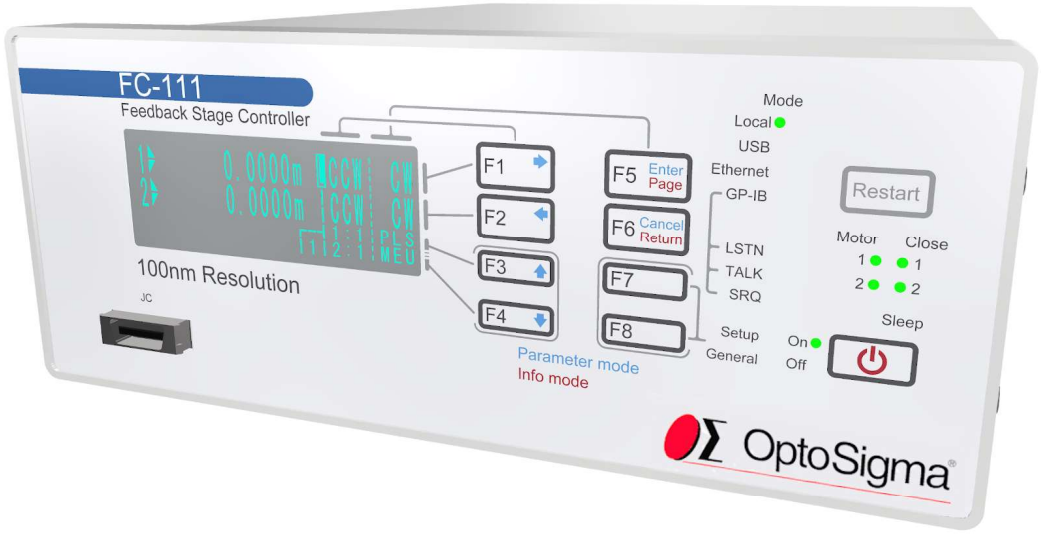
Two-Axis Feedback Stage Controller

FC-111
FC-411
FC-511
FC-611
FC-911

Instruction manual

- FS Series Stage -



Target FV01.032 ~

Target EN01.06

MF-1023-02.01

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■ Precautions for use

Please read this instruction manual carefully before use to ensure correct use. Keep this manual in a safe place and use as a reference when operating this equipment.

- This equipment is for controlling the associated feedback stage in closed loop and open loop. Do not use it for any other purpose.
- This instrument is a precision instrument. Please handle with care.
- Protect from impact or excessive force from being applied to the equipment.
- Maintain the installation environment described in this instruction manual.

■ Safety　Please be sure to observe

Explains what you must observe to prevent harm to people and others, and damage to property.

・ The degree of harm or damage caused by improper use is classified and explained in the following display.

⚠DANGER	This symbol indicates that a risk of death or serious injury is imminent.
⚠WARNING	This symbol indicates that there is a possibility of death or serious injury.
⚠CAUTION	This symbol indicates that there is a possibility of physical damage to the equipment.

・ Important notices are categorized and explained by the following symbols.

	Indicates required content that must be executed.
	Indicates prohibited content that must not be executed.
	Indicates a Caution that you should be aware of. Also displayed on the equipment.

・ General usage requirements.

⚠WARNING	
	Use within the power supply voltage range specified in this instruction manual. Input voltage outside the specified range may cause smoke or fire.
	Do not use a damaged power cable as this may result in electric shock, short circuit, or fire.
	Make sure that the power cable plug is fully inserted. Incomplete insertion may cause smoke or fire due to electric shock or overheating.
	Use the fuse specified in this instruction manual. Using anything other than the rated value may cause smoke or fire.
	Make sure to ground the protective earth terminal to earth ground to prevent electric shock.
	Do not use in an explosive atmosphere. Never use it in a place where flammable or explosive gas or vapor is present because this may cause an explosion or fire.
	Do not place in a corrosive atmosphere as this can cause corrosion and poor contact of the electrical connections and can cause malfunction or failure, possibly resulting in a fire.
	Do not use in dusty places. Dust accumulation on the power cable plug or insulation can contribute to damage due to multiple causes, possibly resulting in smoke or fire.
	Do not use the product where it will be exposed to water as this can cause an electric shock or malfunction.
	Do not open the cover. It may cause an electric shock or malfunction.
	Do not plug or unplug the power cable with wet hands due to a risk of electric shock.
	Do not connect stages other than those described in this instruction manual as this may cause an electric shock or malfunction, risk of a runaway stage, smoke, or fire.
	Do not use the product if there are any signs of damage or malfunction due to risk of electric shock, smoke, or fire. In case of damage or malfunctions, immediately unplug the power cable from the outlet.

■ The symbols on the product

	Indicates a protective ground terminal.
	Indicates a frame terminal.

■ Precautions for moving and shipping

The following are precautions for moving and transporting the equipment. Please observe these precautions.

- Turn off the MAIN POWER switch, remove all connection cables, and then move the instrument.
- Do not move the equipment by stacking equipment.
- When shipping the equipment, please use the original packing materials.
- Be sure to attach this instruction manual when moving or s the product.

■ Precautions for install

The following are precautions for installing the equipment. Please be sure to observe.

- Avoid places where the temperature and humidity are high, where the product is exposed to direct sunlight, or where the temperature changes rapidly.
- Do not install it in a place where it will be exposed to water.
- Install it on a sturdy and horizontal base.
- There is an intake slit on the right side and an exhaust slit for the cooling fan on the left side. To prevent the internal temperature from rising, provide a space of 50 mm or more on both sides.
- When using it in a closed space such as a rack, make sure that the ambient temperature of the equipment
- does not exceed 40 ℃ .
- Do not place anything over 20 kg on this equipment.
- Be sure to ground the protective earth terminal to earth.
- Connect the stage ground to the frame terminal of the instrument.
- Do not use the product in a place where there is a strong magnetic field or electric field, or where there is a lot of distortion or noise in the input power supply waveform.
- Allow for space to access the MAIN POWER switch.
- Do not plug the power cable into an outlet that makes it difficult to insert or remove the plug, or place anything in front of the plug that makes it difficult to connect or disconnect.

■ Precautions for peripheral equipment connection

The following are precautions for connecting this equipment and peripheral components.

- Do not connect or disconnect any connectors while the power button is turned on.
- Ony connect feedback stages that conform to our feedback stage specifications.
- Do not connect any active power source to the EMG connector. Passive, mechanical switch only.
- Be sure to connect models that are compatible with the minimum resolution for the feedback stage and feedback stage controller.

■ Cleaning

To clean use a soft cloth with a mild detergent diluted with water and wipe gently.

⚠WARNING	When cleaning, be sure to turn off the power with the POWER button, turn off the MAIN POWER switch, and unplug the power cable from the outlet.

⚠CAUTION	Use only neutral detergent diluted with water. Discoloration and roughness of the painted surface, fading of printed characters, and cloudiness of the acrylic board may occur.

Contents

1. Overview

This equipment is for controlling the feedback stage in closed loop and open loop. The communication interface is GP-IB, USB, or Ethernet, and remote operation is possible using ASCII communication commands. Using the included teaching function, this equipment can automatically execute programs written to the internal memory. The teaching function can be operated from the front panel, general-purpose I / O, all communication interfaces, and the jog controller.

2. Package Contents

Listed below are the items that are included in the shipping container. If anything is missing or damaged, contact us or your distributor.

Name	Model or specification	Quantity	Remarks
Feedback stage controller	FC-111 FC-411 FC-511 FC-611 FC-911	1	Model included will match the model that was purchased.
Power cable	Plug : KP-218 Connector : KS-16A Code : VCTF3 × 0.75mm2	1	2.3m, Tracking resistance
Protective ground wire, frame connection wire	AWG18	2	3m, Green/Yellow
Fuse	250V, 2.5A, Time lag	4	2 pre-installed at the time of shipment
Instruction manual	-	1	This book

・ Power cable

For power supplies other than AC100 V, use an approved power supply cable which meets the safety standards where the controller will be used. If you have any questions, please contact the distributor. For the specifications of the connectable power cable and the procedure for inserting the plug of the power cable into the power outlet, refer to the following

Connector	Code	Plug	Length
IEC-60320-C13 Rated: 7A, 250V UL, CSA Approved	Type SJT, No16 AWG Min. 3-Conductors (Single phase: 2-current carrying & ground) UL, CSA Approved	NEMA6-15P Tandem blade Rated: 7A, 250V UL, CSA Approved	2.3m or less

Compatible commercial power supply
AC100V ～ 240V, 50/60Hz

3. Option

See below for connectable options. Change the parameter "Option type" according to the option to connect. For details, see our catalog or website.

・ Connectable options

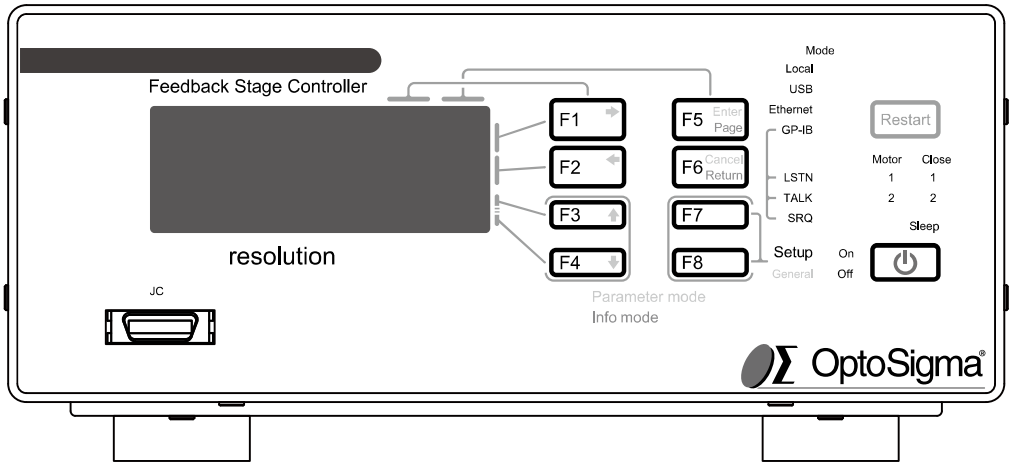
Model	Parameter "Option type" setting values
JC-01, JC-01-3, JC-01-4	Type0
MD-400	Type1

⚠WARNING Do not connect other than the above options.

4. Part names and functions

4-1.Front panel

Description of the names and functions on the front panel.



(1) Display unit

The display contents are menus such as coordinate values, status, and F1-F8 button operations. For details, See ″5. Display and operation″.

(2) F1 / ➡ button

(3) F2 / ⬅ button

(4) F3 / ⬆ button

(5) F4 / ⬇ button

F1 to F4 execute the functions displayed on the right side of the display unit. The arrows are used in parameter mode. For F1 to F4, See ″5. Display and operation″ for more information. For arrows, See ″5. Display and operation″ and ″7. Parameters″.

(6) F5 / Enter / Page button

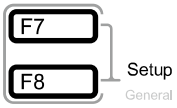
F5 performs the function displayed on the right side of the display. Enter is used in parameter mode, and Page is used in INFORMATION mode. For F5, See ″5. Display and operation″ and ″7. Parameters″.

(7) F6/ Cancel / Return button

F6 performs the function displayed on the right side of the display. Cancel is used in parameter mode, and Return is used in INFORMATION mode. For F6 Return, See ″5. Display and operation″ and ″7. Parameters″.

(8) F7 button

(9) F8 button



F7 and F8 execute the functions displayed on the right side of the display unit. General is used to display parameter mode, and Setup is used to display setup mode. For F7, F8 and Setup, See ″5. Display and operation″. For General, See ″7. About parameters″.

(10) Restart button

"Restart" will restart the controller. When the button is pressed and released, the startup operation is the same as when the power is turned on. The state after restart is shown below.

Item	Contents
Parameters	Parameters will not be reset to default values, but if they are being changed, the changed content will not be reflected. See "7. About parameters".
Mode	After Restart, the mode will be the mode set by the parameter "Ini Mode" .
Coordinate value	Both axes will be set to zero.
Stage	If a stage is moving, it stops. If it is stopped, it remains stopped. At startup, the motor coils will be powered off momentarily, then powered back up.
Command	Any pending command will be discarded. ⚠ If the command "A:" or "M:" is executed without setting the command "D:" or "ACC:" after the restart, the speed will be set to parameters "Max Speed" and "Acc Time" . See "7. About parameters".
Teaching registration contents	It will not be deleted, but if the command "T_OFF:" is not executed after editing, the edited content will not be reflected and will be discarded.
Communication	Communication will be disconnected. After the restart is complete, it will be in the initial state, so it will be the mode set by the parameter "Ini mode" . ⚠ Depending on the control software used, communication may resume after the equipment has been restarted or after the mode has been changed, resulting in unintended stage operation.
Link during USB communication	Will be disconnected. To relink, the software must close the COM port and then reconnect the cable. For USB, See "(2) USB".
Jog controller	Reboot according to the mode.

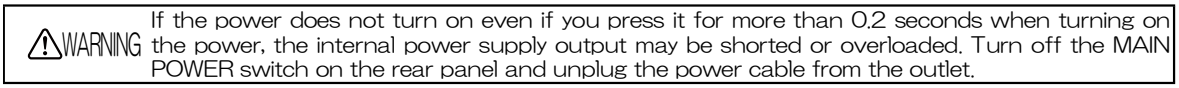
(11) POWER button

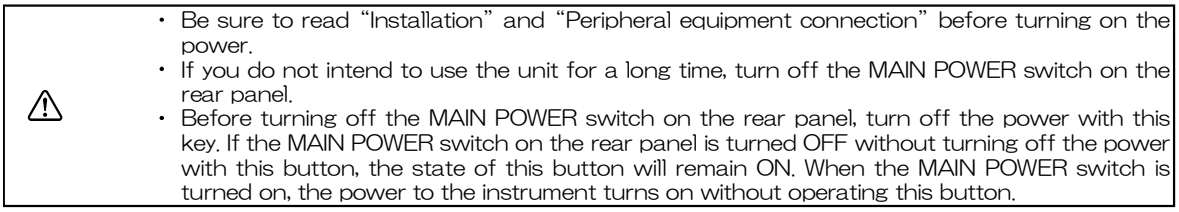
(12) On lamp

(13) Off lamp

Operates the equipment power. Press to turn the power on when the MAIN POWER switch on the rear panel is ON. Press to turn off the power when the power is on or in sleep mode. However, it cannot be used when the "On lamp", "Off lamp", and "Sleep lamp" are off. The operation method is shown below.

Power on	Power off	Usage prohibited
Sleep On Off ● ↓ Press for over 0.2 seconds Sleep On ● Off	Sleep On ● Off ● Sleep On Off ↓ Press for over 1 seconds Sleep On Off ●	Sleep On Off





(14)LOCAL lamp

(15)USB lamp

(16)Ethernet lamp

(17)GP-IB lamp

The green indicators light up in the currently selected mode. In TEACH mode, both the "LOCAL lamp" and "REMOTE lamp" are lit.

LOCAL	REMOTE			TEACH		
	USB	Ethernet	GP-IB	USB	Ethernet	GP-IB
Mode Local ● USB Ethernet GP-IB LSTN TALK SRQ	Mode Local USB ● Ethernet GP-IB LSTN TALK SRQ	Mode Local USB Ethernet ● GP-IB LSTN TALK SRQ	Mode Local USB Ethernet GP-IB ● LSTN TALK SRQ	Mode Local ● USB ● Ethernet GP-IB LSTN TALK SRQ	Mode Local ● USB Ethernet ● GP-IB LSTN TALK SRQ	Mode Local ● USB Ethernet GP-IB ● LSTN TALK SRQ

(18)LSTN lamp

(19)TALK lamp

(20)SRQ lamp

When communication is performed and the communication interface is set to GP-IB, the LSTN lamp, TALK lamp, and SRQ lamp will be lit depending on the status. The LSTN lamp lights when this equipment receives a command, and the TALK lamp Lights when sent to. The SRQ lamp lights when a service request is executed from this equipment.

LSTN	TALK	SRQ
Mode Local USB Ethernet GP-IB ● LSTN ● TALK SRQ	Mode Local USB Ethernet GP-IB ● LSTN TALK ● SRQ	Mode Local USB Ethernet GP-IB ● LSTN TALK SRQ ●

(21)Motor1 , 2 lamp

This shows the motor excitation status of the stage. The axis whose green lamp is lit is energized and the axis whose light is off is demagnetized.

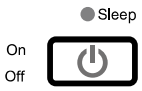
First axis excitation On Second excitation On	First axis excitation On Second excitation Off	First axis excitation Off Second excitation On	First axis excitation Off Second excitation Off
Motor 1 ● 2 ●	Motor 1 ● 2	Motor 1 2 ●	Motor 1 2

(22)Close1 , 2 lamp

Indicates the stage control loop status. An axis whose green lamp is lit is in a closed loop state, and an axis that is not lit is in an open loop state.

First axis Close Second axis Close	First axis Close Second axis Open	First axis Open Second axis Close	First axis Open Second axis Open
Close ●1 ●2	Close ●1 2	Close 1 ●2	Close 1 2

(23) SLEEP lamp

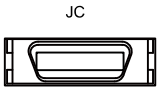


Lights when the equipment is in sleep mode. At this time, the On lamp goes off.

(24) Sleep function

In sleep mode, the display turns off and the motor is demagnetized. Modes, coordinate values, statuses, and commands retain the state prior to sleep execution. When returning from the sleep state, if the stage table has moved to a different position from before sleep execution, it will move to the coordinate value before sleep execution by feedback control. However, if an error other than a limit error, overflow error, or emergency stop occurs in the sleep state, the coordinates before the sleep execution cannot be restored. In addition, when the instrument is restarted due to a power failure or instantaneous voltage drop, all retained modes, coordinate values, statuses, and commands are discarded. For error, See ″11. Status″. For Restart, See ″(10) Restart button″. Becomes a little warm in sleep mode, but this is not a malfunction.

(25) JC connector



A connector for connecting options. Change the parameter ″Option type″ according to the option to connect.

Connectable options

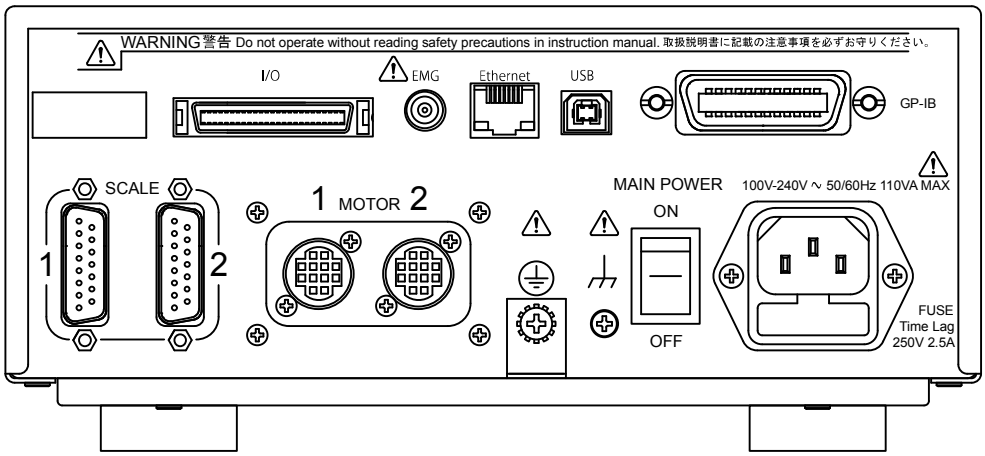
Model
JC-01, JC-01-3, JC-01-4
MD-400

⚠WARNING Do not connect other than the above options.

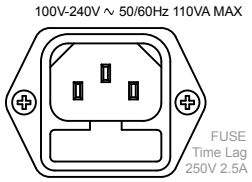
⚠ When removing the jog controller from the instrument, shut off the power supply to the jog controller.

4-2.Rear panel

Names and functions on the rear panel.



(1) AC connector



Connector for power cable. When the power supply is AC100 V, use the included power cable. For power supplies other than AC100 V, use an approved power supply cable which meets the safety standards where the controller will be used. If you have any questions, please contact the distributor. For the specifications of the connectable power cable and the procedure for inserting the plug of the power cable into the power outlet, refer to the following

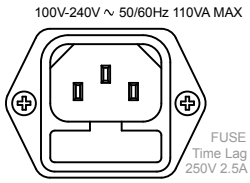
Connector	Code	Plug	Length
IEC-60320-C13 Rated: 7A, 250V UL, CSA Approved	Type SJT, No16 AWG Min. 3-Conductors (Single phase: 2-current carrying & ground) UL, CSA Approved	NEMA6-15P Tandem blade Rated: 7A, 250V UL, CSA Approved	2.3m or less

Step1 Make sure the power supply is within the AC 100 V to 240 V range.
Step2 Check that the MAIN POWER switch is OFF.
Step3 Connect the power cable to the AC inlet.
Step4 Insert the power cable plug into an outlet.

⚠WARNING Connect to an overvoltage category Ⅱ power supply.

⚠
- Use only the power cable that comes with the product or that meets local safety standards.
- Do not use the power cable supplied with this equipment as the power cable for other equipment.
- Please follow the procedure for plugging the power cable into the outlet.

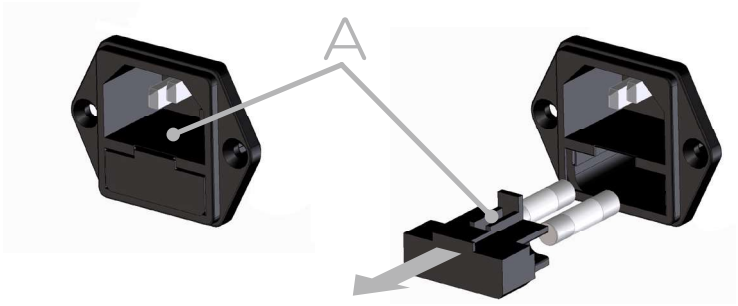
(2) Fuse holder



The fuse holder is under the AC connector. Refer to the following for fuse specifications and replacement procedure.

Voltage	Current	Characteristic	Size
AC250V	2.5A	Time lag	ϕ 5mm × 20mm

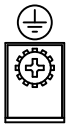
Step1 Check that the MAIN POWER switch is OFF.
Step2 Unplug the power cable from the outlet.
Step3 Disconnect the power cable from the AC inlet.
Step4 Hook the tip of a thin flathead screwdriver or similar tool into the groove in part A below, and apply force in the direction of the arrow to remove the holder.



Step5 Replace both fuses with the above specifications.
Step6 Push the holder with the replaced fuse firmly into the AC inlet.
Step7 Connect the power cable to the AC inlet.
Step8 Connect the power cable according to the AC inlet insertion procedure.

⚠
- Do not use the included fuse for other equipment.
- When replacing, always replace both fuses

(3) Protective earth terminal



Electrical ground terminal. Connect the round crimp terminal of the included protective conductor wire to this terminal. When the power cable includes a ground connection, this terminal does not need to be used.

⚠WARNING When using a power supply cable without a ground terminal, a separate ground connection must be used due to this being a class I apparatus. There is a risk of electric shock if not grounded.

⚠
- Use the protective grounding cable supplied with the instrument for grounding.
- Do not use the included the protective grounding cable for other equipment.

(4) Enclosure terminal

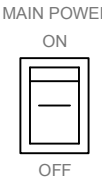
Connect this terminal to a surface plate or metal mount that holds the stage to provide a common ground between the controller and the stage. Connect the round crimp terminal side to this terminal.

⚠WARNING	Do not use as a protective earth terminal.

⚠CAUTION	If not connected, the system may not function correctly.

⚠	• Use the attached frame connection line for connection. • Do not use the frame connection cable supplied with this equipment for other equipment.

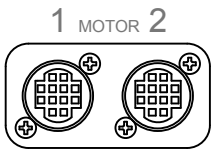
(5) MAIN POWER switch



Turns the main power on and off. This switch alone does not turn on the power to the instrument. The POWER button on the front panel must also be pressed to turn on the instrument.

⚠	• Be sure to read “Installation” and “Connection” before turning on the power with this switch. • If not using the product for a extended time, set this switch to OFF. • Turn off the power with the POWER button on the front panel before turning off this switch. If this switch is turned off without turning off the power with the POWER button, the state of POWER button will remain ON. When the MAIN POWER switch is turned on, the power to the instrument turns on without operating this button.

(6) Motor cable connectors

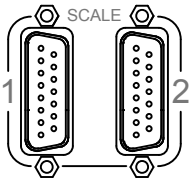


Connections for the stage motor cables. Connect the axis one stage to the left connector and the axis two stage to the right connector.

⚠WARNING	Please connect only approved feedback stages that meet our stage specifications.

⚠CAUTION	Be sure to correctly connect the motor cable and scale cable to the first and second axes with the power off. If the connections are incorrect, unintended operation will occur.

(7) Scale cable connectors

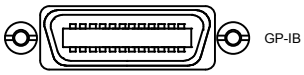


Connections for the stage scale cables. Connect the axis one stage to the left connector and the axis two stage to the right connector.

> ⚠WARNING Please connect only approved feedback stages that meet our stage specifications.

> ⚠CAUTION Be sure to correctly connect the motor cable and scale cable to the first and second axes with the power off. If the connections are incorrect, unintended operation will occur.

(8) GP-IB connector



Connection for the GP-IB cable. Use this when you want to operate the instrument via the GP-IB interface. For details, see ″(1) GP-IB″.

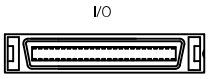
(9) USB connector (B type)

Connection for the USB cable. Use this when you want to operate the instrument via the USB interface. For details, see ″(2) USB″.

(10) Ethernet connector (LAN)

Connection for the Ethernet cable. Use this when you want to operate the instrument via the Ethernet interface. For details, see ″(3) Ethernet″.

(11) I/O connector



The controller has a general-purpose input and output connector which includes digital input and output, teaching operation input and status output, scale division signal output, in-position signal output, and alarm signal output. Refer to ″(4) General purpose I/O″ for details.

(12) EMG connector

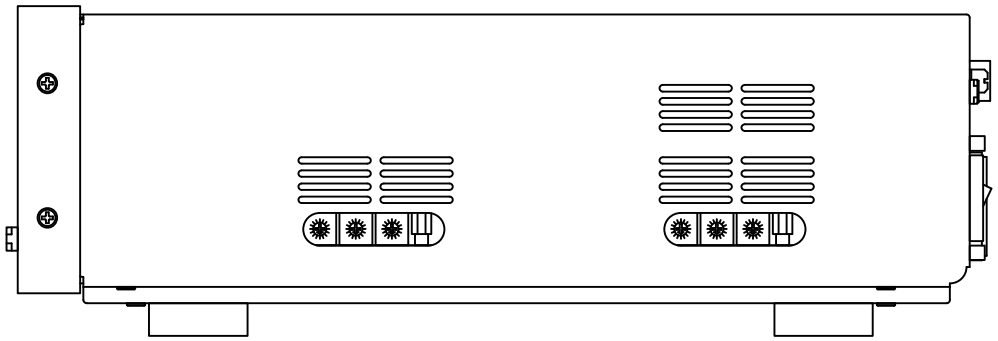
Connection for an emergency stop switch. Use this when you want to stop the stage operation in an emergency. Refer to “(5) Emergency stop” for details.

> ⚠WARNING To enable the emergency stop switch, change the parameter “EMG Connecter” to Enable and perform a test operation to confirm that it active.

> ⚠CAUTION Do not connect any device that supplies power. Passive switch only.

4-3.Right side panel

Names and functions on the right side panel.



(1) Ventilation slots

⚠CAUTION Do not block the ventilation slots. See "Installation" for details.

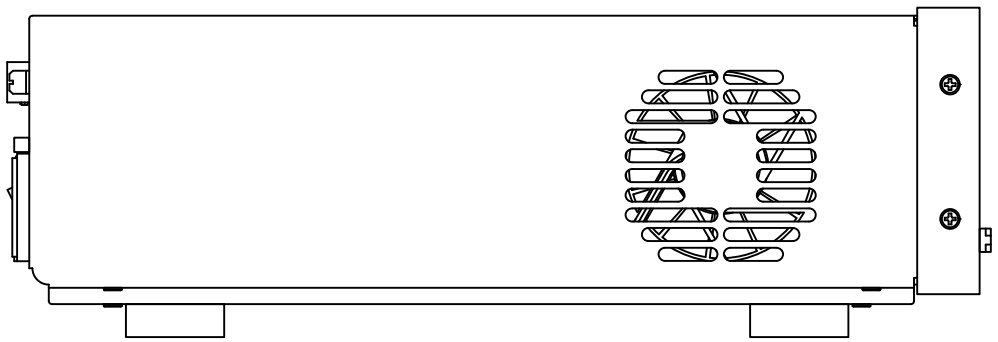
(2) Dial switch for motor driver setting

Dial switch for motor driver setting. For details, refer to "(6) Motor driver setting switch".

⚠CAUTION Depending on your environment, you may be asked to change the settings. Do not change any other settings. If it is changed incorrectly, unintended stage operation may occur.

4-4.Left side panel

Names and functions on the left side panel.



(1) Ventilation slots

⚠CAUTION Do not block the intake slit. See "Installation" for details.

(2) Cooling fan

4-5.Audio Indicator

An audible beep indicates certain operations. The beep can be turned off with the parameter. Note that the beep may be interrupted at times; this is not a malfunction.

Length of beep	Operation
About 0.1 seconds	Button operation
	Completion of command "RESET:"
About 0.1 seconds twice	Start of command "RESET:"
About 0.3 seconds (two-step sound)	Transition to sleep mode and return
About 0.4 seconds	POWER button operation
	Restart button operation
About 1 seconds	Entering stage stroke limits
About 2 seconds	Error occurrence
Continuous tone	Internal power supply output short circuit or overload The volume depends on the degree of overload of the internal power supply. It also sounds in sleep mode. See "14. Troubleshooting" for details.

5. Operations

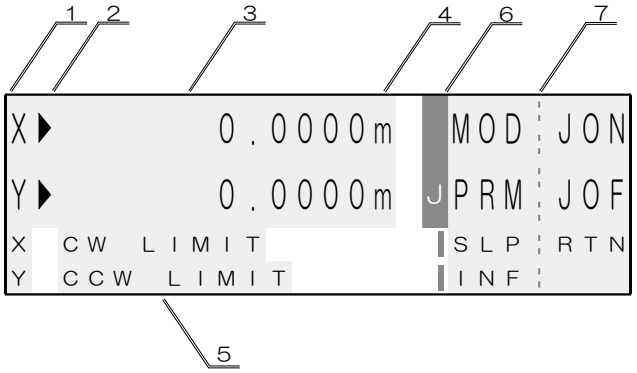
5-1.List of modes

The operational modes are as follows.

Mode	Contents
SETUP	Switch modes.
LOCAL	Local operation using the front panel buttons and jog controller.
REMOTE	Remote operation using a communication interface.
TEACH	Automatic execution with commands registered in the internal memory is possible.
MOVEMENT TEST	Execute a test operation to verify stage function.
PARAMETER	Edit operational Parameters.
INFORMATION	Displays controller information.

5-2.Common contents

The display contents are common to all modes.

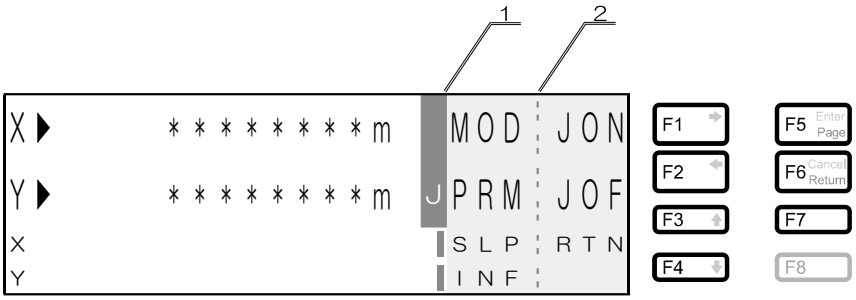


No	Item	Contents			
1	Axis name	The upper display (X) corresponds to axis one. The lower display (Y) to axis two. The display contents depend on the setting of the parameter ″AXIS Name″.			
2	Positioning status	▶	READY	All operations are accepted.	Motion completed successfully, Position is Stable. *1
		▷	READY	All operations are accepted.	Motion did not complete successfully. *1
		〉	BUSY	Operation is denied.	Motion in process and has not been completed. *1, *2
		□ no display	BUSY	Operation is denied.	Command operation or error has occured. * 3
3	Coordinate value	The upper display corresponds to axis one. The lower display to axis two. The display value can be either the read value from the encoder or the commanded value. See the parameter ″Count Sel″.			
		Model	Minimum digit	Example (unit :mm)	
		FC-111	100nm	0.0001m	
		FC-411	50nm	0.00005m	
		FC-511	10nm	0.00001m	
		FC-611	5nm	0.000005m	
		FC-911	1nm	0.000001m	
4	Unit	The upper display corresponds to axis one. The lower display to axis two. The unit displayed is set by the parameter ″Unit Select″. In the example above, both axes are set to millimeter.			
		Unit	Contents	Example (Model: FC-111)	
		n	Nanometer (nm)	12345600n	
		u	Micrometer (um)	12345.6u	
		m	Millimeter (mm)	12.345600m	
		°	Degrees (mm)	12.345600°	
		□ no display	Minimum digit is minimum resolution	12.345600□	
5	Status	See ″11. Status″ for more information.			
6	Jog controller connection confirmation mark	J	″J″ in the block	Power is supplying to the Jog controller.	
		■	Block only	The power supply to the Jog controller is shutting off.	
		□ no display		The Jog controller connector is not connected.	
7	Menu	This is a function assigned from F1 to F7.			

*1 See parameter “INPos Range” for in-position range.
*2 BEC button and command “BEC:” can be used.
*3 BEC button and command “BEC:” cannot be used.

5-3.SETUP Mode

SETUP mode is used to choose the item of each mode, sleep and the Jog Controller's power supply. To switch to this mode, press the F7 and F8 buttons simultaneously when the stage is stopped in LOCAL, REMOTE, or TEACH mode.



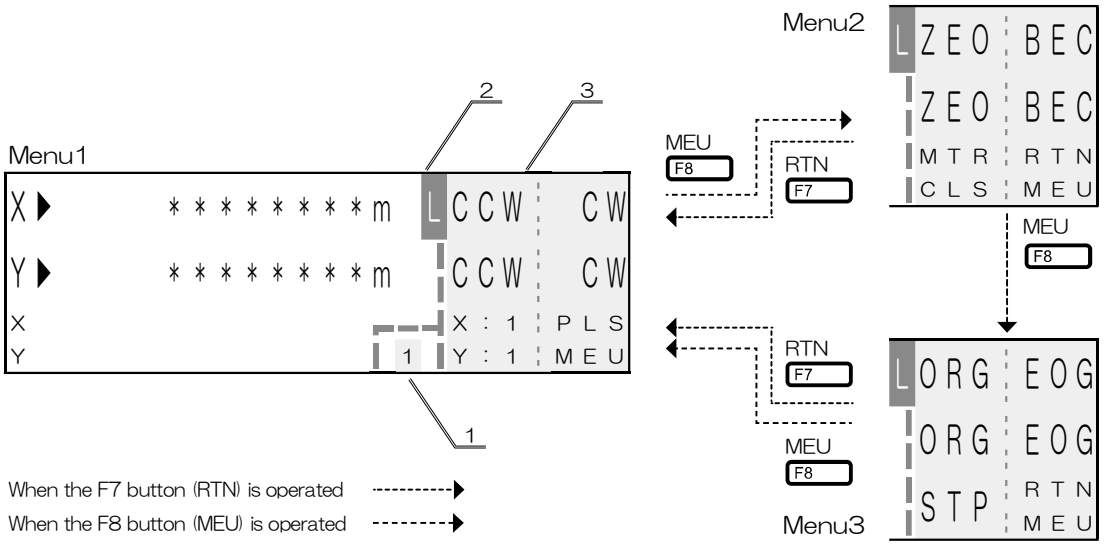
No	Item	Contents
1	Mode	Block only
2	Menu	This is a function assigned from F1 to F7.

