DENSO ROBOT

Vertical articulated

V*-G-T SERIES

Horizontal articulated

H*-G-T SERIES

OPERATION MANUAL (T03)

Preface

Thank you for purchasing this high-speed, high-accuracy assembly robot.

Before use, read this manual carefully together with related manuals to safely get the maximum benefit from your robot in your assembling operations.

This manual covers the following products

■ Robot system configured with the RC7M controller

- Vertical articulated robot V∗-G-T series
- Horizontal articulated robot H∗-G-T series

(Note) The robot controller version is indicated in the main software ver. column of the controller setting table affixed on the controller. It can also be checked on the Version screen called up by pressing [ExtScrn]—[Set]—[Maint.]—[Version] from the top screen of the teach pendant.

Important

To ensure operator safety, be sure to read the precautions and instructions in "SAFETY PRECAUTIONS."

How this book is organized

Chapter 1 Operating Devices

This chapter describes the teach pendant and operation panel to be used for running the robot and creating programs. It also provides the menu tree of key commands configured on the touch panel of the teach pendant.

Chapter 2 Manual Operation

This chapter guides you through running the robot manually and describes the coordinates.

Chapter 3 Creating Programs

This chapter describes how to create programs by recording steps and function codes with the teach pendant. It also provides the editing procedure.

Chapter 4 Teach-Checking and Correcting

This chapter provides the teach-checking and correcting procedures for steps programmed.

Chapter 5 Operational Check (Individual/Auto)

This chapter gives the instructions for operational check of programs in Individual and Auto modes.

Chapter 6 Interface Panel Screen

This chapter shows the interface panel screen and describes the functions of the buttons, keys and lamps on the screen.

Chapter 7 Options

This chapter describes optional μVision board and pendant extension cable.

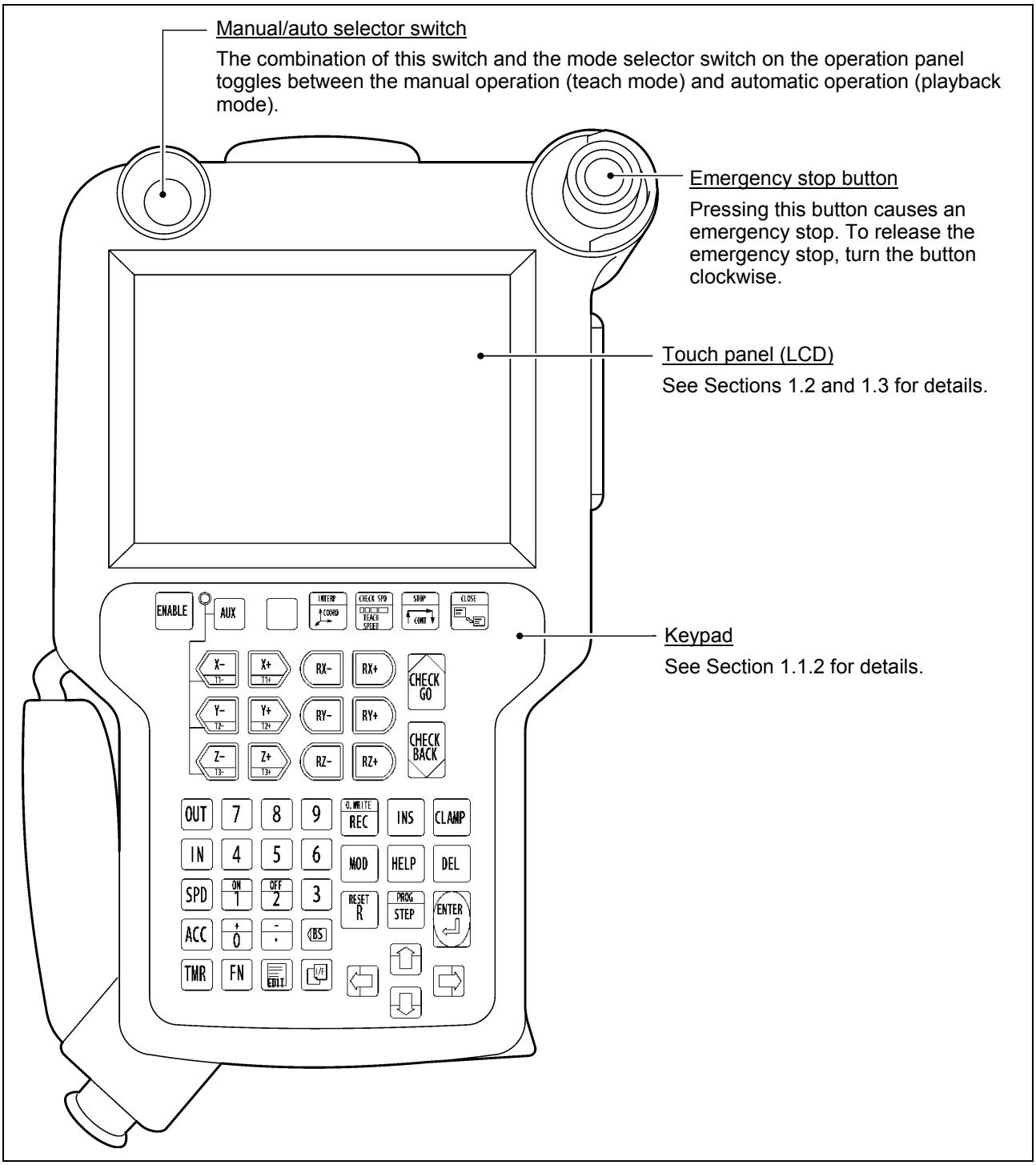
Contents

Chapter 1
Operating Devices

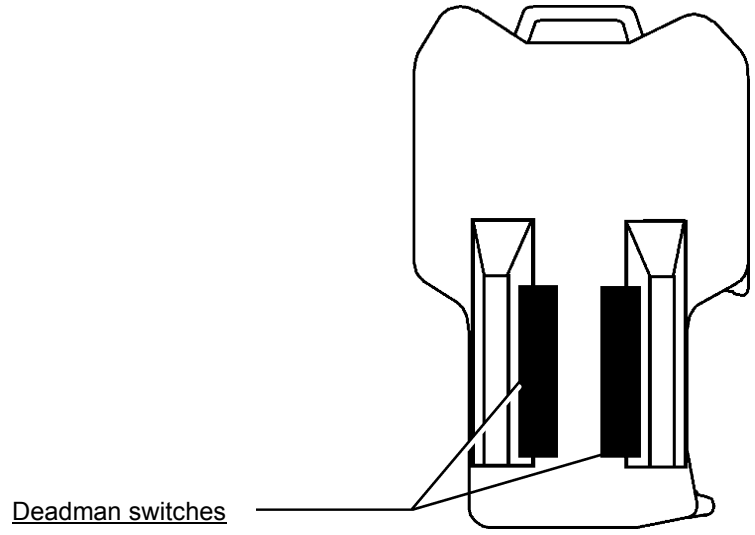
1.1 Teaching Pendant Overview

1.1.1 Names and Functions of Teach Pendant Components

The teach pendant consists of a manual/auto selector switch, emergency stop button, touch panel, deadman switches, and keypad. Section 1.1.2 details the keys on the keypad.



Teach Pendant (Top Face)



Deadman switches

Holding down either one of these switches supplies power to the motors and releases the brakes.

These switches are enabled only in the teach mode.

Without either one of these switches being ON, driving joints is not allowed.

If danger impends, release the switch, and the robot immediately stops.

Teach Pendant (Bottom Face)

1.1.2 Keys on the Teach Pendant Keypad

	Keys	Functions	Functions when keys are pressed with the ENABLE key held down
Auxiliary keys	ENABLE	This is an Enable operation key for preventing wrong operations due to unintentional depression of keys. It also works to extend the functions of particular keys.	—
	AUX	Press this key to drive auxiliary axes. (When an auxiliary axis is in use, the upper left LED is lit.)	—
	INTERP COORD	Each time this key is pressed, the coordinate system to be applied in the manual operation cycles through the following three. 	Each time this key is pressed, the interpolation in the record status toggles between JOINT and LINEAR.
	CHECK SPD TEACH SPEED (5 choices)	Each time this key is pressed, the manual operation speed cycles through five shifts 1 through 5. (1: inching)	Each time this key is pressed, the CHECK GO/BACK speed cycles through five shifts 1 through 5.
	STOP CONT	Each time this key is pressed, the CHECK GO/BACK operation toggles between ONE and CONTINUE.	Pressing this key suspends program execution of the robot being during playback and turns the cycle operation signal off. (**Tip:** Pressing the HOLD/RUN switch on the operation panel stops the robot but it does not turn the cycle operation signal off.)
	CLOSE	Each time this key is pressed, the active screen cycles through the scroll screen → monitor 1 screen → monitor 2 screen.	Pressing this key closes the currently active monitor screen.
	CHECK GO	Pressing this key with the deadman switch held down runs the robot program in ascending order.	—
	CHECK BACK	Pressing this key with the deadman switch held down runs the robot program in descending order.	—
Programming keys	SPD (10 choices)	Use this key to select the speed number (0 to 9) in the record status (indirect specification). Direct specification (e.g. in mm/sec) is also possible.	—
	OUT	Use this key to set user output signals in the record status.	—

	Keys	Functions	Functions when keys are pressed with the ENABLE key held down
Programming keys	IN	Use this key to set user input signals in the record status.	—
	TMR (10 choices)	Use this key to select the timer number (0 to 9) in the record status.	—
	ACC (5 choices)	Use this key to select the accuracy number (0 to 4) in the record status.	—
	FN	Press this key to enter function codes.	—
Shortcut keys	I/F	Each time this key is pressed, the interface panel screen toggles ON (display) and OFF (hide). (The interface panel screen is the one currently selected.)	—
	EDIT	In the teach mode, pressing this key enters the on-screen program edit mode. In the on-screen program edit mode, pressing this key updates the contents, terminates editing, and returns to the top screen.	—
Edit keys	O.WRITE REC	Pressing this key records a step. It updates the joint command values with the current ones and also updates the configuration parameter values.	Pressing this key overwrites a recorded step with a new one together with the position and record status.
	INS	—	Pressing this key inserts a step.
	MOD	Pressing this key updates the joint command values with the current ones. (It does not update the configuration parameter values.)	Pressing this key modifies the position at the step.
	DEL	—	Pressing this key deletes a step.
	RESET R	When the top screen is first displayed, pressing this key calls up a shortcut menu. On the subsequent screens, pressing this key cancels an entry or returns to the preceding screen. Pressing this key twice outputs an error reset signal.	—
	PROG STEP	Pressing this key calls a step.	Pressing this key calls a program.
	ENTER	Pressing this key establishes the entered data.	—

	Keys	Functions	Functions when keys are pressed with the ENABLE key held down
Edit keys	HELP	—	—
	BS	This is a backspace key that clears the last entered data.	—
Function related keys	CLAMP	—	—
Arm traverse keys	X- T1- / X+ T1+	1st-axis drive keys	—
	Y- T2- / Y+ T2+	2nd-axis drive keys	—
	Z- T3- / Z+ T3+	3rd-axis drive keys	—
	RX- / RX+	4th-axis drive keys	—
	RY- / RY+	5th-axis drive keys	—
	RZ- / RZ+	6th-axis drive keys	—
Numeric keys	+ 0 : 9 - .	Numeric data entry keys	. : - 0: + 1: ON 2: OFF (ON/OFF are used to issue output signals manually.)
Cursor keys	↑ ← → ↓	These keys are used to move the cursor.	<u>On the teach/playback mode screen</u> Up/Down arrow keys for moving to the desired execution step. (Possible only on the teach/playback mode screen.) <u>On the on-screen program edit mode screen</u> Up/Down arrow keys for page feed. <u>On various setting-up screens</u> Left/Right arrow keys for selecting target items.

1.1.3 Pendantless State

What is pendantless state?

A pendantless state allows the user to initiate or stop programs from the line controller or operation panel without connecting the teach pendant.

Note: When using the robot controller in a pendantless state, be sure to set up an emergency stop switch, referring to the "Positioning of emergency stop switches" in the SAFETY PRECAUTIONS.

Functions available in a pendantless state

The table below lists the functions available in a pendantless state, which differ depending upon the operation modes.

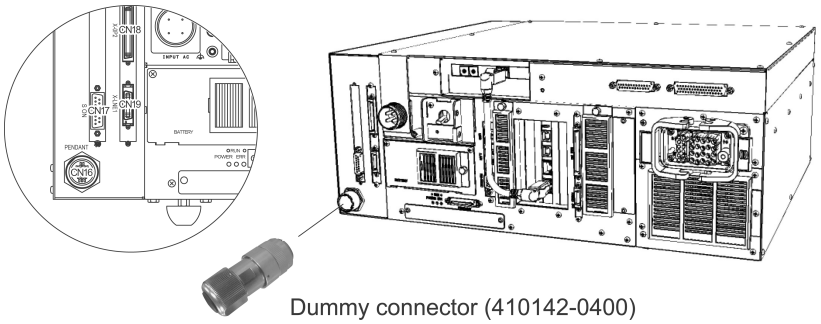
●: Available
△: Not available

Operating device	Operation	Teach	Individual	Auto	Connection cutting-off
Teach pendant	Edit programs	△	-	-	-
	Run robot	△	-	-	-
	Select programs	△	△	-	-
	Check GO, BACK	△	-	-	-
	Clear errors	△	△	△	-
	Monitor	△	△	△	-
	IF panel	△	△	△	-
Operation panel	Initiate programs	-	●*	-	-
	Stop programs	-	●	-	-
	Clear errors	△	●	●	-
Line controller	Select programs	-	-	●	-
	Initiate programs	-	-	●	-
	Stop programs	-	-	●	-
	Clear errors	△	●	●	-
WINCAPSIII	Transfer projects from WINCAPSIII	△	△	△	-
	Receive projects from WINCAPSIII	△	●	●	-

* The currently selected program (default: Program 0) runs.

Putting the controller into a pendantless state

Turn the controller power OFF. Disconnect the teach pendant from connector CN16 and set the dummy connector (410142-0400) to the connector instead.

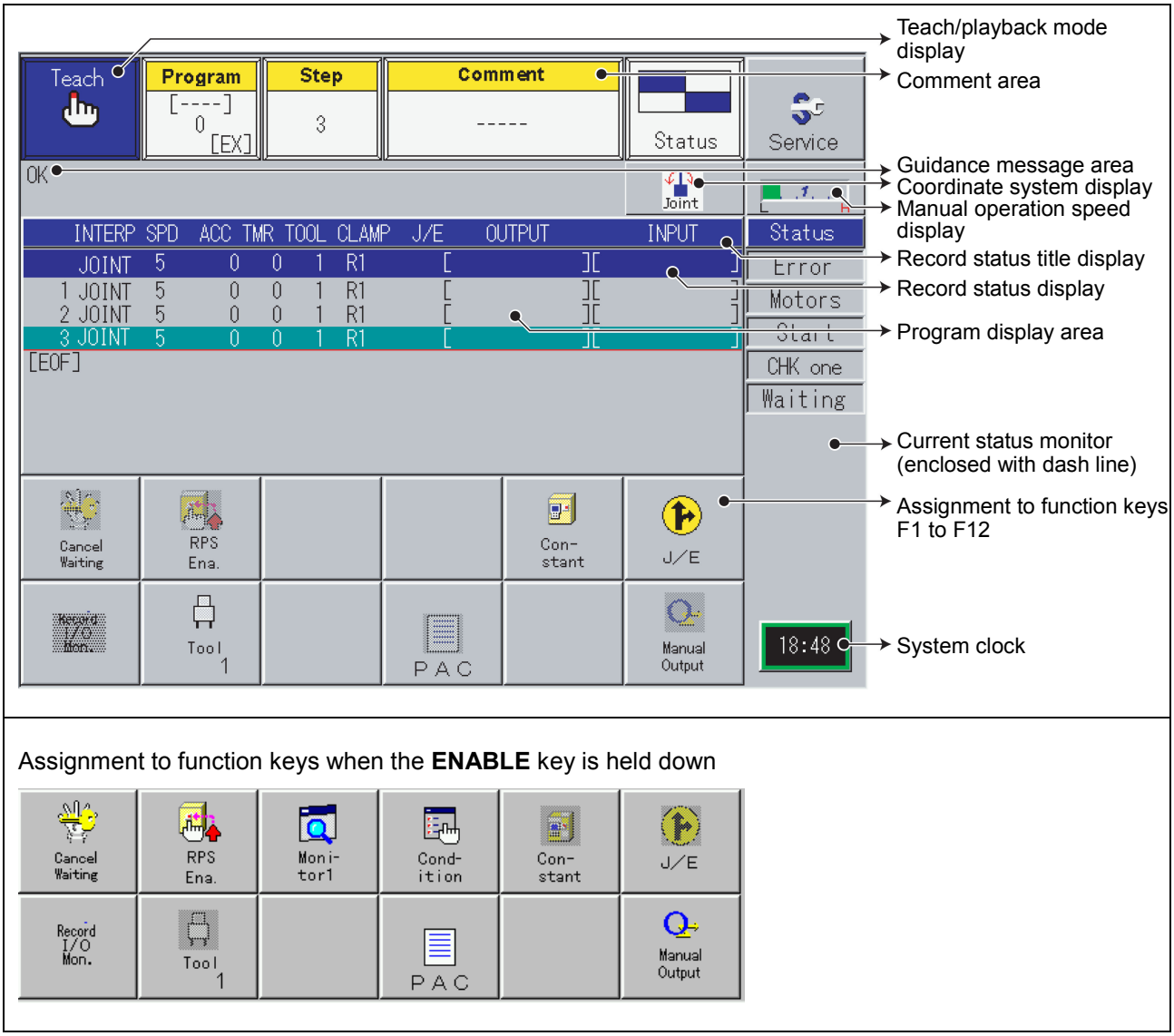


Dummy connector (410142-0400)

Note: Be sure to turn the controller power OFF before connecting/disconnecting the dummy connector or teach pendant. Connecting the teach pendant instead of the dummy connector with the controller power ON allows the teach pendant to display the top screen, but the teach pendant is inoperable. This state is dangerous since it is possible for external equipment to start programs.

