

TOSHIBA

PROGRAMMABLE CONTROLLER

Single-Axis Positioning Module

For T2, EX100, M20/40

EX100

USER'S MANUAL

Installation and Specifications

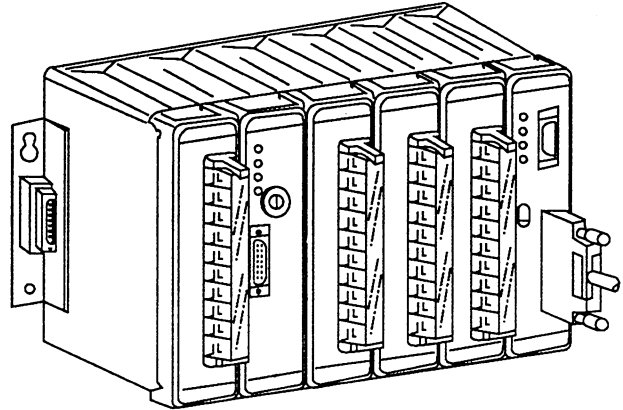
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Single-Axis Positioning Module

*Model: EX100*MMC11*



This manual describes the functions and operation of the MC11 Positioning Module of the EX100 series. To operate the module correctly it is advisable that the reader also peruse the operation manual and programmer's manual of the EX100.

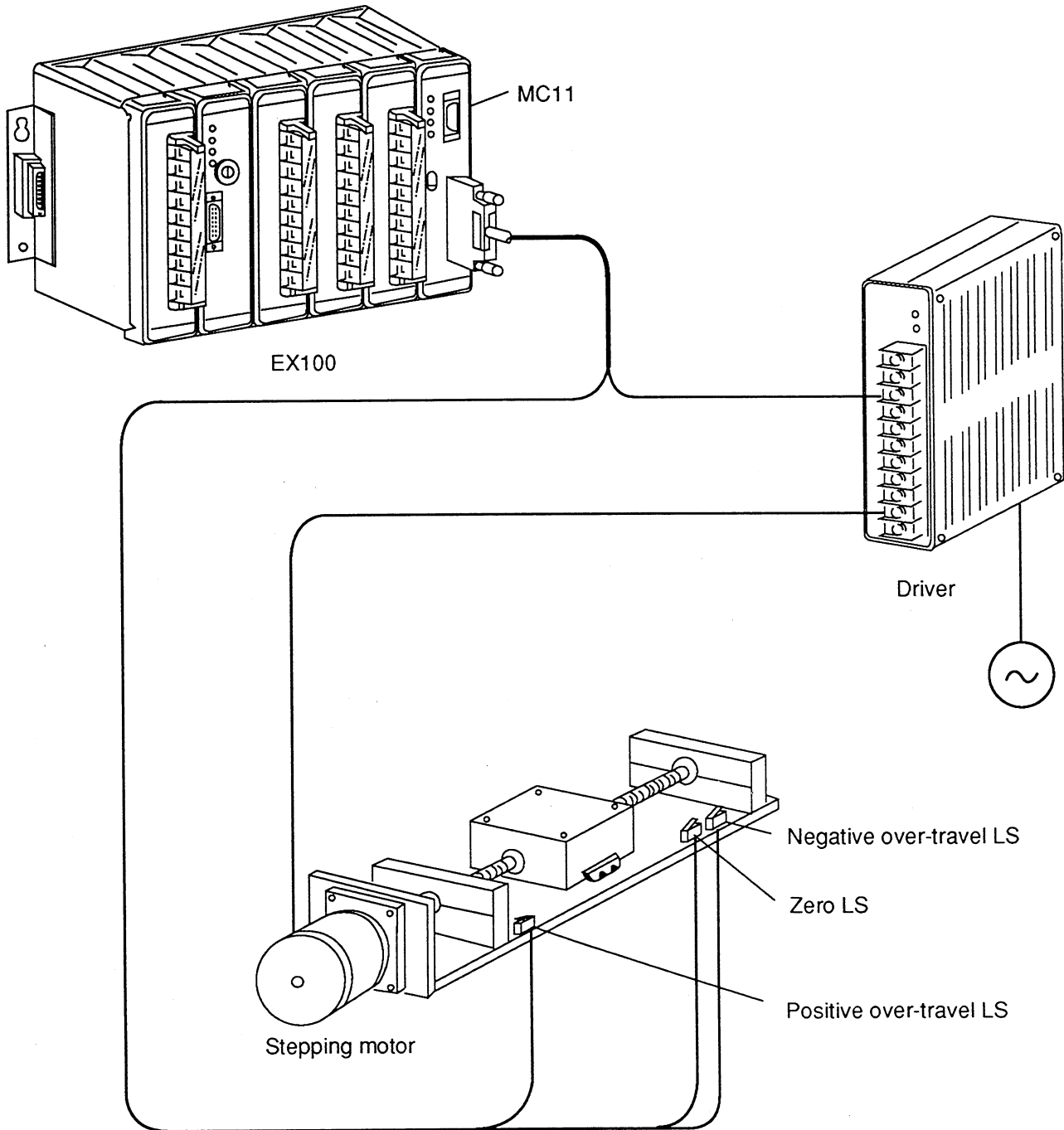
1.1 Principal functions

- Control Motors
The MC11 module outputs sequences of pulses to control the following motors.
 - (1) Stepping motor driver
 - (2) Servo motor driver with a pulse input function
- Simple Setting
To minimize the software of the EX CPU, parameter values can be set using the same programmer as that of the EX100.
- Direct Writing
Data can be set directly by operating the EX100. This also allows control by EX CPU commands.
- Override
The speed can be varied during movement and the system can be used for transfer control.
- Built-in Electronic Gear
The gear sets the command unit in any desired value.
- Maintenance-Free Hardware
The memory is an EEPROM which eliminates the need for battery backup.

1. System Configuration

1.2 (1) Stepping motor System configuration

Connect the stepping motor driver to this module as shown below.

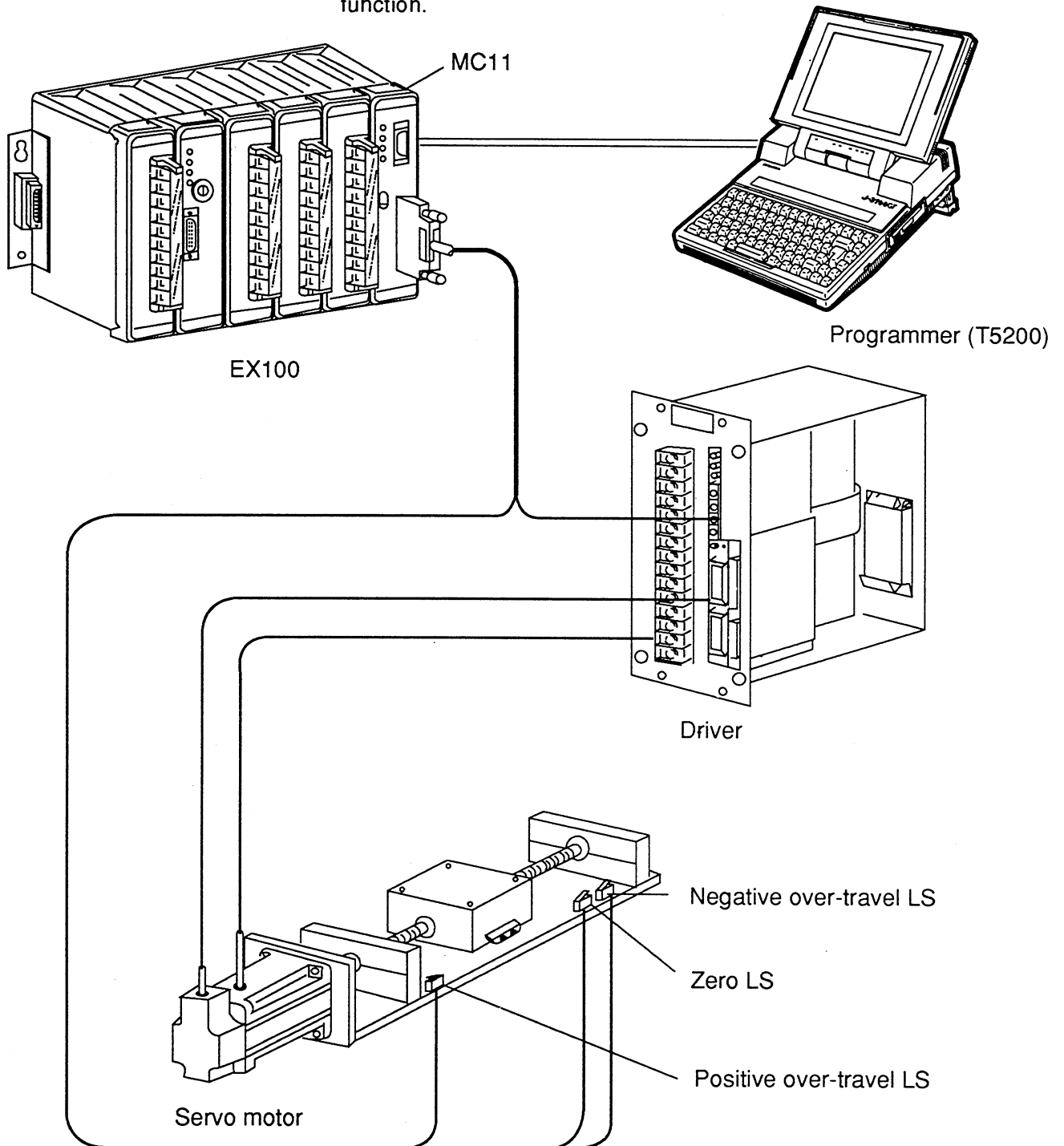


- Number of control axes
This module uses 64 points per module. Connect a maximum of approximately six modules to one EX100 unit.

1. System Configuration

(2) Servo driver

When a servo motor is used, install a servo driver with a pulse input function.

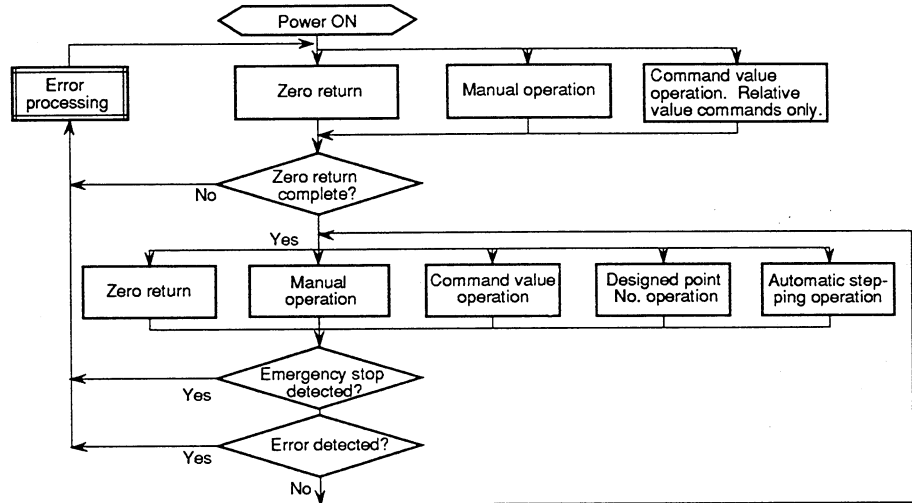


- Number of control axes
This modules uses 64 points per module. Connect a maximum of approximately six modules to one EX100 unit.

1. System Configuration

1.3 Outline of operation

The MC11 stores parameters and position data in the EEPROM contained in the module and performs positioning according to operation commands given by the EX100. The modules operation flow is shown below.



Unless zero return is performed, the MC11 does not perform the designated operation or the automatic stepping operation.

An emergency stop sets the same state as that when the power is turned on. Perform zero return.

An error sets up the same state as that when the power is turned on. Perform zero return.

1. System Configuration

[Outline of Operation]

Each operation is outlined below.

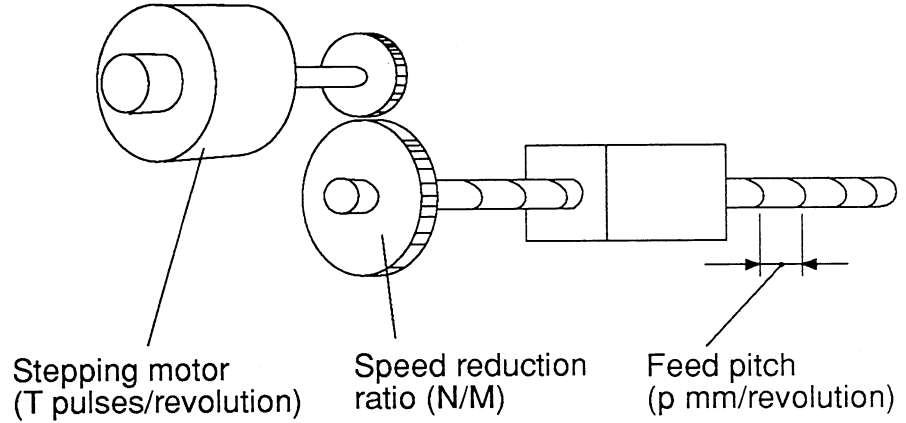
Operation mode	Outline of operation
Zero return	Returns the system to the zero position.
Manual operation	Operates in accordance with designated speed and direction.
Command value operation	Moves the designated amount or to the designated position at maximum speed.
Point No. operation	Moves the specified amount of movement or to the position stored at the designated point No. at the specified speed.
Automatic stepping operation	Automatically moves from designated point No. to point No. where the dwell timer value is specified as 9999.

1. System Configuration

1.4 Precision and command unit

(1) Positioning precision

In positioning, the precision is determined by the minimum amount of movement of the drive motor and by the machine system as follows.



$$\text{Positioning precision} = \frac{\text{Feed pitch} \times \text{numerator of speed reduction ratio}}{\text{Motor pulse} \times \text{denominator of speed reduction ratio}} = \frac{P \times N}{T \times M}$$

Set the command unit for this module greater than the above-mentioned positioning precision.

(2) Command unit

The command unit is the minimum amount of movement that can be specified in parameters. For example, when connecting a ball screw with a lead of 5 mm to a motor operating at 1000 pulses per revolution to set the minimum amount of movement to 0.01 mm, provide the electronic gear numerator and electronic gear denominator as follows to handle 0.01 mm as one command unit.

$$\text{Electronic gear numerator} = \frac{\text{Motor pulses}}{1 \text{ revolution}} = 1000$$

$$\text{Electronic gear denominator} = \frac{\text{Feed pitch}}{\text{Minimum amount of movement}} = 500$$

1. System Configuration

(3) Maximum traveling speed and output pulse frequency

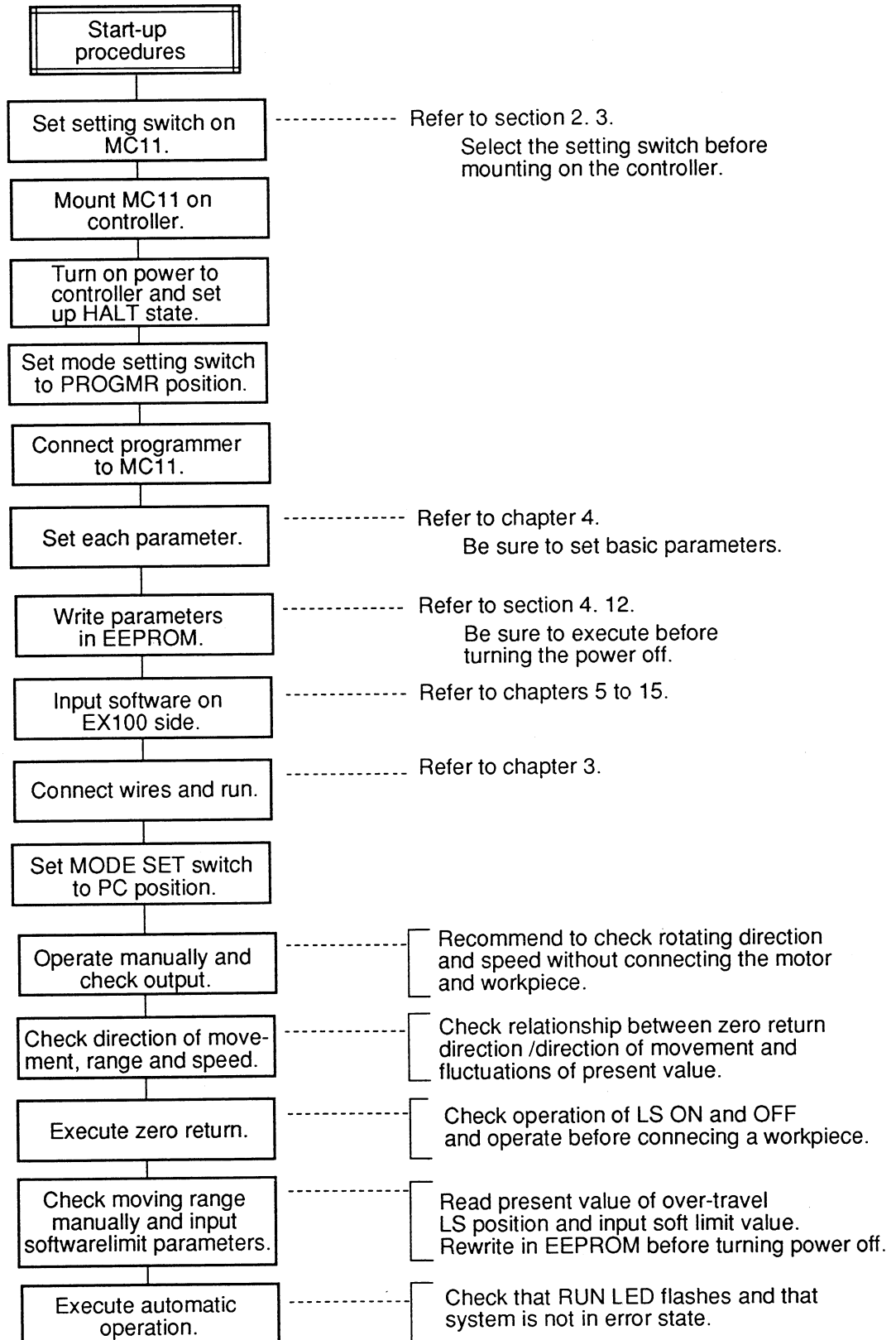
The output pulse frequency is limited by the maximum frequency of the motor driver and that of the MC11 (200K pps). The stepping motor and servo driver frequencies must not exceed approximately 20 and 200K pps respectively.

$$\text{Maximum frequency} = \frac{\text{Maximum speed (Command unit/minute)} \times \text{electronic gear numerator}}{60 \text{ (sec)} \times \text{electronic gear denominator}}$$

1. System Configuration

1.5 The procedures to start up the MC11 are shown in the following flowchart.

Start-up procedures



2. Specification

2.1 Performance specifications

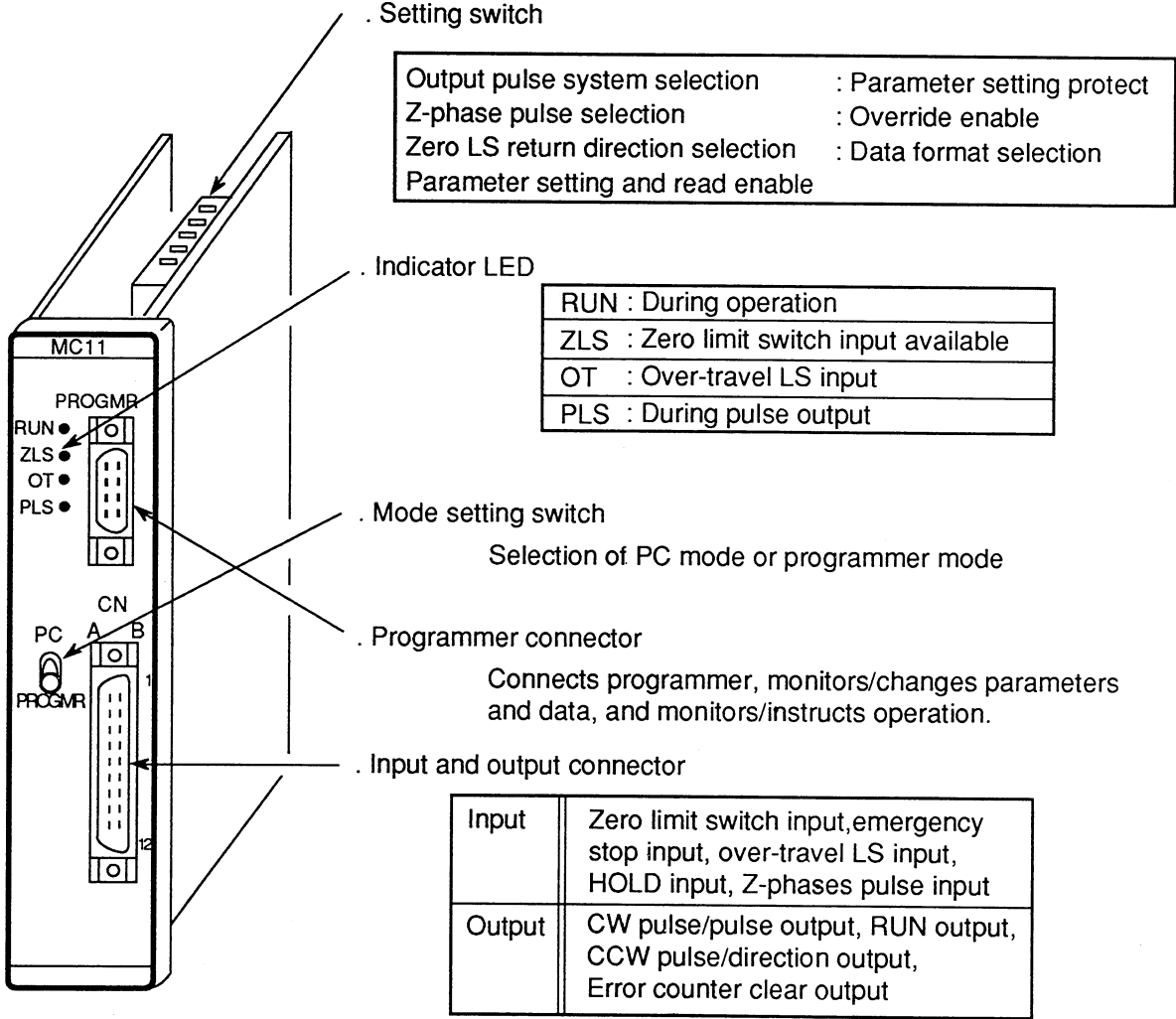
Item	Specification
Number of controlled axes	1 axis
Command unit	Pulse-mm-inch and other
Command value range	±999, 999
Command data capacity	64 points
Maximum pulse output speed	999, 999 command unit/min, (200K pps)
Acceleration/deceleration system	Automatic trapezoidal/triangular acceleration/deceleration
Acceleration/deceleration time	0 to 26 sec
Backlash compensation	0 to 1000 pulses
Zero offset amount	±999, 999 command units
Dwell time	0 to 99.98 sec
Number of occupied points	X + Y 4 words (64 points)
Parameter data save	EEPROM

2. Specification

2.2 I/O specifications

	Item		Specification
External input	Input voltage		12/24 V DC (Z phases: 5 V selectable)
	Input current		10 mA (when 24 V DC is input)
	ON/OFF voltage		ON voltage: 9.6 V OFF voltage: 3.2 V
	ON/OFF delay		5 ms or less (Z phases: 1 ms or less)
External Output	Pulse output	Mode DIP SW selection	1. CW/CCW (positive/negative direction pulse) 2. PULSE/DIR (pulse/direction)
		Output system	Open collector (5 to 24 V DC, 50 mA)
		ON/OFF delay	2 μ s
	RUN output	Output system	Open collector (5 to 24 V DC, 50 mA)
		Operation	During normal operation: ON/when there is a problem: OFF
	Current consumption	Internal power supply	300 mA/500 mA (Hand-held programmer used)
External power supply		100 mA - 12/24 V DC	

2.3 Module components



2. Specification

(1) Functions of LEDs indicators

LED		Operation	
RUN	During operation	Alight	During normal operation (external power supply normal)
		Flashing	Error has occurred. (Data setting, operation stop error or other state)
		Not alight	A problem has occurred. (External power supply shortage or not supplied, or other reason)
ZLS	Zero LS	Alight	Zero limit switch input ON
		Not alight	Zero limit switch input OFF
OT	Over-travel LS	Alight	Over-travel LS input
		Not alight	Over-travel LS not input
PLS	During pulse output	Flashing	During pulse output
		Not alight	Output stop

(2) Functions of the mode setting switch

Select between the PC mode and programmer mode while the pulse output is stopped.