Button	Display	Contents
F1	MOD	Select a mode. Each time you press it, it switches. LOCAL → REMOTE → TEACH → Back to top
F2	PRM	Move to PARAMETER mode.
F3	SLP	Transit to sleep state. For details, see ″(24) Sleep function″. To return from sleep mode, press any of the F1 to F8 buttons.
F4	INF	Move to INFORMATION mode.
F5	JON＊1	Supply power to the Jog controller.
F6	JOF＊1, 2	Power supply to the jog controller is stopped.
F7	RTN	Exit the SETUP mode.
F8	-	None

＊1 If the jog controller connector is not connected, it will not be displayed. If it is connected, either will be displayed.d.
＊2 Can be used only when positioning is completed or an error occurs and the stage is stopped.

5-4.LOCAL Mode

In LOCAL mode, the stages can be operated from the front panel of the instrument. In this mode, menus 1 to 3 are used to operate the stages from the front panel. Use the F7 or F8 button to switch menus. For the procedure to switch to this mode, refer to ″5-3. SETUP mode″.



No	Item	Contents
1	Command pulse amount	Represents the quantity of movement pulses output to the stage with a single click of the CW or CCW button. Use "PLS" to select the pulse amount. Only menu 1 is displayed.
2	Mode	L (LOCAL) is displayed.
3	Menu	Displays the functions assigned to F1 through F7.

Menu	Button	Target axis	Display	Contents
1	F1	1	CCW	Moves the stage in the CCW direction(Motor side). Press and hold for continuous operation, and press once (single click) for pulse operation. See LS" for pulse amount selection. Flashes when at the limit of travel. The control status during continuous operation differs depending on the setting of the parameters "Jog Cont" and "Stage Cont Type" . *1
	F2	2		
	F3	1	3, 2, 1	Sets the speed of the stage when operated by the CW or CCW button. The operation speed changes each time the button is pressed. The speed depends on the setting of parameters "Jog Speed 3" , "Jog Speed 2" and og Speed 1" . 1 at startup. Axis display depends on the parameter "AXIS Name"setting. In this case, the first axis side is X and the second axis side is Y. [Speed stage1 => Speed stage2 => Speed stage3 => Back to Speed stage1]
	F4	2		
	F5	1	CW	Moves the stage in the CW direction(Anti motor side). Press and hold for continuous operation, and press once (single click) for pulse operation. See LS" for pulse amount selection. Flashes when at the limit of travel. The control status during continuous operation differs depending on the setting of the parameters "Jog Cont" and "Stage Cont Type" . *1
	F6	2		
	F7	-	PLS, PST	Sets the number of movement pulses output to the stage when the CW or CCW button is clicked once. When the display is PLS, the value changes each time it is pressed. It is ″1″ at startup. The speed depends on the parameter ″Jog Speed 1″. When the stage is moving, the display changes to blinking PST, and the function of this button switches to stop movement. When movement is completed or stopped by this button, the display returns to PLS. [1pulse => 10pulse => 100pulse => 1000pulse => Back to top]
	F8	-	MEU	Switch to menu 2.
	F7+F8	-	-	If both button are pressed at the same time switches to the SETUP mode. For details on the SETUP mode, see ″5-3. SETUP mode″.
2	F1	1	ZEO	Set the coordinate value of the target axis to zero. *1
	F2	2		
	F3	-	MTR	Set the motor power to on or off. It changes each time it is pressed. For state, check the Motor lamp on the front panel. [Motor coils excited - Power on : Exc] Moter 1 Exc => Exc => Not => Not => Back to top Moter 2 Exc Not Exc Not
	F4	-	CLS	Sets the positioning control method (Closed loop or Open loop). It changes each time it is pressed. For state, check the Close lamp on the front panel. Close 1 Close => Close => Open => Open => Back to top Close 2 Close Open Close Open
	F5	1	BEC	Clear Error (when positioning status display is ″>″) or Cancel ESTOP (when emergency stop is executed). When limit error, overflow error or TEACHING command error, errors can be canceled without affecting the coordinate values. To cancel the emergency stop, press either button.
	F6	2		
	F7	-	RTN	Return to Menu 1.
	F8	-	MEU	Switch to menu 3.
	F7+F8	-	-	If both button are pressed at the same time switches to the SETUP mode. For details on the SETUP mode, see ″5-3. SETUP mode″.
3	F1	1	ORG	Return the stage to the mechanical origin . Even if the software limit is set, the software limit is ignored. The return method can be selected by the parameter "ORG Mode Sel" . Refer to ″9. Return to origin″ for the return method. For details on software limits, see "3. Options" , "+ Soft LMT Pos" and "-Soft LMT Pos" . *1
	F2	2		
	F3	1, 2	STP	Stops movement of machine origin return and the electric origin return.
	F4			
	F5	1	EOG	Return the stage to electrical origin. Refer to ″9. Return to origin″ for the return method. *1
	F6	2		
	F7	-	RTN	Return to Menu 1.
	F8	-	MEU	Return to Menu 1.
	F7+F8	-	-	If both button are pressed at the same time switches to the SETUP mode. For details on the SETUP mode, see ″5-3. SETUP mode″.

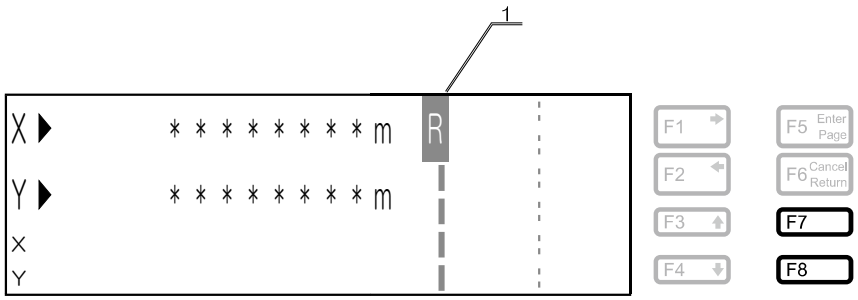
* 1 While one axis is operating, the other axis can be operated.

⚠ Before demagnetizing the motor or operating the stage, make sure that there is no influence on the surroundings.

5-5.REMOTE mode

Remote mode allows operation of the stages by remote control from an external computer. For the procedure to switch to this mode, refer to ″ ① SETUP mode″. For parameters, refer to ″7. Parameters″. For each communication interface, refer to ″12. Specifications″.

> ⚠ Connect only the communication cable appropriate to the communication interface set in the parameters.



No	Item	Contents
1	Mode	R (REMOTE) is displayed. When shifting to the parameter setting mode, P (PARAMETER) is displayed. For details, refer to ″6. Commands″.

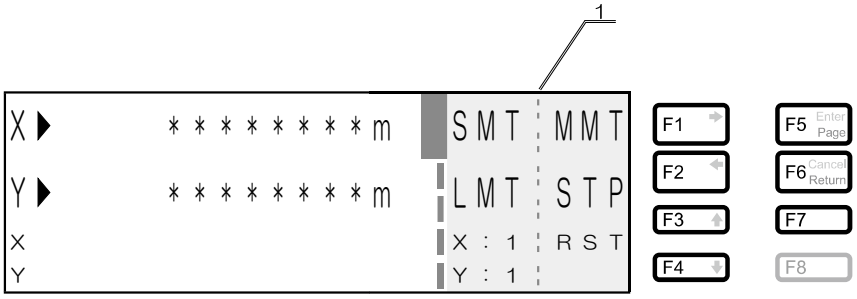
Button	Display	Contents
F1-F8	-	None
F7+F8	-	If both button are pressed at the same time switches to the SETUP mode. For details on the SETUP mode, see ″5-3. SETUP mode″.

5-6.TEACH mode

TEACH mode allows the operation program registered in the internal memory of the equipment to be executed. For the procedure to switch to this mode, refer to ″ ① SETUP mode″. For the operation, refer to ″8. TEACHING function″.

5-7.MOVEMENT TEST mode

Movement Test mode moves the stage with one of three prepared movement patterns. This mode can be switched by double clicking the F5 button after entering the TEACH mode.
Restart is necessary to exit this mode. For TEACH mode, refer to ″5-6. TEACH mode″. For details of operation, refer to ″10. Movement test″.



No	Item	Contents
1	Menu	It is the function of the F1 to F7 buttons.

Button	Target axis	Display	Contents
F1	1, 2	SMT	Perform step movement. Pitch is ten percent of the stage's stroke.
F2	1, 2	LMT	Perform reciprocating motion between limit sensors.
F3	1	3, 2, 1	Select the operation speed of the test operation. The operation speed changes each time the button is pressed. The speed depends on the setting of parameters "Jog Speed 3" , "Jog Speed 2" and "Jog Speed 1" . 1 at startup.
F4	2	3, 2, 1	
F5	1, 2	MMT	Perform step movement. Pitch is 1mm.
F6	1, 2	STP	Stops test operation.
F7	-	RST	Reset the equipment to exit this mode.
F8	-	-	None

⚠ Before operating the stage, make sure that there is no influence on the surroundings.

5-8.PARAMETER mode

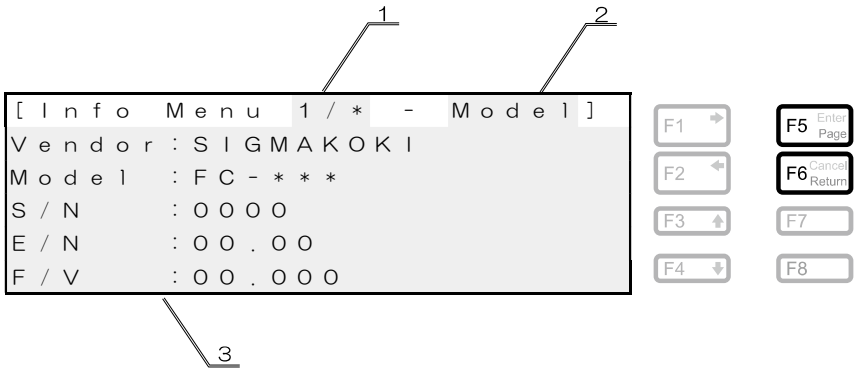
PARAMETER mode is used to check or change the parameters. Refer to ″5-3. SETUP mode″ for how to enter this mode. For the operation, see "7. Parameters" .

5-9.INFORMATION mode

INFORMATION mode displays information regarding this equipment on the display panel. For the procedure to switch to this mode, refer to ″5-3. SETUP mode″.

(1) Equipment information

Displays information such as the controller model name.

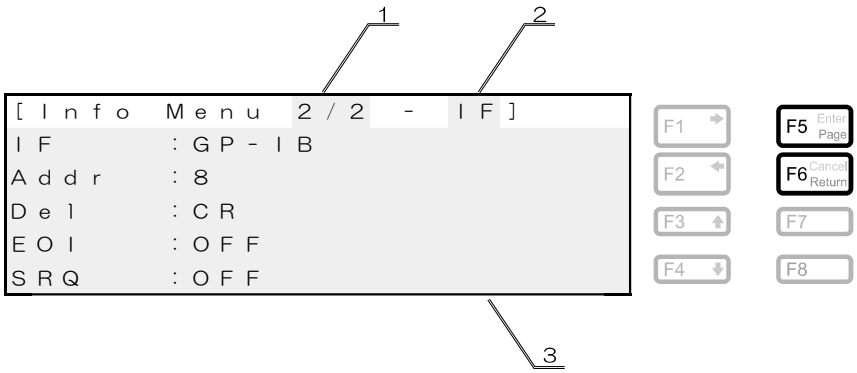


No	Item	Contents		
1	Page	Page number		
2	Category	Model	Indicates Equipment information.	
3	Information	Vendor	Vendor name	
		Model	Model name	FC-111
				FC-411
				FC-511
				FC-611
				FC-911
		S/N	Serial Number	
		E/N	Equipment Number	
		F/V	Firmware Version	

Button	Display	Contents
F1-F4	-	None
F5 (Page)	-	Switch to next page.
F6 (Return)	-	Returns to the mode before the transition to INFORMATION mode.
F7-F8	-	None

(2) GP-IB interface information

If the parameter "I / F Sel" is set to GP-IB, the GP-IB settings are displayed.

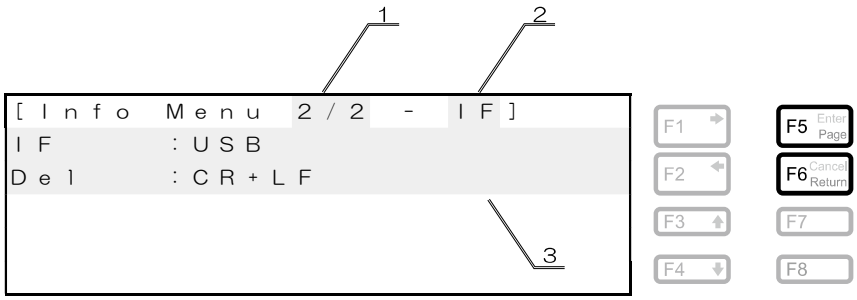


No	Item	Contents	
1	Page	Page number	
2	Category	IF	It means the communication information
3	Information	IF	The configured communication interface.
		Addr	GP-IB address setting value
		Del	GP-IB delimiter
		EOI	GP-IB end of Identify
		SRQ	GP-IB service request

Button	Display	Contents
F1-F4	-	None
F5 (Page)	-	Return to first page.
F6 (Return)	-	Returns to the mode before the transition to INFORMATION mode.
F7-F8	-	None

(3) USB interface information

If the parameter “I / F Sel” is set to USB, the USB settings are displayed.

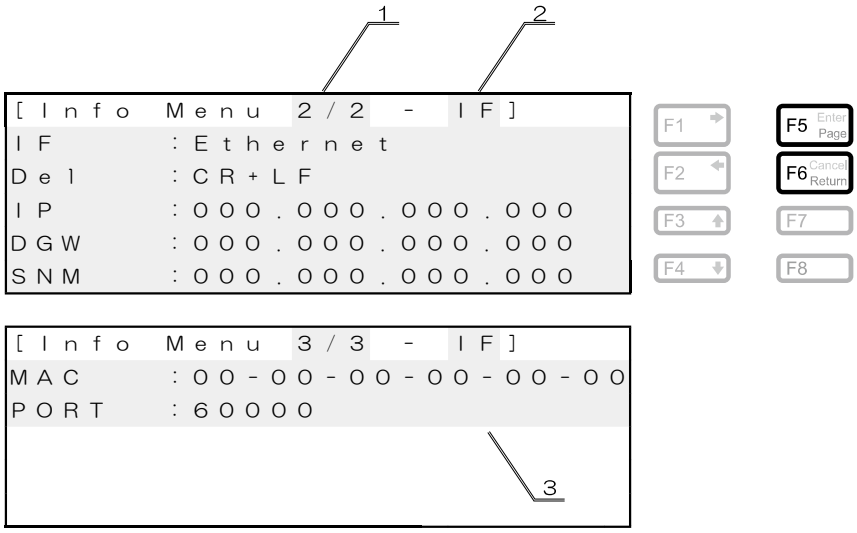


No	Item	Contents	
1	Page	Page number	
2	Category	IF	It means the communication information
3	Information	IF	The configured communication interface.
		Del	USB delimiter

Button	Display	Contents
F1-F4	-	None
F5 (Page)	-	Return to first page.
F6 (Return)	-	Returns to the mode before the transition to INFORMATION mode.
F7-F8	-	None

(4) Ethernet interface information

If the parameter “I / F Sel” is set to Ethernet, the Ethernet settings are displayed.



No	Item	Contents	
1	Page	Page number	
2	Category	IF	It means the communication information
3	Information	IF	The configured communication interface.
		Del	Ethernet delimiter
		IP	Ethernet IP address
		DGW	Ethernet default gateway
		SNM	Ethernet subnet mask
		MAC	Ethernet MAC address
		PORT	Ethernet Port Number (Fixed)

Button	Display	Contents
F1-F4	-	None
F5 (Page)	-	Moves to the next page for the second page and to the first page for the third page.
F6 (Return)	-	Returns to the mode before the transition to INFORMATION mode.
F7-F8	-	None

6. Commands

Commands are sent and received from the communication interface in ASCII code format.

⚠
- Before control, check that the communication interface is operating normally.
- Please familiarize yourself with the functions before using the commands.
- Set the command transmission interval to 10msec or more.
- Please check clearance around of the stages before operation.

6-1. List of commands

The modes that allow these commands to be used are LOCAL, REMOTE, and TEACH modes. Commands cannot be used in other modes.

(1) Available modes

Describes the modes in which the command can be used.

Symbol	Contents
L	It indicates that it can be used in the LOCAL mode.
R	It indicates that it can be used in the REMOTE mode.
R	Indicates that it can be used after switching from REMOTE mode to PARAMETER mode.
T	It indicates that it can be used in the TEACH mode.
T	Indicates that it can only be registered in the internal memory as a teaching program.

(2) Available positioning states

Describes the positioning states in which the command can be used.

Symbol	Contents
R	It indicates that it can be used in the positioning completed state.
B	Indicates that it can be used during stage move.
-	This command is not related to the positioning status.

(3) List

Item	No.	Command name	Description	Mode	State	Page
Control	01	RESET:	Reset controller	L R T	R B	26
	02	*RST	Reset controller	L R T	R B	26
	03	RESET_RET:	Reset controller ("END" is returned after completion)	L R T	R B	26
	04	SLEEP:	Turn on or off the sleep function	L R T	R	26
	05	SLEEP_RET:	Turn on or off the sleep function (Status is returned after completion)	L R T	R	26
	06	SLEEP?	Get the sleep status	L R T	R	27
	07	MODE:	Change mode	L R T	R	27
	08	MODE?	Get current mode	L R T	R B	27
	09	F:	Change the positioning control method (Closed or Open loop)	R T	R	28
	10	FR:	Get positioning control method (Close or Open loop)	R	R	28
	11	C:	Change the excitation state of the motor	R T	R	28
	12	CR:	Get the excitation state of the motor	R	R	29
	13	BEC:	Cancel busy and error conditions	L R T	R B	29
	14	CMDR:	Get the last sent command (Exclude this command)	L R T	R B	29
	15	ECHO:	Change command echo back state	R	R	30
	16	ECHOR:	Get command echo back status	R	R	30
Information	17	*IDN?	Get the equipment information	L R T	R	30
	18	VENDOR:	Get the vendor name	R	R	30
	19	MODEL:	Get the model name	R	R	31
	20	SN:	Get the serial number	R	R	31
	21	EN:	Get the equipment number	R	R	31
	22	FV:	Get the firmware varsion	R	R	31
	23	RESO:	Get the resolution	R	R	32
	24	LIMR:	Get the stage stroke	R	R	32
	25	AN:	Get the axis name	R	R	33
	26	UNT:	Get the unit	R	R	33

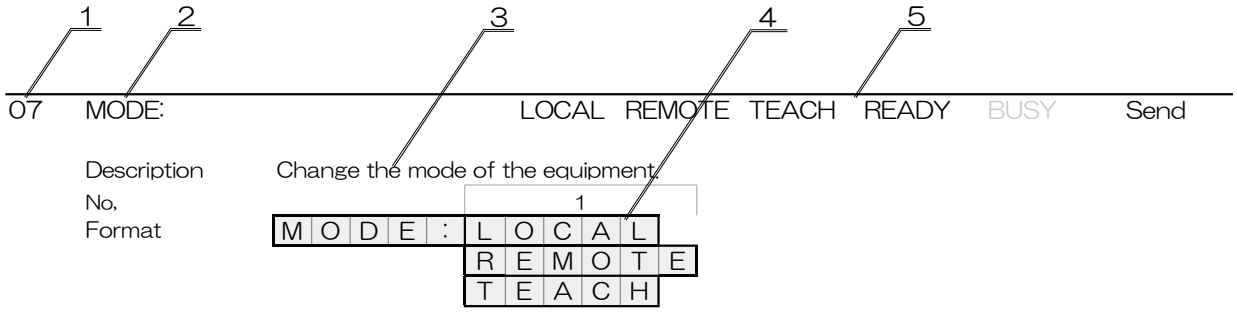
Item	No,	Command name	Description	Mode	State	Page
Motion status Information	27	Q:	Get the status (Position coordinate values, Error, Motion, and Positioning)	R T	R B	34
	28	SRQ:	Get the status (Error, Motion, and Positioning)	R T	R B	37
	29	P:	Get the position coordinate values	R T	R B	39
	30	ER:	Get the error status	R T	R B	40
	31	STS:	Get the motion status	R T	R B	42
	32	!:	Get the positioning status	R T	R B	43
Origin	33	H:	Return to mechanical origin	R T	R	44
	34	Z:	Return to electrical origin	R T	R	44
	35	R:	Set the position coordinate values to zero	R T	R	45
	36	LIMG:	Perform the stage stroke detection movement	R	R	45
Motion	37	L:	Operation stop and emergency stop	R	R B	45
	38	ACC:	Set the acceleration and deceleration time	R T	R	46
	39	ACCR:	Get the acceleration and deceleration time	R	R B	46
	40	D:	Set the movement speed of the stage	R T	R	47
	41	DR:	Get the movement speed	R	R B	48
	42	A:	Set the position to move in absolute motion	R T	R	49
	43	M:	Set the amount of movement to move in relative motion	R T	R	50
	44	G	Start moving (The setting values is lost after execution)	R T	R	51
	45	GN:	Start moving (The setting values is not lost.)	R T	R	51
	46	GC:	Delete the setting values of the "A:" and "M:" commands	R	R	52
	47	GR:	Get the setting values of the "A:" and "M:" commands	R	R B	52
	48	JG:	It moves according to the set number of pulses	R T	R	53
	49	JY:	Start moving without specifying a target point	R	R B	53
Position registration	50	PIT_DEL:	Delete location information registered for the specified number	R	R	54
	51	PIT_SET:	Register current coordinate value to specified number	R	R	54
	52	PIT_GET:	Get the coordinate value registered in the specified number	R	R	54
	53	PITG:	Start Moving to the coordinate value registered in the specified number	R	R	54
General purpose I/O	54	I:	Get general-purpose input status	R T	R B	55
	55	O:	Set general-purpose Output status	R T	R B	55
Teaching	56	T_ON:	Enter edit mode	T	R	55
	57	T_OFF:	Save contents and exit	T	R	55
	58	T_DEL:	Delete content	T	R	56
	59	T_SET:	Set content	T	R	56
	60	T_GET:	Get content	T	R	56
	61	TC:	Select a channel	T	R	56
	62	TCR:	Get current channel	T	R B	56
	63	TQ:	Get teaching status	T	R B	57
	64	TG:	Teaching start	T	R	57
	65	TP:	Pause	T	R B	57
	66	TO:	Execute line by line	T	R	57
	67	TL:	Stop execution	T	R B	57
	68	TR:	Get channel subscription status	T	R B	58
	69	TFR:	Get the loop count	T	R B	58
	70	TM:	Set the Teaching monitor function	T	R	59
	71	TMR:	Get the Teaching monitor function setting	T	R	59
	72	TNR:	Get current line number	T	R B	60
	73	TACR:	Get current execution command	T	R B	60
Teaching registration only	74	FS:	Loop setting	T	-	60
	75	FE:	Set loop end	T	-	60
	76	END:	Set the execution end line	T	-	60
	77	T:	Set the wait time	T	-	60
	78	GIS:	Wait until the specified general-purpose input state is reached	T	-	61
Parameter settings	79	PRM_ON:	Switch to parameter setting mode	R	R	61
	80	PRM_OFF:	Exit parameter setting mode	R	R B	61
	81	PRM_SET:	Set parameters	R	R B	61
	82	PRM_GET:	Get parameters	R	R B	61

6-2. Command description format

Explains how to read the command description.

(1) Send command format

Describes the send command format. Sending means sending a command from the computer to the equipment. There is no reply from the equipment to the computer after receiving these commands. The command format is not case sensitive.



No,	Item	Subcommand	Description
1	Control	LOCAL	Switch to LOCAL mode
		REMOTE	Switch to REMOTE mode
		TEACH	Switch to TEACH mode

6

No	Item		Contents	Description
1	Command Number		-	The command number.
2	Command Name		-	The name of the command.
3	Feature Description		-	Describes the feature of the command.
4	Send Format		-	This is the format when sending commands.
5	Conditions that can be sent	Mode	LOCAL	It indicates that black characters are usable, and gray characters are disabled. The outline character of REMOTE can be used after sending the command "PRM_ON:". The outline character of TEACH can be used only for registration in the internal memory as a Teaching program.
			REMOTE	
			REMOTE	
			TEACH	
			TEACH	
		Control state	READY * 1	It indicates that black characters are usable, and gray characters are disabled.
			BUSY * 2	
		Command type	Send	Indicates that the command is a send-only command.
			Send/Reply	Indicates that the command has a reply after sending the command.
			Teaching registration only	It can be used only when registering in the internal memory as a Teaching program.
6	Details		No,	Format block number.
			Subcommand	The name of the subcommand.
			Description	Describes the subcommand.

* 1 All operations are accepted.
* 2 Operation related to operation is denied.

(2) Send / Reply command format

Explains the format of the send /reply command. With the send/reply commands, there is a reply from the equipment after sending. Sending means sending a command from the computer to the equipment. Reply means that there is a reply from the device to the computer. The command format is not case sensitive.

08 MODE? LOCAL REMOTE TEACH READY BUSY Send/Reply

Description Check the current mode of the equipment.

Send format

M	O	D	E	?

No. 1 2

Reply format

***	/	
	,	****

Item	No.1	No.2	Description
Status	LOCAL	None	LOCAL mode
		SETUP	SETUP mode
		PRM	PARAMETER mode (From SETUP mode)
		INFO	INFORMATION mode
	REMOTE	None	REMOTE mode
		PRMCMD	PARAMETER mode (From "PRM_ON:" command)
		SETUP	SETUP mode
		PRM	PARAMETER mode (From SETUP mode)
		INFO	INFORMATION mode
	TEACH	JOGCMD	TEACH mode (JOG and command operation) * 1
		IO	TEACH mode (I/O port operation) * 1
		EDIT	TEACH edit mode (From "T_ON:" command)
		TEST	MOVEMENT TEST mode
		SETUP	SETUP mode
		PRM	PARAMETER mode (From SETUP mode)
		INFO	INFORMATION mode

* 1 It can be confirmed by the reply contents by the command "PRM_GET: A15" .

* Example 1 LOCAL mode

Send	Replay
MODE ?	LOCAL

* Example 2 PARAMETER mode (From "PRM_ON:" command)

Send	Replay
MODE ?	REMOTE,PRMCMD

16 ECHOR: LOCAL REMOTE TEACH READY BUSY Send/Reply

Description Check the echo back status.

Send format

E	C	H	O	R	:

No. 1

Reply format

O
1

No.	Item	Reply	Description
1	Status	0	Not Echo back
		1	Echo back

No	Item	Contents	Description
1	Reply format	-	Reply format
2	Details	No.	Block number for reply format.
		Reply	The reply content.
		Description	A description of the reply.
3	Reply example	-	This is a reply example.

6-3. Echo back

When echo back is turned on, the command sent immediately before is echoed back. If the command sent from the equipment is a command error, "CMD ER" is returned.
Note : Please be sure to clear the receive buffer of the personal computer before sending the next command.

(1) Command without a reply

Send format

M	O	D	E	:	L	O	C	A	L

No,

					1				

Reply format

M	O	D	E	:	L	O	C	A	L

No,	Description
1	Reply send command

(2) Command with a reply

Send format

M	O	D	E	?

No,

					1		2				3				

Reply format

M	O	D	E	?		L	O	C	A	L

No,	Description
1	Reply send command
2	Space
3	Reply contents of "MODE?" Command reply

(3) When a command error occurs due to a send command

Send format

***

No,

					1	

Reply format

C	M	D		E	R

* There is a space between "CMD" and "ER" .

No,	Description
1	Reply command error

6-4. Command description

(1) Control commands

01 RESET: LOCAL REMOTE TEACH READY BUSY Send

Description: Restart the equipment. Same as the Restart button on the front panel, but does not disconnect the USB communication link.

Send format: R E S E T :

02 *RST LOCAL REMOTE TEACH READY BUSY Send

Description: Restart the equipment. Same as the Restart button on the front panel, but does not disconnect the USB communication link.

Send format: * R S T

03 RESET_RET: LOCAL REMOTE TEACH READY BUSY Send/Reply

Description: Restart the equipment. "END" will be returned after the restart is completed. Same as the Restart button on the front panel, but does not disconnect the USB communication link.

Send format: R E S E T _ R E T :

No, Reply format: 1 / E N D

No,	Item	Reply	Description
1	Status	END	Restart complete

04 SLEEP: LOCAL REMOTE TEACH READY BUSY Send

Description: The equipment enters and returns to sleep mode. Transfer cannot be performed while editing parameters and teaching contents. For details on sleep, see "(24) Sleep function".

No, Send format: 1 / S L E E P : 0 / 1

No,	Item	Subcommand	Description
1	Status	0	OFF
		1	ON

05 SLEEP_RET: LOCAL REMOTE TEACH READY BUSY Send/Reply

Description: The equipment enters and returns to sleep mode. Reply after going to sleep mode or after returning. Transfer cannot be performed while editing parameters and teaching contents. For details on sleep, see "(24) Sleep function".

No, Send format: 1 / S L E E P _ R E T : 0 / 1

No,	Item	Subcommand	Description
1	Control	0	OFF
		1	ON

No, Reply format: 1 / 0 / 1

No,	Item	Reply	Description
1	Status	0	Switch to sleep mode OFF
		1	Switch to sleep mode ON

06 SLEEP? LOCAL REMOTE TEACH READY BUSY Send/Reply

Description Check the sleep mode status. For details on sleep, see "(24) Sleep function".

Send format

S	L	E	E	P	?

No,

Reply format

1
0
1

No,	Item	Reply	Description
1	Status	0	Sleep mode OFF
		1	Sleep mode ON

07 MODE: LOCAL REMOTE TEACH READY BUSY Send

Description Change the mode of the equipment.

No, 1

Send format

M	O	D	E	:	L	O	C	A	L
					R	E	M	O	T	E
					T	E	A	C	H	

No,	Item	Subcommand	Description
1	Control	LOCAL	Switch to LOCAL mode
		REMOTE	Switch to REMOTE mode
		TEACH	Switch to TEACH mode

08 MODE? LOCAL REMOTE TEACH READY BUSY Send/Reply

Description Check the current mode of this equipment.

Send format

M	O	D	E	?

No, 1 2

Reply format

***				
	,	****		

Item	No,1	No,2	Description
Status	LOCAL	None	LOCAL mode
		SETUP	SETUP mode
		PRM	PARAMETER mode (From SETUP mode)
		INFO	INFORMATION mode
	REMOTE	None	REMOTE mode
		PRMCMD	PARAMETER mode (From "PRM_ON:" command)
		SETUP	SETUP mode
		PRM	PARAMETER mode (From SETUP mode)
		INFO	INFORMATION mode
	TEACH	JOGCMD	TEACH mode (JOG and command operation) * 1
		IO	TEACH mode (I/O port operation) * 1
		EDIT	TEACH edit mode (From "T_ON:" command)
		TEST	MOVEMENT TEST mode
		SETUP	SETUP mode
		PRM	PARAMETER mode (From SETUP mode)
		INFO	INFORMATION mode

* 1 It can be confirmed by the reply contents by the command "PRM_GET: A15".

* Example 1 LOCAL mode

Send	Reply
MODE ?	LOCAL

* Example 2 PARAMETER mode (From "PRM_ON:" command)

Send	Reply
MODE ?	REMOTE,PRMCMD

09 F: LOCAL REMOTE TEACH READY BUSY Send

Description: Change the feedback stage control method.

No,
Send format

		1	2
F	:	1	0
		2	1
		W	

No,	Item	Subcommand	Description
1	Axis	1	First axis
		2	Second axis
		W	Both axis
2	Control	0	Open loop
		1	Closed loop

10 FR: LOCAL REMOTE TEACH READY BUSY Send/Reply

Description: Get the feedback stage control method.

No,
Send format

			1
F	R	:	/
			1
			2
			W

No,	Item	Subcommand	Description	Reply format block No,
1	Axis	None	Depends on the parameter "AXIS Sel" * 1	None
		1	First axis	1
		2	Second axis	1
		W	Both axis	1 : First axis 2 : Second axis

* 1 It can be checked by "PRM_GET: G01" command.

No,
Reply format

	1		2	
0		,	0	
1			1	

No,	Item	Reply	Description
1 , 2	Status	0	Open loop
		1	Closed loop

11 C: LOCAL REMOTE TEACH READY BUSY Send

Description: Change the current motor excitation state.

No,
Send format

		1	2
C	:	1	0
		2	1
		W	

No,	Item	Subcommand	Description
1	Axis	1	First axis
		2	Second axis
		W	Both axis
2	Control	0	Non-excitation
		1	Excitation

12 CR: LOCAL REMOTE TEACH READY BUSY Send/Reply

Description: Get the current motor excitation status.

No,
Send format

C	R	:	/	1
				1
				2
				W

No,	Item	Subcommand	Description	Reply format block No,
1	Axis	None	Depends on the parameter "AXIS Sel" * 1	None
		1	First axis	1
		2	Second axis	1
		W	Both axis	1 : First axis 2 : Second axis

* 1 It can be checked by "PRM_GET: G01" command.

No,
Reply format

1		2
0	,	0
1		1

No,	Item	Reply	Description
1 , 2	Status	0	Non-excitation
		1	Excitation

13 BEC: LOCAL REMOTE TEACH READY BUSY Send

Description: Forcibly completes positioning during operation. Cancel in case of error or emergency stop.

Resolvable errors * 2	Limit error
	Overflow error
	Teaching command error
Releasable state	Emergency

* 2 Command errors are excluded because they are cleared when a normal command is received.

No,
Send format

B	E	C	:	/	1
					1
					2
					W

No,	Item	Subcommand	Description
1	Axis	None	Depends on the parameter "AXIS Sel" * 3
		1	First axis
		2	Second axis
		W	Both axis

* 3 It can be checked by "PRM_GET: G01" command.

14 CMDR: LOCAL REMOTE TEACH READY BUSY Send/Reply

Description: Gets the last normal command sent other than this command. If a command has not been sent before issuing this command, "*" is returned.

Send format

C	M	D	R	:

No,
Reply format

1
****

No,	Item	Reply example	Description
1	Command	BEC:	Last command sent

15 ECHO: LOCAL REMOTE TEACH READY BUSY Send

Description Set echo back after sending command. For details, see “6-3. Echoback” .

