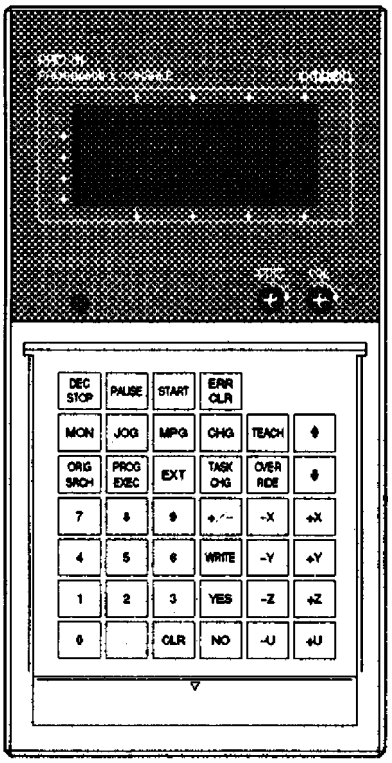
CVM1-PRS71
Teaching Box

Operation Manual

Produced June 1995



Notice:

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

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

⚠ DANGER! Indicates information that, if not heeded, is likely to result in loss of life or serious injury.

⚠ WARNING Indicates information that, if not heeded, could possibly result in loss of life or serious injury.

⚠ Caution Indicates information that, if not heeded, could result in relatively serious or minor injury, damage to the product, or faulty operation.

OMRON Product References

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

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

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

Visual Aids

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

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

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

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TABLE OF CONTENTS

About this Manual:

This manual describes the installation and operation of the CVM1-PRS71 Teaching Box and includes the sections described below. The CVM1-PRS71 Teaching Box is a Peripheral Device for CV-series PCs and is used with the CV500-MC221 and CV500-MC421 Motion Control Units.

Please read this manual carefully along with the operation manuals for the CV500-MC221 and CV500-MC421 Motion Control Units, and be sure you understand the information provided before attempting to install and operate the Teaching Box.

There are four manuals used with the CV500-MC221 and CV500-MC421 Motion Control Units (MC Units). These manuals are listed in the following table. The suffixes have been left off of the catalog numbers. Be sure you are using the most recent version for your area.

Name	Content	Cat. No.
CV500-MC221/MC421 Motion Control Unit Operation Manual: Introduction	Describes the features, applications, and basic operation of the Motion Control Units. Read this manual first before using a Motion Control Unit.	W254
CV500-MC221/MC421 Motion Control Unit Operation Manual: Details	Describes the operation of the Motion Control Units in detail. Read the *Operation Manual: Introduction*, above, before attempting to read this manual.	W255
CVM1-PRS71 Teaching Box Operation Manual	Describes the operation of the Teaching Box connected to a Motion Control Unit.	W257
CV500-ZN3PC1 MC Support Software Operation Manual	Describes creating control programs and setting operating parameters for MC Units using the MC Support Software.	W256

Section 1 provides an outline of the Teaching Box, including features, applications, a list of Teaching Box functions, and a list of key functions.

Section 2 provides information on axis control, the operating modes of the MC Unit, and other functions that can be controlled from the Teaching Box. Be sure to read this section before starting actual operations to gain an general understanding of operations.

Section 3 describes the procedures for connecting the Teaching Box, installing it on in a control panel, and changing displays.

Section 4 contains information on the basic operations necessary for operating the Teaching Box. Be sure to read this section to fully understand the basic operations before reading detailed descriptions of each function given in following sections.

Section 5 describes the methods for monitoring five kinds of data. The procedure described in the first subsection is required for monitoring any type of data. Read the first subsection before reading any other subsection.

Section 6 provides information on procedures for origin searches, program execution, jogging, and handle feeding operations. Execute these operations only after locking the servo for the axis to be moved.

Section 7 provides information on changing MC Unit control modes, locking and freeing servos, protecting memory, and absolute encoder functions.

Section 8 describes procedures for changing the override value and for teaching. The functions described in this section can be executed in any control mode.

Section 9 describes deceleration stops, resetting error, and wiring checks.

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

SECTION 1
Introduction

This section provides an outline of the Teaching Box, including features, applications, a list of Teaching Box functions, and a list of key functions.

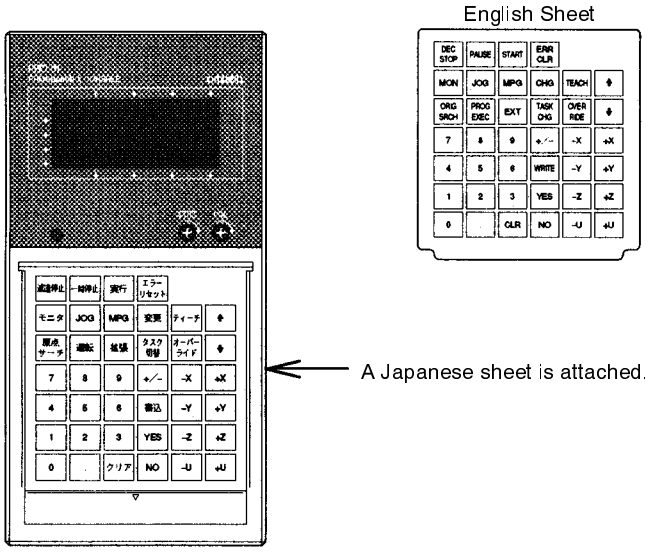
1-1 Confirmation of Product Contents

Please confirm that the contents of the products you have purchased are complete and correct.

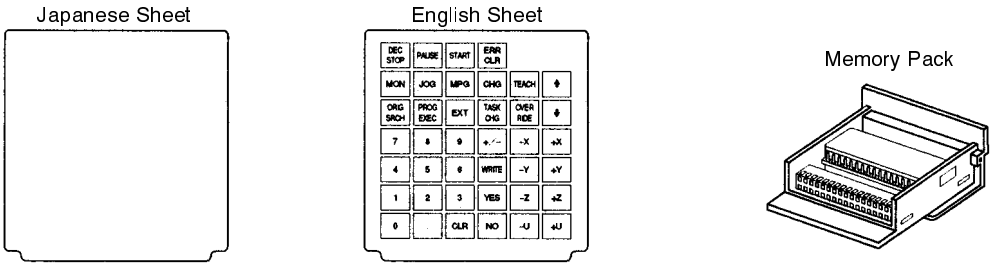
If you already have a CV Programming Console (CVM1-PRS21), simply replace the Memory Pack and the Key Sheet to use it as a Teaching Box for the MC Unit. In this case, a CVM1-MP701 Memory Pack must be purchased.

Note The Teaching Box is shipped with a Japanese Key Sheet attached. Replace the sheet with the English Key Sheet and set pin 2 of the MC Unit's DIP switch to ON for English displays. Refer to *3-3 Display Language* for details.

CVM1-PRS71 Teaching Box



CVM1-MP701 Memory Pack



1-2 Features and Applications

Features

The CVM1-PRS71 Teaching Box has the following features.

Detailed Displays

The status of all four axes can be seen at a glance from the messages displays. (16 characters x 4 lines).

Interactive Operation

Interactive operation allows even those who use the Teaching Box for the first time to use it with ease through key inputs from menus.

Error Messages

Error messages are displayed when errors occur in the Motion Control Unit (MC Unit) or in the servodriver. These error messages help minimize the scale of problems caused by the error.

Applications

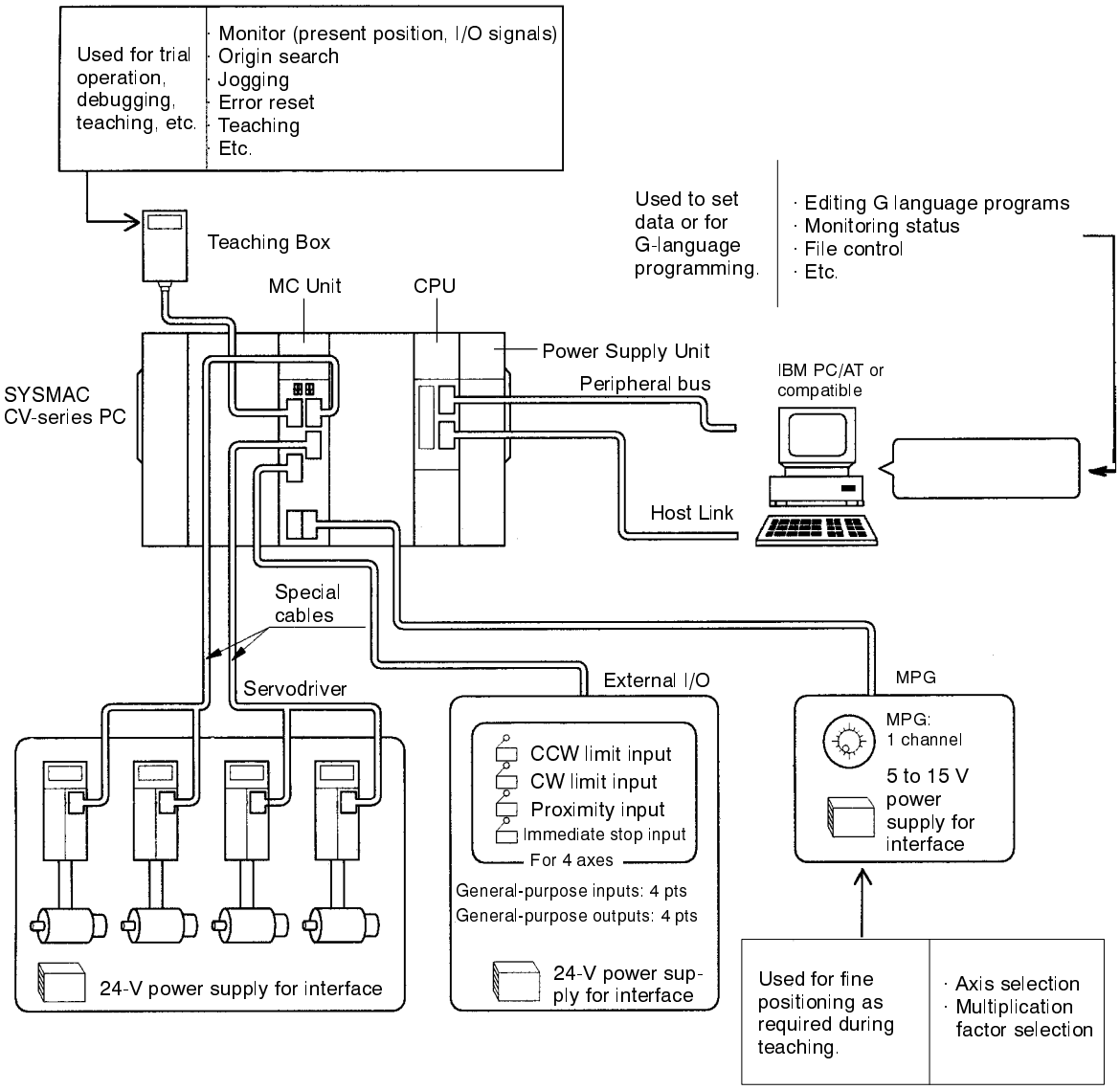
The Teaching Box is mainly used for the following purposes.

- Wiring check
- Monitoring operation via program execution
- Checking movement during feeding operations
- Creating position data through feeding operations and teaching

When feeding operations are performed using a manual pulse generator or jogging operations from the PC, the Teaching Box is mainly used for monitoring the present position.

1-3 System Configuration

The system configuration of the MC Unit is shown below.