1.2 Touch Panel Components Available in the Teach Mode

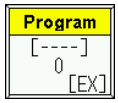
This section gives a screen sample shown on the touch panel in the teach mode. The components of the screen are detailed later.

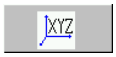
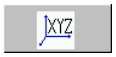
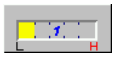


Assignment to function keys when the **ENABLE** key is held down

1.2.1 Operation Keys

The following six operation keys are provided in the upper two rows on the touch panel. The table below gives the description of their functions.

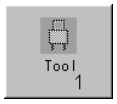
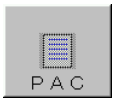
Functions		Functions when keys are pressed with the ENABLE key held down
	Shows the program number currently selected. Pressing this key calls up the Program List screen.	Same as at left.
	Shows the step number currently selected. Pressing this key calls up the Step Selection screen.	Same as at left.

Functions	Functions when keys are pressed with the ENABLE key held down
 Pull-down menu key. Pressing this key allows you to switch to the "Monitor 1," "Monitor 2," "I/F," or "Ext Scrn" screen.	Same as at left.
 Pressing this key shows the Service screen where you can access various functions including monitor, file manager, etc.	Same as at left.
 Pressing this key allows you to select the coordinate system to apply in the manual operation. This key is functionally equivalent to the corresponding key on the teach pendant keypad.	 Pressing this key allows you to select the coordinate system in the record status.
 This key allows you to select the manual operation speed of the robot. Each time this key is pressed, the speed cycles through five shifts 1 through 5.	 This key allows you to select the playback speed in CHECK GO/BACK operation. Each time this key is pressed, the speed cycles through five shifts 1 through 5.

1.2.2 Function Keys F1 to F12

The following 12 function keys are provided in the bottom two rows on the touch panel. The table below gives the description of their functions.

	Functions	Functions when keys pressed with the ENABLE key held down
1	— (Not available when shaded.)	 Pressing this key forcedly cancels the waiting state for an I signal (input signal) or J/E (jump/end) command.
2	— (Not available when shaded.)	 Shows the current RPS state. Pressing this key enables or disables the RPS (robot programming select). In Auto mode, the RPS is unconditionally enabled; in Individual mode, you need to enable the RPS.
3	— (Not available when shaded.)	 Pressing this key displays the monitor menu including the cycle time monitor.
4	— (Not available when shaded.)	 Pressing this key allows you to set up teach/playback conditions. The teach/playback condition screen can be accessed also from the Service screen.
5	 Pressing this key proceeds to the constant mode in which tool data and other constants can be set up.	— (Not available when shaded.)

	Functions	Functions when keys pressed with the ENABLE key held down
6	 Pressing this key allows you to record J (jump) and E (end) commands.	— (Not available when shaded.)xx
7	— (Not available when shaded.)	 Pressing this key displays the record I/O monitor where the I/O signals recorded in the current step are shown with their names.
8	 Shows the current tool number. Pressing this key allows you to select the desired tool number.	— (Not available when shaded.)
9	— (Reserved.)	— (Reserved.)
10	— (Not available when shaded.)	 Pressing this key with the `CALL_PAC` or `RUN_PAC` step being selected calls up the corresponding PAC program window.
11	— (Reserved.)	— (Reserved.)
12	— (Reserved.)	 Pressing this key manually toggles output signals (O signals) between ON and OFF in the teach mode.

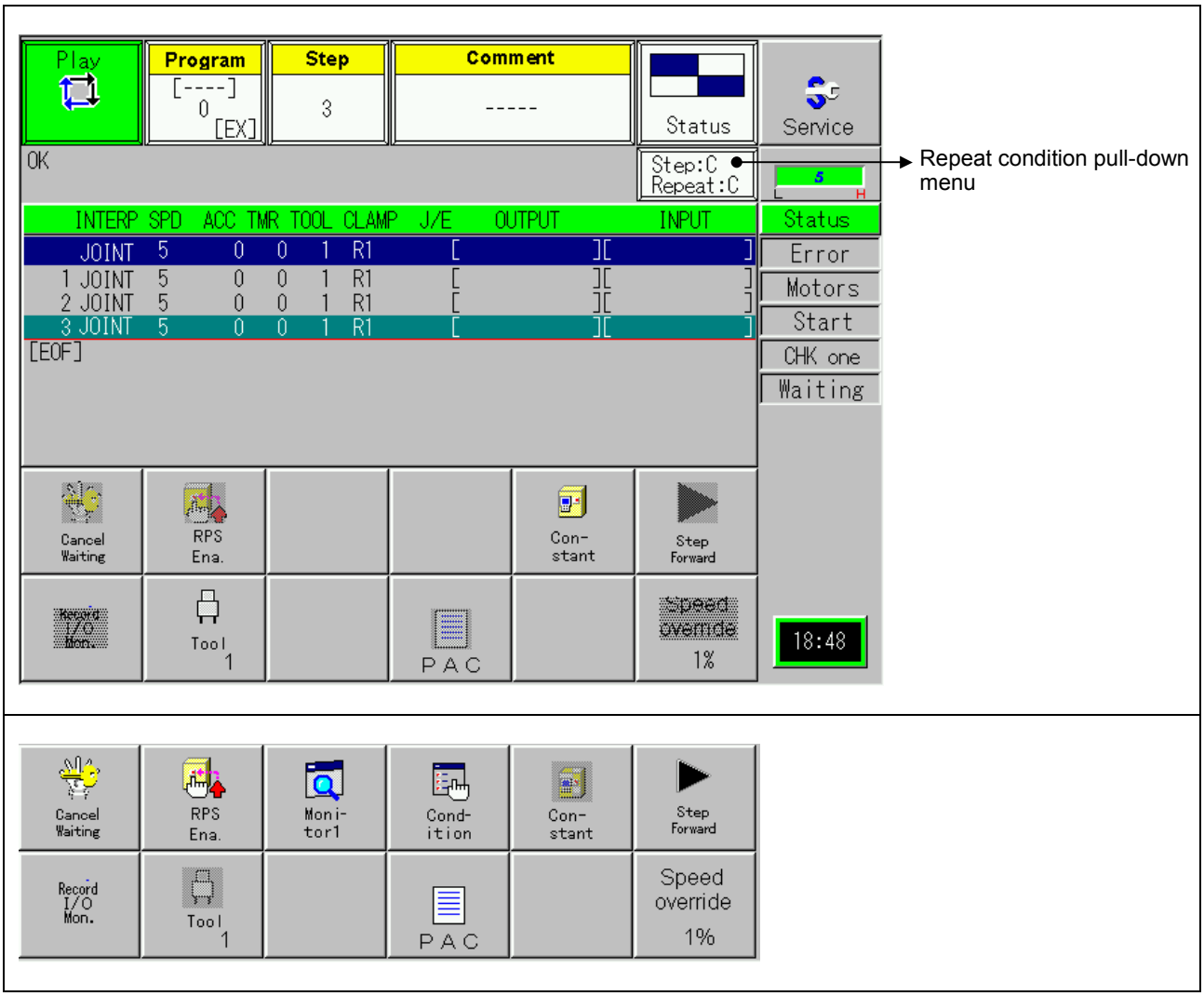
1.2.3 Current Status Monitor

The current status monitor is displayed in the upper right corner of the touch panel. It contains up to eight items as described below.

Monitor items	Display type
"Error," "Motors," "Start," "CHK once (continue)," and "Waiting"	These monitor items are always displayed in the fixed positions, even when dimmed.
"Machine lock," "Emergency stop," and "Deadman"	These monitor items are displayed only when the related event occurs. The display positions are not fixed.

1.3 Touch Panel Components Available in the Playback Mode

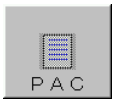
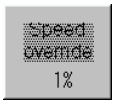
This section gives a screen sample shown on the touch panel in the playback mode. The components of the screen are detailed later. For the components common to both the playback and teach modes, see Section 1.2.



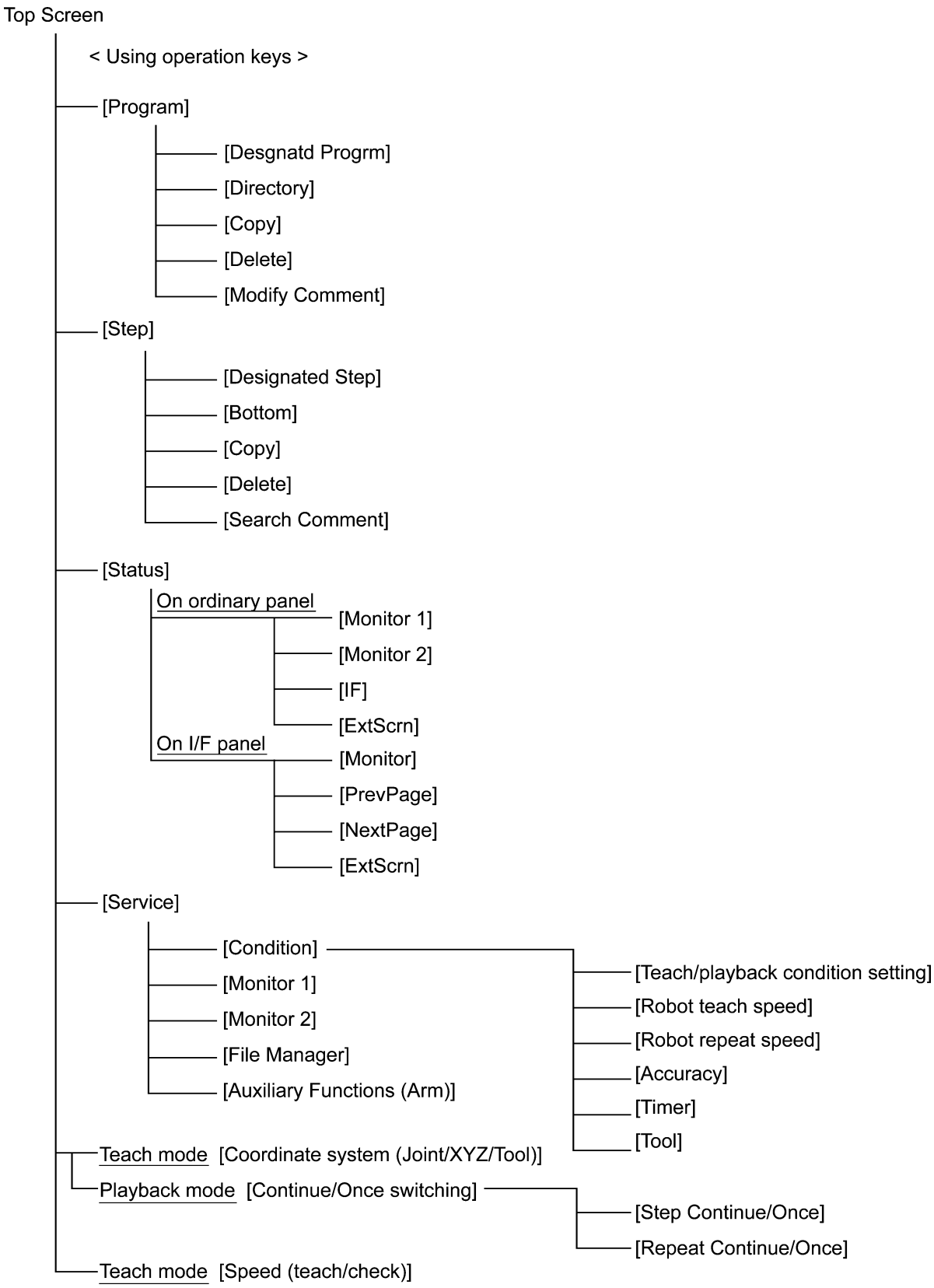
1.3.1 Operation Keys

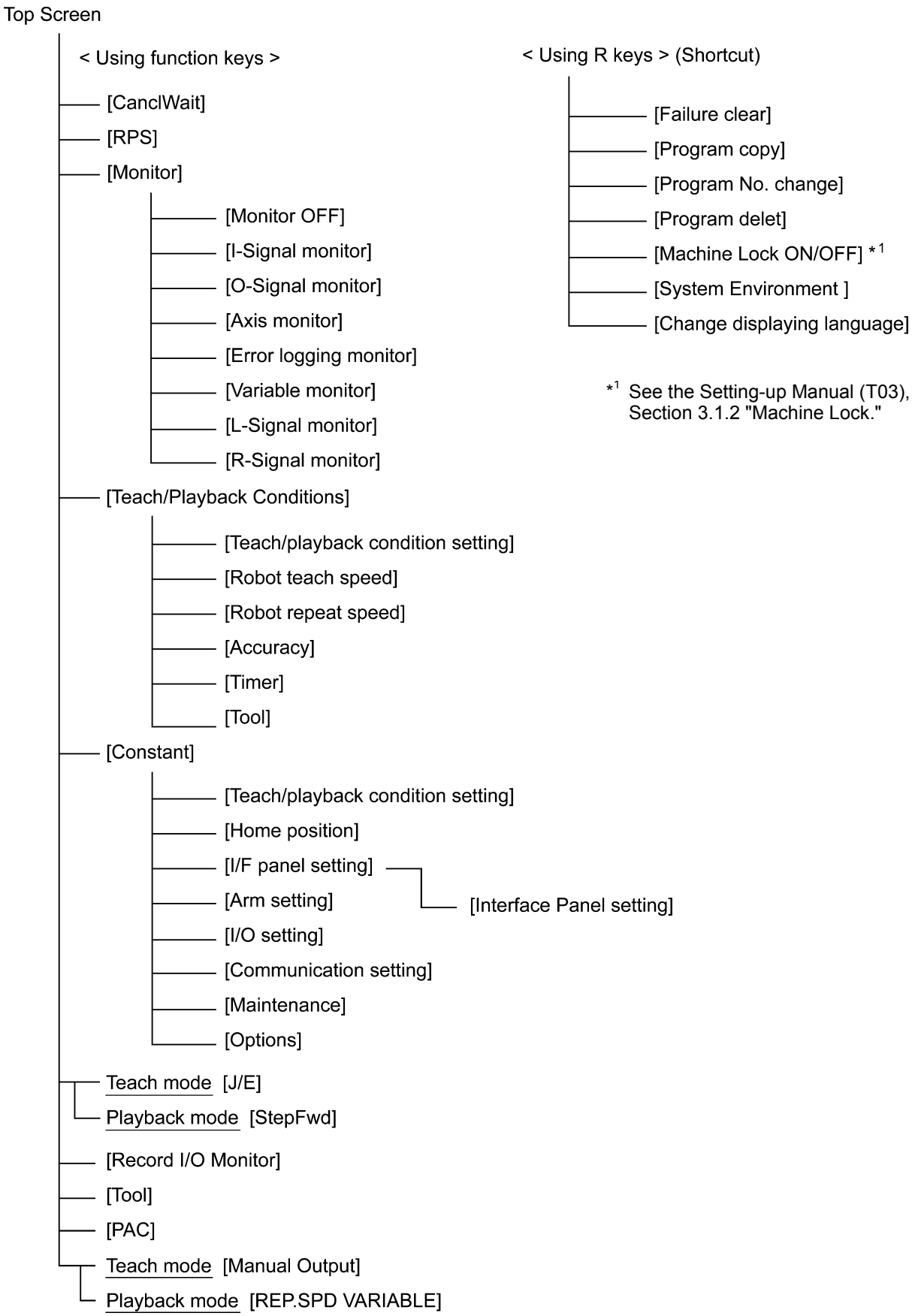
Functions	Functions when keys are pressed with the ENABLE key held down
Step:C Repeat:C Shows the current repeat conditions. Pressing this pull-down menu key allows you to select whether or not to repeat a step and program in Individual and Teach modes.	—

1.3.2 Function Keys F1 to F12

	Functions	Functions when keys pressed with the ENABLE key held down
6	— (Not available when shaded.)	 This key is used when the repeat condition for Step Forward is "Once." See Section 5.2 for details.
10	— (Not available when shaded.)	 When `CALL_PAC` is in execution, this key is used to call up the corresponding PAC program window in the playback mode. (PAC: Denso robot language)
12	— (Not available when shaded.)	 This key is used to temporarily change the playback speed without changing the record speed. See Chapter 5 for details.

