encoder, is to be reset to zero.
③ When the motor has been left four days or longer with the absolute encoder disconnected from the battery.
④ When an absolute encoder error alarm has occurred.

(2) Initialize the (15-bit type) absolute encoder by the following procedure.

① Turn OFF power to the PROGIC-8 system including the SERVOPACK.

② Discharge the super capacitor in the encoder by either of the following methods :

(A) By using the encoder connector

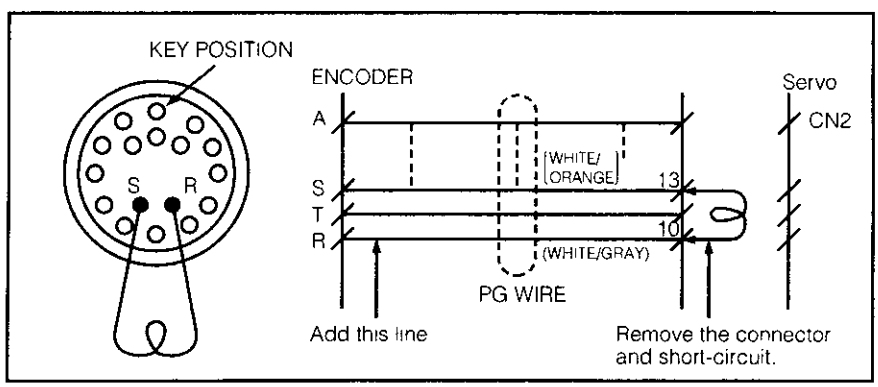
(a) Remove the encoder connector.
(b) Short-circuit pins R and S of the encoder connector.
(c) Let the connector stand for two minutes or longer with the pins short-circuited.
(d) Remove the short-circuited lead and replace the connector securely.

(B) By using the SERVOPACK connector

(a) Remove the SERVOPACK connector.
(b) Short-circuit pins 10 and 13 of the SERVOPACK connector.
(c) Let the connector stand for two minutes or longer with the pins short-circuited.
(d) Remove the short-circuited lead and replace the connector securely.

③ Reconnect the cables normally to connect the battery to the encoder. The battery is housed in the PLC unit.

④ Turn ON power to the system.
If an absolute encoder error alarm is issued, repeat the above procedures from ①. If no error occurs, the absolute encoder has been initialized.

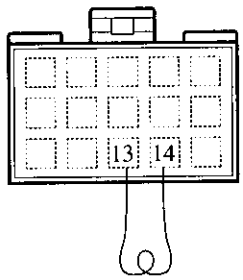


(3) Initialize the (12-bit type) absolute encoder by the following procedures.

① Connect the SERVOPACK, servo motor, and PROGIC-8 normally. Turn ON power to the system and energize for about five minutes, then turn OFF power.

② Reset the absolute position data in the encoder as follows.

(a) Remove the encoder connector.
(b) Short-circuit pins 13 and 14 of the encoder connector for about 2 or 3 seconds.
(c) Remove the short-circuited lead and replace the connector securely.



③ Reconnect the cables normally to connect the battery to the encoder. The battery is housed in the PLC unit.

④ Turn ON power to the system.
If an absolute encoder error alarm is issued, repeat the above procedures from (1). If no error occurs, the absolute encoder has been initialized.

4.3.4 Zero-point Setting

After initializing the absolute encoder, set the zero-point to determine the mechanical coordinate zero-point and the mechanical coordinate system.

(1) MC control coil and MC control relay for zero-point setting

To set the zero-point automatically, turn ON the zero-point setup signals (Q105-Q108) of the MC control coil of the corresponding axes to be set while the zero-point setup mode (Q112) signal is ON.

<MC unit 1>	<MC unit 2>
-- ( ) Q105 : The 1st axis zero-point setting	-- ( ) Q233 : The 1st axis zero-point setting
-- ( ) Q106 : The 2nd axis zero-point setting	-- ( ) Q234 : The 2nd axis zero-point setting
-- ( ) Q107 : The 3rd axis zero-point setting	-- ( ) Q235 : The 3rd axis zero-point setting
-- ( ) Q108 : The 4th axis zero-point setting	-- ( ) Q236 : The 4th axis zero-point setting
-- ( ) Q112 : Zero-point setting mode	-- ( ) Q240 : Zero-point setting mode

Whether the zero-point is set or not is stored in memory as the ON-OFF state of the MC control relays (P105-P108) for individual axes.

<MC unit 1>	<MC unit 2>
⊣ ⊢ P105 : ON : The 1st axis zero-point setting completed	⊣ ⊢ P233 : ON : The 1st axis zero-point setting completed
⊣ ⊢ P106 : ON : The 2nd axis zero-point setting completed	⊣ ⊢ P234 : ON : The 2nd axis zero-point setting completed
⊣ ⊢ P107 : ON : The 3rd axis zero-point setting completed	⊣ ⊢ P235 : ON : The 3rd axis zero-point setting completed
⊣ ⊢ P108 : ON : The 4th axis zero-point setting completed	⊣ ⊢ P236 : ON : The 4th axis zero-point setting completed

4.3.4.1. Operation procedure for setting zero-point

Set the zero-point as follows.

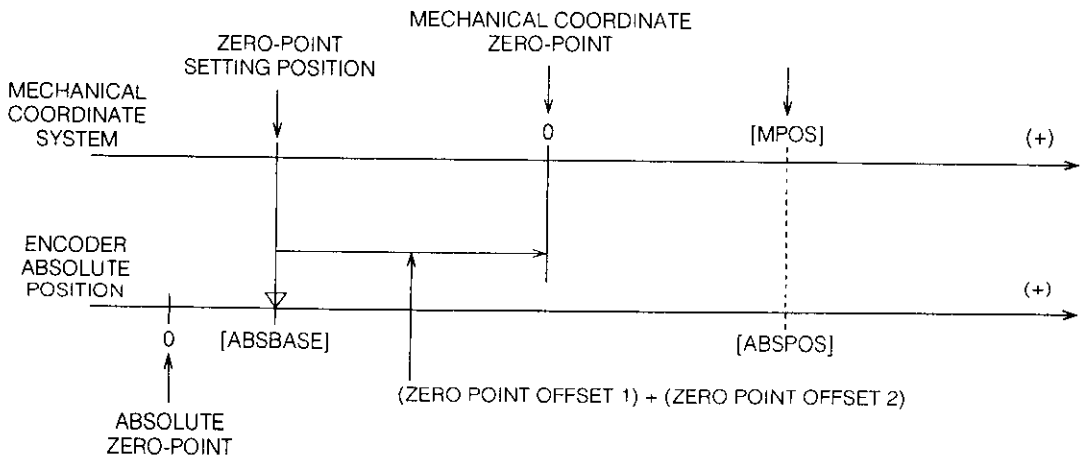
① Turn ON the zero-point setup mode (Q112/Q240) signal of the MC control coil.
② Move the axes by jog operation to the point to be set as the zero-point.
③ Turn ON the zero-point setup signal of the MC control coil of the axis to set up the zero-point ON.
→ The unit fetches the absolute data of that point from the encoder and stores them as "ABSBASE." Then the mechanical coordinate system zero-point is determined by shifting that point by the sum of zero point offset 1 and zero point offset 2, which are set for the parameters in advance.

<Parameter>
PA57 : Zero point offset 1 (Zero-point shift length) [command unit]
PA58 : Zero point offset 2 (Shift) [command unit]

After the zero-point is set, the MC control relay of the corresponding axis which indicates completion of zero-point setup is set to "completed."

Note : If zero-point setup operation is performed while the axes are moving, an alarm is issued.

④ Repeat the above steps ② and ③ for each axis.
⑤ After the mechanical coordinate system of all the axes has been set, the unit is ready for operation, that is, automatic operation and programmed operation according to the teachpendant box are available.



◎ The mechanical coordinate system set by the above procedure is automatically reset from the next power-ON by the following calculation, so that programmed operation can be started immediately.

MPOS [command unit] = ([ABSPOS] – [ABSBASE])
– [(zero point offset 1) + (zero point offset 2)]

4. ABSOLUTE POSITION DETECTING FUNCTIONS

4.4 SELF DIAGNOSIS OF THE ABSOLUTE POSITION DETECTING FUNCTION

(1) Position error check at power-ON

To check an error of the absolute encoder, the mechanical coordinates stored at power-OFF are compared with those at the next power-ON. If the difference is greater than the tolerance set for parameter PA10, it is recognized as an absolute position error and an alarm is issued. To clear this alarm, perform "alarm reset." This check is omitted if 0 is set for the tolerance.

(2) Battery check

Absolute position data are backed up by the battery and machine motion is continuously detected even while power is OFF. This battery is housed in the PLC unit. If the battery weakens, the absolute position detecting function becomes inoperable. The PLC unit checks the battery and issues the battery alarm before it becomes completely dead.
If the battery alarm is issued, replace immediately, within a month it at the battery in the PLC unit. Replace the battery with the unit powered. While power is OFF, the absolute position data are temporarily backed up by the super capacitors in the absolute encoder and the PLC unit, but the data will be lost if battery replacement takes one hour or longer and no power is supplied during the work.

> Note : The unit is operable even after the battery alarm is issued. However, if both the battery and the super capacitors are discharged, it becomes inoperable and an absolute encoder error or absolute position error alarm is issued. If this occurs, the whole procedure must be repeated from initializing the absolute encoder.
> After the battery becomes weak, the absolute encoder cannot be used as an ordinary incremental encoder.

4.5 RELATION TO OTHER FUNCTIONS

4.5.1 Auto Operation

If the absolute position detecting function is alive in the system, an alarm is issued if the special procedure to start up the absolute position detecting system has never been performed or if absolute data are lost. In this state, neither automatic operation nor programmed operation using the teach pendant are possible.

4.5.2 Soft Stroke Limit Function

After the absolute position detecting system is started up, the soft stroke limit function is available immediately after power-ON.

4.5.3 Backlash Compensation

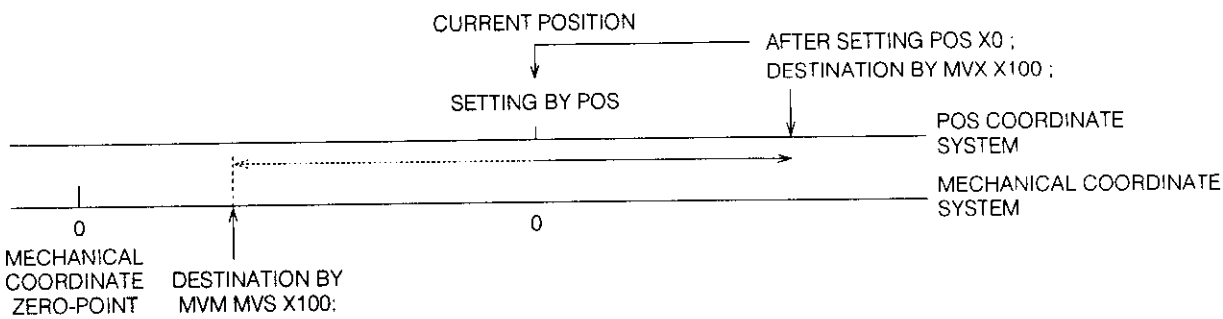
Backlash compensation is invalidated until the zero-point is set. At the 1st zero-point setup, and at each succeeding power-ON, the backlash compensation is disregarded to set the mechanical coordinate zero-point.
The backlash compensation direction with this equipment is fixed to reverse to the return-to-zero direction, so that backlash compensation takes effect after movement is made in reverse to the return-to-zero direction.

4.5.4 Mechanical Coordinate Command Mode (MVM)

① MVM MOV X • • • Y • • • Z • • • S • • • ;
② MVM MVS X • • • Y • • • Z • • • ;

X, Y, Z, S, I, J, K, L : command value 0 to ± 99999999 (command unit)

(1) Use this command to command instructions in the original mechanical coordinates after switching current position values of the axes by POS command.
(2) Command values for MVM are always recognized as absolute values regardless of ABS and INC commands. MVM can only be combined with MOV and MVS.
(3) Mechanical coordinates are used for return to zero. They are not affected by POS coordinate setting.



(4) Place this command at the head of the block for positioning (motion) with mechanical coordinates.
MVM MVS X ··· Y ··· Z ··· F ··· ;
(5) MVM is valid only for the block where it is placed.
(6) If the absolute position detecting system is active, MVM command employs the mechanical coordinate system set by zero-point setup procedure.

4.5.5 Zero-point Return Operation (ZRN)

(A) Using Incremental Detecting System (Parameter : PA15 = 0 or 2)

① ZRN X • • • Y • • • Z • • • S • • • ;
② ZRN X • • • Y • • • Z • • • ;
③ ZRN X • • • Y • • • ;
④ ZRN X • • • Y ;

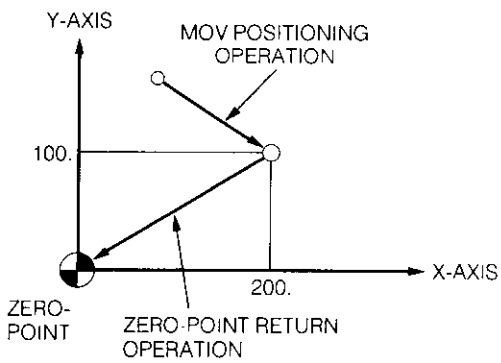
X, Y, Z, S : Aimed position 0 to ±99999999 (command unit)

(1) ZRN command first performs similar to MOV command, that is it moves the axes to a aimed position at the rapid traverse speed (specified by PA04), then returns the axes to the zero-point by the procedure the same as that of the ZRN (return to zero) command of the PLC unit. Positioning to the aimed position is omitted by the first zero-point return command after power-ON.
The direction of returning to zero is set by parameter PA50 (zero-point return direction).

(2) The format is ZRN X • • • Y • • • Z • • • S • • • ; (up to four axes selected). Up to four axes can be moved at the same time. Even if an axis is specified, it is not moved unless a coordinate on it is specified.

(3) Program example

ZRN X100. Y200. ;



(4) The next block is started when positioning for return to zero is completed on all the specified axes.

(5) At the first execution of ZRN after power-ON, MOV positioning (for relief) is skipped.