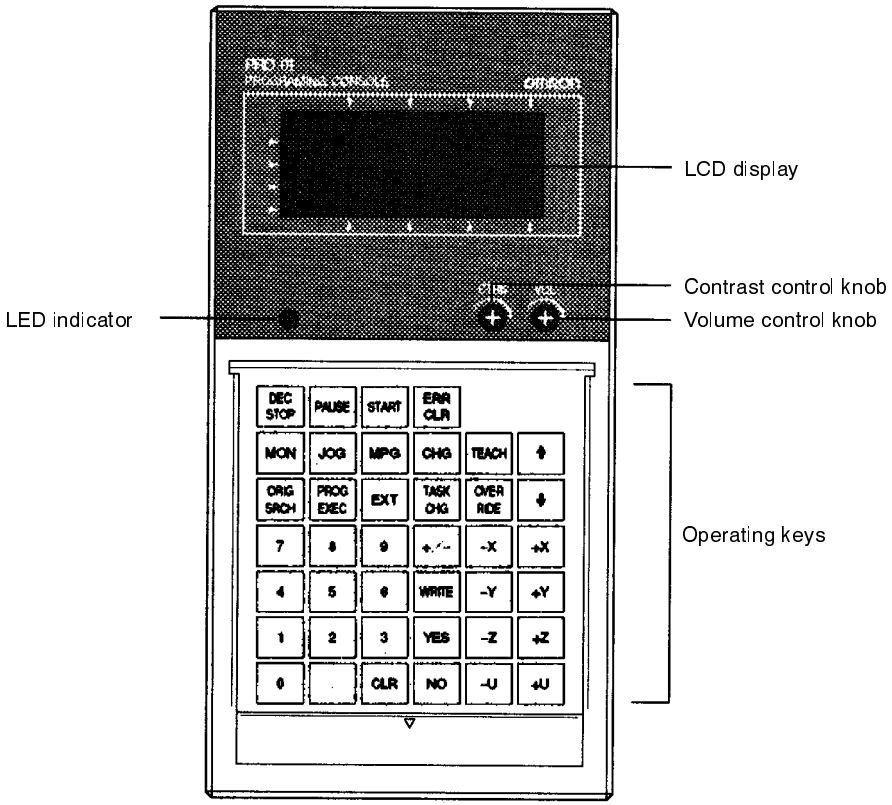
1-4 List of Functions

The following table lists the functions of the Teaching Box.

Function		Description
Deceleration stop		Decelerates all axes to a stop.
Error reset	MC Unit error reset	Resets errors that have occurred in the MC Unit.
	Servodriver error reset	Resets alarms for the servodriver.
Monitor	Present position	Monitors the following present position: Present position in the reference coordinate system (using user-set unit such as “mm”). Present position in the reference coordinate system (in pulses). Error counter value.
	Position data	Reads position data stored in the MC Unit.
	Errors	Reads errors that have occurred in the MC Unit.
	I/O signals	Monitors and changes I/O signals connected to the MC Unit.
	Z-phase tolerance	Monitors the number of pulses to the Z phase from the origin input.
Origin search		Searches for the origin.
Program execution	Task/program No. designation	Designates the desired task and program to be executed.
	Cycle run	Executes tasks.
	Single block run	Executes the program block by block.
Jogging		Jogs individual axes. More than one axis can be jogged at the same time.
MPG feeding	Axis	Designates the axis to be fed by MPG (manual pulse generator).
	Multiplication factor	Designates the multiplication factor for 1 pulse for the MPG.
Override		Increases or decreased the operating speed during memory operation.
Teaching		Registers the present position as position data.
Extension	Mode	Changes the mode used to control the MC Unit.
	Servo-lock/servo-free	Locks or frees the servomotor.
	Memory protect	Protects or clears protection for memory (position data area) in the MC Unit.
Error detection		CPU errors Communications errors

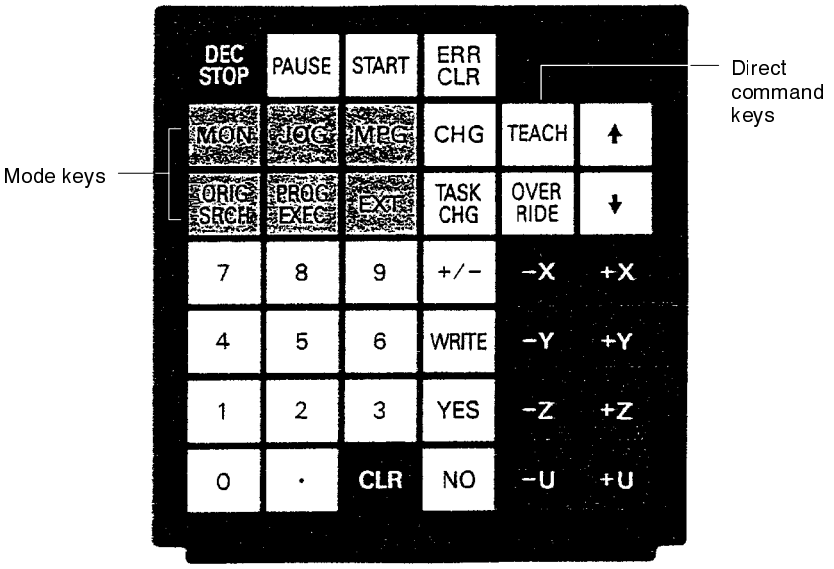
1-5 Nomenclature and Functions

Shown below are the parts, functions, and key arrangement of the Teaching Box.



Part	Function
LCD display	Displays various data. Illuminated by LED.
LED indicator	Lit while the CPU of the PC is executing the user program (RUN or MONITOR mode).
Contrast control knob	Used to control the contrast of the LCD display.
Volume control knob	Used to control the buzzer sound produced when an input is made by pressing keys or when an error occurs.
Operating keys	Refer to the following pages.

Operating Key Arrangement



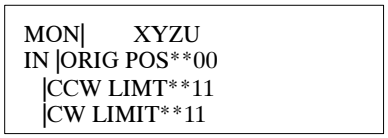
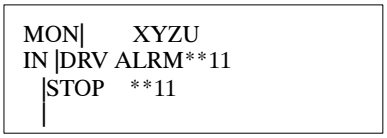
Classification	Function
Mode keys	Used to set the Teaching Box mode.
Direct command keys	Used to give a direct command to immediately execute a specific function in any Teaching Box mode.

Key Functions

Classification	Key	Function
Mode keys	MON	Monitors present position or I/O signals (MONITOR mode).
	ORIG SRCH	Moves the selected axis to the origin (ORIGIN SEARCH mode).
	JOG	Jogs the selected axis (JOG mode).
	MPG	Designates the axis and multiplication factor when using a manual pulse generator (MPG mode).
	PROG EXEC	Executes programs (RUN mode).
	EXT	Sets the control mode for the MC Unit, force-locks/unlocks the servo, etc. (EXTENSION mode).
Direct command keys	OVERRIDE	Increases or decreases the speed of the axis under operation.
	TEACH	Writes the present position of axes as position data.
Other keys	DEC STOP	Decelerates and stops all axis movement. Stopping using the DEC STOP Key is treated as a system error.
	PAUSE	Stops program execution or origin searches. This key is valid only during program execution or origin searches.
	START	Starts positioning.
	ERR CLR	Resets errors to clear the error status of the MC Unit.
	CHG	Enables changing numeral data.
	TASK CHG	Changes the task to be executed in PROGAM EXECUTION mode.
	Numeric	Used to input numeric data.
	+/−	Used to change the sign (+/−) of numbers. Every press of the key toggles the sign. (+ is not displayed.)
	CLR	Clears data that has been set or returns to the previous display.
	WRITE	Outputs data that has been set or writes it to memory.
	YES, NO	Used when a confirmation display appears.
	↓,↑	Scroll the display up and down.
	Feed keys: +X, −X, +Y, −Y, +Z, −Z, +U and −U	Used to jog or handle-feed an axis. These keys are valid only in JOG or MPG mode.

1-6 Precautions in Using the CV500-MC221

The operating procedures of the Teaching Box using the CV500-MC421 MC Unit are the same as those of the Teaching Box using the CV500-MC221 MC Unit. Descriptions in this manual are given for the Teaching Box using the CV500-MC421. Note the following precautions when using the CV500-MC221.

Item	Precautions
Monitoring	Monitored present data is displayed for all four axes. “0” is displayed for the unsupported axes (Z and U axes). The I/O signals are also displayed for all four axes. The CCW limit input, CW limit input, immediate stop input and alarm input are displayed as “1” for unsupported ases as shown below. (Even when “1” is displayed, the X and Y axis can be operated.)   *: “0” or “1”
Jog MPG	The +Z, −Z, +U and −U Keys are not supported.
Other functions	All other operations for the Z and U axes are also not supported.

SECTION 2
Outline of MC Unit Operation

This section provides information on axis control, the control modes for the MC Unit, and other functions that can be controlled from the Teaching Box. Be sure to read this section before starting actual operations to gain an general understanding of operations.

2-1 Axes and Tasks

The axes for operation and tasks to be performed are described below.

Axes

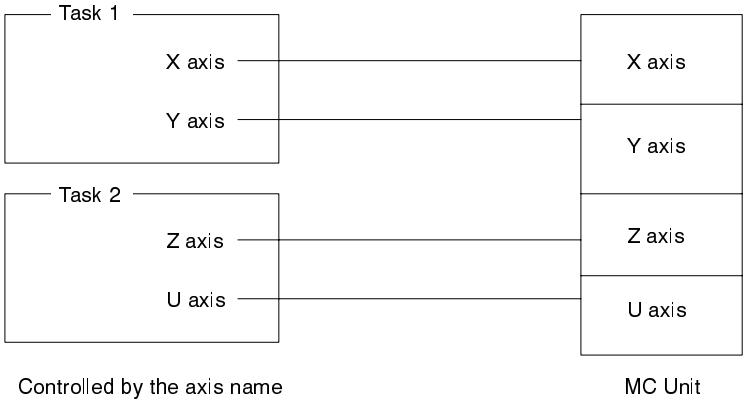
Operations can be performed on the desired axes, either one or more specific axes or all axes.

Tasks

Tasks are an executable unit of programming in MC programs. Up to four tasks can be executed by the MC Unit.

Tasks must be taken into consideration when creating or teaching position data or when executing programs. Each task is designed to control one or more axes as illustrated by the following example.

Example:
The following example shows two tasks designed to control two axes each.

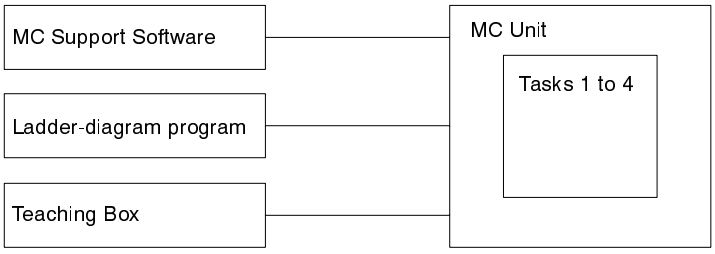


2-2 MC Unit Control Modes

The following section describes the systems and modes used to control the MC Unit.

Command Systems

Tasks are controlled through the following three systems: the MC Support Software, ladder-diagram program, and Teaching Box. The MC Unit may be processing commands from all the three systems at the same time.



There are three modes used to control the MC Unit from the Teaching Box. These three control modes are provided to avoid possible problems that may be caused with commands coming from three different control systems and also to secure the user's safety.

- The MC Unit is initially set to the T.BOX LIMITED mode which allows only monitoring from the Teaching Box.
- When executing any function other than monitoring, change the control mode to either T.BOX ENABLED or T.BOX RESERVED.
- Control modes of the MC Unit can be changed only from the Teaching Box.

Note Refer to *4-2 Changing the MC Unit Control Mode* for information on changing the control mode.

Control modes of the MC Unit are described in the following table.