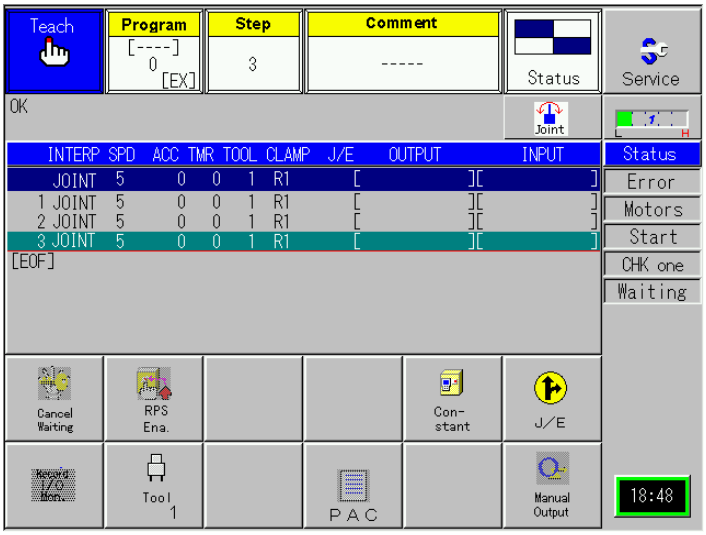
1.4 Menu Tree


Top Screen
< Using operation keys >
[Program]
[Desgnatd Progrm]
[Directory]
[Copy]
[Delete]
[Modify Comment]
[Step]
[Designated Step]
[Bottom]
[Copy]
[Delete]
[Search Comment]
[Status]
On ordinary panel
[Monitor 1]
[Monitor 2]
[IF]
[ExtScrn]
On I/F panel
[Monitor]
[PrevPage]
[NextPage]
[ExtScrn]
[Service]
[Condition]
[Monitor 1]
[Monitor 2]
[File Manager]
[Auxiliary Functions (Arm)]
[Teach/playback condition setting]
[Robot teach speed]
[Robot repeat speed]
[Accuracy]
[Timer]
[Tool]
Teach mode [Coordinate system (Joint/XYZ/Tool)]
Playback mode [Continue/Once switching]
[Step Continue/Once]
[Repeat Continue/Once]
Teach mode [Speed (teach/check)]


Top Screen
< Using function keys >
[CanclWait]
[RPS]
[Monitor]
[Monitor OFF]
[I-Signal monitor]
[O-Signal monitor]
[Axis monitor]
[Error logging monitor]
[Variable monitor]
[L-Signal monitor]
[R-Signal monitor]
[Teach/Playback Conditions]
[Teach/playback condition setting]
[Robot teach speed]
[Robot repeat speed]
[Accuracy]
[Timer]
[Tool]
[Constant]
[Teach/playback condition setting]
[Home position]
[I/F panel setting]
[Arm setting]
[Interface Panel setting]
[I/O setting]
[Communication setting]
[Maintenance]
[Options]
Teach mode [J/E]
Playback mode [StepFwd]
[Record I/O Monitor]
[Tool]
[PAC]
Teach mode [Manual Output]
Playback mode [REP.SPD VARIABLE]
< Using R keys > (Shortcut)
[Failure clear]
[Program copy]
[Program No. change]
[Program delet]
[Machine Lock ON/OFF] *1
[System Environment]
[Change displaying language]
*1 See the Setting-up Manual (T03), Section 3.1.2 "Machine Lock."

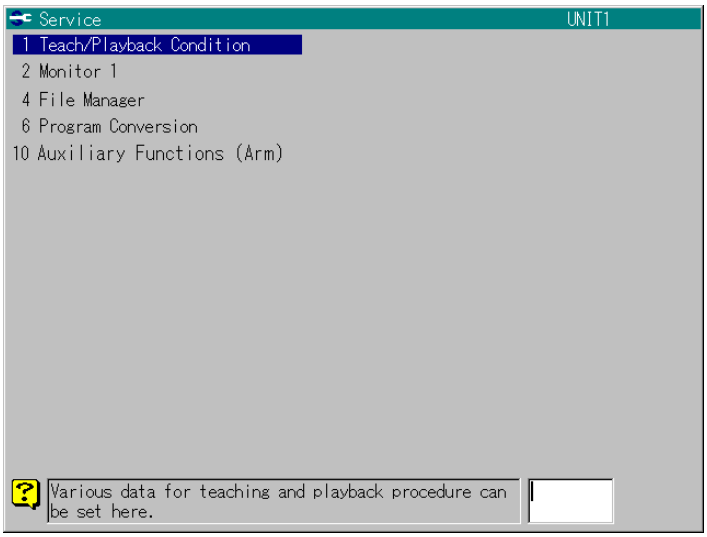
1.5 Configuration of Robot Intrinsic Parameters (Screen example)

Top screen



Press **Service** key ↓ ↑ Press **RESET** key on keypad.

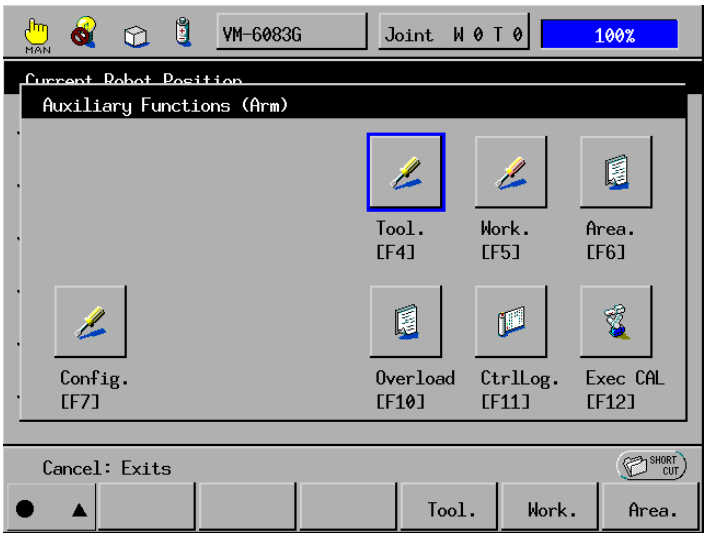
Service screen



(*1)
Note that this operation may not close the extended screen in any of the following states..
- During program editing
- During parameter editing
- During program loading
- In error occurrence state

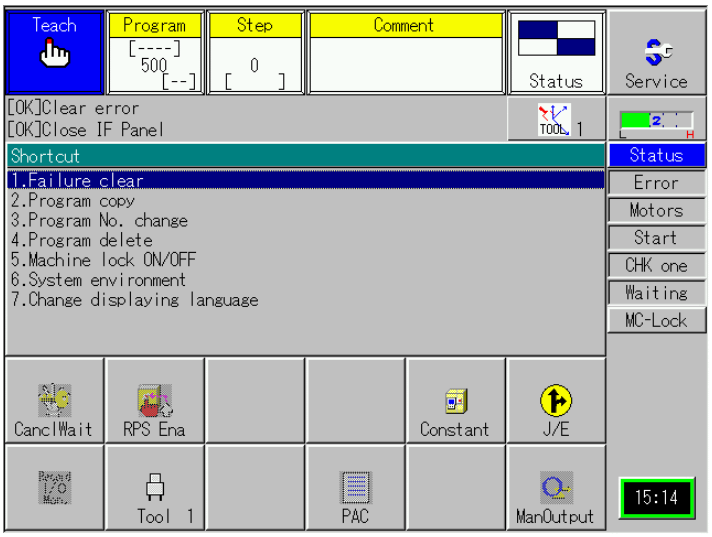
Select "10 Auxiliary Function (Arm). ↓ ↑ With **ENABLE** key held down, press **CLOSE** key on keypad. **(*1)**

Auxiliary Functions (Arm) window



1.6 Shortcuts

On the top screen, press RESET R to display the following shortcut menu.

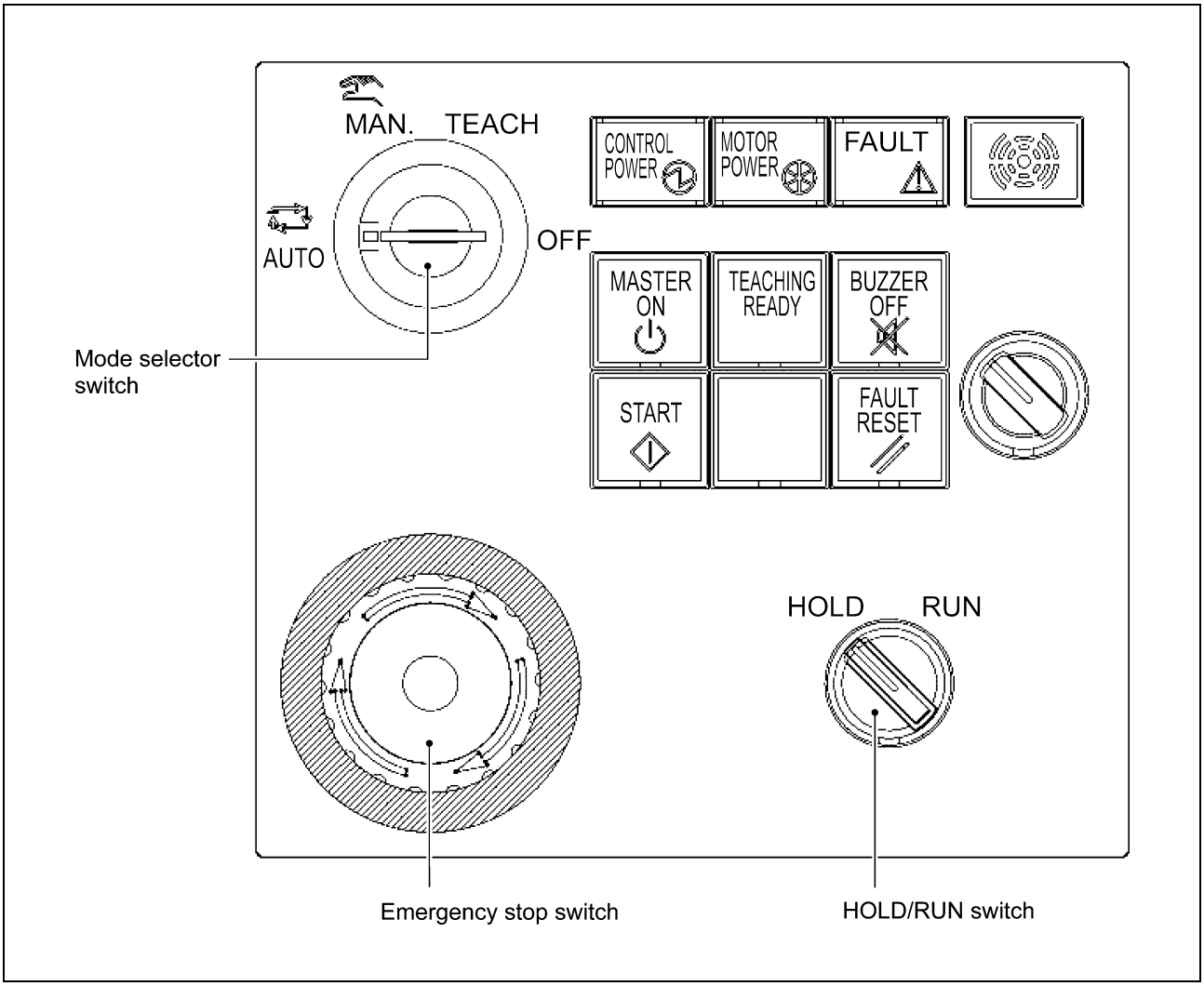


Shortcut menu items

Use	To
1. Failure clear	Clear errors and output the error reset signals. Equivalent to Error reset on the operation panel.
2. Program copy	Copy a registered program according to the program number specified.
3. Program No. change	Change the number assigned to a program registered.
4. Program delete	Delete a program registered.
5. Machine lock ON/OFF	Switch the machine lock on and off.
6. System environment	Display the versions of the controller and teach pendant.
7. Change displaying language	Switch the language on the screen display between Japanese and English. After switching, restarting the controller is required.

1.7 Operation Panel

The operation panel is used to configure the startup conditions and motor ON conditions. The component names of the operation panel are shown below.



Operation Panel

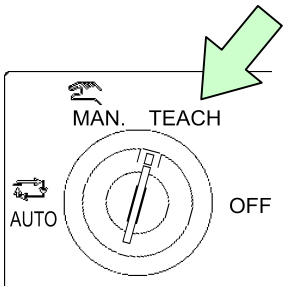
Chapter 2
Manual Operation

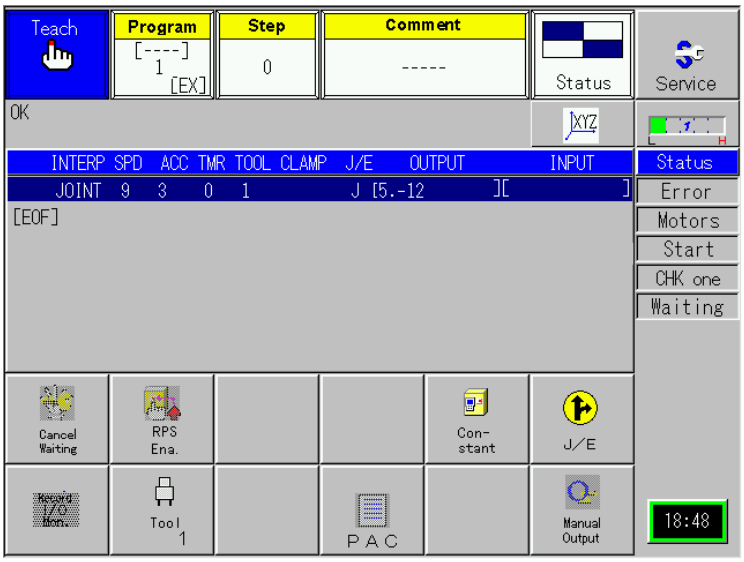
2.1 Operating Procedure

The operating procedure below readies the robot for manual operation.

Step 1 Insert the teach plug (prepared by the customer).

Step 2 On the operation panel, turn the mode selector switch to the TEACH position.