Mode	Operation command acknowledgement	Remarks
PC	EX100	Parameters cannot be set from the programmer, but monitoring is possible.
PROGMR	Programmer	Both parameter setting and monitoring from the programmer are possible.

2. Specification

2.4 Functions of setting switches

The setting switches installed on the MC11 select functions as follows.

SW No.	Function	OFF	ON
1	Output pulse system selection	CW/CCW output	Pulse/direction
2	Z-phase pulse use selection	Z-phase pulse used	Z-phase pulse not used
3	Zero LS ON direction selection	CW	CCW
4	Zero LS OFF direction selection	CW	CCW
5	Parameter setting protection	Parameters settable	Not settable
6	Override enable	Override impossible	Override possible
7	Data format selection	BIN indication	BCD indication
8	PC parameter setting and read	Setting and reading not possible	Setting and reading possible

Set the switches before inserting the MC11 in the base unit.

(1) SW No. 1 (Selection of output pulse system)

Select the pulse system according to the specifications of the driver to be used.

SW No.1	Pulse system	Output waveform
OFF	CW/CCW	
ON	Pulse/direction	

2. Specification

(2) SW No. 2 (Selection of Z-phase pulse)

This switch selects whether the operation pattern and error counter clear is output in the zero return mode.

a. Operation pattern of zero return mode

SW No. 2	Z-phase pulse	Operation pattern
OFF	Z-Phase pulse used	
ON	Z-phase pulse not used	

b. Error counter clear output

SW No. 2	Error counter clear output
OFF	Switches on during zero reset when first Z-phase pulse is input after zero LS OFF. (Minimum 10 ms)
ON	Switched ON during emergency stop input.

(3) SW No. 3 (zero LS-ON direction selection) SW No. 4 (zero LS-OFF direction selection)

This switch selects the operation direction during zero reset. Set this switch according to the machine system to be operated.

2. Specification

Example: If the Z-phase pulse non-use and zero offset is 0.

SW No. 3	SW No. 4	Operating direction during zero return
OFF	OFF	
OFF	ON	
ON	OFF	
ON	ON	



When the zero LS switches ON while moving in the zero LS-ON direction, the machine decelerates and stops. The zero LS has to be switched ON continuously till the machine decelerates and stops.

(4) SW No. 5 (Parameter setting protect)

This switch selects whether to set parameters using the programmer when the mode setting switch is set to the PROGMR mode. Protection is switched ON when adjustments have been made.

SW No. 5	Parameter setting protect
OFF	Parameters can be changed from programmer.
ON	Parameters cannot be changed from programmer.

2. Specification

(5) SW No. 6 (Override enable)

This switch sets whether the moving speed can be changed from the EX100 during pulse output. It is effective during operation when the mode switch is set to the EX mode, except during zero LS-OFF direction movement in zero return.

SW No. 6	Override enable
OFF	Moving speed cannot be changed from EX100.
ON	Moving speed can be changed from EX100. If remaining pulses do not satisfy override command during constant travel, commands are acknowledged but are not executed.

(6) SW No. 7 (Data format selection)

This switch selects whether to express data such as parameters and present values in the BCD or BIN format.

SW No. 7	Data format
OFF	BIN data format
ON	BCD data format

Parameters, present values, etc., are indicated as follows.

■ Parameters and set values

Data Length	Value	BIN expression		BCD expression	
		DEC Indication	HEX Indication	DEC Indication	HEX Indication
Double Length	1	0000000001	00000001H	0000000001	00000001H
	-1	4294967295	FFFFFFFFH	0268435457	10000001H
	999999	0000999999	000F423FH	0010066329	00999999H
	-999999	4293967297	FFF0BDC1H	0278501785	10999999H
Single Length	9999	09999	270FH	39321	9999H
	1	00001	0001H	00001	0001H

2. Specification

■ Present Values (XWn, XWn + 1)

Data Length	Value	BIN expression		BCD expression	
		DEC Indication	HEX Indication	DEC Indication	HEX Indication
Double Length	1	–	0*000001H	–	0*000001H
	–1	–	F*FFFFFFH	–	1*000001H
	999999	–	0*0F423FH	–	0*999999H
	–999999	–	F*F0BDC1H	–	1*999999H



Present values (XWn and XWn + 1) contain status information of the MC11 in the highest data and cannot be read directly using DEC indication.

(7) SW No. 8 (Parameter setting and read)

This switch selects whether the MC11 can be read from and written to using the demultiplexer (FUN004) and multiplexer (FUN003) in the EX100 program.

Be sure to set the switch as follows according to the version of the EX100 OS.

SW No. 8	Parameter setting and reading	Before Ver. 2.0	After Ver. 2.1
OFF	Parameters cannot be set or read.	○	×
ON	Parameters can be set and read.	×	○

The demultiplexer and multiplexer cannot be used unless the OS of the EX100 CPU module is Ver 2.1 or after.



The system does not operate normally if this switch is switched on when the version of the EX100 OS is before 2.0.

2. Specification

2.5 Functions of external inputs and outputs

The MC11 external inputs and outputs have the following functions.

(1) RUN output

The RUN output is closed while the MC11 is in normal operation.

(2) CW pulse/pulse output

A CW pulse is output if set switch No. 1 is OFF. A move pulse is output if the switch is ON.

(3) CCW pulse/direction output

A CCW pulse is output if set switch No. 1 is OFF. The direction of movement is output if the switch is ON.

(4) Error counter clear output

When set switch No. 2 is OFF, the output switches on for 10 ms while the first Z-phase pulse is input after the zero LS is switched off while moving in the zero LS-OFF direction while returning to the zero position. It remains switched on when the external emergency stop input is OFF. There is no output if set switch No. 2 is ON.

(5) Z-phase pulse input (DC5 V)

A Z-phase pulse is input as line driver output when applied to the AC servo motor.

(6) Z-phase pulse input (12/24 V DC input)

This input is used when the Z-phase pulse of the servo driver is open collector output or when wishing to improve the zero position using the stepping motor.

(7) Zero limit switch input (12/24 V DC input)

A zero LS signal is input. Use a NO-type contact.

(8) HOLD input (12/24 V DC input)

This input is open when pausing. Opening this terminal during pulse output causes the system to decelerate and stop. Closing this terminal resumes operation. NEVER input the next operational command when the HOLD input is open.

2. Specification

- (9) External emergency stop input (12/24 V DC)

Opening this terminal causes the system to make an emergency stop.

- (10) CW-side over-travel LS input (12/24 V DC input)

Input the limit switch at the critical operation point on the CW side (+). Use an NC contact.

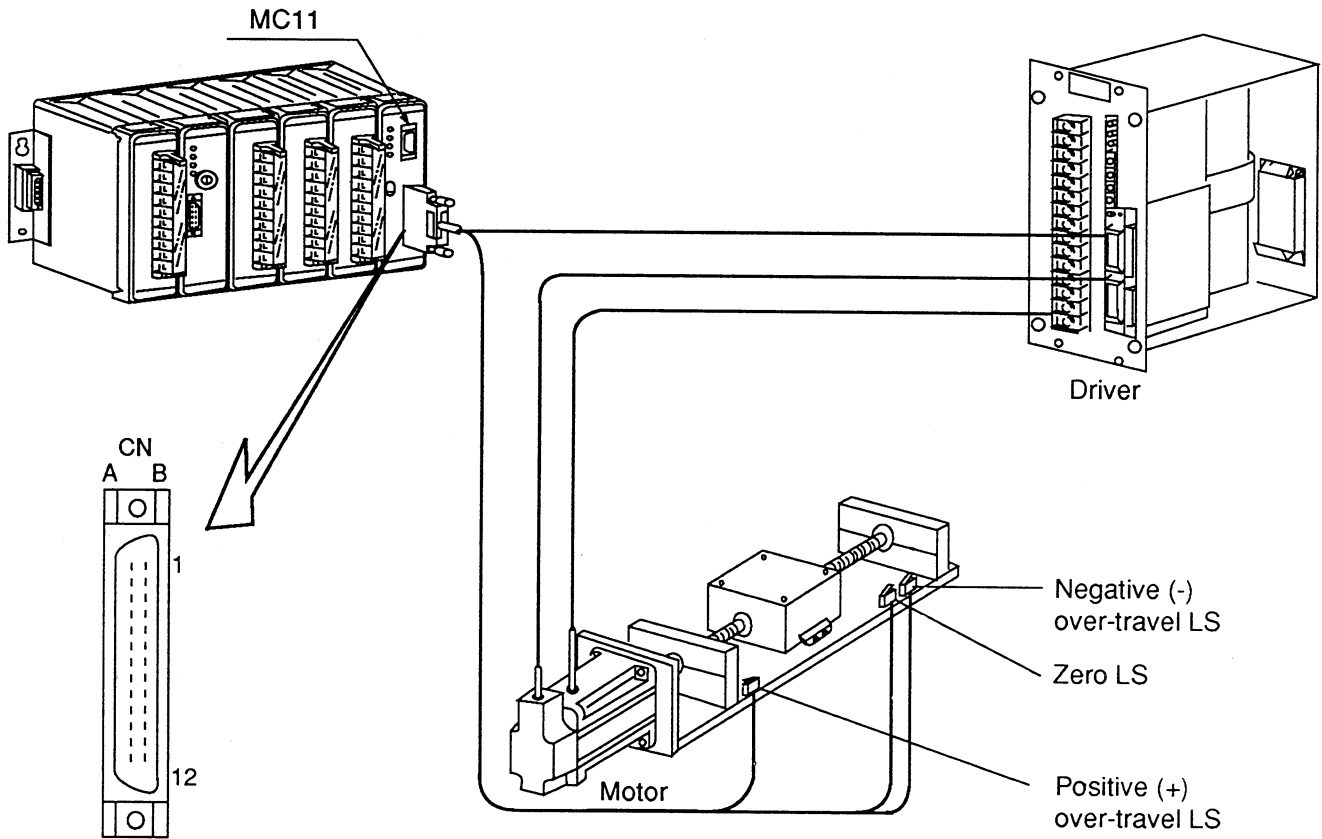
- (11) CCW-side over-travel LS input (12/24 V DC input)

Input the limit switch at the critical operation point on the CCW side (-). Use an NC contact.

3. Wiring Method

3.1 Connecting external inputs and outputs

An example of input and output wiring when the MC11 is used is shown below.



3. Wiring Method

[Connector Layout]

The pin allocations of the input/output connector on the exterior of the MC11 are as follows.

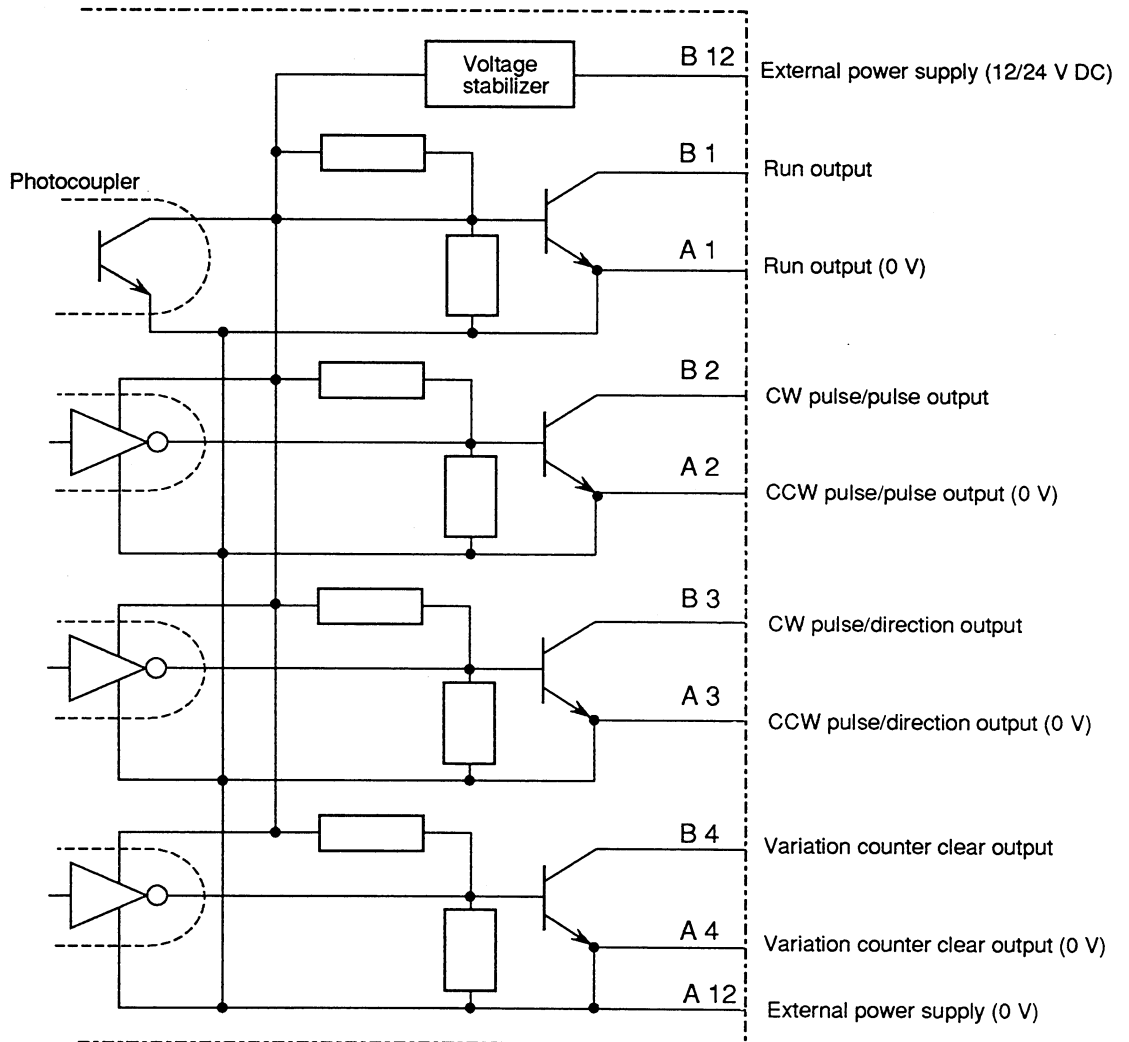
Row A	Pin No.	Row B
Run output (0 V)	1	Run output
CW pulse/pulse output (0 V)	2	CW pulse/pulse output
CCW pulse/direction output (0 V)	3	CCW pulse/direction output
Variation counter clear output (0 V)	4	Variation counter clear output
Z-phase pulse input (0 V)	5	Z-phase pulse input (DC 5 V)
Z-phase Pulse input (0 V)	6	Z-phase pulse input (12/24 V DC)
Zero limit switch input	7	Zero limit switch input (12/24 V DC)
HOLD input	8	HOLD input (12/24 V DC)
Emergency stop input	9	Emergency stop input (12/24 V DC)
CW over-travel LS input	10	CW over-travel LS input (12/24 V DC)
CCW over-travel LS input	11	CCW over-travel LS input (Same as above)
External power supply (0 V)	12	External power supply (12/24 V DC)



Supply external power from a dedicated power source with small voltage fluctuations. Do not use the same power supply for the input and output modules. Connect the Z-phase pulse input by selecting the 5 V DC position (5A-5B) or 12/24 V DC position (6A-6B).

3.2 Output circuits

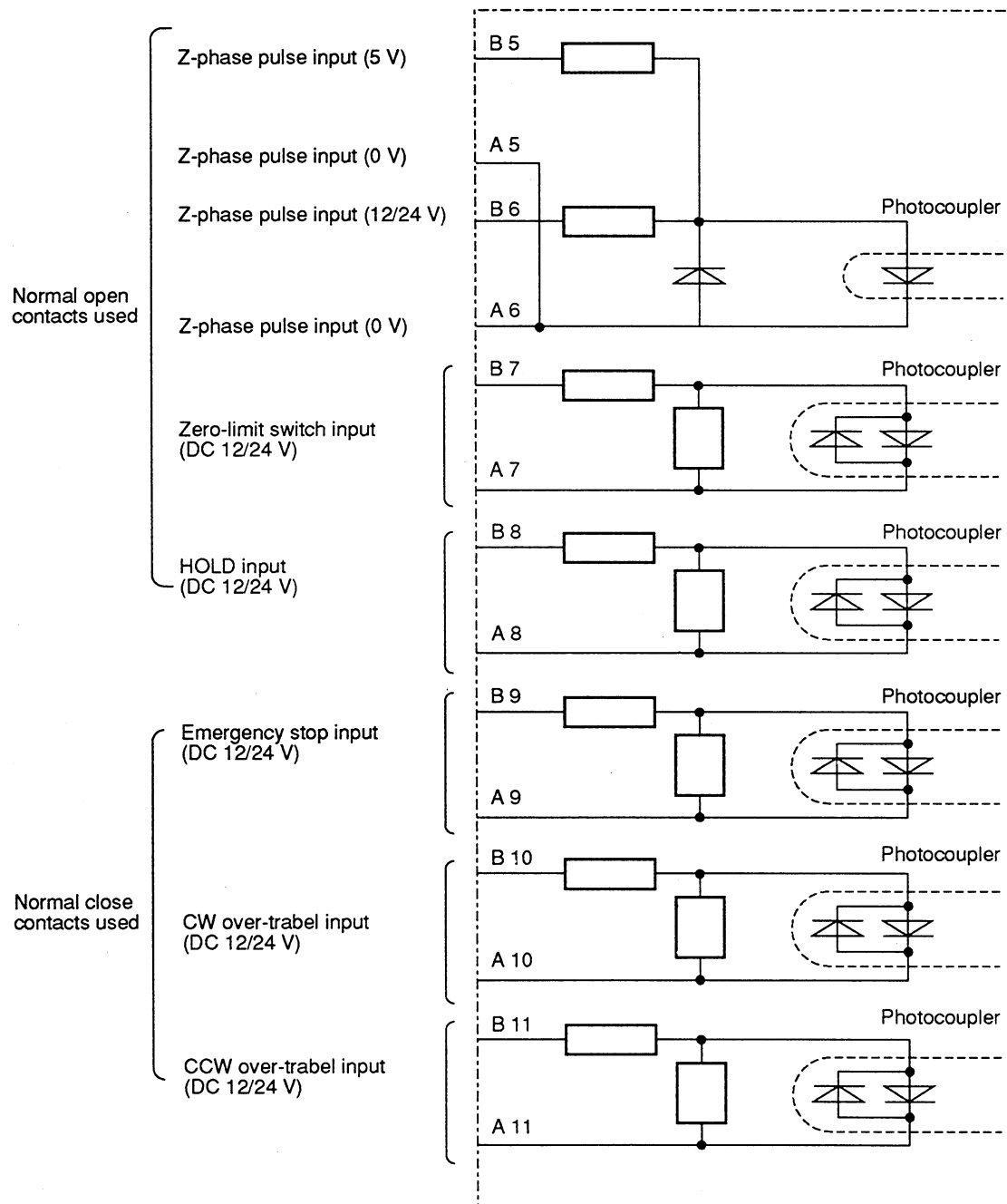
The internal circuits of the output unit are configured as follows.



3. Wiring Method

3.3 Input circuits

The internal circuits of the input unit are configured as follows.



The Z-phase pulse inputs are the terminal having 5 V DC specifications (between B5 and A5) and the terminal having 12/24 V DC specifications (between B6 and A6).

Either is used according to the purpose. The Z-phase pulse input only has source input. The other inputs have no polarity.

3. Wiring Method

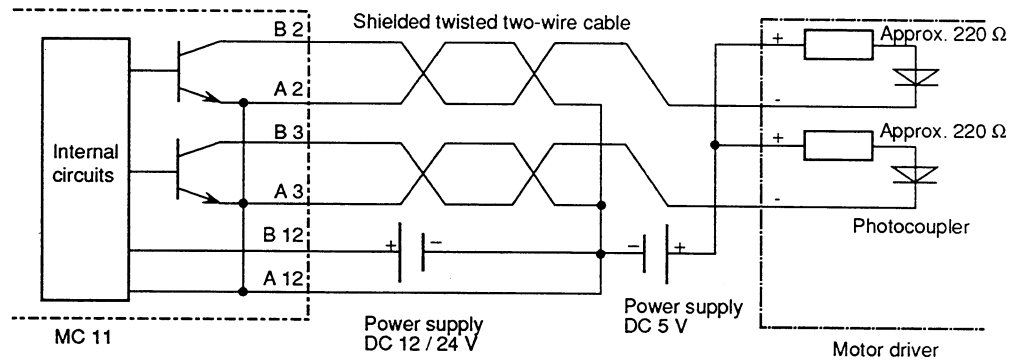
3.4 Example of connecting the pulse output section

An example of connecting the motor driver is shown.