Control mode	Description
T.BOX LIMITED	Default setting which allows only monitoring from the Teaching Box. Normally used for monitoring the present position. This mode is automatically returned to when the power supply to the MC Unit is reset or when the Teaching Box is disconnected and reconnected.
T.BOX ENABLED	Used to execute programs (debugging), teaching, and performed other operations from the Teaching Box. When the MC Unit is set for this control mode, only the following operations are possible from the ladder-diagram program (cyclic). Deceleration stop (for interlocking while jogging) Optional switches (for debugging during program execution) Resetting M codes (for debugging during program execution)
T.BOX RESERVED	All commands (cyclic) form the ladder-diagram program are ignored. This mode is used when performing wiring checks or when teaching. When programs are executed in this mode, those functions that are interfaced with external devices, such as waiting for M code resets or optional inputs, are ignored. The only difference between this mode and the T.BOX ENABLED mode is that in this mode, all commands from the ladder-diagram program are ignored.

Note "T.BOX" stands for the Teaching Box and is used in Teaching Box displays.

2-3 Restricted Functions

Some Teaching Box functions are restricted depending on the control mode of the MC Unit. The following table shows which functions are valid for each control mode.

Function		Control mode		
		T.BOX LIMITED	T.BOX ENABLED	T.BOX RESERVED
Deceleration stop		No	OK	OK
Error reset		No	OK	OK
Override		See note 1	OK	OK
Teaching		No	OK	OK
Monitoring	Present position	OK	OK	OK
	I/O signals	See note 2	OK	OK
	Position data	OK	OK	OK
	Error data	OK	OK	OK
	Z-phase tolerance	OK	OK	OK
Origin searches		No	OK	OK
Jogging		No	OK	OK
MPG (handle feeding)		No	OK	OK
Program execution		No	OK	OK
Extension	Servo Lock	No	OK	OK
	Servo Free	No	OK	OK
	Change mode	OK	OK	OK
	Memory protection	No	OK	OK
	Absolute encoder	No	OK	OK

Note
1. Only the override value can be monitored. No changes can be made.
2. Only monitoring of the ON/OFF status of output signals and monitoring of analog output data is possible. No changes can be made.

SECTION 3
Connecting the Teaching Box

This section describes the procedures for connecting the Teaching Box, installing it on in a control panel, and changing displays.

3-1 Connecting the MC Unit

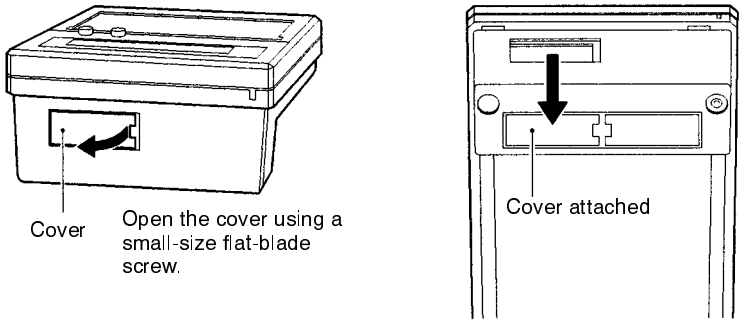
The procedure for connecting the Teaching Box to the MC Unit is described below.

Connecting Cables

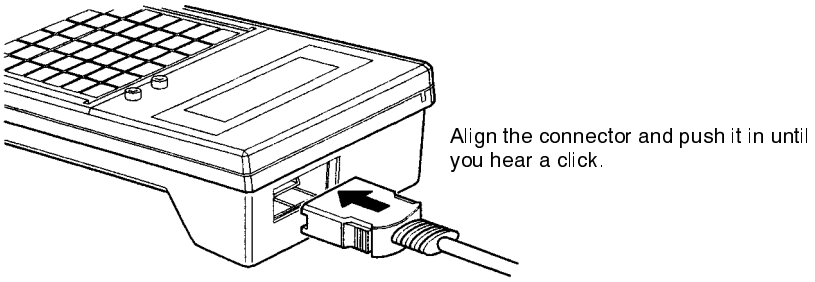
Use the Connecting Cables listed below (separately sold) to connect the Teaching Box to the MC Unit.

Model	Cable length
CV500-CN224	2 m
CV500-CN424	4 m
CV500-CN624	6 m

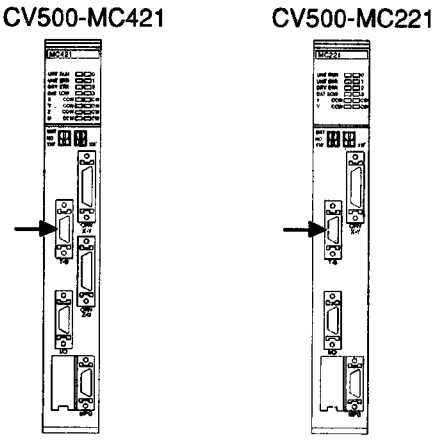
1, 2, 3... 1. Remove the connector cover.



2. Plug the Connecting Cable into the connector.

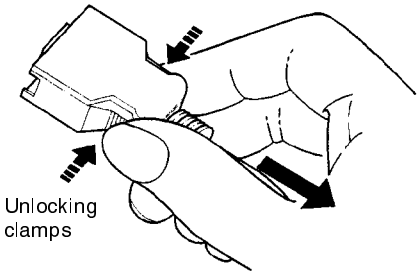


3. Plug the Connecting Cable into the MC Unit connector marked “T.B.”



Removing the Cable

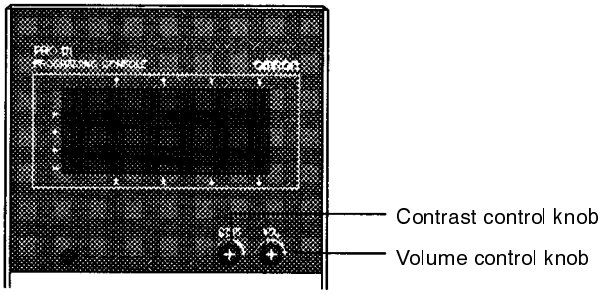
Using your fingers, press in and hold the clamps on both sides of the connector and pull out the connector.



Adjusting the Buzzer and Display Contrast

Turn the volume control knob to adjust the loudness of the buzzer.

Turn the contrast control knob to adjust the contrast of the LCD display.



3-2 Installing in a Panel

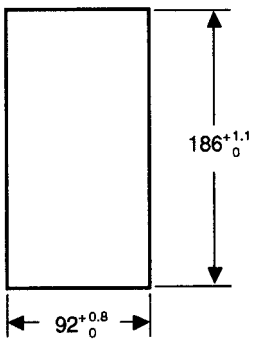
The procedure for installing the Teaching Box in a panel is described below.

Use the C200H-ATT01 Mounting Bracket (separately sold) to instal the Teaching Box in a panel.

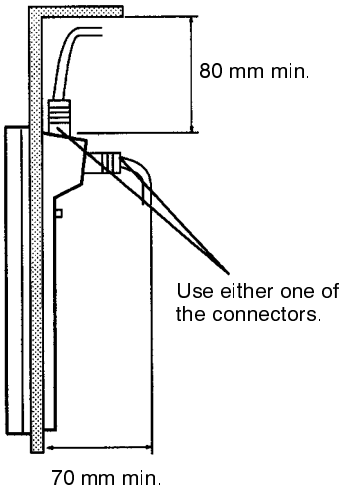
Note When using the Teaching Box inside a control panel, be sure to maintain the ambient temperature between 0 and 55°C.

1, 2, 3... 1. Prepare mounting holes according to the following diagram.

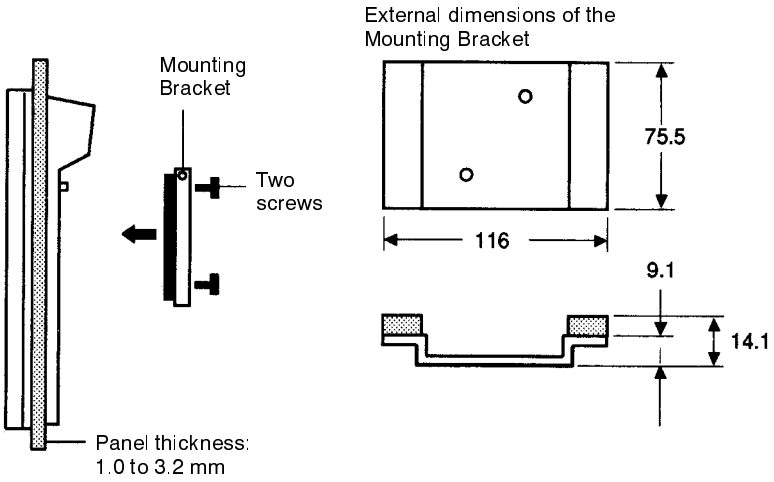
Mounting Hole Dimensions
The following is a standard panel cut.
(Conforming to DIN43700)



2. Provide sufficient spaces so that the connector can be easily connected or disconnected to/from the Teaching Box.



3. Mount the Teaching Box, aligning with the mounting holes and tighten the Mounting Bracket from the back side using screws.

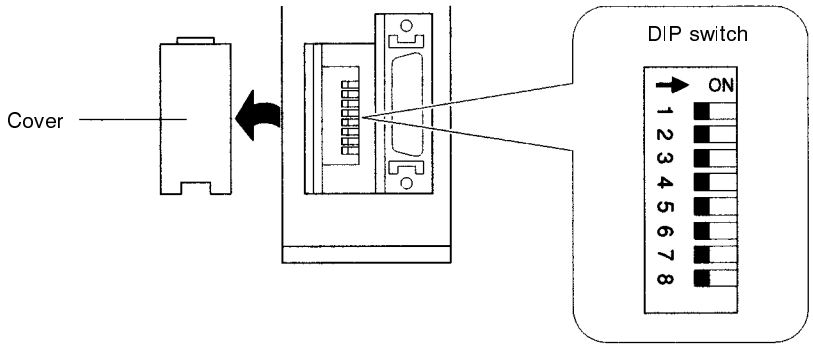


3-3 Display Language

The procedure for changing the language displayed on the Teaching Box between Japanese and English is provided below.

Note Turn off the power to the PC before setting the display language.

1, 2, 3... 1. Remove the DIP switch cover provided on the front of the MC Unit.



2. Set pin 2 of the DIP switch to ON for English and to OFF for Japanese. The default setting is OFF (Japanese). Set it to ON for English displays.

Note The setting of pin 2 on the DIP switch is checked and becomes valid only when the power to the PC is turned on.

SECTION 4
Basic Operations

This section contains information on the basic operations necessary for operating the Teaching Box. Be sure to read this section to fully understand the basic operations before reading detailed descriptions of each function given in following sections.

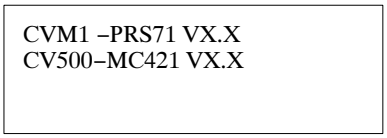
4-1 Initial Operation

The procedure to start operation and the displays that appear right after the power is turned on are described in this section.

1, 2, 3...

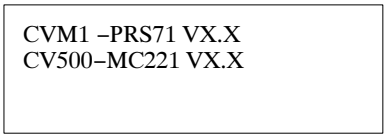
1. Connect the Teaching Box to the MC Unit using the procedure described in *Section* 3 *Connecting the Teaching Box*.
2. Turn on the power to the MC Unit. The following display appears.

CV500-MC421

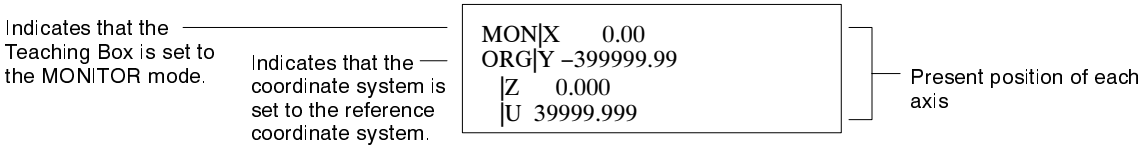


Line 1: Teaching Box model and software version
Line 2: MC Unit model and software version

CV500-MC221



The following display appears in two seconds.



3. Proceed with the desired operation.

Note

1. The control mode of the MC Unit is initially set to the T.BOX LIMITED mode, which allows only monitoring.
2. The Teaching Box is always set to the MONITOR mode when power is turned on.
3. Change the control mode of the MC Unit to perform operations other than monitoring. Refer to *4-2 Changing the MC Unit Control Mode* to change the control mode.