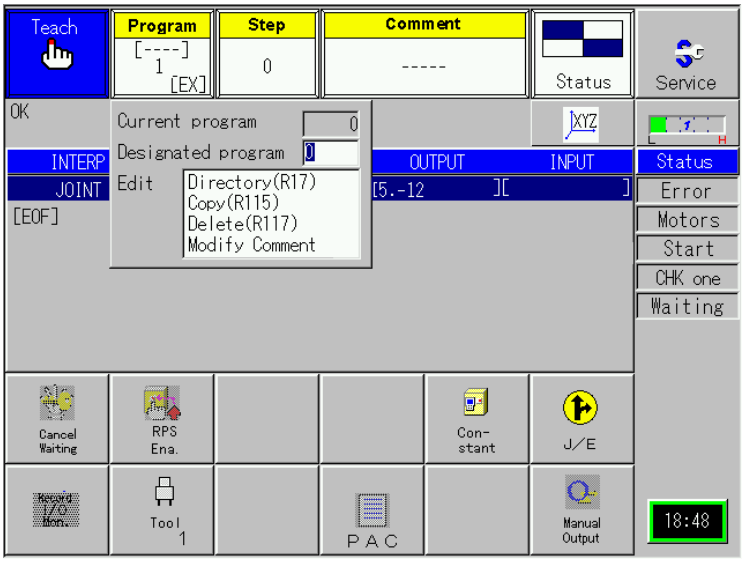


Step 3

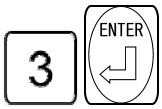
With the teach pendant, select the desired program number (#3 in this sample).

(1) While holding down the **ENABLE** key, press the **STEP** key on the keypad. Or press the **Program** key on the touch panel.

The program number entry window opens as shown below.



(2) Press **3** and **ENTER** keys on the keypad.



If the specified program already exists, a maximum of seven steps appear on the program display area, starting from step 1.

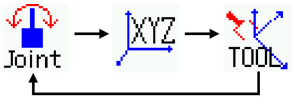
If the specified program does not exist, the step number "0" appears.

Step 4

Select the desired operation coordinate system.

Each time 

is pressed on the keypad, the coordinate system cycles through the following three on the touch panel.



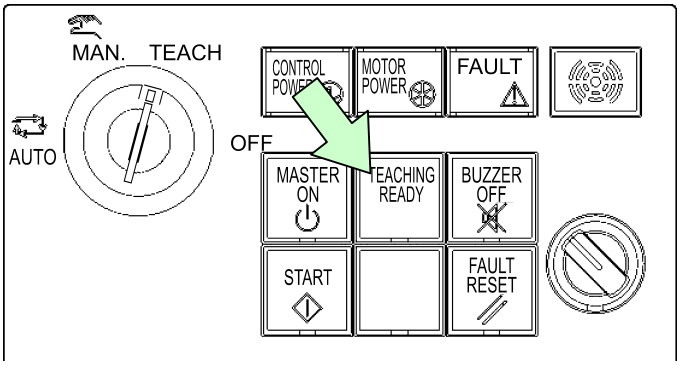
Step 5

Select the teach speed (1 to 5) using 

.

Step 6

On the operation panel, press the **TEACHING READY** key.

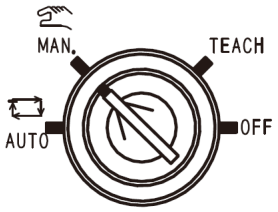


Step 7

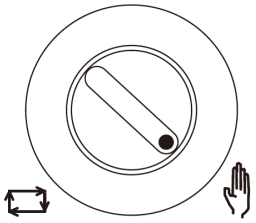
Hold down either one of the deadman switches, and the drive power magnet is turned ON so that the robot is ready to run.

2.2 Out-of-Fence Teaching Procedure

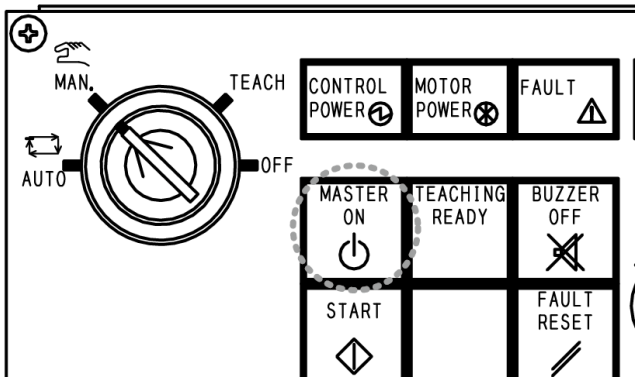
Step 1 On the I/F operation panel, turn the mode selector switch to the MAN. position.



Step 2 On the teach pendant, turn the manual/auto selector switch to the manual operation (Teach mode) position.



Step 3 On the I/F operation panel, press the MASTER ON key.



Step 4 On the I/F operation panel, turn the HOLD/RUN switch to the RUN position.

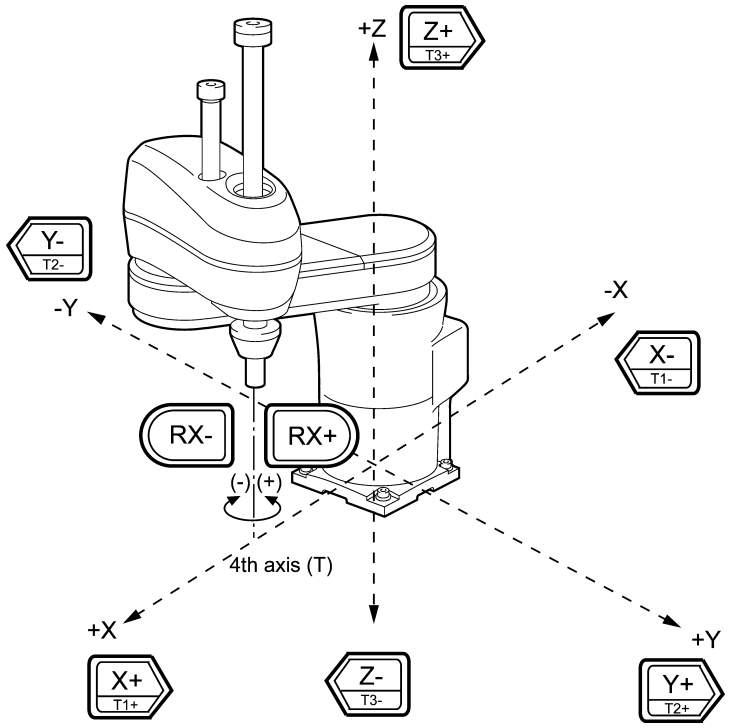
Step 5 Hold down either one of the deadman switches.

Note: The RPS should be enabled beforehand.

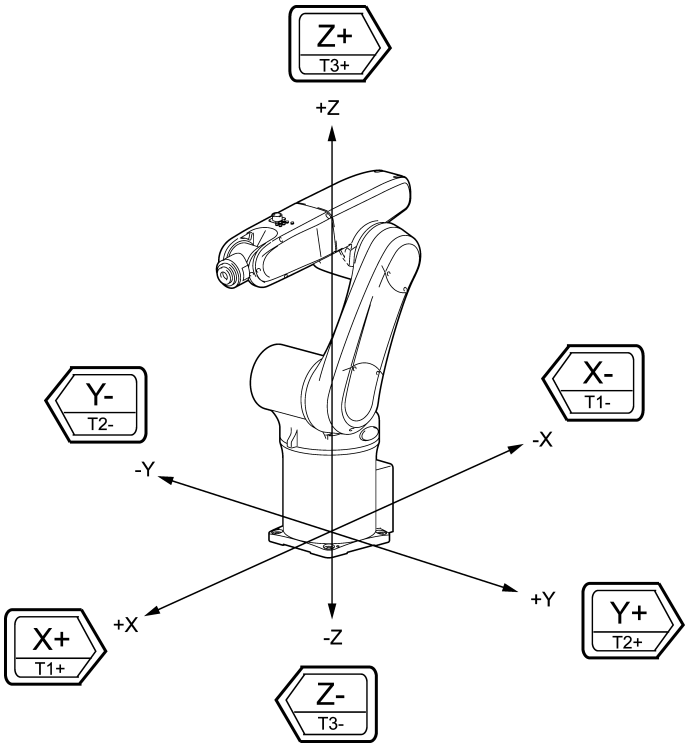
2.3 Motion on Cartesian Coordinate System

When the Cartesian coordinate system (XYZ) is selected, the robot motions as shown below.

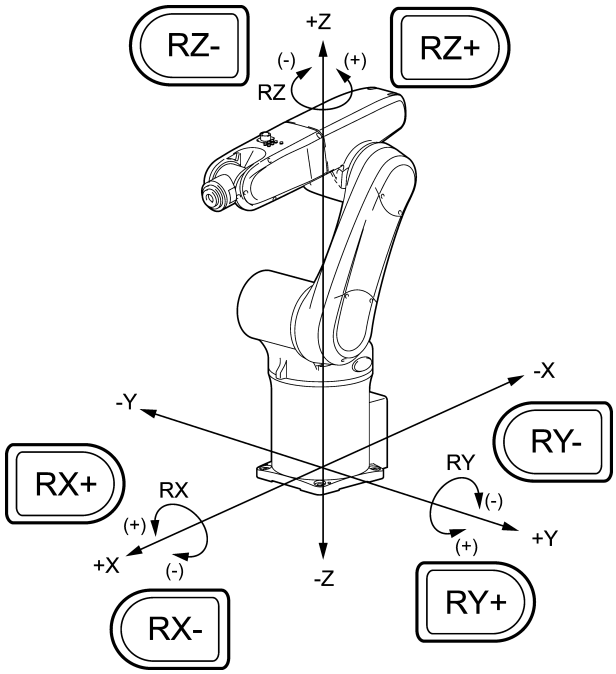
■ 4-axis robot



■ 6-axis robot (Linear motion)



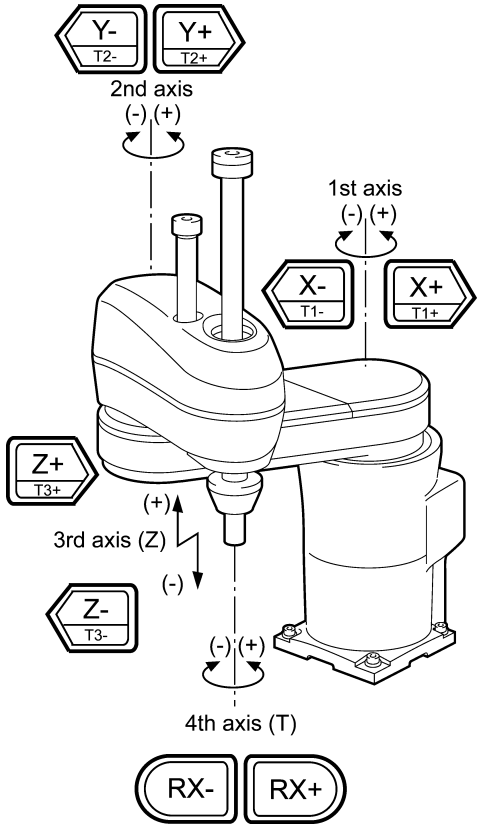
■ 6-axis robot (Rotational motion)



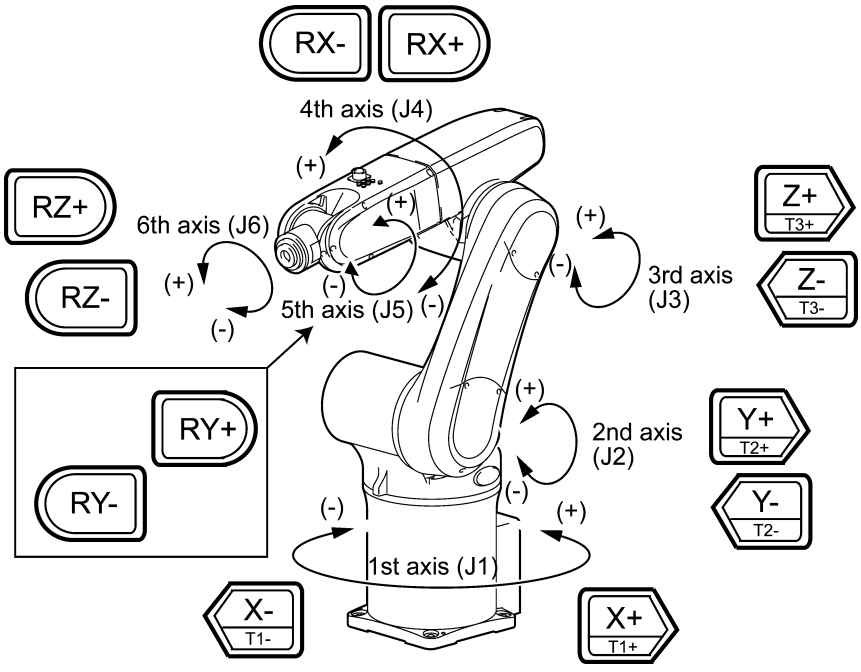
2.4 Motion on Joint Coordinate System

When the joint coordinate system () is selected, the robot motions as shown below.

■ 4-axis robot



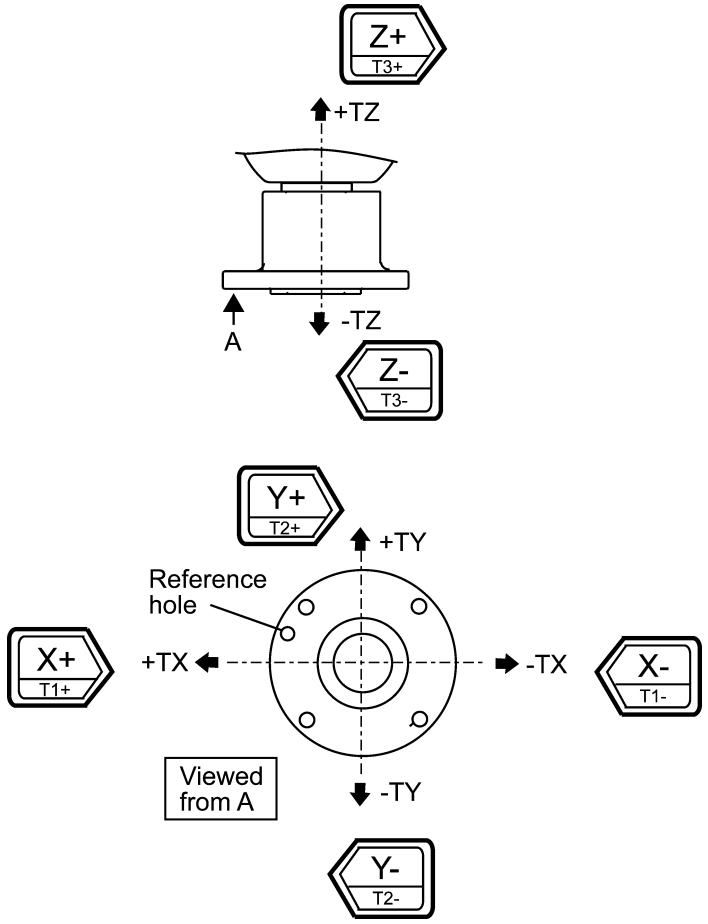
■ 6-axis robot



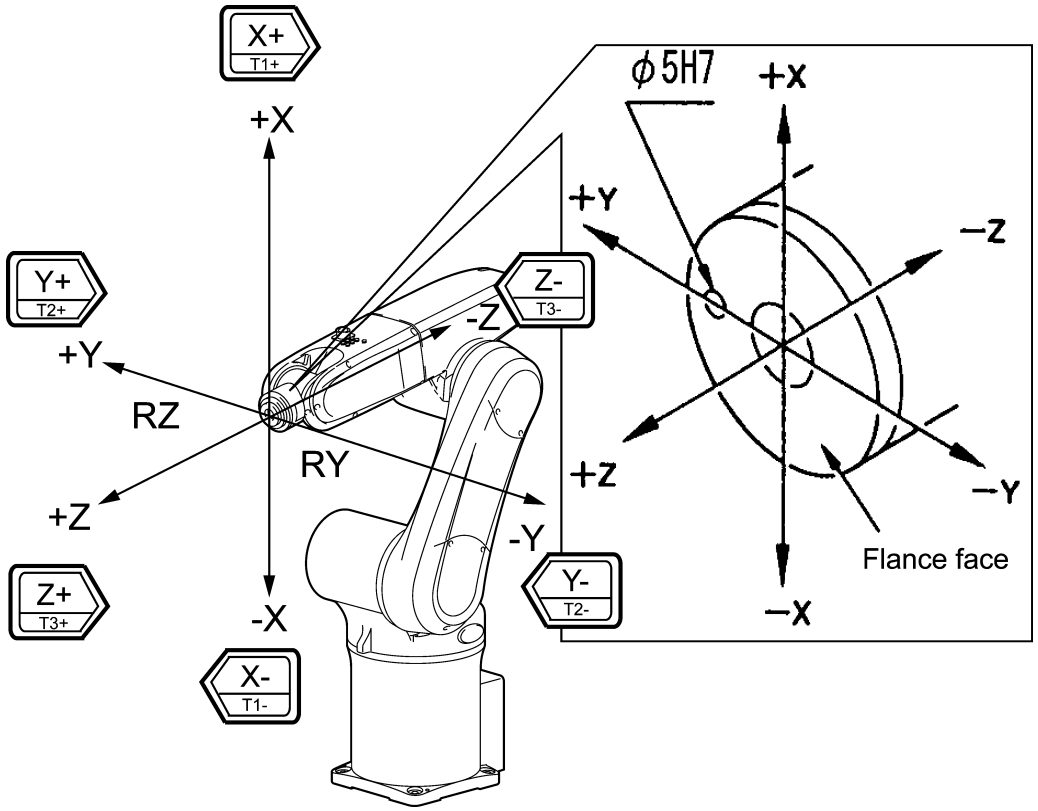
2.5 Motion on Tool Coordinate System

When the tool coordinate system () is selected, the robot motions as shown below.