(B) Using Absolute Detecting System (Parameter : PA15 = 3)

• Zero-point return at PA15 = 3

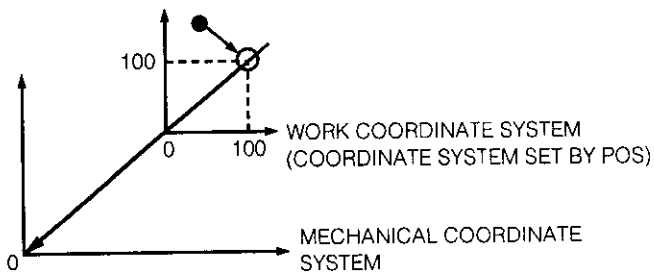
(6) If no zero-point is set, execution of ZRN (return to zero) from the PLC causes an zero-point unset error even during automatic operation.

(7) ZRN command from the PLC unit
Positioning to the mechanical coordinate zero-point is performed similar to that by MOV command.

(8) If a work coordinate system is set by the POS command, the axes are moved to the aimed position in that coordinate system, then to the zero-point of the mechanical coordinate system.

(Example)

ZRM X100. Y100. ;



4.5.6 Absolute/Incremental Mode (ABS, INC)

ABS : Specifies that the succeeding position data are absolute values.
INC : Specifies that the succeeding position data are absolute values.

(1) This command simply specifies the mode of command values in the program, and is not affected by the absolute position detecting function.

5. EXPAND OF PROGRAMMING SYSTEM

The programming system has been updated from version 1.0 to 2.0 to support the following additional functions.

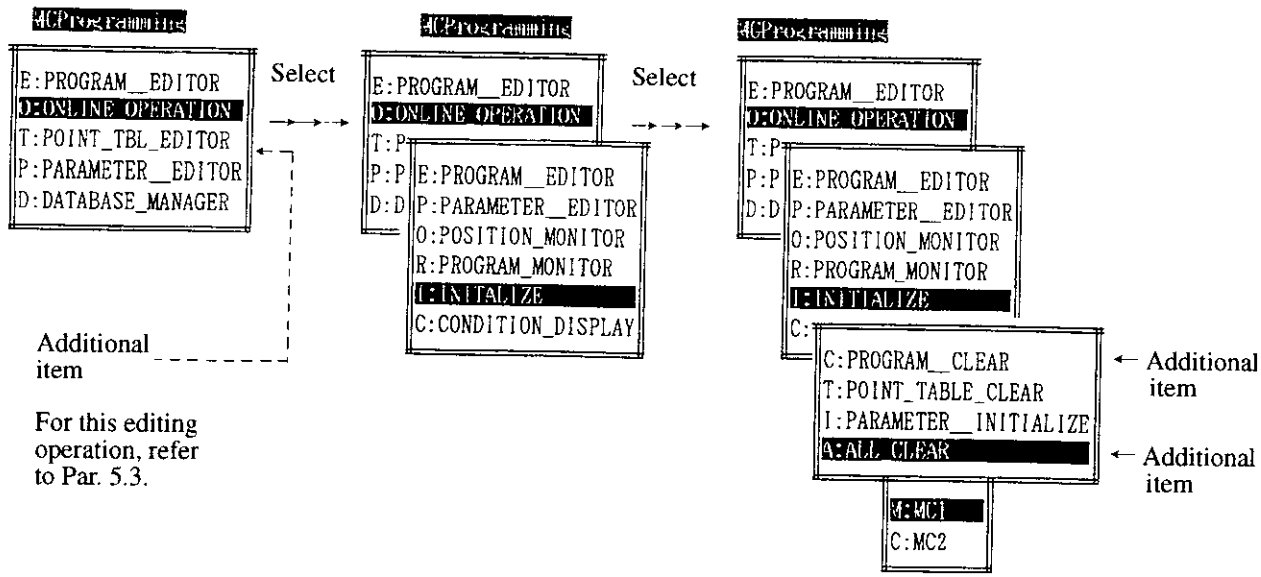
- MC file ID check function
- Point table position command function
- Communication port 2 on the PLC units (PC055, PC056)

5.1 MENU CHANGES

5.1.1 Changes to the Main Menus

(1) The following items are added to the main menus.

- "T : POINT TBL EDITOR" to the "MC Programming" menu
- "T : POINT TABLE CLEAR" and "A : ALL CLEAR" to the "I : INITIALIZE" menu displayed after "O : ONLINE OPERATION."



(2) Selecting "A : All clear" performs the following three items altogether.

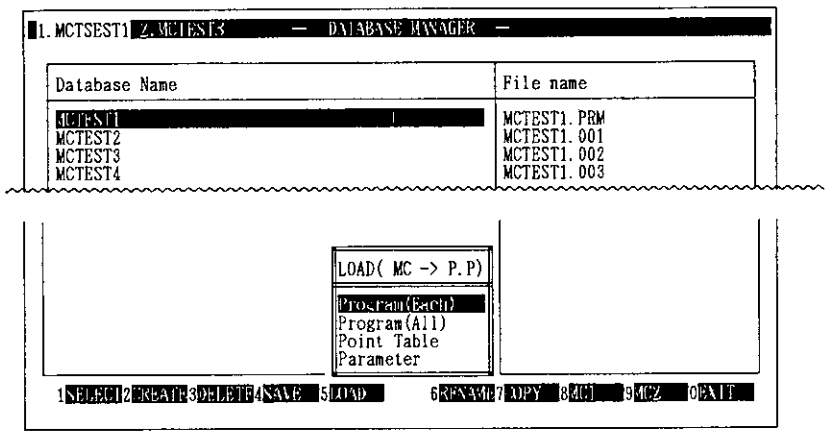
• PROGRAM CLEAR • POINT TABLE CLEAR • PARAMETER INITIALIZE	All clear →	• Proglam is all deleted • Set point data as 0. • Set parameter as initial value

(3) Selecting "T : POINT TABLE CLEAR" resets all point data to 0.

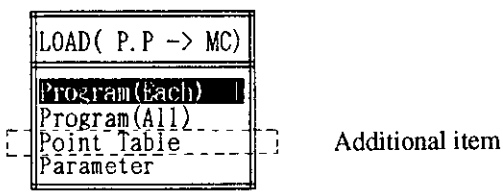
5.1.2 Load/Save Menu Changing

(1) "Point table" is added to the load menu and the save menu on the MC programming database manager display.

• MC Programming → Database Manager : Save



• MC Programming → Database Manager : Save



(2) Load and save operation is same as other files' operation.

5. EXPAND OF PROGRAMMING SYSTEM

5.2 ID CHECK FUNCTIONS

5.2.1 Outline

ID check is performed on MC files only. This function prevents inadvertent loading of motion programs, parameters, and point tables of one system to another MC unit.
If no ID code is set for common parameter P000, no ID check is performed so that any file can be loaded and saved. However, once parameters with an ID code for P000 are loaded to an MC unit, files without the same ID code cannot be loaded or saved to the unit.

5.2.2 ID Code

(1) Set an ID code of up to four half-width alphanumeric characters for common parameter P000.

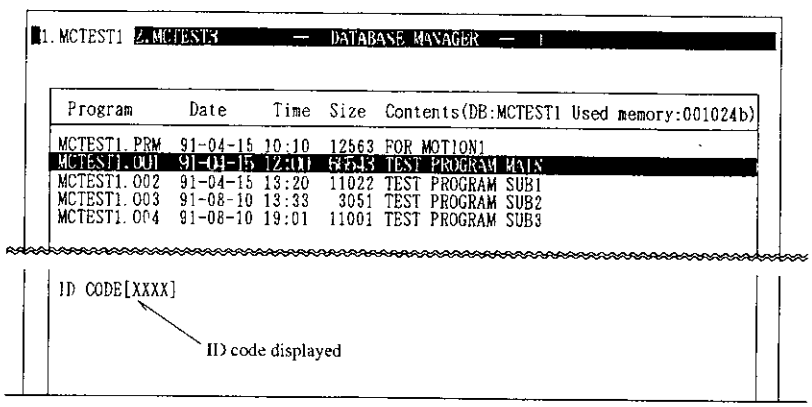
(2) The ID code set for the parameter is for all the files in the database. In other words, each database has a single ID code.

(3) When an MC file is loaded or saved, the ID code in the parameters is checked. If there is no parameter file, it is assumed that no ID code is set.

(4) A valid parameter file with an ID code must be in a format of "database-name.PRM" (PRM for the extender).

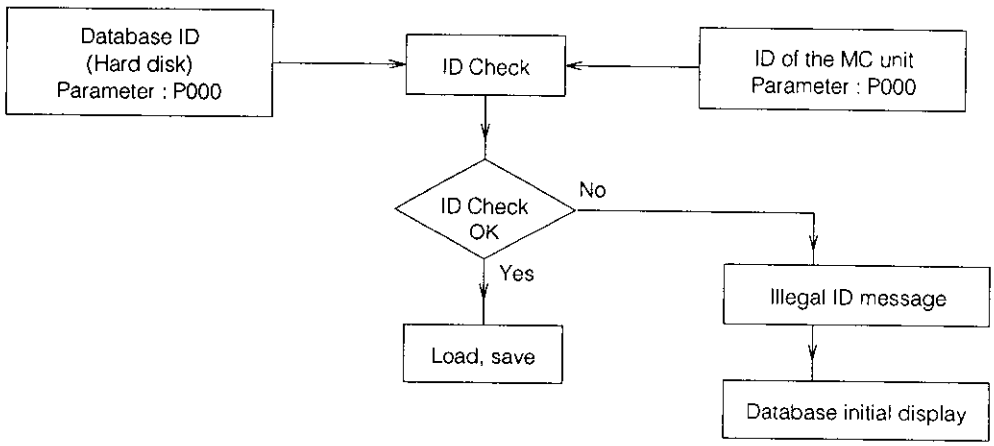
(5) An example of indication of an ID code is shown below.

• MC Programming → Database Manager



5.2.3 ID Check Method

(1) At load or save for MC file, ID check is automatically executed.



(2) If ID check result is "illegal", the following message is displayed.

Example : MC unit 1

```
ID Code Error
unit 1      ID code [XXXX]
database    ID code [YYYY]
```

(3) Whether ID check is performed or not is determined by the following conditions.

Program and Parameter File	ID Check	MC Unit (P000)
Without ID setting → / ←	Not performed / Not performed	→ / ← No ID is set
With ID setting → / ←	Not performed / performed	→ / ← No ID is set
Without ID setting → / ←	Performed / Performed	→ / ← ID is set
With ID setting → / ←	Performed / Performed	→ / ← ID is set

(4) To load or save a file in spite of the illegal ID message, use the online parameter setting and modify the ID code set for P000 to match the legal ID code.

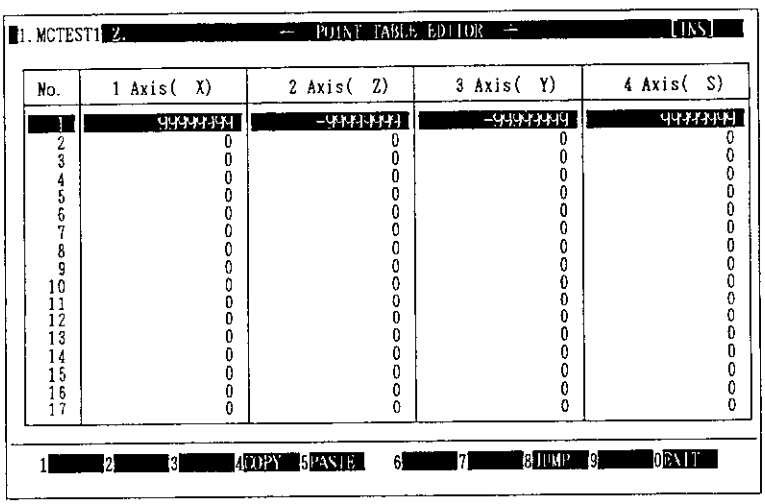
5. EXPAND OF PROGRAMMING SYSTEM

5.3 POINT TABLE EDITING AND PRINTING

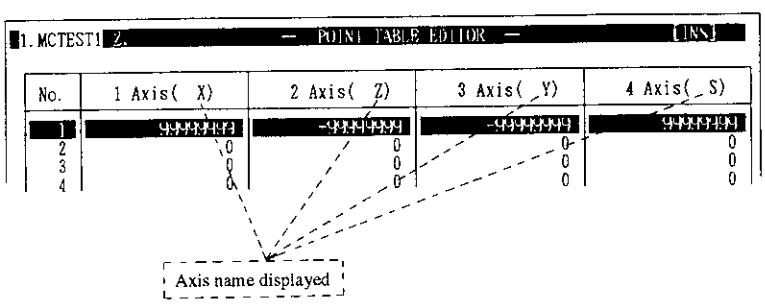
The point table editor display is added to use the point table position instruction supported by the MC unit (MC003).

5.3.1 Point Table Editing (Offline)

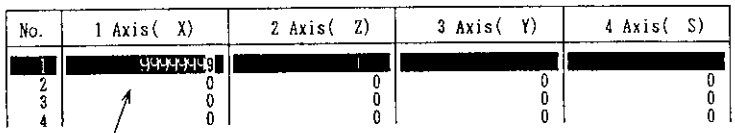
(1) Select "T: POINT TBL EDITOR" from the MC programming menu. The editing display shown below is displayed, where values on the point table can be set or modified.



(2) Indication of axis names (X, Y, etc.) are determined by common parameters P001 to P004. If there is no parameter file, or the names are not set, a "-" (hyphen) is displayed in its place.

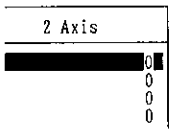


(3) The point table contains zeros as initial values.
To set or modify values, do as follows. (The procedure is basically the same as parameter setting.)
① To move the cursor in a column, use ⬆ or ⬇. The cursor line is displayed in highlight.
② Move the cursor to the position to modify, and depress ⏎.
→ Entry of a value for the first axis column is waited for.
③ Depress ⏎ to move between columns.



The 1st axis column to be waited for.

Depressing ⏎ again makes entry for the 2nd axis column to be waited for.