(1) Example of stepping motor driver

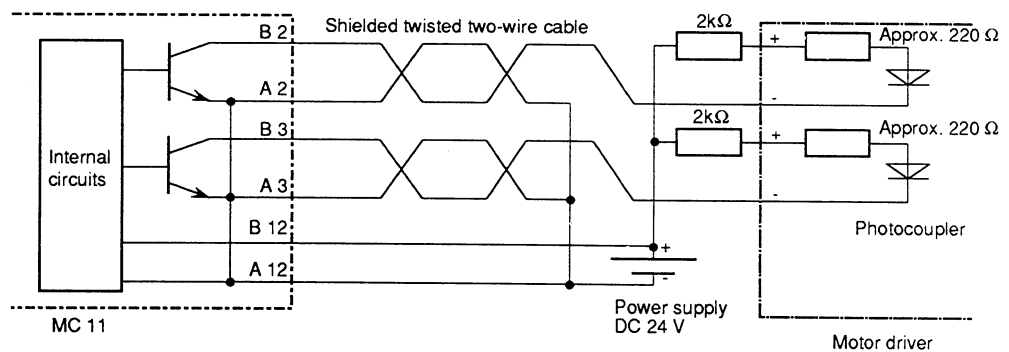
Generally, the stepping motor driver has 5 V DC input.

The motor driver is connected to the pulse output of the MC11 as follows.



(2) Example of connection by 24 V DC only

In some cases, an independent power supply of 5 V DC is not available. In these cases, the motor driver is connected to the pulse output of the MC11 as shown below.



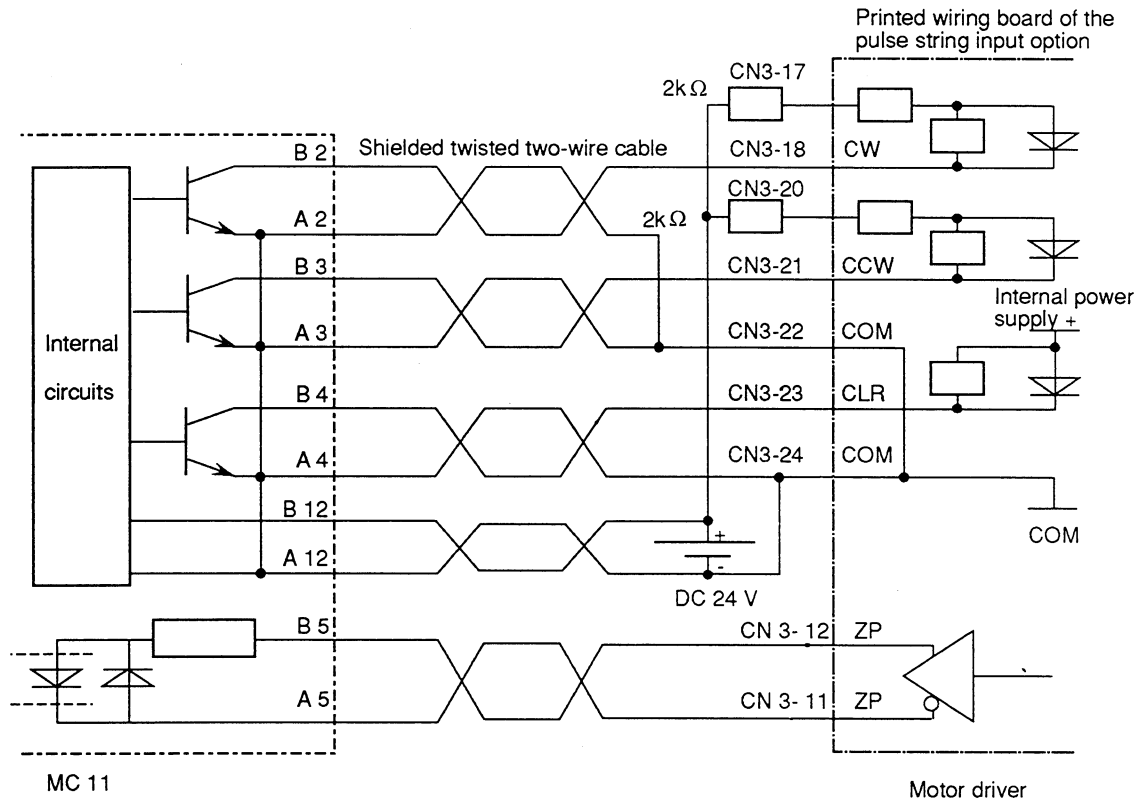
- **Connection resistance**
The specifications of the 2 kΩ resistor shown above must be 1/2 W.
- **Connection cable**
The recommended cable is shielded twisted two-wire cable with a wire cross section of at least 0.2 mm². The cable length must be 1 m or less and must always be separated from other input/output wires and power cables.
- **Power supply**
Use a switching regulator as the power supply. Do not use it for other inputs or outputs.

3. Wiring Method

(3) Example of connection with AC servo driver

An example of connection with an AC servo driver manufactured by Toshiba (model RAD300) is shown below.

Mount the printed wiring board of the pulse-string input option with RAD300.



- **Connection cable**
The recommended cable is shielded twisted two-wire cable with a wire cross section of at least 0.2 mm². The cable length must be 1 m or less. The cable must always be separated from other input/output leads and power cables.
- **Suitable servo driver**
Install a servo driver with a built-in position control loop in the MC11. The response time for code switchover must be 1 ms or less with the driver if the driver has a pulse and code input function.
- **Power supply**
Install the 24 V DC power supply on the servo driver side and supply the power to the MC11 via twisted two-wire.

To operate the MC11, parameters must be set matching a suitable drive system. The parameters include the basic parameters for basic operation of the MC11 and operation parameters used in the automatic stepping operation. These parameters can be set and monitored either by connecting a programmer to the MC11 or by using the demultiplexer and multiplexer instructions from the EX100.

4.1 Basic parameters

The basic parameters are references in operation such as maximum/minimum operation speeds, acceleration and deceleration time and soft over-travel. The parameter types are shown below.

Name	Setting Range	Description
Zero Coordinate	-999999 ~ 999999 Command unit	Present value upon completion of zero return is designated in command units.
Zero Offset	-999999 ~ 999999 Command unit	Distance of movement to the zero coordinate after determining the zero reference position during zero return operation. (The zero reference position is the mechanical reference position after zero LS is switched off.)
+ Soft Limit	-999999 ~ 999999 Command unit	Designates the position of the movement limit on + (CW) side.
- Soft Limit	-999999 ~ 999999 Command unit	Designates the position of the movement limit on - (CCW) side.
Zero Return Speed	1 ~ 999999 Command units/minute	Designates the speed to move the zero LS in the direction to switch it ON and the speed during zero offset movement in zero return.
Maximum Movement Speed	1 ~ 999999 Command units/minute	Designates the maximum operating speed. It is not effective if it is smaller than other speed parameters.
Minimum Movement Speed	1 ~ 999999 Command units/minute	Designates the minimum operating speed. The speed becomes effective when the zero LS moves in the OFF direction during zero return.

4. Parameter

Name	Setting Range	Description
Electronic Gear Denominator	1 ~ 9999 Pulses/revolution	Sets the number of pulses per motor revolution.
Electronic Gear Numerator	1 ~ 9999 Command units/revolution	Sets amount of movement per motor revolution in command units.
Backlash Compensation	1 ~ 1000 Pulse unit	Sets the pulses for compensating backlash which occur with gears when the direction of revolution changes.
Acceleration Time	0 ~ 2600 0.01-s units	Sets the time needed to accelerate from the minimum feed speed to the maximum feed speed.
Deceleration Time	0 ~ 2600 0.01-s units	Sets time needed to decelerate from the maximum feed speed to the minimum feed speed.

4.2 Operation parameters

Operation parameters are command values, feed speeds and dwell timer values at each point No. from Points 1 to 64. The values are stored for use when needed.

Name	Setting Range	Description
Point No.	0, 1 ~ 64, 100	0: Command value operation point No. 1 ~ 64: Designated point No. operation-automatic stepping operation No. 100: Point No. for present value setting
Operation Feed Speed	1 ~ 100%	Designates the movement speed at each point No. in as a percentage of the maximum feed speed. Can be designated at Points 1 to 64. At point 100, the present value to be changed is set.
Command Value	-999999 ~ 999999 Command unit	Designates the command values at various point Nos. in command units. Designates command values for moving at Points 1 to 64. At point 100, the present value to be changed is set.
Dwell Timer	0 ~ 9998 0.01 is seconds	Sets the stop time after completion of moving before starting to move to the next point during automatic stepping operation.
	9999	Setting 9999 indicates that the automatic stepping operation block has ended.

4. Parameter

4.3 Setting and monitoring parameters from the programmer

Connect a programmer directly to the MC11 and monitor the data registers (D000 to D068) to set and monitor the parameters.

	Register	Name	Setting range	Remarks
Operation parameter	D000· D001	Point No.	0,1 ~ 64,100	0 : Command value operation, 100 : Present value change, 1 to 64 : Point Nos.
	D002· D003	Operation speed	1 ~ 100	Percent age of maximum speed
	D004· D005	Command value	-999999 ~ 999999	Designated value of designated point No.
	D006· D007	Present value monitor	-999999 ~ 999999	Only monitoring is possible.
	D008· D009	Dwell timer	0 ~ 9998, 9999	9999; Automatic stepping end, 0.01-s units
	D010· D011	Write flag	0,1	1: While writing operation parameters
	D016· D017	Point No.	1 ~ 64	1 to 64: Point Nos.
	D018· D019	Present value monitor	-999999 ~ 999999	Only monitoring is possible. (Monitoring is also possible while moving.)
Command information	D032	Error code No.	0000 ~ 9999	Monitoring only
	D033	ABS/INC designation	0,1	0: Absolute coordinate mode, 1: Relative coordinate mode
	D034	Auxiliary command data		Designates point No. -operation speed.
	D035	Command No.	0 ~ 5	Selects operation.
	D036	CW/CCW determination	0,1	0: CW, 1: CCW
	D037	Write protect.	0,1	1: Write inhibit
Basic parameter	D048· D049	Zero coordinate	-999999 ~ 999999	Coordinates upon completion of zero return.
	D050· D051	Zero offset	-999999 ~ 999999	Offset during zero return
	D052· D053	+ Software limit (CW)	-999999 ~ 999999	Software over-travel in CW direction.
	D054· D055	- Software limit (CCW)	-999999 ~ 999999	Software over-travel in CCW direction.
	D056· D057	Zero return speed	1 ~ 999999	Movement speed during zero return
	D058· D059	Maximum speed	1 ~ 999999	Movement speed at 100% during command value operation
	D060· D061	Minimum speed	1 ~ 999999	Minimum movement speed
	D064	Electronic gear numerator	1 ~ 9999	Number of pulses per motor revolution.
	D065	Electronic gear denominator	1 ~ 9999	Amountn of movement per motor revolution.
	D066	Backlash compensation	0 ~ 1000	
	D067	Acceleration time	0 ~ 2600	Acceleration time from minimum speed to maximum speed
	D068	Deceleration time	0 ~ 2600	Acceleration time from maximum speed to minimum speed

4.4 Monitoring operation parameters

The procedure to connect the peripheral device, GP110, to the MC for monitoring operational parameters is shown below.

- (1) Set the PC/PROGMR switch installed on the front of the unit to the PROGMR position after checking that the MC11 has finished positioning.
- (2) Connect the peripheral device to the MC11's connector and block monitor data registers D000 and upward.



The MC11 is regarded by the peripheral device as an EX250/2 K step version.

- (3) Check that the write flags (D010 - D011) are 0.
If the write flags are other than 0, set the write flags (D010-D011) to 0.
- (4) Write the point Nos. to be monitored in point No. registers D000 and D001.
- (5) Monitor the operation parameters.

```

P- EX: [GP110] D0000
EX GP: [READY] KEY IN START NO.

< STATUS DISPLAY >

REG. VALUE FEDC BA98 7654 3210 REG. VALUE
D0000 00000 0000 0000 0000 0000 D0008 00000
D0001 00005 0000 0000 0000 0000 D0009 00010
D0002 00000 0000 0000 0000 0000 D0010 00000
D0003 00050 0000 0000 0000 0000 D0011 00000
D0004 00000 0000 0000 0000 0000 D0012 00000
D0005 00300 0000 0000 0000 0000 D0013 00000
D0006 00000 0000 0000 0000 0000 D0014 00000
D0007 00700 0000 0000 0000 0000 D0015 00000
    
```

```

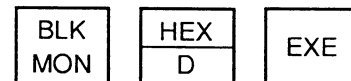
P- EX: [EDIT] "EDIT"
EX GP: [READY] KEY IN SETUP DATA

< STATUS DISPLAY >

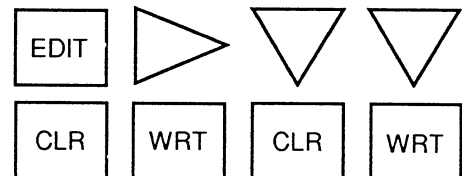
REG. VALUE FEDC BA98 7654 3210 REG. VALUE
D0000 00000 0000 0000 0000 0000 D0008 00000
D0001 00008 0000 0000 0000 0000 D0009 00010
D0002 00000 0000 0000 0000 0000 D0010 00000
D0003 00050 0000 0000 0000 0000 D0011 00000
D0004 00000 0000 0000 0000 0000 D0012 00000
D0005 00300 0000 0000 0000 0000 D0013 00000
D0006 00000 0000 0000 0000 0000 D0014 00000
D0007 00700 0000 0000 0000 0000 D0015 00000
    
```

GP110 Operation Procedure

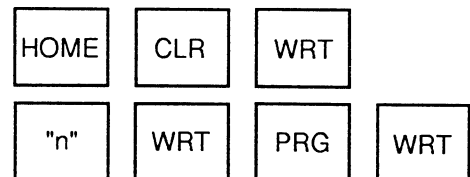
- (2) Data register block monitoring



- (3) Setting write flags to 0.



- (4) Designate the point No. in Point Nos. D000 and D001.



4. Parameter

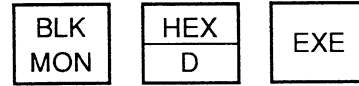
```

P- EX: [D0000] D0000
EX GP: [BLK MON] [REG D] KEY IN START NO.

< STATUS DISPLAY >

REG. VALUE FEDC BA98 7654 3210 REG. VALUE
D0000 00000 0000 0000 0000 0000 D0008 00000
D0001 00008 0000 0000 0000 0000 D0009 00200
D0002 00000 0000 0000 0000 0000 D0010 00000
D0003 00100 0000 0000 0000 0000 D0011 00000
D0004 00000 0000 0000 0000 0000 D0012 00000
D0005 01500 0000 0000 0000 0000 D0013 00000
D0006 00000 0000 0000 0000 0000 D0014 00000
D0007 00700 0000 0000 0000 0000 D0015 00000
    
```

(5) Data register block monitoring.



4.5 Setting operation parameters

Set operation parameters as follows after monitoring the operation parameter of the point No. set as explained on the previous page.

- (1) Set the write flag to 1.
- (2) Write the operation parameters (command value, dwell timer and speed).
- (3) Write the data in the MC11.
- (4) Set the write flags to 0.
- (5) Check the set parameters.

```

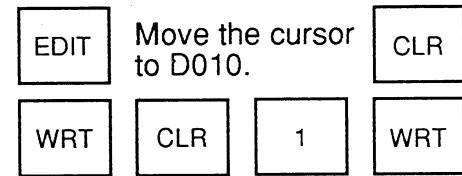
P- EX: [D0000] "EDIT"
EX GP: [BLK MON] [REG D] KEY IN SETUP DATA

< STATUS DISPLAY >

REG. VALUE FEDC BA98 7654 3210 REG. VALUE
D0000 00000 0000 0000 0000 0000 D0008 00000
D0001 00002 0000 0000 0000 0000 D0009 00100
D0002 00000 0000 0000 0000 0000 D0010 00000
D0003 00040 0000 0000 0000 0000 D0011 00001
D0004 00000 0000 0000 0000 0000 D0012 00000
D0005 02000 0000 0000 0000 0000 D0013 00000
D0006 00000 0000 0000 0000 0000 D0014 00000
D0007 00500 0000 0000 0000 0000 D0015 00000
    
```

GP110 Operation Procedure

- (1) Set the write flags to 1. Set D010 and D011 to 1.



- (2) Set the operation parameters.

After moving the cursor, "Value" WRT

D002•D003: Speed
 D004•D005: Command value
 D006•D007: Dwell timer

- (3) Write the set data in the MC11.



```

P- EX: [D0000] "EDIT"
EX GP: [BLK MON] [REG D] KEY IN SETUP DATA

< STATUS DISPLAY >

REG. VALUE FEDC BA98 7654 3210 REG. VALUE
D0000 00000 0000 0000 0000 0000 D0008 00000
D0001 00003 0000 0000 0000 0000 D0009 00050
D0002 00000 0000 0000 0000 0000 D0010 00000
D0003 00100 0000 0000 0000 0000 D0011 00001
D0004 00000 0000 0000 0000 0000 D0012 00000
D0005 07500 0000 0000 0000 0000 D0013 00000
D0006 00000 0000 0000 0000 0000 D0014 00000
D0007 00500 0000 0000 0000 0000 D0015 00000
    
```

```

P- EX: [BLK MON] [HEX D] D0000
EX GP: [BLK MON] [HEX D] KEY IN START NO.

< STATUS DISPLAY >

REG. VALUE FEDC BA98 7654 3210 REG. VALUE
D0000 00000 0000 0000 0000 0000 D0008 00000
D0001 00003 0000 0000 0000 0000 D0009 00050
D0002 00000 0000 0000 0000 0000 D0010 00000
D0003 00100 0000 0000 0000 0000 D0011 00001
D0004 00000 0000 0000 0000 0000 D0012 00000
D0005 07500 0000 0000 0000 0000 D0013 00000
D0006 00000 0000 0000 0000 0000 D0014 00000
D0007 00500 0000 0000 0000 0000 D0015 00000
    
```

(4) Set the write flag to 0.

After moving the cursor to D010,

CLR	WRT
CLR	WRT
PRG	WRT

(5) Check the operation parameters.

BLK MON	HEX D	EXE
---------	-------	-----

4.6 Monitoring basic parameters

Monitor the basic parameters by the peripheral device as follows.

(1) Connect a programmer to the MC11 and monitor data registers D048 and upward.

```

P- EX: [BLK MON] [HEX D] D0048
EX GP: [BLK MON] [HEX D] KEY IN START NO.

< STATUS DISPLAY >

REG. VALUE FEDC BA98 7654 3210 REG. VALUE
D0048 H0000 0000 0000 0000 0000 D0056 H0040
D0049 H0000 0000 0000 0000 0000 D0057 H0000
D0050 H0000 0000 0000 0000 0000 D0058 H0090
D0051 H0500 0000 0000 0000 0000 D0059 H0000
D0052 H0005 0000 0000 0000 0000 D0060 H0001
D0053 H0000 0000 0000 0000 0000 D0061 H0000
D0054 H1000 0000 0000 0000 0000 D0062 H0000
D0055 H0300 0000 0000 0000 0000 D0063 H0000
    
```

GP110 Operation Procedure

(1) Monitor the data registers D048 and upward.

BLK MON	HEX D	4	8
EXE			

(2) Monitor the data registers D064 and upward.

BLK MON	HEX D	6	4
EXE			

4. Parameter

4.7 Monitor the basic parameters using the programmer as follows.

Setting basic parameters

- (1) Set the PC/PROGMR switch on the front of the unit to the PROGMR position after checking that the MC11 has finished positioning.
- (2) Monitor data registers D048 and upward and set the data.
- (3) Write the data in the MC11

```

P- EX: [STOP] "EDIT"
EX GP: [STOP] [STOP] KEY IN SETUP DATA

< STATUS DISPLAY >

REG. VALUE FEDC BA98 7654 3210 REG. VALUE
D0048 H0000 0000 0000 0000 0000 D0056 H0002
D0049 H0000 0000 0000 0000 0000 D0057 H0000
D0050 H0000 0000 0000 0000 0000 D0058 H0005
D0051 H1000 0000 0000 0000 0000 D0059 H0000
D0052 H0003 0000 0000 0000 0000 D0060 H0000
D0053 H0000 0000 0000 0000 0000 D0061 H5000
D0054 H1000 0000 0000 0000 0000 D0062 [STOP]
D0055 H1000 0000 0000 0000 0000 D0063 H0000
  
```

```

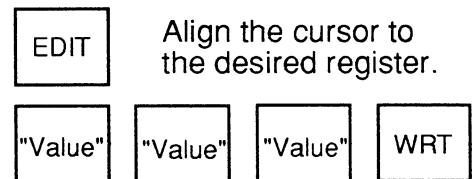
P- EX: [STOP] "EDIT"
EX GP: [STOP] [STOP] KEY IN SETUP DATA

< STATUS DISPLAY >

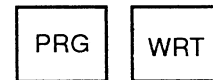
REG. VALUE FEDC BA98 7654 3210 REG. VALUE
D0048 [STOP] 0000 0000 0000 0000 D0056 H0002
D0049 H0000 0000 0000 0000 0000 D0057 H0000
D0050 H0000 0000 0000 0000 0000 D0058 H0005
D0051 H1000 0000 0000 0000 0000 D0059 H0000
D0052 H0003 0000 0000 0000 0000 D0060 H0000
D0053 H0000 0000 0000 0000 0000 D0061 H5000
D0054 H1000 0000 0000 0000 0000 D0062 H0000
D0055 H1000 0000 0000 0000 0000 D0063 H0000
  
```

GP110 Operation Procedure

- (1) Monitor the data registers, set the EDIT mode, and set the value after moving cursor to the desired position.



- (2) Write the parameters in the MC11.



4.8

Setting parameters in the stand-alone mode

The MC11 parameters can be recorded in the auxiliary RAM area by the GP110 for monitoring and changing, and can be recorded again in the MC11. The parameters can be recorded, used, monitored, and changed in the J3100 using the EX-PDS/DOC as described below.

- (1) Set the PC/PROGMR switch on the front of the unit to the PROGMR position after checking that the MC11 has completed positioning. Set the EX100 to the HALT mode.
- (2) Uploads the parameters in the programmer.
- (3) Monitors and changes the parameters.
- (4) Downloads the parameters in the MC11.