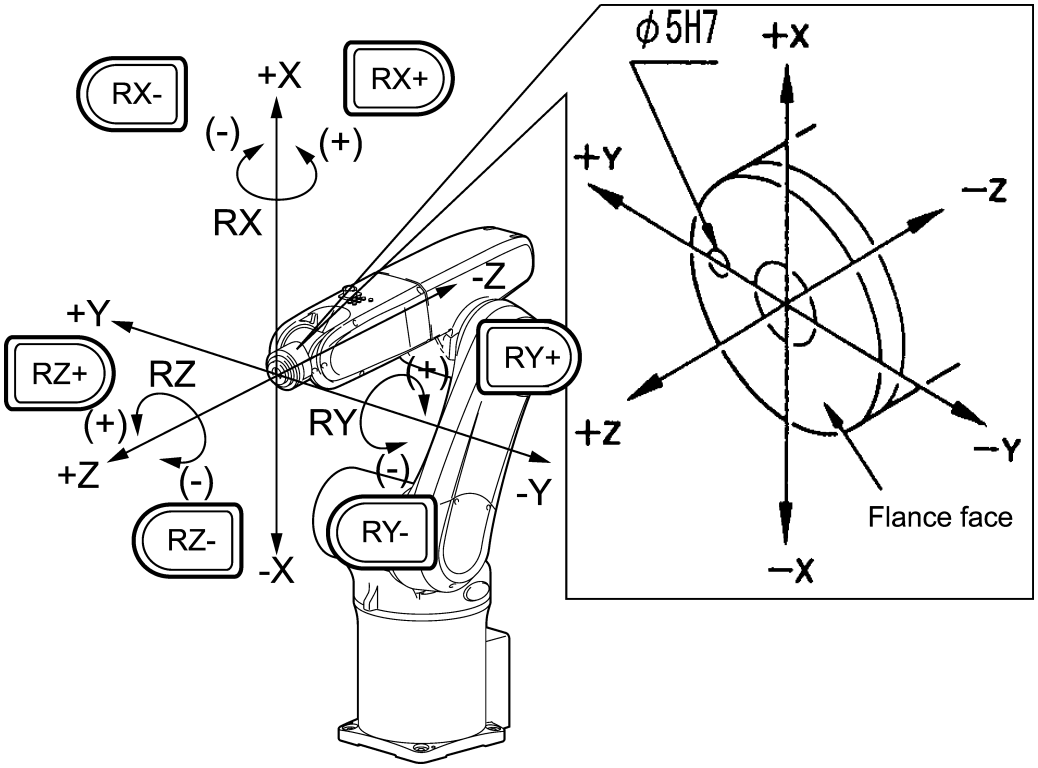
■ 4-axis robot



■ 6-axis robot (Linear motion)



■ 6-axis robot (Rotational motion)



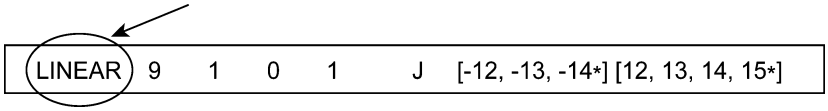
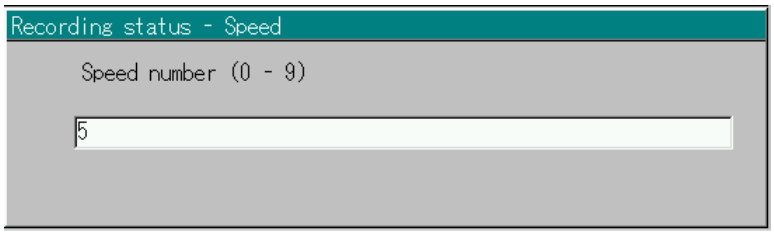
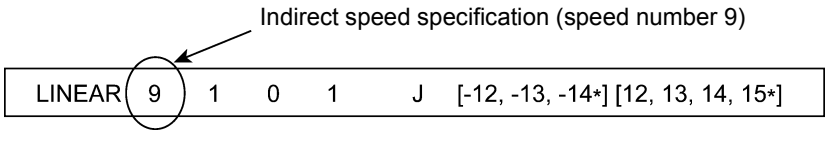
Chapter 3
Creating Programs

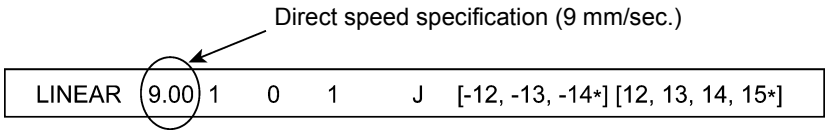
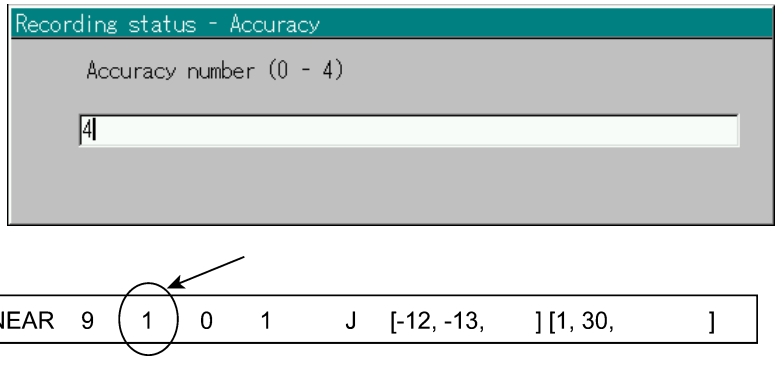
3.1 Setting up Record Status

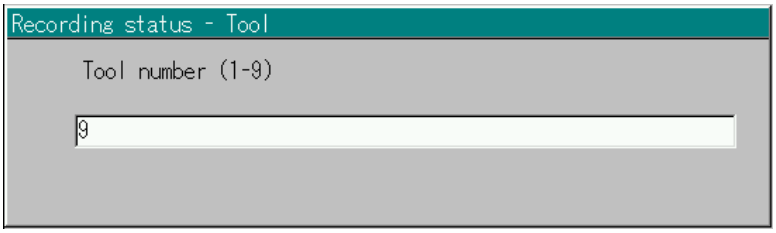
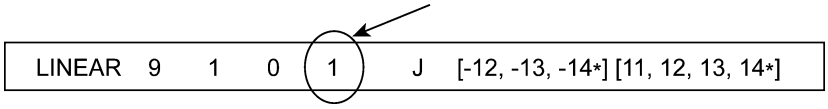
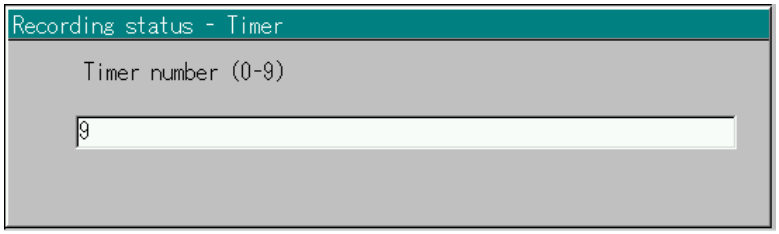
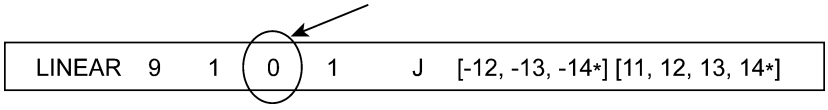
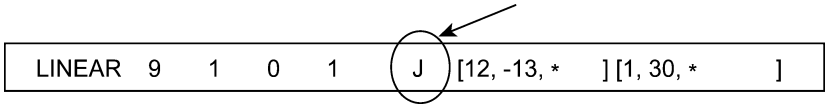
The record status refers to information to be recorded together with position data in each step. Before recording steps, set up the record status. The table below shows the names, definitions, and setup procedure of the record status.

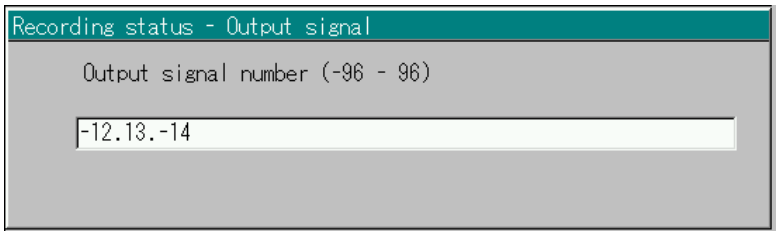
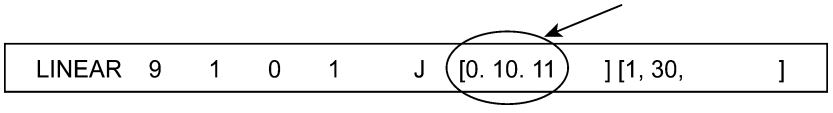
The record status can be set up with the teach pendant (keys on the keypad or function keys on the touch panel).

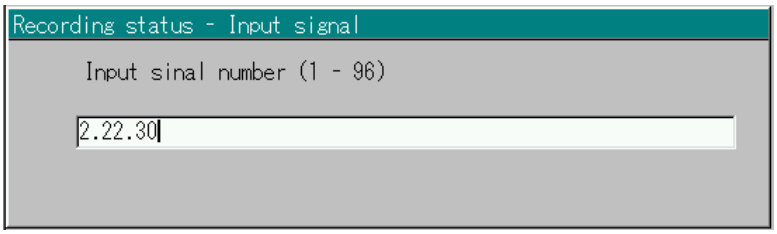
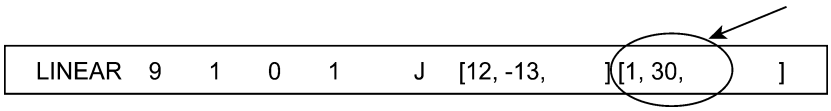
In the teach mode, the record status shows the current step status.

Name	Definitions and setup procedure
INTERP	Interpolation method to this step. With [ENABLE] held down, press [INTERP / COORD] to select the interpolation method. Each time [INTERP / COORD] is pressed, the interpolation method toggles between JOINT and LINEAR. 
SPD	Travel speed to this step. This records any of 10 speed numbers (0 to 9) which should be previously defined for speed data in % in the constant mode. Press [SPD], enter the desired speed number, and press [ENTER].   Entering a speed number is called "indirect speed specification."

Name	Definitions and setup procedure
SPD	**Tip: "Direct speed specification"** The direct speed specification function can be enabled or disabled with the Option Menu. The default is "disable." If this function is enabled, the direct speed specification becomes available, e.g., in mm/sec with the following procedure. Press SPD, ON 1, + 0, and ENTER, and the speed direct entry screen appears. Enter the desired speed (mm/sec) and press ENTER. The direct speed specification applies to LINEAR only, not to JOINT. If the interpolation is switched from LINEAR to JOINT after the speed is directly specified for LINEAR, the speed number 1 (default) in indirect specification applies. The directly specified speed data will be processed as data in mm/sec. if the interpolation is LINEAR. 
ACC	Positioning accuracy in this step. This records any of 5 accuracy numbers (0 to 4) which should be previously defined for distance in mm at the record point in positioning in the Teach/Playback Conditions screen. 0: Encoder value basis 1 to 4: Commanded value basis For details, refer to Section 3.3.3 "Notes for Using Base Programs and PAC Programs." Press ACC, enter the desired accuracy number, and press ENTER. 

Name	Definitions and setup procedure
TOOL	Tool number (1 to 9) to apply in movement to this step. In the Teach/Playback Conditions screen, tool numbers should be previously defined for the TCP distance, inclination, center of gravity, weight, and other parameters of individual tools. Press [Tool 1], enter the desired tool number, and press [ENTER].  
TMR	Timer for waiting time after axis position matching* in this step. (*axis position matching: Arrival of tool end at the target position) This records any of 10 timer numbers (0 to 9) which should be previously defined in the Teach/Playback Conditions screen. Timer 0: Zero second fixed Press [TMR], enter the desired timer number, and press [ENTER].  
J/E	Jump/End command to proceed from this step. Each time [J/E] is pressed, the setting cycles through the following. (None): Proceed to the next step. J: Jump command E: End command 

Name	Definitions and setup procedure
OUT	User output signal that turns ON or OFF after axis position matching in this step. Up to 96 output signals can be recorded. Press [OUT], and the following entry window appears.  - The current record status appears in the ascending order of absolute values. Enter new signals to record, with + for ON and - for OFF. - A single step can have both ON and OFF signals. (For the playback procedure, refer to Chapter 5, Section 5.3.) - To enter signal numbers in succession, delimit them with periods (.). - To delete a signal number (not to turn the signal on or off), move the cursor to the position immediately following the signal number and then press [BS]. - To reset all signal numbers at a time, enter a zero (0). On the program display area, "0" is displayed in the OUTPUT field at the step. - At the step in which all output signal numbers are reset, "0" is displayed in the OUTPUT field on the program display area. - To reset signal numbers except particular ones (10 and 11 for example), enter a zero (0) preceding the particular signal numbers (in this example, enter 0.10.11). On the program display area, "0.10.11" is displayed in the OUTPUT field at the step. - Upon completion of entry, press [ENTER], and the entry window shown above closes. - The record status entered and output information of taught steps are displayed in the ascending order of absolute values of signal numbers in the OUTPUT field. The same signal numbers with + and - are displayed with the + one first.  - If output signal numbers entered overflow the record status area, an asterisk (*) appears instead of the overflowed ones.

Name	Definitions and setup procedure
IN	After axis position matching, the robot waits for this input signal to turn ON. Up to 96 input signals can be recorded. Press [IN] to display the following entry window.  - The current record status appears in the ascending order of absolute values. Enter new signals to record. - No signals with - can be specified. - To enter signal numbers in succession, delimit them with periods (.). - To delete a signal number, move the cursor to the position immediately following the signal number and then press [BS]. - Upon completion of entry, press [ENTER], and the entry window shown above closes. - The record status entered and input information of taught steps are displayed in the ascending order of signal numbers in the INPUT field.  - If output signal numbers entered overflow the record status area, an asterisk (*) appears instead of the overflowed ones.
COMMENT	Every step can be annotated with a comment consisting of up to 10 characters. The comment can be entered or displayed only on the on-screen edit window. On the teach mode screen, no comment can be entered.