4-2 Changing the MC Unit Control Mode

The mode used to control the MC Unit can be changed using the following procedure.

Control Modes

The MC Unit offers three control modes: T.BOX LIMITED, T.BOX ENABLED, and T.BOX RESERVED. The control mode must be changed depending on the desired operations. The control mode can be changed only from the Teaching Box.

The control mode is initially set to the T.BOX LIMITED mode, which allows monitoring only. When performing operations other than monitoring, set the control mode of the MC Unit to either T.BOX ENABLED or T.BOX RESERVED.

For detailed information on these three control modes, refer to *2-2 MC Unit Control Modes*.

Procedure The following procedure shows how to change to the T.BOX ENABLED mode.

1, 2, 3... 1. Press the EXT Key.

```
EXT|                          1/2
 1.CHANGE MODE
 2.SERVO LOCK
 3.SERVO FREE
```

2. Press the 1 Key.

```
EXT|–CHG MODE–
   | T.BOX
   | LIMITED
   |SWITCH:↑,↓
```

3. Press the Down Key. (Press the Up Key or Down Key to select either T.BOX RESERVED or T.BOX ENABLED.)

```
EXT|–CHG MODE–
   | T.BOX
   | RESERVED
   |SWITCH:↑,↓
```

4-3 Changing the Teaching Box Mode

The mode of the Teaching Box can be changed using the following procedure.

For detailed information on operations in each mode, refer to the following sections of this manual.

Teaching Box Modes

The Teaching Box is initially set to the MONITOR mode.

When operating the Teaching Box in another mode, change the mode using the mode keys.

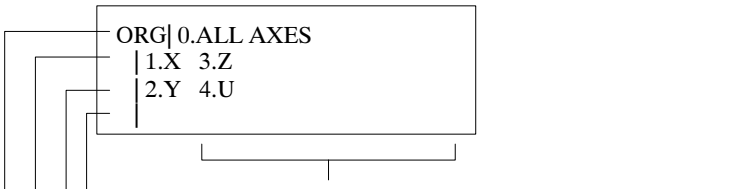
When the control mode of the MC Unit is set to T.BOX LIMITED, only monitoring is possible.

Procedure

The following procedure can be used to change to the ORIGIN SEARCH mode.

1, 2, 3...

1. Set the control mode of the MC Unit to either T.BOX RESERVED or T.BOX ENABLED.
2. Press the ORIG SRCH Key.



Displayed Data Type

MONITOR Mode Displays

ORG:	Monitoring present position
ERC:	Displaying error counter value
IN:	Monitoring/changing input signals
OUT:	Monitoring/changing output signals
D/A:	Monitoring/changing analog output
ERR:	Displaying error information
DT:	Displaying position data
ZMG:	Displaying Z-phase tolerance

Program Execution Modes

CYC:	Cycle run
SIN:	Single block run

Mode and Functions

Modes

MON:	MONITOR mode
ORG:	ORIGIN SEARCH mode
RUN:	RUN mode
JOG:	JOG mode
MPG:	MPG mode
EXT:	EXTENSION mode

Direct Functions

[OV]:	Changing override value
[TH]:	Teaching

Other Functions

[ST]:	Deceleration stop
[RT]:	Error reset

4-4 Direct Functions

Some functions can be executed regardless of the Teaching Box mode, unless the control mode of the MC Unit is set to T.BOX LIMITED. These functions are called direct functions.

Direction Functions

The MC Unit can be operated directly from the Teaching Box.

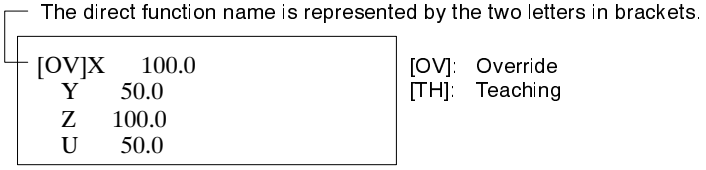
Pressing a direct function key will execute the corresponding function regardless of the Teaching Box mode. The following two direct functions are available

- Changing the override value
- Teaching position data

Procedure

The following procedure can be used to change the override value.

Press the OVERRIDE Key.



Refer to *Section 8 Direct Functions* for further details on direct functions.

4-5 Basic Input Operations

Basic input operations that are common in the Teaching Box operations are described below.

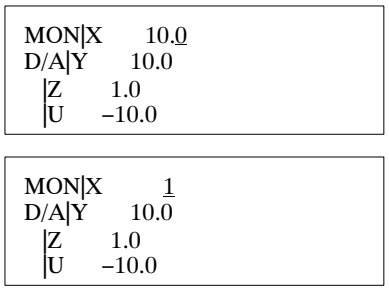
Basic Operation 1

Inputting Numeric Values

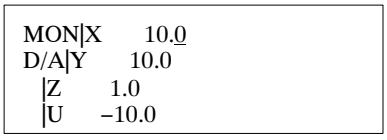
Use the 0 to 9, ., +/– Keys to input numeric values.

When a numeric value is input, the previous value is deleted.

(Example)



If the number just input is wrong, press the CLR Key to return to the previous value.



Basic Operation 2

Setting Input Values

There are two ways to set input values.

One way is to press a specific key other than a numeric key or CLR Key after inputting a numeric value. This method is used when inputting data, such as a program number, that does not need to be stored in the system.

Do not press the WRITE Key when not storing data in the system. When changing the D/A output, press the WRITE Key.

The other way is to press the WRITE Key after inputting a numeric value. This method is used when inputting data, such as position data, that must be stored in the system.

If there is more than one input item, pressing the WRITE Key will move the cursor to the next item.

Basic Operation 3

Returning to the Previous Display

Press the CLR Key to return to the previous display. If the CLR Key is pressed while inputting numeric values, it will return the display to the previous numeric value.

Press the CLR Key several times to return to the initial display for the current modes.

Basic Operation 4

Buzzer Operation

Each buzzer sound has the following meaning.

Sound	Meaning
Beep (short)	A valid key was pressed.
Beep-beep-beep (short)	An operation was attempted for an axis that is not controlled by the MC Unit. An invalid key was pressed. An error occurred.
Beep (longer)	An attempt was made to execute an invalid function for the current display.

Basic Operation 5

Cursor Displays

The cursor appears as a "–" mark at the first input item only in displays that require input of numeric values.

4-6 Handling Error Messages

Descriptions of error message displays and operations for clearing errors are shown below.

Error Message Displays

The Teaching Box continuously monitors the status of the system, tasks, and axes, and displays any errors that are detected. If more than one error occurs at the same time, an error message is displayed based on the following conditions.

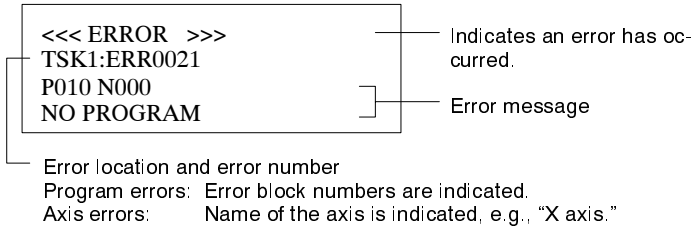
The buzzer sounds when an error message is displayed.

- Only the first system error detected is displayed and stored in memory.
- Only the first task error detected for each task is displayed and stored in memory.
- Only the first axis error detected for each axis is displayed and stored in memory.

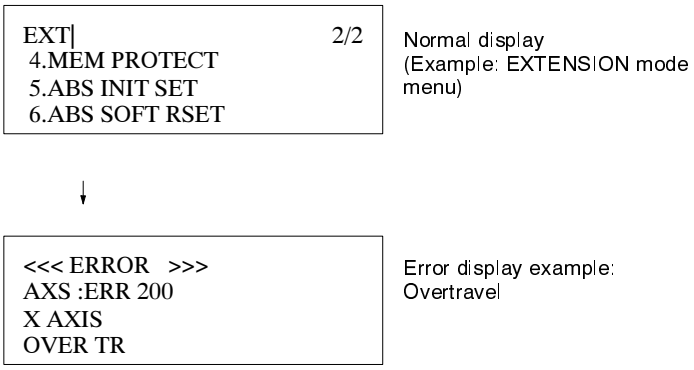
Therefore, if using four tasks for four axes, a maximum of nine errors can be displayed and stored in the memory.

Note For further details on error messages, refer to *Appendix A Error Message List*.

Error Display Example



Clearing and Resetting Errors Use the following procedure to clear error messages.



1, 2, 3... 1. Press the CLR Key.

The displayed error is cleared and the disp;ay returns to the one that existed just before the error occurred.

2. Press the ERR CLR Key.

After resetting the error display, remove the cause of the error. Unless the cause of the error is removed, the same error will occur when the same function is executed.

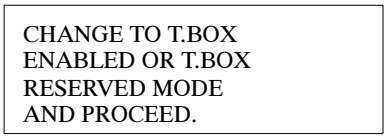
Note For further details on resetting errors, refer to *9-2 Resetting Errors*.

4-7 Warning Messages

There are some functions that cannot be operated depending on the control mode of the MC Unit. When an invalid function is selected, a warning message is displayed.

Restricted Functions

When the functions that cannot be operated unless the MC Unit is set to the T.BOX ENABLED or T.BOX RESERVED is selected, the following message is displayed. The buzzer sound when this message is displayed.



Clearing Warning Messages

If an EXTENSION mode function for an absolute encoder is selected with the control mode set to the T.BOX LIMITED, the operation will proceed as follows:

EXTENSION Mode Menu

```
EXT|                    2/2
 4.MEM PROTECT
 5.ABS INIT SET
 6.ABS SOFT RSET
```

1, 2, 3...

1. Press the 6 Key with the mode set to the T.BOX LIMITED.

Warning Message

```
CHANGE TO T.BOX
ENABLED OR T.BOX
RESERVED MODE.
AND PROCEED.
```

2. Press the CLR Key.

   The warning message is cleared and the display returns to the one that existed just before the message appeared.

```
EXT|                    2/2
 4.MEM PROTECT
 5.ABS INIT SET
 6.ABS SOFT RSET
```

4-8 Axis and Task Displays

Axes and tasks are displayed as shown below.

Axis Displays

The MC Unit is capable of controlling a maximum of four axes. Accordingly, the axis data includes information on all four axes.

If you try to operate an axis that is not being used, a warning message will be displayed.

Example: Monitor Display

```
MON|X   −100.00
ORG|Y    −10.1
   |Z     10.0
   |U    990.99
```

Task Displays

Axis data is displayed for each task, as shown in the following display.

Example: Teaching Display

```
[TH]X    100.00
   Y   1000.0
TK1 Z     10.0
0000U
```

← No data is displayed for the U axis because it has not been assigned to the task 1.

Task No.

SECTION 5
MONITOR Mode Operations

This section describes the methods for monitoring five kinds of data. The procedures described in the first subsection is required for monitoring any type of data. Read the first subsection before reading any other subsection.

5-1 MONITOR Mode

The following five kinds of data can be monitored in the MONITOR mode.

Menu item	Function
1. PRESENT POSITION	Monitors the present position.
2. IN/OUT	Monitors or changes I/O signals.
3. ERROR	Reads error information.
4. POSITION DATA	Monitors position data.
5. Z-PHASE TOLERANCE	Monitors the Z-phase tolerance.

Note For the details on each function, refer to *5-2 Monitoring the Present Position* through *5-6 Monitoring Position Data*.

Use the following procedure to access the MONITOR mode menu and select a function.

1, 2, 3... 1. Press the MON Key. The present position is displayed.

```
MON|X      0.00
ORG|Y –399999.99
   |Z      0.000
   |U  39999.999
```

2. Press the CLR Key. The MONITOR mode menu is displayed.

```
MON|                          1/2
 1.PRESENT POSIT
 2.IN/OUT
 3.ERROR
```

3. Press the Down Key to see the remaining portion of the menu.
   These two displays can be switched with the Up and Down Keys.

```
MON|                          2/2
 4.POSITION DATA
 5.Z–PHASE TOLER
```

4. Press one of the numeric keys 1 to 5 to select the desired operation.

5-2 Monitoring the Present Position

This operation can be used to display the present position for four axes: X, Y, Z and U.