No, 1
Send format E C H O : O
1

No,	Item	Subcommand	Description
1	Control	0	Echo back OFF
		1	Echo back ON

16 ECHOR: LOCAL REMOTE TEACH READY BUSY Send/Reply

Description Get echo back setting status.
Send format E C H O R :

No, 1
Reply format O
1

No,	Item	Reply	Description
1	Status	0	Echo back OFF
		1	Echo back ON

(2) Infomation commands

17 *IDN? LOCAL REMOTE TEACH READY BUSY Send/Reply

Description Get equipment information.
Send format * I D N ?

No, 1 2 3 4 5
Reply format **** , **** , **** , **** , ****

No,	Item	Reply example	Description
1	Information	SIGMAKOKI	Vendor name
2		FC-111	Model name
3		00000	Serial Number
4		00.00	Equipment Number
5		00.000	Firmware Version

18 VENDOR: LOCAL REMOTE TEACH READY BUSY Send/Reply

Description Get the vendor name of this equipment.
Send format V E N D O R :

No, 1
Reply format ****

No,	Item	Reply example	Description
1	Information	SIGMAKOKI	Vendor name

19 MODEL: LOCAL REMOTE TEACH READY BUSY Send/Reply

Description: Get the Model name of this equipment.
Send format: M O D E L :

No, 1
Reply format: ****

No,	Item	Reply	Description
1	Information	FC-111	Model name
		FC-411	
		FC-511	
		FC-611	
		FC-911	

20 SN: LOCAL REMOTE TEACH READY BUSY Send/Reply

Description: Get the Serial Number name of this equipment.
Send format: S N :

No, 1
Reply format: ****

No,	Item	Reply example	Description
1	Information	0000	Serial Number

21 EN: LOCAL REMOTE TEACH READY BUSY Send/Reply

Description: Get the Equipment Number of this equipment.
Send format: E N :

No, 1
Reply format: ****

No,	Item	Reply example	Description
1	Information	00.00	Equipment Number

22 FV: LOCAL REMOTE TEACH READY BUSY Send/Reply

Description: Get the Firmware Version of this equipment.
Send format: F V :

No, 1
Reply format: ****

No,	Item	Reply example	Description
1	Information	00.000	Firmware Version

23 RESO: LOCAL REMOTE TEACH READY BUSY Send/Reply

Description Get the Minimum resolution of this equipment.

No,
Send format

						1
R	E	S	O	:	/	1
						2
						W

No,	Item	Subcommand	Description	Reply format block No,
1	Axis	None	Depends on the parameter "AXIS Sel" * 1	None
		1	First axis	1
		2	Second axis	1
		W	Both axis	1 : First axis 2 : Second axis

* 1 It can be checked by "PRM_GET: G01" command.

No,
Reply format

1		2
****	,	****

No,	Item	Reply	Description
1 , 2	Status	100	Minimum resolution (unit: nm)
		50	
		10	
		5	
		1	

24 LIMR: LOCAL REMOTE TEACH READY BUSY Send/Reply

Description Get the stage stroke. It is necessary to execute the "LIMG:" command in advance. If the "LIMG:" command has not been executed, "*" is returned.

No,
Send format

						1
L	I	M	R	:	/	1
						2
						W

No,	Item	Subcommand	Description	Reply format block No,
1	Axis	None	Depends on the parameter "AXIS Sel" * 2	None
		1	First axis	1
		2	Second axis	1
		W	Both axis	1 : First axis 2 : Second axis

* 2 It can be checked by "PRM_GET: G01" command.

No,
Reply format

1		2
****	,	****

No,	Item	Reply example	Description
1 , 2	Stage information	200000 * 3	Stroke

* 3 The minimum digit is the minimum resolution digit. For FC-111, it is 20.0000mm.

25 AN: LOCAL REMOTE TEACH READY BUSY Send/Reply

Description Get the axis name.

No,
Send format

				1
A	N	:	/	
			1	
			2	
			W	

No,	Item	Subcommand	Description	Reply format block No,
1	Axis	None	Depends on the parameter "AXIS Sel" * 1	None
		1	First axis	1
		2	Second axis	1
		W	Both axis	1 : First axis 2 : Second axis

* 1 It can be checked by "PRM_GET: G01" command.

No,
Reply format

1				2
*	,	*		

No,	Reply example	Description
1	X	First axis name
2	Y	Second axis name

26 UNT: LOCAL REMOTE TEACH READY BUSY Send/Reply

Description Get the unit.

No,
Send format

				1
U	N	T	:	/
				1
				2
				W

No,	Item	Subcommand	Description	Reply format block No,
1	Axis	None	Depends on the parameter "AXIS Sel" * 2	None
		1	First axis	1
		2	Second axis	1
		W	Both axis	1 : First axis 2 : Second axis

* 2 It can be checked by "PRM_GET: G01" command.

No,
Reply format

1				2
*	,	*		

No,	Item	Reply	Description
1 , 2	Unit	N	Nanometer
		U	Micrometer
		M	Millimeter
		D	Degree
		P	No unit (minimum digit is minimum resolution digit)

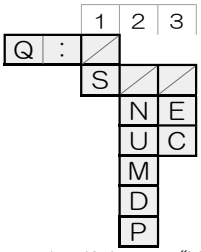
(3) Motion status Information commands

27 Q: LOCAL REMOTE TEACH READY BUSY Send/Reply

Description

Get the coordinate values, the error, motion, and positioning status.
There are two types of reply format, and it choose by block number 1 of the send format.
Reply format 1 is conventional.
Reply format 2 can choose the type and unit of coordinate value.
Also, it is possible to check the positioning status of each axis and all errors that occurre.

No,
Send format



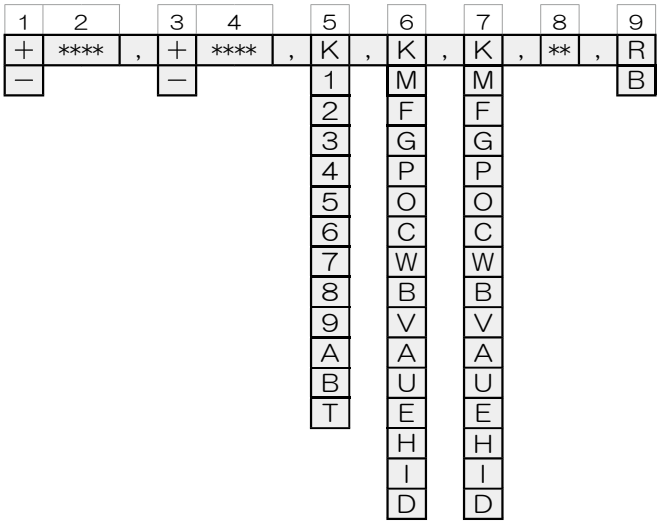
＊1 If there is "No," to be set to "None", pad the specified No, additional command to the left.
However, when No,1 is "None" , No,2 and No,3 cannot be selected.

No,	Item	Subcommand	Description
1 ＊1	Reply format	None	Format1
		S	Format2
2 ＊1	Unit	None	Reply in the unit set in parameter "UNIT Sel" ＊2
		N	Nanometer
		U	Micrometer
		M	Millimeter
		D	Degree
		P	No unit (minimum digit is minimum resolution digit)
3 ＊1	Coordinate value type	None	Reply with the value set in the parameter "Count Sel" ＊3
		E	Encoder values
		C	Command values

＊2 Can be confirmed with the reply by Command "PRM_GET: A03" or "PRM_GET: A04" .

＊3 Can be confirmed with the reply by Command "PRM_GET: G15" or "PRM_GET: G16" .

Reply format1



No,	Item	Reply	Description
1 (First axis) 3 (Second axis)	Sign	＋	Plus
		－	Minus
2 (First axis) 4 (Second axis)	Coordinate value	00000001 ＊4	Coordinate value

＊4 The response content is an example. In the case of FC-111, it represents 100nm.

No,	Item	Reply	Description
5	Status (Error)	K	Normal (No error)
		1	Command error
		2	Scale error
		3	Limit stop
		4	Over speed error
		5	Overflow error
		6	Emergency stop
		7	Interpolator error
		8	Limit error
		9	System error
		A	Slowdown sensor area
		B	Software Limit stop
		T	TEACHING command error
6 (First axis) 7 (Second axis)	Status (Motion)	K	Normal stop
		M	During command move
		F	Out of the in-position range (After positioning is completed) * 1
		G	During fine adjustment * 2, * 3
		P	During electrical origin return
		O	During mechanical origin return
		C	CW side limit stop
		W	CCW side limit stop
		B	CW side software limit stop
		V	CCW side software limit stop
		A	CW side slowdown sensor area
		U	CCW side slowdown sensor area
		E	Error occurred
		H	Motor is transitioning to excitation
		I	Motor is transitioning to non-excitation
		D	Disabled axis (Not set by parameter "AXIS Sel")
8	System reservation	0000	System reservation
9	Status (Positioning)	R	All axes have been positioned and no errors have occurred. * 1
		B	Positioning of all axes is incomplete or an error has occurred. * 2

* 1 All operations are accepted. (This state is READY)

* 2 Refusing operation related to the move of the stage. (This state is BUSY)

* 3 It can be READY state by "BEC:" command.

No,
Reply format2

1	2	3		4	5	6		7		8		9		10		11		12		13
N	+	****	,	N	+	****	,	*****	,	*****	,	K	,	K	,	**	,	R	,	R
U	−			U	−							M		M				B		B
M				M								F		F						
D				D								G		G						
P				P								P		P						
												O		O						
												C		C						
												W		W						
												B		B						
												V		V						
												A		A						
												U		U						
												E		E						
												H		H						
												I		I						
												D		D						

No,	Item	Reply	Description
1 (First axis) 2 (Second axis)	Unit	N	Nanometer
		U	Micrometer
		M	Millimeter
		D	Degree
		P	No unit (minimum digit is minimum resolution digit)
2 (First axis) 5 (Second axis)	Sign	+	Plus
		−	Minus

No,	Item	Reply	Description		
3 (First axis) 6 (Second axis)	Coordinate value	****	Depends on the instruction unit. * 4		
7 (First axis) 8 (Second axis)	Status (Error)	1 , 0	Bit	Reply: 1	Reply: 0
			1 (MSB)	Normal	Error occurred
			2	Command error	No occurred
			3	Scale error	No occurred
			4	Limit stop	Other
			5	Over speed error	No occurred
			6	Overflow error	No occurred
			7	Emergency stop	No occurred
			8	Interpolator error	No occurred
			9	Limit error	No occurred
			10	System error	No occurred
			11	Slowdown sensor area	Other
			12	Software limit stop	Other
			13 (LSB)	TEACHING command error	No occurred
9 (First axis) 10 (Second axis)	Status (Motion)	K	Normal stop		
		M	During command move		
		F	Out of the in-position range (After positioning is completed) * 1		
		G	During fine adjustment, * 2, * 3		
		P	During electrical origin return		
		O	During mechanical origin return		
		C	CW side limit stop		
		W	CCW side limit stop		
		B	CW side software limit stop		
		V	CCW side software limit stop		
		A	CW side slowdown sensor area		
		U	CCW side slowdown sensor area		
		E	Error occurred		
		H	Motor is transitioning to excitation		
		I	Motor is transitioning to non-excitation		
		D	Disabled axis (Not set by parameter "AXIS Sel")		
11	System reservation	0000	System reservation		
12 (First axis) 13 (Second axis)	Status (Positioning)	R	All axes have been positioned and no errors have occurred. * 1		
		B	Positioning of all axes is incomplete or an error has occurred. * 2		

* 1 All operations are accepted. (This state is READY)

* 2 Refusing operation related to the move of the stage. (This state is BUSY)

* 3 It can be READY state by "BEC:" command.

* 4 Example 1 : When the coordinate value is 12.3456mm. (use FC-111)

Unit	Reply coordinate value
nm	12345600
um	12345.6
mm	12.3456
None	123456

* 4 Example 2 : When the coordinate value is 1.23456° . (use FC-511)

Unit	Reply coordinate value
Degree	1.23456
None	123456

Example : First axis is stopped at -12.345678mm, and the unit is nm. The second axes are operating at a position of 0.123456 mm, and the unit is μ m. (use FC-911)

Send	Reply
Q:	-12345678,+00123456,K,K,M,0000,B
Q:S ※5	N-12345678,U+123.456,1000000000000,1000000000000,K,M,0000,R,B
Q:SM ※5	M-12.345678,M+0.123456,1000000000000,1000000000000,K,M,0000,R,B
Q:SE ※5	N-12345678,U+123.456,1000000000000,1000000000000,K,M,0000,R,B
Q:SUC ※5	U-12345.678,U+123.456,1000000000000,1000000000000,K,M,0000,R,B

* 5 The number of digits of the coordinate value varies depending on the unit.

28 SRQ: LOCAL REMOTE TEACH READY BUSY Send/Reply

Description: Get the status. Select Reply format in block No. 1 of Send format. Reply format1 can acquire the conventional method, and Reply format2 can acquire the positioning status and error status for each axis.

No, Send format

					1
S	R	Q	:	/	
				S	

No,	Item	Subcommand	Description
1	Reply format	None	Format1
		S	Format2

No, Reply format1

1		2		3		4		5
K	,	K	,	K	,	**	,	R
1		M		M				B
2		F		F				
3		G		G				
4		P		P				
5		O		O				
6		C		C				
7		W		W				
8		B		B				
9		V		V				
A		A		A				
B		U		U				
T		E		E				
		H		H				
		I		I				
		D		D				

No,	Item	Reply	Description
1	Status (Error)	K	Normal (No error)
		1	Command error
		2	Scale error
		3	Limit stop
		4	Over speed error
		5	Overflow error
		6	Emergency stop
		7	Interpolator error
		8	Limit error
		9	System error
		A	Slowdown sensor area
		B	Software Limit stop
		T	TEACHING command error
2 (First axis) 3 (Second axis)	Status (Motion)	K	Normal stop
		M	During command move
		F	Out of the in-position range (After positioning is completed) * 1
		G	During fine adjustment, * 2, * 3
		P	During electrical origin return
		O	During mechanical origin return
		C	CW side limit stop
		W	CCW side limit stop
		B	CW side software limit stop
		V	CCW side software limit stop
		A	CW side slowdown sensor area
		U	CCW side slowdown sensor area
		E	Error occurred
		H	Motor is transitioning to excitation
		I	Motor is transitioning to non-excitation
		D	Disabled axis (Not set by parameter "AXIS Sel")
4	System reservation	0000	System reservation

* 1 All operations are accepted. (This state is READY)

* 2 Refusing operation related to the move of the stage. (This state is BUSY)

No,	Item	Reply	Description
5	Status (Positioning)	R	All axes have been positioned and no errors have occurred. * 1
		B	Positioning of all axes is incomplete or an error has occurred. * 2

No,
Reply format2

1	2	3	4	5	6	7
*****	*****	K M F G P O C W B V A U E H I D	K M F G P O C W B V A U E H I D	**	R B	R B

No,	Item	Reply	Description		
1 (First axis) 2 (Second axis)	Status (Error)	1 , 0	Bit	Reply: 1	Reply: 0
			1 (MSB)	Normal	Error occurred
			2	Command error	No occurred
			3	Scale error	No occurred
			4	Limit stop	Other
			5	Over speed error	No occurred
			6	Overflow error	No occurred
			7	Emergency stop	No occurred
			8	Interpolator error	No occurred
			9	Limit error	No occurred
			10	System error	No occurred
			11	Slowdown sensor area	Other
			12	Software limit stop	Other
			13 (LSB)	TEACHING command error	No occurred
3 (First axis) 4 (Second axis)	Status (Motion)	K	Normal stop		
		M	During command move		
		F	Out of the in-position range (After positioning is completed) * 1		
		G	During fine adjustment. * 2, * 3		
		P	During electrical origin return		
		O	During mechanical origin return		
		C	CW side limit stop		
		W	CCW side limit stop		
		B	CW side software limit stop		
		V	CCW side software limit stop		
		A	CW side slowdown sensor area		
		U	CCW side slowdown sensor area		
		E	Error occurred		
		H	Motor is transitioning to excitation		
		I	Motor is transitioning to non-excitation		
		D	Disabled axis (Not set by parameter "AXIS Sel")		
5	System reservation	0000	System reservation		
6 (First axis) 7 (Second axis)	Status (Positioning)	R	All axes have been positioned and no errors have occurred. * 1		
		B	Positioning of all axes is incomplete or an error has occurred. * 2		

* 1 All operations are accepted. (This state is READY)
* 2 Refusing operation related to the move of the stage. (This state is BUSY)
* 3 It can be READY state by "BEC:" command.

Example: When axis 1 is stopped and axis 2 is operating.

Send	Reply
SRQ:	K,K,M,0000,B
SRQ:S	1000000000000,1000000000000,K,M,0000,R,B

29 P: LOCAL REMOTE TEACH READY BUSY Send/Reply

Description: Get the coordinate values. There are two types of reply format, and it choose by block number 2 of the send format. Reply format 1 is conventional. Reply format 2 can choose the type and unit of coordinate value.

No,
Send format

1	2	3	4
P	:	／	／
		1	S
		2	N
		W	U
			M
			D
			P

＊1 If there is "No," to be set to "None", pad the specified No, additional command to the left. However, when No,2 is "None" , No,3 and No,4 cannot be selected.

No,	Item	Subcommand	Description	Reply format block No,
1 ※1	Axis	None	Depends on the parameter "AXIS Sel" ＊2	None
		1	First axis	1,2 (Reply format1)
		2	Second axis	1,2,3 (Reply format2)
		W	Both axis	1,2: First axis 3,4: Second axis (Reply format1) 1,2,3: First axis 4,5,6: Second axis (Reply format2)
2 ※1	Reply format	None	Format1	-
		S	Format2	
3 ※1	Unit	None	Reply in the unit set in parameter "UNIT Sel" ＊3	-
		N	Nanometer	
		U	Micrometer	
		M	Millimeter	
		D	Degree	
		P	No unit (minimum digit is minimum resolution digit)	
4 ※1	Coordinate value type	None	Reply with the value set in the parameter "Count Sel" ＊4	-
		E	Encoder values	
		C	Command values	

＊2 It can be checked by "PRM_GET: G01" command.

＊3 Can be confirmed with the reply by Command "PRM_GET: A03" or "PRM_GET: A04" .

＊4 Can be confirmed with the reply by Command "PRM_GET: G15" or "PRM_GET: G16" .

No,
Reply format1

1	2		3	4
＋	****	,	＋	****
－			－	

No,	Item	Reply	Description
1 , 3	Sign	＋	Plus
		－	Minus
2 , 4	Coordinate value	00000001 ＊5	Coordinate value

＊5 Contents are examples. For FC-511, it represents 10nm.

No,
Reply format2

1	2	3		4	5	6
N	＋	****	,	N	＋	****
U	－			U	－	
M				M		
D				D		
P				P		

No,	Item	Reply	Description
1 , 4	Unit	N	Nanometer
		U	Micrometer
		M	Millimeter
		D	Degree
		P	No unit (minimum digit is minimum resolution digit)

No,	Item	Reply	Description
2 , 5	Sign	+	Plus
		−	Minus
3 , 6	Coordinate value	****	Varies by unit * 1

* 1 Example 1 : When the coordinate value is 12.3456mm. (use FC-111)

Unit	Reply coordinate value
nm	12345600
um	12345.6
mm	12.3456
None	123456

* 1 Example 2 : When the coordinate value is 1.23456° . (use FC-511)

Unit	Reply coordinate value
Degree	1.23456
None	123456

Example : First axis is stopped at -12.345678mm, and the unit is nm. The second axes are operating at a position of 0.123456 mm, and the unit is μ m. (use FC-911)

Send	Reply
P:	-12345678,+00123456
P:S * 2	N-12345678,U+123.456
P:1S	N-12345678
P:2S	U+123.456
P:WSN *2	N-12345678,N+123456

* 2 The number of digits of the coordinate value varies depending on the unit.

30 ER: LOCAL REMOTE TEACH READY BUSY Send/Reply

Description Get the error status. There are two types of reply format, and it choose by block number 1 of the send format. Reply format 1 is conventional. Reply format 2 can check all errors that occurred.

No,

Send format

			1	2
E	R	:		
			1	S
			2	
			W	

* 3 If there is "No," to be set to "None", pad the specified No, additional command to the left. However, when No,1 is "None" , No,2 cannot be selected.

No,	Item	Subcommand	Description	Reply format2 block No,
1 * 3	Axis	None	Depends on the parameter "AXIS Sel" * 4	None
		1	First axis	1
		2	Second axis	
		W	Both axis	1: First axis 2: Second axis
2 * 3	Reply format	None	Format1	-
		S	Format2	

* 4 It can be checked by "PRM_GET: G01" command.

No,
Reply format1

1
K
1
2
3
4
5
6
7
8
9
A
B
T

No,	Item	Reply	Description
1	Status (Error)	K	Normal (No error)
		1	Command error
		2	Scale error
		3	Limit stop
		4	Over speed error
		5	Overflow error
		6	Emergency stop
		7	Interpolator error
		8	Limit error
		9	System error
		A	Slowdown sensor area
		B	Software Limit stop
		T	TEACHING command error

No,
Reply format2

1		2
*****	,	*****

No,	Item	Reply	Description		
1 , 2	Status (Error)	1 , 0	Bit	Reply: 1	Reply: 0
			1 (MSB)	Normal	Error occurred
			2	Command error	No occurred
			3	Scale error	No occurred
			4	Limit stop	Other
			5	Over speed error	No occurred
			6	Overflow error	No occurred
			7	Emergency stop	No occurred
			8	Interpolator error	No occurred
			9	Limit error	No occurred
			10	System error	No occurred
			11	Slowdown sensor area	Other
			12	Software limit stop	Other
			13 (LSB)	TEACHING command error	No occurred

Example: Both axes are normal

Send	Reply
ER:	K
ER:S	1000000000000,1000000000000

31 STS: LOCAL REMOTE TEACH READY BUSY Send/Reply

Description Get the motion status.

No,

Send format

				1
S	T	S	:	/
				1
				2
				W

No,	Item	Subcommand	Description	Reply format block No,
1	Axis	None	Depends on the parameter "AXIS Sel" * 1	None
		1	First axis	1
		2	Second axis	
		W	Both axis	1: First axis 2: Second axis

* 1 It can be checked by "PRM_GET: G01" command.

No,

Reply format

1		2
K	,	K
M		M
F		F
G		G
P		P
O		O
C		C
W		W
B		B
V		V
A		A
U		U
E		E
H		H
I		I
D		D

No,	Item	Reply	Description
1 (First axis) 2 (Second axis)	Status (Motion)	K	Normal stop
		M	During command move
		F	Out of the in-position range (After positioning is completed) * 2
		G	During fine adjustment, * 3, * 4
		P	During electrical origin return
		O	During mechanical origin return
		C	CW side limit stop
		W	CCW side limit stop
		B	CW side software limit stop
		V	CCW side software limit stop
		A	CW side slowdown sensor area
		U	CCW side slowdown sensor area
		E	Error occurred
		H	Motor is transitioning to excitation
		I	Motor is transitioning to non-excitation
		D	Disabled axis (Not set by parameter "AXIS Sel")

* 2 All operations are accepted. (This state is READY)

* 3 Refusing operation related to the move of the stage. (This state is BUSY)

* 4 It can be READY state by "BEC:" command.

32 !: LOCAL REMOTE TEACH READY BUSY Send/Reply

Description Get the positioning status. There are two types of reply format, and it choose by block number 1 of the send format. Reply format 1 is conventional. Reply format 2 can check the positioning status of each axis.

No,
Send format

		1	2
!	:		
		1	S
		2	
		W	

※1 If there is "No," to be set to "None", pad the specified No, additional command to the left. However, when No,1 is "None" , No,2 cannot be selected.

No,	Item	Subcommand	Description	Reply format block No,
1 ＊1	Axis	None	Depends on the parameter "AXIS Sel" ＊2	None
		1	First axis	1
		2	Second axis	
		W	Both axis	1: First axis 2: Second axis
2 ＊1	Reply format	None	Format1	-
		S	Format2	

＊2 It can be checked by "PRM_GET: G01" command.

No,
Reply format1

1
R
B

No,	Item	Reply	Description
1	Status (Positioning)	R	All axes have been positioned and no errors have occurred. ＊3
		B	Positioning of all axes is incomplete or an error has occurred. ＊4

No,
Reply format2

1		2
R	,	R
B		B

No,	Item	Reply	Description
1, 2	Status (Positioning)	R	All axes have been positioned and no errors have occurred. ＊3
		B	Positioning of all axes is incomplete or an error has occurred. ＊4

＊3 All operations are accepted. (This state is READY)

＊4 Refusing operation related to the move of the stage. (This state is BUSY)

Example: When axis 1 is stopped and axis 2 is operating.

Send	Reply
!:	B
!:S	R,B
!:1S	R
!:WS	R,B

(4) Commands related to the origin

33 H:

LOCAL REMOTE TEACH READY BUSY Send

Description: Performs machine home position return. For details, see "9. Home Return" . When the axis to be executed is non-excitation, the command error occurs. If ″, R″ is specified at the end of the command, a positioning completion reply is sent for each axis.

No, Send format

	1		2	3
H		:		
	0		1	, R
	1		2	
	2		W	
	3			
	4			

＊1 If there is a number to be set to "None" , pad the additional command with the specified number to the left.

No,	Item	Subcommand	Description
1 ＊1	Mode	None	Depends on the parameter ″ORG Mode Sel″ ＊2
		0	Mode0
		1	Mode1
		2	Mode2
		3	Mode3
		4	Mode4
2 ＊1	Axis	None	Depends on the parameter ″AXIS Sel″ ＊3
		1	First axis
		2	Second axis
		W	Both axis
3 ＊1	Reply request	None	Do not request a reply
		,R	After positioning is complete, return ″1″ for the first axis and ″2″ for the second axis.

＊2 Can be confirmed with the reply by Command "PRM_GET: A30" or "PRM_GET: A31" .

＊3 It can be checked by ″PRM_GET: G01″ command.

34 Z:

LOCAL REMOTE TEACH READY BUSY Send

Description: Perform electrical home return. For details, see "9. Home Return" . When the axis to be executed is non-excitation, the command error occurs. If ″, R″ is specified at the end of the command, a positioning completion reply is sent for each axis.

No, Send format

	1		2
Z	:		
		1	, R
		2	
		W	

※4 If there is a number to be set to "None" , pad the additional command with the specified number to the left.

No,	Item	Subcommand	Description
1 ＊4	Axis	None	Depends on the parameter ″AXIS Sel″ ＊5
		1	First axis
		2	Second axis
		W	Both axis
2 ＊4	Reply request	None	Do not request a reply
		,R	After positioning is complete, return ″1″ for the first axis and ″2″ for the second axis.

＊5 It can be checked by ″PRM_GET: G01″ command.

35 R: LOCAL REMOTE TEACH READY BUSY Send

Description Executes the electrical origin setting (zero set). For details, see "9. If the motor is in the demagnetized state, a command error will occur if the specified axis is demagnetized and executed.

No, 1

Send format R : / 1 2 W

No,	Item	Subcommand	Description
1	Axis	None	Depends on the parameter "AXIS Sel" * 1
		1	First axis
		2	Second axis
		W	Both axis

* 1 It can be checked by "PRM_GET: G01" command.

36 LIMG: LOCAL REMOTE TEACH READY BUSY Send

Description Executes the stage stroke detection operation. This value can be obtained by "LIMR:" command. When the axis to be executed is non-excitation, the command error occurs. When ",R" is added to the end of the send format, the axis number is replied when it is completed.

No, 1 2

Send format L I M G : / / / 1 , R 2 W

* 2 If there is a number to be set to "None" , pad the additional command with the specified number to the left.

No,	Item	Subcommand	Description
1 * 2	Axis	None	Depends on the parameter "AXIS Sel" * 3
		1	First axis
		2	Second axis
		W	Both axis
2 * 2	Reply request	None	Do not request a reply
		,R	After positioning is complete, return "1" for the first axis and "2" for the second axis.

* 3 It can be checked by "PRM_GET: G01" command.

(5) Commands related to the motion

37 L: LOCAL REMOTE TEACH READY BUSY Send

Description Execute stop and emergency stop.

No, 1

Send format L : / 1 2 W E

No,	Item	Subcommand	Description
1	Axis	None	Depends on the parameter "AXIS Sel" * 4
		1	First axis
		2	Second axis
		W	Both axis
		E	Emergency stop ※5

* 4 It can be checked by "PRM_GET: G01" command.

* 5 Can be canceled with Command "BEC:" .

38 ACC: LOCAL REMOTE TEACH READY BUSY Send

Description: Set the acceleration / deceleration time. However, if the instrument is turned off, reset, restarted, or the GENERAL parameter is changed, the set contents are discarded. When without setting of this value, executing the "A:", "M:" or "JG:" commands, the setting value of the parameter "Acc Time" is applied for the acceleration and deceleration time. The setting value of the parameter "Acc Time" can be checked by the reply of "PRM_GET: A18" and "PRM_GET: A19" command.

No, Send format

				1	2	3		4
A	C	C	:	1		***	,	***
				2				
				W				

No,	Item	Subcommand	Description	Send format block No,
1	Axis	1	First axis	3
		2	Second axis	
		W	Both axis	3: First axis 4: Second axis
2	Space	Space sign	Space	-
3	Time	***	Set in milliseconds (10 ~ 2000)	-
4		***		

39 ACCR: LOCAL REMOTE TEACH READY BUSY Send/Reply

Description: Acquires the set acceleration / deceleration time.

No, Send format

					1
A	C	C	R	:	/
					1
					2
					W

No,	Item	Subcommand	Description	Reply format block No,
1	Axis	None	Depends on the parameter "AXIS Sel" * 1	None
		1	First axis	1
		2	Second axis	
		W	Both axis	1: First axis 2: Second axis

* 1 It can be checked by "PRM_GET: G01" command.

No, Reply format

1		2
***	,	***

No,	Item	Reply example	Description
1, 2	Time	100	In this case is100 ms.

40 D: LOCAL REMOTE TEACH READY BUSY Send

Description Set the movement speed of the stage. However, when the power is turned off, RESET, restart or the GENERAL parameter is changed, this value will be lost. When without setting of this value, executing the "A:", "M:" or "JG:" commands, the setting value of the parameter "Max Speed" is applied for the movement speed. The setting value of the parameter "Max Speed" can be checked by the reply of "PRM_GET: G02" and "PRM_GET: G03" command.

No, Send format

		1	2	3	4	5
D	:	1	F	****	F	****
		2	P		P	
		W	N		N	
			U		U	
			M		M	
			D		D	

No,	Item	Subcommand	Description	Send format block No,
1	Axis	1	First axis	3
		2	Second axis	
		W	Both axis	3: First axis 4: Second axis
2, 4	Unit	F, P	No unit / second * 1	
		N	Nanometer / sec	
		U	Micrometer / sec	
		M	Millimeter / sec	
		D	Degree / sec	
3, 5	Speed	****	The setting speed is from the minimum resolution / sec to the parameter "Max Speed" . * 2	

* 1 The minimum digit of the operation speed is the digit of the minimum resolution.

* 2 Example: Operating speed setting (when FC-111 is used and 12.3456 mm / sec)

Unit	Speed
No unit / sec	123456
nm/sec	12345600
μm/sec	12345.6
mm/sec	12.3456

Example: First axis side operation speed is 12.34567mm / sec, second axis side operation speed is 500μm / sec, and when no unit is specified for both axes. (When using FC-511)

Axis	Command
First axis only	D:1F1234567
Second axis only	D:2F50000
Both axis	D:WF1234567F50000

Example: When the First axis side operation speed is 1.234567mm / sec and Millimeter is specified, and the second axis side operation speed is 500μm / sec and Micrometer is specified. (When using FC-911)

Axis	Command
First axis only	D:1M1.234567
Second axis only	D:2U500
Both axis	D:WM1.234567U500

41 DR: LOCAL REMOTE TEACH READY BUSY Send/Reply

Description Acquires the set operation speed.

No,

Send format

			1	2
D	R	:	/	/
			1	F
			2	P
			W	N
				U
				M
				D

＊1 If there is a number to be set to “None”, pad the additional command with the specified number to the left.

No,	Item	Subcommand	Description	Reply format block No,
1 ＊1	Axis	None	Depends on the parameter ″AXIS Sel″ ＊2	None
		1	First axis	1, 2
		2	Second axis	
		W	Both axis	1, 2: First axis 3, 4: Second axis
2 ＊1	Unit	None	Depends on the parameter ″UNIT Sel″ ＊3	
		F, P	No unit (minimum digit of operation speed is digit of minimum resolution)	
		N	Nanometer	
		U	Micrometer	
		M	Millimeter	
		D	Degree	

＊2 It can be confirmed by the reply contents by Command “PRM_GET: G01”.

＊3 It can be confirmed by the reply contents by Command “PRM_GET: A03” and “PRM_GET: A04”.

No,

Reply format

1	2		3	4
F	****	,	F	****
P			P	
N			N	
U			U	
M			M	
D			D	

No,	Item	Reply	Description
1, 3	Unit	F, P	No unit (minimum digit of operation speed is digit of minimum resolution)
		N	Nanometer
		U	Micrometer
		M	Millimeter
		D	Degree
2, 4	Speed	****	The setting speed is from the minimum resolution / sec to the parameter “Max Speed”. ＊4

＊4 Example: Operating speed setting (when FC-111 is used and 12.3456 mm / sec)

Unit	Reply speed
No unit/sec	123456
nm/sec	12345600
um/sec	12345.6
mm/sec	12.3456

＊4 Example: Operating speed setting (when FC-411 is used and 12.3455 ° / sec)

Unit	Reply speed
No unit/sec	123455
° /sec	1.23455

Example: When the First axis side operation speed is 1.234567mm / sec and Millimeter is specified, and the second axis side operation speed is 500 μm / sec and Micrometer is specified. (When using FC-911)

Send	Reply
DR:	N1234567,U500
DR:M	M1.234567,M0.5

42 A:

LOCAL REMOTE TEACH READY BUSY Send

Description: Set the absolute movement coordinate value. Set the coordinate value from the origin (position where the coordinate value is zero). This command alone will not work. To make it work, execute the command "G" or "GN:" . See commands "G" and "GN:" for details.

No,
Send format

		1	2	3	4	5	6	7
A	:	1	+	P	****	+	P	****
		2	−	N		−	N	
		W		U			U	
				M			M	
				D			D	

No,	Item	Subcommand	Description	Send format block No,
1	Axis	1	First axis	2, 3, 4
		2	Second axis	
		W	Both axis	2, 3, 4: First axis 5, 6, 7: Second axis
2, 5	Sign	+	Plus	
		−	Minus	
3, 6	Unit	P	No unit (minimum digit of coordinate value is digit of minimum resolution)	
		N	Nanometer	
		U	Micrometer	
		M	Millimeter	
		D	Degree	
4, 7	Coordinate value	****	Coordinate value * 1 (Setting range depends on the connected stage)	

* 1 Moving coordinate value setting example (when FC-111 is used and 12.3456mm)

Unit	Coordinate value
No unit	123456
nm	12345600
um	12345.6
mm	12.3456

* 1 Moving coordinate value setting example (when FC-411 is used and it is 1.23455 °)

Unit	Coordinate value
No unit	123455
°	1.23455

Example: When using FC-911 and moving the first axis (Unit: nm) from the origin (position where the coordinate value is zero) to -1.234567mm and the second axis (Unit: um) to + 0.5mm

Send example	Send order	Command
Example1	1	A:W-N1234567+U500
	2	G
Example2	1	A:W-N1234567+U500
	2	GN:W

43 M: LOCAL REMOTE TEACH READY BUSY Send

Description: Set the relative movement distance. This command alone will not work. To make it work, execute the command "G" or "GN:" . See commands "G" and "GN:" for details.