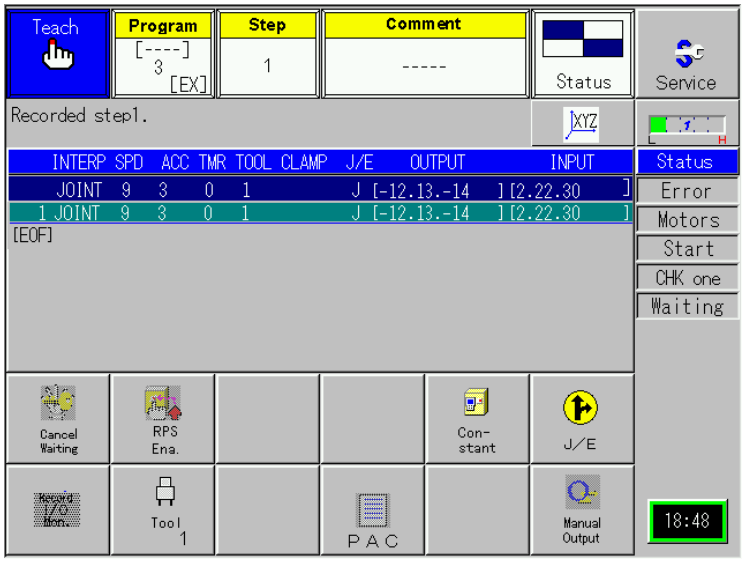
3.2 Recording Steps

Record steps using the procedure below.

Step 1

After the robot position and record status are determined, press O.WRITE REC.

Those data will be recorded at the step immediately following the currently displayed one. (If the target step has been taught, an error occurs.)



Step 2

Repeat the procedures of "Manual operation" (Chapter 2) → "Setting up record status" (Section 3.1) → "Recording steps" (Section 3.2)

The step number automatically increments.

3.3 Recording Function Codes

As listed below, function codes (FN codes, CALL_PAC and RUN_PAC) are provided for writing commands not covered by the record status, e.g., calling a sub program from a start program.

FN codes

	Unconditional	Conditional	Conditional with control pass count
Program call	FN80	FN81	FN82
Step jump	FN20	FN23	FN26
Comment	FN99	--	--

CALL_PAC and RUN_PAC

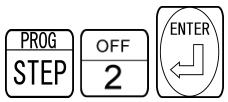
Call PAC program	CALL_PAC
Run PAC program	RUN_PAC

3.3.1 FN Codes

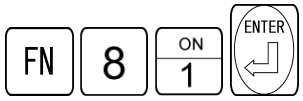
[1] Entry procedure

Given below is an example for recording the command "If input signal I13 is ON, call program 80" at the step following step 2.

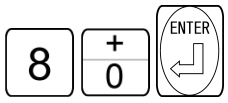
Step 1 On the top screen, select the step that a new step should follow.



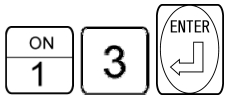
Step 2 Enter a conditional program call command.



Step 3 Enter the program number to be called.



Step 4 Enter the condition (input signal number).




```
 1 JOINT   9     1     0     1        J    [12, -13, 14, *] [1, 12, 30, *    ]
 2 JOINT   9     1     0     1             [                ] [              ]
 3 FN81 [080. I0013]
[EOF]
```

[2] FN code details

Function code	FN20
Name	Step jump
Function	Jump to the specified step in the same program.

■ Description

The FN20 jumps control to the specified step in the same program.

The jump-destination step can have a motion or function command.

■ Usage

The example below records an FN20 at step 4, with the jump-destination step 7.

When this example is played back, the control reaches step 4 and then jumps to step 7 without execution of steps 5 and 6.

FN20

	Interpolation	Speed	Accuracy	Timer	Tool	Clamp	J/E	OUT (O)	IN (I)	Jump to:
1	JOINT	9	1	0	1			[ ]	[ ]	
2	JOINT	9	1	0	0			[ ]	[ ]	
3	JOINT	9	1	0	1			[ ]	[ ]	
4	FN20 [007]							[ ]	[ ]	
5	JOINT	9	1	0	1			[ ]	[ ]	
6	JOINT	9	1	0	1			[ ]	[ ]	
7	JOINT	9	1	0	1			[ ]	[ ]	
8	JOINT	9	1	0	1			[ ]	[ ]	
9	JOINT	9	1	0	1			[ ]	[ ]	

■ Notes

- Using this command does not decelerate the robot.

■ Parameters

1st parameter	Description
Step number	Step number of jump destination. (1 to 999)

■ Display example

```
FN20 [007]
```

Function code	FN23
Name	Conditional step jump
Function	Jump to the specified step in the same program depending upon the given input signal state.

■ Description

The FN23 jumps control to the specified step in the same program if the specified input signal is ON. If the signal is OFF, the control passes to the next step without jump.

The jump-destination step can have a motion or function command.

■ Usage

The example below records an FN23 at step 4, with the jump-destination step 7 and input signal I1.

When this example is played back, control jumps to step 7 if input signal I1 is ON; it passes to step 5 if I1 is OFF.

FN23

	Interpolation	Speed	Accuracy	Timer	Tool	Clamp	J/E	OUT (O)	IN (I)	Jump to: If input signal is OFF	Jump to: If input signal is ON
1	JOINT	9	1	0	1			[ ]	[ ]		
2	JOINT	9	1	0	0			[ ]	[ ]		
3	JOINT	9	1	0	1			[ ]	[ ]		
4	FN23 [007, I1]									↓	┐
5	JOINT	9	1	0	1			[ ]	[ ]		│
6	JOINT	9	1	0	1			[ ]	[ ]		│
7	JOINT	9	1	0	1			[ ]	[ ]		←
8	JOINT	9	1	0	1			[ ]	[ ]		
9	JOINT	9	1	0	1			[ ]	[ ]		

■ Notes

- Using this command does not decelerate the robot.

■ Parameters

1st parameter	Description
Step number	Step number of jump destination. (1 to 999)

2nd parameter	Description
Input signal	Input signal number whose state is a jump execution condition. (1 to 96)

■ Display example

```
FN23 [007,I1]
```

Function code	FN26
Name	Conditional step jump with control pass count
Function	Jump to the specified step in the same program depending upon the control pass count.

■ Description

The FN26 jumps control to the specified step in the same program if control passes through the FN26 step by the "control pass count + 1."

If the "control pass count" is 2, for example, control passes through the FN26 step two times. At the 3rd pass, control jumps to the specified step.

The jump-destination step can have a motion or function command. The "control pass count" is counted in the specified register (V variable). When the register value exceeds the specified count, control jumps and the register value resets to zero.

■ Usage

The example below records an FN26 at step 4, with the jump-destination step 7, register #1 and the control pass count 2.

When this example is played back, control passes to step 5 at the 1st and 2nd passes. At the 3rd pass, control jumps to step 7.

FN26

	Interpolation	Speed	Accuracy	Timer	Tool	Clamp	J/E	OUT (O)	IN (I)	Jump to: 1st & 2nd passes	Jump to: 3rd pass
1	JOINT	9	1	0	1			[ ]	[ ]		
2	JOINT	9	1	0	0			[ ]	[ ]		
3	JOINT	9	1	0	1			[ ]	[ ]		
4	FN26 [007, V1%, 2]									↓	┐
5	JOINT	9	1	0	1			[ ]	[ ]		
6	JOINT	9	1	0	1			[ ]	[ ]		
7	JOINT	9	1	0	1			[ ]	[ ]		←
8	JOINT	9	1	0	1			[ ]	[ ]		
9	JOINT	9	1	0	1			[ ]	[ ]		

■ Notes

- Using this command does not decelerate the robot.
- The current control pass count can be referred to with Monitor | Integer variable.

■ Parameters

1st parameter	Description
Step number	Step number of jump destination. (1 to 999)

2nd parameter	Description
Register #	The register refers to a memory that counts how many times control passes through the FN26 step. (Integer variable 1 to 200) * (Use global integer variables I1 to I200 in PAC language.)

3rd parameter	Description
Control pass count	Count of control passes which is a jump execution condition. Control passes through the F26 step by the "control pass count + 1" and then jumps to the specified step. (1 to 10000)

* The default number of global integer variables to be used is 100. To use more than 100 variables, change the number of variables to be used referring to the SETTING-UP MANUAL (T03), Chapter 5 "Commands Assigned to Function Keys on the Extended Screen," "Displaying and modifying the number of variables used."

■ Display example

```
FN26 [007,V1%,2]
```

Function code	FN80
Name	Program call
Function	Call the specified program.

■ Description

The FN80 calls the specified program.

Upon completion of playback of the called program, control returns to the step immediately following the FN80 step in the original program.

■ Usage

The example below records an FN80 at step 4, with program number 002.

When this example is played back, control is transferred from step 4 of program 001 to the first step of program 002. Upon completion of playback of program 002, control returns to step 5 immediately following the FN80 step of program 001.

FN80 001

	Interpolation	Speed	Accuracy	Timer	Tool	Clamp	J/E	OUT (O)	IN (I)
1	JOINT	9	1	0	1			[ ]	[ ]
2	JOINT	9	1	0	0			[ ]	[ ]
3	JOINT	9	1	0	1			[ ]	[ ]
4	FN80 [002]								
5	JOINT	9	1	0	1			[ ]	[ ]
6	JOINT	9	1	0	1			[ ]	[ ]
7	JOINT	9	1	0	1			[ ]	[ ]
8	JOINT	9	1	0	1			[ ]	[ ]
9	JOINT	9	1	0	1			[ ]	[ ]

002

	Interpolation	Speed	Accuracy	Timer	Tool	Clamp	J/E	OUT (O)	IN (I)
1	JOINT	9	1	0	1			[ ]	[ ]
2	JOINT	9	1	0	0			[ ]	[ ]
3	JOINT	9	1	0	1			[ ]	[ ]

■ Notes

- Using this command does not decelerate the robot.
- In the called program (program 002 in the above example), an FN80 can execute. Up to eight levels of nesting of FN80 are allowed. Nesting exceeding the limit causes the alarm "2D05: Illegal call commands" and stops the robot.

■ Parameters

1st parameter	Description
Program number	Program number to call. (0 to 999)

■ Display example

```
FN80 [002]
```

Function code	FN81
Name	Conditional program call
Function	Call the specified program depending upon the given input signal state.

■ Description

The FN81 calls the specified program if the specified input signal is ON. If the signal is OFF, control passes through the FN81 step without call.

Upon completion of playback of the called program, control returns to the step immediately following the FN81 step in the original program.

■ Usage

The example below records an FN81 at step 4, with program number 002 and input signal I1.

When this example is played back, control is transferred from step 4 of program 001 to the first step of program 002 if input signal I1 is ON. Upon completion of playback of program 002, control returns to step 5 immediately following the FN81 step of program 001.

If input signal I1 is OFF, control does not pass to program 002.

FN81 001

	Interpolation	Speed	Accuracy	Timer	Tool	Clamp	J/E	OUT (O)	IN (I)	Jump to: If input signal is OFF	Jump to: If input signal is ON
1	JOINT	9	1	0	1			[ ]	[ ]		
2	JOINT	9	1	0	0			[ ]	[ ]		
3	JOINT	9	1	0	1			[ ]	[ ]		
4	FN81 [007,I1]										
5	JOINT	9	1	0	1			[ ]	[ ]		
6	JOINT	9	1	0	1			[ ]	[ ]		
7	JOINT	9	1	0	1			[ ]	[ ]		
8	JOINT	9	1	0	1			[ ]	[ ]		
9	JOINT	9	1	0	1			[ ]	[ ]		

002

	Interpolation	Speed	Accuracy	Timer	Tool	Clamp	J/E	OUT (O)	IN (I)
1	JOINT	9	1	0	1			[ ]	[ ]
2	JOINT	9	1	0	0			[ ]	[ ]
3	JOINT	9	1	0	1			[ ]	[ ]

■ Notes

- Using this command does not decelerate the robot.

  If the signal is ON, the tool ends turns inwards to take a shortcut. If it is OFF, the virtual tool end moves towards the target position and when the actual tool end reaches the accuracy range of the area, the program checks the input signal state again.

- In the called program (program 002 in the above example), an FN81 can execute. Up to eight levels of nesting of FN81 are allowed. Nesting exceeding the limit causes the alarm "2D05: Illegal call commands" and stops the robot.

■ Parameters

1st parameter	Description
Program number	Program number to call. (0 to 999)

2nd parameter	Description
Input signal	Input signal number whose state is a call execution condition. (1 to 96)

■ Display example

```
FN81 [007,I1]
```

Function code	FN82
Name	Conditional program call with control pass count
Function	Call the specified program depending upon the control pass count.

■ Description

The FN82 calls the specified program if control passes through the FN82 step by the "control pass count +1."

If the "control pass count" is 2, for example, control passes through the FN82 step two times. At the 3rd pass, control calls the specified program.

Upon completion of playback of the called program, control returns to the step immediately following the FN82 step in the original program.

■ Usage

The example below records an FN82 at step 4, with program number 002, register #1 and the control pass count 2.

When this example is played back, control passes to step 5 at the 1st and 2nd passes. At the 3rd pass, control is transferred from step 4 of program 001 to the first step of program 002. Upon completion of playback of program 002, control returns to step 5 immediately following the FN82 step of program 001.

FN82 001

	Interpolation	Speed	Accuracy	Timer	Tool	Clamp	J/E	OUT (O)	IN (I)	Jump to: 1st & 2nd passes	Jump to: 3rd pass
1	JOINT	9	1	0	1			[ ]	[ ]		
2	JOINT	9	1	0	0			[ ]	[ ]		
3	JOINT	9	1	0	1			[ ]	[ ]		
4	FN82 [007,V1%,2]										
5	JOINT	9	1	0	1			[ ]	[ ]		
6	JOINT	9	1	0	1			[ ]	[ ]		
7	JOINT	9	1	0	1			[ ]	[ ]		
8	JOINT	9	1	0	1			[ ]	[ ]		
9	JOINT	9	1	0	1			[ ]	[ ]		

002

	Interpolation	Speed	Accuracy	Timer	Tool	Clamp	J/E	OUT (O)	IN (I)
1	JOINT	9	1	0	1			[ ]	[ ]
2	JOINT	9	1	0	0			[ ]	[ ]
3	JOINT	9	1	0	1			[ ]	[ ]

■ Notes

- Using this command does not decelerate the robot.
- In the called program (program 002 in the above example), an FN82 can execute. Up to eight levels of nesting of FN82 are allowed. Nesting exceeding the limit causes the alarm "2D05: Illegal call commands" and stops the robot.
- The current control pass count can be referred to with Monitor | Integer variable.

■ Parameters

1st parameter	Description
Program number	Program number to call. (1 to 999)

2nd parameter	Description
Register #	The register refers to a memory that counts how many times control passes through the FN82 step. (Integer variable 1 to 200) * (Use global integer variables I1 to I200 in PAC language.)

3rd parameter	Description
Control pass count	Count of control passes which is a call execution condition. Control passes through the F82 step by the "control pass count + 1" and then calls the specified program. (1 to 10000)

* The default number of global integer variables to be used is 100. To use more than 100 variables, change the number of variables to be used referring to the SETTING-UP MANUAL (T03), Chapter 5 "Commands Assigned to Function Keys on the Extended Screen," "Displaying and modifying the number of variables used."

■ Display example

```
FN82 [007,V1%,2]
```

Function code	FN99
Name	Comment
Function	Declare the rest of a step to be comments.

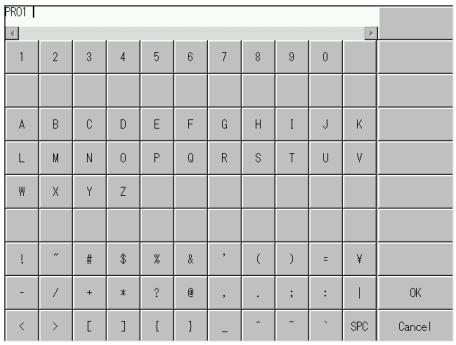
■ Description

The FN99 allows you to describe a comment in a program.

Entering an FN99 calls up the following software keypad with which you can enter ASCII characters.

A comment described at step 0 will be treated as a program name and displayed in the Program name area at the upper section of the touch panel.

Software keypad



■ Notes

- Using this command does not decelerate the robot.
- Any number of comments can be described in a program.