4. Parameter

	Register	Name	Setting range	Remarks
Basic parameters	D000·D001	Zero coordinate	-999999 ~ 999999	Coordinate when zero return is completed
	D002·D003	Zero offset	-999999 ~ 999999	Offset during zero return
	D004·D005	+ Software limit (CW)	-999999 ~ 999999	Software over-travel in CW direction
	D006·D007	- Software limit (CCW)	-999999 ~ 999999	Software over-travel in CCW direction
	D008·D009	Zero return speed	1 ~ 999999	Movement speed during zero return
	D010·D011	Maximum speed	1 ~ 999999	Movement speed at 100% during command value operation
	D012·D013	Minimum speed	1 ~ 999999	Minimum movement speed
	D016	Electronic gear numerator	1 ~ 9999	Number of pulses per motor revolution
	D017	Electronic gear denominator	1 ~ 9999	Movement amount per motor revolution
	D018	Backlash compensation	0 ~ 1000 (Pulses)	
	D019	Acceleration time	0 ~ 2600 (0.01 s)	Time required to accelerate from the minimum speed to maximum speed
	D020	Deceleration time	0 ~ 2600 (0.01 s)	Time require to decelerate from the maximum speed to the minimum speed
Operation parameters	D024·D025	Command position data	-999999 ~ 999999	Amount of movement during command value operation
	D026·D027	For the changing present value	-999999 ~ 999999	Register used when changing the present value
	D032·D033	For present value monitoring	-999999 ~ 999999	Area for monitoring the present value
	D035	Point No. during operation	1 ~ 64	Point No. during operation
	D037	MC error code		Point No. at when an error occurred and the error code
	D040·D041 D042·D043 ↓ D166·D167	Command value No. 1 Command value No. 2 ↓ Command value No. 64	-999999 ~ 999999 Command unit	Command values at point Nos. are stored during the automatic stepping and designated point No. operations.
	D168 D169 ↓ D231	Speed No. 1 Speed No. 2 ↓ Speed No. 64	1 ~ 100 (%)	Speeds for moving to point Nos. are stored during the automatic stepping and designated point No. operations.
	D232 D233 ↓ D295	Dwell timer No. 1 Dwell timer No. 2 ↓ Dwell timer No. 64	0000 ~ 9999 (0.01-s units)	Dwell timers for point Nos. are stored during the automatic stepping operations.

4. Parameter

4.9 Setting and monitoring parameters from the EX100

The parameter values can be monitored and set directly from the EX100 by using the Multiplexer instruction (FUN003) and Demultiplexer instruction (FUN004). A product after Ver 2.1 must be used as the EX100 MPU module.

◆ Multiplexer Instruction (FUN003)

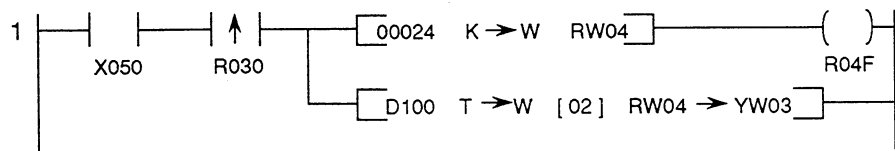
Expression	$\text{---} \boxed{A} \text{ T} \rightarrow \text{W} [nn] \boxed{B} \rightarrow \text{C} \text{---}$ Error output
Description	Register A : Designate the first register to store the parameter to be written in the MC11. nn : Designate the word length of the parameter to be written (1 to 63). Register B : Set the transfer destination address in MC11 and start-up flag as input instruction for a special modules. Register C : Designate the same register as the auxiliary data setting register of the MC11.
Example	$\text{---} \boxed{D010} \text{ T} \rightarrow \text{W} [16] \boxed{RW00} \rightarrow \text{YW02} \text{---}$ Error output Write the parameters stored in an area of 16 words from D010 in the transfer addresses shown by R000 to R00D.

◆ Demultiplexer Instruction (FUN004)

Expression	$\text{---} \boxed{A} \text{ W} \rightarrow \text{T} [nn] \boxed{B} \rightarrow \text{C} \text{---}$ Error output
Description	Register A : Designate the same register as present-value register of the MC11. nn : Designate the word length of the parameter to be read from the MC11 (1 to 63). Register B : Set the transfer destination address in MC11 and start-up flag as input instruction for a special modules. Register C : Designate the top register to store the read parameters.
Example	$\text{---} \boxed{XW01} \text{ W} \rightarrow \text{T} [04] \boxed{RW00} \rightarrow \text{D000} \text{---}$ Error output Read 4-word data from the internal address shown by R000 to R00D using the MC11 and write the data after D000. (MC11 is mounted at the right side of the MPU module.) RW00, R00F: Always ON, R00E: Always OFF, R000 to R00D: Top inner address of the destination.

[Application Example]

When writing command values for command value operation in the MC11.



RW04: R04F ON, R04E OFF, and R04D to R040 24 (BIN).

[Explanation]

When X050 switches on, command values stored in D100 and D101 are written in the MC11. YW03 is an auxiliary data register. By executing this command, the value of YW03 does not change, but the command value the MC11 changes.

4.10 Internal addresses and data of parameters

The following parameters are stored in the MC11 according to the internal addresses. The internal addresses of Register B of the multiplexer and demultiplexer instructions designate the following values.

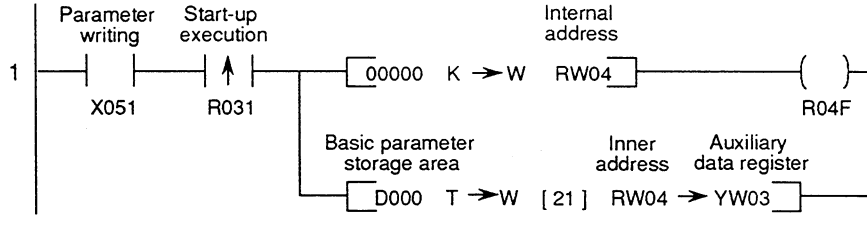
	Internal address	Name	Setting range	Remarks
Basic parameters	0	Zero coordinate	-999999 ~ 999999	Coordinate when zero return is completed
	2	Zero offset	-999999 ~ 999999	Offset during zero return
	4	+ Software limit (CW)	-999999 ~ 999999	Software over-travel in CW direction
	6	- Software limit (CCW)	-999999 ~ 999999	Software over-travel in CCW direction
	8	Zero return speed	1 ~ 999999	Movement speed during zero return
	10	Maximum speed	1 ~ 999999	Movement speed at 100% during command value operation
	12	Minimum speed	1 ~ 999999	Minimum movement speed
	16	Electronic gear numerator	1 ~ 9999	Number of pulses per motor revolution
	17	Electronic gear denominator	1 ~ 9999	Movement amount per motor revolution
	18	Backlash compensation	0 ~ 1000 (Pulses)	
	19	Acceleration time	0 ~ 2600 (0.01 s)	Time required to accelerate from the minimum speed to maximum speed
20	Deceleration time	0 ~ 2600 (0.01 s)	Time required to decelerate from the maximum speed to the minimum speed	
Operation parameters	24	Command position data	-999999 ~ 999999	Amount of movement during command value operation
	26	For the changing present value	-999999 ~ 999999	Register used when changing the present value
	32	For present value monitoring	-999999 ~ 999999	Area for monitoring the present value
	35	Point No. during operation	1 ~ 64	Point No. during operation
	37	MC error code		Point No. at when an error occurred and the error code
	40	Command value No. 1	-999999 ~ 999999	Command values at point Nos. are stored during the automatic stepping and designated point No. operations.
	42	Command value No. 2	(Command unit)	
	↓ 166	↓ Command value No. 64		
	168	Speed No. 1	1 ~ 100 (%)	Speeds for moving to point Nos. are stored during the automatic stepping and designated point No. operations.
	169	Speed No. 2		
	↓ 231	↓ Speed No. 64		
	232	Dwell timer No. 1	0000 ~ 9999 (0.01-s units)	Dwell timers for point Nos. are stored during the automatic stepping operations.
	233	Dwell timer No. 2		
↓ 295	↓ Dwell timer No. 64			

4. Parameter

4.11 [Basic Parameter Writing]

Example of using the parameter setting program from the EX100

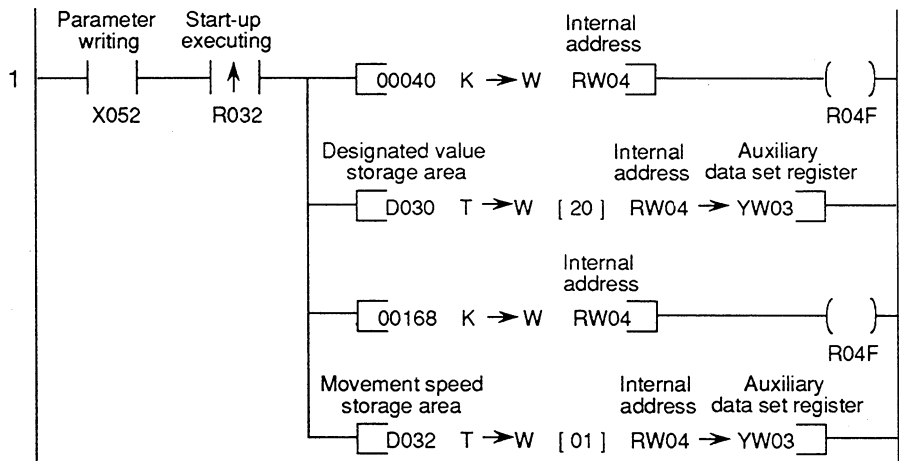
Execute the following program when writing basic parameters in the MC11 from the EX100.



- ◆ When X051 switches on, parameters from D000 (zero coordinate) to D020 (deceleration time) are written in the MC11.

[Setting Point No. 1 Command Value and Speed]

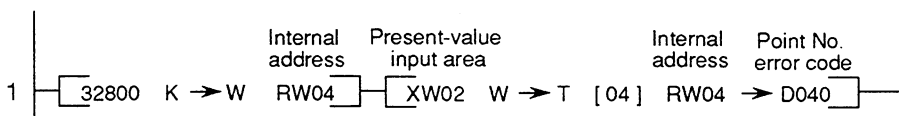
Execute the following program when setting operation parameters of point No. 1 using designated point No. operation.



- ◆ When X052 switches on, D031 and D030 (command values) and D032 (speed) are written in the MC11.

[Point No. Error Code Monitoring]

Execute the following program to always monitor error codes of the point No. executed by the MC11.



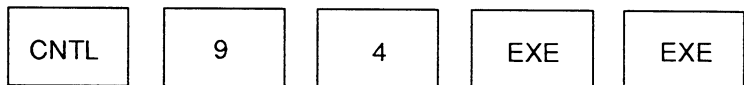
- ◆ The point No. and error code can always be monitored at D040 and D042.

4.12 Procedures for saving data in the ROM and in external memory

(1) Writing data in the EEPROM of the MC11
 The MC11 operates by reading EEPROM parameters in the RAM when the power is turned on. Therefore, be sure to write the parameters in the EEPROM before turning the power off if the parameters are changed using the programmer. This is explained below.

- (1) Set the MODE selecting switch on the MC11 to the PROGMR position.
- (2) Set the operation select switch on the EX100 to HALT.
- (3) Connect the programmer to the programmer connector on the MC11.
- (4) Write the data in the EEPROM.

[GP110 Key Operation]



(2) Recording and executing data with the external memory
 The parameters of the MC11 can be recorded and executed using the cassette tape or floppy disk as follows.

Media	Peripheral device	Operation	Key operation
Cassette tape	GP110	LOAD	[CMT] [9] [5] [EXE] [EXE]
		RECORD	[CMT] [9] [6] [EXE] [EXE]
		COMPARE	[CMT] [9] [7] [EXE] [EXE]
Floppy disk	GP110 + FDD110	RECORD MC11 ↓ FD	[SFT] + [FD] ----- Set the FD mode. [2] [EXE] ----- Select the RECORD command. [0] [EXE] ----- Select drive A. [File name] [EXE] --- Input the file name and execute recording.
		LOAD MC11 ↑ FD	[SFT] + [FD] ----- Set the FD mode. [3] [EXE] ----- Select the LOAD command. [0] [EXE] ----- Select drive A. ▽ ▲ [EXE] [EXE] Select the file name and execute it.
		COMPARE	[SFT] + [FD] ----- Set the FD mode. [4] [EXE] ----- Select the COMPARE command. [0] [EXE] ----- Select drive A. ▽ ▲ [EXE] [EXE] Select the file name and execute it.

5. Input and Output Allocation

When mounted on the EX100, the MC11 occupies an input/output area of X + Y 4W.

Display of input and output allocation of programs shown on the left

P	P	M	D	D	
S	U	C	I	O	
5	1	1	3	3	
1	1	1	1	1	

↑
Single-axis positioning module

< I/O CARD LAYOUT >				
---- UNIT #0 ----			---- UNIT #1 ----	
SLOT	I/O		SLOT	I/O
00	[CPU]		00	[]
01	[X+Y04W]	←	01	[]
02	[X 01W]		02	[]
03	[Y 01W]		03	[]

In this example, the areas XW00, XW01, YW02, and YW03 are used.

5. Input and Output Allocation

The following data is allocated for input and output.

Address	BIT	Name	Description
XWn	F	Pulse output flag	0: No pulse output 1: Pulse output
	E	Positioning complete flag	0: Positioning not complete 1: Positioning complete
	D	Zero return complete flag	0: Zero return not complete 1: Zero return complete
	C	Data sign bit	0: Present value is + 1: Present value is -
	B	Override acknowledgement complete	0: Override not acknowledged yet 1: Override acknowledgement completed
	A	PROGMR/PC mode flag	0: Programmer ready 1: EX100 ready
	9	BIN/BCD flag	0: BIN data mode 1: BCD data mode
	8	Error flag	0: No error 1: Error found
XWn+1	7 ~ 4	Present value -999999 ~ 999999 BIN/ BCD data	BIN/ BCD $16^5 / 10^5$
	3 ~ 0		$16^4 / 10^4$
	F ~ C		$16^3 / 10^3$
	B ~ 8		$16^2 / 10^2$
YWn+2	7 ~ 4	Auxiliary data BIN/ BCD data	$16^1 / 10^1$
	3 ~ 0		$16^0 / 10^0$
	F ~ C		$16^3 / 10^3$: Point No. designation : Point No.
	B ~ 8		$16^2 / 10^2$: Automatic stepping operation : Start point No.
YWn+3	7 ~ 4	Emergency stop command Stop command Manual operation command Automatic start command	$16^1 / 10^1$: Manual or override : Speed
	3 ~ 0		$16^0 / 10^0$: Designated value operation : Designated value
	F		0: Emergency stop 1: During normal operation
	E		0: During operation 1: Decelerate and stop
	D	0: 1: During manual operation	
	C	ON when/ zero return, command value, automatic stepping or point No. operation is started	
	B	Command value operation mode 1: During command value operation	
	A	Zero return mode 1: During zero return	
	9	Automatic stepping operation mode 1: During automatic stepping operation	
	8	Override command 1: At start of override command	
	7	Absolute/ relative coordinate change 0: Absolute coordinate 1: Relative coordinate	
	6	Movement direction CW/ CCW change 0: CW 1: CCW	
	5	Command value data YWn + 2/ buffer 0: YWn + 2 used 1: Designated value buffer used	
4 ~ 2	For future use		
1	Present value change mode 1: When present value is changed		
0	Error reset 0: Normal 1: Error reset		

Set the parameters and operate the MC11 through the programmer or through the EX100.

Set the MODE switch on the front panel of the MC11 to the PROGMR position when operating through the programmer. Set the switch to the PC position when operating through the EX100.

6.1 Operation using the programmer

Set the MODE switch on the front panel of the MC11 to the PROGMR position. This inhibits operation from the EX100. Check the following when sending commands from the programmer:

- (1) Positioning of the MC11 has been finished.
- (2) An error has not occurred.
- (3) Ranges and levels of the parameters are correct.

[Operating Procedure]

- (1) Connect the programmer to the MC11 and monitor D032 to D036.
- (2) Write data in the MC11 according to the following table.
- (3) Execute using the RUN command (CNTL81).
- (4) Execute the HALT command (CNTL80) to decelerate and stop.

Operation and Data Register Information

Operation	Register	D033	D034	D035	D036
		ABS/INC designation	Command auxiliary data	Command No.	CW/CCW
Zero return		-	-	1	-
Designated point No. operation		0/1	Point No. (1 ~ 64)	2	-
Automatic stepping operation		0/1	Point No. (1 ~ 64)	3	-
Command value operation		0/1	-	4	-
Manual operation		-	Operation speed (1 ~ 100)	5	0/1

[Example of Zero Return Operation Using the GP110]

- (1) Connect the programmer to the MC11 and set the MODE switch to the PROGMR position.
- (2) Monitor after D032 using the block monitor function.

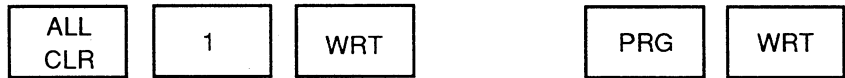


6. Operation

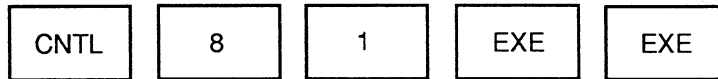
- (3) Set the EDIT mode and align the cursor at D035.



- (4) Set the zero return command No. to 1.



- (5) Execute zero return.



6.2 Operation using the EX100

Set the MODE switch on the front panel of the MC11 to the PC position. Check the following when operating from the EX100.

- (1) Positioning of the MC11 has been finished.
- (2) An error has not occurred.
- (3) Ranges and levels of the parameters are correct.

The following commands are sent to the MC11 by the EX100 for various operations.

Operation command from EX100	YWn + 2	YWn + 3												
		F	E	D	C	B	A	9	8	7	6	5	1	0
Operation	Auxiliary data	Emergency stop	Stop	Manual operation command	Automatic start command	Command value operation mode	Zero return mode	Automatic stepping operation mode	Override command	Absolute/relative coordinate change	Movement direction change	Command value data change	Present value change	Error reset
Emergency stop	-	0	-	-	-	-	-	-	-	-	-	-	-	-
Stop	-	1	1	-	-	-	-	-	-	-	-	-	-	-
Manual operation	CW	1	0	1	0	-	-	-	-	-	0	-	-	-
	CCW	1	0	1	0	-	-	-	-	-	1	-	-	-
Zero return operation	-	1	0	0	1	0	1	0	-	-	-	-	0	-
Designated point No. operation	Absolute	1	0	0	1	0	0	0	-	0	-	-	0	-
	Relative	1	0	0	1	0	0	0	-	1	-	-	0	-
Automatic stepping operation	Absolute	1	0	0	1	0	0	1	-	0	-	-	0	-
	Relative	1	0	0	1	0	0	1	-	1	-	-	0	-
Command value operation (YWn + 2 used)	Absolute	1	0	0	1	1	0	0	-	0	-	0	0	-
	Relative	1	0	0	1	1	0	0	-	1 ⁰	0	0	0	-
Command value operation (Buffer used)	Absolute	1	0	0	1	1	0	0	-	0	-	1	0	-
	Relative	1	0	0	1	1	0	0	-	1	-	1	0	-
Override command	Operation speed	1	0	-	-	-	-	-	1	-	-	-	-	-
Error reset	-	1	-	-	-	-	-	-	-	-	-	-	-	1
Present value change	-	1	0	0	1	1	1	1	-	-	-	-	1	-

1 : ON 0 : OFF - : Either ON or OFF is acceptable.

⁰₁ : Operation changes by ON/OFF.

The zero return complete flag is 0 when the power is turned on, when an emergency stop is executed, or when an error occurs. Executing zero return, sets the zero return complete flag to 1. The MC11 operates differently as follows by switching the zero return complete flag ON and OFF.

Zero return complete flag		0	1	Zero return complete flag		0	1
Operation	Zero return operation	○	○	Operation	Automatic stepping operation	×	○
	Manual operation	○	○		Point No. operation	×	○
	Command value operation (relative coordinate)	○	○		Software limit function	-	○
	Command value operation (absolute coordinate)	×	○		Present value change function	○	○

[Table meanings] 0 : ON, 1 : OFF, ○ : Executable, × : non-executable, - : Invalid

Basically, the MC11 is operated after zero return. If zero return is not possible, use the command value operation (relative coordinate) and present value change functions.

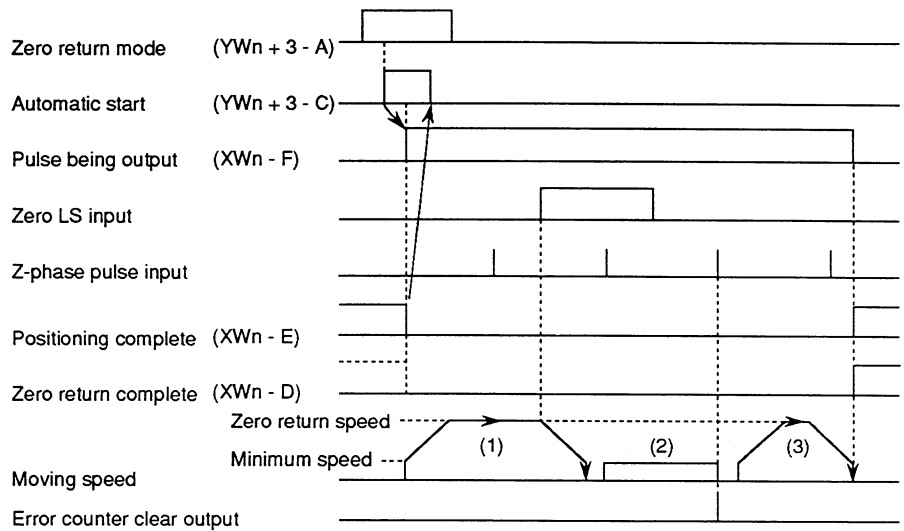
7.1 Zero return operating sequence

In zero return, the following three stages are executed in succession.

- (1) Zero LS-ON direction moving
Move in the direction shown by SW 3 (zero LS-ON direction) of the MC11 and switch on the zero LS to decelerate and stop the machine.
- (2) Zero LS-OFF direction moving
Move in the direction shown by SW 4 (zero LS-OFF direction) of the MC11 at the minimum speed. Use SW 2 (Z-phase pulse) of the MC11 to select whether to immediately stop after the LS is switched off or to stop at the first Z-phase pulse after switching off the LS.
- (3) Zero offset moving
After moving in the OFF direction, move by the parameter zero offset at the zero return speed. Set its present value in the zero coordinate value.