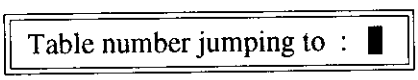


④ Enter a value by number keys for the axis to be set or modified.
Setting range is from -99999999 to +99999999.
⑤ Repeat ② to ④ to complete the point table.

(4) When entry is not waited for, the following scroll operations are possible.
- The cursor moves by ⬆ or ⬇.
- Depressing ⬆ when the cursor is on the first line makes a jump to the last (500th) line.
- Depressing ⬇ when the cursor is on the 500th line makes a jump to the 1st line.

(5) The following jump functions (by function key f8) are available.

After selecting "Goto step", enter the point number to be jumped to in the window shown below.

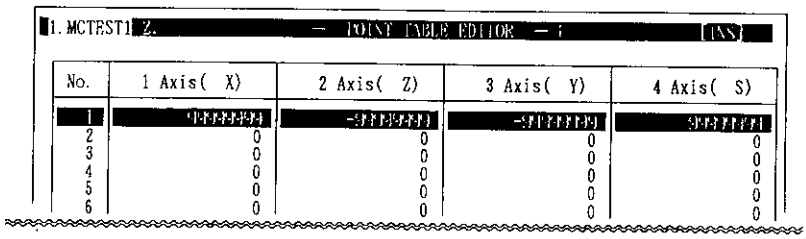


(6) [f4] [COPY] and [f5] [PASTE] can be valid.
Copying and pasting operation in one-line unit is as follows.

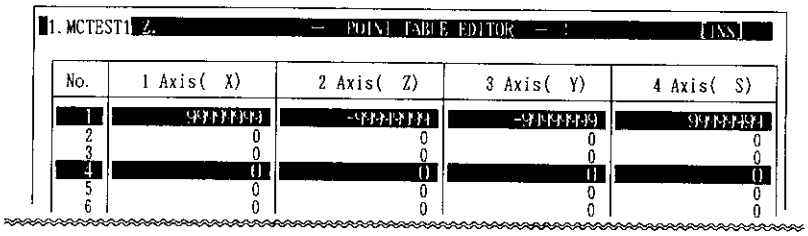
Example : Copying the 1st line to the 4th line.

① Move the cursor to the 1st line.

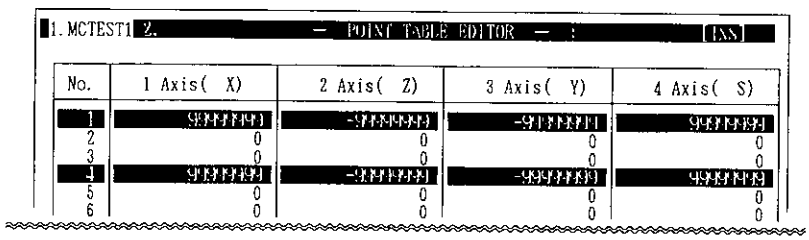
② Depress [f4].
→ The data on the 1st line are stored.



③ Move the cursor to the 4th line.



④ Depress [f5].
→ The stored data are pasted to the 4th line.



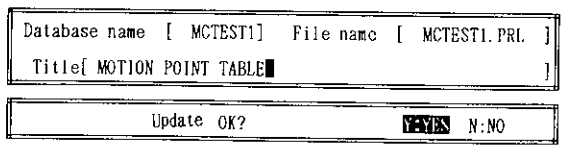
Note : By the above paste operation, the data on the first line can be copied to any location for a desired number of times, until the copy function key [f4] is depressed the next time and the selected data are changed.

(7) To exit from point table editing, do as follows. The procedure is basically the same as when exiting from (offline) parameter setting.

① Depress [f10].

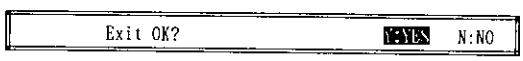
is displayed.

② Select "SAVE"
→ The following display appears.



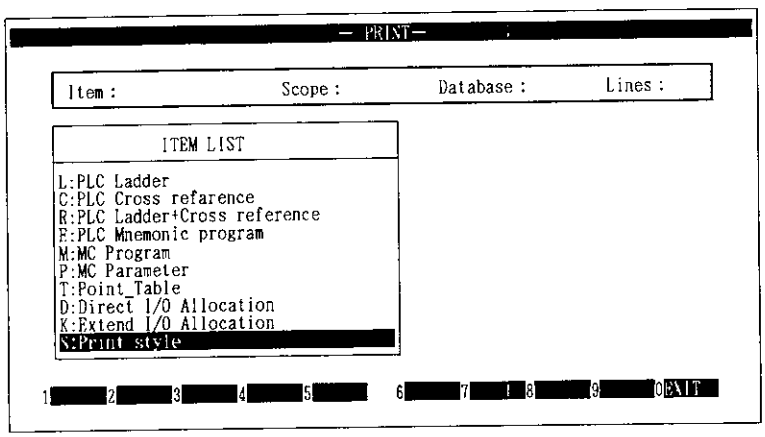
or

③ Depress "Y : YES" to update or enter. The editing operation is terminated.
④ To discard the edited table, select "QUIT" in step ②. After that, depress "Y : YES" to exit.

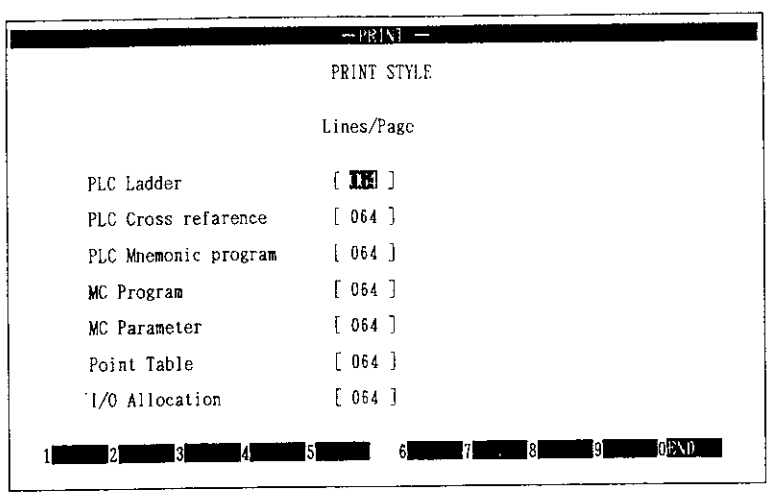


5.3.2 Point Table Printing

(1) "T : Point Table" is added to the print menu displayed after the utility menu.
Utility → PRINT menu



(2) Select "S: Print style" to set the number of lines per page.
S : PRINT STYLE → line number setting display

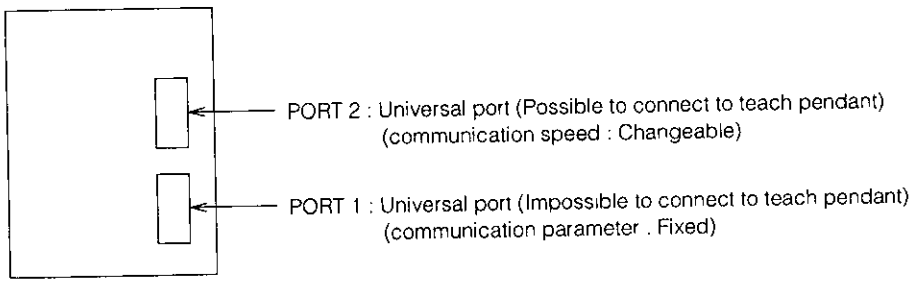


(3) Printing start operation is the same as the operation of "parameter" or "program".

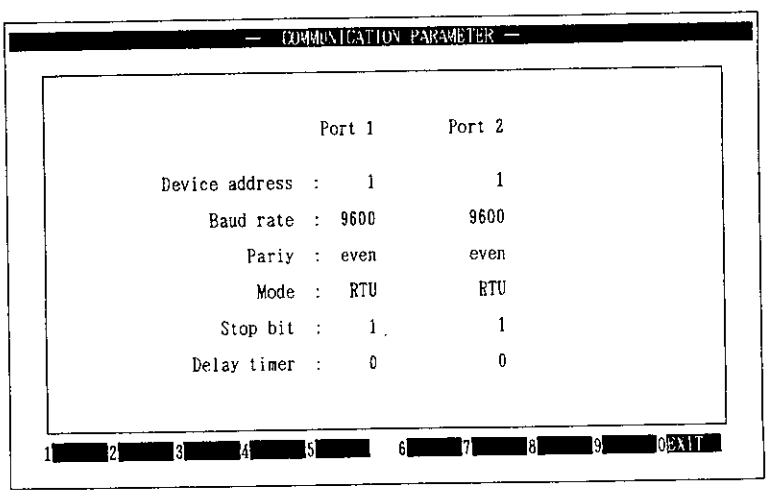
5.4 DISPLAY AND SETTING OF COMMUNICATION PARAMETERS

Communication port 2 has been added to PLC units (PC055, PC056), at which communication speed can be modified. To display and set communication parameters for modifying the speed, do as follows.

PLC UNIT (PC055, PC056)



(1) Select from the PLC programming menu from "O : ONLINE OPERATION" to "C : CONDITION DISPLAY" to "T : COMMUNICATION PARAMETER."
→ Parameters of communication ports 1 and 2 are displayed.



(2) With port 1, the communication parameters are only displayed but cannot be modified.

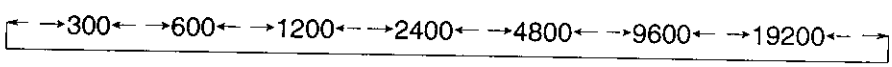
(3) With port 2, not only the communication parameters are displayed but "Baud rate" can be set or modified.

(4) To set or modify the baud rate at port 2, do as follows.

① Depress [↵] on the communication parameter display.
→ The baud rate at port 2 is ready for setting or modification.

② The cursor position is displayed in highlight.
The baud rate can be switched by [←] or [→] cyclically as shown below.

Baud rate (bps)



③ Place the cursor at the baud rate to be set, then depress [↵].
→ The baud rate at the cursor position is selected and the highlight disappears.

④ Depressing [ESC] after step ①, when it is ready for modification, the status before modification is restored.

6. ADDITIONAL HARDWARE

6.1 ADDITIONAL DEVICE

6.1.1 Additional Unit List

The following units are added for new models

Name	Type	Specification
MC unit	JEPMC-MC003	• Use of the teach pendant is possible. • Absolute/incremental encoder switching is possible. : Parameter can be specified for individual axes. Note : To use an absolute encoder, a special cable is necessary.
PLC unit	JEPMC-PC055	• Use of the teach pendant is possible. • Absolute/incremental encoder switching is possible. : The battery for the absolute encoder is provided. • A RS-232C port (port 2) is added.
	JEPMC-PC056	Adding to the above specifications, an expanded I / O unit can be used.
Teach pendant	JEPMC-TB050	• Teaching function • Manual operation
PROM module	JEPMC-MM001	• For routine sequence setting • 16,000 steps

Notes :
1. If any of the above new MC units is to be used, also use a new model PLC unit. Existing and new model units cannot be mixed.
2. The power unit, the I/O unit, and the base unit are common to existing and new models.

<Common units>
- Power unit --- JEPMC-PS050
- I/O unit --- JEPMC-IO050
- Base units --- JEPMC-MB041 (4-slot)
  --- JEPMC-MB051 (5-slot)
  --- JEPMC-MB052 (5-slot)
  --- JEPMC-MB062 (6-slot)

6. ADDITIONAL HARDWARE

6.1.2 Additional Cable List

To use the additional functions or the absolute encoder (parameter : PA15 = 2 or 3) select the following cable.

NO.	Mark	Application	Type	Code
1	J3	I / O cable (MC) Between MC unit I/O and machine I/O (For MC 003 type)	JEPMC-W5551-05 -10 -30	
2	J4	Servo cable (For absolute encoder) MC unit : SV1 to SV4 Servopack : SR type	JEPMC-W5511-05 -10 -30	DE9404909-05 -10 -30
3	J4	Servo cable (For absolute encoder) MC unit : SV1 to SV4 Servopack : Σ DRI	JEPMC-W5521-05 -10 -30	DE9404910-05 -10 -30
4	J4	Servo cable (For absolute encoder) MC unit : SV1 to SV4 Servopack : Σ SGD	JEPMC-W5531-05 -10 -30	DE9404911-05 -10 -30
5	J5	Cable for communication (Port 2) Between PLC and Teach pendant (For PC055, PC056)	JEPMC-W5320-02 -05	DE9404664-1 -2

6.2 ADDITIONAL UNITS HARDWARE SPECIFICATIONS

6.2.1 Hardware Specifications of the New MC Unit

The new MC unit (-MC003) can use either an absolute or incremental encoder by switching. In relation to this improvement, specifications of servomotor control are changed as follows. Other hardware specifications have not been changed from the conventional models.

Specification List

<table>
<tr><th colspan="2"></th><th colspan="2">Specification</th></tr>
<tr><td>Servomotor Control</td><td colspan="3">Analog speed commanding servo amplifier
Encoder : Incremental or absolute (Yaskawa absolute encoder)
Phase-A and phase-B inputs from line receiver (phase-B leads during forward rotation)
Input absolute rated voltage : ±15 V
Differential input voltage : ±0.2 V
Maximum response frequency : 1 MPPS at 50% duty</td></tr>
<tr><td></td><td></td><td colspan="2">Cable</td></tr>
<tr><td></td><td>Type SR</td><td>For incremental encoder</td><td>For absolute encoder</td></tr>
<tr><td></td><td></td><td>JEPMC-W5510-05
-10
-30</td><td>JEPMC-W5511-05
-10
-30</td></tr>
<tr><td></td><td>Σ DRI</td><td>JEPMC-W5520-05
-10
-30</td><td>JEPMC-W5521-05
-10
-30</td></tr>
<tr><td></td><td>Σ SGD</td><td>JEPMC-W5530-05
-10
-30</td><td>JEPMC-W5531-05
-10
-30</td></tr>
<tr><td></td><td>For General Purpose</td><td>JEPMC-W5540-05
-10
-30</td><td>JEPMC-W5541-05
-10
-30</td></tr>
</table>

6. ADDITIONAL HARDWARE

6.2.2 New PLC Units Specifications

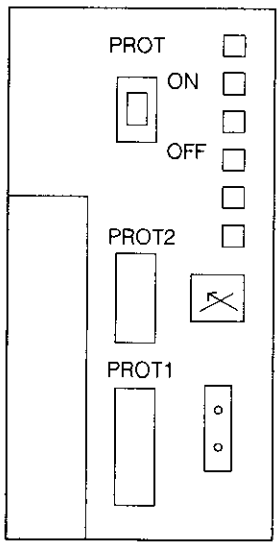
Hardware specifications of the new PLC units (PC055, PC056) are shown below. One communication port has been added to make a total of two. A battery for backup of the absolute encoder and program memory is incorporated.