No,
Send format

		1	2	3	4	5	6	7
M	:	1	+	P	****	+	P	****
		2	−	N		−	N	
		W		U			U	
				M			M	
				D			D	

No,	Item	Subcommand	Description	Send format block No,
1	Axis	1	First axis	2, 3, 4
		2	Second axis	
		W	Both axis	2, 3, 4: First axis 5, 6, 7: Second axis
2, 5	Sign	+	Plus	
		−	Minus	
3, 6	Unit	P	No unit (minimum digit of moving distance is digit of minimum resolution)	
		N	Nanometer	
		U	Micrometer	
		M	Millimeter	
		D	Degree	
4, 7	Distance	****	Set the Movement distance * 1 (The range depends on the connected stage)	

* 1 Movement distance setting example (when FC-111 is used and 12.3456mm).

Unit	Movement distance
No unit	123456
nm	12345600
um	12345.6
mm	12.3456

* 1 Movement distance setting example (when FC-411 is used and it is 1.23455 °).

Unit	Movement distance
No unit	123455
°	1.23455

Example: When using FC-911 and moving from the current position to the first axis (Unit: nm) -12.345678mm and the second axis (Unit: um) to + 0.5mm.

Send example	Send order	Command
Example1	1	M:W-N12345678+U500
	2	G
Example2	1	M:W-N12345678+U500
	2	GN:W

44 G

LOCAL REMOTE TEACH READY BUSY Send

Description: The operation set by Command "A:" and "M:" starts. After execution, the values set with the commands "A:" and "M:" are discarded. When ",R" is specified at the end, positioning completion reply is sent for each axis.

No, Send format

	1
G	
,	R

No,	Item	Subcommand	Description
1	Reply request	None	Do not request a reply
		,R	After positioning is complete, return "1" for the first axis and "2" for the second axis.

45 GN:

LOCAL REMOTE TEACH READY BUSY Send

Description: The operation set by Command "A:" and "M:" starts. The values set by post-execution commands "A:" and "M:" are retained. When ",R" is specified at the end, positioning completion reply is sent for each axis.

No, Send format

		1	2
G	N :		
		1	, R
		2	
		W	

No,	Item	Subcommand	Description
1	Axis	None	Depends on the parameter "AXIS Sel" * 1
		1	First axis
		2	Second axis
		W	Both axis
2	Reply request	None	Do not request a reply
		,R	After positioning is complete, return "1" for the first axis and "2" for the second axis.

* 1 It can be confirmed by the reply contents by Command "PRM_GET: G01" .

Example: When FC-111 is used and Command "A:" "M:" "G" "GN:" is used

(Before sending, confirm that the positioning status of the movement target axis is READY with the command "Q:" , "SRQ:" , "!:" And send it.)

No	Send command	Description	Movement setting value		Coordinate value	
			First axis	Second axis	First axis	Second axis
1	R:W	Set the electrical origin for both axes (zero set)	None	None	0mm	0mm
2	A:1-P100000	First axis: Absolute motion (A) -10mm	A -10mm	↑	↑	↑
3	GN:1	Move first axis	↑	↑	-10mm	↑
4	GN:2	Command error	↑	↑	↑	↑
5	A:2+P100000	Second axis: Absolute motion (A) +10mm	↑	A +10mm	↑	↑
6	GN:2	Move second axis	↑	↑	↑	+10mm
7	GN:W	It does not work because it is already moving to the destination.	↑	↑	↑	↑
8	M:W-P10000-P10000	First axis: Relative motion (M) -1mm Second axis: Relative motion (M) -1mm	M -1mm	M -1mm	↑	↑
9	GN:1	Move first axis	↑	↑	-11mm	↑
10	GN:1	Move first axis	↑	↑	-12mm	↑
11	GN:2	Move second axis	↑	↑	↑	+9mm
12	GN:W	Move both axes	↑	↑	-13mm	+8mm
13	A:1-P10000	First axis: Absolute motion (A) -1mm	A -1mm	↑	↑	↑
14	GN:1	Move first axis	↑	↑	-1mm	↑
15	GN:W	Move both axes	↑	↑	↑	+7mm
16	G	Move both axes	Discarded	Discarded	↑	+6mm
17	GN:W	Command error	None	None	↑	↑

46 GC: LOCAL REMOTE TEACH READY BUSY Send

Description: Deletes the value set by Command "A:" and "M:".

No,
Send format

			1	
G	C	:	/	
			1	
			2	
			W	

No,	Item	Subcommand	Description
1	Axis	None	Depends on the parameter "AXIS Sel" * 1
		1	First axis
		2	Second axis
		W	Both axis

* 1 It can be confirmed by the reply contents by Command "PRM_GET: G01" .

47 GR: LOCAL REMOTE TEACH READY BUSY Send/Reply

Description: Get the coordinate value and movement distance of the set command "A:", "M:".

No,
Send format

			1	2
G	R	:	/	/
			1	P
			2	N
			W	U
				M
				D

* 2 If there is a number to be set to "None" , pad the additional command with the specified number to the left.

No,	Item	Subcommand	Description	Reply format block No,
1 * 2	Axis	None	Depends on the parameter "AXIS Sel" * 3	None
		1	First axis	1, 2, 3, 4
		2	Second axis	
		W	Both axis	1, 2, 3, 4: First axis 5, 6, 7, 8: Second axis
2 * 2	Unit	None	Depends on the parameter "UNIT Sel" * 4	
		P	No unit (minimum digit of moving distance is digit of minimum resolution)	
		N	Nanometer	
		U	Micrometer	
		M	Millimeter	
		D	Degree	

* 3 It can be confirmed by the reply contents by Command "PRM_GET: G01" .
* 4 It can be confirmed by the reply contents by Command "PRM_GET: A03" and "PRM_GET: A04" .

No,
Reply format

1		2	3	4		5		6	7	8						
*	,	*			,	*	,	*								
A		N	+	****		A		N	+	****						
M		U	−			M		U	−							
		M						M								
		D						D								
		P						P								

No,	Item	Reply	Description
1, 5	Command	A	Absolute ("A:" command)
		M	Relative ("M:" command)
2, 6	Unit	P	No unit (minimum speed digit is minimum resolution digit)
		N	Nanometer
		U	Micrometer
		M	Millimeter
		D	Degree
3, 7	Sign	+	Move in the plus direction
		−	Move in the minus direction
4, 8	Coordinate value	****	Coordinate value or moving distance
Common		*	When not set

48 JG: LOCAL REMOTE TEACH READY BUSY Send

Description: Executes movement by specifying the number of pulses (1 pulse = minimum resolution). When ″, R″ is specified at the end, positioning completion reply is sent for each axis.

No, Send format

	1	2	3	4	5
J G :	1		+	***	/ /
	2		−		, R

No,	Item	Subcommand	Description
1	Axis	1	First axis
		2	Second axis
2	Space	Space sign	Space
3	Sign	+	Move in the plus direction
		−	Move in the minus direction
4	Coordinate value	***	Set movement command value（1 ～ 1000）
5	Reply request	None	Do not request a reply
		,R	After positioning is complete, return ″1″ for the first axis and ″2″ for the second axis.

49 JY: LOCAL REMOTE TEACH READY BUSY Send

Description: Executes the operation without specifying the movement distance. The operation continues until a limit sensor input, operation stop command “L:” or speed stage “0” is transmitted. The operation speed can be selected from nine parameters “Jy Speed 1” to “Jy Speed 9” and “Jy Speed H” . When operating at speed stages 1-9, the operating speed can be changed in stages 1-9. When operating at speed stage H, speed stages 1 to 9 cannot be selected. The control status during operation depends on the settings of the parameters “Jy Cont” and “Stage Cont Type” . When ″, R″ is specified at the end, positioning completion reply is sent for each axis.

No, Send format

	1	2	3	4	5
J Y :	1		+	0	/ /
	2		−	1	, R
	W			2	
				3	
				4	
				5	
				6	
				7	
				8	
				9	
				H	

No,	Item	Subcommand	Description
1	Axis	1	First axis
		2	Second axis
		W	Both axis
2	Space	Space sign	Space
3	Sign	+	Move in the plus direction
		−	Move in the minus direction
4	Speed stage	0	Stop movement when executing JY command
		1 ～ 9	Set 1 to 9 (depends on parameter “Jy Speed 1 to 9”)
		H	Set H (depends on parameter “Jy Speed H”)
5	Reply request	None	Do not request a reply
		,R	After positioning is complete, return ″1″ for the first axis and ″2″ for the second axis.

(6) Coordinate registration commands

50 PIT_DEL: LOCAL REMOTE TEACH READY BUSY Send

Description: Deletes the 1st and 2nd axis position information registered with Command "PIT_SET:".

No, / Send format:

								1	
P	I	T	_	D	E	L	:	***	

No,	Item	Subcommand	Description
1	Number	***	Location registration designation number (1 ~ 20)

51 PIT_SET: LOCAL REMOTE TEACH READY BUSY Send

Description: Registers the current position of the first and second axes to the specified number. However, the registered position will be discarded if the power is turned off, reset, restarted, or parameter is changed.

No, / Send format:

								1	
P	I	T	_	S	E	T	:	***	

No,	Item	Subcommand	Description
1	Number	***	Location registration designation number (1 ~ 20)

52 PIT_GET: LOCAL REMOTE TEACH READY BUSY Send/Reply

Description: Acquires the location information registered with Command "PIT_SET:".

No, / Send format:

								1	
P	I	T	_	G	E	T	:	**	

No,	Item	Subcommand	Description	Reply format block No.
1	Number	***	Location registration designation number (1 ~ 20)	1,2: First axis 3,4: Second axis

No, / Reply format:

1	2		3	4
*		,	*	
+	***		+	***
−			−	

No,	Item	Reply	Description
1, 3	Sign	+	Plus
		−	Minus
2 ,4	Coordinate value	***	Coordinate value (minimum digit is digit with minimum resolution) * 1
Common		*	When not set

* 1 Axis that is not selected by parameter "AXIS Sel" is zero.

53 PITG: LOCAL REMOTE TEACH READY BUSY Send

Description: Move to the position registered with Command "PIT_SET:" . If the power of the equipment is turned OFF, RESET, restarted, or the GENERAL parameter is changed, the contents registered with the command "PIT_SET:" will be discarded. When ",R" is specified at the end, positioning completion reply is sent for each axis.

No, / Send format:

					1	2	
P	I	T	G	:	***		
						,	R

No,	Item	Subcommand	Description
1	Number	***	Location registration designation number (1 ~ 20)
2	Reply request	None	Do not request a reply
		,R	After positioning is complete, return "1" for the first axis and "2" for the second axis.

(7) General purpose I / O commands

54 I: LOCAL REMOTE TEACH READY BUSY Send/Reply

Description: Get the status of the general-purpose input port.

Send format:

I	:

No,

Reply format:

1
*

No,	Item	Reply	Description
1	Status	*	Input state number

Input status

Input state number * 1	Input1 (3pin)	Input2 (28pin)	Input3 (4pin)
0	OFF	OFF	OFF
1	ON	OFF	OFF
2	OFF	ON	OFF
3	ON	ON	OFF
4	OFF	OFF	ON
5	ON	OFF	ON
6	OFF	ON	ON
7	ON	ON	ON

* 1 See "(4) General-purpose I / O" for ON / OFF status and input circuit.

55 O: LOCAL REMOTE TEACH READY BUSY Send

Description: Get the status of the general-purpose output port.

No,

Send format:

		1
O	:	*

No,	Item	Subcommand	Description
1	Control	*	Output state number

Output status

Output state number * 1	Output1 (1pin)	Output2 (26pin)	Output3 (2pin)
0	OFF	OFF	OFF
1	ON	OFF	OFF
2	OFF	ON	OFF
3	ON	ON	OFF
4	OFF	OFF	ON
5	ON	OFF	ON
6	OFF	ON	ON
7	ON	ON	ON

* 1 See "(4) General-purpose I / O" for ON / OFF status and input circuit.

(8) Commands related to teaching

56 T_ON: LOCAL REMOTE TEACH READY BUSY Send

Description: Move to the teaching registration edit mode.

No,

Send format:

T	_	O	N	:

57 T_OFF: LOCAL REMOTE TEACH READY BUSY Send

Description: Return from the teaching registration edit mode. The registered content is saved before returning.

No,

Send format:

T	_	O	F	F	:

58 T_DEL: LOCAL REMOTE TEACH READY BUSY Send

Description: Deletes the contents of the registered line of teaching for the currently selected channel. This command can be used after sending the command "T_ON:" and is reflected after sending the command "T_OFF:".

No,			1
Send format	T	_ D E L :	***

No,	Item	Subcommand	Description
1	Line	***	Set line number (1～200)

59 T_SET: LOCAL REMOTE TEACH READY BUSY Send

Description: Sets the teaching content of the currently selected channel to the specified line. For the commands that can be set, see "(4) Registered commands". This command can be used after sending the command "T_ON:" and is reflected after sending the command "T_OFF:".

No,			1	2	3
Send format	T	_ S E T :	***	_	*****

No,	Item	Subcommand	Description
1	Line	***	Set line number (1～200)
2	Space	Space sign	Space
3	Command	*****	Registration command

60 T_GET: LOCAL REMOTE TEACH READY BUSY Send/Reply

Description: Acquires the contents of the registered line of the currently selected channel.

No,		1
Send format	T _ G E T :	***

No,	Item	Subcommand	Description
1	Line	***	Set line number (1～200)

No,	1
Reply format	*****

No,	Item	Reply	Description
1	Command	*****	Registered content

61 TC: LOCAL REMOTE TEACH READY BUSY Send

Description: Select the teaching channel. Please wait for the registration contents to be read.

No,		1
Send format	T C :	*

No,	Item	Subcommand	Description
1	Channel	*	Channel select (1～5)

62 TCR: LOCAL REMOTE TEACH READY BUSY Send/Reply

Description: Get the current teaching channel.

Send format: T C R :

No,	1
Reply format	*

No,	Item	Reply	Description
1	Channel	*	Current channel

63 TQ: LOCAL REMOTE TEACH READY BUSY Send/Reply

Description: Acquires the status related to teaching.

Send format:

T	Q	:

No,

Reply format:

1		2		3		4
K	,	*	,	***	,	*****
M						
P						
O						
I						
T						
R						
E						

No,	Item	Reply	Description
1	Status	K	Stopped * 1
		M	During move * 1
		P	Paused
		O	During move (executed line by line) * 1
		I	General I/O operation status
		T	Teaching edit mode
		R	loading teaching registration contents * 2
		E	Teaching command error
2	Channel	*	Current channnel
3	Line	***	Current line number
4	Command	*****	Current command

* 1 When the parameter "TEACH IF" is set to "I / O", the motion status can not be checked.

* 2 All operations are disabled until reading is complete.

64 TG: LOCAL REMOTE TEACH READY BUSY Send

Description: Starts the execution of the selected channel. It also resumes execution when paused.

Send format:

T	G	:

65 TP: LOCAL REMOTE TEACH READY BUSY Send

Description: If it is sent during teaching, it will pause. If you want to resume, execute the command "TG:".

Send format:

T	P	:

66 TO: LOCAL REMOTE TEACH READY BUSY Send

Description: Executes the contents line by line in the paused state. If the stage is operating, this command is not allowed and discarded until positioning is completed.

Send format:

T	O	:

67 TL: LOCAL REMOTE TEACH READY BUSY Send

Description: Stops teaching and returns the line number to the first line.

No,

Send format:

T	L	:	1
			E

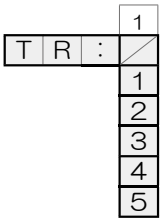
No,	Item	Subcommand	Description
1	Axis	None	Stop teaching
		E	Perform emergency stop *

* It can be canceled with Command "BEC:" .

68 TR: LOCAL REMOTE TEACH READY BUSY Send/Reply

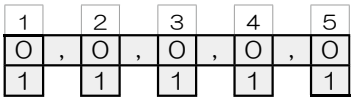
Description: Check the registration status of the teaching channel.

No,
Send format



No,	Item	Subcommand	Description
1	Channel	None	Set all channels
		1 ~ 5	Set each channel

No,
Reply format

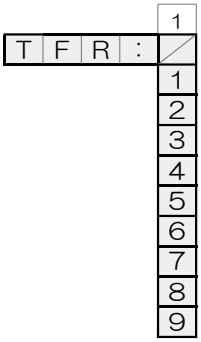


No,	Item	Reply	Description	
1	Status	0, 1	Channel1 or specified channel	0: Unregistered 1: Registered
2			Channel2	
3			Channel3	
4			Channel4	
5			Channel5	

69 TFR: LOCAL REMOTE TEACH READY BUSY Send/Reply

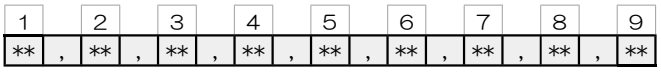
Description: Check the number of loops currently being executed. It can be used only during teaching execution. When the reply content is 0, it indicates that the target loop is not executed or unused.

No,
Send format



No,	Item	Subcommand	Description
1	Loop	None	Set all loops
		1 ~ 9	Set each loop

No,
Reply format



No,	Item	Reply	Description	
1	Count of loops	**	Loop1 or Specified loop	Current loop count (1 ~ 99999)
2			Loop2	
3			Loop3	
4			Loop4	
5			Loop5	
6			Loop6	
7			Loop7	
8			Loop8	
9			Loop9	

70 TM: LOCAL REMOTE TEACH READY BUSY Send

Description: Set the teaching monitor. By turning this setting ON, the executed command is returned to the interface set by the parameter "I / F Sel". Reply format1 except "FE:", and "FE:" is Reply format2. The set value of the parameter "I / F Sel" can be confirmed by the reply contents by the command "PRM_GET: G24".

No, Send format

			1
T	M	:	0
			1

No,	Item	Subcommand	Description
1	Control	0	Monitor setting OFF
		1	Monitor setting ON

No, Reply format1

1	2	3
***		*****

No,	Item	Reply	Description
1	Line	***	Execution line number (001 ~ 200)
2	Space	Space sign	Space
3	Command	*****	Execution command

No, Reply format2

1	2	3	4	5	6	6
***		*****		[	**	]

No,	Item	Reply	Description
1	Line	***	Execution line number (001 ~ 200)
2	Space	Space sign	Space
3	Command	*****	Execution command
4	Space	Space sign	Space
5	brackets	[	Use as separator
6	Count of loops	**	Current loop count (1 ~ 99999)
7	brackets	]	Use as separator

Example 1 When the line number is the second line and the execution command is "M:".

Auto reply
002,M:1+P10000

Example 2: When the line number is the second line, the execution command is "FE:", and the loop count is the third.

Auto reply
002 FE:1 [3]

71 TMR: LOCAL REMOTE TEACH READY BUSY Send/Reply

Description: Gets the teaching monitor setting status.

Send format

T	M	R	:

No, Reply format

1
0
1

No,	Item	Reply	Description
1	Status	0	Monitor setting is OFF
		1	Monitor setting is ON

72 TNR: LOCAL REMOTE TEACH READY BUSY Send/Reply

Description: Gets the teaching line number currently being executed or in standby.

Send format:

T	N	R	:

No,

Reply format:

1
***

No,	Item	Reply	Description
1	Line	***	Execution line number

73 TACR: LOCAL REMOTE TEACH READY BUSY Send/Reply

Description: Gets the teaching command currently being executed or in standby.

Send format:

T	A	C	R	:

No,

Reply format:

1
*****

No,	Item	Reply	Description
1	Command	*****	Execution command

(9) Commands related to teaching registration only

74 FS: LOCAL REMOTE TEACH READY BUSY Register

Description: Set the loop operation to repeat the specified range. The loop range is between the same loop numbers from this command to the command "FE:". You can put another loop inside the loop. For a description example, see "(1) Transmission example 1". Be sure to use "FE:" when using this command. If "FE:" is not registered, unintended operation may occur.

No,

Send format:

		1	2	3
F	S	:	*	***

No,	Item	Reply	Description
1	Loop	*	Set loop (1 ~ 9)
2	Space	Space sign	Space
3	Count of loops	***	Loop count (1 ~ 99999)

75 FE: LOCAL REMOTE TEACH READY BUSY Register

Description: Set the end of the loop range. The loop range is from Command "FS:" to the same loop number of this command. You can put another loop inside the loop. For a description example, see "(1) Transmission example 1". When using this command, be sure to use "FS:". If "FS:" is not registered, unintended operation may occur.

No,

Send format:

			1
F	E	:	*

No,	Item	Subcommand	Description
1	Loop	*	Set loop (1 ~ 9)

76 END: LOCAL REMOTE TEACH READY BUSY Register

Description: Set the last teaching line. Execution ends at this line.

Send format:

E	N	D	:

77 T: LOCAL REMOTE TEACH READY BUSY

Description: Set the wait time during teaching execution in increments of 0.1 seconds.

No,

Send format:

		1
T	:	***

No,	Item	Subcommand	Description
1	Time	***	Set wait time (0.1 ~ 99.9)

78 GIS: LOCAL REMOTE TEACH READY BUSY Register

Description: Wait until the specified general-purpose input port turns ON. Note that the ON hold time should be 10msec or more. For the ON status and input circuit, see "(4) General-purpose I / O" .

No, | 1
Send format | G I S : *

No,	Item	Subcommand	Description
1	Control	*	Set general-purpose input（0～7）

(10)Commands related to Parameter settings

79 PRM_ON: LOCAL REMOTE TEACH READY BUSY Send

Description: Move to parameter setting mode.
Send format: P R M _ O N :

80 PRM_OFF: LOCAL REMOTE TEACH READY BUSY Send

Description: Save the parameters and return from parameter setting mode to REMOTE mode. If only the AXIS parameter is changed, it will not be restarted *, but if the GENERAL parameter is changed, it will be restarted *.
* USB communication is not disconnected. Otherwise it is the same as the Restart button on the front panel.
Send format: P R M _ O F F :

81 PRM_SET: LOCAL REMOTE TEACH READY BUSY Send

Description: Set the parameters. For details on parameter numbers and content numbers, see "7-5.

No, | 1 | 2 | 3 | 4
Send format | P R M _ S E T : | A / G | *** | | *****

No,	Item	Subcommand	Description
1	Type	A	AXIS parameter
		G	GENERAL parameter
2	Number	***	Set parameter number
3	Space	Space sign	Space
4	Contents	*****	Set parameter contents

82 PRM_GET: LOCAL REMOTE TEACH READY BUSY c

c: Get the contents of the parameter. For details on parameter numbers and content numbers, see "7-5.

No, | 1 | 2
Send format | P R M _ G E T : | A / G | ***

No,	Item	Subcommand	Description
1	Type	A	AXIS parameter
		G	GENERAL parameter
2	Number	***	Set parameter number

No, | 1
Reply format | *****

No,	Item	Reply	Description
1	Contents	*****	Parameter contents

7. Parameters

Describes the built-in setting parameters.

⚠ When changing parameters, please do after understanding the function fully.

7-1. List of parameters

(1) Parameter type

AXIS Parameters: Perform settings related to stage operation and machine home position return direction.

GENERAL parameters: Perform settings related to stage control and communication.

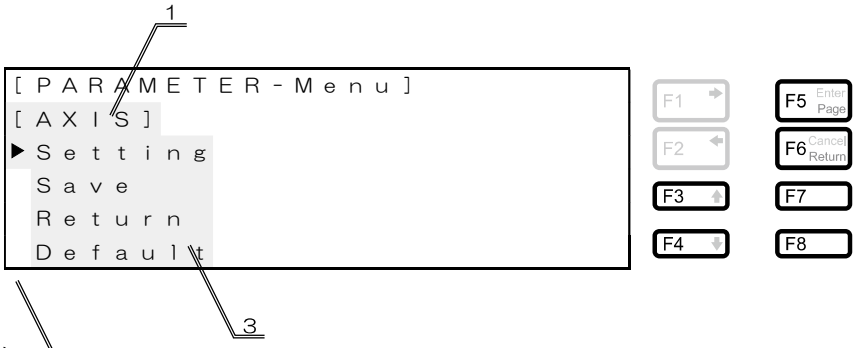
Type	No,	Axis	Display	Description	Page
AXIS	01	First	AXIS Name	Setting the display axis name	71
	02	Second			
	03	First	UNIT Sel	Unit setting	71
	04	Second			
	05	First	Pos Dir	Setting the coordinate count direction	71
	06	Second			
	07	First	INPos Range	In-position range setting	71
	08	Second			
	09	First	FB Speed	Setting the feedback speed	72
	10	Second			
	11	First	ZERO Cont	Zero control setting	72
	12	Second			
	13	First	Stage Config	Stage configuration settings	72
	14	Second			
	15	-	TEACH IF	TEACH operation interface settings	72
	16	First	Acc Cont	Acceleration / deceleration control settings	73
	17	Second			
	18	First	Acc Time	Acceleration / deceleration time setting	73
	19	Second			
	20	First	Jog Speed 3	JOG speed 3 setting	73
	21	Second			
	22	First	Jog Speed 2	JOG speed 2 setting	73
	23	Second			
	24	First	Jog Speed 1	JOG speed 1 setting	74
	25	Second			
	26	First	Jog Cont	Operation control settings when operating CCW and CW buttons	74
	27	Second			
	28	First	ORG Dir	Setting the machine origin return direction	74
	29	Second			
	30	First	ORG Mode Sel	Setting the machine origin return mode	74
	31	Second			
	32	First	ORG Mode3 Pos	Machine origin return Mode 3 specified position setting	75
	33	Second			
	34	First	ORG Speed H	Machine origin return speed H setting	75
	35	Second			
	36	First	ORG Speed M	Machine origin return speed M setting	75
	37	Second			
	38	First	ORG Speed L	Machine origin return speed L setting	76
	39	Second			
	40	First	EORG Speed	Electric origin return speed setting	76
	41	Second			
	42	First	Soft LMT Sel	Software limit function setting	76
	43	Second			
	44	First	+ Soft LMT Pos	Setting the software limit position on the plus side	77
	45	Second			
	46	First	− Soft LMT Pos	Setting the software limit position on the minus side	77
	47	Second			

Type	No.	Axis	Display	Description	Page
AXIS	48	-	L <-> R Sel	Jog controller left / right button operation axis setting	77
	49	-	T <-> B Sel	Jog controller up / down button operation axis setting	77
	50	-	Right Dir	Setting the count direction of the right button of the jog controller	78
	51	-	Top Dir	Setting the count direction of the up button of the jog controller	78
	52	First	Jy Cont	Command "JY:" control settings	78
	53	Second			
	54	First	Jy Speed H	JY speed H setting	78
	55	Second			
	56	First	Jy Speed 9	JY speed 9 setting	79
	57	Second			
	58	First	Jy Speed 8	JY speed 8 setting	80
	59	Second			
	60	First	Jy Speed 7	JY speed 7 setting	80
	61	Second			
	62	First	Jy Speed 6	JY speed 6 setting	80
	63	Second			
	64	First	Jy Speed 5	JY speed 5 setting	81
	65	Second			
	66	First	Jy Speed 4	JY speed 4 setting	81
	67	Second			
	68	First	Jy Speed 3	JY speed 3 setting	81
	69	Second			
	70	First	Jy Speed 2	JY speed 2 setting	82
	71	Second			
	72	First	Jy Speed 1	JY speed 1 setting	82
	73	Second			
GENERAL	01	-	AXIS Sel	Control target axis setting	83
	02	First	Max Speed	Maximum speed setting	83
	03	Second			
	04	First	Lin/Rot	Setting the control stage type	83
	05	Second			
	06	First	Stop Sel	Stop control setting	83
	07	Second			
	08	First	EMG Motor Excite	Setting of motor status at emergency stop	83
	09	Second			
	10	-	EMG Connector	Enable / disable emergency stop function	84
	11	First	Motor Excite	Setting the motor status at startup	84
	12	Second			
	13	First	Stage Cont Type	Setting the feedback stage control method	84
	14	Second			
	15	First	Count Sel	Setting display contents of display unit counter	84
	16	Second			
	17	First	CD Drive	Setting the current down drive	85
	18	Second			
	19	First	INP Dec	In-position judgment time setting	85
	20	Second			
	21	First	FBT Sel	Setting the feedback start timing	85
	22	Second			
	23	-	Ini Mode	Initial mode setting	85
	24	-	I/F Select	Interface settings	86
	25	-	USB Del	USB delimiter setting	86
	26	-	GP-IB Addr	GP-IB address setting	86
	27	-	GP-IB Del	GP-IB delimiter setting	86
	28	-	GP-IB EOI	GP-IB EOI setting	86
	29	-	GP-IB SRQ	GP-IB SRQ setting	87
	30	-	ETHER Del	Ethernet delimiter setting	87
	31	-	IP Address	Ethernet IP address setting	87
	32	-	Default Getway	Ethernet default gateway settings	87
	33	-	Subnet Mask	Setting the Ethernet subnet mask	87
	34	-	ECHO BACK	Setting the command echo back function	88
	35	-	TEACH Monitor	Teaching monitor function setting	88

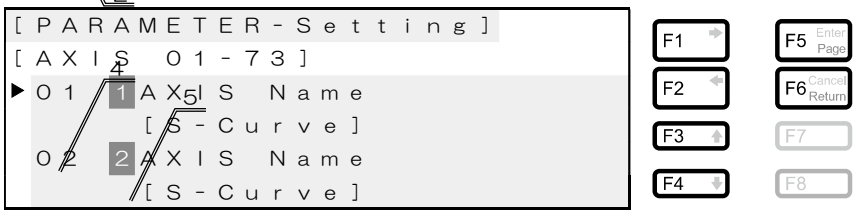
Type	No.	Axis	Display	Description	Page
GENERAL	36	-	GENERAL IN Chat	General-purpose input port chattering check function setting	88
	37	-	TEACH IN Chat	TEACH input port chattering check function setting	88
	38	-	Sleep Sel	Enable / disable sleep function	88
	39	-	BEEP Sel	Enable / disable beep sound	89
	40	-	Disp bright	Setting the display brightness	89
	41	First	lmt Stop Sel	Stop the limit sensor	89
	42	Second			
	43	-	Option type	Option type selection	89

7-2. Description of display panel

(1) PARAMETER mode top screen



(2) Parameter editing screen



No	Item	Description	
1	Type	The type of parameter.	
2	Cursor	Selection cursor.	
3	Menu	Setting	Move to the parameter edit screen.
		Save	Save the parameters. If the parameter has not been changed, it will not be saved.
		Return	Returns to the mode before entering PARAMETER mode. Coordinate values are maintained. This content is displayed except after changing the GENERAL parameter.
		Reset To Start	Reboot with the same operation as the command “RESET:” . Displayed when “2: Save” is executed with the GENERAL parameter changed.
		Default	Default all parameters of the displayed type. * After that, if you execute “2: Save” , it will be saved with default parameters.
4	Range	The range of parameter No.	
5	Supported axes	The axis corresponding to the parameter. Parameters without axis display are common to both axes.	
6	Contents	The content of the parameter.	

* Default parameters may differ from factory parameters. See the attached ″Parameter sheet at shipment″.

⚠ Please do not operating by setting all parameters to default values. Be sure to set according to the performance of the connected stage.

Button	Display	Description
F1 / →	Top	None
	Edit	Move the cursor up 10 items.
F2 / ←	Top	None
	Edit	Move the cursor down 10 items.
F3 / ↑	Top	Move the cursor up.
	Edit	Move the cursor up 1 items.
F4 / ↓	Top	Move the cursor down.
	Edit	Move the cursor down 1 items.
F5 (Enter)	Top	Determine the item of the cursor.
	Edit	Move to the lower layer.
F6 (Cancel)	Top	None
	Edit	Move to the upper layer.
F7	Top	None
	Edit	
F8	Top	None
	Edit	
F7 + F8	Top	Move to GENERAL parameter.
	Edit	None

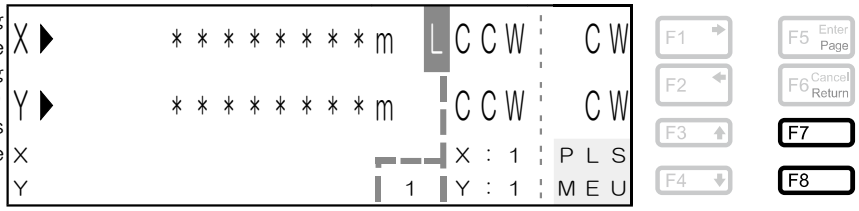
7-3. Procedure for transition to GENERAL parameters

Describes the procedure for moving to the GENERAL parameter.

- Procedure1

For example, when nothing is being executed in the LOCAL mode, pressing both the F7 (PLS / RTN) and F8 (MEU) buttons simultaneously displays the SETUP mode menu.

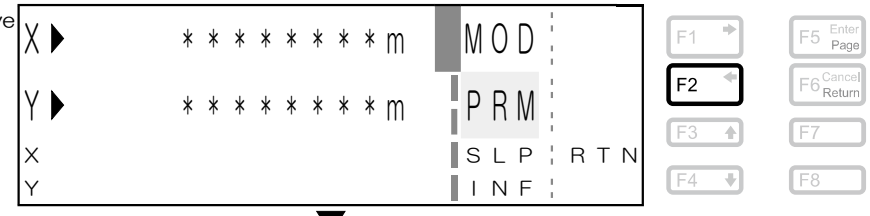
LOCAL mode



- Procedure2

Press F2 button (PRM) Move to PARAMETER mode.

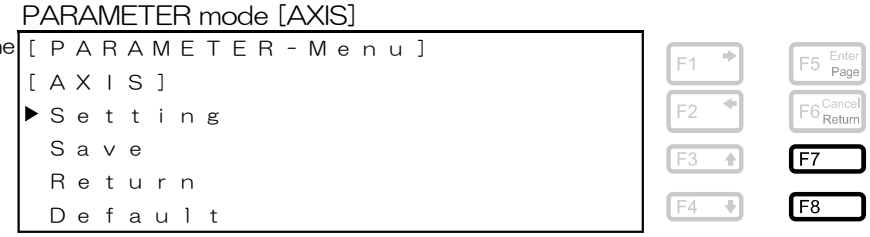
SETUP mode



- Procedure3

Press F7 + F8 button at the same time.

PARAMETER mode [AXIS]



▼

・Procedure4
GENERAL parameter editing mode.

PARAMETER mode [GENERAL]

```
[ P A R A M E T E R - M e n u ]
[ G E N E R A L ]
▶ S e t t i n g
  S a v e
  R e t u r n
  D e f a u l t
```

7-4. How to change parameter settings

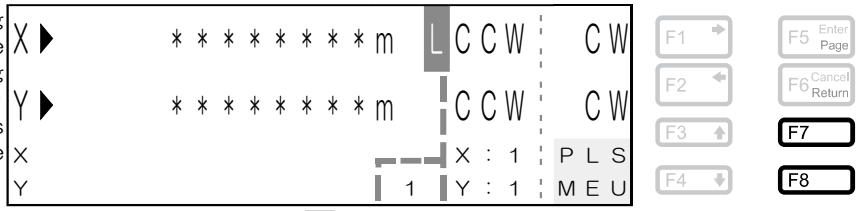
The parameter settings can be changed using the front panel operation or commands. For the setting method, see the setting example below.