Data for axes that are not being used is also displayed. If an encoder is not connected to an axis that is not being used, the display will read "0." If it is connected, the display increases or decreases depending on the rotation of the encoder.

Note This function can also be executed by selecting "1. PRESENT POSITION" in the MONITOR mode menu.

Procedure

Use the following procedure to monitor the present position.

Press the MON Key. The present position in the reference coordinate system is displayed.

```
MON|X      0.00
ORG|Y –399999.99
   |Z*     0.000
   |U      0.000
```

Note An asterisks (*) indicates that the origin is not defined.

Press the Up or Down Key to change the display method as shown below.

Press the Down Key to display the present position in the reference coordinate system in pulses.

```
MON|X        0P
ORG|Y –39999999P
   |Z*       0P
   |U        0P
```

Note "P" indicates that the unit is pulse.

Press the Down Key again to display the error counter value in pulses.

```
MON|X      –200P
ERC|Y       100P
   |Z*     –10P
   |U        0P
```

Note If the unit is pulse, values multiplied by 4 are displayed. For example, if the Encoder resolution is 1000 p/r and if it makes one turn from 0 pulses, the following value is displayed: 1000 x 4 =4000

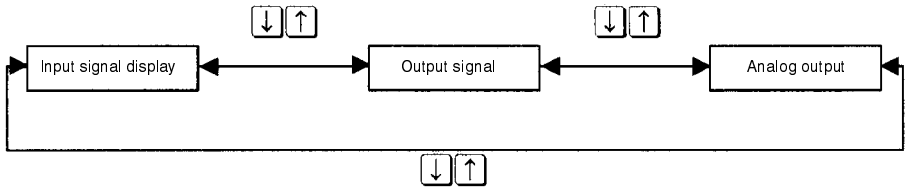
5-3 Monitoring and Changing I/O Signals

This operation is used to display the status of input signals, output signals, and analog output. The values of output signals and analog output can be changed.

The status of the following input and output signals are displayed.

Type	Signal
Input signals	Origin, CCW limit, CW limit, driver alarm input, immediate stop, and general-purpose inputs
Output signals	Run command, alarm reset, sensor ON, and general-purpose outputs
Analog output	Displays analog output in the range between –10.0 V and +10.0 V.

The input signal display, output signal display, and analog output display can be changed using the Up and Down Keys.



Procedure 1

Use the following procedure to monitor input signals.

1, 2, 3...

1. Select "2. IN/OUT" from the MONITOR mode menu,

```
MON|       XYZU
IN |ORIG POS0100
   |CCW LIMT0001
```

1: ON
0: OFF

2. Change the display using the Up and Down Keys.

```
MON|      XYZU
IN |DRV ALRM0010
   |STOP   0010
   |
```

DRV alarm: Driver alarm input

```
MON|      1234
IN |GET IN  0010
   |
   |
```

GET IN: General-purpose inputs

Procedure 2 Use the following procedure to monitor the output signals.

1, 2, 3... 1. With the last screen of Procedure 1 displayed, press the Down Key.

```
MON|      XYZU
OUT|RUN COM 0010
   |ALM RSET0000
   |SENSR ON0000
```

2. Change the display using the Up and Down Keys.

```
MON|      1234
OUT|GET OUT 0010
   |
   |
```

GET OUT: General-purpose outputs

Procedure 3 Use the following procedure to monitor the analog outputs.

With the last screen of the Procedure 2 displayed, press the Down Key.

```
MON|X      10.0
D/A|Y*     10.0
   |Z      1.0
   |U     –10.0
```

Analog output status is displayed in the range between –10.0 V and +10.0 V.

Note When changing a value in Procedure 4 or 5, the following two conditions must be satisfied.

- The control mode of the MC Unit must be set to a mode other than the T.BOX LIMITED.
- The servo for all axes must not be locked.

One of the following message is displayed if the above two conditions are not satisfied.

```
CHANGE TO T.BOX
ENABLED OR T.BOX
RESERVED MODE
AND PROCEED.
```

```
PUT ALL AXES IN
SERVOFREE STATUS
AND THEN PROCEED
```

Press the CLR Key to return to the previous display.

Note Refer to *4-2 Changing the MC Unit Control Mode* to change the control mode. Refer to *7-3 Freeing Servos* for information on freeing the servos

Procedure 4 Use the following procedure to change the output signals.

1, 2, 3... 1. After selecting the output signal from the MONITOR mode display, press the CHG Key.

Press the CLR Key to return to the initial display.

2. Follow the steps given below to change the value.
   a) Use the Up and Down Keys to move the cursor.
   b) Using the 1 and/or 0 Keys, input data in the range between 0000 and 1111. Example: To output a RUN command for the U axis without changing any other axes, input "0011."
   c) If necessary, press the CLR Key when inputting data to return to the output state displayed just before inputting the new state.
3. Press the WRITE Key to set and output the newly input data.

Procedure 5 Use the following procedure to change an analog output.

1, 2, 3... 1. After selecting the analog output from the MONITOR mode display, press the CHG Key.

2. Change the value.
   • Data can be input in the range between −10.0 and +10.0.
   • Other input procedures are the same as in Procedure 4, above.
3. Press the WRITE Key. The newly input data is defined and output.

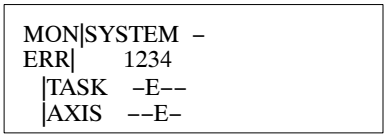
5-4 Error Data Displays

Information on errors that have occurred in the system or in tasks 1 to 4 can be read and displayed using this operation. If an error occurs during normal operation, the display automatically changes to the error display.

Note For details on automatic error displays and error resetting, refer to *9-2 Resetting Errors*.

Procedure Use the following procedure to access error data.

1, 2, 3... 1. Select "3. ERROR" from the MONITOR mode menu.
   • "E" is displayed where errors have occurred.
   • "−" indicates a normal state (no error).
   • "1" to "4" correspond to the X through U axes.



Note If an error has occurred in more than one item, change the display using the Up and Down Keys.

2. Press the Down Key Error to display errors in the following order: system, task 1, task 2, task 3, task 4, X axis, Y axis, Z axis, and U axis. Only items where errors have occurred are displayed.

Example: Error in Program Execution

```
<<< ERROR   >>>
TSK2:ERR0021
P010 N000
NO PROGRAM
```

Example: Error in Jogging

```
<<< ERROR   >>>
AXS :ERR 200
X AXIS
OVER TR
```

5-5 Monitoring Position Data

This operation is used to display position data stored in the MC Unit. The position data is stored in A0000 to A1999.

Procedure

Use the following procedure to display position data.

1, 2, 3...

1. Select “4.POSITION DATA” from the MONITOR mode menu.

```
MON|POSIT  A0000
DT |
   |
   |
```

2. Input the address number of the first position to be monitored. “100” is input in this example. If this step is skipped, the display starts from A0000.

```
MON|POSIT  A0100
DT |
   |
   |
```

3. Press the Down Key.

```
A0100=–399.99999
A0101=     0.000
A0102=–     1.0
A0103= 3999.9999
```

Four positions starting from the one designated in step 2 are displayed.

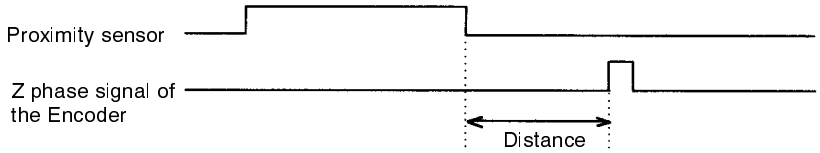
```
A0101=     0.000
A0102=–     1.0
A0103= 3999.9999
A0104=   50.0000
```

Press the Down Key to display the next positions and the Up Key to display the previous positions.

5-6 Monitoring the Z-Phase Tolerance

This operation is used to display the Z-phase tolerance.

When all the axes complete the origin search operations, the distance between the proximity sensor and the Z phase signal of the encoder is displayed as an absolute value (pulses x4).



Note This function is normally used during adjustments of the system after the origin search operations are completed.

1, 2, 3... 1. Select “5. Z-PHASE TOLERANCE” from the MONITOR mode menu.

```
MON|X     1000P
ZMG|Y*       0P
  |Z       11P
  |U     2000P
```

An asterisk (*) indicates that the origin has not been defined.

In this example, the tolerance for the Y axis is not displayed because the origin search operation for the Y axis has not been completed.

SECTION 6
Origin Searches, Program Execution, Jogging, and MPG

This section provides information on procedures for origin searches, program execution, jogging, and handle feeding operations. Execute these operations only after locking the servo for the axis to be moved.

6-1 Origin Search

This operation is used to execute origin searches for a specified axis or for all axes. There are two kinds of origin search operations.

- Using an incremental encoder
- Using an absolute encoder

For axes using incremental encoders, the present position will be force-set to 0 to define the present position as the origin if the origin search operation is entered with origin search method set to set the origin when power is turned on.

If the origin search method is set to any other method, the origin search is executed using the following two steps

Step 1: The machine origin is located
Step 2: A move is made to the origin in the reference coordinate system.

Origin searches using an absolute encoder are executed by one action, i.e., a move is made to the machine origin (i.e., in the reference coordinate system).

Press the PAUSE Key to cancel an origin search during execution.

Note

1. The offset value between the machine origin and the origin in the reference coordinate system must be set in advance using the system parameter.
2. The origin search mode is specified as a system parameter.

Procedure

Use the following procedure to execute an origin search for all axes.

1, 2, 3...

1. Press the ORIG SRCH Key.

```
ORG| 0.ALL AXES
   | 1.X   3.Z
   | 2.Y   4.U
   |
```

2. Press the 0 Key. (If selecting an individual axis, press one of the numeric Keys 1 to 4.)

```
ORG|
   | OK?
ALL|
   | YES / NO
```

Indicates that all axes have been selected. Selected axes are indicated as follows: ALL: All axes, X: X axis, Y: Y axis, Z: Z axis and U: U axis

3. Press the YES Key.

   The origin search is started and the present position monitor display appears. The present position is updated for the axes in motion.

```
ORG|X*      0.00
   |Y*–399999.99
ALL|Z*     0.000
   |U*      0.00
```

An asterisk (*) indicates that the origin has not been defined.

When an axis has come to a stop at the origin in the reference coordinate system, the origin search is completed and the asterisks in the display disappear. The following display appears then the search has been completed for all designated axes.

```
ORG|
   |
ALL| COMPLETE!
   |
```

4. Press the CLR Key. The axis selection display shown in step 1, above, will return.

Note The CLR Key is not valid during origin searches, Press the PAUSE Key to cancel the origin search.

6-2 Program Execution

This operation is used to execute the program using a cycle run or a single-block run. A program and task stored in the MC Unit are designated for execution.

Cycle Run
The designated program is executed from the beginning.

Single-block Run
The designated program is executed block by block.

Note Programs can be easily debugged by alternately executing them using a cycle run and single-block run.

Procedure

Use the following procedure to access the RUN mode menu.

1, 2, 3...

1. Press the PROG EXEC Key.

```
RUN|1.CYCLE RUN
   |2.SINGLE RUN
   |
   |
```

2. Press the 1 or 2 Key to select either the cycle run or single-block run.
3. Refer to the procedures in the next two subsections to continue.

6-3 Cycle Run

This operation is used to execute a designated program from the beginning.

Procedure

Use the following procedure to execute a program in a cycle run.

1, 2, 3...

1. Select “1. CYCLE RUN” from the RUN mode menu.

```
RUN|–CYCLE RUN–
CYC|PROGRM P000
TK1|BLOCK  N000
   | RUN: START
```

Indicates task 1.
Press the TASK CHG Key to change the task.