Specifications List

	Specifications	
Type	JEPMC-PC055 (without expanded I/O) JEPMC-PC056 (correspond to expanded I/O)	
I/O Point	Discrete I/O point : 512 points ; register I/O point : 128 points	
I/O Portion Construction	Basic I/O Unit	Discrete I/O : 128 points (at using mounting base JEPMC-MB041/052) Discrete I/O : 256 points (at using mounting base JEPMC-MB051/062)
	Expanded I/O Unit (2000 series)	Discrete I/O : 384 points (at using mounting base MB041/MB052) Discrete I/O : 256 points (at using mount base MB051/MB062) Register I/O : 128 points
Processor	16 bit processor TMS 320C25 made by TI	
Communication Port 1 [PORT 1]	Specifications Condition Protocol Application	RS 232C, D-sub 9pin Baud rate : 9600bps ; Data : 8bit ; Parity : even ; Stop bit : 1 MEMOBUS protocol For communication with personal computer programmer, monitor device and market FA terminal.
Communication Port 2 [PORT 2]	Specification Condition Protocol Application	RS 232C, D-sub 15pin Baud rate : 19.2kbps (Changeable) ; Data : 8bit , Parity : even , Stop bit : 1 MEMOBUS protocol, I : N combination For communication with teach pendant, personal computer programmer, monitor device and market FA terminal
Indicator Lamp	RUN TX1 RX1/ERR TX2 RX2/ERR BAT ALM	ON (green) during scan processing. OFF when scan stops. ON (green) while characters are sent from communication port 1. RXI ON while characters are received from communication port 1. ERR ON (red) when an error (parity, overrun, etc.) occurs at communication port 1. ON (green) while characters are sent from communication port 2. RX2 : ON while characters are received from communication port 2. ERR : ON (red) when an error (parity, overrun, etc.) occurs at communication port 2. ON (red) when memory backup battery voltage drops. OFF when battery voltage is normal
Memory Back-up	Also used to back-up the absolute encoder. Type : ER6V (3 6V) One lithium battery. Normal life is five years (at 25℃). Total normal time for retaining memory contents without energizing : 1 year (at 25°C)	
Memory Protect Switch	Toggle switch ON : Program and data write from the personal computer to the PC or MC unit disabled	
Dimensions in mm	80 (W) × 130 (H) × 100 (D)	
Weight	0 4kg	

Instrumentation layout on the unit front is shown below.

PLC units : -PC055, -PC056



RUN Indicator lamp
TX2 Indicator lamp
RX2/ERR Indicator lamp
TX1 Indicator lamp
RX1/ERR Indicator lamp
BAT ALM Indicator lamp

DEV : For 1 : N Communication
Rotary switch for setting local station address.

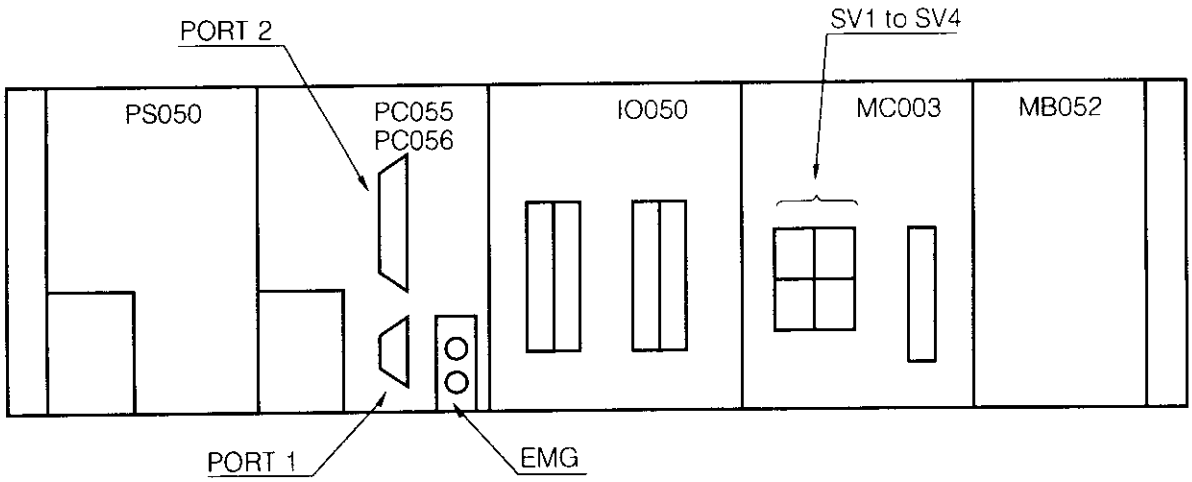
EMG : Emergency stop connector

PROT : Memory protect switch

6. ADDITIONAL HARDWARE

6.3 WIRING

6.3.1 Connector Types



• The following connectors are added to the new model PLC unit.

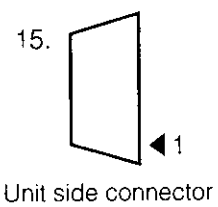
Specifications	Unit	Cable	Manufacturer
PORT2	17LE-13150-27 (D2BC)	17JE-23150-02 (D8D8)	DDK
EMG	BL2-12591 6	SL2-12668.8	WEIDMULLER

A cable connector is pertaining to the EMG connector.

• The new MC unit has a connector similar to the existing model, but some functions of the connector pins have been changed. See par. 6.3.3.

6.3.2 Additional Connectors and Pins Layout for New PLC Units (-PC055, -PC056)

(1) Pins layout for PORT 2



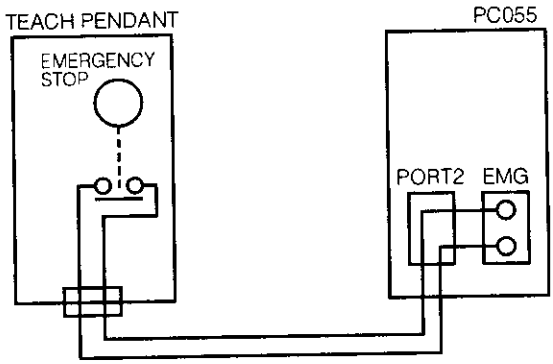
Unit side connector

Pin No.	Signal Name
1	FG
2	* TXD
3	* RXD
4	RTS
5	CTS
6	DSR
7	GND
8	NC
9	DTR
10	GND
11	GND
12	VCC (+5V)
13	VCC (+5V)
14	EMG1
15	ENG2

(2) EMG connector pin layout

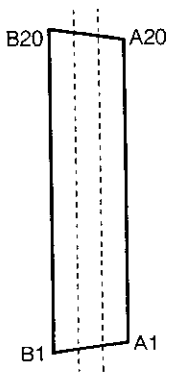
The EMG connector pin is arranged to directly connect to the NC contact of the emergency push-button on the teach pendant.

Note that this pin is left open if the teachpendant is disconnected from part 2.



6.3.3 Connectors and Pins Layout for New MC Unit

(1) Connectors for I/O signals (MC I/O)



Pin No.	Signal Name	Pin No.	Signal Name
B20	+24V	A20	0 24 V
B19	+24V	A19	0 24 V
B18	—	A18	—
B17	COMMON 1	A17	COMMON 1
B16	OTF 1	A16	OTR 1
B15	DEC 1	A15	ZERO 1
B14	OTF 2	A14	OTR 2
B13	DEC 2	A13	ZERO 2
B12	COMMON 2	A12	COMMON 2
B11	OTF 3	A11	OTR 3
B10	DEC 3	A10	ZERO 3
B9	OTF 4	A9	OTR 4
B8	DEC 4	A8	ZERO 4
B7	COMMON 3	A7	COMMON 3
B6	SKIP 1	A6	SKIP 2
B5	SKIP 3	A5	SKIP 4
B4	—	A4	—
B3	0 24 V	A3	0 24 V
B2	BRK 1	A2	BRK 2
B1	BRK 3	A1	BRK 4

UNIT SIDE CONNECTOR : FCN-365P-040-AU MADE BY FUJITSU

6. ADDITIONAL HARDWARE

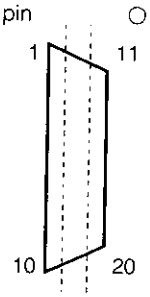
(2) Connectors for servo I/F (SV1 to SV4)

△marked pin

Pin No.	Signal Name	Pin No.	Signal Name
1	PA	11	SVON
2	$\overline{PA}$	12	PCON
3	PB	13	OTF_OUT
4	$\overline{PB}$	14	OTR_OUT
5	PC	15	SVALM
6	$\overline{PC}$	16	SEN
7	D / A	17	0_{24}OUT
8	GND	18	-BA
9	GND	19	+24OUT
10	GND	20	+BA

○ marked pin

△marked pin ○ marked pin



FG (Connected from connector body with shielded wires)

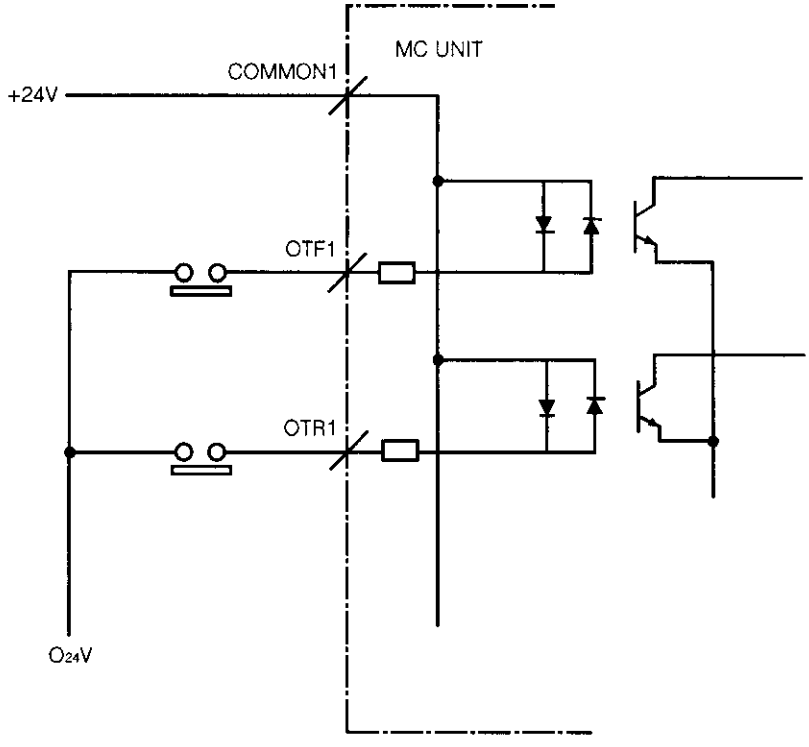
UNIT SIDE CONNECTOR : 10220-L8A9VE MADE BY 3M

6.3.4 New MC Unit Signals Description (-MC003)

(1) Content of I/O Connector Signals

Signal Name	Content
+24V	I/O power supply input
0 24V	I/O power supply input
COMMON 1,2,3*	Input signal common line +24V or 0 24V
OTF 1 to 4	Forward overtravel input Open when overtravel occurs (NC contact)
OTR 1 to 4	Reverse overtravel input Open when overtravel occurs (NC contact)
DEC 1 to 4	Zero-point return deceleration dog input (NC contact) For return to zero using the deceleration dog and phase-C pulse
ZERO 1 to 4	Zero-point return and zero-position signal inputs For zero-point return using the proximity switch To use phase-C pulse for zero-point return, make sure to open these signals
BRK 1 to 4	Brake control output (Open collector output) Output trangistor ON
SKIP 1 to 4	Skip input signal Open when skip (NC contact)

*COMMON 1 is power for the input signals for axes 1 and 2.
COMMON 2 is power for the input signals for axes 3 and 4.
COMMON 3 is power for the ship input signal.
For input signals, 0V common is recommended, although 24V common is possible.