(1) Example 1

From the LOCAL mode, change the mechanical origin return method "ORG Mode Sel" on axis 1 by operating the front panel.

・Procedure1
For example, when nothing is being executed in the LOCAL mode, pressing both the F7 (PLS / RTN) and F8 (MEU) buttons simultaneously displays the SETUP mode menu.

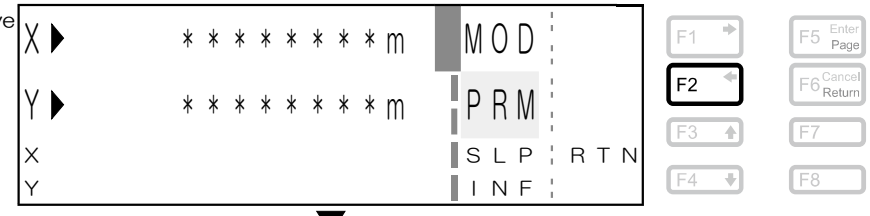
LOCAL mode



▼

・Procedure2
Press F2 button (PRM) Move to PARAMETER mode.

SETUP mode



▼

・Procedure3
After confirming that the cursor is at "1: Setting", press the F5 / ENTER button to move to the parameter edit mode.

PARAMETER mode [AXIS]

```
[ P A R A M E T E R - M e n u ]
[ A X I S ]
▶ S e t t i n g
  S a v e
  R e t u r n
  D e f a u l t
```

▼

・Procedure4
Press the F2 / ◀ button and F4 / ▼ button to display First axis "ORG ModeSel".

PARAMETER mode [AXIS] Setting mode

```
[ P A R A M E T E R - S e t t i n g ]
[ A X I S   0 1 - 7 3 ]
▶ 0 1  1 A X I S  N a m e
         [ S - C u r v e ]
  0 2  2 A X I S  N a m e
         [ S - C u r v e ]
```

▼

・Procedure5
Press the F5 (ENTER) button,
Move the cursor down.

PARAMETER mode [AXIS] Setting mode

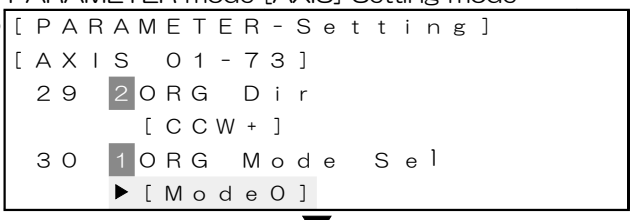
```
[ P A R A M E T E R - S e t t i n g ]
[ A X I S   0 1 - 7 3 ]
  2 9  2 O R G  D i r
         [ C C W + ]
▶ 3 0  1 O R G  M o d e  S e l
         [ M o d e 0 ]
```

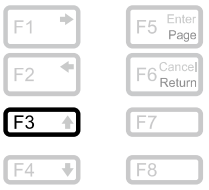
▼

• Procedure6

Press F3 / ↑ button to change the item from [Mode0] to [Mode1].

PARAMETER mode [AXIS] Setting mode

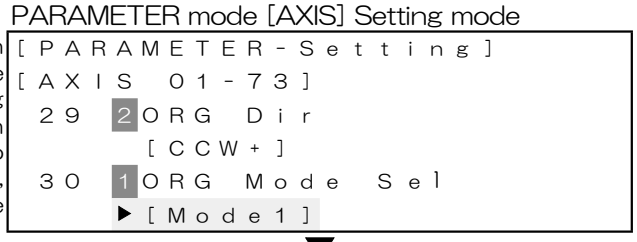




• Procedure7

Press the F5 (ENETR) button to move the cursor to the upper layer. (Note: Pressing the F6 (CANCEL) button returns the parameter to the state before the change, and moves the cursor to the upper layer.)

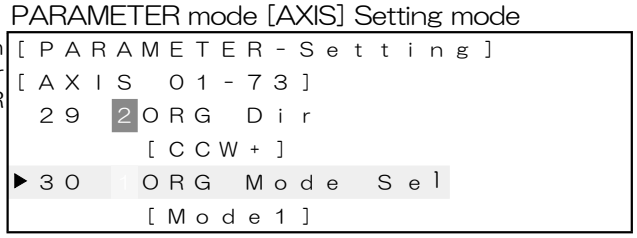
PARAMETER mode [AXIS] Setting mode



• Procedure8

Press F6 (CANCEL) button to return from parameter edit mode to PARAMETER mode.

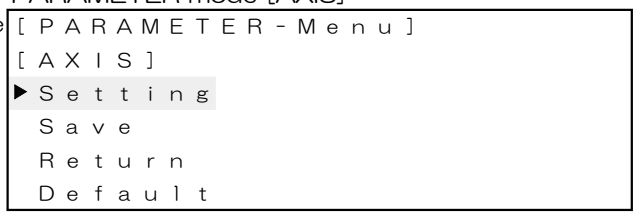
PARAMETER mode [AXIS] Setting mode

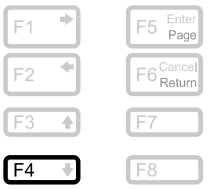


• Procedure9

Press F4 / ↓ button to move the cursor to ″2: Save″.

PARAMETER mode [AXIS]

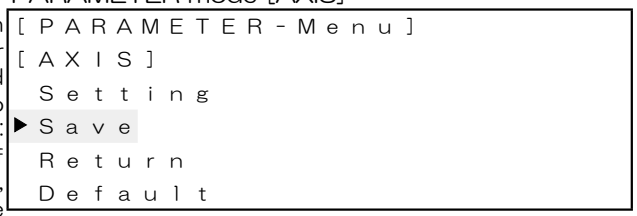




• Procedure10

Press F5 (ENTER) button to save the changes. After ″Save OK″ is displayed on the screen, return to PARAMETER mode. (Note: If the power is turned off or restarted before saving, the changes will not be reflected.)

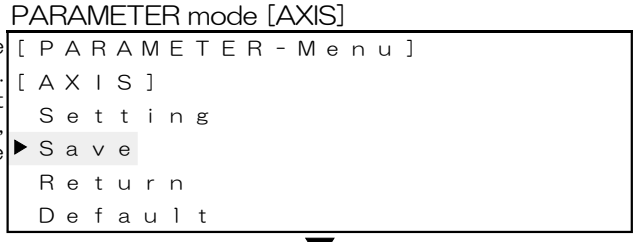
PARAMETER mode [AXIS]

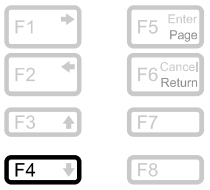


• Procedure11

Press F4 / ↓ button to move the cursor to "3: Return". (Note: If you return without saving after making changes, the changes will not be reflected.)

PARAMETER mode [AXIS]



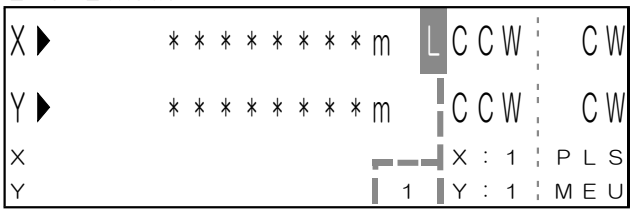


• Procedure12

Press F5 (ENTER) button to return from PARMETER mode to LOCAL mode. This completes the parameter change.

PARAMETER mode [AXIS]

LOCAL mode



(2) Example 2

From the LOCAL mode, change the JOG speed L "Jog Speed 1" on first axis by operating the front panel.

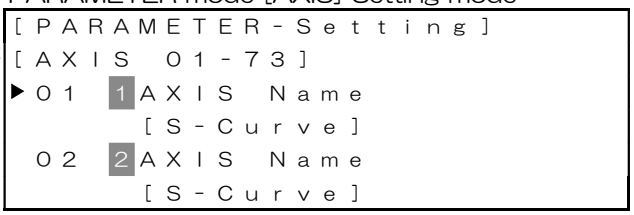
• Procedure1 ~ 3

Same as example 1.

• Procedure4

Press the F2 / ← button and F4 / ↓ button to display first axis "Jog Speed 1".

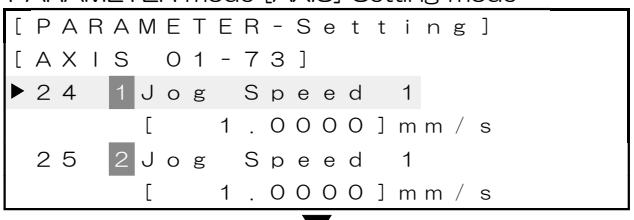
PARAMETER mode [AXIS] Setting mode



• Procedure5

Press the F5 (ENTER) button to move the cursor to the lower layer.

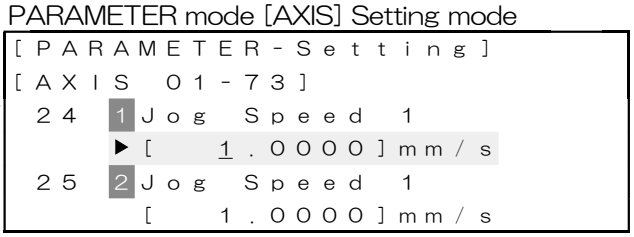
PARAMETER mode [AXIS] Setting mode

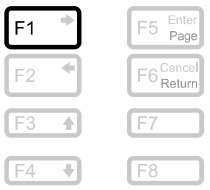


• Procedure6

Pressing the F1 / → button moves the Under bar from the first digit to the first decimal place.

PARAMETER mode [AXIS] Setting mode



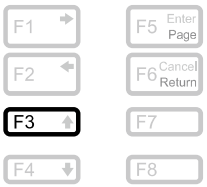


• Procedure7

Press F3 / ↑ button to change [0] to [5].

PARAMETER mode [AXIS] Setting mode

```
[PARAMETER-Setting]
[AXIS  01-73]
 24  1 Jog  Speed  1
     ▶[   1.0000]mm/s
 25  2 Jog  Speed  1
      [   1.0000]mm/s
```



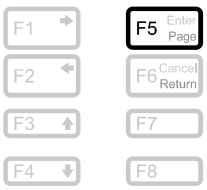
▼

• Procedure8

Press the F5 (ENTER) button to move the cursor to the upper layer. (Note: Pressing the F6 (CANCEL) button returns the parameter to the state before the change, and moves the cursor to the upper layer.)

PARAMETER mode [AXIS] Setting mode

```
[PARAMETER-Setting]
[AXIS  01-73]
 24  1 Jog  Speed  1
     ▶[   1.5000]mm/s
 25  2 Jog  Speed  1
      [   1.0000]mm/s
```



▼

• Procedure9

Press F6 (CANCEL) button to return from parameter edit mode to PARAMETER mode.

PARAMETER mode [AXIS] Setting mode

```
[PARAMETER-Setting]
[AXIS  01-73]
▶24  1 Jog  Speed  1
      [   1.5000]mm/s
 25  2 Jog  Speed  1
      [   1.0000]mm/s
```

▼

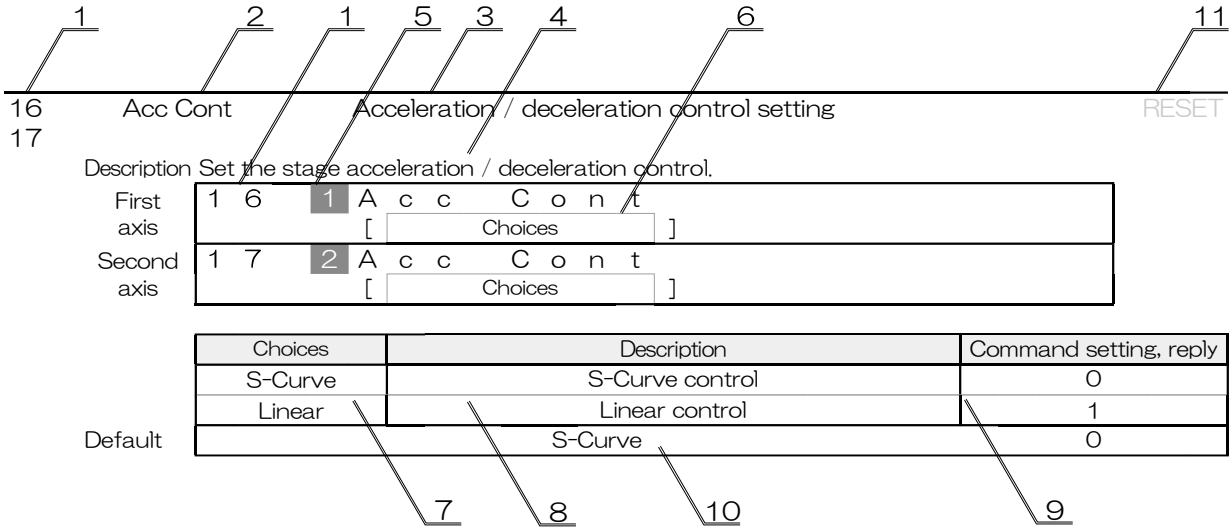
After that, the procedure is the same as steps 9 to 12 of setting example 1.

```
[PARAMETER-Menu]
[AXIS]
▶Setting
 Save
 Return
 Default
```

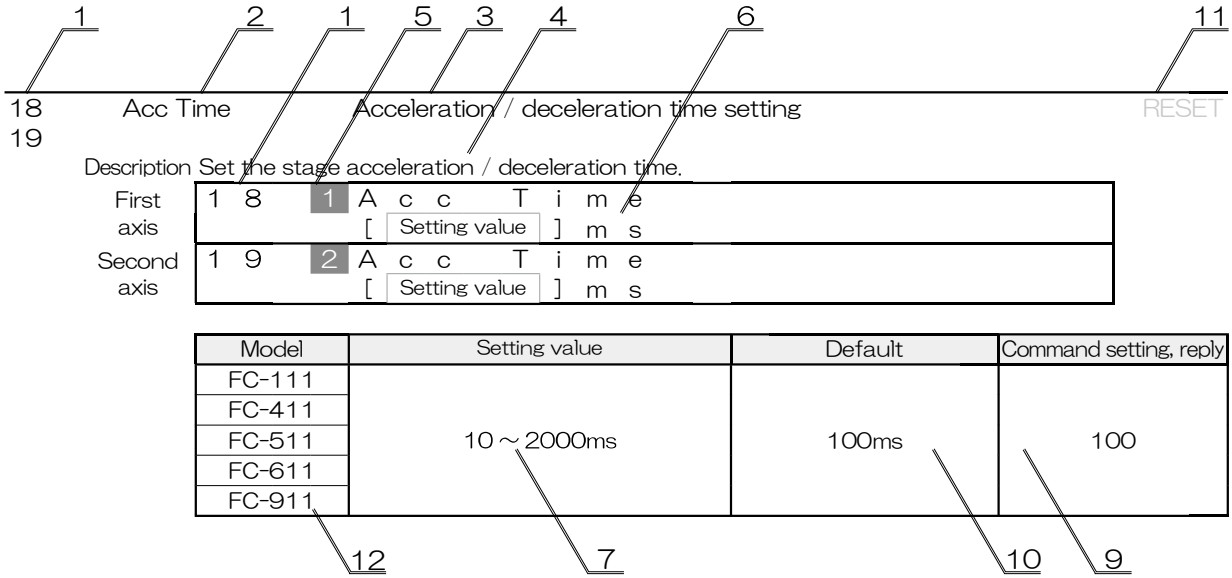
7-5. How to read parameter descriptions

The following explains how to read the parameter description page.

(1) For parameters to select



(2) For parameters set with numbers



No	Item	Contents
1	Parameter No.	Parameter number. Used with the commands "PRM_GET:" and "PRM_SET:".
2	Parameter display name	This is the name of the parameter displayed on the display unit.
3	Parameter name	The name of the parameter.
4	Parameter description	A description of the parameter.
5	Target axis	The target axis. If the target axis is not displayed, use the common setting for both axes or select the axis to be used.
6	Choices or Setting value	Indicates the type to be set. Choices or settings.
7	Details	Indicates a choices candidate or a settable range.
8	Description	A description of the choice.
9	Command setting, reply	The value to be sent or returned when using the commands "PRM_SET:" and "PRM_GET:".
10	Default	Indicates the default of the parameter. * 1
11	Whether to restart	Indicates whether or not a restart is performed automatically after saving parameters. Black text is executed, gray text is not executed. * 2
12	Model	Indicates the model name of the feedback stage controller.

* 1 The default parameters may be different from the factory parameters. See the attached "Parameter sheet at shipment".

* 2 Restarting is the same operation as the command "RESET:".

7-6. Parameter description

(1) AXIS parameters

01 02 AXIS Name — Display axis name — RESET

Description Set the axis name to be displayed. Both axes can be set the same.

First axis	0 1 1 A X I S N a m e [Choices]
Second axis	0 2 2 A X I S N a m e [Choices]

Choices	Description	Command setting, reply
1 ~ 9 and A ~ Z	Specify with numbers and alphabets	Axis name 3: 3
		Axis name A: 10
Default: First axis	1	1
Default: Second axis	2	2

03 04 UNIT Sel — Display unit — RESET

Description Set the unit to be displayed.

First axis	0 3 1 U N I T S e l [Choices]
Second axis	0 4 2 U N I T S e l [Choices]

Choices	Description	Command setting, reply
nm	Display in nanometers	0
um	Display in micrometer	1
mm	Display in millimeter	2
Degree	Display in degree	3
OFF	Display without units *	4
Default: mm		2

* The minimum digit of the coordinate value is the minimum resolution digit.

05 06 Pos Dir — Coordinate value counting direction — RESET

Description Set the direction in which the coordinate value counts up.

First axis	0 5 1 P o s D i r [Choices]
Second axis	0 6 2 P o s D i r [Choices]

Choices	Description	Command setting, reply
CCW+	Set in CCW direction (motor side)	0
CW+	Set in CW direction (opposite motor side)	1
Default: CCW+		0

07 08 INPos Range — In-position range — RESET

Description Set the range for determining the completion of positioning.

First axis	0 7 1 I N P o s R a n g e [Choices]
Second axis	0 8 2 I N P o s R a n g e [Choices]

Choices	Description	Command setting, reply
± 1count	Set to ± 1 count	0
± 3count	Set to ± 3 count	1
± 7count	Set to ± 7 count	2
Default: ± 1count		0

09 FB Speed Feedback speed RESET
10

Description Set the feedback speed during positioning operation (BUSY).

First axis: 09 1 FB Speed [Choices]
Second axis: 10 2 FB Speed [Choices]

Choices	Description	Command setting, reply
FAST	Faster than before	0
NORMAL	Conventional speed	1
Default	NORMAL	1

11 ZERO Cont Zero control RESET
12

Description After positioning is completed, set whether to perform positioning control to reach the target coordinate position even within the in-position range.

First axis: 11 1 ZERO Cont [Choices]
Second axis: 12 2 ZERO Cont [Choices]

Choices	Description	Command setting, reply
OFF	No control (stops in the in-position range)	0
ON	Control for target position	1
Default	ON	1

13 Stage Config Stage configuration RESET
14

Description Set the stage configuration. The factory settings are set according to the stage connected to this instrument. To change the settings, contact us or our distributor.

First axis: 13 1 Stage Config [Choices]
Second axis: 14 2 Stage Config [Choices]

Choices	Description	Command setting, reply
Type0	Type1 / Type2 / Type3 以外に対応	0
Type1	Standard settings	1
Type2	FC-911 standard setting	2
Type3	Long stroke stage standard setting	3
Default	Type1	1

15 TEACH IF TEACH interface RESET

Description Set the teaching operation interface.

15 TEACH IF [Choices]

Choices	Description	Command setting, reply
JOG/CMD	Stage controller JOG operation and command, select jog controller	0
I/O	Select general-purpose I / O	1
Default	JOG/CMD	0

16 Acc Cont — Acceleration / deceleration control — RESET
17

Description Set the stage acceleration / deceleration time.

First axis: 16 1 Acc Cont [Choices]

Second axis: 17 2 Acc Cont [Choices]

Choices	Description	Command setting, reply
S-Curve	S-Curve control	0
Linear	Linear control	1
Default	S-Curve	0

18 Acc Time — Acceleration / deceleration time — RESET
19

Description Set the stage acceleration / deceleration time.

First axis: 18 1 Acc Time [Setting value] ms

Second axis: 19 2 Acc Time [Setting value] ms

Model	Setting value	Default	Command setting, reply
FC-111	10 ~ 2000ms	100ms	100
FC-411			
FC-511			
FC-611			
FC-911			

20 Jog Speed 3 — JOG Speed 3 — RESET
21

Description Set the operation speed 3 when pressing and holding the CW, CCW and Jog controller buttons. Set it below the "Max Speed". If the setting value is large, it will return to the previous setting value.

First axis: 20 1 Jog Speed 3 [Setting value] mm / s

Second axis: 21 2 Jog Speed 3 [Setting value] mm / s

Model	Setting value	Default *	Command setting, reply
FC-111	"Max Speed" mm / s or less	10.0000mm/s	100000
FC-411		10.00000mm/s	1000000
FC-511		10.00000mm/s	1000000
FC-611		10.000000mm/s	10000000
FC-911		5.000000mm/s	5000000

* At the time of parameter default execution, if "Max Speed" is less than the default, it will be "Max Speed".

22 Jog Speed 2 — JOG Speed 2 — RESET
23

Description Set the operation speed 2 when pressing and holding the CW, CCW and Jog controller buttons. Set it below the "Jog Speed 3". If the setting value is large, it will return to the previous setting value.

First axis: 22 1 Jog Speed 2 [Setting value] mm / s

Second axis: 23 2 Jog Speed 2 [Setting value] mm / s

Model	Setting value	Default *	Command setting, reply
FC-111	"Jog Speed 3" mm / s or less	5.0000mm/s	50000
FC-411		5.00000mm/s	500000
FC-511		5.00000mm/s	500000
FC-611		5.000000mm/s	5000000
FC-911		2.500000mm/s	2500000

* At the time of parameter default execution, if "Max Speed" is less than the default, it will be "Max Speed".

24 Jog Speed 1 JOG Speed 1 RESET
25

Description Set the operation speed 1 when pressing and holding the CW, CCW and Jog controller buttons. Set it below the "Jog Speed 2". If the setting value is large, it will return to the previous setting value.

First axis	24	1 Jog Speed 1 [Setting value] mm/s
Second axis	25	2 Jog Speed 1 [Setting value] mm/s

Model	Setting value	Default *	Command setting, reply
FC-111	"Jog Speed 2" mm / s or less	1.0000mm/s	10000
FC-411		1.00000mm/s	100000
FC-511		1.00000mm/s	100000
FC-611		1.000000mm/s	1000000
FC-911		1.000000mm/s	1000000

* At the time of parameter default execution, if "Max Speed" is less than the default, it will be "Max Speed".

26 Jog Cont Set control when operating CCW and CW buttons RESET
27

Description Set the operation when operating the CW and CCW buttons on the front panel. After the operation stops, it returns to the setting of the parameter "Stage Cont Type". However, if the parameter "Stage Cont Type" is set to "Close" and the set speed is 10 μm / s or less, even if it is set to ON (open loop control), open loop control will not be performed during operation.

First axis	26	1 Jog Cont [Choices]
Second axis	27	2 Jog Cont [Choices]

Choices	Description	Command setting, reply
OFF	Setting the parameter "Stage Cont Type"	0
ON	Set to open loop control	1
Default	ON	1

28 ORG Dir Mechanical origin return direction RESET
29

Description Set the direction of mechanical origin return.

First axis	28	1 ORG Dir [Choices]
Second axis	29	2 ORG Dir [Choices]

Choices	Description	Command setting, reply
CCW+	Set in CCW direction (motor side)	0
CW+	Set in CW direction (opposite motor side)	1
Default	CW+	1

30 ORG Mode Sel Mechanical origin return method RESET
31

Description Set the machine zero point return method. Please refer to the "About 9. Origin" for more information.

First axis	30	1 ORG Mode Sel [Choices]
Second axis	31	2 ORG Mode Sel [Choices]

Choices	Description	Command setting, reply
Mode0	Set to Mode0	0
Mode1	Set to Mode1	1
Mode2	Set to Mode2	2
Mode3	Set to Mode3	3
Mode4	Set to Mode4	4
None	None	5
Default	Mode0	0

32 ORG Mode3 Pos Mechanical origin return Mode3 specified position RESET
33

Description Set the return position when mechanical origin return Mode3 is set. Please refer to the "About 9. Home Return" for more information.

First axis: 3 2 1 O R G M o d e 3 P o s [Setting value] m m

Second axis: 3 3 2 O R G M o d e 3 P o s [Setting value] m m

Model	Setting value	Default	Command setting, reply
FC-111	0.0001 ~ 999.9999mm	0.5000mm	5000
FC-411	0.00005 ~ 999.99995mm	0.50000mm	50000
FC-511	0.00001 ~ 999.99999mm	0.50000mm	50000
FC-611	0.000005 ~ 999.999995mm	0.500000mm	500000
FC-911	0.000001 ~ 999.999999mm	0.500000mm	500000

34 ORG Speed H Mechanical origin return speed H RESET
35

Description Set the mechanical origin return speed High. Please refer to the "About 9. Home Return" for more information. Set it below the "Max Speed". If the setting value is large, it will return to the previous setting value.

First axis: 3 4 1 O R G S p e e d H [Setting value] m m / s

Second axis: 3 5 2 O R G S p e e d H [Setting value] m m / s

Model	Setting value	Default *	Command setting, reply
FC-111	"Max Speed" mm / s or less	10.0000mm/s	100000
FC-411		10.00000mm/s	1000000
FC-511		10.00000mm/s	1000000
FC-611		10.000000mm/s	10000000
FC-911		5.000000mm/s	5000000

* At the time of parameter default execution, if "Max Speed" is less than the default, it will be "Max Speed".

36 ORG Speed M Mechanical origin return speed M RESET
37

Description Set the mechanical origin return speed Middle. Please refer to the "About 9. Home Return" for more information. Set it below the "ORG Speed H". If the setting value is large, it will return to the previous setting value.

First axis: 3 6 1 O R G S p e e d M [Setting value] m m / s

Second axis: 3 7 2 O R G S p e e d M [Setting value] m m / s

Model	Setting value	Default *	Command setting, reply
FC-111	"ORG Speed H" mm / s or less	5.0000mm/s	50000
FC-411		5.00000mm/s	500000
FC-511		5.00000mm/s	500000
FC-611		5.000000mm/s	5000000
FC-911		2.500000mm/s	2500000

* At the time of parameter default execution, if "Max Speed" is less than the default, it will be "Max Speed".

38 ORG Speed L Mechanical origin return speed L RESET
39

Description Set the mechanical origin return speed Low. Please refer to the "About 9. Home Return" for more information. Set it below the "ORG Speed M". If the setting value is large, it will return to the previous setting value.

First axis	38	1 ORG Speed L [Setting value] mm/s
Second axis	39	2 ORG Speed L [Setting value] mm/s

Model	Setting value	Default *	Command setting, reply
FC-111	"ORG Speed M" mm / s or less	1.0000mm/s	10000
FC-411		1.00000mm/s	100000
FC-511		1.00000mm/s	100000
FC-611		1.000000mm/s	1000000
FC-911		1.000000mm/s	1000000

* At the time of parameter default execution, if "Max Speed" is less than the default, it will be "Max Speed".

40 EORG Speed Electric origin return speed RESET
41

Description Set the electric origin return speed. Please refer to the "About 9. Home Return" for more information. Set it below the "Max Speed". If the setting value is large, it will return to the previous setting value.

First axis	40	1 EORG Speed [Setting value] mm/s
Second axis	41	2 EORG Speed [Setting value] mm/s

Model	Setting value	Default *	Command setting, reply
FC-111	"Max Speed" mm / s or less	5.0000mm/s	50000
FC-411		5.00000mm/s	500000
FC-511		5.00000mm/s	500000
FC-611		5.000000mm/s	5000000
FC-911		2.500000mm/s	2500000

* If the "Max Speed" is less than the default of this parameter at the time of parameter default, it will be the value of "Max Speed".

42 Soft LMT Sel Software limit function setting RESET
43

Description Set whether to use the limit function specified by the coordinate value.

First axis	42	1 Soft LMT Sel [Choices]
Second axis	43	2 Soft LMT Sel [Choices]

Choices	Description	Command setting, reply
OFF	Not use	0
ON	Use	1
Default	OFF	0

44 + Soft LMT Pos + Software limit position RESET
45

Description Set the range of the plus direction limit from the zero position specified by the coordinate value.
However, if the setting exceeds the limit sensor position, it stops at the limit sensor.

First axis
```
44 1 + Soft LMT Pos
[ Setting value ] mm
```
Second axis
```
45 2 + Soft LMT Pos
[ Setting value ] mm
```

Model	Setting value	Default	Command setting, reply
FC-111	0.0001 ~ 999.9999mm	999.9999mm	9999999
FC-411	0.00005 ~ 999.99995mm	999.99995mm	99999995
FC-511	0.00001 ~ 999.99999mm	999.99999mm	99999999
FC-611	0.000005 ~ 999.999995mm	999.999995mm	999999995
FC-911	0.000001 ~ 999.999999mm	999.999999mm	999999999

46 - Soft LMT Pos - Software limit position RESET
47

Description Set the range of the minus direction limit from the zero position specified by the coordinate value.
However, if the setting exceeds the limit sensor position, it stops at the limit sensor.

First axis
```
46 1 - Soft LMT Pos
[ Setting value ] mm
```
Second axis
```
47 2 - Soft LMT Pos
[ Setting value ] mm
```

Model	Setting value	Default	Command setting, reply
FC-111	0.0001 ~ 999.9999mm	999.9999mm	9999999
FC-411	0.00005 ~ 999.99995mm	999.99995mm	99999995
FC-511	0.00001 ~ 999.99999mm	999.99999mm	99999999
FC-611	0.000005 ~ 999.999995mm	999.999995mm	999999995
FC-911	0.000001 ~ 999.999999mm	999.999999mm	999999999

48 L <-> R Sel Jog controller left / right button operation axis setting RESET

Description Set the axis that operates with the left / right buttons of the jog controller.

```
48 L <-> R Sel
[ Choices ]
```

Choices	Description	Command setting, reply
None	No use	0
AXIS1	Set first axis	1
AXIS2	Set second axis	2
Default: AXIS1		1

49 T <-> B Sel Jog controller up / down button operation axis setting RESET

Description Set the axis that operates with the up / down buttons on the jog controller.

```
49 T <-> B Sel
[ Choices ]
```

Choices	Description	Command setting, reply
None	No use	0
AXIS1	Set first axis	1
AXIS2	Set second axis	2
Default: AXIS2		2

50 Right Dir — Jog controller right button count direction — RESET

Description Set the count direction when operating the right button of the jog controller.

```
5 0  R i g h t  D i r
     [ Choices ]
```

Choices	Description	Command setting, reply
Plus	Set in the plus direction	0
Minus	Set in the minus direction	1
Default	Plus	0

51 Top Dir — Jog controller up button count direction — RESET

Description Set the count direction when operating the up button of the jog controller.

```
5 1  T o p  D i r
     [ Choices ]
```

Choices	Description	Command setting, reply
Plus	Set in the plus direction	0
Minus	Set in the minus direction	1
Default	Plus	0

52 53 Jy Cont — Command ″JY:″ control — RESET

Description Set the operation during execution of the command ″JY:″. After the operation stops, it returns to the setting of the parameter ″Stage Cont Type″. However, if the parameter “Stage Cont Type” is set to “Close” and the set speed is 10 μm / s or less, even if it is set to ON (open loop control), open loop control will not be performed during operation.

First axis
```
5 2  1 J y  C o n t
     [ Choices ]
```
Second axis
```
5 3  2 J y  C o n t
     [ Choices ]
```

Choices	Description	Command setting, reply
OFF	Setting the parameter ″Stage Cont Type″	0
ON	Set to open loop control	1
Default	ON	1

54 55 Jy Speed H — JY Speed H — RESET

Description Set the operation speed of JY speed H. Set it below the ″Max Speed″. If the setting value is large, it will return to the previous setting value.

First axis
```
5 4  1 J c  S p e e d  H
     [ Setting value ] m m / s
```
Second axis
```
5 5  2 J c  S p e e d  H
     [ Setting value ] m m / s
```

Model	Setting value	Default *	Command setting, reply
FC-111	″Max Speed″ mm / s or less	10.0000mm/s	100000
FC-411		10.00000mm/s	1000000
FC-511		10.00000mm/s	1000000
FC-611		10.000000mm/s	10000000
FC-911		5.000000mm/s	5000000

* At the time of parameter default execution, if ″Max Speed″ is less than the default, it will be ″Max Speed″.

56 Jy Speed 9 JY Speed 9 RESET
57

Description Set the operation speed 2 when pressing and holding the CW, CCW and Jog controller buttons. Set it below the "Jog Speed 3". If the setting value is large, it will return to the previous setting value.

First axis: 5 6 1 J y S p e e d 9 [Setting value] m m / s

Second axis: 5 7 2 J y S p e e d 9 [Setting value] m m / s

Model	Setting value	Default *	Command setting, reply
FC-111	"Jy Speed H" mm / s or less	5.0000mm/s	50000
FC-411		5.00000mm/s	500000
FC-511		5.00000mm/s	500000
FC-611		5.000000mm/s	5000000
FC-911		4.000000mm/s	4000000

* At the time of parameter default execution, if "Max Speed" is less than the default, it will be "Max Speed".

■ About the minimum speed of Jy Speed1 to 8

The minimum operation speed of Jy Speed1 to 8 is determined by the setting of Jy Speed9. See the table below for details. For example, if Jy Speed 9 is set to 10mm / s while using FC-111, the minimum operation speed is 0.0002mm / s. The minimum speed of FC-111 can be set to 0.0001mm / s, but in this example, it does not operate because the minimum speed is 0.0002mm / s.