2. Designates the program number. In this example, “50” has been input.

```
RUN|–CYCLE RUN–
CYC|PROGRM P050
TK1|BLOCK  N000
   | RUN: START
```

If the program has been altered from the MC Support Software, input the program number again even to execute the same program. If the program number is not input again, an error will occur. The new program will be executed from the first block.

3. Press the PROG EXEC Key.

```
RUN|STATUS RUN
CYC|PROGRM P050
TK1|BLOCK  N010
   |
```

Status
RUN: Under operation
END: Operation completed
ERR: Error occurred.
PAUSE: Temporarily stopped

If the PAUSE Key is pressed, the program is temporarily stopped and the display changes to the previous one. Program execution resumes when the PROG EXEC is pressed. If the program number is input, the program starts from the beginning. The program cannot be executed if any error has occurred.

4. Press the CLR Key to return to the RUN mode menu. The CLR Key is not valid during program execution. Pressing the CLR Key while the status is END or ERR will return to the restart display.

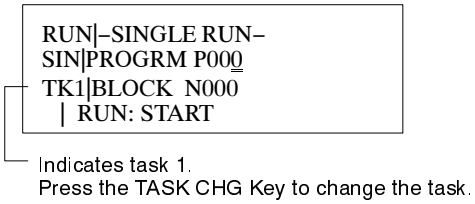
Note Programs can be more easily debugged by alternately executing cycle runs and the single-block runs using the following type of procedure. Press the PAUSE Key during cycle run execution to stop the program. Then, press the CLR Key to access to the RUN mode menu. Select the single-block run operation on the menu to resume operation using a single-block run.

6-4 Single-block Run

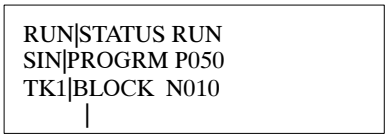
This operation is used to execute programs block by block.

Procedure Use the following procedure to execute a program block by block.

1, 2, 3... 1. Select “2. SINGLE RUN” from the RUN mode menu.

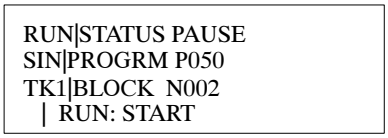


2. Designate a program number. In this example, “50” is input.
3. Press the PROG EXEC Key. The first block of the program number 50 is executed.



Press the PAUSE Key to stop cancel execution in progress.

When first block has been executed, the status is set to PAUSE and the execution stops. The next block number to be executed is displayed.



Press the PROG EXEC Key while the status is set to PAUSE to execute the next block.

4. Press the CLR Key to return to the display to input the program number. Press the CLR Key again to return to the RUN mode menu display.

6-5 Jogging

This operation is used to jog an axis.

The actual feedrate used for jogging is determined according to the following formula.

Feedrate = Override (%) x Maximum jog feedrate

The maximum jog feedrate is set as a parameter in advance.

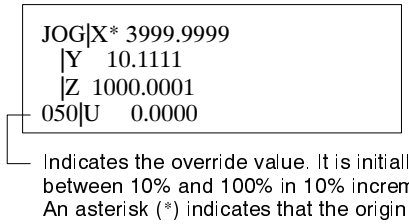
Note If you want to teach positions during jogging, press the TEACH Key where necessary. Refer to *8-2 Teaching* for information on teaching.

Procedure

Use the following procedure to jog.

1, 2, 3...

1. Press the JOG Key. The JOG mode is entered and the following display appears.



The value set in this step will not be cleared until the MC Unit power is turned off or the Teaching Box is disconnected.

Note The override value used here is valid only in the JOG mode. When the mode is changed, the override value that existed before selecting the JOG mode becomes valid until the JOG mode is entered again. The operating feedrates are thus not affected by the change between RUN mode and JOG mode.

2. Press one of the following jog feed keys:

+X, –X, +Y, –Y, +Z, –Z, +U and –U Keys.

The selected axis is jogged and the present position on the display is updated.

6-6 Handle Feeding

This operation is used to designate the axis and the MPG multiplication factor for handle feeding. The MPG multiplication factor can be selected out of the four values registered in the system parameters.

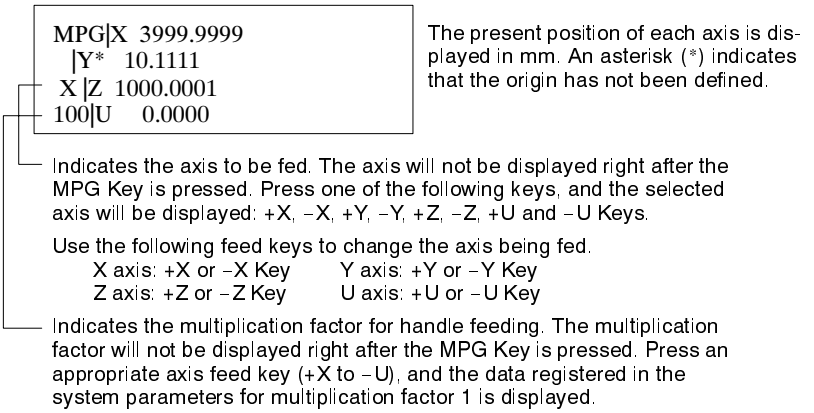
Note If you want to teach positions during handle feeding operations, press the TEACH Key where necessary. Refer to *8-2 Teaching* for information on teaching.

Procedure

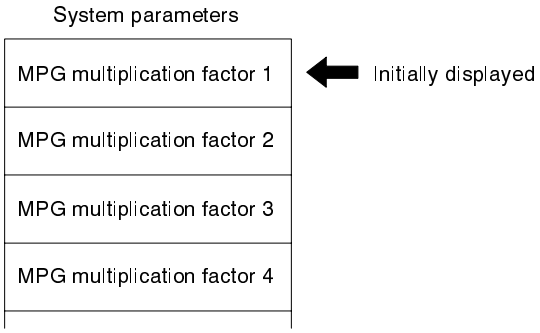
Use the following procedure to execute handle feed operations.

1, 2, 3...

1. Press the MPG Key. The MPG mode is entered and the following display appears.



Any one of the four MPG multiplication factors registered in the system parameters can be used. Select a desired one using the Up and Down Keys.



2. Turn the MPG connected to the MC Unit to feed the selected axis.
3. If turning the MPG by one scale unit feeds the axis exactly the amount designated by the multiplication factor, use the following procedure to feed the axis.
   a) Stop the MPG. (Don't turn it.)
   b) Press the MPG Key.
   c) Select a desired axis.
   d) Turn the MPG to feed the selected axis.

⚠ Caution In the following cases, turning the MPG by one scale unit may not feed the axis by the amount designated by the multiplication factor.
1. The MPG Key was pressed to select an axis while turning the MPG.
2. The axis being operated was changed while turning the MPG.

SECTION 7
EXTENSION Mode Operations

This section provides information on changing MC Unit control modes, locking and freeing servos, protecting memory, and absolute encoder functions.

7-1 EXTENSION Mode

The following operations can be executed in the EXTENSION mode.

Operation	Function
1. CHANGE MODE	Changes the control mode of the MC Unit. The control mode is initially set to the T.BOX LIMITED mode. The control mode must be changed when executing any operations other than monitoring.
2. SERVO LOCK	Locks the servo for a designated axis or for all axes.
3. SERVO FREE	Frees the servo for a designated axis or for all axes.
4. MEM PROTECT	Protects or frees the memory of the MC Unit.

Note Refer to *4-2 Changing the MC Unit Control Mode* to change the control mode.

Procedure

Use the following procedure to access the EXTENSION mode menu.

1, 2, 3...

1. Press the EXT Key.

```
EXT|                    1/2
 1.CHANGE MODE
 2.SERVO LOCK
 3.SERVO FREE
```

Using the Up or Down Cursor Key, scroll up or down the menu.

```
EXT|                    2/2
 4.MEM PROTECT
 5.ABS INIT SET
 6.ABS SOFT RSET
```

2. Press one of the numeric Keys 1 to 4 to select an operation.

   Note "5.ABS INIT SET" and "6.ABS SOFT RSET" are not supported.

3. Refer to the following sections for the procedures for individual operations.
4. Press the CLR Key after completing the selected operation. The display returns to the EXTENSION mode menu.

7-2 Servo Lock

This operation can be used to lock the servo for a selected axis or for all axes.

Procedure

Use the following procedure to lock a servo.

1, 2, 3...

1. Select "2.SERVO LOCK" from the EXTENSION mode menu.

```
EXT|-SERVO FREE-
  |0.ALL AXES
  |1.X  3.Z
  |2.Y  4.U
```

2. Select the axis(es) for which the servo is to be lock. In this example, all axes are selected.

```
EXT|-SERVO LOCK-
  |OK?
ALL|
  |YES / NO
```

Indicates selected axes as follows:
ALL: All axes; X: X axis; Y: Y axis; Z: Z axis; U: U axis

3. Press the YES Key to lock the servo. When completed the operation has been , the following display appears.

```
EXT|–SERVO LOCK–
   |
ALL| COMPLETE!
   |
```

7-3 Servo Free

This operation can be used to free the servo for a selected axis or for all axes.

Procedure

Use the following procedure to free a servo.

1, 2, 3...

1. Select “3.SERVO FREE” from the EXTENSION mode menu.

```
EXT|–SERVO FREE–
   |0.ALL AXES
   |1.X   3.Z
   |2.Y   4.U
```

2. Select the axis(es) for which the servo is to be freed. In this example, all axes are selected.

```
EXT|–SERVO FREE–
   | OK?
ALL|
   | YES / NO
```

Indicates selected axes as follows:
ALL: All axes; X: X axis; Y: Y axis; Z: Z axis; U: U axis

3. Press the YES Key to free the servo. When the operation has been completed, the following display appears.

```
EXT|–SERVO FREE–
   |
ALL| COMPLETE!
   |
```

7-4 Memory Protect/Release

This operation can be used to protect or release the protection of memory in the MC Unit.

Procedure Use the following procedure to protect or release protection from memory.

1, 2, 3... 1. Select “4. MEMORY PROTECT” from the EXTENSION mode menu.

```
EXT|–MEM PROT–
   |PROTECTED
   |
   |SWITCH:↑,↓
```

Memory is initially protected when operation is started.

2. Select “protected” or “released” using the Up or Down Key.

When the Up or Down Key is pressed, the selected mode, the display will toggle between “protected” and “released.”

Note If the TEACH Key is pressed while the memory is protected, the following display appears.

```
POSITION DATA IS
PROTECTED.
RELEASE THE PRO–
TECT AND PROCEED
```

Press the CLR Key to return to the previous display.

SECTION 8
Direct Functions

This section describes procedures for changing the override value and for teaching. The functions described in this section can be executed in any control mode.

8-1 Changing the Override Value

This operation can be used to change the override value for each axis. The current override value is displayed for each axis.

Procedure Use the following procedure to change the override value.

1, 2, 3... 1. Press the OVERRIDE Key.

```
[OV]X    100.0
  Y*     50.0
  Z     100.0
  U      50.0
```

An asterisk (*) indicates that the origin has not been defined.

Pressing the CLR Key from this initial display will return to the previous mode.

2. Press the CHG Key.

```
[OV]X    100.0
  Y*     50.0
  Z     100.0
  U      50.0
```

← The cursor appears.

3. Using the Up and Down Keys, move the cursor to the value to be changed. In this example, the cursor is moved to the Z axis value.

```
[OV]X    100.0
  Y*     50.0
  Z     100.0
  U      50.0
```

4. Using the numeric Keys, input a new override value between 0.1 and 199.9. In this example, 111.5 is input.

```
[OV]X    100.0
  Y*     50.0
  Z     111.5
  U      50.0
```

If a wrong value is input, press the CLR Key. The previous override value will return.

5. Press the WRITE Key to set the newly input data.

8-2 Teaching

This operation can be used to teach position data. Positions set by jogging or handle feeding can be written into designated addresses using this operation.