6. ADDITIONAL HARDWARE

(2) Contents of SV1 to SV4 Connector Signals

Signal Name	Content
+24OUT	Servo I/O signal power supply output Connects to the servo side I/O signal power supply input
0_{24} OUT	Servo I/O signal power supply output Connects to the servo side I/O signal power supply input
GND	0V at control power supply and speed command output
SVON	Servo ON reference output (open collector output) Output trangistor ON at servo ON
OTF_OUT	Forward overtravel output (open collector output) Outputs the OTF signal which is entered to MC unit I/O connector, to servo. Output trangistor OFF when overtravel occurs.
OTR_OUT	Outputs the OTR signal which is entered to MC unit I/O connector, to servo Output trangistor OFF when overtravel occurs.
SVALM	Servo alarm signal input (NC contact) "Open" at alarm occurence
PA, $\overline{PA}$ PB, $\overline{PB}$ PC, $\overline{PC}$	Feedback signal output (differential line receiver input) Connects PG signal input from servo
D/A	Speed command output Analog speed command output
+BA, –BA	Battery power supply Connects to the battery input of the absolute type Servopack
SEN	Signal output Connects to the SEN input of the absolute type Servopack

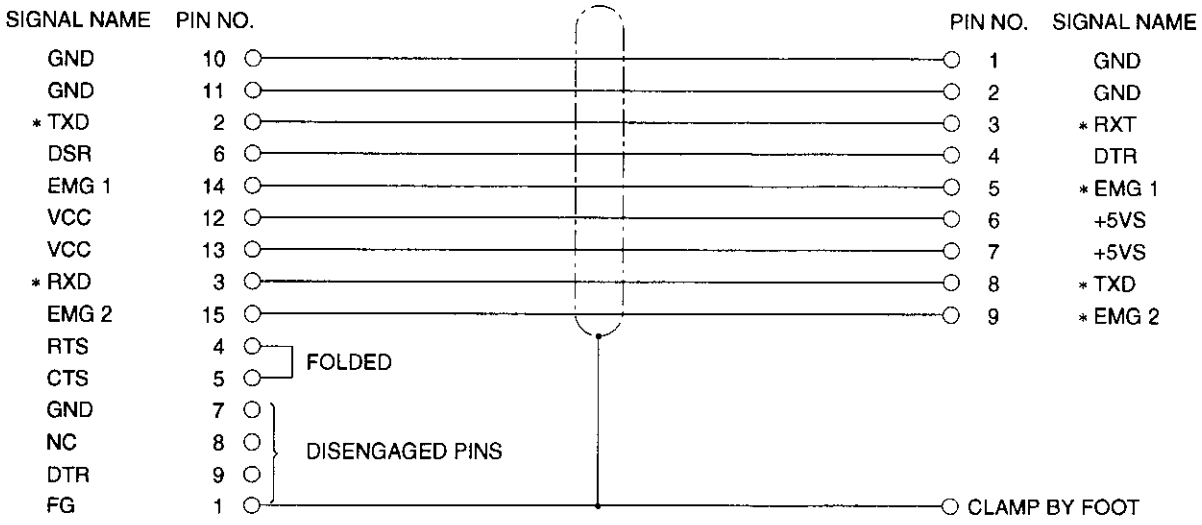
6.3.5 Additional Cable Specifications

(1) Cables between PC055- and PC056- PORT2 and Teach Pendant

Type : JEPMC-W5320-02 (2m)
-05 (5m)

SPECIFICATIONS

PC055-PORT2 (15P) TB050-PORT (9P)
PC056-



PC055- and PC056- PORT SIDE CONNECTOR : 17JE-23150-02 (D8B) MADE BY DDK

(2) Cables between MC 003-MC I/O and Machine I/O, 24VDC Power Supply

Type : JEPMC-W5551-05 (0.5m)
-10 (1m)
-30 (3m)

MC003–MC I/O

PIN NO.	MARKER	
B20	+24V	+24V
B19	+24V	+24V
A20	024V	024V
A19	024V	024V
B17	COM1	+24V
A17	COM1	+24V
B16	OTF1	The 1st axis forward overtravel SW (0V common)
A16	OTR1	The 1st axis reverse overtravel SW (0V common)
B15	DEC1	The 1st axis zero-point return decel limit SW (0V common)
A15	ZERO1	The 1st axis zero-point position SW (0V common)
B14	OTF2	The 2nd axis forward overtravel SW (0V common)
A14	OTR2	The 2nd axis reverse overtravel SW (0V common)
B13	DEC2	The 2nd axis zero-point return decel limit SW (0V common)
A13	ZERO2	The 2nd axis zero-point position SW (0V common)
B12	COM2	+24V
A12	COM2	+24V
B11	OTF3	The 3rd axis forward overtravel SW (0V common)
A11	OTR3	The 3rd axis reverse overtravel SW (0V common)
B10	DEC3	The 3rd axis zero-point return decel limit SW (0V common)
A10	ZERO3	The 3rd axis zero-point position SW (0V common)
B9	OTF4	The 4th axis forward overtravel SW (0V common)
A9	OTR4	The 4th axis reverse overtravel SW (0V common)
B8	DEC4	The 4th axis zero-point return decel limit SW (0V common)
A8	ZERO4	The 4th axis zero-point position SW (0V common)
B7	COM3	+24V
A7	COM3	+24V
B6	SKIP1	The 1st axis skip SW (0V common)
A6	SKIP2	The 2nd axis skip SW (0V common)
B5	SKIP3	The 3rd axis skip SW (0V common)
A5	SKIP4	The 4th axis skip SW (0V common)
B2	BRK1	The 1st axis brake control relay
A2	BRK2	The 2nd axis brake control relay
B1	BRK3	The 3rd axis brake control relay
A1	BRK4	The 4th axis brake control relay
B3	024V	024V
A3	024V	024V

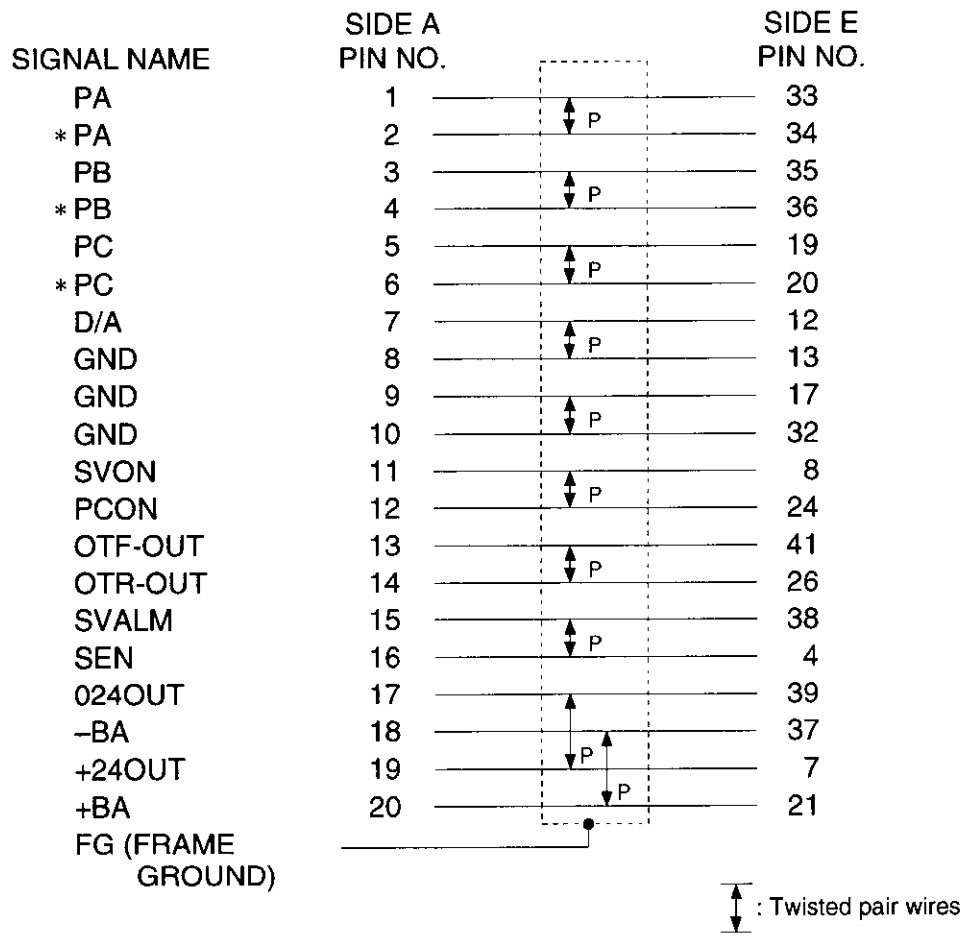
MC003 SIDE CONNECTORS : FCN–363J040 (CRIMP JACK HOUSING) MADE BY FUJITSU
FCN–363J-AU/T (CRIMP CONTACT (REEL)) MADE BY FUJITSU
FCN–360C040-B (COVER) MADE BY FUJITSU

MACHINE SIDE : LOOSE WIRE
WIRE : AWG#24

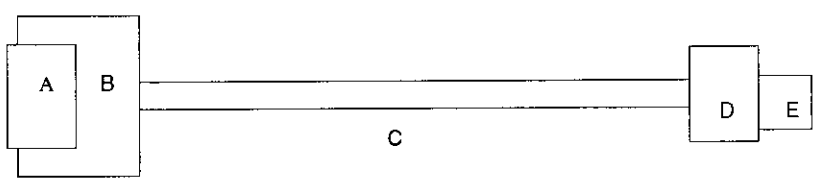
(3) Cables between MC003-SV1 to SV4 and SR SERVOPACK

Type : JEPMC-W5511-05 (0.5m)
-10 (1m)
-30 (3m)

SPECIFICATIONS



FORM



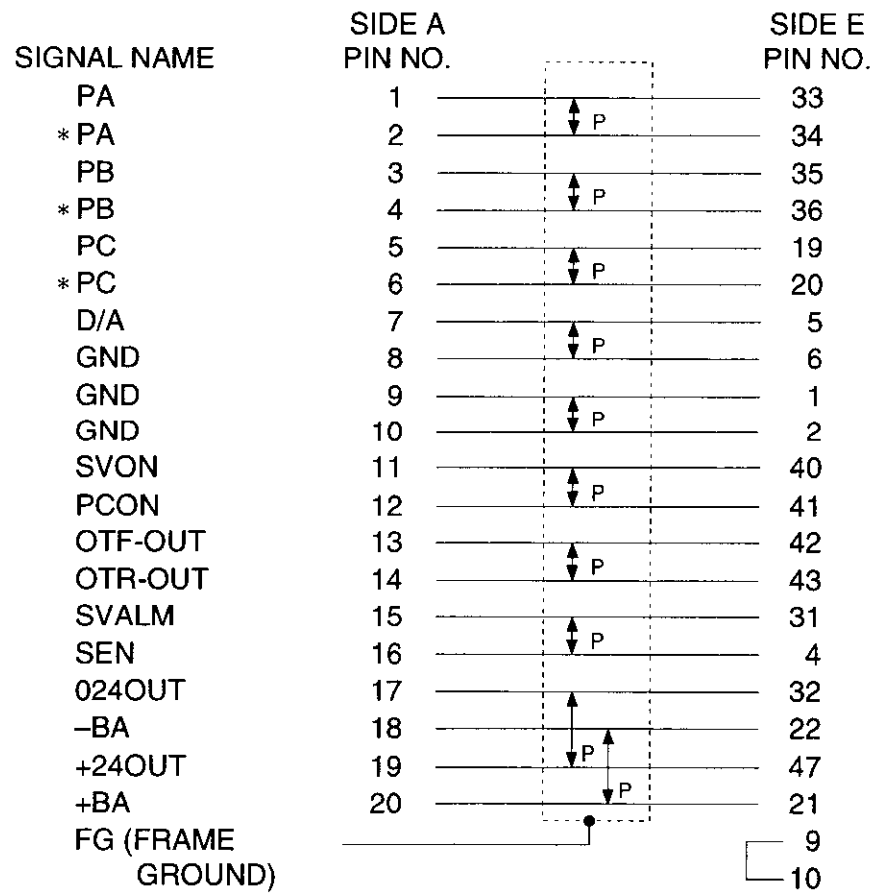
MC003 SIDE CONNECTORS
A : 10120-6000EL (PRESSURE PLUG) MADE BY 3M
B : 10320-52A0-008 (PLASTIC SHELL) MADE BY 3M
C : SSRFPVV-SB (WIRE (AWG#28)) 28×10P
SERVO SIDE CONNECTOR
D : MR-50L MADE BY HONDA
E : MRP-50F01 MADE BY HONDA

6. ADDITIONAL HARDWARE

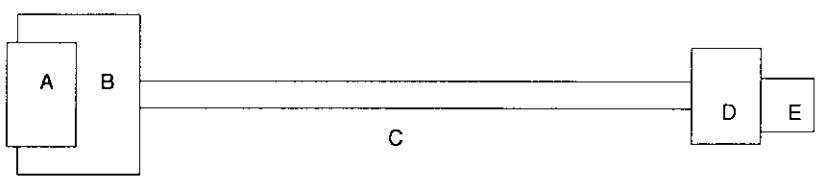
(4) Cables between MC003-SV1 to SV4 and Σ series DR1 SERVOPACK

Type : JEPMC-W5521-05 (0.5m)
-10 (1m)
-30 (3m)

SPECIFICATIONS



FORM

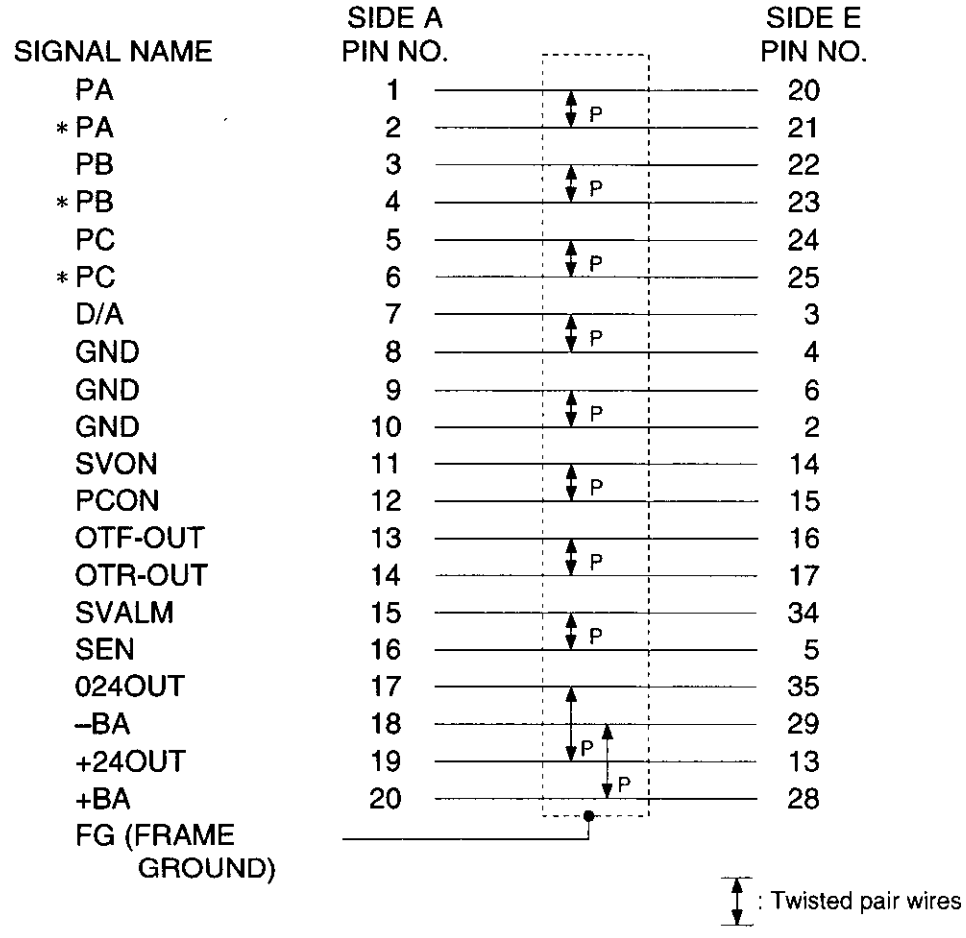


MC003 SIDE CONNECTORS
A : 10120-6000EL (PRESSURE PLUG) MADE BY 3M
B : 10320-52A0-008 (PLASTIC SHELL) MADE BY 3M
C : SSRFPVV-SB (WIRE (AWG#28)) 28×10P
SERVO SIDE CONNECTORS
D : MR-50L MADE BY HONDA
E : MRP-50M01 MADE BY HONDA

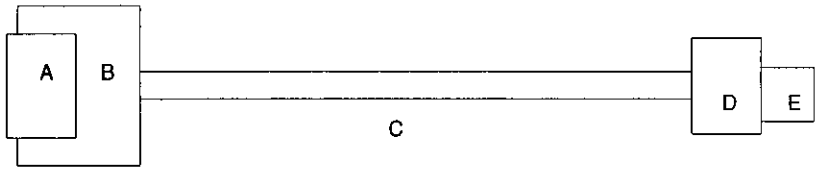
(5) Cables between MC003-SV1 to SV4 and Σ series SGD SERVOPACK

Type : JEPMC-W5531-05 (0.5m)
-10 (1m)
-30 (3m)

SPECIFICATIONS



FORM



MC003 SIDE CONNECTORS
A : 10120-6000EL (PRESSURE PLUG) MADE BY 3M
B : 10320-52A0-008 (PLASTIC SHELL) MADE BY 3M
C : SSRFPVV-SB (WIRE (AWG#28)) 28×10P
SERVO SIDE CONNECTORS
D : 10336-3210-000 (PLASTIC SHELL) MADE BY 3M
E : 10136-6000EL (PRESSURE PLUG) MADE BY 3M

APPENDIX 1

Parameters related the added functions are underlined with a dotted line as follows.