Model	Jy Speed 9 speed setting range			Minimum speed
FC-111	0.0001mm/s	-	6.5535mm/s	0.0001mm/s
	6.5536mm/s	-	13.1070mm/s	0.0002mm/s
	13.1071mm/s	-	32.7675mm/s	0.0005mm/s
	32.7676mm/s	-	65.5350mm/s	0.0010mm/s
	65.5351mm/s	-	100.0000mm/s	0.0020mm/s
FC-411	0.00005mm/s	-	3.27675mm/s	0.00005mm/s
	3.27680mm/s	-	6.55350mm/s	0.00010mm/s
	6.55355mm/s	-	16.38375mm/s	0.00025mm/s
	16.38380mm/s	-	32.76750mm/s	0.00050mm/s
	32.76755mm/s	-	65.53500mm/s	0.00100mm/s
	65.53550mm/s	-	100.0000mm/s	0.00250mm/s
FC-511	0.00001mm/s	-	0.65535mm/s	0.00001mm/s
	0.65536mm/s	-	1.31070mm/s	0.00002mm/s
	1.31071mm/s	-	3.27675mm/s	0.00005mm/s
	3.27676mm/s	-	6.55350mm/s	0.00010mm/s
	6.55351mm/s	-	13.10700mm/s	0.00020mm/s
	13.10701mm/s	-	32.76750mm/s	0.00050mm/s
	32.76751mm/s	-	50.00000mm/s	0.00100mm/s
FC-611	0.000005mm/s	-	0.327675mm/s	0.000005mm/s
	0.327680mm/s	-	0.655350mm/s	0.000010mm/s
	0.655355mm/s	-	1.638375mm/s	0.000025mm/s
	1.638380mm/s	-	3.276750mm/s	0.000050mm/s
	3.276755mm/s	-	6.553500mm/s	0.000100mm/s
	6.553550mm/s	-	16.383750mm/s	0.000250mm/s
	16.383755mm/s	-	30.000000mm/s	0.000500mm/s
FC-911	0.000001mm/s	-	0.065535mm/s	0.000001mm/s
	0.065536mm/s	-	0.131070mm/s	0.000002mm/s
	0.131071mm/s	-	0.327675mm/s	0.000005mm/s
	0.327676mm/s	-	0.655350mm/s	0.000010mm/s
	0.655351mm/s	-	1.310700mm/s	0.000020mm/s
	1.310701mm/s	-	3.276750mm/s	0.000050mm/s
	3.276751mm/s	-	6.000000mm/s	0.000100mm/s

58 Jy Speed 8 JY Speed 8 RESET
59

Description Set the 8th operation speed of JY speed. Set it below the "Jy Speed 9". If the setting value is large, it will return to the previous setting value.

First axis	5 8	1 J y S p e e d 8 [Setting value] m m / s
Second axis	5 9	2 J y S p e e d 8 [Setting value] m m / s

Model	Setting value	Default *	Command setting, reply
FC-111	"Jy Speed 9" mm / s or less	1.0000mm/s	10000
FC-411		1.00000mm/s	100000
FC-511		1.00000mm/s	100000
FC-611		1.000000mm/s	1000000
FC-911		1.000000mm/s	1000000

* At the time of parameter default execution, if "Max Speed" is less than the default, it will be "Max Speed".

60 Jy Speed 7 JY Speed 7 RESET
61

Description Set the 7th operation speed of JY speed. Set it below the "Jy Speed 8". If the setting value is large, it will return to the previous setting value.

First axis	6 0	1 J y S p e e d 7 [Setting value] m m / s
Second axis	6 1	2 J y S p e e d 7 [Setting value] m m / s

Model	Setting value	Default *	Command setting, reply
FC-111	"Jy Speed 8" mm / s or less	0.5000mm/s	5000
FC-411		0.50000mm/s	50000
FC-511		0.50000mm/s	50000
FC-611		0.500000mm/s	500000
FC-911		0.500000mm/s	500000

* At the time of parameter default execution, if "Max Speed" is less than the default, it will be "Max Speed".

62 Jy Speed 6 JY Speed 6 RESET
63

Description Set the 6th operation speed of JY speed. Set it below the "Jy Speed 7". If the setting value is large, it will return to the previous setting value.

First axis	6 2	1 J y S p e e d 6 [Setting value] m m / s
Second axis	6 3	2 J y S p e e d 6 [Setting value] m m / s

Model	Setting value	Default *	Command setting, reply
FC-111	"Jy Speed 7" mm / s or less	0.1000mm/s	1000
FC-411		0.10000mm/s	10000
FC-511		0.10000mm/s	10000
FC-611		0.100000mm/s	100000
FC-911		0.100000mm/s	100000

* At the time of parameter default execution, if "Max Speed" is less than the default, it will be "Max Speed".

64 Jy Speed 5 JY Speed 5 RESET
65

Description Set the 5th operation speed of JY speed. Set it below the "Jy Speed 6". If the setting value is large, it will return to the previous setting value.

First axis	641	Jy Speed 5 [Setting value] mm/s
Second axis	652	Jy Speed 5 [Setting value] mm/s

Model	Setting value	Default *	Command setting, reply
FC-111	"Jy Speed 6" mm / s or less	0.0500mm/s	500
FC-411		0.05000mm/s	5000
FC-511		0.05000mm/s	5000
FC-611		0.050000mm/s	50000
FC-911		0.050000mm/s	50000

* At the time of parameter default execution, if "Max Speed" is less than the default, it will be "Max Speed".

66 Jy Speed 4 JY Speed 4 RESET
67

Description Set the 4th operation speed of JY speed. Set it below the "Jy Speed 5". If the setting value is large, it will return to the previous setting value.

First axis	661	Jy Speed 4 [Setting value] mm/s
Second axis	672	Jy Speed 4 [Setting value] mm/s

Model	Setting value	Default *	Command setting, reply
FC-111	"Jy Speed 5" mm / s or less	0.0100mm/s	100
FC-411		0.01000mm/s	1000
FC-511		0.01000mm/s	1000
FC-611		0.010000mm/s	10000
FC-911		0.010000mm/s	10000

* At the time of parameter default execution, if "Max Speed" is less than the default, it will be "Max Speed".

68 Jy Speed 3 JY Speed 3 RESET
69

Description Set the 3th operation speed of JY speed. Set it below the "Jy Speed 4". If the setting value is large, it will return to the previous setting value.

First axis	681	Jy Speed 3 [Setting value] mm/s
Second axis	692	Jy Speed 3 [Setting value] mm/s

Model	Setting value	Default *	Command setting, reply
FC-111	"Jy Speed 4" mm / s or less	0.0050mm/s	50
FC-411		0.00500mm/s	500
FC-511		0.00500mm/s	500
FC-611		0.005000mm/s	5000
FC-911		0.005000mm/s	5000

* At the time of parameter default execution, if "Max Speed" is less than the default, it will be "Max Speed".

70 Jy Speed 2 JY Speed 2 RESET
71

Description Set the 2th operation speed of JY speed. Set it below the "Jy Speed 3". If the setting value is large, it will return to the previous setting value.

First axis	7 0	1	J y S p e e d 2 [Setting value] m m / s
Second axis	7 1	2	J y S p e e d 2 [Setting value] m m / s

Model	Setting value	Default *	Command setting, reply
FC-111	"Jy Speed 3" mm / s or less	0.0010mm/s	10
FC-411		0.00100mm/s	100
FC-511		0.00100mm/s	100
FC-611		0.001000mm/s	1000
FC-911		0.001000mm/s	1000

* At the time of parameter default execution, if "Max Speed" is less than the default, it will be "Max Speed".

72 Jy Speed 1 JY Speed 1 RESET
73

Description Set the 1th operation speed of JY speed. Set it below the "Jy Speed 2". If the setting value is large, it will return to the previous setting value.

First axis	7 2	1	J y S p e e d 1 [Setting value] m m / s
Second axis	7 3	2	J y S p e e d 1 [Setting value] m m / s

Model	Setting value	Default *	Command setting, reply
FC-111	"Jy Speed 2" mm / s or less	0.0005mm/s	5
FC-411		0.00050mm/s	50
FC-511		0.00050mm/s	50
FC-611		0.000500mm/s	500
FC-911		0.000500mm/s	500

* At the time of parameter default execution, if "Max Speed" is less than the default, it will be "Max Speed".

(2) GENERAL parameters

01 AXIS Sel — Axis Setting — RESET

Description Set the number of axes to be controlled.

```
0 1   A X I S   S e l
      [ Choices ]
```

Choices	Description	Command setting, reply
1	First axis only	0
2	Second axis only	1
1 + 2	Both axis	2
Default: 1 + 2		2

02 / 03 Max Speed — Maximum operating speed — RESET

Description Set the maximum operation speed. Set the speed below the maximum operation speed of the connected stage. If the command "A:" or "M:" is started without setting the command "D:" during communication, the operation will be performed at the speed of this parameter.

First axis
```
0 2   1 M a x   S p e e d
      [ Setting value ] m m / s
```

Second axis
```
0 3   2 M a x   S p e e d
      [ Setting value ] m m / s
```

Model	Setting value	Default	Command setting, reply
FC-111	0.0001 ~ 100.0000mm/s	10.0000mm/s	100000
FC-411	0.00005 ~ 100.00000mm/s	10.00000mm/s	1000000
FC-511	0.00001 ~ 50.00000mm/s	10.00000mm/s	1000000
FC-611	0.000005 ~ 30.000000mm/s	10.000000mm/s	10000000
FC-911	0.000001 ~ 6.000000mm/s	5.000000mm/s	5000000

* Do not set a value that exceeds the maximum moving speed of the connected stage.

04 / 05 Lin/Rot — Control stage type — RESET

Description Set the type of stage to be controlled.

First axis
```
0 4   1 L i n / R o t
      [ Choices ]
```

Second axis
```
0 5   2 L i n / R o t
      [ Choices ]
```

Choices	Description	Command setting, reply
Linear	Set to linear stage	0
Rotate	Set to rotating stage	1
Default: Linear		0

06 / 07 Stop Sel — Stop control setting — RESET

Description Set how to stop the stage. Valid when executing the front panel JOG button and command "L:".

First axis
```
0 6   1 S t o p   S e l
      [ Choices ]
```

Second axis
```
0 7   2 S t o p   S e l
      [ Choices ]
```

Choices	Description	Command setting, reply
SD Stop	Stop deceleration	0
IM Stop	Stop immediately	1
Default: SD Stop		0

08 / 09 EMG Motor Excite — Motor status at emergency stop — RESET

Description Set the motor status at emergency stop.

First axis

0 8	1	E M G M o t o r E x c i t e
	[	Choices]

Second axis

0 9	2	E M G M o t o r E x c i t e
	[	Choices]

Choices	Description	Command setting, reply
Disable	Not excite	0
Enable	Excite	1
Default	Disable	0

10 EMG Connector Use of emergency stop RESET

Description Set whether to use the emergency stop function.

1 0	1	E M G C o n n e c t o r
	[	Choices]

Choices	Description	Command setting, reply
Disable	Not Use	0
Enable	Use	1
Default	Disable	0

11 Motor Excite Motor status at startup RESET
12

Description Set the motor status at startup.

First axis

1 1	1	M o t o r E x c i t e
	[	Choices]

Second axis

1 2	2	M o t o r E x c i t e
	[	Choices]

Choices	Description	Command setting, reply
Disable	Not excite	0
Enable	Excite	1
Default	Enable	1

13 Stage Cont Type Feedback stage control type RESET
14

Description Set the feedback stage control method.

First axis

1 3	1	S t a g e C o n t T y p e
	[	Choices]

Second axis

1 4	2	S t a g e C o n t T y p e
	[	Choices]

Choices	Description	Command setting, reply
Close	Closed loop	0
Open	Open loop	1
Default	Close	0

15 Count Sel Display counter contents RESET
16

Description Set the type of counter to be displayed.

First axis

1 5	1	C o u n t S e l
	[	Choices]

Second axis

1 6	2	C o u n t S e l
	[	Choices]

Choices	Description	Command setting, reply
Encoder	Encoder reading coordinate value	0
Out Pulse	Command coordinate value	1
Default	Encoder	0

17 CD Drive Current down drive RESET
18

Description Set whether to operate with the motor drive current constantly reduced.

First axis
```
1 7  1 C D  D r i v e
     [  Choices  ]
```
Second axis
```
1 8  2 C D  D r i v e
     [  Choices  ]
```

Choices	Description	Command setting, reply
OFF	Normal	0
ON	Reduce drive current	1
Default	OFF	0

19 INP Dec In-position judgment time RESET
20

Description Set the in-position judgment time.

First axis
```
1 9  1 I N P  D e c
     [  Choices  ]
```
Second axis
```
2 0  2 I N P  D e c
     [  Choices  ]
```

Choices	Description	Command setting, reply
Normal	Normal	0
Short	Decrease the judgment time	1
Default	Normal	0

21 FBT Sel Feedback start timing RESET
22

Description Set the timing to start feedback. When "Normal" is choose, the timing of the feedback start is switched automatically according to the moving speed. When "After" is choose, feedback is started when the move command ends regardless of the moving speed.

First axis
```
2 1  1 F B T  S e l
     [  Choices  ]
```
Second axis
```
2 2  2 F B T  S e l
     [  Choices  ]
```

Choices	Description	Command setting, reply
Normal	Normal	0
After	Started when the move command ends	1
Default	Normal	0

23 Ini Mode Initial mode RESET

Description Set the startup mode.
```
2 3  I n i  M o d e
     [  Choices  ]
```

Choices	Description	Command setting, reply
REMOTE	Start in REMOTE mode	0
LOCAL	Start in LOCAL mode	1
TEACH	Start in TEACH mode	2
Default	LOCAL	1

24 I/F Sel Communication interface RESET

Description Set the communication interface.

```
2 4 I / F S e l
    [ Choices ]
```

Choices	Description	Command setting, reply
USB	USB interface	0
Ethernet	Ethernet interface	1
GP-IB	GP-IB interface	2
Default	USB	0

25 USB Del USB delimiter RESET

Description Set the USB interface delimiter.

```
2 5 U S B D e l
    [ Choices ]
```

Choices	Description	Command setting, reply
CR + LF	Carriage return code and line feed code	0
CR	Carriage return code	1
LF	Line feed code	2
Default	CR + LF	0

26 GP-IB Addr GP-IB address RESET

Description Set the GP-IB address.

```
2 6 1 G P - I B A d d r
    [ Choices ]
```

Choices	Description	Command setting, reply
1 ~ 30	Specify the address numerically	1 ~ 30
Default	8	8

27 GP-IB Del GP-IB delimiter RESET

Description Set the GP-IB interface delimiter.

```
2 7 G P - I B D e l
    [ Choices ]
```

Choices	Description	Command setting, reply
CR + LF	Carriage return code and line feed code	0
EOI	End or Identify	1
CR	Carriage return code	2
LF	Line feed code	3
Default	CR + LF	0

28 GP-IB EOI GP-IB EOI RESET

Description Enable / disable EOI of GP-IB interface.

```
2 8 G P - I B E O I
    [ Choices ]
```

Choices	Description	Command setting, reply
OFF	Disable	0
ON	Enable	1
Default	ON	1

29 GP-IB SRQ GP-IB SRQ RESET

Description Enables / disables the SRQ of the GP-IB interface.

```
2 9    G P - I B   S R Q
       [   Choices   ]
```

Choices	Description	Command setting, reply
OFF	Disable	0
ON	Enable	1
Default	ON	1

30 ETHER Del Ethernet delimiter RESET

Description Set the Ethernet interface delimiter.

```
3 0    E T H E R   D e l
       [   Choices   ]
```

Choices	Description	Command setting, reply
CR + LF	Carriage return code and line feed code	0
CR	Carriage return code	1
LF	Line feed code	2
Default	CR + LF	0

31 IP Address Ethernet IP address RESET

Description Set the IP address of the Ethernet interface.

```
3 1    I P   A d d r
       [   Setting value   ]
```

Setting value	Command setting, reply
000000000000 ~ 255255255255	Depends on set value
Default 192168001210	192168001210

32 Default Getway Ethernet Default Getway RESET

Description Set the default gateway for the Ethernet interface.

```
3 2    D e f a u l t   G a t e W a y
       [   Setting value   ]
```

Setting value	Command setting, reply
000000000000 ~ 255255255255	Depends on set value
Default 192168011254	192168011254

33 Subnet Mask Ethernet Subnet Mask RESET

Description Set the subnet mask for the Ethernet interface.

```
3 3    S u b n e t   M a s k
       [   Setting value   ]
```

Setting value	Command setting, reply
000000000000 ~ 255255255255	Depends on set value
Default 255255255000	255255255000

34 ECHO BACK Command echo back RESET

Description Set whether to return the command description sent immediately before.

```
3 4  E C H O  B A C K
     [  Choices  ]
```

Choices	Description	Command setting, reply
OFF	Not reply	0
ON	Reply	1
Default	OFF	0

35 TEACH Monitor Teaching monitor RESET

Description Set whether to return the contents of the teaching line currently being executed. Reply to the set communication interface.

```
3 5  T E A C H  M o n i t o r
     [  Choices  ]
```

Choices	Description	Command setting, reply
OFF	Not reply	0
ON	Reply	1
Default	OFF	0

36 GENERAL IN Chat General-purpose input port chattering check RESET

Description Set whether to check chattering of the general-purpose input port.

```
3 6  G E N E R A L  I N  C h a t
     [  Choices  ]
```

Choices	Description	Command setting, reply
OFF	Disable	0
ON	Enable	1
Default	OFF	0

37 TEACH IN Chat TEACH input port chattering check RESET

Description Set whether to check chattering of the teaching operation input port.

```
3 7  T E A C H  I N  C h a t
     [  Choices  ]
```

Choices	Description	Command setting, reply
OFF	Disable	0
ON	Enable	1
Default	OFF	0

38 Sleep Sel Sleep RESET

Description Set whether to use the sleep function.

```
3 8  S l e e p  S e l
     [  Choices  ]
```

Choices	Description	Command setting, reply
OFF	Not use	0
ON	Use	1
Default	ON	1

39 BEEP Sel — Beep — RESET

Description Set whether to emit a beep sound. However, continuous sound cannot be turned off.

```
3 9   B E E P   S e l
      [   Choices   ]
```

Choices	Description	Command setting, reply
OFF	Do not beep	0
ON	Sound a beep	1
Default	ON	1

40 Disp bright — Display brightness — RESET

Description Set the display brightness.

```
4 0   D i s p   b r i g h t
      [   Choices   ]
```

Choices	Description	Command setting, reply
25%	Set to 25%	0
50%	Set to 50%	1
75%	Set to 75%	2
100%	Set to 100%	3
125%	Set to 125%	4
150%	Set to 150%	5
175%	Set to 175%	6
200%	Set to 200%	7
Default	100%	3

41 Imt Stop Sel — Stop the limit sensor — RESET
42

Description Select the stop method when the limit sensor is input.

First axis
```
4 1   1   l m t   S t o p   S e l
      [   Choices   ]
```

Second axis
```
4 2   2   l m t   S t o p   S e l
      [   Choices   ]
```

Choices	Description	Command setting, reply
SD Stop	Set to slowdown stop	0
IM stop	Set to stop immediately	1
Default	IM stop	1

43 Option type — Option type selection — RESET

Description Select the option type to connect.

```
4 3   O p t i o m   t y p e
      [   Choices   ]
```

Choices	Description	Command setting, reply
Type0	JC-01, JC-01-3, JC-01-04	0
Type1	MD-400	1
Default	Type0	0

8. Teaching function

The teaching function is a function to execute commands registered inside this equipment when in the TEACH mode. It can execute all lines automatically or one line at a time. The registered commands are executed sequentially from the first line, and execution ends when the command "END:" or the completion of the 200th line. If there is a line where no command is registered (blank line), skip that line. In the case of an error that can be cleared, executing the error clear returns to the first line. The error can be cleared by operating the "BEC" button of the target axis after switching to the command "BEC:" or LOCAL mode.

⚠
- Before moving the stage, make sure that there is no effect on the surroundings.
- Check the registration details before performing teaching.

8-1. About channels

There are 1 to 5 channels, and the number of stored lines per channel is 200. The following table shows the image stored in the internal memory.

Line	Channel1	Channel2	Channel3	Channel4	Channel5
1	D:1M1	D:1M1	JG:1 +100	JG:1 -100	FS:1 100
2	M:1+M10	M:1-M10			FS:2 100
3	G	G	END:	END:	M:1+U100
4	END:	END:			G
5					FE:2
≀					
198					FE:1
199					END:
200					

8-2. About registration and editing

Registration of contents is possible only by command. The commands used for registration and editing are shown below.

Item	No.	Commands	Function	Page
Teaching	56	T_ON:	Move to teaching edit mode	55
	57	T_OFF:	Save teaching content and return to TEACH mode	55
	58	T_DEL:	Delete the contents of the line registered for teaching	56
	59	T_SET:	Set teaching content for each line	56
	60	T_GET:	Get the contents of the line registered for teaching	56
	61	TC:	Select teaching channel	56
	62	TCR:	Get the current teaching channel	56
	63	TQ:	Get teaching status	57
	68	TR:	Get teaching channel registration status	58

(1) Example 1

Set the operation speed of the first axis to 1 mm / sec. After moving 10 times in increments of 1 mm from the current position, move the axis in the negative direction 10 mm and wait for 1 second. Repeat this 10 times.

Send command	Description
T_ON:	Move to TEACH edit mode
TC:1	Select channel 1
T_SET:1 D:1M1	First axis operation speed set to 1mm / sec
T_SET:2 H:1	Set First axis mechanical home return
T_SET:3 FS:1 10	Set 10 times for loop level 1
T_SET:4 M:1+M1	Set first axis relative movement set value to 1mm
T_SET:5 FS:2 10	Set 10 times for loop level 2
T_SET:6 GN:1	Start moving
T_SET:7 FE:2	End location of loop level 2
T_SET:8 M:1-M10	Set first axis relative movement set value to -10mm
T_SET:9 G	Start moving
T_SET:10 T:1.0	Wait 1 second
T_SET:11 FE:1	End location of loop level 1
T_SET:12 END:	Teaching end line setting
T_OFF:	Save teaching contents and return to normal mode

(2) Example 2

Retrieve the first and fourth lines from Example 1.

Send command	Reply command	Description
T_ON:	-	Move to TEACH edit mode
TC:1	-	Select channel 1
T_GET:1	D:1M1	Get first line
T_GET:4	M:1+M1	Get line 4
T_GET:13	-	Not registered

(3) Example 3

Delete the first to fourth lines of Example 1.

Send command	Description
T_ON:	Move to TEACH edit mode
TC:1	Select channel 1
T_DEL:1	Delete first line
T_DEL:2	Delete line 2
T_DEL:3	Delete line 3
T_DEL:4	Delete line 4
T_OFF:	Save teaching contents and return to normal mode

(4) Registration target command

This is a list of commands that can be registered for teaching.

Item	No,	Commands	Function	Page
Control	09	F:	Change the positioning control method(Closed or Open loop)	28
	11	C:	Change the excitation state of the motor	28
Origin	33	H:	Return to mechanical origin	44
	34	Z:	Return to electrical origin	44
	35	R:	Set the position coordinate values to zero	45
Motion	38	ACC:	Set the acceleration and deceleration time	46
	40	D:	Set the movement speed of the stage	47
	42	A:	Set the position to move in absolute motion	49
	43	M:	Set the amount of movement to move in relative motion	50
	44	G	Start moving (The setting values is lost after execution)	51
	45	GN:	Start moving (The setting values is not lost.)	51
	48	JG:	It moves according to the set number of pulses	53
General purpose I/O	55	O:	Set general-purpose Output status	55
Teaching registration only	74	FS:	Loop setting	60
	75	FE:	Set loop end	60
	76	END:	Set the execution end line	60
	77	T:	Set the wait time	60
	78	GIS:	Wait until the specified general-purpose input state is reached	61

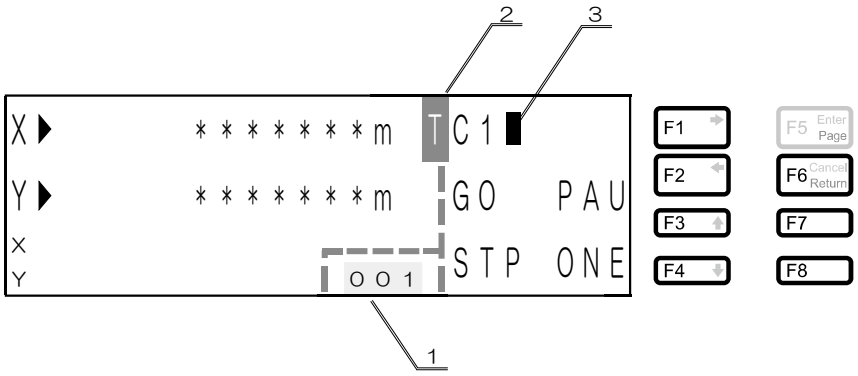
8-3. Teaching operation

Perform teaching operations with the front panel, commands, general-purpose I / O, and jog controller. When "I / O" is selected in the parameter "TEACH IF", operation is possible only with general-purpose I / O. When "JOG / CMD" is selected, operation can be performed from other than general-purpose I / O. There is no need to unify the types of operations. For example, you can start execution on the front panel and stop it with a jog controller or command.

⚠ Before moving the stage, make sure that there is no effect on the surroundings.

(1) Front panel operation

Operable when the parameter "TEACH IF" is "JOG / CMD".



No	Item	Contents
1	Line number	Displays the current line number.
2	Mode	T (TEACH) is displayed.
3	Confirmation of registration	You can check the registration of teaching content.

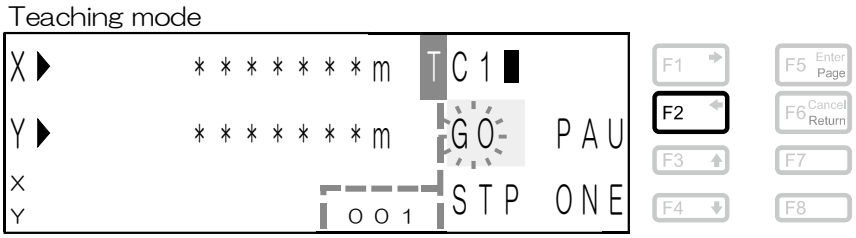
Button	Display	Contents
F1	C1 ■	Select the teaching channel. It changes each time the F1 (C) button is pressed. If no command is registered, the right side of the channel number will be blank. When the display is blinking, the teaching contents are being registered, so the F1 to F8 buttons cannot be operated. The state on the left shows that channel 1 is selected and commands are registered. C1 → C2 → C3 → C4 → C5 → Return to C1
F2	GO	Perform teaching. The display flashes during execution.
F3 F4	STP	Stop the teaching execution. The blinking "GO" , "PAU" , and "ONE" will stop blinking.
F5	-	If the teaching execution has stopped, press the switch twice (double-click) to switch to the operation test mode. * The operation test mode has nothing to do with teaching.
F6	PAU	If pressed during teaching, pauses after the current execution is completed. The display flashes during pause. To restart, press F2 (GO) button.
F7 F8	ONE	Press when stopped or paused to execute one command line. The display flashes during execution of one line. After execution of one line, the display stops blinking and pauses.
F7 + F8	-	If both button are pressed at the same time switches to the SETUP mode. For details on the SETUP mode, see "5-3. SETUP mode".

- Channel selection
  Select a channel with the F1 (C) button. It changes each time it is pressed.

・ Start moving

Press F2 (GO) button to start execution. GO starts flashing when execution starts. Execution starts from the first line, and when the command “END:” or the 200th line is completed, execution and GO stop blinking, return to the state before execution, and wait. If an error occurs or an emergency stop occurs during execution, the operating stage stops immediately and stops at the line where it was executing. If a stop occurs due to a limit error, overflow error, or emergency stop, the line returns to the first line when released with the BEC button or command ″BEC:″ on the front panel. To clear any error other than the above, restart the power, restart, or send the command ″RESET:″.

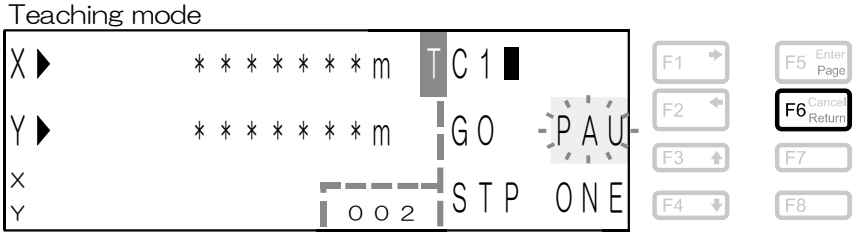
When you press the F2 (GO) button, It will be executed.
* GO blinks.



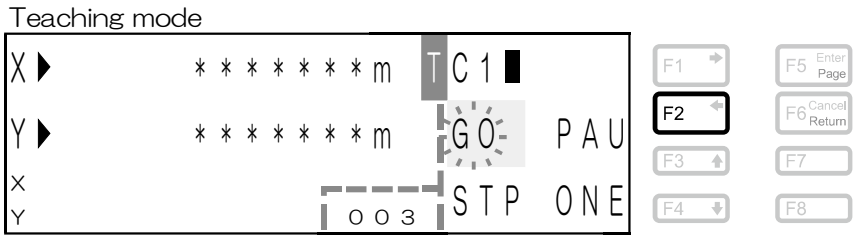
・ Pause

To pause during execution, press the F6 (PAU) button. Pauses after execution of the currently executed line is completed, and PAU blinks. To resume execution, press the F2 (GO) button.

When F6 (PAU) button is pressed, Pause.
* PAU flashes.



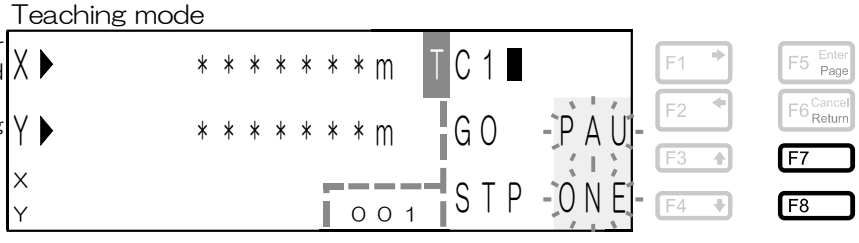
When you press the F2 (GO) button, Execution resumes.
* GO blinks.



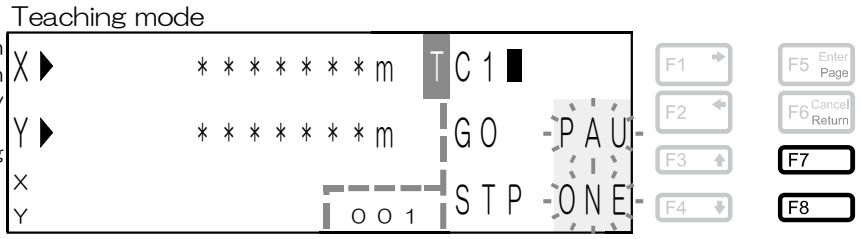
・ One line execution

Press F7 (ONE) button or F8 (ONE) button to execute one line at a time. Can be executed while paused or stopped. When stopped, press F7 (ONE) button or F8 (ONE) button to execute one line and pause. When paused, one line is executed each time the button is pressed. However, if the stage is operating, no operation will be accepted. If an error occurs or an emergency stop occurs during execution, the operating stage stops immediately and stops at the line where it was executing. In the case of a stop due to a limit error, overflow error, or emergency stop, if it is released with the BEC button on the front panel or the command ″BEC:″, it returns to the first line and waits. To clear any error other than the above, restart the power, restart, or send the command ″RESET:″.

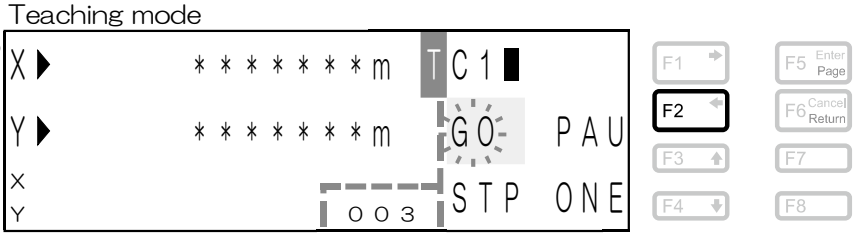
If the F7 (ONE) button or F8 (ONE) button is pressed while stopped, Pause.
* ONE and PAU blink during execution of one line.



Press the F7 (ONE) button or F8 (ONE) button again to execute the next line only once.
* ONE and PAU blink during execution of one line.

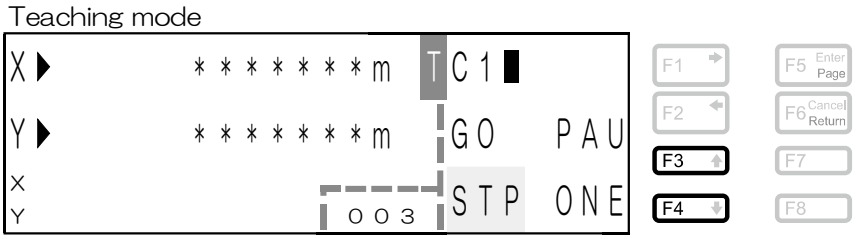


Press F2 (GO) button to execute from the next line.
* GO blinks.



・ Stop
If you press the F3 (STP) button or the F4 (STP) button, the stage will stop immediately if it is running, and will stop executing. After stopping, it returns to the first line.

Press F3 (STP) or F4 (STP) to stop execution.



(2) Command operation
Operable when the parameter "TEACH IF" is "JOG / CMD". The list of operation commands is shown below.

Item	No.	Commands	Description	Page
Teaching	61	TC:	Select a channel	56
	62	TCR:	Get current channel	56
	63	TQ:	Get teaching status	57
	64	TG:	Teaching start	57
	65	TP:	Pause	57
	66	TO:	Execute line by line	57
	67	TL:	Stop execution	57
	68	TR:	Get channel subscription status	58
	69	TFR:	Get the loop count	58
	70	TM:	Set the Teaching monitor function	59
	71	TMR:	Get the Teaching monitor function setting	59
	72	TNR:	Get current line number	60
	73	TACR:	Get current execution command	60

(3) Jog controller operation
Operable when the parameter "TEACH IF" is "JOG / CMD". See the jog controller instruction manual.

(4) Operation with general-purpose I / O

Operable when the parameter "TEACH IF" is "I / O". Teaching operation can be performed by switch input. For details, see "(4) General-purpose I / O" .

⚠ The input current waveform should be pulsed (rise and fall time <100 μsec).

Terminal name	Terminal number	Description
T_1	43	Change channel
T_2	19	
T_3	44	
T_START	20	Start moving
T_PAUSE	45	Pause
T_ONE_STEP	21	One line execution
T_STOP	46	Stop

・ Explanation of terms

Item	Description
ON	ON means that a current flows through the input terminal of the photocoupler inside this equipment.
OFF	OFF means to cut off the current flowing to the input terminal of the photocoupler inside this equipment.

・ Explanation of Terminal

Item	Description
T_1、T_2、T_3	T_1, T_2, and T_3 are pins for selecting channels. T_START, T_PAUSE, T_ONE_STEP, and T_STOP are available while you continue to select channels at T_1, T_2, and T_3. If T_1, T_2, and T_3 are set to other than channels 1 to 5, the above terminal functions cannot be used. If you change the state of T_1, T_2, T_3 during execution, stop the execution.
T_START	T_START is a terminal to start teaching execution. Turn ON for 10ms or more with pulse width.
T_PAUSE	T_PAUSE is a terminal for temporarily stopping teaching. While ON, pause without executing the next line.
T_ONE_STEP	T_ONE_STEP is a terminal to execute the registered contents line by line. Executes each time a pulse is input. However, if the stage is operating, this command will not be permitted and will be discarded until positioning is completed. If a pulse is input to the T_ONE_STEP pin while the T_PAUSE pin is turned ON when T_START is not being executed, the registered contents can be executed line by line from the first line. The pulse width should be 10ms or more.
T_STOP	T_STOP is a pin for stopping the stage immediately when the stage is operating and stopping the teaching execution. After stopping, it returns to the first line. Turn ON for 10ms or more with pulse width.