Note This operation cannot be executed if the present position has not been defined or if the memory of the MC Unit is protected. Free the protect to execute this function. If tried to execute the function while the memory is protected, the following message will be displayed.

```
POSITION DATA IS
PROTECTED.
RELEASE THE PRO–
TECT AND PROCEED
```

Press the CLR Key to return to the previous display.

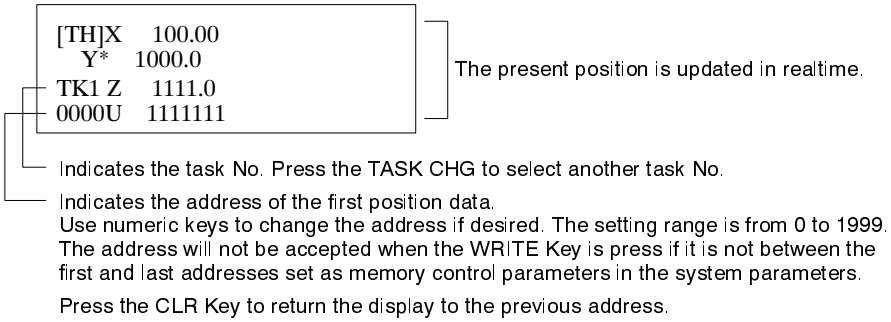
Note For releasing the protection of the memory, refer to Section 7-4 Memory Protect/ Release.

Procedure

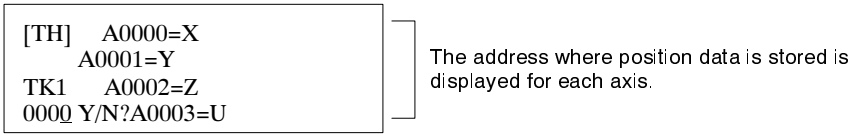
Use the following procedure to teach position data

1, 2, 3...

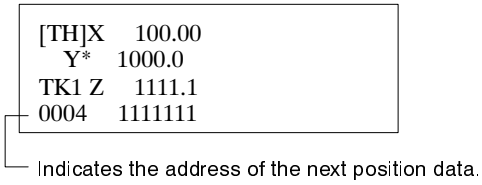
1. Press the TEACH Key. The present position of the axes controlled by task 1 are displayed.



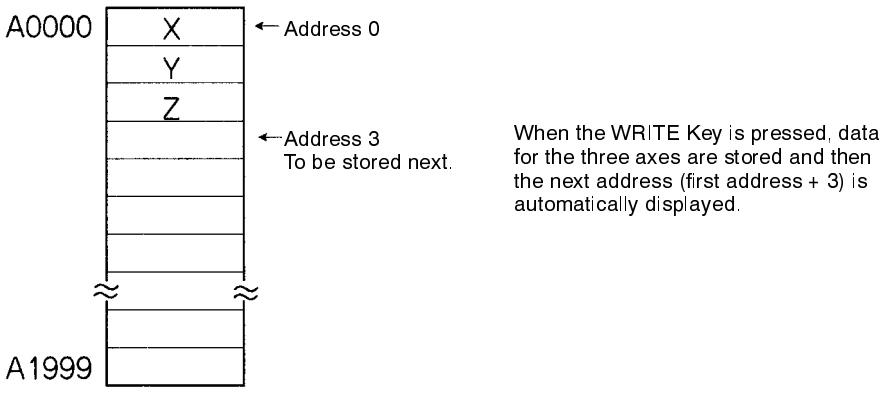
2. Press the WRITE Key.



3. Press the YES Key to write the position data.



Note Position data is stored in series for the axes controlled by one task. The following example shows memory addresses when the X, Y and Z axes are controlled by task 1.



SECTION 9
Other Operations

This section describes deceleration stops, resetting error, and wiring checks.

9-1 Deceleration Stop

This operation can be used to decelerate and stop all axes and, at the same time, to stop program execution.

Procedure Use the following procedure to execute a deceleration stop.

1, 2, 3... 1. Press the DEC STOP Key.

```
[ST]

ALL TASKS STOP !
```

2. Press the CLR Key to return to the MONITOR mode.

Note A deceleration stop is treated as a system error. After pressing the DEC STOP Key, press the ERR CLR Key to reset the error. Unless the error is reset, other operations cannot be executed.

9-2 Error Resetting

This operation can be used to reset an error in the MC Unit or the servodriver.

Procedure 1 Use the following procedure to reset an error occurred in the MC Unit.

1, 2, 3... 1. Press the ERR CLR Key.

```
[RT]

 1.MC UNIT
 2.DRIVER
```

2. Press the 1 Key.

```
[RT]    MC UNIT

RESET ERROR ?
  YES / NO
```

3. Press the YES Key. The error will be reset only for the task where it occurred.

```
[RT]    MC UNIT

ERROR RESET !
```

Procedure 2 Use the following procedure to reset an error in the servodriver.

1, 2, 3... 1. Select “2.DRIVER” from the menu shown in step 1 in procedure 1.

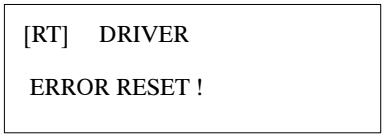
```
[RT]     DRIVER
    0.ALL AXES
    1.X  3.Z
    2.Y  4.U
```

2. Using the 0 to 4 Keys, select an axis for which to reset the error. In this example, all axes are selected.

```
[RT]    DRIVER
 <ALL AXES>
 RESET ERROR ?
   YES / NO
```

Indicates the axes selected.
0: All axes; 1: X axis; 2: Y axis; 3: Z axis; 4: U axis

3. Press the YES Key to reset the error for the selected axes.



9-3 Wiring Check

This operation can be used to check if the MC Unit is properly connected to external devices. This operation is normally executed when operating the MC Unit for the first time or when an error occurs during operations.

I/O connections and encoder connections can be checked using this operation.

Procedure

Use the following procedure to check wiring.

1, 2, 3...

1. Set the control mode to T.BOX RESERVED.
2. Select the MONITOR mode and carry out the following checks.
   - Check if I/O signal lines are correctly connected using the I/O signal monitor display.
   - Check if the encoder is correctly connected by monitoring the present position.

Note Refer to *5-2 Monitoring the Present Position* and *5-3 Monitoring and Changing I/O Signals* for MONITOR mode procedures.

Appendix A
Error Message List

The error messages, probably causes, and most likely remedy are shown in the following table.

These messages are output by the system in the MC Unit. The buzzer sounds when the message is displayed.

No.	Messages	Causes and Remedy
1	POSITION DATA IS PROTECTED. RELEASE THE PRO– TECT AND PROCEED	One of the following operations was performed with the memory protected.: The TEACH key was pressed. The WRITE key was pressed. Switch to the EXTENSION mode and release the memory protection. See section 7-4.
2	TURN OFF DIP SW No.1 AND THEN PROCEED.	One of the ABS Encoder functions in the EXTENSION mode was selected with pin 1 on the DIP switch of the MC Unit turned ON. Turn OFF pin 1 on DIP switch of the MC Unit.
4	AN ERROR HAS OCCURRED. RESET ERROR AND THEN PROCEED.	An attempt was made to execute a function other than monitoring or a deceleration stop while am error message was displayed. Reset the error. See section 9-2.
5	CHANGE TO T.BOX ENABLED OR T.BOX RESERVED MODE AND PROCEED.	An attempt was made in the T.BOX LIMITED mode to execute a function that can be executed only in the T.BOX ENABLED or T.BOX RESERVED. Change the mode to either T.BOX ENABLED or T.BOX RESERVED. See section 4-2.
6	PUT ALL AXES IN SERVOFREE STATUS AND THEN PROCEED	An attempt was made to change the D/A output or output signal with the servo locked. Free the servo for all axes. See section 7-3.
7	SYSTEM PARA– METERS ARE COR– RUPTED. DOWNLOAD SYSTEM PARAMETER	The system parameters are corrupted for some reasons. Download the system parameters using the MC Support Software. After downloading, restart the MC Unit or reset the power. No operation will be possible while this message is displayed.
8	ORIGIN IS NOT ESTABLISHED. ESTABLISH ORIGIN AND THEN PROCEED	An attempt was made to teach the present position without establishing the origin. Establish origin for all axes controlled by the task and then proceed.
9	PUT THE AXIS IN SERVOLOCK STATUS AND THEN PROCEED	An attempt was made to execute MPG feeding or jogging without locking the servos. Lock the servos for the designated axes and then proceed.

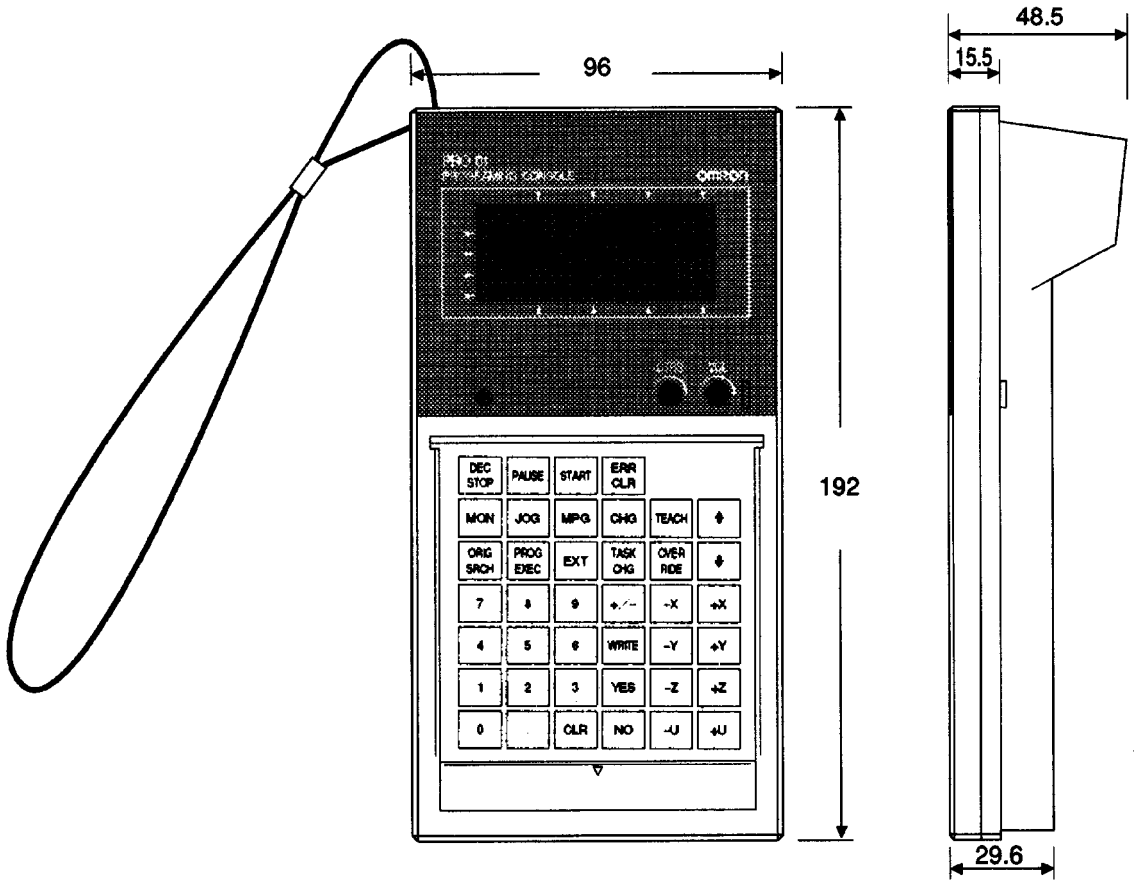
Appendix B
Specifications and External Dimensions

General specifications and external dimensions are given below.