7. Zero Return

[Example of a Timing Chart for Zero Return]

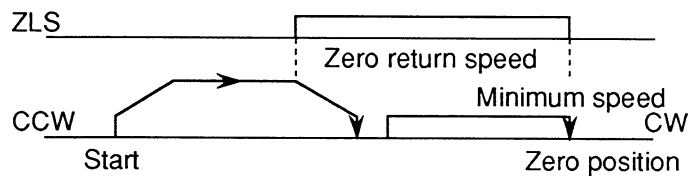


7.2 Selecting the zero return direction

The zero return movement direction is set by an internal switch of the MC11. By combining the switches, the following four direction combinations can be selected.

- (1) SW3: OFF, zero LS-ON direction: CW
- SW4: OFF, zero LS-OFF direction: CW

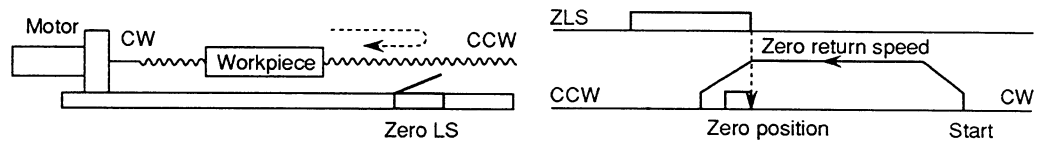
Moves in the CW direction at the zero return speed when zero return starts and stops if the LS switches ON. Next, moves in the CW direction at the minimum speed and stops if the LS switches OFF. Stops at the zero position.



7. Zero Return

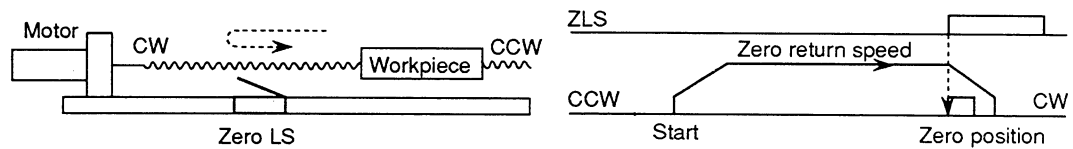
- (2) SW3: ON, zero LS-ON direction: CW
 SW4: OFF, zero LS-OFF direction: CW

Moves in the CCW direction at the zero return speed when zero return starts and stops if the LS switches ON. Next, returns in the CW direction at the minimum speed and stops if the LS switches OFF. Stops at the zero position.



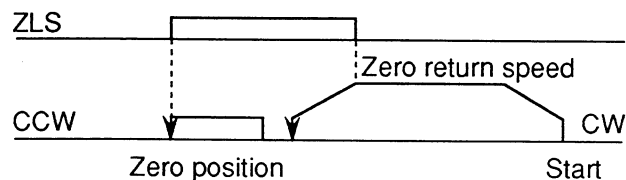
- (3) SW3: OFF, zero LS-ON direction: CW
 SW4: ON, zero LS-OFF direction: CCW

Moves in the CW direction at the zero return speed when zero return starts and stops if the LS switches ON. Next, returns in the CCW direction at the minimum speed and stops if the LS switches OFF. Stops at the zero position.



- (4) SW3: ON, zero LS-ON direction: CCW
 SW4: ON, zero LS-OFF direction: CCW

Moves in the CCW direction at the zero return speed when zero return starts and stops if the LS switches on. Next, moves in the CCW direction at the minimum speed and stops if the LS switches off. The stopped position is the zero position.



ZLS has to be switched on continuously after ZLS switches ON while moving at the zero return speed and stops when returning to the zero point. Be careful of the length of the dog for ZLS.

7. Zero Return

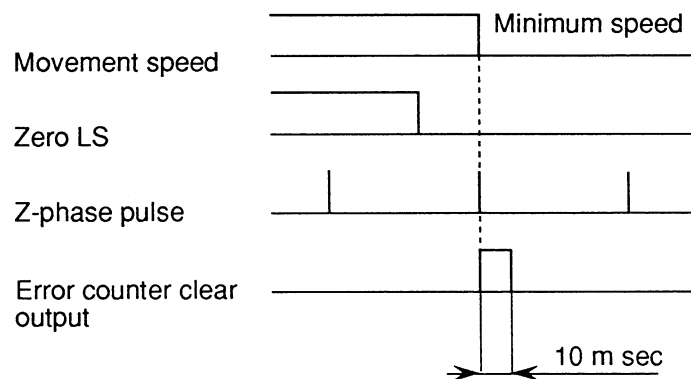
7.3 Selecting use of the Z-phase pulse

Z-phase pulses are used or are not used when deciding the reference for the zero position in zero return. This selection is made by switching on and off the second switch on the MODE switch in the MC11.

(1) Z-phase pulse use mode (SW2: OFF)

When a Z-phase pulse is used, movement in the zero LS-OFF direction stops if the zero LS switches off. When the Z-phase pulse first detected starts up, the error counter clear output is switched on for 10 ms.

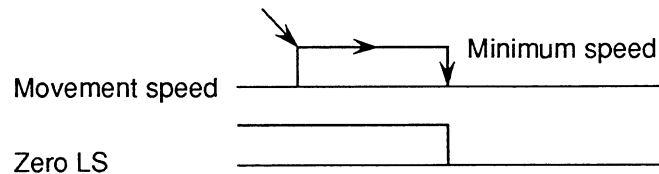
Select this mode if the servo motor is used.



(2) Z-phase pulse non-use mode (SW2: ON)

When a Z-phase is not used, movement in the zero LS-OFF direction stops if the zero LS switches off. The error counter clear output does not switch on at this time.

Select this mode if the stepping motor is used.

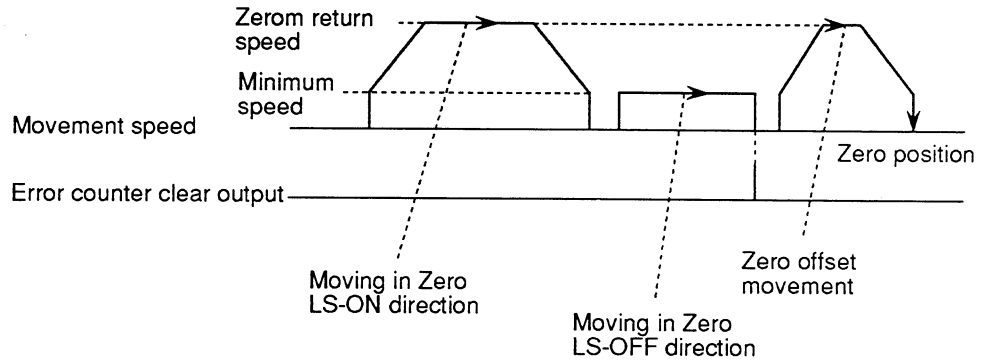


7. Zero Return

7.4 Zero offset movement

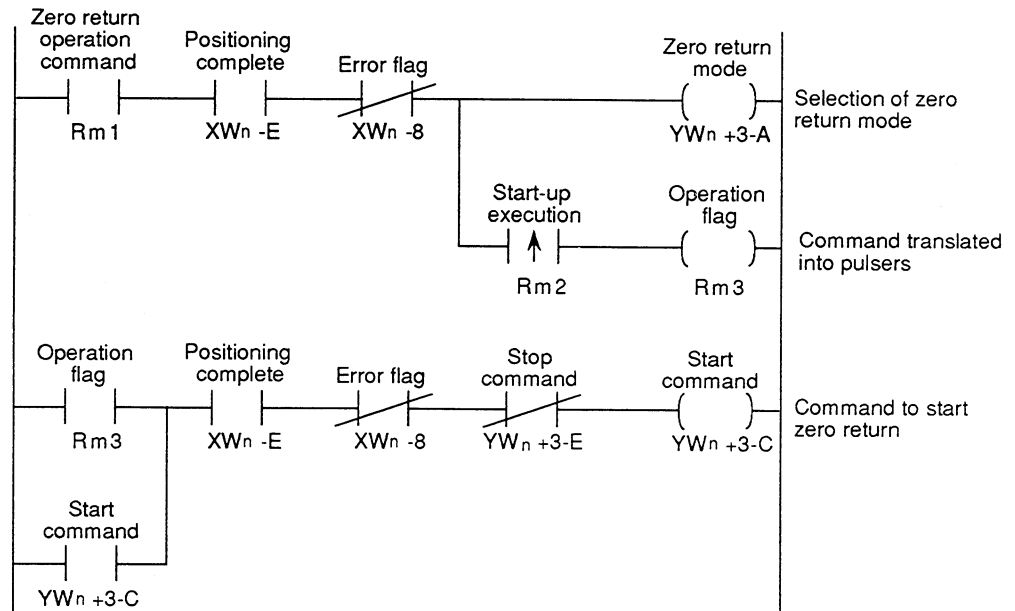
In zero return motion, the machine moves relatively according to the value set as the zero offset amount of the basic parameter after completing moving in the zero LS-OFF direction. Then the machine stops. Set the present value of this stop position as the zero coordinate value, complete zero return operation, and switch on the zero return complete flag.

If the zero offset is 0, zero return is completed without executing this operation.



7.5 Example of an EX100 program

A sample program for zero return operation is shown below.



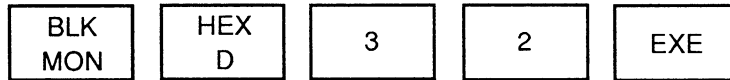
Be sure to interlock the Start command (YWn+3-C) with the positioning complete signal (XWn-E), error flag (XWn-8) and Stop command (YWn+3-E) as shown above. The MC11 sometimes does not accept pulse signals such as 1-Scan ON. Do not use these signals.

7. Zero Return

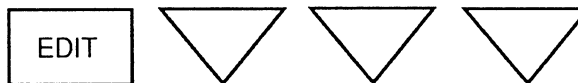
7.6 Example of operation using the GP110

Zero return is shown as an example.

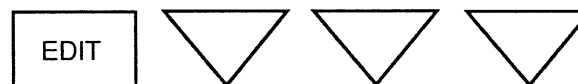
- (1) Connect the programmer to the MC11 and set the MODE switch to the PROGMR position.



- (2) Monitor D032 and upward using the block monitor function.



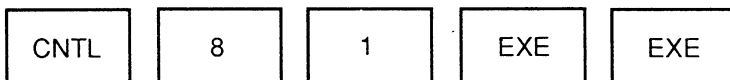
- (3) Set the EDIT mode and align the cursor to D035.



- (4) Set the zero return command No. to 1.



- (5) Execute zero return.



8. Designated Point No. Operation

Designate the point No. of the operation parameter set in the MC11 and move the machine by a fixed feed rate.

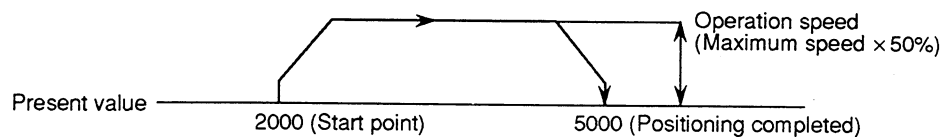
Command values can be handled as absolute/relative coordinates by using the absolute/relative change command (YWn+3-7). A case where operation parameters are stored is explained below.

Point No.	Operation speed	Command value	Dwell timer
1	50	5000	50
2	70	0	100
3	100	10000	300
4	25	3000	9999
5	100	-5000	3
•	•	•	•
•	•	•	•
64	80	2000	9999

8.1 Operation in the absolute coordinate mode

Command values are handled as absolute coordinate data. Operation of Point No. 1 given in the above table is shown as an example.

Operation: Move from the start point (2000) to the completion point (5000).

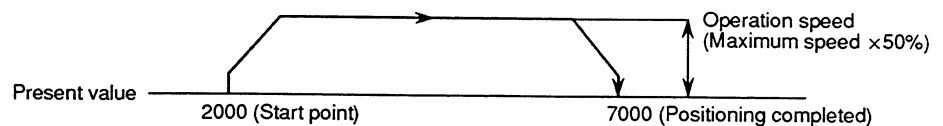


8.2 Operation in the relative coordinate mode

Command values are handled as relative coordinate data.

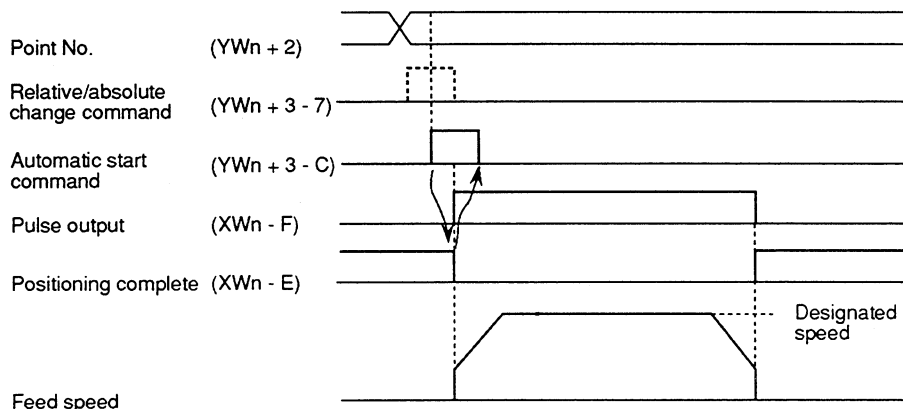
Operation of Point No. 1 given in the above table is shown as an example.

Operation: Move from the start point (2000) to the completion point (7000).

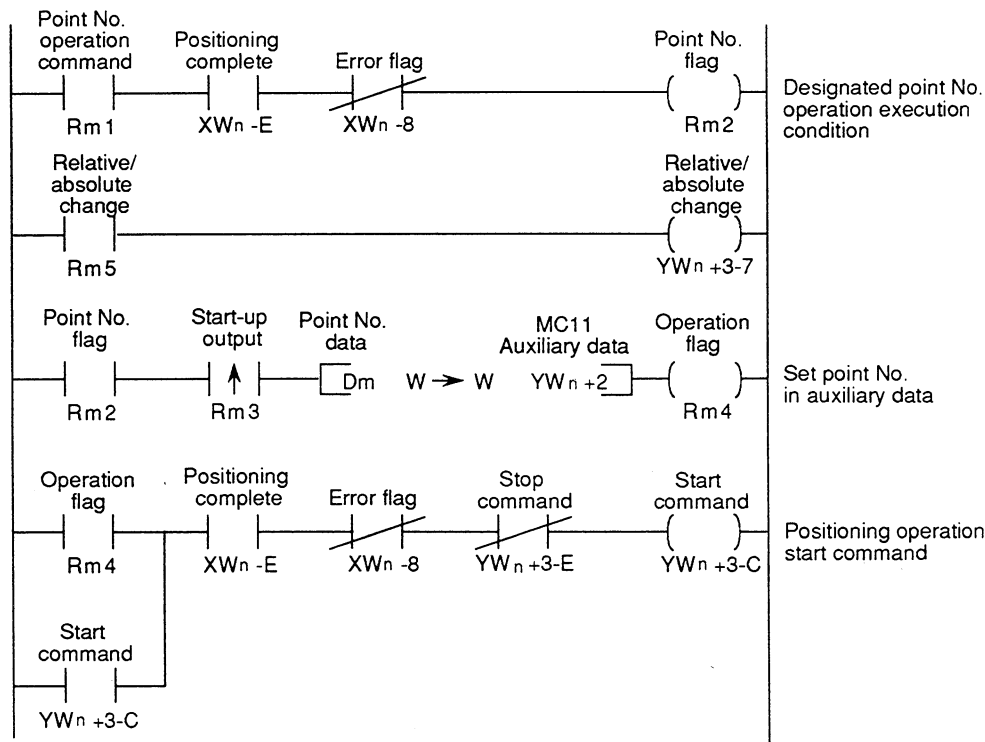


8. Designated Point No. Operation

8.3 Example of a timing chart An example of a timing chart for designated point No. operation is given below.



8.4 Example of an EX100 program A sample program for designated point No. operation is shown below.



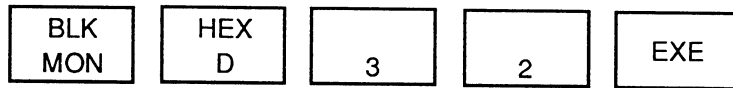
Be sure to interlock the Start command ($Y_{Wn} + 3 - C$) with the positioning complete signal ($X_{Wn} - E$), error flag ($X_{Wn} - 8$) and Stop command ($Y_{Wn} + 3 - E$) as shown above. The MC11 sometimes does not accept pulse signals such as 1-Scan ON. do not use these signals.

8. Designated Point No. Operation

8.5 Example of operation using the GP110

The procedure for designated point No. operation from the GP110 is shown below.

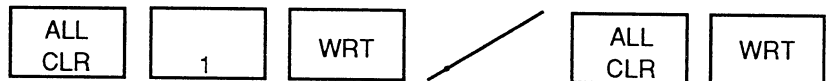
- (1) Connect the programmer to the MC11 and set the MODE switch to the PROGMR position.
- (2) Monitor D032 and upward using the block monitor function.



- (3) Set the EDIT mode and align the cursor to D033.



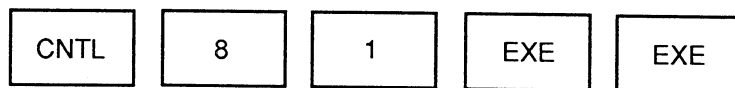
- (4) Set D033 to 1 for relative coordinate movement, or set to 0 for absolute coordinate movement.



- (5) Designate a point No. in D034 and write it in the MC11.



- (6) Execute designated point No. operation.



9. Automatic Stepping Operation

Designate point Nos. and execute the automatic stepping operation to automatically execute the stepping operation. Operation is from the designated point No. to the point No. designated to end automatic stepping. Designate the point Nos. according to the operation parameters (command values, feed speeds and dwell timers) for the end automatic stepping end.

The end point is the position where the dwell timer value is set to 9999. Be sure to set the dwell timer to 9999 to execute automatic stepping by designating Point No. 64.

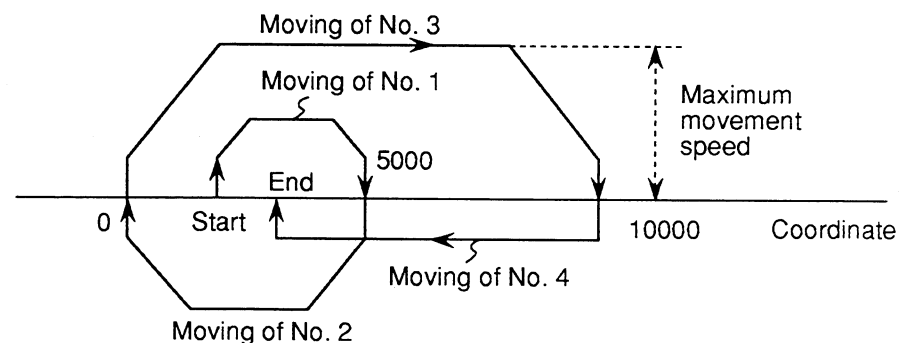
[Example of Operation Parameters]

Point No.	Operation speed	Command value	Dwell timer
1	50	5000	50
2	70	0	100
3	100	10000	300
4	25	3000	9999
5	100	-5000	3
.	.	.	.
.	.	.	.
64	80	2000	9999

9.1 Operation in the absolute coordinate mode

The command values are handled as absolute coordinate data.

[Example of Operation from Point No. 1]



[Movement Sequence]

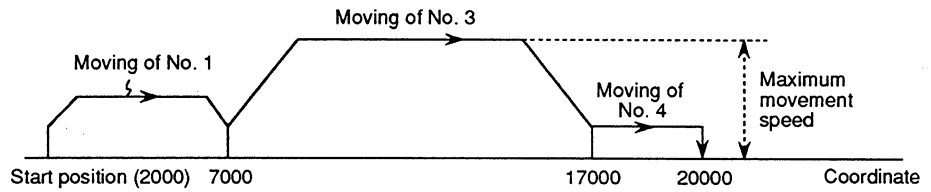
	No. 1	No. 2	No. 3	No. 4
Present value	5000	0	10000	3000
dwell timer	Start position → 0.5 sec.	→ 1sec.	→ 30 sec.	→ end

9. Automatic Stepping Operation

9.2 Operation in the relative coordinate mode

The command values are handled as relative coordinate data.