1.1 PARAMETER LIST

Parameter List (Common Alarm)

No.	Name	Range	Unit	Related Parameter No.	Rewrite from the Ladder	Effective Timing of Change	Initial value	Parameter Type
P006 to P009	Reserved							
P010	Interpolation feed maximum speed	1 to 240000	(×1000) Command units / min		○	Immediately	24000	A
P011	Reserved							
P012	Reserved							
P013	Change skip signal	1 : Each axis 0 : OR of all axis			×	Power up	0	B

○ : Possible
× : Not possible

Parameter List (Individual Axis Alarm A : Axes 1 to 4)

No.	Name	Range	Unit	Related Parameter No.	Rewrite from Ladder	Effective Timming of Change	Initial Value	Parameter Type
PA01	Position loop gain ; kp	0 to 200	S^{-1}		○	Reset	30	A
PA02	Reserved							
PA03	Reserved							
PA04	Feed speed 1	1 to 240000	(×1000) Command units / min		○	immedi-ately	60	A
PA05	Linear accel/decel constant (1)	1 to 32767	15625 (Command units) / S^2		○	Reset	100	A
PA06	Positioning completion range	0 to 250	Command units	07	○	Reset	1	A
PA07	Positioning completion check time	0 to 32767	ms (multiple of 2)	06	○	Reset	0	A
PA08	Encoder pulse	32768	Pulses	63	×	Power-ON	2048	C
PA09	Servo tracking error	1 to 99999999	Pulses		○	Reset	30000	A
PA10	ABSO encoder permis	0 to 99999999	Pulses	15	×	Power-ON	30000	A
PA11	Machine rotation/ command unit	1 to 1500000	Command units		×	Power-ON	32768	A
PA12	Gear ratio (motor rotation speed)	1 to 10000000	Rotations		×	Power-ON	1	A
PA13	Gear ratio (machine rotation speed)	1 to 10000000	Rotations		×	Power-ON	1	A
PA14	Mode selection b0 : Motor rotation direction (reverse connection) b1 : Finite / infinite b2 : Linear / rotary	 0:Forward rotation 1:Reverse rotation 0:Finite length, 1: Infinite length 0:Linear type; 1: Rotary type		 18-b0	×	Power-ON	 0 0 0	 B B C
PA15	Select absolute encoder	• Setting result is ; (Encoder) (Detecting system) 0 : Incremental ·····Incremental 2 ; Absolute ·····Incremental 3 : Absolute ·····Absolute • Setting method is; (bit) b0=system : 0 : Incremental , 1 : Absolute b1=Encoder : 0 : Incremental ; 1 : Absolute		10	×	Power-ON	0	C
PA16	Reserved							
PA17	Function selection 1 b1 : Reserved b2 : 2-step accel/decel b3 : Speed limit b4 : Accel/decel type selection	 0 : 1-step 1 : 2-step 0 : Not set 1 ; Set 0 : Not set 1 . Set		 38,39 46 68 to 71. 76, 77. 47, 48	×	Reset	 0 0 0	 B B B

APPENDIX 1

Parameter List (Individual Axis Alarm A : Axes 1 to 4) (Cont'd)

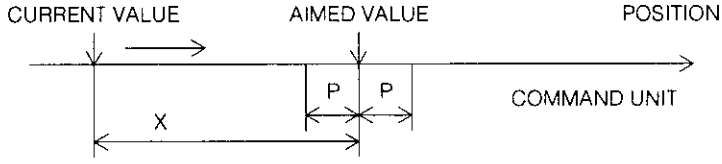
No.	Name	Range	Unit	Related Parameter No.	Rewrite from Ladder	Effective Timming of Change	Initial Value	Parameter Type
PA18	Function selection 2 b0 : Soft LS b1 : Backlash compensation	0 : Not used ; 1 : Used 0 : Not used ; 1 : Used		40, 41 42	×	Power-ON	0 0	B B
PA57	Zero point offset 1	0 to 99999999	Command unit	58 15	×	Power-ON	0	B
PA58	Zero point offset 2	0 to 99999999	Command unit	57 15	×	Power-ON	0	B

1.2 PARAMETER EXPLANATIONS

Parameter List (Common Parameter)

No.	Name	Content	Initial Value
PO13	Change skip signal	This parameter switches the mode of operation of the skip signal used for skip (SKP) command. 0: The four skip signals are OR'ed, so that when any one of them goes ON, the position of all the axes is stored as skip memory position. 1. When any of the skip signals goes ON, the position of the corresponding axis is stored as skip memory position.	0

Parameter List (Individual Axis Parameter A : Axes 1 to 4)

No.	Name	Content	Initial Value
PA06	Positioning completion range	If the distance from the target position given as the difference between the current position and commanded position (in command units) becomes a set value or smaller, this parameter sets in-position status to 1. The parameter specifies the allowable range of in-position check for MOV, ZRN, and PFN commands.  P : Positioning completion range (1 to 250 command units) If lcurrent value - target valuel <=, then in-position status = 1 If 0 is set for the parameter, in-position check is not performed.	1
PA07	Positioning completion check time	This parameter sets time during which the axes enter the above positioning completion range. If the axes fails to enter the positioning completion range within this time, an alarm is issued If 0 is set, the check time becomes infinite.	0
PA10	ABSO encoder permissible error	This parameter is for checking the difference between the position at power-OFF and that at the next power-ON. Setting range: 0 to 99999999 (pulses) When power is turned OFF, the current position is stored. It is compared to the current position read at the next power-ON, and if the difference is greater than the value set for this parameter, an alarm (of code A12) is issued. This parameter cannot be reset without setting zero-point.	30000
PA15	Select absolute encoder	This parameter selects an encoder and the position detecting system to be used in a system having an absolute position detecting function. (Setting Value) (Encoder Used) (Position Detecting System) 0 Incremental ····· Incremental 2 Absolute ····· Incremental 3 . Absolute ··· · ···· ····· Absolute Set each bit as follows. b0 = Position detecting system 0 · Incremental ; 1 : Absolute b1 = EncoderUsed 0 . Incremental ; 1 : Absolute	0

Parameter List (Individual Axis Alarm A : Axes 1 to 4) (Cont'd)

<table>
<tr><th colspan="2">No.</th><th>Name</th><th>Content</th><th>Initial Value</th></tr>
<tr><td>PA14</td><td>b0</td><td>Motor rotation direction</td><td>Use this parameter to turn the motor in reverse direction by forward rotation command, or in forward direction by reverse rotation command when it is necessary because of machine configuration.

<table><tr><th>b1</th><th>Direction</th><th>Motor Rotating Direction</th></tr><tr><td rowspan="2">0</td><td>+</td><td>Forward</td></tr><tr><td>-</td><td>Reverse</td></tr><tr><td rowspan="2">1</td><td>+</td><td>Reverse</td></tr><tr><td>-</td><td>Forward</td></tr></table></td><td>0</td></tr>
<tr><td></td><td>b1</td><td>Finite / infinite mode</td><td>This is a parameter related to the motion limit

<table><tr><th>b1</th><th>Content</th></tr><tr><td>0</td><td>Finite mode
Select this mode when there is a limit to motion
(Soft LS available)</td></tr><tr><td>1</td><td>Infinite mode
Select this mode when there is no limit to motion, for endless motion such as of a round table or of negative direction feed of a press feeder (Soft LS unavailable)</td></tr></table>
Note : If an absolute encoder is used, be careful not to let the motor revolution count go beyond ±99999 even if infinite length mode is selected.</td><td>0</td></tr>
<tr><td></td><td>b2</td><td>Linear / rotary mode</td><td>Set this parameter according to whether the load moves in a line or a circle.

<table><tr><th>b2</th><th>Mode</th><th>Content</th></tr><tr><td>0</td><td>Liner</td><td>-99999999 to +99999999</td></tr><tr><td>1</td><td>Rotary</td><td>Current position data are given as follows, regardless of the rotation numbers
0 to [set value of PA11-1]
(anywhere in a single-rotation motion)</td></tr></table></td><td>0</td></tr>
<tr><td>PA57</td><td></td><td>Zero point offset 1</td><td rowspan="2">These parameters set the zero-point shift amount and the zero-point shift file control for the absolute position detecting function

• PA57 : Zero-point shift amount
• PA58 : Zero-point shift file control

Setting range of both parameters is as follows.

• 0 to 99999999 command units

When the absolute position detecting system is started up, the position of the mechanical coordinate zero-point set by zero-point setting is shifted by the sum of the amounts set for these command offsets. The offsets take effect on auto setting of the mechanical coordinate system at the succeeding power-ON</td><td>0</td></tr>
<tr><td>PA58</td><td></td><td>Zero point offset 2</td><td>0</td></tr>
</table>

APPENDIX 2 MC CONTROL COILS AND MC CONTROL RELAYS

2.1 OUTLINE

(1) MC control coils are special signals of fixed assignment for controlling MC units from the PLC unit.

(2) Reference numbers of the MC control coils are as follows.
- For MC unit 1 : Q1 to Q128
- For MC unit 2 : Q129 to Q256

(3) For the name and function of each coil, see Appendix 2.2.
The reference numbers in parentheses are for MC unit 2.

(4) The MC control relays are signals of fixed assignment for notifying specific statute of MC units to the PLC unit.

(5) Reference numbers of the MC control relays are as follows.
- For MC unit 1 : P1 to P128
- For MC unit 2 : P129 to P256

(6) For the name and function of each relay, see Appendix 2.3.
The reference numbers in parentheses are for MC unit 2.

APPENDIX 2 MC CONTROL COILS AND MC CONTROL RELAYS

2.2 MC CONTROL COILS

2.2.1 MC Control Coil List

	Q8 (Q136)	Q7 (Q135)	Q6 (Q134)	Q5 (Q133)	Q4 (Q132)	Q3 (Q131)	Q2 (Q130)	Q1 (Q129)
	Q16 (Q144)	Q15 (Q143)	Q14 (Q142)	Q13 (Q141)	Q12 (Q140)	Q11 (Q139)	Q10 (Q138)	Q9 (Q137)
	Q24 (Q152)	Q23 (Q151)	Q22 (Q150)	Q21 (Q149)	Q20 (Q148)	Q19 (Q147)	Q18 (Q146)	Q17 (Q145)
FOR FUTURE USE								
	Q32 (Q160)	Q31 (Q159)	Q30 (Q158)	Q29 (Q157)	Q28 (Q156)	Q27 (Q155)	Q26 (Q154)	Q25 (Q153)
	Q40 (Q168)	Q39 (Q167)	Q38 (Q166)	Q37 (Q165)	Q36 (Q164)	Q35 (Q163)	Q34 (Q162)	Q33 (Q161)
	Q48 (Q176)	Q47 (Q175)	Q46 (Q174)	Q45 (Q173)	Q44 (Q172)	Q43 (Q171)	Q42 (Q170)	Q41 (Q169)
	FOV3	FOV2	FOV1	FOV0	ROV3	ROV2	ROV1	ROV0
	Q56 (Q184)	Q55 (Q183)	Q54 (Q182)	Q53 (Q181)	Q52 (Q180)	Q51 (Q179)	Q50 (Q178)	Q49 (Q177)
	Q64 (Q192)	Q63 (Q191)	Q62 (Q190)	Q61 (Q189)	Q60 (Q188)	Q59 (Q187)	Q58 (Q186)	Q57 (Q185)
	Q72 (Q200)	Q71 (Q199)	Q70 (Q198)	Q69 (Q197)	Q68 (Q196)	Q67 (Q195)	Q66 (Q194)	Q65 (Q193)
	Q80 (Q208)	Q79 (Q207)	Q78 (Q206)	Q77 (Q205)	Q76 (Q204)	Q75 (Q203)	Q74 (Q202)	Q73 (Q201)
FOR FUTURE USE								
	Q88 (Q216)	Q87 (Q215)	Q86 (Q214)	Q85 (Q213)	Q84 (Q212)	Q83 (Q211)	Q82 (Q210)	Q81 (Q209)
	Q96 (Q224)	Q95 (Q223)	Q94 (Q222)	Q93 (Q221)	Q92 (Q220)	Q91 (Q219)	Q90 (Q218)	Q89 (Q217)
	Q104 (Q232)	Q103 (Q231)	Q102 (Q230)	Q101 (Q229)	Q100 (Q228)	Q99 (Q227)	Q98 (Q226)	Q97 (Q225)
	Q112 (Q240)	Q111 (Q239)	Q110 (Q238)	Q109 (Q237)	Q108 (Q236)	Q107 (Q235)	Q106 (Q234)	Q105 (Q233)
	BSMOD	···	···	···	BSET4	BSET3	BSET2	BSET1
	Q120 (Q248)	Q119 (Q247)	Q118 (Q246)	Q117 (Q245)	Q116 (Q244)	Q115 (Q243)	Q114 (Q242)	Q113 (Q241)
FOR FUTURE USE	Q128 (Q256)	Q127 (Q255)	Q126 (Q254)	Q125 (Q253)	Q124 (Q252)	Q123 (Q251)	Q122 (Q250)	Q121 (Q249)

Note : ( ) means a reference name of MC unit 2.