Terminal name	Channel1	Channel2	Channel3	Channel4	Channel5
T_1	ON	OFF	ON	OFF	ON
T_2	OFF	ON	ON	OFF	OFF
T_3	OFF	OFF	OFF	ON	ON

・Check execution status

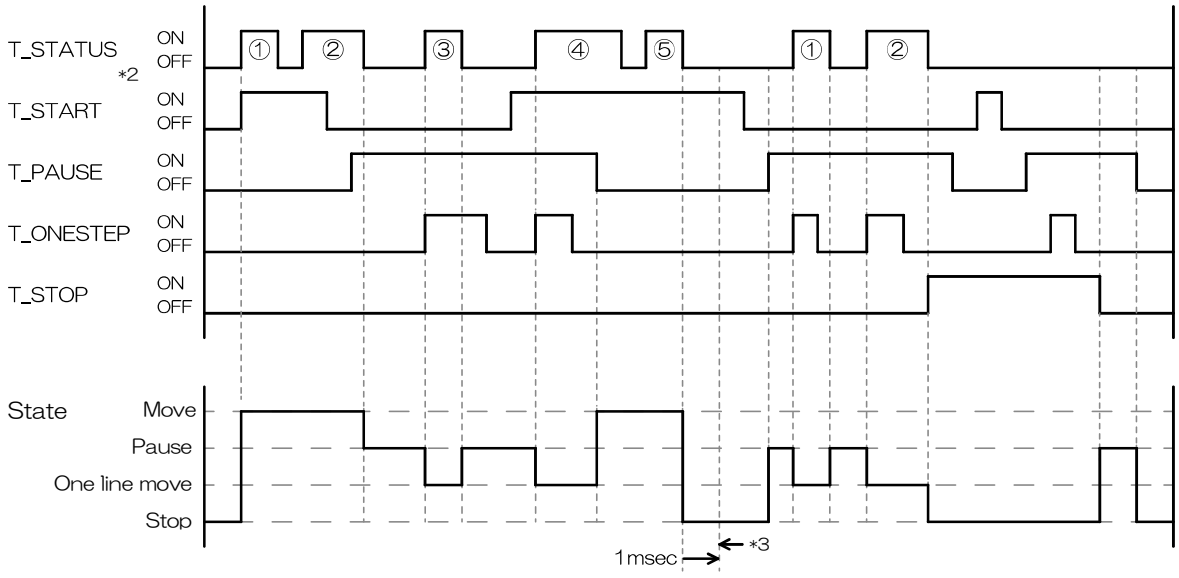
The status can be checked with the following terminals.

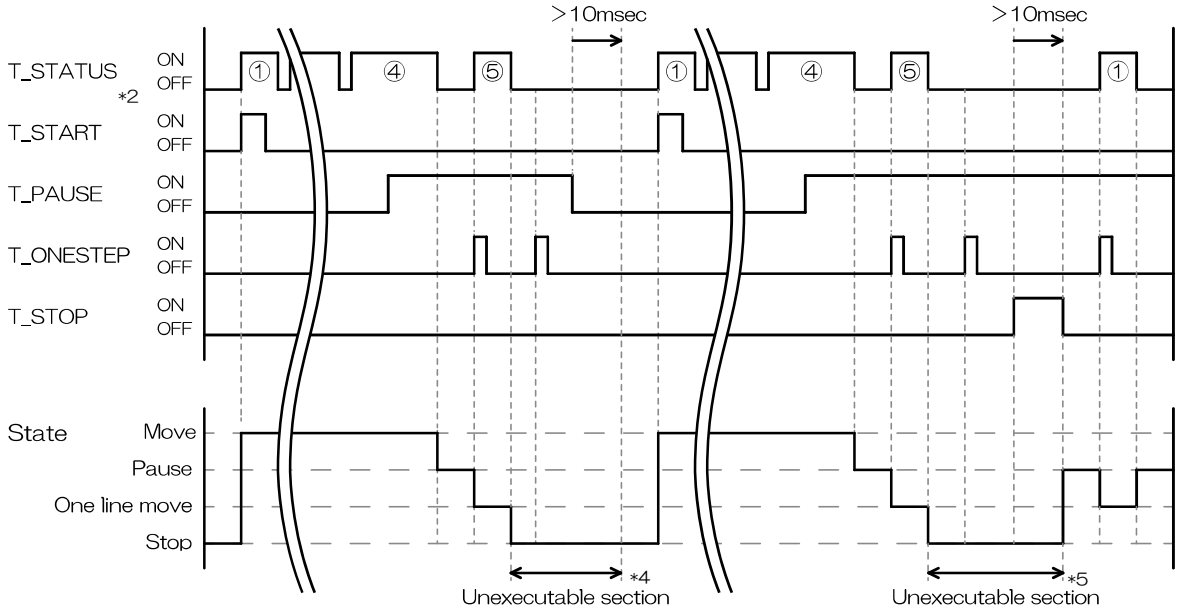
Terminal name	Terminal number	Description
T_STATUS	17	Output HIGH during execution of registration line
/T_STATUS	42	Inverted output of T_STATUS

*1 The T_STATUS signal is output regardless of the setting of the parameter "TEACH IF".

・Operation example and execution status of each terminal

Line number	Registered contents	Description
①	D:1M1	First axis operation speed set to 1mm / sec
②	H:1	Set First axis mechanical home return
③	M:1+M1	Set first axis relative movement set value to +1mm
④	G	Start moving
⑤	END:	Teaching end line setting





*2 ON of the T_STATUS signal has the same meaning as T_STATUS pin HIGH.

*3 The OFF time of the T_STATUS signal during automatic execution is about 500 μ sec. If the OFF time of the T_STATUS signal continues for 500 μsec or more (for example, 1 msec) while the T_PAUSE pin is not turned ON, determine that automatic execution has ended.

*4 After executing the last line in one line execution, it cannot be re-executed unless the T_PAUSE pin is turned OFF for 10msec or more.

*5 If the T_PAUSE pin remains ON after executing the last row in one row execution, it cannot be re-executed unless the T_STOP pin is turned ON for at least 10 msec.

9.Home return

There are two types of origin, mechanical origin and electric origin.

⚠	Before moving the stage, make sure that there is no effect on the surroundings.

Type	Contents
Machine origin	Position after Mode 0 to 4 operation based on the limit sensor mounted inside the stage
Electric origin	Zero position of coordinate value

9-1.Mechanical origin return

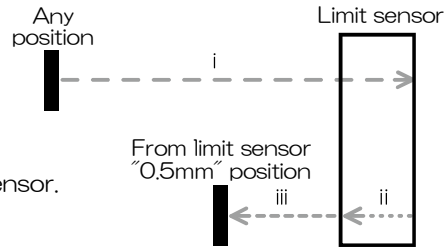
(1)Mechanical origin return Mode0

Move to the position of 0.5mm from the limit sensor and set the coordinate value to zero.

i. Operates from any position to the limit sensor detection position.
Speed : Parameter "ORG Speed H"
Direction : Parameter "ORG Dir"

ii. It operates until it passes through the limit sensor.
Speed : 1/10 of parameter "ORG Speed L"
Direction : Opposite direction to parameter "ORG Dir"

iii. It moves 0.5mm from the position where it passed the limit sensor.
Speed : Parameter "ORG Speed L"
Direction : Opposite direction to parameter "ORG Dir"



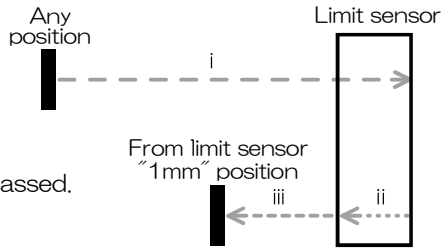
(2)Mechanical origin return Mode1

Move to the position of 1mm from the limit sensor and set the coordinate value to zero.

i. Operates from any position to the limit sensor detection position.
Speed : Parameter "ORG Speed H"
Direction : Parameter "ORG Dir"

ii. It operates until it passes through the limit sensor.
Speed : 1/10 of parameter "ORG Speed L"
Direction : Opposite direction to parameter "ORG Dir"

iii. Operates 1mm from the position where the limit sensor has passed.
Speed : Parameter "ORG Speed L"
Direction : Opposite direction to parameter "ORG Dir"



(3)Mechanical origin return Mode2

Move to the middle point between the CW and CCW limit sensors and set the coordinate value to zero.

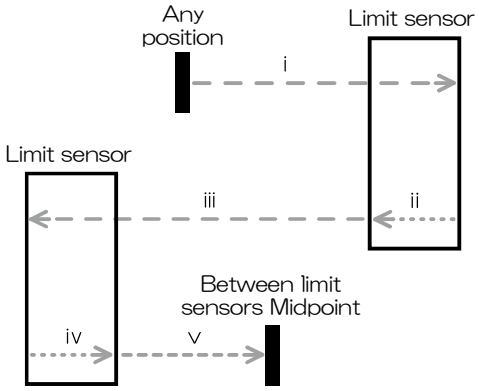
i. Operates from any position to the limit sensor detection position.
Speed : Parameter "ORG Speed H"
Direction : Parameter "ORG Dir"

ii. It operates until it passes through the limit sensor.
Speed : 1/10 of parameter "ORG Speed L"
Direction : Opposite direction to parameter "ORG Dir"

iii. Operates to the limit sensor detection position on the opposite side.
Speed : Parameter "ORG Speed H"
Direction : Opposite direction to parameter "ORG Dir"

iv. It operates until it passes through the limit sensor.
Speed : 1/10 of parameter "ORG Speed L"
Direction : Parameter "ORG Dir"

v. Operates to the middle point between limit sensors.
Speed : Parameter "ORG Speed L"
Direction : Parameter "ORG Dir"



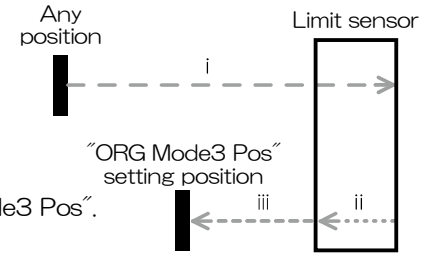
(4) Mechanical origin return Mode3

Move from the limit sensor to the setting position of the parameter "ORG Mode3 Pos" and set the coordinate value to zero.

i. Operates from any position to the limit sensor detection position.
Speed : Parameter "ORG Speed H"
Direction : Parameter "ORG Dir"

ii. It operates until it passes through the limit sensor.
Speed : 1/10 of parameter "ORG Speed L"
Direction : Opposite direction to parameter "ORG Dir"

iii. It operates from the position where the limit sensor has been passed to the position set in the parameter "ORG Mode3 Pos".
Speed : Parameter "ORG Speed M"
Direction : Opposite direction to parameter "ORG Dir"



(5) Mechanical origin return Mode4

> ⚠ Do not use it on any stage other than the stage equipped with the ORG sensor. Unintended behavior.

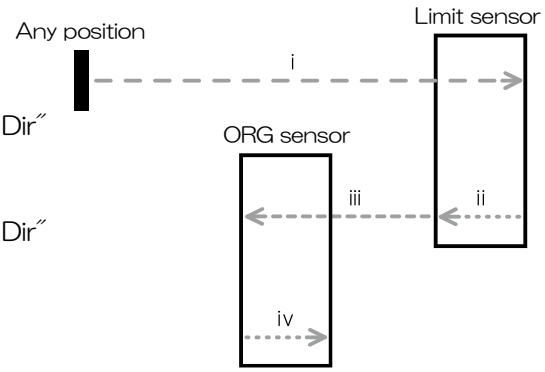
Operates to the ORG sensor detection position and sets the coordinate value to zero.

i. Operates from any position to the limit sensor detection position.
Speed : Parameter "ORG Speed H"
Direction : Parameter "ORG Dir"

ii. It operates until it passes through the limit sensor.
Speed : 1/10 of parameter "ORG Speed L"
Direction : Opposite direction to parameter "ORG Dir"

iii. Operates to the ORG sensor detection position.
Speed : Parameter "ORG Speed M"
Direction : Opposite direction to parameter "ORG Dir"

iv. It operates until it comes out of the ORG sensor.
Speed : Parameter "ORG Speed L"
Direction : Parameter "ORG Dir"



9-2. Electric home return

(1) Electric home return

Move to the position of zero (0mm) of the coordinate value from the current position.

Speed : Parameter "EORG Speed"
Direction : Zero direction of coordinate value from current position

10. About Movement Test

You can check that the stage is connected correctly to this instrument. There are three types of operation, and operations are performed on the front panel. See “5-7. MOVEMENT TEST mode” for how to shift to the operation test mode.

⚠ Before moving the stage, make sure that there is no effect on the surroundings.

10-1. Movement Test

(1) Step Movement Test SMT (F1 button)

The travel distance obtained by dividing the stage stroke (nominal value) into 10 steps is one step, and the stage is reciprocated in 10 steps. After reciprocating, the stroke calculation operation is performed again. The stage stroke (nominal value) is calculated from the value by operating between the CW and CCW limit sensors.

i. Operates from any position to the limit sensor detection position.
Speed : Parameter ″ORG Speed H″
Direction : Parameter ″ORG Dir″

ii. It operates until it passes through the limit sensor.
Speed : 1/10 of parameter ″ORG Speed L″
Direction : Opposite direction to parameter ″ORG Dir″

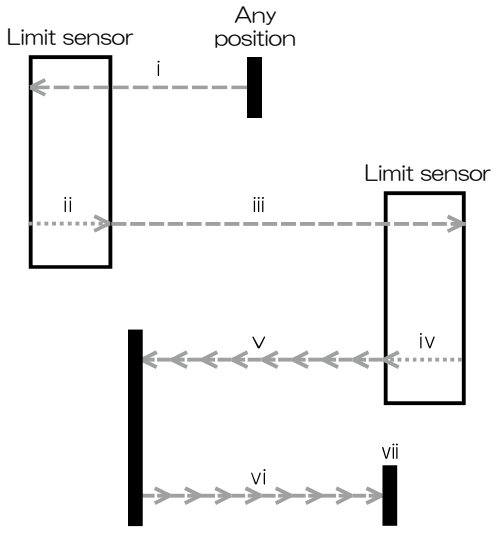
iii. Operates to the limit sensor detection position on the opposite side.
Speed : Parameter ″ORG Speed H″
Direction : Opposite direction to parameter ″ORG Dir″

iv. It operates until it passes through the limit sensor.
Speed : 1/10 of parameter ″ORG Speed L″
Direction : Parameter ″ORG Dir″

v. Operates 1/10 stroke steps.
Speed : JOG speed 1-3
Direction : Parameter ″ORG Dir″

vi. Operates 1/10 stroke steps.
Speed : JOG speed 1-3
Direction : Opposite direction to parameter ″ORG Dir″

vii. Return to i.



(2) Movement test between limit sensors LMT (F2 button)

Reciprocates between the CW and CCW limit sensor detection positions.

i. Operates from any position to the limit sensor detection position.
Speed : Parameter ″ORG Speed H″
Direction : Opposite direction to parameter ″ORG Dir″

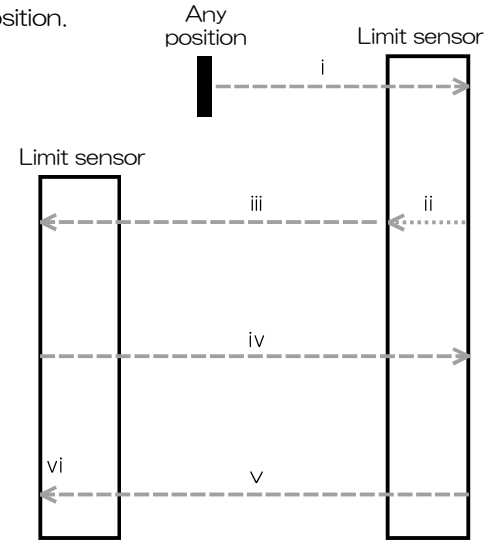
ii. It operates until it passes through the limit sensor.
Speed : 1/10 of parameter ″ORG Speed L″
Direction : Parameter ″ORG Dir″

iii. Operates to the limit sensor detection position on the opposite side.
Speed : Parameter ″ORG Speed H″
Direction : Parameter ″ORG Dir″

iv. It operates until it passes through the limit sensor.
Speed : Parameter ″ORG Speed H″
Direction : Opposite direction to parameter ″ORG Dir″

v. Operates to the limit sensor detection position on the opposite side.
Speed : Parameter ″ORG Speed H″
Direction : Parameter ″ORG Dir″

vi. Return to iv.



(3) Milli Step Movement Test　MMT (F5 button)

Calculate the stage stroke (nominal value) and reciprocate between strokes in 1mm steps. After reciprocating, the stroke calculation operation is performed again. The stage stroke (nominal value) is calculated from the value by operating between the CW and CCW limit sensors.

i. Operates from any position to the limit sensor detection position.
Speed : Parameter "ORG Speed H"
Direction : Parameter "ORG Dir"

ii. It operates until it passes through the limit sensor.
Speed : 1/10 of parameter "ORG Speed L"
Direction : Opposite direction to parameter "ORG Dir"

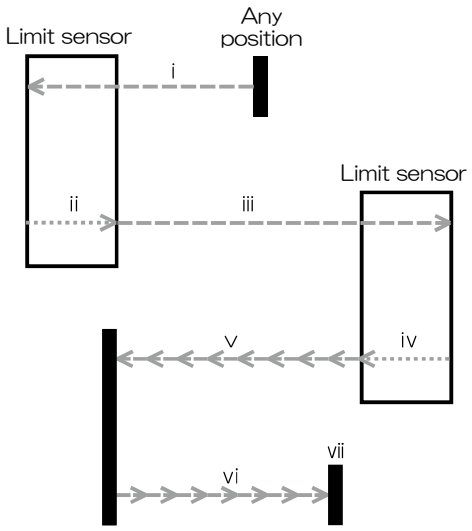
iii. Operates to the limit sensor detection position on the opposite side.
Speed : Parameter "ORG Speed H"
Direction : Opposite direction to parameter "ORG Dir"

iv. It operates until it passes through the limit sensor.
Speed : 1/10 of parameter "ORG Speed L"
Direction : Parameter "ORG Dir"

v. Operates 1mm step.
Speed : JOG Speed 1 ～ 3
Direction : Parameter "ORG Dir"

vi. Operates 1mm step.
Speed : JOG Speed 1 ～ 3
Direction : Opposite direction to parameter "ORG Dir"

vii. Return to i.



11.About status

Status can be checked with the display and status command. For the display, see ″5. Operation″ . Refer to ″6. Command″ for the command.

11-1.Operation related status

This status indicates the operation status of the connection stage and this equipment.

(1)Operation status list

No	Contents	Reply *
01	Normal stop(This state is READY)	K
02	During command move(This state is BUSY)	M
03	Out of the in-position range (After positioning is completed) (This state is FREADY)	F
04	Out of the in-position range (During fine adjustment) (This state is FBUSY)	G
05	During electrical origin return	P
06	During mechanical origin return	O
07	CW side limit stop	C
08	CCW side limit stop	W
09	CW side software limit stop	B
10	CCW side software limit stop	V
11	CW side slowdown sensor area	A
12	CCW side slowdown sensor area	U
13	Error occurred	E
14	Motor is transitioning to excitation	H
15	Motor is transitioning to non-excitation	I
16	Disabled axis (Not set by parameter ″AXIS Sel″)	D

* See the commands “Q:” , “SRQ:” and “STS:” .

(2)Operation status description

01 Normal stop

Description	Positioning is completed within the in-position range.
Display	See ″Positioning status″ in ″5.Operations″.
Status command reply contents	K

02 During command move

Description	Command operation is being performed.
Display	See ″Positioning status″ in ″5.Operations″.
Status command reply contents	M

03 Out of the in-position range (After positioning is completed) (This state is READY)

Description	It is out of the in-position range after positioning is completed.
Display	See ″Positioning status″ in ″5.Operations″.
Status command reply contents	F

04 Out of the in-position range (During fine adjustment) (This state is BUSY)

Description	This is the state where the positioning operation after the command operation is being executed.
Display	See ″Positioning status″ in ″5.Operations″.
Status command reply contents	G

05 During electrical origin return

Description	It is operating toward the electrical origin.
Display	-
Status command reply contents	P

06 During mechanical origin return

Description	It is operating toward the machine origin.
Display	-
Status command reply contents	O

07 CW side limit stop

Description	It is a state stopping with CW limit sensor.
Display	CW LMT（CW button flashing）
Status command reply contents	C

08 CCW side limit stop

Description	It is a state stopping with CCW limit sensor.
Display	CCW LMT（CCW button flashing）
Status command reply contents	W

09 CW side software limit stop

Description	It is a state stopping with CW software limit.
Display	CW SLMT（CW button flashing）
Status command reply contents	B

10 CCW side software limit stop

Description	It is a state stopping with CCW software limit.
Display	CCW SLMT（CCW button flashing）
Status command reply contents	V

11 CW side slowdown sensor area

Description	It is in the CW side slowdown sensor.
Display	CW S/D
Status command reply contents	A

12 CCW side slowdown sensor area

Description	It is in the CCW side slowdown sensor.
Display	CCW S/D
Status command reply contents	U

13 Error occurred

Description	An error has occurred.
Display	-
Status command reply contents	E

14 Motor is transitioning to excitation

Description	This is the state in which the motor is being shifted to the excitation state.
Display	-
Status command reply contents	H

15 Motor is transitioning to non-excitation

Description	This is the state in which the motor is being shifted to the demagnetized state.
Display	-
Status command reply contents	I

16 Disabled axis (Not set by parameter "AXIS Sel")

Description	This is the state where all controls related to the axis are disabled. Set by the parameter "AXIS Sel". See "AXIS Sel" in "7. Parameterts"
Display content	-
Status command reply contents	D

11-2. Error status

This status indicates the error status of the connection stage and this equipment.

(1) Error status list

No	Contents	Display	Reply *	
			Format1	Format2 (13 bits)
01	Normal (No error)	(Hidden)	K	1st bit is 1
02	Command error	CMD ER	1	2nd bit is 1
03	Scale error	SCALE ER	2	3rd bit is 1
04	Limit stop	CW LMT • CCW LMT	3	4th bit is 1
05	Over speed error	OS ER	4	5th bit is 1
06	Overflow error	OF ER	5	6th bit is 1
07	Emergency stop	EMERGENCY	6	7th bit is 1
08	Interpolator error	IP ER	7	8th bit is 1
09	Limit error	LIMIT ER	8	9th bit is 1
10	System error	SYS ER	9	10th bit is 1
11	Slowdown sensor area	CW S/D • CCW S/D	A	11th bit is 1
12	Software Limit stop	CW SLMT • CCW SLMT	B	12th bit is 1
13	TEACHING command error	TCMD ER	T	13th bit is 1

* See the commands "Q:" , "SRQ:" and "STS:" .

Error status description

01 Normal (No error)

Description		No error has occurred.
Display		(Hidden)
Status command reply contents	Reply format 1	K
	Reply format 2	1st bit is 1

02 Command error CMD ER

Description		This error occurs when a command string that is not defined in this equipment or that does not match the status of this equipment is sent from the PC.
Display		CMD ER
Status command reply contents	Reply format 1	1
	Reply format 2	2nd bit is 1

Occurrence case	1)	A command was sent that cannot be used in the current mode.
	2)	An ASCII code string other than the defined command was sent.
	3)	A code other than ASCII code was sent.
	4)	A normal delimiter was sent with a string that did not match the delimiter settings already sent to this equipment.
	5)	There is an unnecessary code in the communication buffer, and a command with this unnecessary code added was sent.
	6)	A command to specify an axis other than the controllable axis was sent.
	7)	The motor of the axis that issues the operation command is demagnetized.
	8)	In the limit sensor input state, a command to operate to the further limit sensor was transmitted.
	9)	In the state where the software limit is set, a command that operates to the further software limit is sent.
Release and recovery	The command can be sent even in the command error state, so it will be canceled when a command string defined in this equipment or in accordance with the status of this equipment is sent.	

03 Scale error SCALE ER

Description		Occurs when no scale signal is input.
Display		SCALE ER
Status command reply contents	Reply format 1	2
	Reply format 2	3rd bit is 1

Occurrence case	1）	The scale cable connector has disconnected from this equipment.
	2）	The scale cable is broken.
	3）	Encoder is broken.
Release and recovery	Turn off the power of the instrument, remove the cause, and then turn on the power.	

04 Limit stop CW LMT・CCW LMT

Description		It is in the CW or CCW limit sensor of one or both axes.
Display	For CW limit	CW LMT（CW button flashing）
	For CCW limit	CCW LMT（CCW button flashing）
Status command reply contents	Reply format 1	3
	Reply format 2	4th bit is 1

Release and recovery	It cannot be operated in the limit sensor direction any more. Operate in the opposite direction.

05 Over speed error OS ER

Description		Occurs when operating at a speed higher than the count capability of the coordinate value counter.
Display		OS ER
Status command reply contents	Reply format 1	4
	Reply format 2	5th bit is 1

Occurrence case	1）	Something collided with the stage.
	2）	The stage is undergoing vibration.
	3）	Strong noise is mixed in the scale signal.
	4）	A strong flash hit the stage.
Release and recovery	After removing the cause, restart or restart the power supply or send the command ″RESET:″.	

06 Overflow error OF ER

Description		Occurs when the difference between the coordinate value and the specified position is 5mm or more.
Display		OF ER
Status command reply contents	Reply format 1	5
	Reply format 2	6th bit is 1

Occurrence case	1）	The stage got out of step-out.
	2）	After the positioning was completed, the stage knob was turned and moved by 5 mm or more. (Only in closed loop state)
	3）	When the stage moves without permission because the connection axis of the motor cable and the scale cable do not match (when the stage moves more than 5 mm)
Release and recovery	If you want to keep the coordinate values after removing the cause, perform a busy error cancel. If it is not necessary to maintain the coordinate values, restart or restart the power supply, or send the command ″RESET:″.	

07 Emergency stop EMERGENCY

Description		Emergency stop.
Display		EMERGENCY
Status command reply contents	Reply format 1	6
	Reply format 2	7th bit is 1

Release and recovery	See "(5) Emergency stop".

08 Interpolator error IP ER

Description		Occurs when the magnitude of the scale signal is out of the specified range.
Display		IP ER
Status command reply contents	Reply format 1	7
	Reply format 2	8th bit is 1

Occurrence case	1) The scale is dirty
	2) A strong flash hit the stage.
	3) Encoder is broken.
Release and recovery	Turn off the power of the instrument, remove the cause, and then turn on the power.

09 Limit error LIMIT ER

Description		Occurs when the CW and CCW limits are on at the same time.
Display		LIMIT ER
Status command reply contents	Reply format 1	8
	Reply format 2	9th bit is 1

Occurrence case	1) The motor cable connector has disconnected from this equipment.
	2) Both the CW and CCW limit sensor wires of the motor cable are broken.
	3) Either the CW or CCW limit sensor wire of the motor cable has been disconnected, and the limit has been entered on the opposite side from the disconnected side.
	4) Dirt or foreign matter has entered both the CW and CCW limit sensors mounted on the stage.
	5) The limit sensor mounted on the stage has failed.
Release and recovery	If you want to keep the coordinate values after removing the cause, perform a busy error cancel. If it is not necessary to maintain the coordinate values, restart or restart the power supply, or send the command "RESET:".

10 System error SYS ER

Description		Occurs when this quipment system is out of order.
Display		SYS ER
Status command reply contents	Reply format 1	9
	Reply format 2	10th bit is 1

Release and recovery	It cannot be canceled or restored. Unplug the power cable from the outlet and contact our company or our distributor.

11 Slowdown sensor input CW S/D • CCW S/D

Description		Either one-axis or both-axis CW and CCW slowdown sensors are included.
Display	For CW slowdown sensor input	CW S/D
	For CCW slowdown sensor input	CCW S/D
Status command reply contents	Reply format 1	A
	Reply format 2	11th bit is 1

12 Software limit stop CW SLMT • CCW SLMT

Description		One or both axes CW or CCW software limit is included.
Display	For CW software limit	CW SLMT (CW button flashing)
	For CCW software limit	CCW SLMT (CCW button flashing)
Status command reply contents	Reply format 1	B
	Reply format 2	12th bit is 1

Release and recovery	It cannot be operated in the limit sensor direction any more. Operate in the opposite direction.

13 Teaching command error TCMD ER

Description		The content of the teaching registration line to be executed does not match the status of this equipment.
Display		TCMD ER
Status command reply contents	Reply format 1	T
	Reply format 2	13th bit is 1

Occurrence case	1)	In the limit sensor input state, it was the contents of the registration line that operates on the limit sensor side that is further included.
	2)	Set the operation speed (command ″D:″) in the registration line, and then set the parameter ″Max Speed″ to a value less than the registered operation speed (command ″D:″) and execute the registration line.
Release and recovery	If you want to keep the coordinate values after removing the cause, perform a busy error cancel. If it is not necessary to maintain the coordinate values, restart or restart the power supply, or send the command ″RESET:″.	

12.Specification

These are the specifications for this equipment.

12-1.Basic performance

Model	Minimum command unit	In-position range * 1	Maximum speed setting	The maximum amount of movement setting range
FC-111	100nm	± 100, ± 300, ± 700nm	100mm/sec	−13421.7728～+13421.7727mm
FC-411	50nm	± 50, ± 150, ± 350nm	100mm/sec	−6710.88640～+6710.88635mm
FC-511	10nm	± 10, ± 30, ± 70nm	50mm/sec	−1342.17728～+1342.17727mm
FC-611	5nm	± 5, ± 15, ± 35nm	30mm/sec	−671.088640～+671.088635mm
FC-911	1nm	± 1, ± 3, ± 7nm	6mm/sec	−134.217728～+134.217727mm

* 1 Set the in-position range with the parameter “INPos Range” .

Item		Contents
Stage control axes		2
Error detection, etc.		Command error, Scale error, Limit stop
		Overspeed error, Overflow error, Emergency stop
		Interpolator error, Limit error, System error
		Software limit stop, Teaching command error
Number of control interface ports	One for each	Jog controller, Emergency stop input
		GP-IB, USB, Ethernet, General purpose I / O

12-2.General specifications

Item	Contents
Power source	AC100V ～ 240V, 50/60Hz
Allowable variations of voltage	AC90V ～ 264V
Power consumption	110VA max
Fuse	250V, 2.5A, Time lag, 2 used
External dimensions	W220 × H88 × D290mm
Weight	5.2kg
Operating temperature	0℃～ 40℃
Operating ambient humidity	20% ～ 80%RH (No condensation)
Storage temperature	-10℃～ 55℃
Ambient storage humidity	20% ～ 80%RH (No condensation)
Place of use	Indoor
Storage altitude	up to 2000m
Operating altitude	up to 2000m
Maximum operating time	Continuous operation possible

12-3.Safety and electromagnetic compatibility

Item	Contents
Target model	FC-511, FC-611, FC-911
Safety	EN61010-1:2010 compliant, Overvoltage category II, Pollution degree 2
Electromagnetic compatibility	EN61326-1:2013 compliant, EN61000-3-2:2014 compliant EN61000-3-3:2013 compliant

Item	Conditions		
Electromagnetic compatibility	Cable (2m or less)	Motor	Attach a ferrite core to one end (body side) of the cable. *3
		Scale	Attach ferrite cores to both ends of the cable. *3
		Jog controller	
	Cable (3m or less)	Emergency stop (Twisted pair, no shield)	Wrap one end (body side) of the prepared cable twice around the ferrite core. *4
		GP-IB (shield) *2	Attach a ferrite core that matches the external shape of the prepared cable to one end (body side) of the cable. *4
		USB (shield) *2	
		Ethernet (shield) *2	
		汎用I/O (shield)	
	General purpose I / O	Connector hood	EMI measures
		Housing	General-purpose I / O board stored in metal box

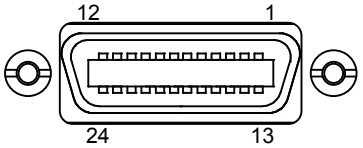
*2 Connect only the interface that communicates

*3 Ferrite core model: ZCAT 1730-0730A: made by TDK

*4 Ferrite core model: ZCAT series: made by TDK

12-4. Interface specifications

(1) GP-IB



- Connection
  This instrument is equipped with a GP-IB connector and can be connected to a personal computer. When using, prepare a GP-IB cable.

- Communication
  In order for the PC to communicate with the instrument, the PC must have GP-IB communication-capable software (such as our sample software). Also, it is necessary to set the mode of this equipment to REMOTE and set the parameter "I / F Sel" to GP-IB. The GP-IB address must not be the same as other devices. Check the connection between the PC and this equipment by sending and receiving operation information commands (such as "Q:").

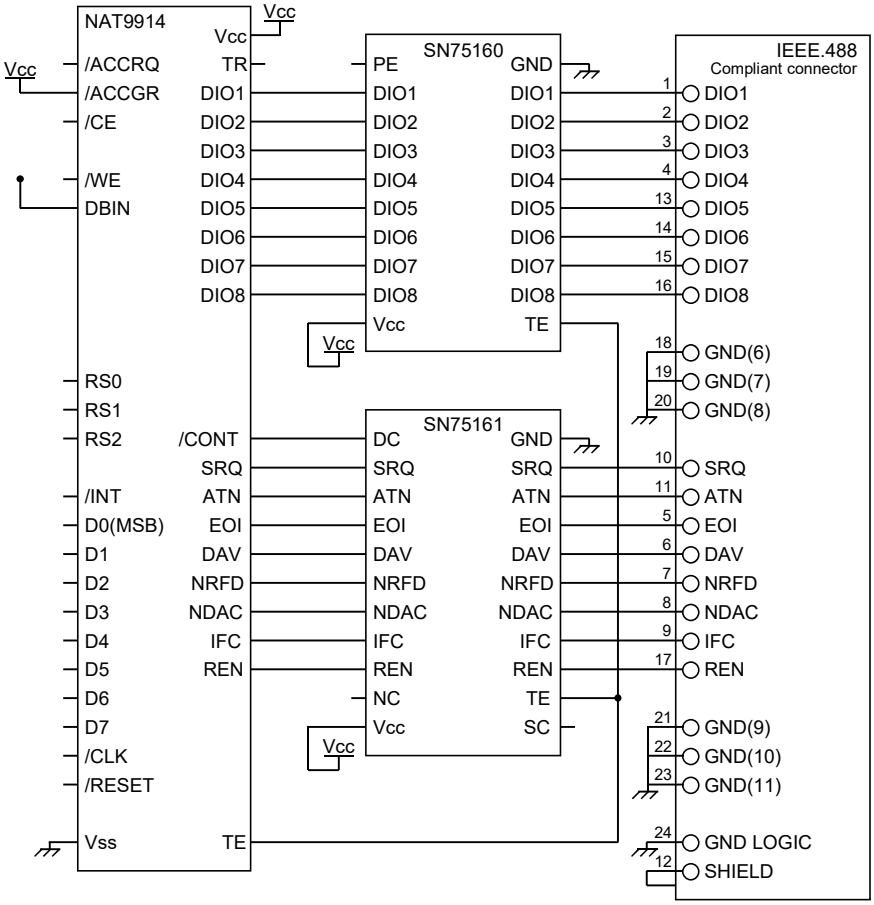
- To disconnect
  Close GP-IB from the PC software. When disconnecting the cable, there is no problem even if this equipment is turned on. However, it is recommended that this equipment be turned off for safety. For information on personal computers, see the instruction manual for your personal computer.