[Example of Operation from Point No. 1]

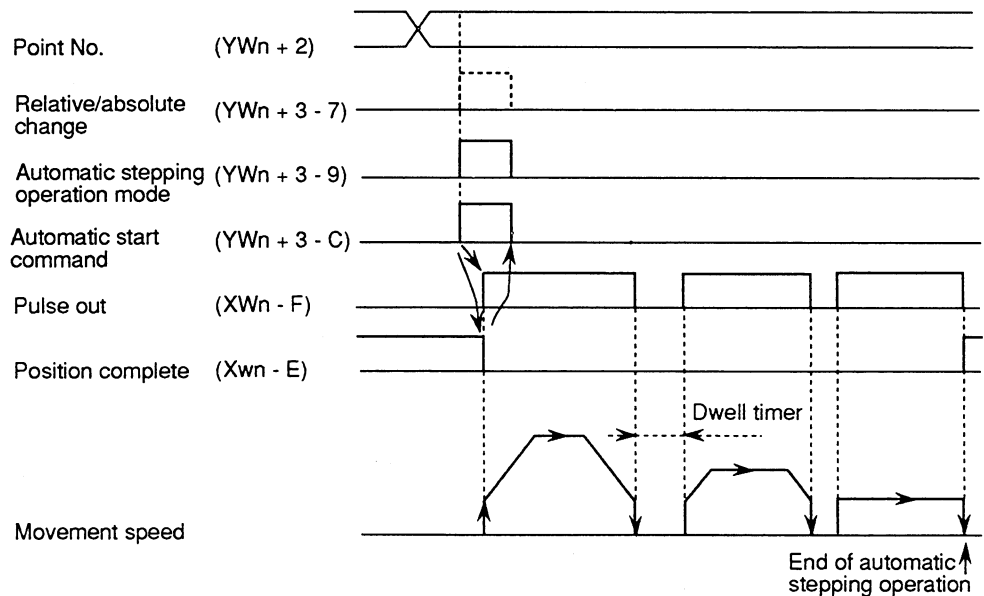


[Movement Sequence]

	No. 1	No. 2	No. 3	No. 4
Present value	7000	7000	17000	20000
Start position	→ 7000	→ 7000	→ 17000	→ 20000
dwell timer	0.5 sec.	1sec.	30 sec.	end

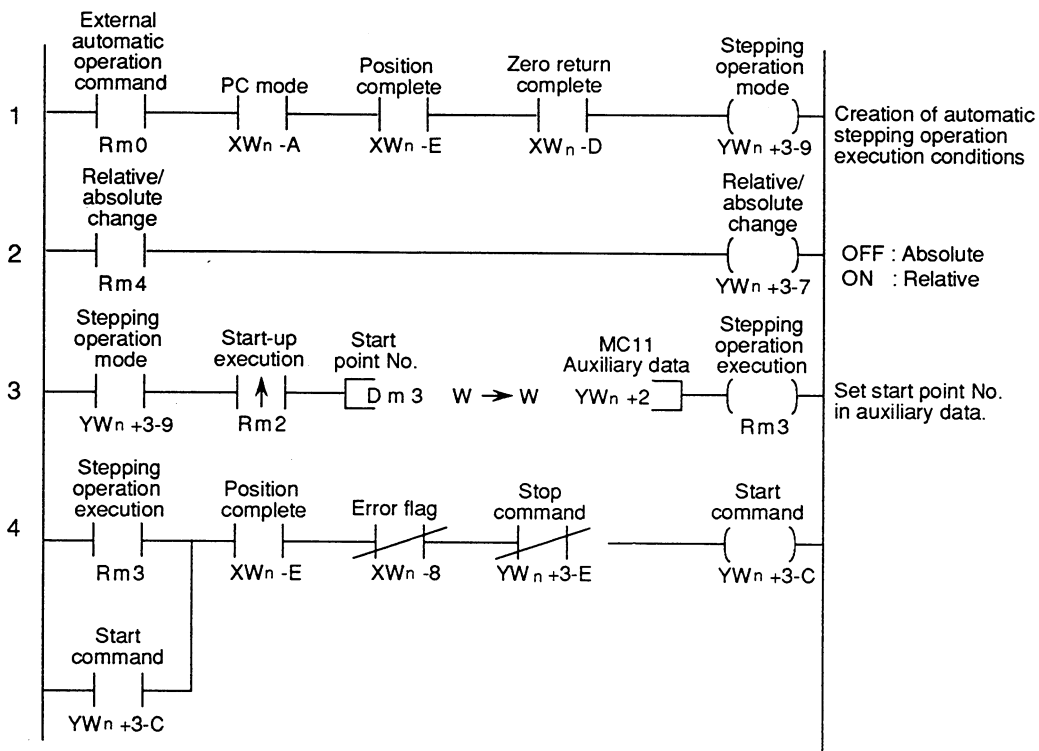
9.3 Example of a timing chart

- (1) Set the MODE switch on the MC11 to the PC position.
- (2) Switch on the START command after setting the automatic stepping operation mode while the pulse output is switched off.



9. Automatic Stepping Operation

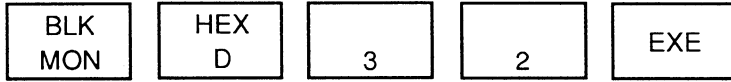
9.4 Example of an EX100 program



9. Automatic Stepping Operation

9.5 Example of operation using the GP110

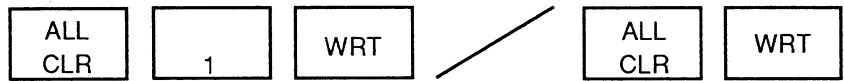
- (1) Connect the programmer to the MC11 and set the MODE switch to the PROGMR position.
- (2) Monitor D032 and upward using the block monitor function.



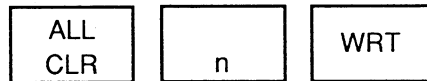
- (3) Set the EDIT mode and align the cursor to D033.



- (4) Set D033 to 1 for relative coordinate moving, and set it to 0 for absolute coordinate moving.



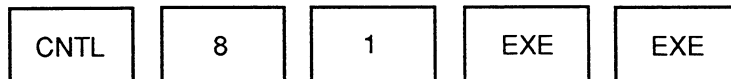
- (5) Designate a point No. in D034.



- (6) Designate 3 in D035 and write it in the MC11.



- (7) Execute automatic stepping operation.



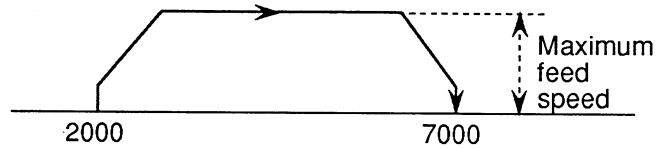
10. Command Value Operation

Provide command values to the MC11 and execute command value operation to carry out the specified movement by one cycle. Command values are given to the EX100 using auxiliary data (YWn+2) or by directly writing the data in the internal parameters, 24 and 25). The feed speed is the maximum movement speed.

10.1 Command value operation in the absolute coordinate mode

Command values are handled as absolute coordinate data.

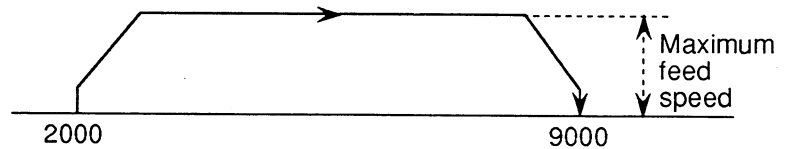
An example of movement when the command value is 7000 is given below.



10.2 Command value operation in the relative coordinate mode

Command values are handled as relative coordinate data.

An example of movement when the command value is 7000 is given below.



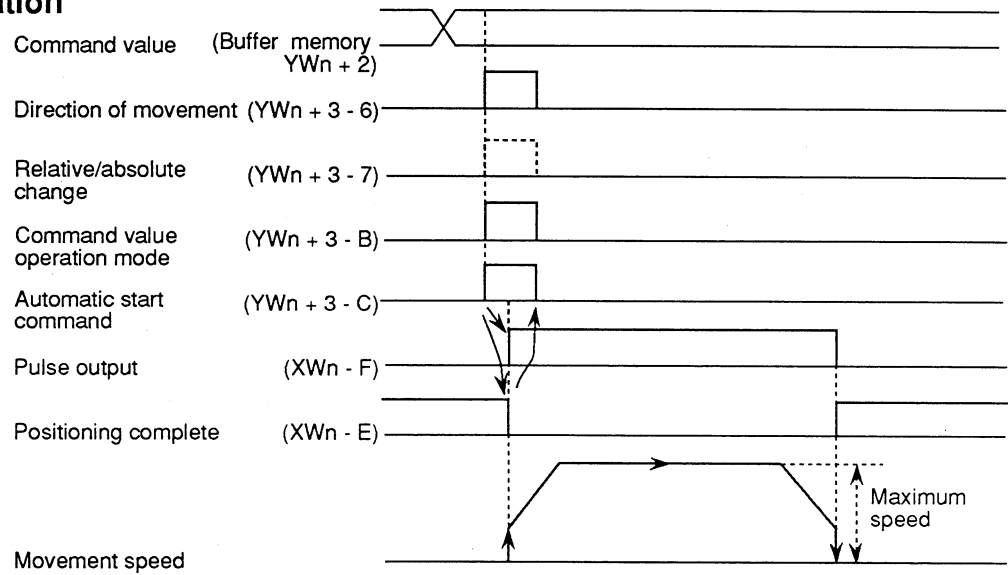
10.3 Range of command values

Operation	Auxiliary data YWn + 2	Internal parameter 24 • 25
Operation from EX100	0 ~ 9999	-999999 ~ 999999
Operation from programmer	-	-999999 ~ 999999

10. Command Value Operation

10.4

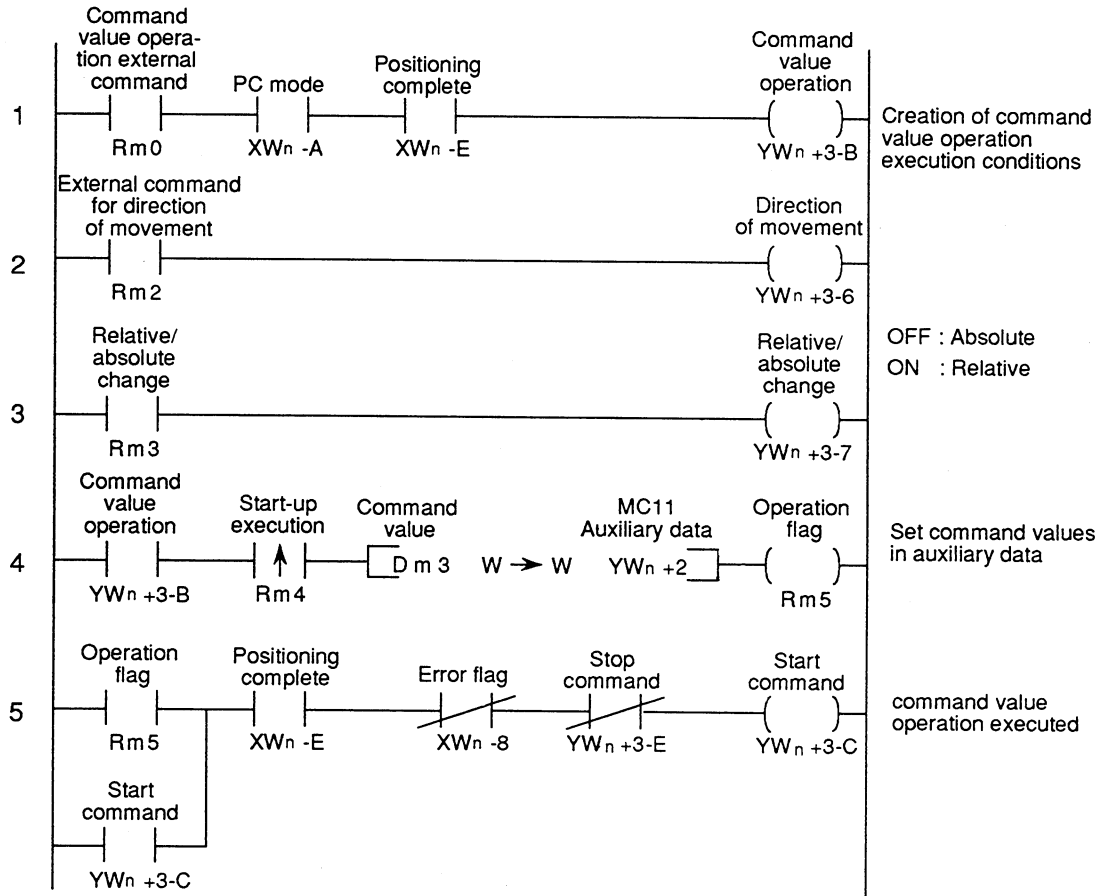
Timing chart for command value operation



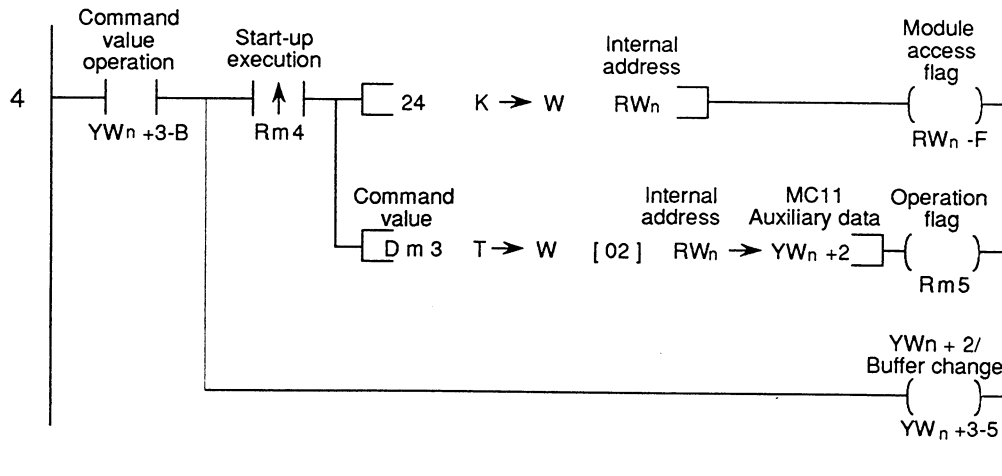
10. Command Value Operation

10.5 Example of EX100 command value operation program

An example when command values of auxiliary data are used is shown below.



Change circuit No. 4 in the above circuit as follows when using command values of the internal buffer memory.



RWn: 32792 (internal address: 24, RWn - F: ON). Do not use the direction of movement (YWn+3-6) when the internal buffer memory is used.

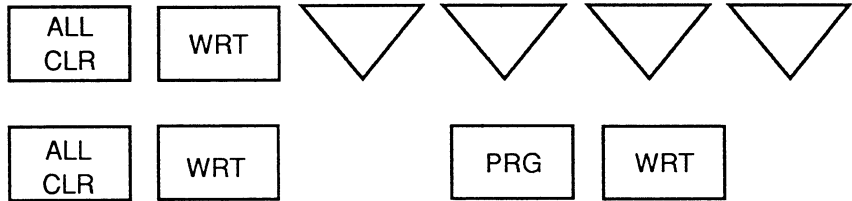
10. Command Value Operation

10.6 Example of operation using the GP110AP2

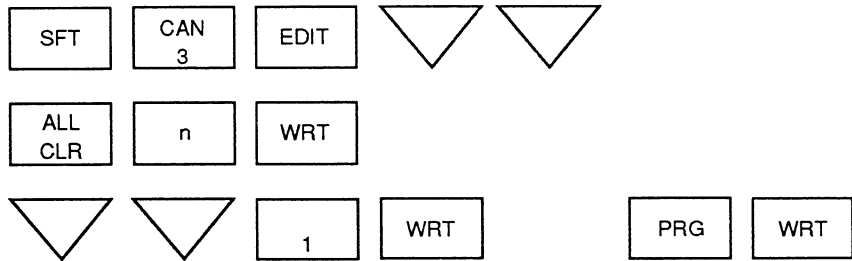
- (1) Connect the programmer to the MC11 and set the MODE switch to the PROGMR position.
- (2) Perform double-length monitoring of D000 and upward using the block monitor function and set the EDIT mode.



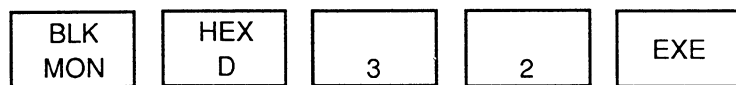
- (3) Set D000, D001, D010 and D011 to 0 and write them in the MC11.



- (4) Write the command values in D004 and D005 and set 1 in the write flag.



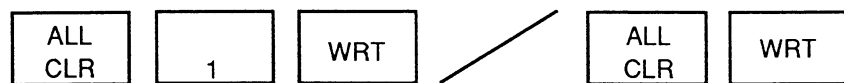
- (5) Monitor D032 and upward using the block monitor function.



- (6) Set the EDIT mode and align the cursor to D033.



- (7) Set D033 to 1 for relative coordinate moving, or set it to 0 for absolute coordinate moving.



10. Command Value Operation

(8) Designate a point No. in D034.

ALL CLR	n	WRT
------------	---	-----

(9) Designate 4 in D035 and write if in the MC11.

ALL CLR	4	WRT	PRG	WRT
------------	---	-----	-----	-----

(10) Execute command value operation.

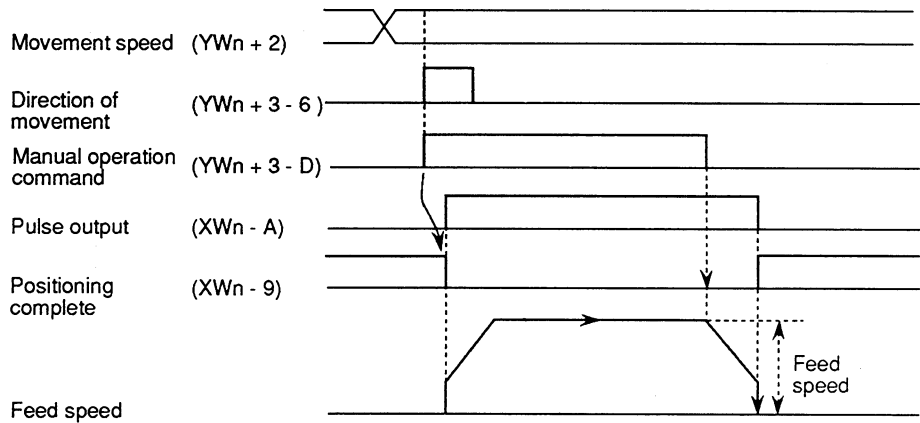
CNTL	8	1	EXE	EXE
------	---	---	-----	-----

11. Manual Operation

The machine continues to move according to the designated feed speed and direction while the manual operation command is issued.

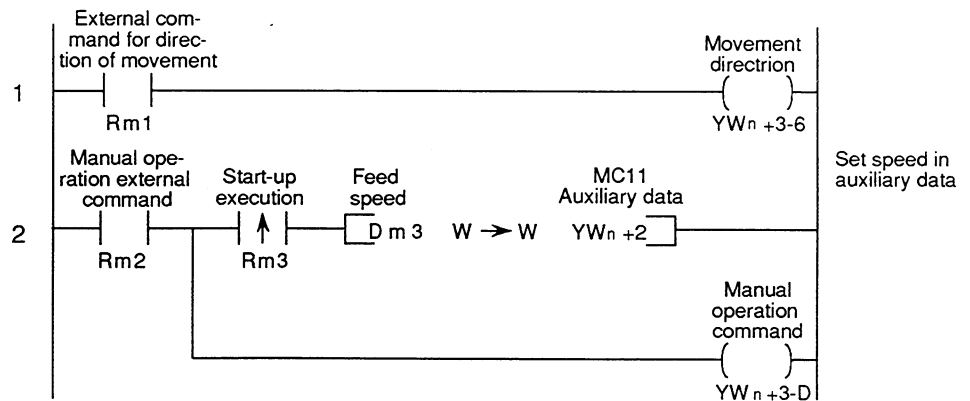
11.1 Manual operation from the EX100

- (1) Connect the programmer to the MC11 and set the MODE switch to the PC position.
- (2) Set the speed (1 to 100) in the auxiliary data, select the moving direction and switch on the manual operation flag. Manual moving continues while the manual operation flag is switched ON.



11.2 Example of an EX100 program

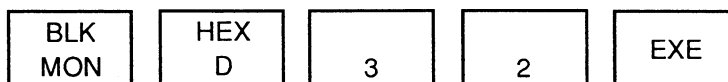
A sample example of manual operation using the EX100 is shown below.



11. Manual Operation

11.3 Example of operation by using the GP110

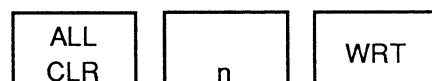
- (1) Connect the programmer to the MC11 and set the MODE switch to the PROGMR position.
- (2) Monitor D032 and upward using the block monitor function.



- (3) Set the EDIT mode and align the cursor to D034.



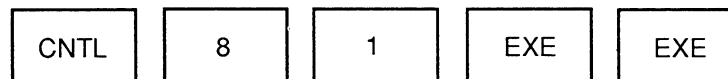
- (4) Designate a feed speed in D034.



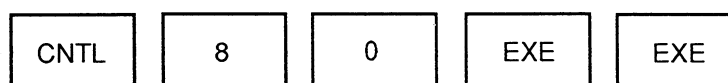
- (5) Designate 5 in D035 and write it in the MC11.



- (6) Execute manual operation.



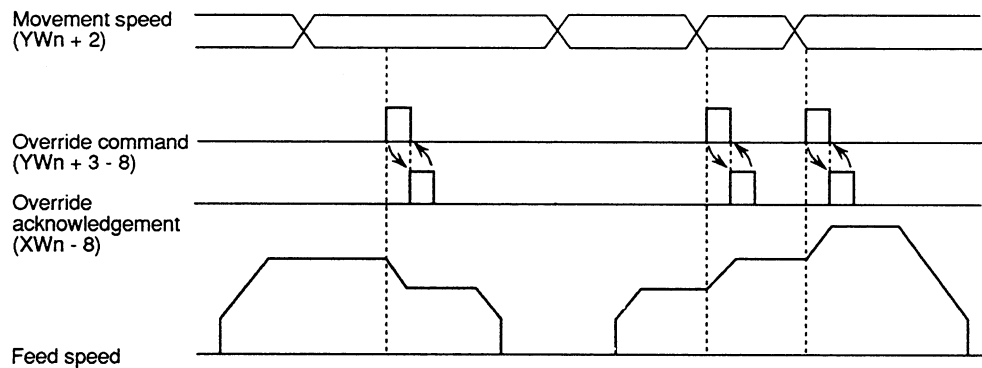
- (7) Stop manual operation.



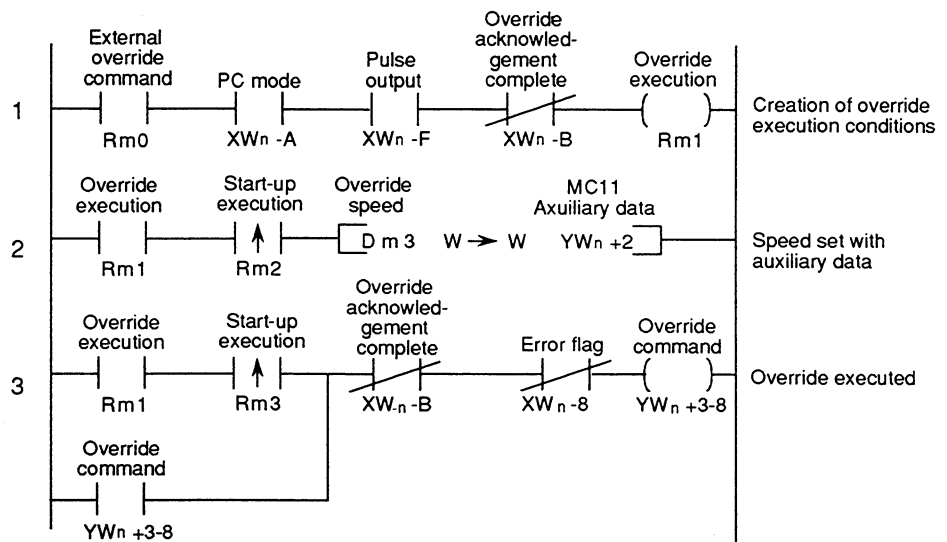
The feed speed of the MC11 can be changed from the EX100 during operation. The speed can be changed freely between the maximum and minimum speeds. Override cannot be executed in the following cases.