2.2.2 Name and Function of MC Control Coil

Possible mode : O = Online editing A = Automatic M = Manual E = Editing

Reference	Signal Name	Name	Mode O	Mode A	Mode M	Mode E	Function and Timing
Q1 to Q40 (Q129 to Q168)	...						For future use
Q41 (P169) Q42 (P170) Q43 (P171) Q44 (P172)	ROV0 ROV1 ROV2 ROV3	Override for rapid traverse speed	1	1	1	0	These coils switch the override number while MOV is being executed during jogging in manual mode or during programmed operation in auto mode The numbers can be switched even while the axes are moving
Q45 (P173) Q46 (P174) Q47 (P175) Q48 (P176)	FOV0 FOV1 FOV2 FOV3	Override for interpolation speed	1	1	0	0	These coils switch the override number during interpolation in programmed operation in auto mode. The numbers can be switched even while the axes are moving.
Q49 to Q104 (Q177 to Q232)	...						For future use
Q105 (P233) Q106 (P234) Q107 (P235) Q108 (P236)	BSET1 BSET2 BSET3 BSET4	Zero point set-up	1	1	1	1	These signals store absolute zero-point position (e.g., mechanical coordinate zerp-point) in an absolute position detecting system using an absolute encoder. The signals are valid when the encoder has been initialized and Q112 (BSMOD) is ON. BEST1=For the 1st axis BEST2=For the 2nd axis BEST3=For the 3rd axis BEST4=For the 4th axis
Q112 (P240)	BSMOD	Mode for zero point set-up	1	1	1	1	The above zero-point cannot be set unless this signal is ON. Turn ON this signal before turning ON origin setting signals.
Q113 to Q128 (Q241 to Q256)	...						For future use

Q 44	Q 43	Q 42	Q 41	Override %	Q 44	Q 43	Q 42	Q 41	Override %
0	0	0	0	The 2nd feed speed (PA31)	1	0	0	0	30
0	0	0	1	1	1	0	0	1	40
0	0	1	0	2	1	0	1	0	50
0	0	1	1	4	1	0	1	1	60
0	1	0	0	6	1	1	0	0	70
0	1	0	1	8	1	1	0	1	80
0	1	1	0	10	1	1	1	0	90
0	1	1	1	20	1	1	1	1	100

Q 48	Q 47	Q 46	Q 45	Override %	Q 48	Q 47	Q 46	Q 45	Override %
0	0	0	0	50	1	0	0	0	130
0	0	0	1	60	1	0	0	1	140
0	0	1	0	70	1	0	1	0	150
0	0	1	1	80	1	0	1	1	160
0	1	0	0	90	1	1	0	0	170
0	1	0	1	100	1	1	0	1	180
0	1	1	0	110	1	1	1	0	190
0	1	1	1	120	1	1	1	1	200

APPENDIX 2 MC CONTROL COILS AND MC CONTROL RELAYS

2.3 MC CONTROL RELAYS

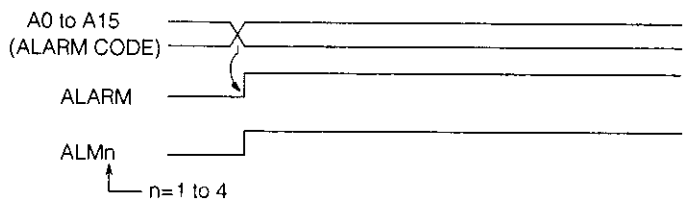
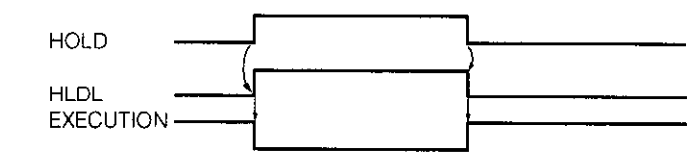
2.3.1 MC Control Relay List

	P8(P136)	P7(P135)	P6(P134)	P5(P133)	P4(P132)	P3(P131)	P2(P130)	P1(P129)
	ZRNL	ENDL	STPL	SBKL	HLDL	STRL	ALRM	MCRD
	P16(P144)	P15(P143)	P14(P142)	P13(P141)	P12(P140)	P11(QP39)	P10(P138)	P9(P137)
	SVN4	SVN3	SVN2	SVN1	MOV4	MOV3	MOV2	MOV1
	P24(P152)	P23(O151)	P22(P150)	P21(P149)	P20(P148)	P19(P147)	P18(P146)	P17(P145)
	ALM4	ALM3	ALM2	ALM1	ZPT4	ZPT3	ZPT2	ZPT1
	P32(P160)	P31(P159)	P30(P158)	P29(P157)	P28(P156)	P27(P155)	P26(P154)	P25(P153)
	ERST	···	MDEN	MFIR	TBOX	ONEO	AUTO	MANO
	P40(P168)	P39(P167)	P38(P166)	P37(P165)	P36(P164)	P35(P163)	P34(P162)	P33(P161)
FOR FUTURE USE								
	P48(P176)	P47(P175)	P46(P174)	P45(P173)	P44(P172)	P43(P171)	P42(P170)	P41(P169)
	M7	M6	M5	M4	M3	M2	M1	M0
	P56(P184)	P55(P183)	P54(P182)	P53(P181)	P52(P180)	P51(P179)	P50(P178)	P49(P177)
	AM7	AM6	AM5	AM4	AM3	AM2	AM1	AM0
	P64(P192)	P63(P191)	P62(P190)	P61(P189)	P60(P188)	P59(P187)	P58(P186)	P57(P185)
	AM15	AM14	AM13	AM12	AM11	AM9	AM8	AM7
	P72(P200)	P71(P199)	P70(P198)	P69(P197)	P68(P196)	P67(P195)	P66(P194)	P65(P193)
	ZER2	DEC2	NOT2	POT2	ZER1	DEC1	NOT1	POT1
	P80(P208)	P79(P207)	P78(P206)	P77(P205)	P76(P204)	P75(P203)	P74(P202)	P73(P201)
	ZER4	DEC4	NOT4	POT4	ZER3	DEC3	NOT3	POT3
	P88(P216)	P87(P215)	P86(P214)	P85(P213)	P84(P212)	P83(P211)	P82(P210)	P81(P209)
	···	···	···	···	BRK4	BRK3	BRK2	BRK1
	P96(P224)	P95(P223)	P94(P222)	P93(P221)	P92(P220)	P91(P219)	P90(P218)	P89(P217)
FOR FUTURE USE								
	P104(P232)	P103(P231)	P102(P230)	P101(P229)	P100(P228)	Q99(P227)	Q98(P226)	Q97(P225)
	P112(P240)	P111(P239)	P110(P238)	P109(P237)	P108(P236)	P107(P235)	P106(P234)	P105(P233)
	BSMOD	···	···	···	BSET4	BSET3	BSET2	BSET1
	P120(P248)	P119(P247)	P118(P246)	P117(P245)	P116(P244)	P115(P243)	P114(P242)	P113(P241)
FOR FUTURE USE								
	P128(P256)	P127(P255)	P126(P254)	P125(P253)	P124(P252)	P123(P251)	P122(P250)	P121(P249)

Note : ( ) means a reference name of MC unit 2.

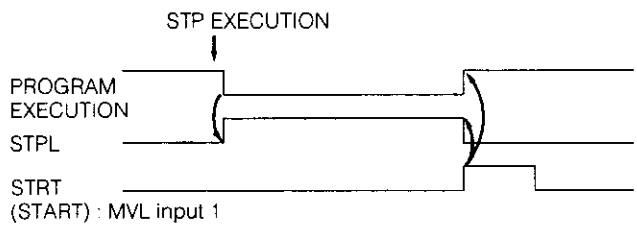
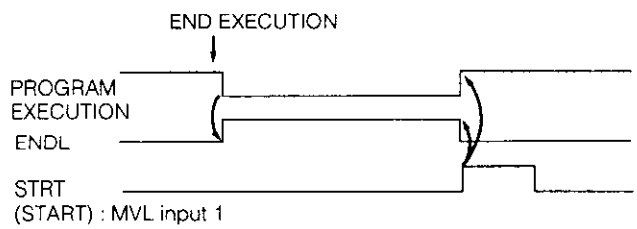
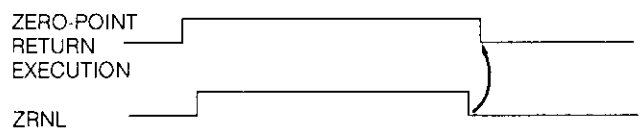
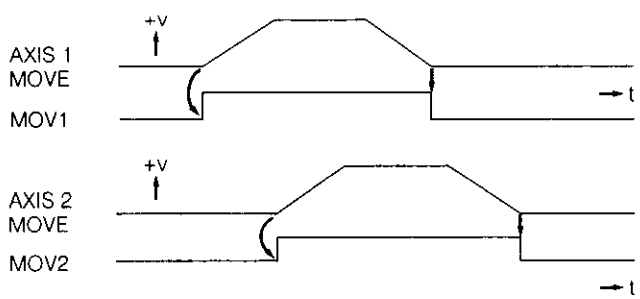
2.3.2 Name and Function Relay

Possible mode : O = Online editing A = Automatic M = Manual E = Editing

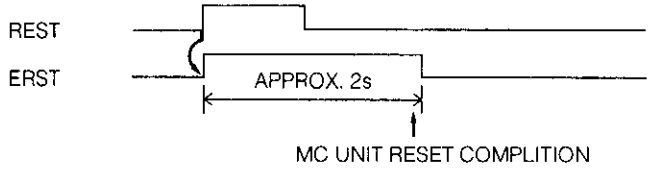
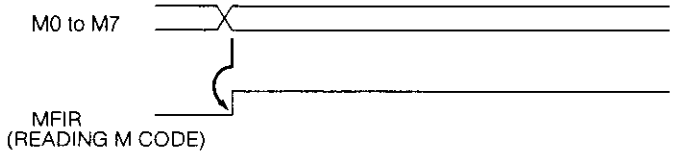
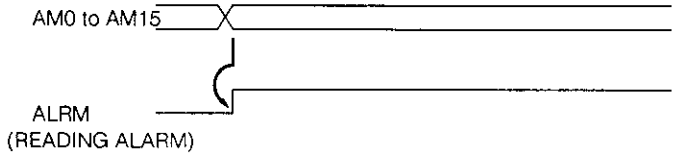
Reference	Signal Name	Name	Mode O	Mode A	Mode M	Mode E	Function and Timing
P1(p129)	MCRD	MC unit ready	1	1	1	1	This relay indicates whether the MC unit is ready. The relay is synchronized with system information "MC ready."
P2(P130)	ALRM	Alarm	1	1	1	1	This relay indicates the alarm status of the MC unit. When an alarm is issued, the code of the alarm is set and the alarm output is turned ON. When all the alarms in the history have been cleared one by one by alarm clear, the alarm code is reset to 0 and the alarm output is turned OFF. 
P21(P149)	ALM1		1	1	1	1	
P22(P150)	ALM2		1	1	1	1	
P23(P151)	ALM3		1	1	1	1	
P24(P152)	ALM4		1	1	1	1	ALM1 to ALM4 go on when there are alarm on the corresponding axes If only ALRM goes ON, it indicates a common alarm has occurred.
P3(P131)	STRL	Running	1	1	0	0	This relay indicates that program operation is ongoing. The relay is turned ON and OFF upon the following conditions. (a) ON conditions • Program operation is ongoing. (MVL) • Commands from the personal computer programmer are being executed block by block. (b) OFF conditions • END command has been executed. • Single-block execution has been completed. • An alarm has occurred • Reset signal is ON.
P4(P132)	HLDL	Holding	0	1	0	0	This relay indicates a temporary halt status during programmed operation 
P5(P133)	SBKL	Single block operation	0	1	0	0	This relay indicates a block is being executed in single- block operation during programmed operation.