■ Parameters

1st parameter	Description
Comment	Text consisting of a maximum of 60 characters

■ Display example

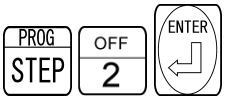
```
FN99 [ ABC ]
```

3.3.2 CALL_PAC and RUN_PAC

[1] Entry procedure

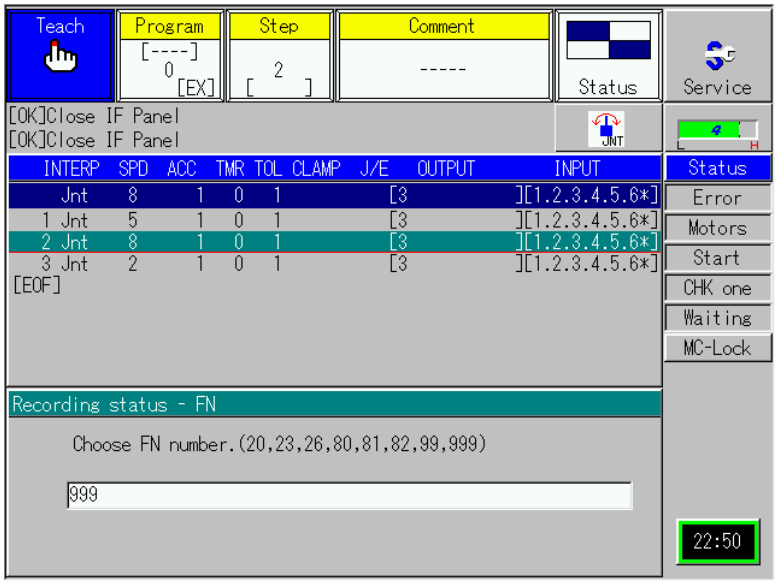
Step 1

On the top screen, select the step that a new step should follow.



Step 2

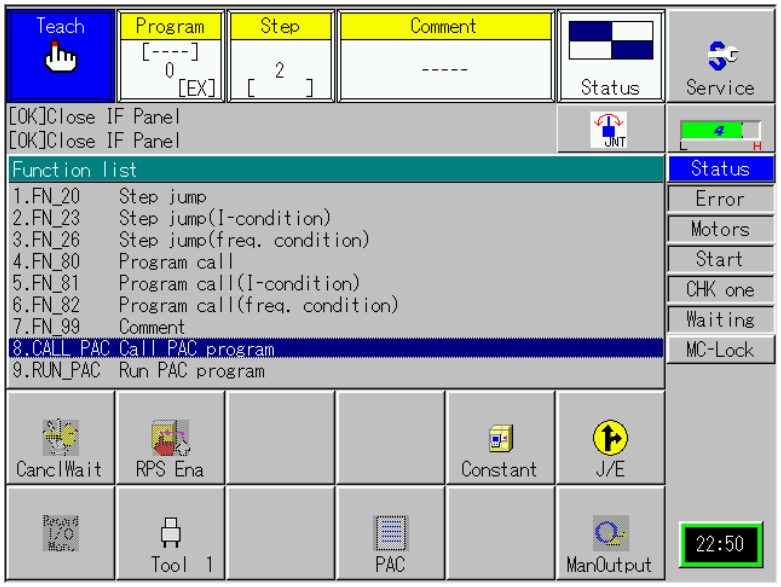
Press FN, enter 999, and then press ENTER.



Step 3

A list of function codes appears.

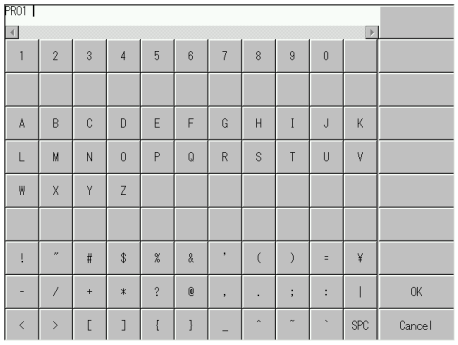
Select CALL_PAC (or RUN_PAC), and then press ENTER.



Step 4

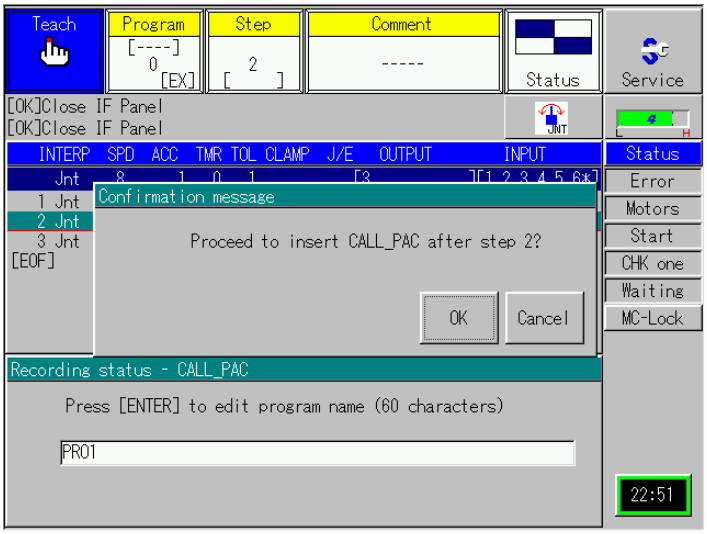
The software keypad appears.
Enter the name of the PAC program and then press the OK button on the software keypad or 

on the hardware keypad.



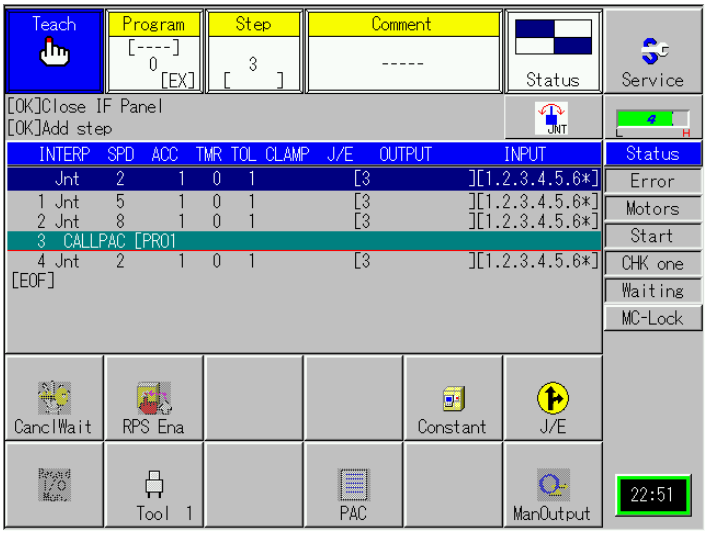
Step 5

The confirmation window appears.
Press OK.



Step 6

Check that `CALL_PAC` is inserted.



[2] CALL_PAC and RUN_PAC details

Function code	CALL_PAC
Name	PAC program call
Function	Call the specified PAC program.

■ Description

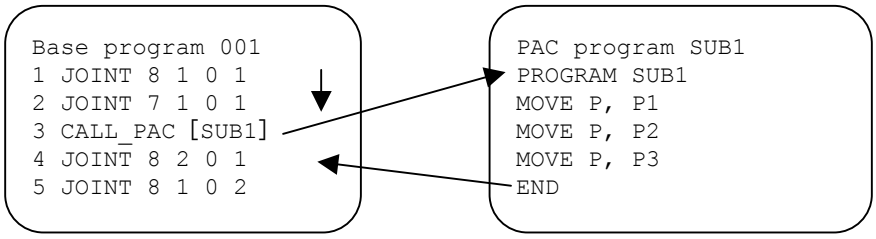
The CALL_PAC calls the specified PAC program.

Upon completion of playback of the called program, control returns to the step immediately following the CALL_PAC step in the original program.

■ Usage

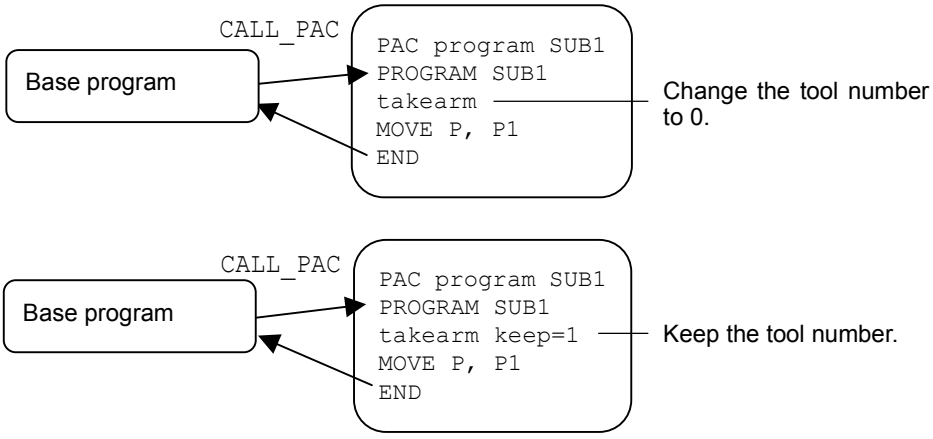
The example below records a CALL_PAC at step 3, with PAC program SUB1.

When this example is played back, control is transferred from step 3 of program 001 to the first step of PAC program SUB1. Upon completion of playback of SUB1, control returns to step 4 immediately following the CALL_PAC step of program 001.



■ Notes

- Using this command does not decelerate the robot.
- In the called PAC program (SUB1 in the above example), it is possible to call any other PAC program, but not possible to call a base program.
- If the PAC program specified in this command does not exist, the error "2D06: Specified PAC program does not exist." occurs.
- This command is executable even at the first step.
- Executing a takearm statement in a PAC program called by a base program changes the tool number to 0. To block the number change, use a keep option of a takearm statement.



■ Parameters

1st parameter	Description
Program name	PAC program name to call. (Max. 64 characters)

■ Display example

```
CALL PAC [SUB1]
```

Function code	RUN_PAC
Name	Parallel execution of PAC program
Function	Run the specified PAC program in parallel.

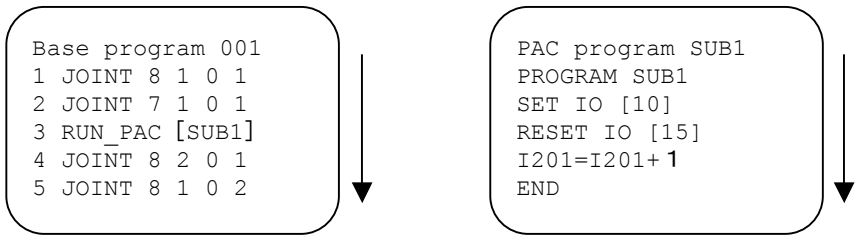
■ Description

The RUN_PAC executes the specified PAC program in parallel.

■ Usage

The example below records a CALL_PAC at step 3, with PAC program SUB1.

When base program 001 is played back and control passes to step 3, the CALL_PAC starts PAC program SUB1. That is, both base program 001 and PAC program SUB1 are concurrently executed.



■ Notes

- Using this command does not decelerate the robot.
- A PAC program (SUB1 in the above example) cannot run a base program.
- This command is executable even at the first step.
- To run a PAC program again after stop, reexecute a PAC program in a base program.

■ Parameters

1st parameter	Description
Program name	PAC program name to run. (Max. 64 characters)

■ Display example

```
RUN PAC [SUB1]
```

3.3.3 Notes for Using Base Programs and PAC Programs

(1) Integer variable

Integer variables V1 to V200 in base programs are functionally equivalent to global integer variables I1 to I200 in PAC programs.

Both the "I100=1" in PAC programs and "V100=1" in base programs refer to the same variable area.

Integer variables in base programs	Global integer variables in PAC programs
	I0
V1	I1
V2	I2
•	•
•	•
V200	I200
•	

(2) Relationship between cubes and areas

This robot system uses AREA0 to AREA3 for setting up the home position, so they are not available in PAC programs. (AREA4 to AREA7 are available.)

AREA0 to AREA3 correspond to Cube 1 to Cube 4 in base programs.

AREA 0 = Cube 1
AREA 1 = Cube 2
AREA 2 = Cube 3
AREA 3 = Cube 4

(3) Notes for starting programs

- A base program can be started directly from external equipment, but a PAC program cannot.
- To start a PAC program, use a `CALL_PAC` or `RUN_PAC` command in a base program.

(4) About takearm

Starting a base program causes a takearm command to execute internally. When program transaction returns to a base program, a takearm command is automatically executed even if a PAC program as shown below is called by a CALL_PAC.

Therefore, an error occurs if a takearm command is executed in a PAC program

that called from a base program by a RUN_PAC.

```
Base program
JOINT 1 1 0 1
CALL_PAC EXE_GIVEARM
RUN_PAC SUB1
```

```
PAC program
PROGRAM EXE_GIVEARM
givearm
end
```

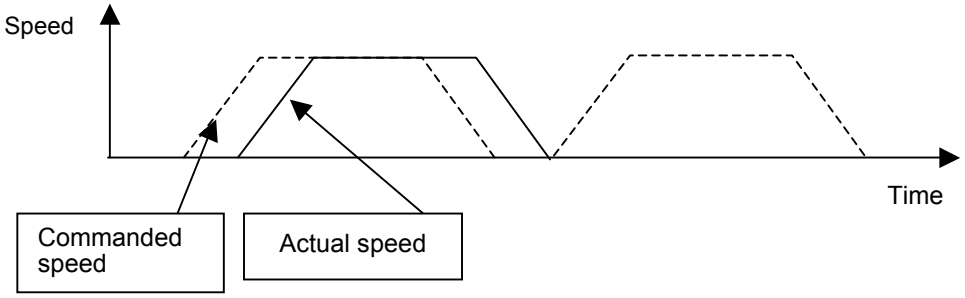
For details about the PAC program, refer to the Programmer's Manual (I) (T03).

(5) About positioning accuracy

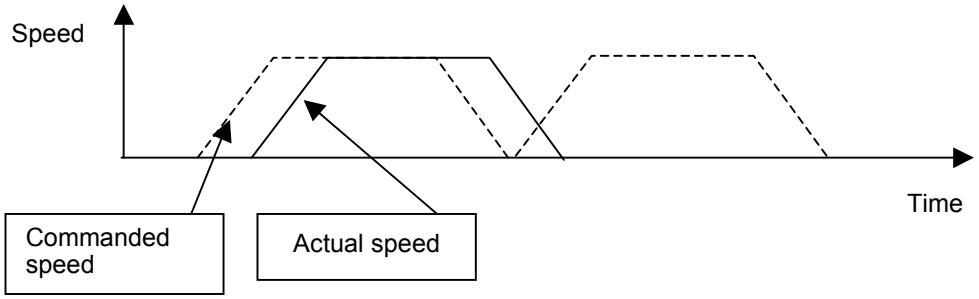
The entry range of the accuracy indexes has changed from 1 to 4 to 0 to 4.

Index	Entry range	Default
0	0.0 mm (Fixed. User modification not allowed)	0.0 mm
1	0.1 to 100.0 mm (Based on commanded value)	0.5 mm
2		20 mm
3		300 mm
4		600 mm

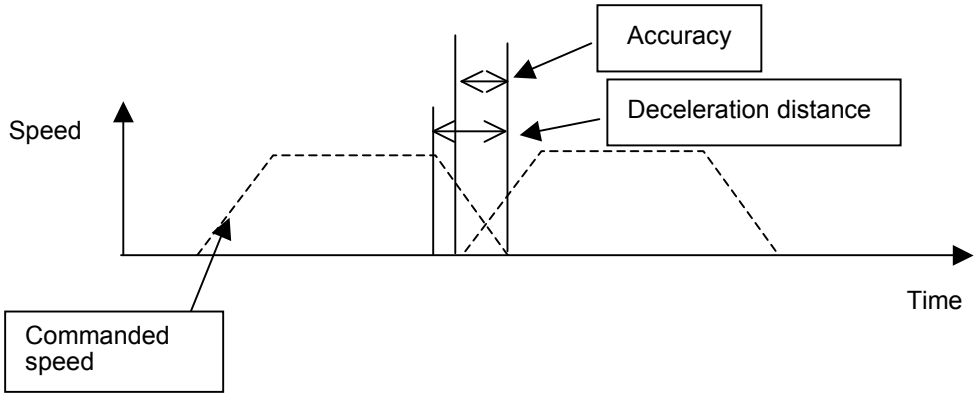
- When the entry range is 0.0 mm: The moment the robot encoder angle reaches the target value, the next step executes.