- (1) Internal Switch No. 6 of the MC11 is switched off.
- (2) While moving at the minimum speed during zero return.
- (3) The number of remaining pulses is too small to execute overriding in fixed-rate feeding.
- (4) During acceleration or deceleration or when not moving at a fixed speed.
- (5) The designated speed is below the minimum speed or above the maximum speed. In this case, the speed is not changed, but the error flag switches ON. Operation continues.

- 12.1 Timing chart**
- (1) Write the speed (1 to 100) to be changed in the auxiliary data (YWn+2).
 - (2) Switch on the override command (YWn+3-8).



12.2 Example of an EX100 program

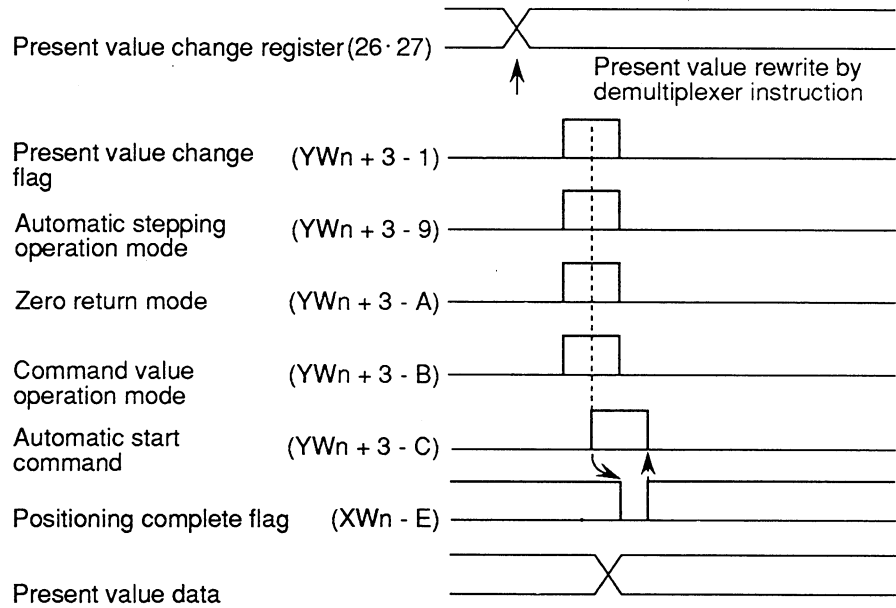


13. Changing the Present Value

The present values of the MC11 can be changed freely from the EX100 or programmer.

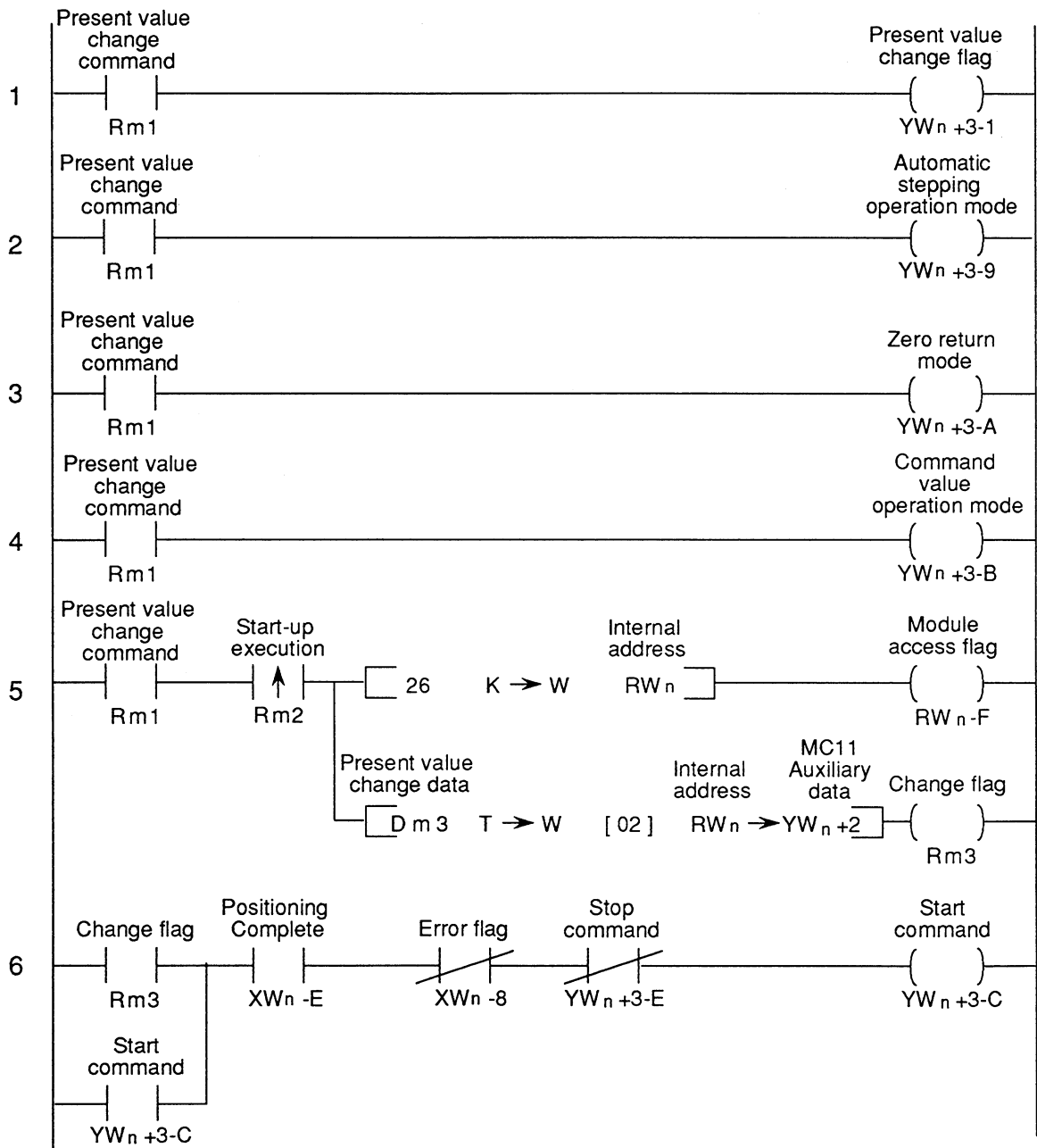
13.1 Timing chart for changing the present value

- (1) Write the present value to be changed in the internal addresses 26 and 27 using the Demultiplexer instruction (FUN003).
- (2) Switch on the present value change flag, as well as the automatic stepping operation, zero return, and command value operation mode flags, and switch on the Start command.



13. Changing the Present Value

13.2 A sample program for changing the present values is shown below.
Example of an EX100 program



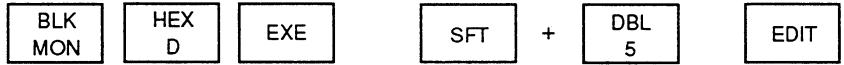
The Start command cannot instruct 1-scan ON. Be sure to handshake with the Positioning Complete signal.

13. Changing the Present Value

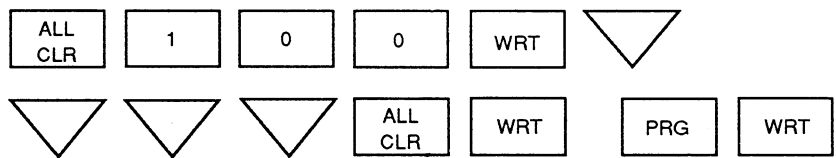
13.3 Example of operation using the GP110

An example of changing the present value is shown below.

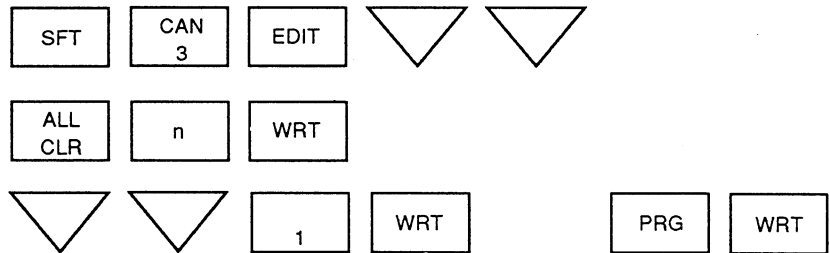
- (1) Connect the programmer to the MC11 and set the MODE switch to the PROGMR position.
- (2) Perform double-length monitoring of D000 and upward using the block monitor function and set the EDIT mode.



- (3) Set D000 and D001 to 100 and D010 and D011 to 0 and write the data in the MC11.



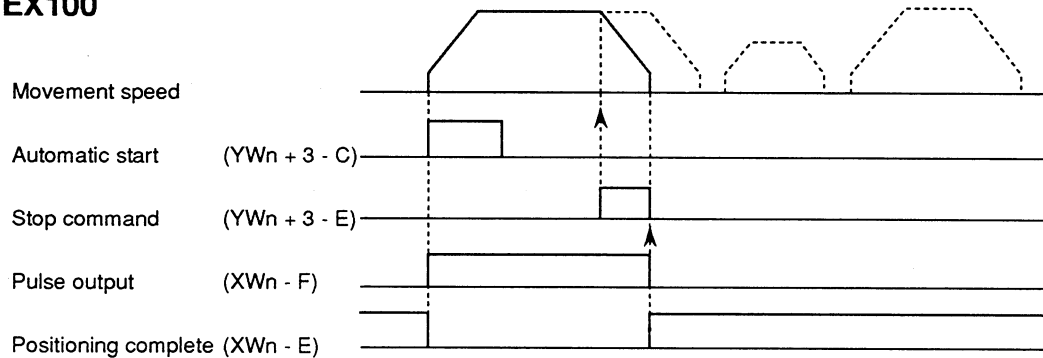
- (4) Write the present values in D004 and D005 and set 1 in the write flag.



The stop command is given by the EX100 or programmer to decelerate and stop during automatic operation, manual operation, or zero return.

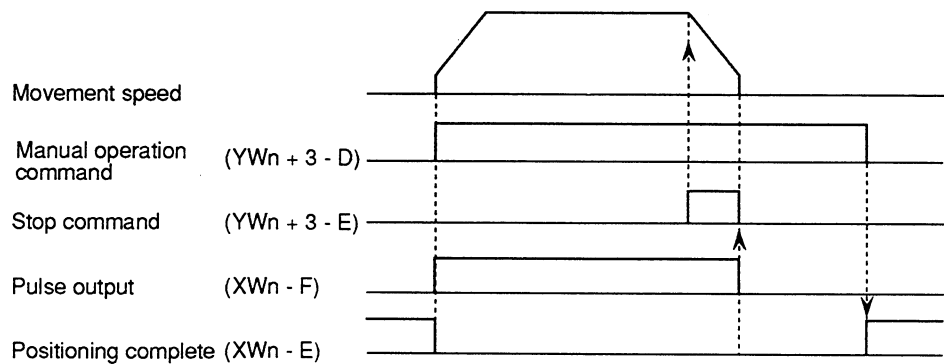
14.1 Stopping the automatic stepping and command value operations from the EX100

The machine decelerates and stops if a stop command is issued during automatic stepping operation, provided automatic stepping operation also stops.



14.2 Stopping manual operation from the EX100

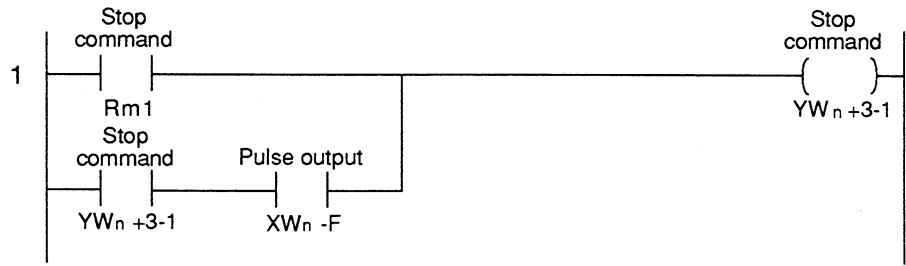
The machine decelerates and stops even when the manual operation command is ON if the stop command is issued during manual operation.



14. Stop

14.3 Example of an EX100 program

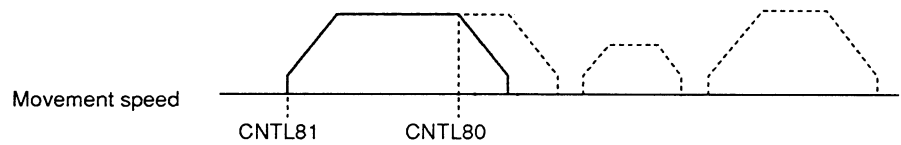
A sample program to issue a stop command using the EX100 is shown below.



The one-scan ON command cannot be issued to the MC11. Be sure to handshake with the pulse output as mentioned above.

14.4 Stopping operation from the GP110

The machine decelerates and stops according to the Stop command (Command 80).



- (1) Connect the programmer to the MC11 and set the MODE switch to the PROGMR position.
- (2) Execute the Stop command.

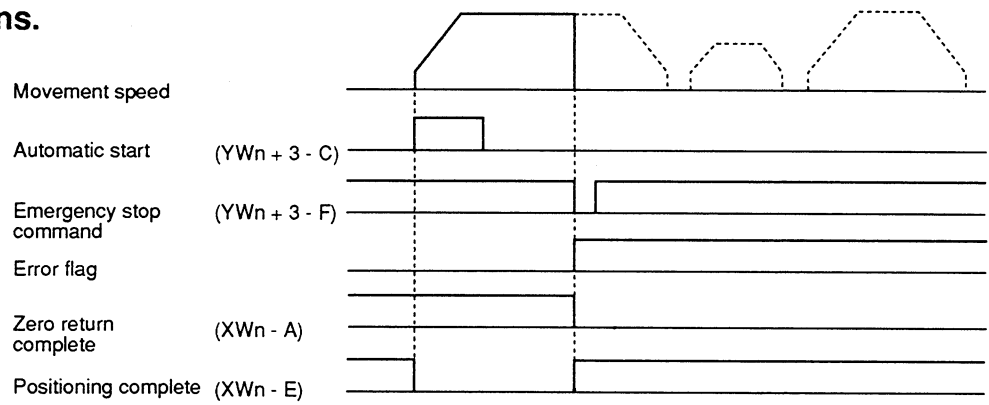
15. Emergency Stop

When the emergency stop command is switched off, the pulse output is interrupted and an error results. Emergency stop cannot be executed by the programmer.

Executing an emergency stop switches off the zero return complete flag. Execute zero return before resuming automatic operation.

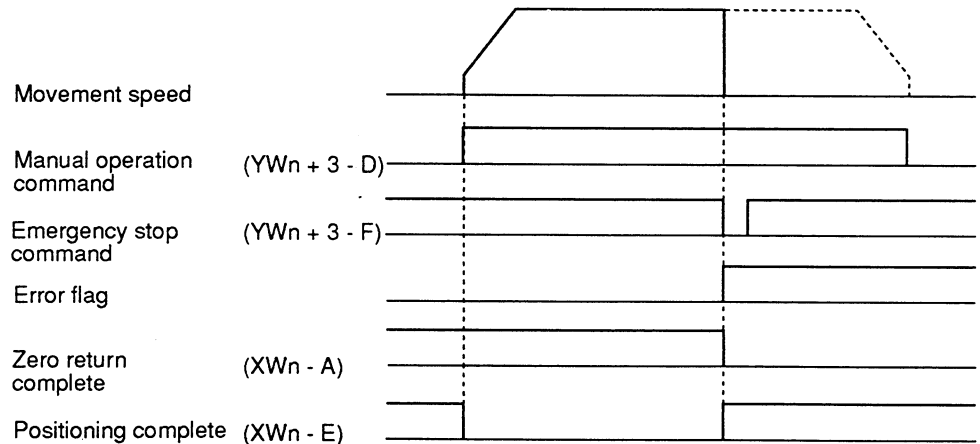
15.1 Emergency stop for the automatic stepping and command value operations.

If the emergency stop command switches off during automatic stepping operation, the machine stops immediately and an error results.



15.2 Emergency stop during manual operation

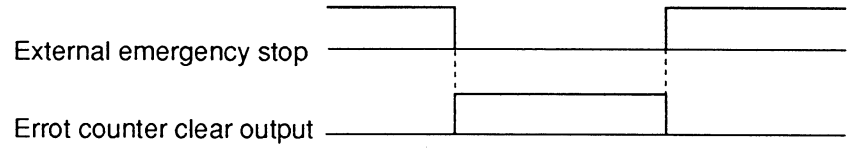
The machine stops immediately even when the manual operation command is ON if the emergency stop command switches off during manual operation.



15. Emergency Stop

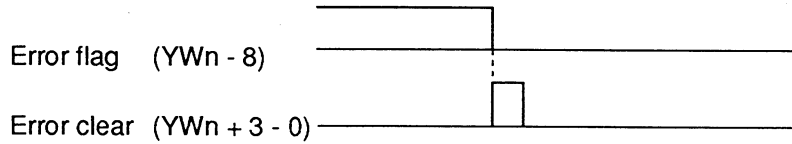
15.3 External emergency stop and clearing the error counter

Switch on the error counter clear output when the No. 2 switch of the internal setting switch of the MC11 is switched ON and the external emergency stop command is OFF. The servo motor then stops suddenly.

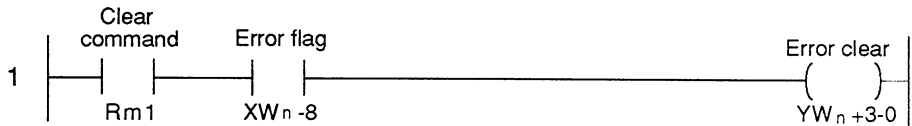


Execute error clear to execute next operation when the system is in an error state. Read the values of the internal data (36) of the MC11 for error details. Monitor the values of D032 when the programmer is connected to the MC11.

16.1 Error clear timing chart

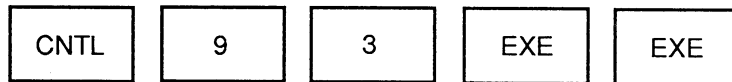


16.2 Example of an EX100 program



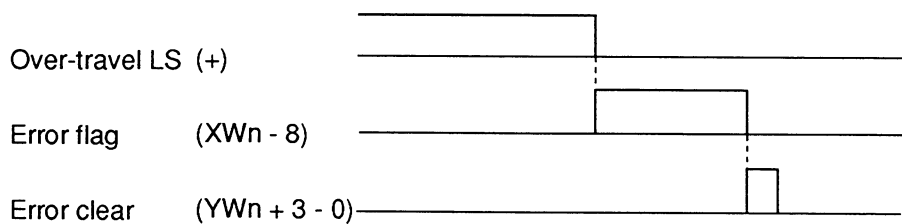
16.3 Clearing errors from the GP110

- (1) Connect the programmer to the MC11 and set the MODE switch to the PROGMR position.
- (2) Execute the Error Clear command.



16.4 Over-travel LS and error clear

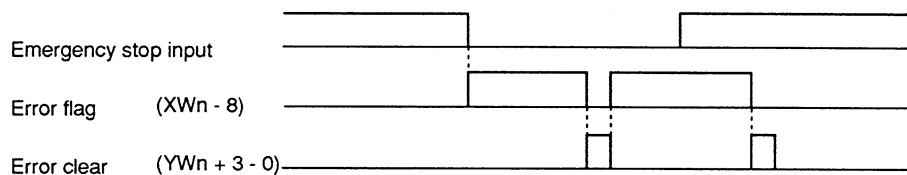
If the positive and negative over-travel LSs switch off on external input of the MC11, Error Code 69 or 70 is output and the error flag switches on. By executing the error clear command, the error flag switches off regardless of whether the over-travel LS is on or off.



16. Error Clear

16.5 Emergency stop, emergency stop input, and error clear

If an emergency stop due to external input of the MC11 or the emergency stop command switches off, error code 34 or 35 is output and the error flag switches on. Error clear cannot be completed at this time even if the error clear command is executed. In this case, it is necessary to switch on emergency stop from external input and the emergency stop command.



17. Error Codes

The error flag switches on and an error code is output if the MC11 enters an error state. The cause of the error can be determined to quickly recover the system by reading error codes by the programmer or the software of the EX100. The error codes, causes and troubleshooting are shown below.

Error Code	Name	Cause	Troubleshooting
1	Hardware error	Results of OS-ROM BCC check during power on were erroneous.	Turn the power off and again on. If the problem recurs, change the module.
3	Parameter error	Results of EEPROM BCC check during power on were erroneous.	After resetting the error, write in the PROM and turn the power on again. If the problem recurs, change the module.
4	EX data error	A command from the EX contained an error	Check the program operation timing and data and rectify the problem.
6	Data protect	Parameters were changed in the data protect state.	Switch off switch 5 and change the parameters.
7	No-block end error	Automatic stepping operation was executed to Point 64 as there was no end point.	Correct the operation parameters.
9	Zero return incomplete	Automatic stepping or an other operation was performed without completing zero return.	Perform automatic operation after executing zero return.
10	Mode mismatch	Programmer issued an inappropriate command in the PC mode or during operation.	Do not issue inappropriate commands from the programmer during PC mode or operating.
11	Speed mismatch	The maximum speed of the basic parameter was smaller than the minimum speed.	Reset to correct maximum and minimum speeds.
12	Problem with the write flag	The write flag has a value other than 0 or 1 during parameter writing by the programmer.	Be sure to set 0 or 1 in the write flag.
13	Point No. write trouble	A value other than 0 to 64 and 100 was designated as a point No.	Designate a correct point No.

17. Error Codes

Continued

Error Code	Name	Cause	Troubleshooting
14	Designated value exceeded	A value other than -999999 to 999999 was designated as a value.	Write a value inside the range.
15	Operation speed trouble	A value other than 1 to 100 was designated as the speed.	Write a value inside the range.
16	Dwell time trouble	A value other than 0 to 9999 was designated as the dwell time.	Write a value inside the range.
20	Override speed mismatch	A value outside the maximum and minimum speeds was designated as the speed when the override command was given.	Designate value inside range. Minimum speed/maximum speed x 100 ≤ designated speed ≤ 100
21	Minimum speed exceeded	The minimum speed of a basic parameter was outside the range of 1 to 999999.	Designate value inside range.
22	Maximum speed exceeded	The maximum speed of a basic parameter was outside the range of 1 to 999999.	Designate value inside range.
28	Zero return speed exceeded	The zero return speed of a basic parameter was outside the range of 1 to 999999.	Designate value inside range.
29	Zero offset exceeded	The zero offset of a basic parameter was outside the range of -999999 to 999999.	Designate a value inside range.
30	Backlash compensation value exceeded	The backlash compensation value of a basic parameter was outside the range of 0 to 1000.	Designate a value inside range.
31	Positive software limit exceeded	The positive software limit was outside the range of -999999 to 999999.	Designate a value inside range.
32	Negative software limit exceeded.	The negative software limit value was outside the range of -999999 to 999999.	Designate a value inside range.