APPENDIX 2 MC CONTROL COILS AND MC CONTROL RELAYS

Possible mode : O = Online editing A = Automatic M = Manual E = Editing

Reference	Signal Name	Name	Mode O	Mode A	Mode M	Mode E	Function and Timing
P6(P134)	STPL	Program stop	1	1	0	0	This relay goes on when STP command is executed during programmed operation. It goes OFF when operation is restarted. 
P7(P135)	ENDL	Program end	1	1	0	0	This relay goes ON when END command is executed during programmed. It goes OFF when operation is operation restarted. 
P8(P136)	ZRNL	Zero point returning	1	1	1	0	This relay indicates that zero-point return is being performed. The relay is also turned ON by either zero-point return command in PLC motion commands or programmed operation. • Operation example of PLC motion command 
P9(P137) P10(P138) P11(P139) P12(P140)	MOV1 MOV2 MOV3 MOV4	Axis 1 running Axis 2 running Axis 3 running Axis 4 running	1	1	1	0	These relays indicates that the corresponding axes are moving. The relays go ON when the axes are moving regardless of programmed or manual operation, or of the mode of operation. 
P13(P141) P14(P142) P15(P143) P16(P144)	SVN1 SVN2 SVN3 SVN4	Axis 1 servo ON Axis 2 servo ON Axis 3 servo ON Axis 4 servo ON	1	1	1	1	These relays indicate the Servo ON status of corresponding axes

Possible mode : O = Online editing A = Automatic M = Manual E = Editing

Reference	Signal Name	Name	Mode O	Mode A	Mode M	Mode E	Function and Timing
P17(P145) P18(P146) P19(P147) P20(P148)	ZPT1 ZPT2 ZPT3 ZPT4	Axis 1 zero point Axis 2 zero point Axis 3 zero point Axis 4 zero point	1	1	1	1	These relays indicate that the corresponding axes are at the zero-point (in the range within the tolerance distance specified by PA55 from the mechanical zero-point). If the position detecting system is incremental, these signals are not output until the first zero-point return is completed after power-ON.
P25(P153) P26(P154) P27(P155)	MANL AUTL ONEL	Manual mode Auto mode Online edit mode	1	1	1	1	These relays indicate the current operation mode of MC unit
P29(P157) P30(P158)	MFIR MDEN	M code sampling Complete moving	1	1	0	0	These relays request reading M code outputs (SET Mnn) If M code output is commanded in the same block as a motion command, the relays go ON at completion of the motion. The relay signals indicate completion of the motion.
P32(P160)	ERST	MRS output	1	1	1	1	This relay outputs external equipment reset signals synchronized with MRS command start-up. 
P41(P169) P42(P170) P43(P171) P44(P172) P45(P173) P46(P174) P47(P175) P48(P176)	MO to M7	M code output (8 bit binary)	1	1	0	0	These relays output nn value when the SET Mnn is executed. 
P49(P177) P50(P178) P51(P179) P52(P180) P53(P181) P54(P182) P55(P183) P56(P184) P57(P185) P58(P186) P59(P187) P60(P188) P61(P189) P62(P190) P63(P191) P64(P192)	AM0 to AM15	Alarm code output (16 bit binary)	1	1	0	0	These relays output the cause when the MC unit alarms occur. 

APPENDIX 2 MC CONTROL COILS AND MC CONTROL RELAYS

Possible mode : O = Online editing A = Automatic M = Manual E = Editing

Reference	Signal Name	Name	Mode				Function and Timing
			O	A	M	E	
P65(P193) P66(P194) P67(P195) P68(P196)	POT1 NOT1 DEC1 ZER1	Axis 1 overtravel + Axis 1 overtravel – Axis 1 deceleration signal for ZRN Axis 1 zero point signal	1	1	1	1	These relays indicate the ON/OFF status of MC unit "Direct input"
P69(P197) P70(P198) P71(P199) P72(P200)	POT2 NOT2 DEC2 ZER2	Axis 2 overtravel + Axis 2 overtravel – Axis 2 deceleration signal for ZRN Axis 2 zero point signal					
P73(P200) P74(P200) P75(P200) P76(P200)	POT3 NOT3 DEC3 ZER3	Axis 3 overtravel + Axis 3 overtravel – Axis 3 deceleration signal for ZRN Axis 3 zero point signal					
P77(P200) P78(P200) P79(P200) P80(P200)	POT4 NOT4 DEC4 ZER4	Axis 4 overtravel + Axis 4 overtravel – Axis 4 deceleration signal for ZRN Axis 4 zero point signal					
P81(P209) P82(P210) P83(P211) P84(P212)	BRK1 BRK2 BRK3 BRK4	Axis 1 brake output Axis 2 brake output Axis 3 brake output Axis 4 brake output	1	1	1	1	These relays indicate the ON/OFF status of the brake output.

APPENDIX 3

If an error occurs with MC units, the following alarm codes are displayed automatically on the personal computer programmer or on the teachpendant. On the personal computer programmer, the body of the message is also displayed.
Alarm codes related to the added functions are underlined with a wavy line.

Alarm Code List (Common Alarm)

Code	Message	Cause	Action to be taken
001	Program capacity over.	Program capacity is exceeded.	Delete unnecessary programs.
002	Program character max over.	Number of characters in a single block exceeded 128.	Correct the program. (The number of characters)
003	Nothing program number.	The specified program was not found.	Correct the program mode.
004	Command argument error.	• No data follow the symbol. • No symbol presedes the data.	Correct the program.
005	Numerical or decimal point error.	• "–"(minus sign). "0"(zero), or "." (decimal point) is used erroneously. • The decimal point is in the wrong position.	Correct the program. Check the decimal setting parameter.
006	Character error.	There are prohibited characters in the significant information area.	Correct the program.
007	Data over flow.	Input data has a wrong number of numerals.	Correct the program. (The number of numerals)
008	Command error. (SYNTAX)	An unavailable command is used.	Correct the program.
009	Command error. (Duplicate)	Incompatible commands are specified in a single block.	Correct the program.
010	"F" command error.	F command is omitted in interpolation operation.	Correct the program.
011	Circular interval radius none.	Radius 0 is specified for a circular command.	Correct the program. (R or I and J)
012	Circular interval another area.	Out-of-area specification error with a circular command	Correct the program. (X, Y, or R)
013	Program number out of range.	The value of P is out of range.	Correct the program (P)
014	Notch command error.	Parameter setting error	• Check function setting parameters. • Correct the program.
015	—	—	—
016	Command error. (interval, plane, terminal)	Interpolation instruction error ordinary instruction error End point instruction error	Correct the program.
017	Invalid offset number.	Offset number specification error	Correct the program.
018	Nothing subprogram number.	P is omitted in GSB block.	Correct the program. (P)

APPENDIX 3

Alarm Code List (Common Alarm) (Cont'd)

Code	Message	Cause	Action to be taken
019	Nothing subprogram.	The program number called by GSB was not found.	Check the related programs.
020	Subprogram error. (NOT "RET")	There is no RET at the end of a subprogram	Correct the program.
021	Multi subprogram call.	There are five or more subprogram calls	Correct the program to reduce subprogram calls to four or less.
022	Program error. (NOT "END")	There is no END at the end of the program	Correct the program.
023	Time set error. (wait command)	No time is specified in the TIM block.	Correct the program
024	Axis undefined	The axis to be used is not available.	• Correct the program. • Check system setting parameters.
025	Divide by zero.	Division by zero was performed.	• Correct the program. • Correct the related parameters.
026	Over flow.	An overflow occurred during operation.	• Correct the program • Correct the related parameters
027	Branch command error.	There is no destination for the branch command.	Correct the program
028	Repeat command error.	• There is no DEND for the repetition command • The ranges to be repeated are overlapping.	Correct the program
029	Paletting command error.	• The set value for the matrix set-up command is out of range. • The value for the grid point positioning command is out of range.	Correct the program
030	Point table command error.	The specification of the point table is out of range.	Correct the program.

Alarm Code List (Common Alarm) (Cont'd)

Code	Message	Cause	Action to be taken
071	MC unit breakdown (1) RAM.	MC unit failure	Contact your Yaskawa representative
072	MC unit breakdown (2) RAM.	MC unit failure	Contact your Yaskawa representative.
073	MC unit breakdown (3) RAM.	MC unit failure	Contact your Yaskawa representative.
074	MC unit breakdown (4) RAM.	MC unit failure	Contact your Yaskawa representative.
075	MC unit breakdown (1) ROM.	MC unit failure	Contact your Yaskawa representative
076	MC unit breakdown (2) ROM.	MC unit failure	Contact your Yaskawa representative.
077	MC unit breakdown (3) ROM.	MC unit failure	Contact your Yaskawa representative.
078	MC unit breakdown (4) ROM.	MC unit failure	Contact your Yaskawa representative
079	Paramerter broken.	• The backup battery is disconnected • Power system failure-MC unit failure	• Check the PLC built-in battery. • Check the power system. •Reset the parameters, program, and offsets. If the error recurs, contact your Yaskawa representative.
080	Axis nume duplicate.	Axis names are duplicated.	Correct parameters.
081	Emergency stop.	Emergency stop	Reset the emergency stop.
082	—	—	—
083	ABS system battery falls off	The battery voltage dropped in the system using an absolute position detecting encoder.	• Immediately replace the lithium battery (ER6V) contained in the PLC unit with a new one. • Replace within a month at the longest.
084	—	—	—
085	—	—	—
086	—	—	—
087	—	—	—
088	—	—	—
089	—	—	—
090	—	—	—

APPENDIX 3

Alarm Code List (Individual Axis Alarm A : Axes 1 to 4)

Code	Message	Cause	Action to be taken
A01	Servoamp abnormal.	Servo amplifier is abnormal	• Check for a servo amplifier error. • Reset the servo amplifier. If the error recurs, contact your Yaskawa representative.
A02	"+" direction over travel.	• Positive direction overtravel signal ON • Operation error or program error • Parameter setting error	• Check the overtravel limit switch, reset the error, and retract in the opposite direction. • Check parameters related to overtravel alarm detection. • Check the overtravel input signal.
A03	"–" direction over travel.	• Negative direction overtravel signal ON • Operation error or program error • Parameter setting error	• Check the overtravel limit switch, reset the error, and retract in the opposite direction • Check parameters related to overtravel alarm detection. • Check the overtravel input signal.
A04	Excessively deviation.	Excess deviation in servo system follow-up	• Check connections between the MC unit, servo amplifier, and motor. • Check parameter settings related to system setting and servo characteristics • Check mechanical load.
A05	"+" direction soft over travel.	• Positive direction overtravel signal ON • Operation error or program error • Parameter setting error	• Check the program and operation, reset the error, and retract in the opposite direction • Check parameters related to soft limit switches.
A06	"–" direction soft over travel.	• Negative direction overtravel signal ON • Operation error or program error • Parameter setting error	• Check the program and operation, reset the error, and retract in the opposite direction. • Check parameters related to soft limit switches
A07	Invalid position.	• Positioning error	• Check parameters related to servo characteristics. • Check connection between servo amplifier and motor • Check mechanical load.
A08	——	——	——
A09	——	——	——
A10	PG broken wire.	• Parameter setting error • Encoder or servo amplifier is abnormal • MC unit failure	• Check wiring of the absolute encoder • Contact your Yaskawa representative.

Alarm Code List (Individual Axis Alarm A : Axes 1 to 4) (Cont'd)

Code	Message	Cause	Action to be taken
A11	Detect over run.	• Parameter setting error • Erroneous wiring with the motor and/or the encoder • Runaway was detected with the MC unit. • MC unit failure	• Check system setting parameters. • Check wiring of the motor and the encoder. • Review the servo system by modifying settings of servo characteristic parameters • Contact your Yaskawa representative.
A12	Axis move to excess at power off	when an absolute encoder is used, any of the following is observed : -Axes moved while power is OFF. -Parameter setting error -Absolute encoder error	• Check the mechanical position and indicated position, then reset. • Check the system setup parameters.
A13	ABS encoder rotation over	When an absolute encoder is used, the motor rotation count exceeded ±99999 from the encoder initialized position	• Check the mechanical position and indicated position. • Check the parameter, such as gear ratio. • Review the system configuration, such as mechanical stroke. • Initialize the absolute encoder.
A14	ABS encoder alarm	When an absolute encoder is used, the absolute encoder alarm is issued.	• Check the alarm contents by the digital operator of the SERVOPACK. • Initialize the absolute encoder.
A15	Encoder alarm (COM)	When an absolute encoder is used, the absolute encoder communication alarm is issued.	• Check connections between the MC unit and servo amplifier • Check the SEN signal. • Check 24VDC.
A16	Nothing zero set	When an absolute encoder is used, zero-point is not set.	Set the zero-point.
A17	Zero set miss	When an absolute encoder is used, any of the following is observed : -Positioning by zero-point setting is incomplete. -Zero-point setting was attempted while axes are moving.	• Verify the positioning completion range set by the parameter. • Set the zero-point after the axes stop.
A18	Encoder battery alarm	When an absolute encoder is used, the battery alarm from the absolute encoder is issued.	• Check the battery at occuring alarm 083. • Check connections between MC unit, servo amplifier and servo motor
A19	——	——	——
A20	——	——	——

PROGIC-8

MULTIAXED MOTION CONTROLLER

INSTRUCTION MANUAL OF ADDITIONAL FUNCTIONS

TOKYO OFFICE Ohtemachi Bldg. 1-6-1 Ohtemachi, Chiyoda-ku, Tokyo, 100 Japan
Phone (03) 3284-9111 Telex YASKAWA J33530 Fax (03) 3284-9034
SEOUL OFFICE 8th Floor Seoul Center Bldg, 91-1, Sogong-Dong, Chung-ku, Seoul, Korea 100-070
Phone (02) 776-7844 Fax (02) 753-2639
TAIPEI OFFICE Shen Hsiang Tang Sung Chiang Building 10F 146 Sung Chiang Road, Taipei, Taiwan
Phone (02) 563-0010, -7732 Fax (02) 567-4677
YASKAWA ELECTRIC AMERICA, INC.
Chicago-Corporate Headquarters 2942 MacArthur Blvd. Northbrook, IL 60062-2028, U.S.A.
Phone (708) 291-2340 Fax (708) 498-2430
Chicago-Technical Center 3160 MacArthur Blvd. Northbrook, IL 60062-1917, U.S.A
Phone (708) 291-0411 Fax (708) 291-1018
MOTOMAN INC.
805 Liberty Lane West Carrollton, OH 45449, U.S.A
Phone (513) 847-6200 Fax (513) 847-6277
YASKAWA ELECTRIC EUROPE GmbH
Niederhochstadter Straße 73, 61476 Kronberg-Oberhöchstadt, Germany
Phone (06173) 9380 Telex 415660 YASE D Fax (06173) 68421
YASKAWA ELÉTRICO DO BRASIL COMÉRCIO LTDA.
Rua Conde Do Pinhal 8-5, Andar Sala 51 CEP 01501-São Paulo-SP, Brasil
Phone (011) 35-1911 Fax (011) 37-7375
YASKAWA ELECTRIC (SINGAPORE) PTE. LTD.
CPF Bldg. 79 Robinson Road # 13-05, Singapore 0106
Phone 2217-530 Telex (87) 24890 YASKAWA RS Fax 224-5854
YATEC ENGINEERING CORPORATION
Shen Hsiang Tang Sung Chiang Building 10F 146 Sung Chiang Road, Taipei, Taiwan
Phone (02) 563-0010 Fax (02)567-4677

YASKAWA ELECTRIC CORPORATION

YASKAWA

SIE-C888-1.5

593-40