- Specification

Item		Contents
Function	SH1	Source handshake all functions
	AH1	Acceptor handshake all functions
	T6	Basic talker function, Serial poll function, Talker cancellation by MLA
	TE0	No extended talker function
	L4	Basic listener function, Release of listener by MTA (no listen only)
	LE0	No function
	SR1	Service request all functions
	DC2	No SDC function
	RL2	No local lockout function
	DT0	No device trigger function
	PP0	No parallel pole function
	C0	Without controller function
Address		1 ～ 30
Delimiter		CR+LF, EOI, CR, LF
Service request		Enabled or disabled
Flow control		None (fixed)
Connector used		Manufacturer: DDK Corporation Model: 57LE-20240 (57LE Series)
Applicable plug, cable		IEEE-488 compliant product, GP-IB compliant product

・Pin assignment and circuit diagram

Pin Number	Signal Name
1	DIO1
2	DIO2
3	DIO3
4	DIO4
5	EOI
6	DAV
7	NRFD
8	NDAC
9	IFC
10	SRQ
11	ATN
12	SHILD
13	DIO5
14	DIO6
15	DIO7
16	DIO8
17	REN
18	GND
19	GND
20	GND
21	GND
22	GND
23	GND
24	GND



(2) USB

- Connection
  This instrument is equipped with a USB typeB connector (Function) and can be connected to a USB typeA connector (Host) of a personal computer. When using, please prepare USB1.0, 1.1, 2.0, 3.0, 3.1 compatible cable *1.
  *1 Standard-A (male) -Standard-B (male) Connector straight cable (USB1.0, USB1.1, USB2.0, USB3.0, USB3.1)

- Driver installation (for Windows 10)
  When connecting for the first time, connect the USB cable, turn on the PC, and then turn on the power of the instrument. The driver is automatically installed on the PC and recognized as a COM port.

- Driver installation (for Windows 7, 8, 8.1)
  The setting information file "stage_controller_usb_cdc_drv_w ***. Inf" is required. This setting information file can be obtained from the download page of our homepage (note that the setting information file differs depending on the version of Windows OS). Start the installation by manually specifying the setting information file when installing the driver. After the driver is installed, "Stage Controller Usb Cdc Port (COM *)" will be created in the port of the PC.

  The COM number of "Stage Controller Usb Cdc Port (COM *)" is changed for each USB port. Once the driver is installed, the newly added USB port will be automatically installed.

- Communication
  The port is recognized as a virtual COM port. In order for the PC to communicate with the DX, software that enables serial communication with the PC is required. Also, it is necessary to set the mode of this equipment to REMOTE and set the parameter "I / F Sel" to USB. Check the COM port number with Device Manager. The baud rate (communication speed) of the COM port can be set to any number (example: 9600 bps). Check the connection between the PC and this equipment by sending and receiving operation information commands (such as "Q:").

- To disconnect
  When disconnecting, be sure to close the COM port with the PC software before disconnecting. When disconnecting the cable, there is no problem even if this equipment is turned on. However, it is recommended that this equipment be turned off for safety. For information on personal computers, see the instruction manual for your personal computer. If the power to the instrument is restarted or restarted without closing the COM port from the PC software, it may be necessary to reconnect the cable after closing the COM port from the software to relink. (Some software automatically closes the COM port and automatically connects after restarting.)

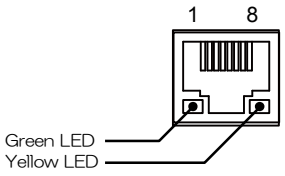
- Specification

Item		Contents
Function		Used as a virtual COM port.
Number of port		1port
Transfer speed		Supports full-speed transfer (12Mbps)
Delimiter		CR+LF, CR, LF
Connector used	Manufacturer	OMRON Corporation
	Model	XM7B-0442
	Type	Standard-B
Applicable plug, cable		「Standard-A (male)」connector - 「Standard-B (male)」connector Straight cable (USB1.0, USB1.1, USB2.0, USB3.0, USB3.1)

- Pin assignment

Pin number	Signal name
1	VBUS
2	D-
3	D+
4	GND

(3) Ethernet



- Connection
  This device is equipped with an Ethernet connector, and can be connected to a personal computer directly or via a hub (router). LAN cable can be either cross or straight. Use a cable category that supports 10Mbps and 100Mbps transfers. When connecting, you need to set the IP address, default gateway, and subnet mask. Set the parameters of this equipment according to the information of the IP address, default gateway, and subnet mask of the personal computer used. For the IP address setting, if the IP address of the PC used as an example is ″192.168.015.188″, set ″188″ to another value. Set the default gateway and subnet mask to the same values as on the PC. If you use the same LAN area, you do not need to set the default gateway.
- Communication
  In order for the PC to communicate with this instrument, the PC must have software capable of TCP / IP communication (sample software provided by NEC). Also, it is necessary to set the mode of this equipment to REMOTE and set the parameter ″I / F Sel″ to Ethernet. Check the connection between the PC and this equipmnt by sending and receiving operation information commands (such as ″Q:″). When communicating with a communication application, it is necessary to set the port number in addition to the IP address settings.

- Specification

Item	Contents
Number of port	1
Product specifications	IEEE802.3x Flow control compliant
Transfer speed	Supports 10Mbps and 100Mbps transfer
Delimiter	CR+LF, CR, LF
IP address	000.000.000.000 ～ 255.255.255.255
Default gateway	000.000.000.000 ～ 255.255.255.255
Subnet mask	000.000.000.000 ～ 255.255.255.255
Port number	60000（fixed）
Connector used	RJ45

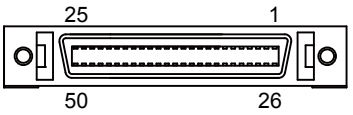
- Pin assignment

Pin number	Signal name
1	TX+
2	TX-
3	RX+
4	NC
5	NC
6	RX-
7	NC
8	NC

- LED

LED color	Contents
Green lighting	Lights when the communication speed is 100Mbps, and turns off when the communication speed is 10Mbps or when no cable is connected.
Yellow lighting	Illuminates when a valid link is detected and flashes when data transmission or reception is detected.

(4) General purpose I / O



This section describes the functions of each pin of the general-purpose I / O.

・ Specification

Item		Contents
Function	Input	General purpose input × 3 port
		Teaching operation × 1
		Busy error cancel × 1
	Output	General purpose output × 3 port
		Scale division pulse signal × 2 axes
		Alarm signal × 2 axes
		In-position signal × 2 axes
		Teaching state × 1
Connector used	Manufacturer	3M Japan Co., Ltd.
	Model	50 pin half pitch connector (MDR) 10150-5202PL
Applicable plug	Manufacturer	3M Japan Co., Ltd.
	Model	50 pin half pitch connector (MDR) 10150-3000PE
		50 pin half pitch connector (MDR) 10150-6000**

・ Pin assignment and function explanation

i. Input terminal

The internal circuit and specifications are shown in ″Internal Circuit and Specifications″-″Input Terminal″.

Terminal Number	Terminal Name	Contents
3	General purpose input 1	Select each general purpose input. The status can be checked with the command ″I:″.
28	General purpose input 2	
4	General purpose input 3	
29	General purpose input COMMON	Common terminal for general purpose input.
43	T_1	Select a teaching number. See the table below for patterns. Patterns other than those in the table below are invalid.
19	T_2	
44	T_3	
20	T_START	Start teaching.
45	T_PAUSE	Pauses teaching execution.
21	T_ONE_STEP	Execute teaching one line at a time for each input.
46	T_STOP	Stop the teaching execution.
22	T_COMMON	Common terminal for teaching operation input.
24	BE_CANCEL	Executes busy error cancellation. See “BEC” or the command “BEC:” for details.
49	BE_COMMON	Common terminal for BE CANCEL input.

Teaching number pattern table

Terminal	Channel				
	1	2	3	4	5
T_1	ON	OFF	ON	OFF	ON
T_2	OFF	ON	ON	OFF	OFF
T_3	OFF	OFF	OFF	ON	ON

ii. Output terminal
The internal circuit and specifications are shown in "Internal Circuit and Specifications"-"Output Terminal".

Terminal Number	Terminal Name	Contents	Output circuit
1	General purpose output1	Outputs the status selected by the "O:" command. It is off at startup.	Open collector
26	General purpose output2		
2	General purpose output3		
27	General purpose output COMMON	Common terminal for general purpose output.	-
8	1PA	A-phase output of scale-divided pulse (2-phase square wave) on First axis side	Line driver
33	1/PA	Inverted output of 1PA	
9	1PB	B-phase output of scale-divided pulse (2-phase square wave) on First axis side	
34	1/PB	Inverted output of 1PB	
10	1AL	Alarm output for First axis. Outputs a HIGH level when any of an interpolator error, scale error, limit error, or overflow error occurs. See "11. Status" for details of each error. In the case of only a limit error, if a normal stage is connected to the motor cable, it returns to the LOW level.	Line driver
35	1/AL	Inverted output of 1AL	
11	1INP	In-position output for First axis. Outputs HIGH level upon completion of positioning and detection by limit sensor, and outputs LOW level when an operation command is input. However, if an operation command is input during detection of the limit sensor, a LOW level is output when the signal passes through the limit sensor.	
36	1/INP	Inverted output of 1INP	
37	2PA	A-phase output of scale-divided pulse (2-phase square wave) on Second axis side	
13	2/PA	2PA inverted output.	
38	2PB	B-phase output of scale-divided pulse (2-phase square wave) on Second axis side	
14	2/PB	Inverted output of 2PB	
39	2AL	Alarm output for Second axis. Outputs a HIGH level when any of an interpolator error, scale error, limit error, or overflow error occurs. See "11. Status" for details of each error. In the case of only a limit error, if a normal stage is connected to the motor cable, it returns to the LOW level.	
15	2/AL	Inverted output of 2AL	
40	2INP	In-position output for Second axis. Outputs HIGH level upon completion of positioning and detection by limit sensor, and outputs LOW level when an operation command is input. However, if an operation command is input during detection of the limit sensor, a LOW level is output when the signal passes through the limit sensor.	
16	2/INP	2INP inverted output.	
17	T_STATUS	Execution status output of teaching registration contents	
42	/T_STATUS	Inverted output of T_STATUS	
5, 6, 25, 30, 47	+5V	5V power supply terminal. ⚠ The maximum output current of each terminal is 0.2A. Do not exceed 1A in total.	-
7, 12, 18, 23, 31, 32, 41, 48, 50	GND	GND terminal for 5V power supply.	-

- Internal circuit and specifications

i. Input terminal

Input terminals include general-purpose input, teaching operation, and busy error cancel. The input is a photocoupler LED. The phototransistor is turned on by passing current through the LED, and the phototransistor is turned off by interrupting the current. In the case of general-purpose input, the status of this phototransistor can be checked with the command "I:". See "I:" in "6. Commands" for details. For teaching operation and busy error cancellation, the function "Pin assignment and function explanation" can be executed by turning on the phototransistor.

⚠CAUTION The input current must not exceed 20mA. Exceeding this may cause a failure.

⚠
- Use LED current within the range of 5 to 20mA.
- The input current waveform should be pulsed (rise and fall time <100 μsec).
- The time width of ON and OFF of general-purpose input should be at least longer than the transmission cycle of command "I:".
- When connecting the COMMON terminal to the GND of this instrument, use the power supply of the input terminal at 5V of this instrument.

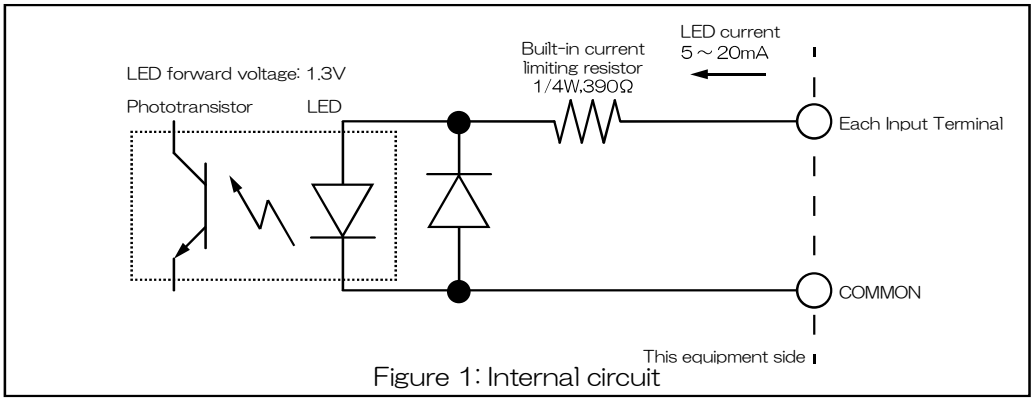


Figure 1: Internal circuit

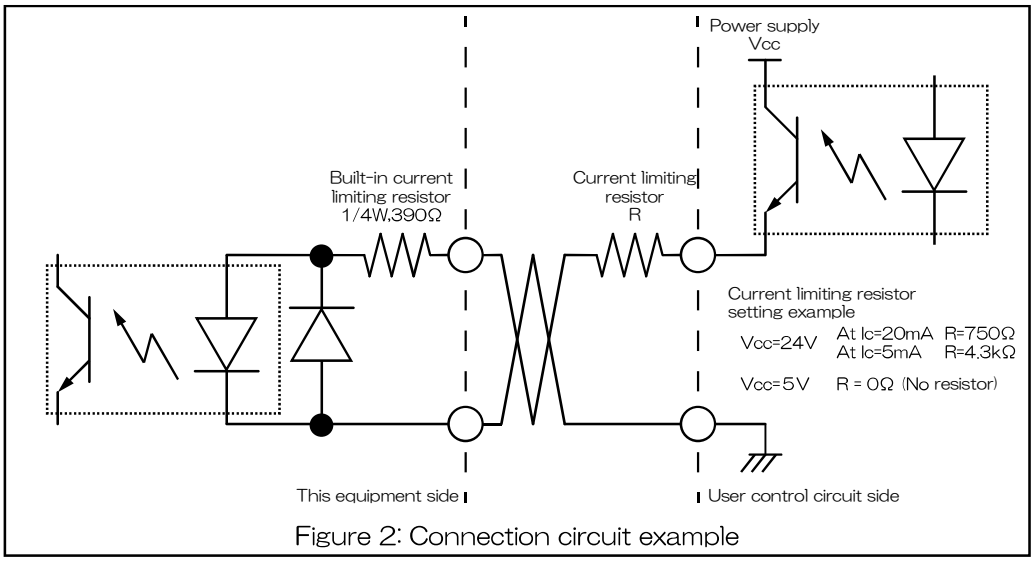


Figure 2: Connection circuit example

ii. Output terminal

a. Open collector

The output is a phototransistor of a photocoupler, which is open collector. The photo transistor can be turned ON and OFF with the command "O:". See "O:" in "6. Commands" for details.

⚠CAUTION	Vceo should not exceed 30V and Ic should not exceed 150mA. Exceeding this may cause a failure.

⚠	When connecting the COMMON terminal to the instrument's GND, use the instrument's 5V power supply.

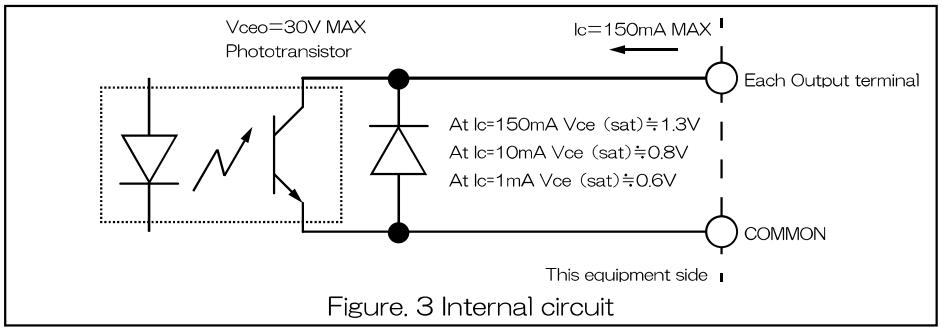


Figure. 3 Internal circuit

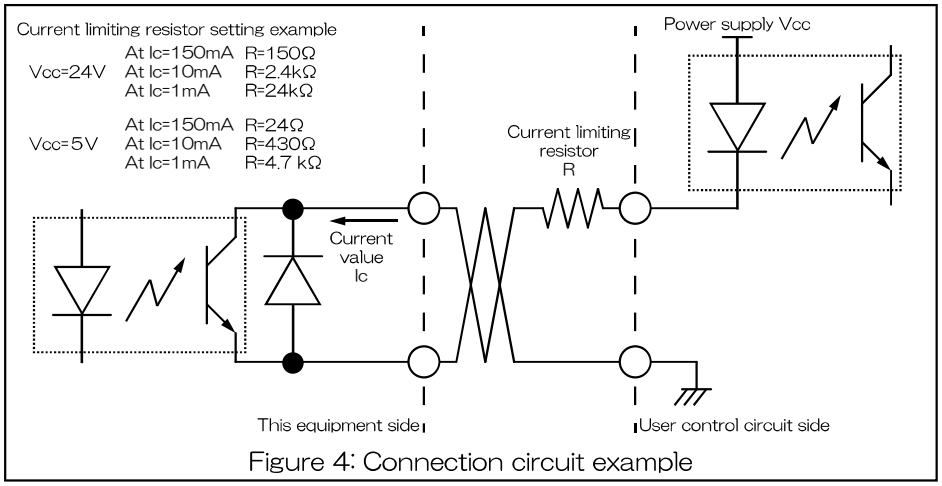


Figure 4: Connection circuit example

b. Line driver

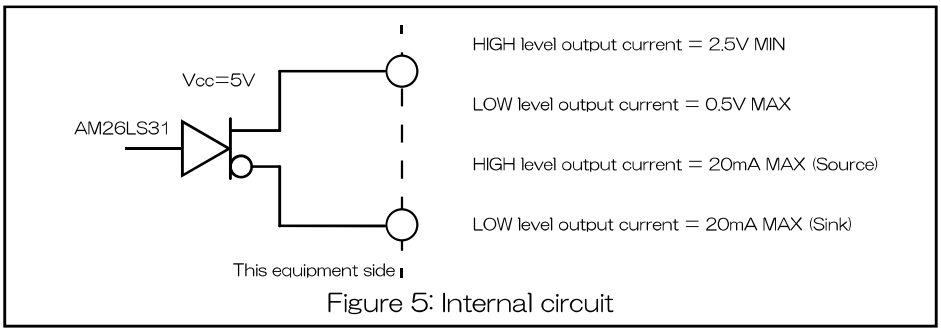


Figure 5: Internal circuit

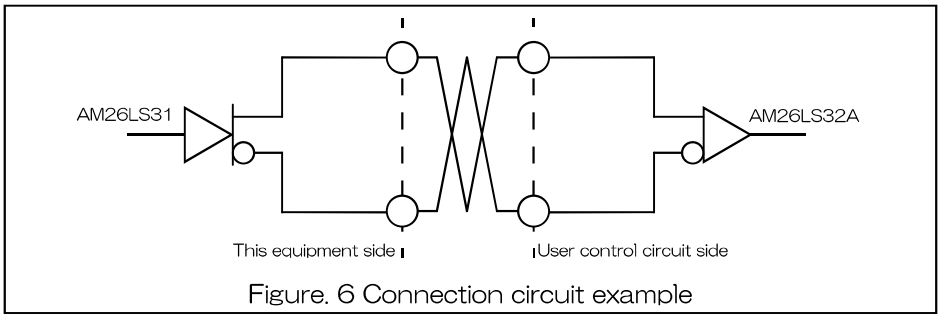
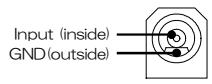


Figure. 6 Connection circuit example

(5) Emergency



The contact type of the input contact is ″B contact″. The contact type cannot be changed. After changing the parameter ″EMG Connector″ to ″Enable″ and releasing the short circuit between the input and GND, the operation of the stage connected to the instrument is immediately stopped and ″EMERGENCY″ is displayed on the display. The state of the motor at this time depends on the setting of the parameter ″EMG Motor Excite″. After that, operations related to the stage operation cannot be performed. To recover, short-circuit the input and GND, and then cancel the busy error to maintain the coordinate value. If it is not necessary to maintain the coordinate values, restart the power, restart, or send the command “RESET:” . See “BEC” or the command “BEC:” for busy error cancellation. See “EMG Motor Excite” for the parameter “EMG Connector” and the parameter “EMG Motor Excite” for setting the motor excitation and demagnetization during an emergency stop.

⚠WARNING When using, be sure to change the parameter ″EMG Connector″ to Enable and perform a test operation to confirm that it can be used.

⚠CAUTION Do not connect anything that outputs power, such as an AC adapter.

・Specification

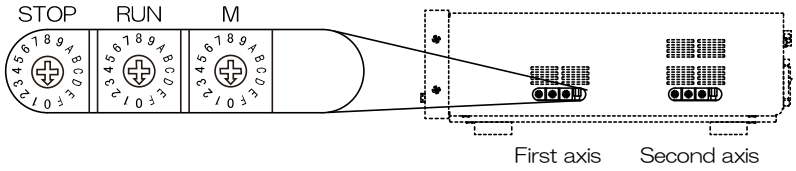
Item		Contents
Connector used	Manufacturer	Hosiden Corporation
	Model	HEC3800-01-010 DC power jack (JEITA RC-5320A compliant)
Applicable plug, cable		JEITA RC-5320A TYPE4 Twisted pair

(6) Motor driver setting switch

The input terminal motor driver is set for each axis. When the right side of the stage controller is viewed from the front, the left side is the setting switch for First axis and the right side is the setting switch for Second axis. The settings to be made are the stop current, drive current, and number of divisions. At the time of shipment, it is set according to the stage purchased at the same time. If you want to change the settings, please contact us or our distributor.

⚠CAUTION Depending on your environment, you may be required to change the settings, but do not change anything else. If you change it intentionally, the stage may move unintentionally.

・Settings (FC-111, FC-411)



i. Stop current (STOP)
Set the stop current value as a percentage (%) of the drive current.

SW No.	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
%	25	30	35	41	45	50	55	59	63	67	71	75	79	83	87	91

ii. Drive current (RUN)
Set the current value when driving the motor.

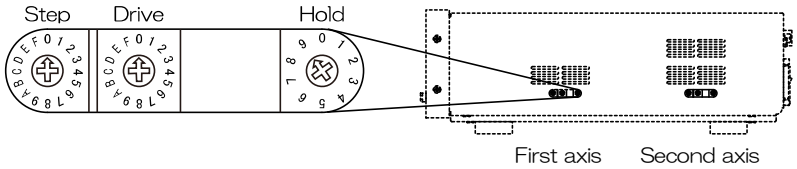
SW No.	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Current value(A)	0.35	0.44	0.52	0.59	0.67	0.75	0.83	0.9	0.98	1.05	1.12	1.19	1.27	1.34	1.4	1.48

iii. Setting the number of divisions (M)
Set the number of divisions. *

SW No.	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Division number	1	2	4	5	8	10	20	40	80	16	25	50	100	125	200	250

* The step angle for the number of divisions is “step angle = basic step angle (0.72 or 0.36 °) / number of divisions”

• Settings (FC-511, FC-611, FC-911)



iv. Setting the number of divisions (Step)
Set the number of divisions. *

SW No.	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Division number	1	2	4	10	20	40	100	200	400	800	-	-	-	-	-	-

* The step angle for the number of divisions is "step angle = basic step angle (0.72 or 0.36 °) / number of divisions"

v. Drive current (Drive)
Set the current value when driving the motor.

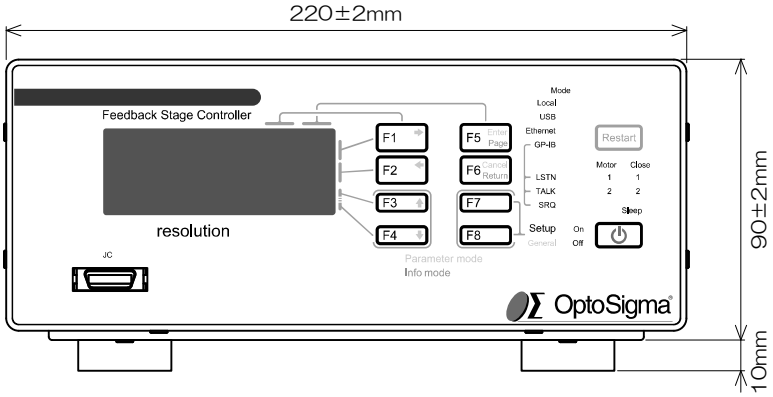
SW No.	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Current value(A)	0.3	0.325	0.35	0.375	0.4	0.425	0.45	0.475	0.5	0.525	0.55	0.575	0.6	0.65	0.7	0.75

vi. Stop current (Hold)
Set the stop current value as a percentage (%) of the drive current.

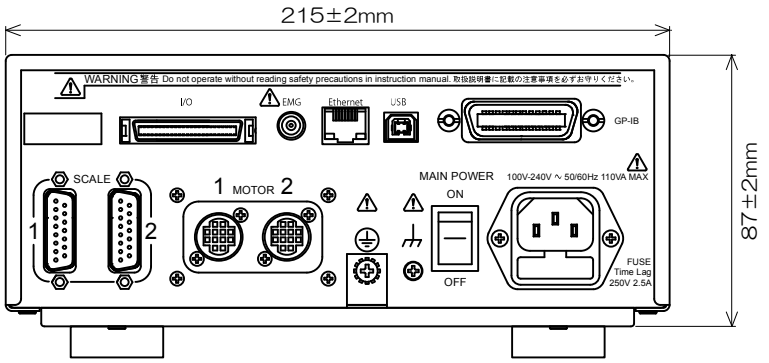
SW No.	0	1	2	3	4	5	6	7	8	9
%	10	20	30	40	50	60	70	80	90	100

13.Dimensions

13-1.Front panel

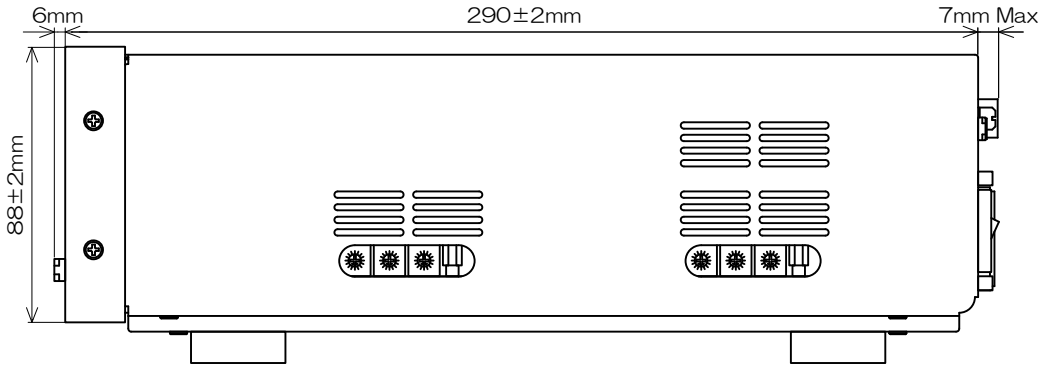


13-2.Rear panel

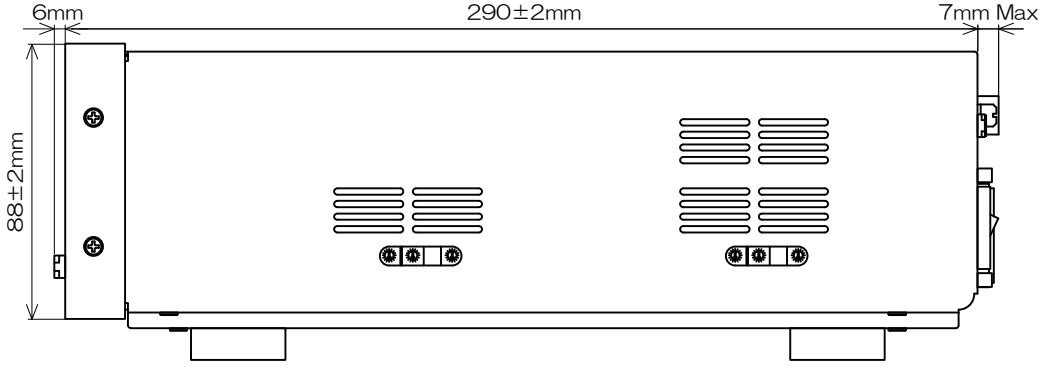


13-3.Right side panel

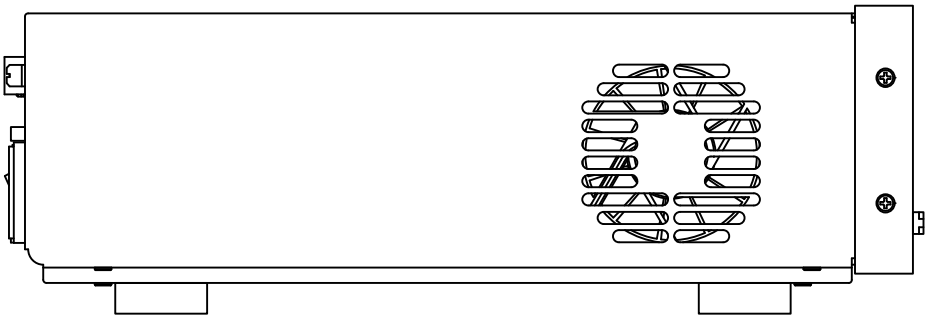
(1) FC-111, FC-411



(2) FC-511, FC-611, FC-911



13-4. Left side panel



14. Trouble shooting

If a problem occurs, check the following. If this does not solve the problem, unplug the power cable from the outlet and contact our company or our distributor.

Contents	Possible cause	Workaround	Page
• Can not turn on. • The power turned off during use.	Power cable is not connected.	Connect the power cable.	6
	The fuse has blown.	Check the fuse and replace it if it is blown. If it cuts off frequently, the instrument may be malfunctioning. Unplug the power cable from the outlet and contact our company or our distributor.	7
	The MAIN POWER switch on the rear panel is not turned on.	Turn on the MAIN POWER switch.	8
• A constant beep sounds. • Pressing the POWER button on the front panel while the Off lamp is lit turns off the Off lamp.	The output of the internal power supply is short-circuited or overloaded.	step 1 Turn off the MAIN POWER switch, disconnect all the cables of the connected peripheral devices, and wait at least 10 seconds. step 2 Turn ON the MAIN POWER switch with only the power cable connected. If the beep continues to sound, proceed to step 4. step 3 Check that the Off lamp is lit, then press and release the POWER button for one second. step 4 If the power cannot be turned on, the beep continues to beep even if it can be turned on, or if the Off lamp goes off while the POWER button is being pressed, the instrument may be malfunctioning. Unplug the power cable from the outlet and contact our company or our distributor. If the power can be turned on, one of the peripheral devices may be faulty or a device with a different pin assignment may be connected. Check the peripheral devices.	8, 11
• The display screen is off.	The POWER button on the front panel is not ON.	Press the POWER button to turn it on	3
	The MAIN POWER switch on the rear panel is not turned on	Turn on the MAIN POWER switch.	8
	The computer is sleeping.	Wake up from sleep.	5
• The menu is off. • Certain buttons cannot be operated.	The communication mode is set.	Switch to LOCAL or TEACH mode.	13
• GP-IB communication is not possible.	Communication interface setting is other than GP-IB.	Select GP-IB in parameter "I / F Sel".	86
	Communication settings do not match.	Check the communication conditions and set the parameters.	86
• USB communication is not possible.	Communication interface setting is other than USB.	Select USB in parameter "I / F Sel".	86
	Communication settings do not match.	Check the communication conditions and set the parameters.	86
• Ethernet communication is not possible.	Communication interface setting is other than Ethernet	Select Ethernet in parameter "I / F Sel".	86
	Communication settings do not match.	Check the communication conditions and set the parameters.	86, 87
• Teaching operation cannot be performed with the front panel, command, or jog controller.	"I/O" is selected in parameter "TEACH IF"	Change the parameter "TEACH IF" to "JOG / CMD".	72
• Teaching operation cannot be performed from general-purpose I / O.	The circuit connected to the general-purpose I / O connector does not meet the specifications.	Check the specifications of the general-purpose I / O connector.	112
	"JOG / CMD" is selected in parameter "TEACH IF"	Change the parameter "TEACH IF" to "I / O".	72

Contents	Possible cause	Workaround	Page
• Teaching operation cannot be performed from the optional jog controller.	Jog controller is disconnected.	Check the connection of the jog controller. * See the jog controller instruction manual for details.	1, 5
• Emergency stop is not possible.	You have not changed any parameters.	Change the parameter "EMG Connector" to Enable.	84
• The emergency stop state cannot be released. • Make an unintended emergency stop.	The connector connected to the EMG connector is disconnected	Check the connection.	116
	The cable connected to the EMG connector is broken	Check the connected cable.	116
	The EMERGENCY switch of the optional jog controller is pressed	Set the EMERGENCY switch of the jog controller to Off. * See the jog controller instruction manual for details.	1
• Sleep cannot be performed.	The stage is operating.	Wait for positioning to be completed.	12, 43
	An error has occurred.	Please clear the error.	14, 29, 101
	Teaching is running.	Wait for the execution to be completed or stop the execution.	90
• Stage does not work.	Motor not energized.	Check the lighting status of the front panel Motor lamp.	4
	The axis connected to the axis selection parameter does not match	Check the connection with the parameter "AXIS Sel".	83
• The stage moves on its own.	The axes of the motor cable and scale cable are not aligned.	Check the connection.	8, 9
• Positioning is not completed. • Coordinate values are not stable during positioning operation.	The platen or metal base that fixes the stage is vibrating	Make sure that vibration is not transmitted to the stage	-
	Strong light is on the stage	Avoid strong light on the stage	-
	Receives strong magnetic fields, electric fields, and noise	Please do not receive them.	-
• CMD ER is displayed.	A command string that is not defined in this equipment or that does not match the status of this equipment is sent from the PC.	See "11. Status".	103
• SCALE ER is displayed.	No scale signal is input.	See "11. Status".	104
• OS ER is displayed.	Operating at a speed higher than the count capability of the coordinate value counter.	See "11. Status".	104
• OF ER is displayed.	The difference between the coordinate value and the specified position is 5mm or more.	See "11. Status".	104
• LIMIT ER is displayed.	CW and CCW limits are entered at the same time	See "11. Status".	105
• IP ER is displayed.	The magnitude of the scale signal is out of the specified range	See "11. Status".	105
• EMERGENCY is displayed.	Emergency stop	See "11. Status".	105
• SYS ER is displayed.	The instrument system is broken	See "11. Status".	105
• TCMD ER is displayed.	The content of the teaching registration line to be executed does not match the status of this equipment.	See "11. Status".	106

15.Update history

Edition	Document control number	Revision date	Supported FV	Supported EN	Contents
1	MF-1023-01.01	-	01.030～	01.06	-
1	MF-1023-01.02	July, 29, 2020	01.030～	01.06	• Warranty change • Change of power cable specifications
1	MF-1023-01.03	Aug, 20, 2020	01.030～	01.06	Vendor name change
1	MF-1023-01.04	Sep, 2, 2020	01.030～	01.06	Typo correction
1	MF-1023-01.05	Sep, 9, 2020	01.030～	01.06	Image change
2	MF-1023-02.00	Apr, 21, 2021	01.032～	01.06	• Command addition • Parameter addition
2	MF-1023-02.01	Aug, 31, 2021	01.032～	01.06	Change contact URL

Memo

16.Index