17. Error Codes

Continued

Error Code	Name	Cause	Troubleshooting
33	Software limit mismatch.	The + software limit was smaller than the - software limit.	Set correct values.
34	External emergency stop	External emergency stop of the MC11 was OFF.	Check the external emergency stop input.
35	Emergency stop	Emergency stop from the EX100 was OFF.	Check operation on the EX100 side.
36	Point No. trouble	A point No. value was outside the range of 1 to 64 when a command for a designated point No. or automatic stepping operation was issued.	Designate a correct point No.
37	Operation speed mismatch	The designated speed was outside the range between the maximum and minimum speeds when an operational command was issued.	Designate value inside range. Minimum speed/maximum speed x 100 ≤ designated speed ≤ 100
39	Zero coordinate value exceeded	The zero coordinate value was outside the range of -999999 to 999999.	Designate a value within the range.
40	BCD error	The parameter command data values in the BCD mode contained values other than BCD.	Use BCD data.
41	Zero return speed mismatch	The zero return speed of a basic parameter was outside the range between the minimum and maximum speeds.	Designate a value inside range.
42	Parameter write mode mismatch	Parameters were written from the programmer while in the AUTO mode.	Do not write parameters while in the AUTO mode.
44	Electronic gear numerator exceeded	The electronic gear numerator of a basic parameter was outside the range of 1 to 9999.	Designate a value inside range.

17. Error Codes

Continued

Error Code	Name	Cause	Troubleshooting
45	Electronic gear denominator exceeded	The electronic gear denominator of basic parameter was outside the range of 1 to 9999.	Designate a value inside range.
46	Acceleration time exceeded	The acceleration time of a basic parameter was outside the range of 0 to 2600.	Designate a value inside range.
47	Deceleration time exceeded	The deceleration time of a basic parameter was outside the range of 0 to 2600.	Designate a value inside range.
48	Present value exceeded	The present value exceeded the software over-travel range during operation.	Return to inside the range by manual operation and execute.
49	Designated value mismatch	An attempt was made to operate outside the range of the software limit, using a designated value.	Correct the software limit value or command value.
50	Number of pulses for moving exceeded	Number of pulses for moving for one cycle exceeded 0FFFFFFH.	Review the command and basic parameter values.
51	Maximum speed exceeded	The output pulse frequency exceeded 200 kHz while an operation command was effective.	Review the electronic gear numerator/denominator values and maximum speed.
52	Minimum speed zero	The command speed was smaller than minimum speed while an operation command was effective.	Review the command speed and minimum speed.
53	Zero return speed exceeded	The output pulse frequency exceeded 200 kHz during zero return.	Review the electronic gear numerator/denominator values and zero return speed.
55	Maximum speed and deceleration time mismatch	The maximum speed and deceleration time are too large.	Reduce the maximum speed or deceleration time.

17. Error Codes

Continued

Error Code	Name	Cause	Troubleshooting
56	Relative/absolute designation error	Designation of relative/absolute while a programmer command was effective was other than 0 and 1.	Set the flag to 0 or 1.
57	Command No. error	A command No. value was outside the range of 0 to 5 while a programmer command was effective.	Designate a value 0 to 5 as a command value.
58	CW/CCW direction designation error	A direction designation value was other than 0 and 1 when a command was issued by the programmer.	Set the flag to 0 or 1.
59	Write protect error	Parameter write protect designated other than 0 and 1 when a command was issued by the programmer.	Set the flag to 0 or 1.
60	EEPROM write error	Parameter writing in EEPROM did not end properly.	Replace the module if the error recurs after re-execution.
61	Data loading mode error	An attempt was made to load parameters using the programmer while the EX100 was running or the MC11 was in the PC mode, in operation, or in the protect mode.	Halt the EX100 and set the MC11 SW to PROGMR to clear write protect. Then load the parameters.
62	Data recording mode error	An attempt was made to record parameters and compare them in the programmer while the EX100 was running or the MC11 was in the PC mode or in operation.	Halt the EX100 and set the MC11 SW to PROGMR. Record and compare while stopped.
64	Memory initialize mode error	An attempt was made to initialize RAM parameters while the EX100 was running or the MC11 was in the PC mode, in operation, or in the protect mode.	Halt the EX100 and set the MC11 SW to PROGMR. Then initialize the parameters after clearing write protect.

17. Error Codes

Continued

Error Code	Name	Cause	Troubleshooting
65	EEPROM write mode error	An attempt was made to write parameters in the EEPROM while the EX100 was running or the MC11 was in the PC mode, in operation, or in the protect mode.	Halt the EX100 and set the MC11 SW to PROGMR to clear write protect. Then write the parameters.
66	Program check mode error	An attempt was made to check parameter ranges while the EX100 was running or the MC11 was in the PC mode or in operation.	Halt the EX100 and set the MC11 SW to PROGMR. Then check while stopped.
67	EEPROM read mode error	An attempt was made to read from EEPROM to RAM while the EX100 was running or the MC11 was in the PC mode, in operation or in the protect mode.	Halt the EX100 and set the MC11 SW to PROGMR to clear write protect. Then read.
69	CW-side over-travel limit switch input.	The over-travel limit switch on the CW side is operating or one of its wires is disconnected.	Clear the limit manually after resetting the error. Check the wiring if the limit does not function.
70	CCW-side over-travel limit switch input	The over-travel limit switch on the CCW side operated or one of its wires is disconnected.	Clear the limit manually after resetting the error. Check the wiring if the limit does not function.
71	Write protect save error	Parameter writing was executed while write protect was 1.	Set write protect to 0 from the programmer and re-execute.

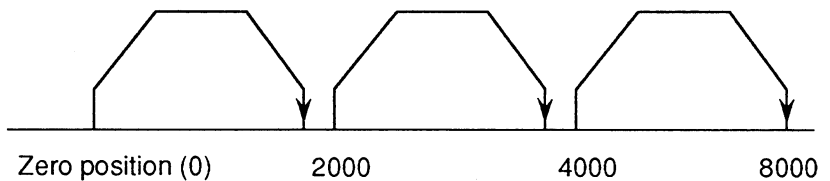
18. Application Example

Application examples using the MC11 are shown below.

18.1 Example of operation

Study the program below to execute the following operation.

- (1) Turn the power on and press the ZERO RETURN pushbutton switch to execute zero return.
- (2) Press the automatic execution button and repeat feeding at a fixed rate three times as shown below.
- (3) Clear the present value to 0 after feeding at a fixed rate.
- (4) Wait one second using the timer on the PC side before proceeding to the next execution after one feed at a fixed rate.



18.2 Module layout and addresses

Study the following layout.

P	P	D	D	M	
S	U	I	O	C	
5	1	3	3	1	
1	1	1	1	1	

Assign areas XW02, XW03, YW04 and YW05 for MC11.

Assign X000 to the zero return pushbutton switch.

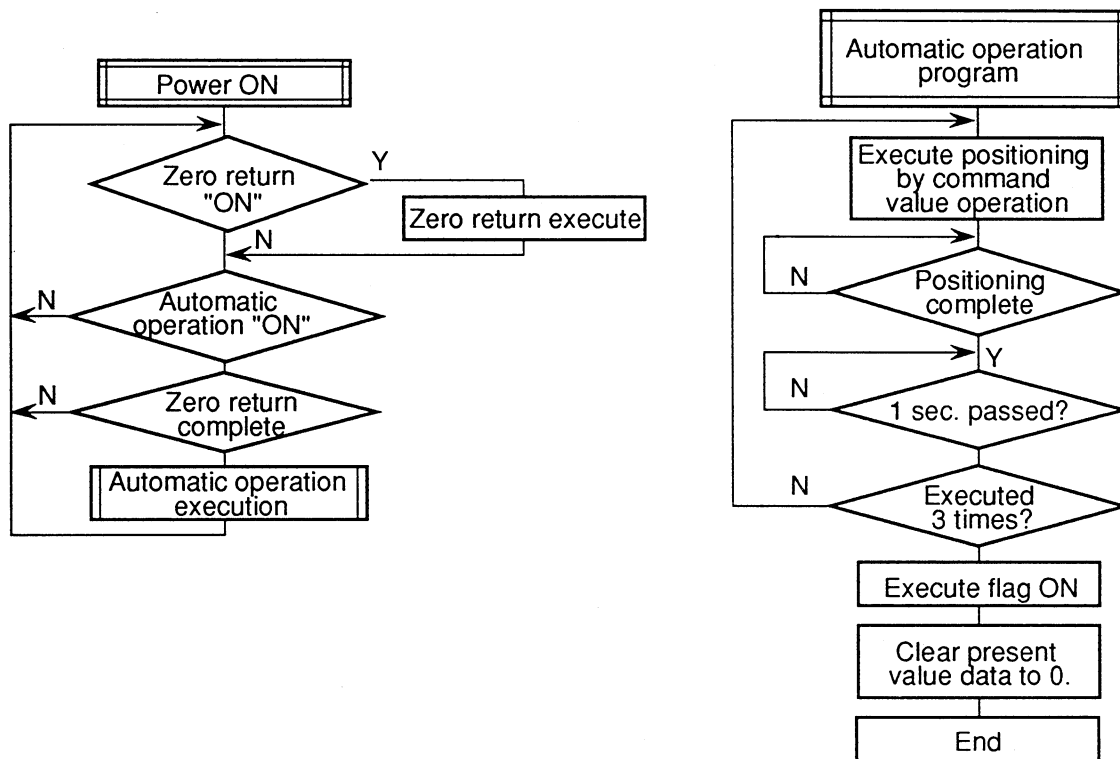
Assign X001 to the automatic execution pushbutton switch. Switch ON Y010 after feeding at a fixed rate and before starting automatic execution.

18. Application Example

18.3 The operation flow that satisfies the above specifications is shown.

Program operation flow

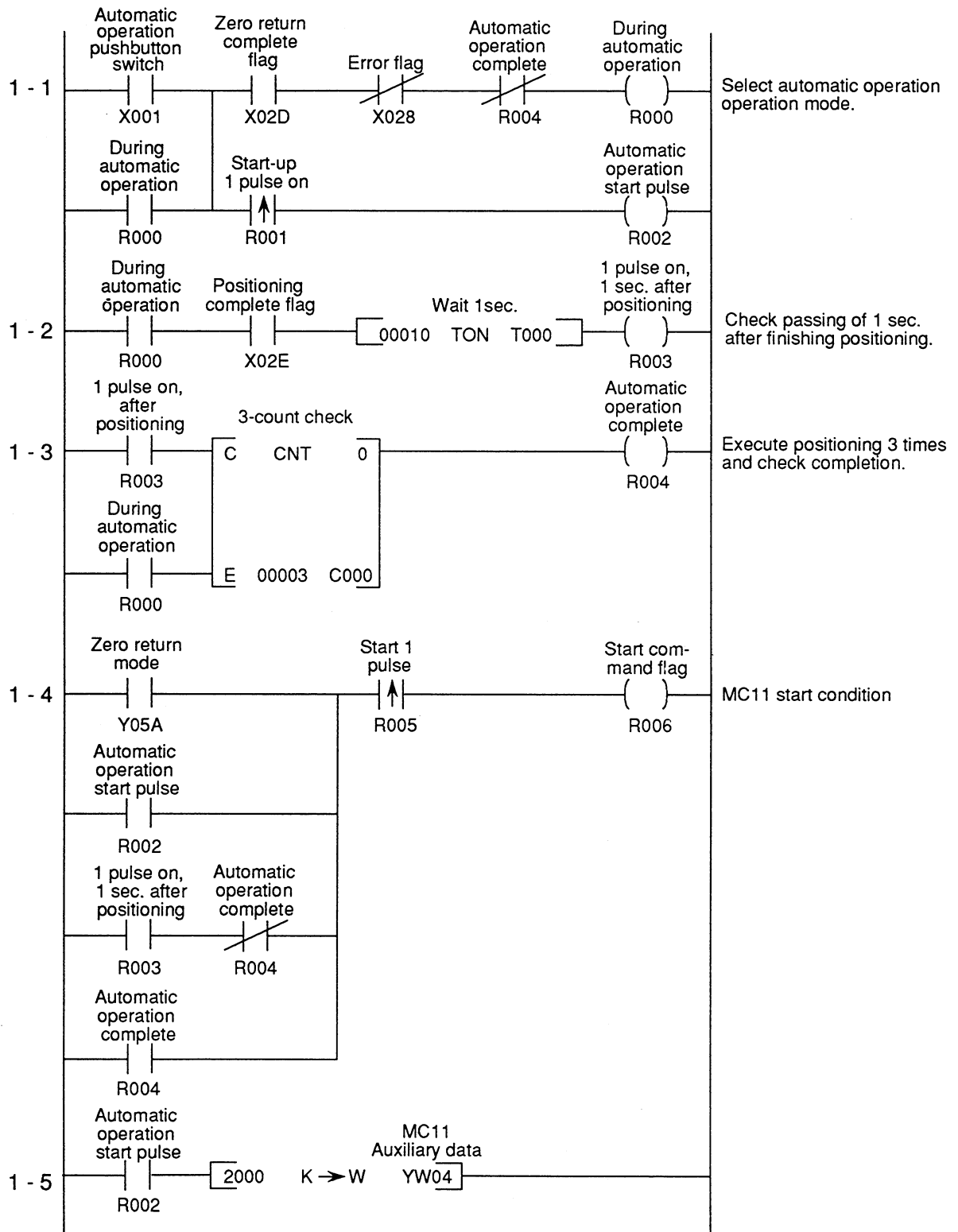
The software of the MC11 can be simplified by automatic operation. Instead, the method using command value operation is explained below.



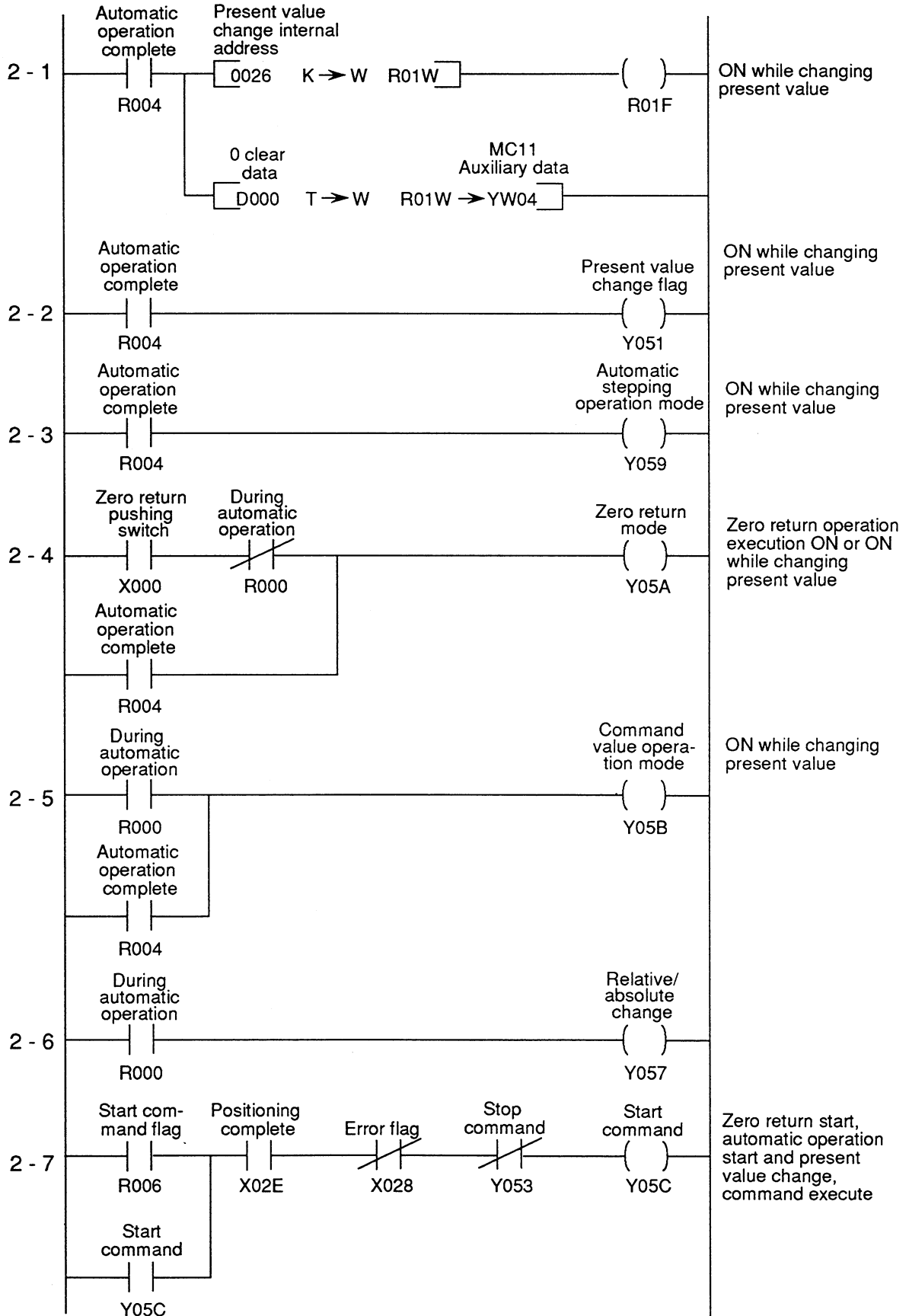
18. Application Example

18.4 A ladder program example is shown below.

Program example



18. Application Example



[MC11 Addresses]

The addresses of the MC11 devices allocated to XW02, XW03, YW04 and YW05 are as follows.

X02F: Flag during pulse output	Y05F: Emergency stop command
X02E: Positioning completion flag	Y05E: Stop command
X02D: Zero return completion flag	Y05D: Manual operation command
X02C: Data sign bit	Y05C: Auto start command
X02B: Override acknowledgement completion	Y05B: Command value operation mode
X02A: PROGMR/PC mode flag	Y05A: Zero return mode
X029: BIN/BCD flag	Y059: Automatic stepping operation mode
X028: Error flag	Y058: Override command
X027	Y057: Absolute/relative coordinate change
↓ : Present value data	Y056: Moving direction CW/CCW change
X020	Y055: Command value change (YWn+2/buffer)
	Y051: Present value change mode
	Y050: Error reset
XW03: Present value data	YW04: Auxiliary data

18.5 Example of setting basic parameters

◆ Setting feed speed and acceleration/deceleration time

When setting a feed speed or an acceleration or deceleration time, the parameter value must be selected appropriately in accordance with the motor to be used.

(1) Stepping motor

Generally, the maximum operation frequency of the stepping motor is approximately 20 kHz or less. Stepout is caused if the rated torque is surpassed during acceleration or deceleration. This is why it is necessary to adjust the settings of the acceleration and deceleration times to match the equipment to be actually used, and to set the minimum speed to approximately 1 kHz or less.

[Check Conditions]

$$\frac{\text{Maximum speed} \times \text{electronic gear numerator}}{\text{Electronic gear denominator}} \leq 120000 \text{ ppm}$$

$$\frac{\text{Minimum speed} \times \text{electronic gear numerator}}{\text{Electronic gear denominator}} \leq 600000 \text{ ppm}$$

Acceleration time-deceleration time ≥ 50 msec.

18. Application Example

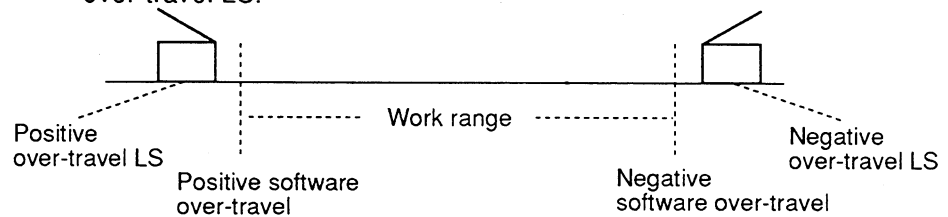
(2) Servo Motor

When using the servo motor, the minimum speed moves in the direction of switching off the zero LS during zero return and will be the operation speed when setting the zero position. A speed approximately 1/20 to 1/100 of the maximum speed is recommended to be set.

Set the acceleration and deceleration time to 0 unless the load inertia is small. Adjust the response to workpiece movement by adjusting the gains of the position and speed control loops on the servo motor driver side.

◆ Example of setting the software limits

Input the software limits according to the condition of the actual equipment after deciding the electronic gear values, zero coordinates, and zero offset. Normally, the software limit values are set inside the range of the over-travel LS.



◆ Changing the direction of movement

In the MC11, the CCW and CW directions are always negative and positive directions. The recommended method to change the CW direction to the positive direction is to change the CW and CCW by the pulse output wiring and to connect accordingly.

A. List of Programmer Operation Commands

	Outline of operation	Programmer		Operation state		
		MP 100	GP 110	EX	MC	SW
Status display	Status display of MC11	CMD 00	SYS 1	-	-	-
Parameter display	Display of MC11 version and format. Display and setting of data ID.	CMD 01				
Parameter transfer	Parameter data saved in the MC11 EEPROM is transferred to the RAM.	CMD 05	CNTL 5	HALT	HALT	PROG MR
Deceleration and stopping	Pulses output are decelerated and stopped to halt operation.	CMD 80	CNTL 80	-	-	PROG MR
Operation start	Starts the designated operation.	CMD 81	CNTL 81	-	-	PROG MR
Parameter check	Checks parameters in the RAM.	CMD 83	CNTL 83	HALT	HALT	PROG MR
Parameter initialize	Initializes parameters and user IDs in the RAM.	CMD 90	CNTL 90	HALT	HALT	PROG MR
Error reset	Resets error now occurring (software processable).	CMD 93	CNTL 93	-	HALT	PROG MR
Parameter save	Writes RAM parameters in the EEPROM.	CMD 94	CNTL 94	HALT	HALT	PROG MR
Cassette tape run	Runs the parameters from the cassette tape in the RAM.	CMD 95	CMT 95	HALT	HALT	PROG MR
Cassette tape recording	Records MC11 RAM parameters on the cassette tape.	CMD 96	CMT 96	HALT	HALT	PROG MR
Compares with cassette tape	Compares parameters of the cassette tape and RAM.	CMD 97	CMT 97	HALT	HALT	PROG MR

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Printed in USA