General Specifications

Item	Specifications
Power supply	300 mA or less at 5 VDC +5%/−10%, (Supplied from the MC Unit)
Ambient operating temperature	0 to 55 °C
Ambient operating humidity	10% to 90% (no condensation)
Ambient operating atmosphere	No corrosive gasses
Storage temperature	−20 to 75 °C
Display	Semi-transmissive liquid crystal display (with LED) 16 characters x 4 rows; 5 x 7 dots/character
Weight	370 g
External dimensions	192 x 96 x 48.5 mm (H x W x D)

External Dimensions (Unit: mm)



Glossary

absolute position A position given in respect to the origin rather than in respect to the present position.

acceleration/deceleration curve Curves which determine the rate of acceleration to the maximum feed rate and the rate of deceleration from the maximum feed rate.

auxiliary bit A bit in the Auxiliary Area.

Backplane A base to which Units are mounted to form a Rack. Backplanes provide a series of connectors for these Units along with buses to connect them to the CPU and other Units and wiring to connect them to the Power Supply Unit. Backplanes also provide connectors used to connect them to other Backplanes.

basic instruction A fundamental instruction used in a ladder diagram. See *advanced instruction*.

baud rate The data transmission speed between two devices in a system measured in bits per second.

BCD Short for binary-coded decimal.

binary A number system where all numbers are expressed in base 2, i.e., numbers are written using only 0's and 1's. Each group of four binary bits is equivalent to one hexadecimal digit. Binary data in memory is thus often expressed in hexadecimal for convenience.

bit The smallest piece of information that can be represented on a computer. A bit has the value of either zero or one, corresponding to the electrical signals ON and OFF. A bit represents one binary digit. Some bits at particular addresses are allocated to special purposes, such as holding the status of input from external devices, while other bits are available for general use in programming.

block number Numbers used to distinguish blocks in MC programs. Block numbers are roughly equivalent to program line numbers.

bus A communications path used to pass data between any of the Units connected to it.

channel See *word*.

CIO Area A memory area used to control I/O and to store and manipulate data. CIO Area addresses do not require prefixes.

comment block A program block that contains comments input by the programmer. Comment blocks and program blocks share the same block numbers, but comment blocks begin with an asterisk rather than an "N."

control bit A bit in a memory area that is set either through the program or via a Programming Device to achieve a specific purpose, e.g., a Restart Bit is turned ON and OFF to restart a Unit.

counter A dedicated group of digits or words in memory used to count the number of times a specific process has occurred, or a location in memory accessed through a TC bit and used to count the number of times the status of a bit or an execution condition has changed from OFF to ON.

CPU The name of the Unit in a PC that contains the main CPU and other main PC components. See also *central processing unit*.

CPU Backplane A Backplane used to create a CPU Rack.

CPU Bus Unit A special Unit used with CV-series PCs that mounts to the CPU bus. This connection to the CPU bus enables special data links, data transfers, and processing.

CPU Bus Unit Area A part of the CIO Area allocated to CPU Bus Units. The use of the words and bits in this area is determined by the Unit to which they are allocated.

CPU Rack The main Rack in a building-block PC, the CPU Rack contains the CPU, a Power Supply, and other Units. The CPU Rack, along with the Expansion CPU Rack, provides both an I/O bus and a CPU bus.

CV-mode A form of communications useable only with CV-series PCs. See *C-mode*.

CV-series PC Any of the following PCs: CV500, CV1000, CV2000, or CVM1

CVSS See *CV Support Software*.

CW and CCW Abbreviations for clockwise (CW) and counterclockwise (CCW). CW and CCW are defined for a motor shaft in reference to a viewer facing the shaft on the end of the motor from which the shaft extends from the motor for connection.

CW/CCW limits Limits on the CW and CCW sides of the origin which can be internally set to restrict rotation of the shaft.

data area An area in the PC's memory that is designed to hold a specific type of data.

decimal A number system where numbers are expressed to the base 10. In a PC all data is ultimately stored in binary form, four binary bits are often used to represent one decimal digit, via a system called binary-coded decimal.

dwell time A setting that specifies the period of time during which positioning will stop before execution of the next positioning action.

error counter A counter used to ensure positioning accuracy when positioning via pulse trains. The error counter receives a target position as a specific number of pulses in a pulse train from the Motion Control Unit and outputs analog speed voltages to drive a servomotor accordingly. The specified number of pulses in the error counter is counted down by feedback from an encoder measuring actual motor shaft movement, causing voltage output to stop when the number of pulses equals zero, i.e., when the target position has been reached.

feedback The return of a portion of the output of a circuit or device to its input. It is used in servocontrol systems to help bring actual values closer to target values.

flag A dedicated bit in memory that is set by the system to indicate some type of operating status. Some flags, such as the carry flag, can also be set by the operator or via the program.

gain The increase in signal power produced by an amplifier.

G language A programming language used widely in position control. Program functions are entered simply by entering a "G," a 2-digit numerical code, and adding any needed parameters.

hunting The tendency, in servosystems, to overcompensate when the system's momentum carries it past the target position.

IBM PC/AT or compatible A computer that has similar architecture to, that is logically compatible with, and that can run software designed for an IBM PC/AT computer.

inching Manual feeding wherein positioning is executed one pulse at a time.

incremental position A position given in respect to the present position, rather than in respect to the origin.

initial position The present position when a start command is executed.

in position The range within which the system is determined to be at the target position.

input The signal coming from an external device into the PC. The term input is often used abstractly or collectively to refer to incoming signals.

interpolation The mathematical calculation of missing values based pm known values. The Motion Control Unit uses interpolation when positioning along two or more axes simultaneously. There are three types of interpolation possible: linear, circular, and helical (a combination of linear and circular).

interface An interface is the conceptual boundary between systems or devices and usually involves changes in the way the communicated data is represented. Interface devices such as NSBs perform operations like changing the coding, format, or speed of the data.

least-significant (bit/word) See *rightmost (bit/word)*.

leftmost (bit/word) The highest numbered bits of a group of bits, generally of an entire word, or the highest numbered words of a group of words. These bits/words are often called most-significant bits/words.

linear interpolation Dual-axis, linear positioning from the present position to a point designated as the interpolation end point based on specified points.

load The processes of copying data either from an external device or from a storage area to an active portion of the system such as a display buffer. Also, an output device connected to the PC is called a load.

local In network communications, the node or device from which communications are being viewed. See *remote*.

LSS Abbreviation for Ladder Support Software.

M code An abbreviation for machine code. The user can set various M codes for various positions so that each M code will be output when the workpiece passes its respective position.

MC program A G-language program that controls the MC Unit's operation.

megabyte A unit of storage equal to one million bytes.

most-significant (bit/word) See *leftmost (bit/word).*

MS-DOS An operating system in common use on smaller computers.

NC contacts Normally-closed contacts. A pair of contacts on a relay that open when the relay is energized.

negative software limit The lower limit on the number of pulses set as a software parameter.

nesting Programming one loop within another loop, programming a call to a subroutine within another subroutine, or programming an IF–ELSE programming section within another IF–ELSE section.

NO contacts Normally-open contacts. A pair of contacts on a relay that close when the relay is energized.

OFF The status of an input or output when a signal is said not to be present. The OFF state is generally represented by a low voltage or by non-conductivity, but can be defined as the opposite of either.

offline The state in which a Programming Device is not functionally connected to the CPU, although it may be connected physically.

offset A positive or negative value added to a base value such as an address to specify a desired value.

ON The status of an input or output when a signal is said to be present. The ON state is generally represented by a high voltage or by conductivity, but can be defined as the opposite of either.

online The state in which a Programming Device is functionally connected to the CPU so that CPU data and programs can be monitored or accessed.

online edit An edit to a program made from a peripheral device connected to and currently online with a PC in PROGRAM or MONITOR mode. In MONITOR mode, this means that the program is changed while it is actually being executed.

origin proximity input A signal input to indicate that the axis is near the origin.

origin search An operation used to automatically move the axes to the origin or to define the origin.

output The signal sent from the PC to an external device. The term output is often used abstractly or collectively to refer to outgoing signals.

parameters Data which determines limits and other conditions under which an operation will be carried out.

PC An acronym for Programmable Controller.

PC Setup A group of operating parameters set in the PC from a Programming Device to control PC operation.

positive software limit The upper limit on the number of pulses set as a software parameter.

present value The current value registered in a device at any instant during its operation. Present value is abbreviated as PV. The use of this term is generally restricted to timers and counters.

program block A unit of programming in MC programs roughly equivalent to program lines.

Programmable Controller A computerized device that can accept inputs from external devices and generate outputs to external devices according to a program held in memory. Pro-

grammable Controllers are used to automate control of external devices. Although single-unit Programmable Controllers are available, building-block Programmable Controllers are constructed from separate components. Such Programmable Controllers are formed only when enough of these separate components are assembled to form a functional assembly, i.e., there is no one individual Unit called a PC.

Programming Device A Peripheral Device used to input a program into a PC or to alter or monitor a program already held in the PC. There are dedicated programming devices, such as Programming Consoles, and there are non-dedicated devices, such as a host computer.

pulses Discrete signals sent at a certain rate. The Motion Control Unit outputs pulses, each of which designates a certain amount of movement. Such pulses are converted to an equivalent control voltage in actual positioning.

pulse rate The distance moved the motor shaft divided by the number of pulses required for that movement.

pulse train A series of pulses output together.

remote In network communications, the node or device with which communications are taking place. See *local*.

retrieve The processes of copying data either from an external device or from a storage area to an active portion of the system such as a display buffer. Also, an output device connected to the PC is called a load.

rightmost (bit/word) The lowest numbered bits of a group of bits, generally of an entire word, or the lowest numbered words of a group of words. These bits/words are often called least-significant bits/words.

RUN mode The operating mode used by the PC for normal control operations.

servicing The process whereby the PC provides data to or receives data from external devices or remote I/O Units, or otherwise handles data transactions for Link Systems.

servolock An operation whereby a rotary encoder is used to maintain the position of a motor while it is stopped. Whenever the motor axis moves, the rotary encoder sends a feedback pulse to an error counter, causing a rotation voltage to be generated in the reverse direction so that the motor rotates back to its original position.

software error An error that originates in a software program.

sub-program A group of instructions that are executed independently of the main program.

target position A parameter for a positioning action that designates what position is to be reached at the completion of the action.

teaching Automatically writing the present position into memory, via the Teaching Box, as the target position for the designated positioning action.

transfer The process of moving data from one location to another within the PC, or between the PC and external devices. When data is transferred, generally a copy of the data is sent to the destination, i.e., the content of the source of the transfer is not changed.

unit address A number used to control network communications in FINS protocol. Unit addresses are computed for Units in various ways, e.g., 10 hex is added to the unit number to determine the unit address for a CPU Bus Unit.

unit number A number assigned to some Link Units, Special I/O Units, and CPU Bus Units to facilitate identification when assigning words or other operating parameters.

uploading The process of transferring a program or data from a lower-level or slave computer to a higher-level or host computer. If a Programming Devices is involved, the Programming Device is considered the host computer.

watchdog timer A timer within the system that ensures that the scan time stays within specified limits. When limits are reached, either warnings are given or PC operation is stopped depending on the particular limit that is reached.

WDT See *watchdog timer*.

wiring check A check performed automatically at startup to detect wiring problems such as reversed polarity or disconnections.

word A unit of data storage in memory that consists of 16 bits. All data areas consists of words. Some data areas can be accessed only by words; others, by either words or bits.

work bit A bit that can be used for data calculation or other manipulation in programming, i.e., a 'work space' in memory. Also see *work word*.

write-protect A state in which the contents of a storage device can be read but cannot be altered.

zone A range of positions or values which can be defined so that flags are turned ON whenever the present position is within the range.

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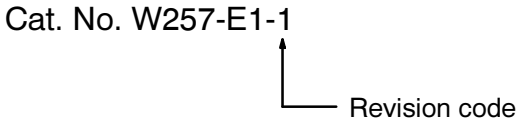
Revision History

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



The following table outlines the changes made to the manual during each revision. Page numbers refer to the previous version.

Revision code	Date	Revised content
1	June 1995	Original production