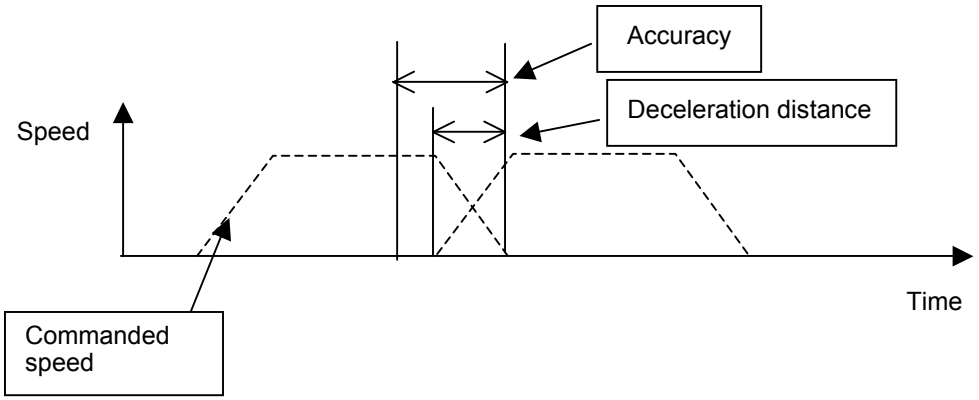
- When the entry range is "0.1 ≤ Accuracy < 1.0": The moment the commanded speed value reaches the target value, the next step executes.



- When the entry range is "Deceleration distance > Accuracy": The moment the commanded speed value reaches the accuracy range of the area specified, the next step executes.



- When the entry range is "Deceleration distance ≤ Accuracy": The moment the commanded value reaches the start point of deceleration, the next step executes.



3.4 Program Samples

(1) Start program

Moving from the 1st to the 2nd home position.

The FN81 checks the input signal I0013. If it is ON, the FN81 calls program 80.

```
    Interpolation  Speed  Accuracy  Timer  Tool  Clamp  J/E  OUT (O)  IN (I)

 1  JOINT          0      2         0      1                [0    ]  [1    ]
 2  JOINT          9      3         0      1                [     ]  [     ]
 3  JOINT          9      3         0      1                [     ]  [     ]
 4  FN81[080,I0013]
 5  JOINT          9      2         0      1           J    [     ]  [     ]
 6  JOINT          9      2         0      1                [     ]  [     ]
 7  JOINT          9      2         0      1                [     ]  [1    ]
 8  JOINT          9      2         0      1           E    [     ]  [     ]
```

(2) Jumped-to program

Executing sub jobs and returning to the original position.

This program is called by the start program.

```
    Interpolation  Speed  Accuracy  Timer  Tool  Clamp  J/E  OUT (O)  IN (I)

 1  JOINT          0      2         0      1                [0    ]  [1    ]
 2  JOINT          9      2         0      1                [     ]  [     ]
 3  JOINT          9      2         0      1                [     ]  [     ]
 4  JOINT          9      1         0      1                [22   ]  [     ]
 5  JOINT          9      2         0      1                [-22  ]  [     ]
 6  JOINT          9      2         0      1                [     ]  [     ]  End
[EOF]
```

(3) Job program

Starting from the 2nd home position, executing jobs, and returning to the 1st home position.

```
    Interpolation  Speed  Accuracy  Timer  Tool  Clamp  J/E  OUT (O)  IN (I)

 1  JOINT          0      2         0      1                [0    ]  [     ]
 2  LINEAR         9      2         0      1                [     ]  [     ]
 3  LINEAR         9      1         0      1                [     ]  [     ]
 4  LINEAR         9      1         0      1                [     ]  [     ]
 5  LINEAR         9      1         0      1                [     ]  [     ]
 6  LINEAR         9      1         0      1                [     ]  [     ]
  . . .
70  JOINT          9      2         0      1                [2    ]  [     ]
71  JOINT          9      2         0      1                [-2   ]  [     ]
72  JOINT          9      2         0      1                [     ]  [1    ]
73  LINEAR         9      2         0      1           E    [     ]  [     ]
[EOF]
```

1st home position

3.5 Editing Programs with Base Program Editor

Using the base program editor allows you to edit base programs stored in your PC.

This section gives the program editing procedure using the base program editor.

3.5.1 Receiving Programs using WINCAPSIII (Controller → PC)

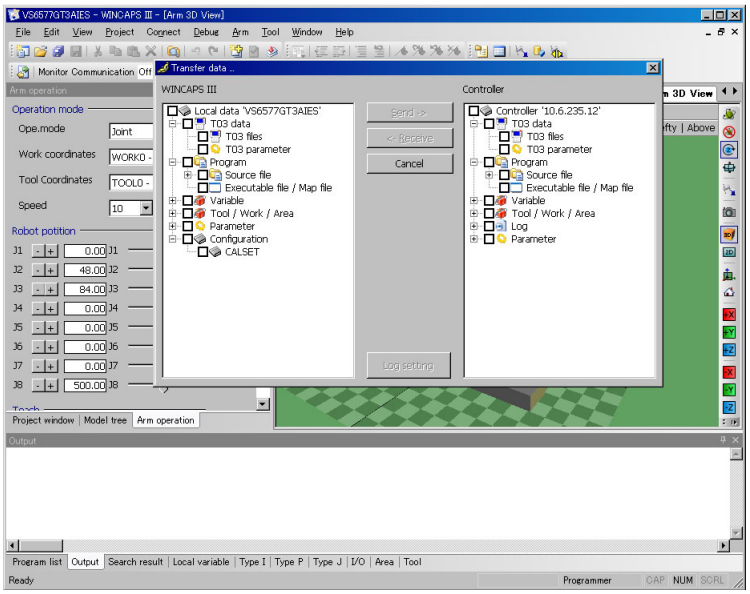
Use WINCAPSIII and receive the program to edit from the robot controller.

Step 1

Connect WINCAPSIII in your PC to the controller.

Select **Connect | Transfer data**.

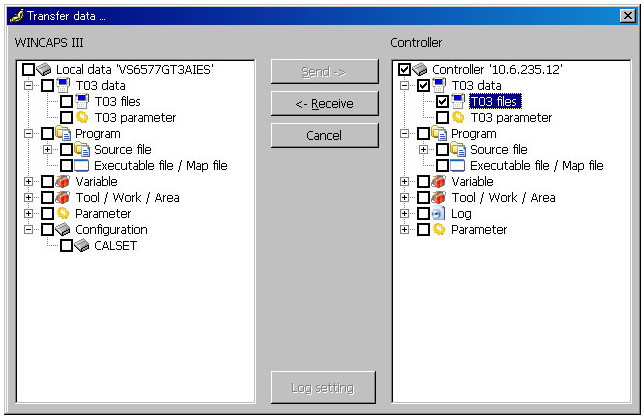
The Transfer dialog box appears as shown below.



Step 2

Select the "T03 files" check box in the Controller frame.

This enables WINCAPSIII to receive data from the controller into a folder where the current WINCAPSIII project is stored.



WINCAPSIII receives the following types of files from the controller.

- Base program file: rrrr.nnn.TTP
  (where, rrrr is a robot model name and nnn is a program number, any of 0 to 999.)
- Interface panel configuration file: IFPANELnn.IFP
  (where, nn is a page number, any of 00 to 09.)
- Controller error definition file: PLCERROR.EPL

Note: File transfer with the "T03 files" check box being selected causes all of the base program file, interface panel configuration file, and controller error definition file to be transferred at a time.

Note: To make the interface panel configuration transferred by WINCAPSIII go into effect, restarting the controller is required.

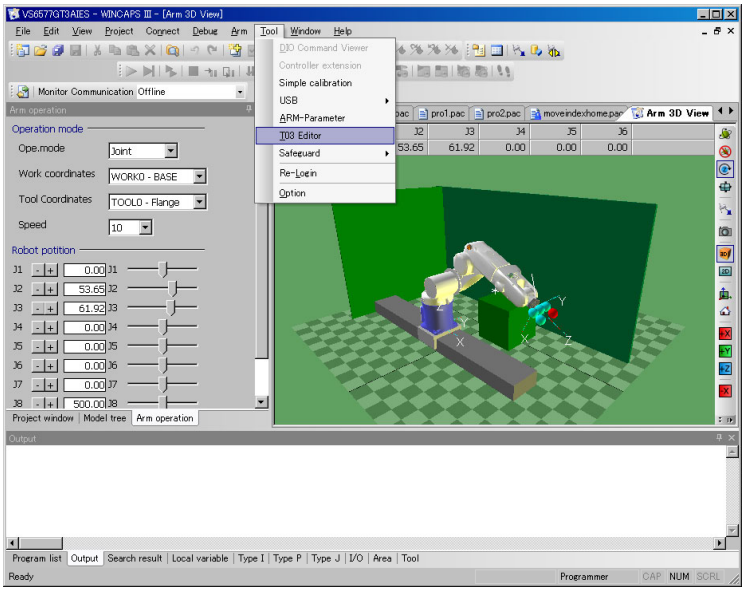
3.5.2 Editing Programs

Edit program files received in the previous section, using the base program editor.

Step 1

Starting the base program editor

In WINCAPSIII, select **Tool | T03 Editor**.

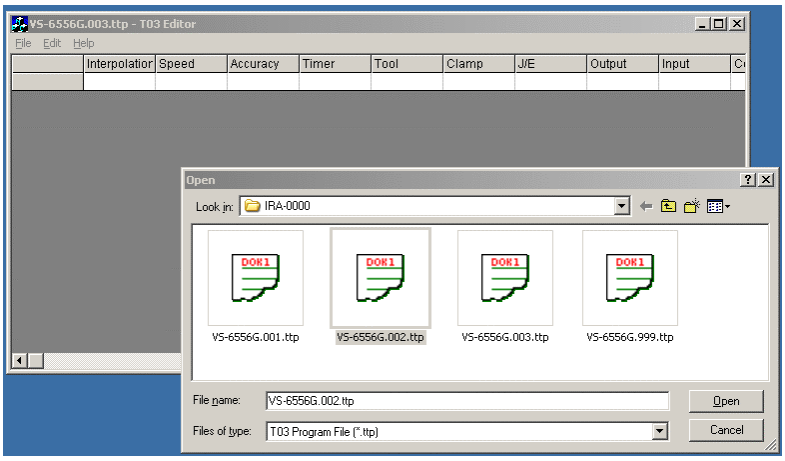


Step 2

Selecting the file to edit

If the editor runs, select **File | Open**.

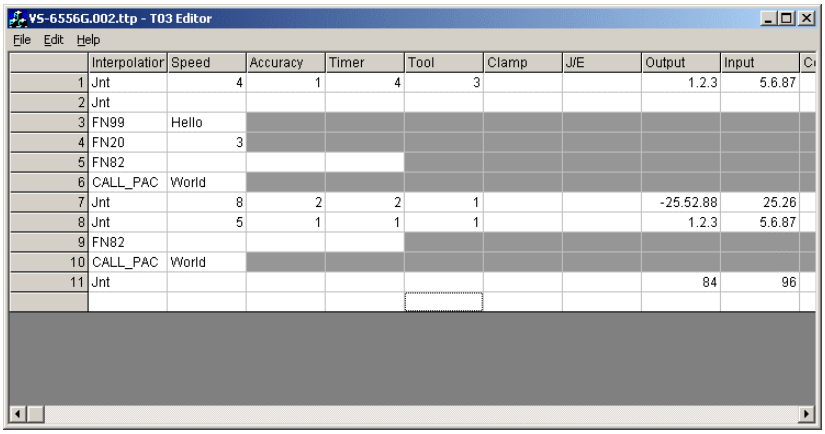
The "Open file" dialog box appears, in which the desired file can be selected.



Step 3

Select the desired file to edit.

The editor shows the contents of the selected file.



	Interpolation	Speed	Accuracy	Timer	Tool	Clamp	J/E	Output	Input
1	Jnt	4	1	4	3			1.2.3	5.6.87
2	Jnt								
3	FN99	Hello							
4	FN20	3							
5	FN82								
6	CALL_PAC	World							
7	Jnt	8	2	2	1			-25.52.88	25.26
8	Jnt	5	1	1	1			1.2.3	5.6.87
9	FN82								
10	CALL_PAC	World							
11	Jnt							84	96

Step 4

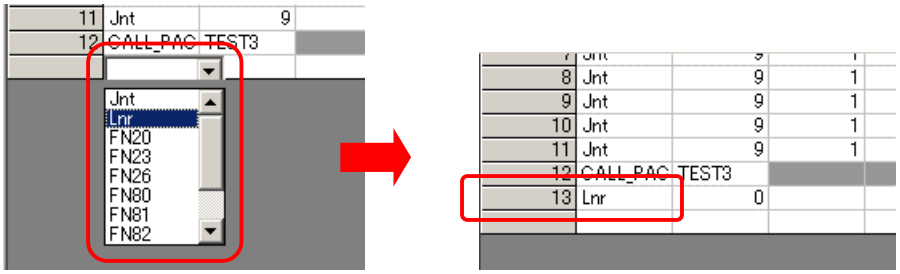
Editing the file

The editor allows you to easily edit programs with the mouse and keyboard.

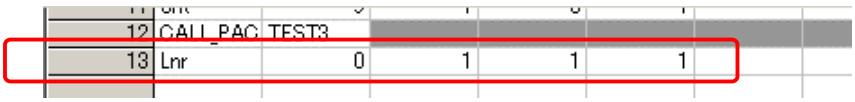
(1) Adding lines

Click the Interpolation column in the last line to display command candidates to be added.

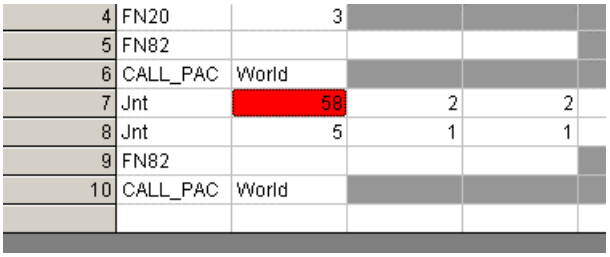
Select the desired command, and one line is newly added.



Enter parameter values necessary to the command to complete the new line.



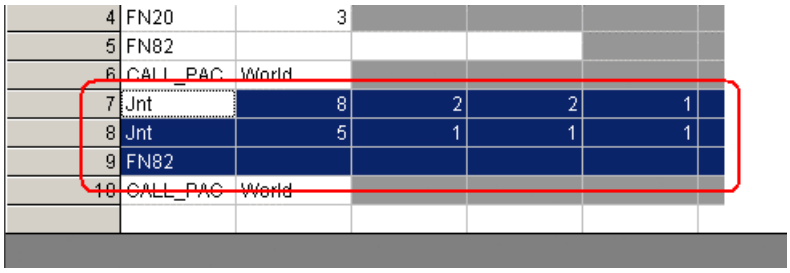
Note: If an invalid parameter value is entered, the field may turn red, prompting you to correct it.



(2) Selecting lines

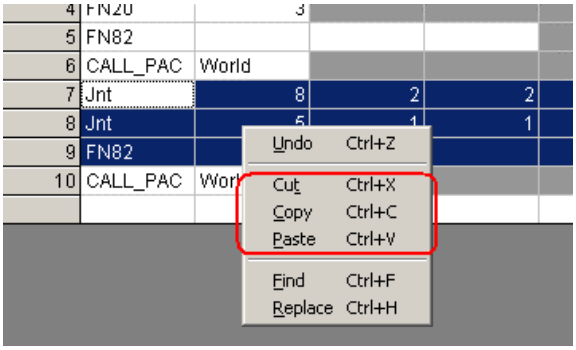
Click the step column to select the whole line.

It is possible to select two or more lines at a time.



(3) Deleting, copying, or pasting lines

Right-click the mouse or click **Edit**, and the following menu appears.



- To delete a line, select **Trim**.
- To copy a line, select **Copy**.
- To paste a line, select **Paste**.

3.5.3 Transmitting Programs using WINCAPSIII (PC → Controller)

Transmit edited program files to the controller with the "Transfer data" menu in WINCAPSIII.

Step 1

Before transmitting files in WINCAPSIII, make sure that:

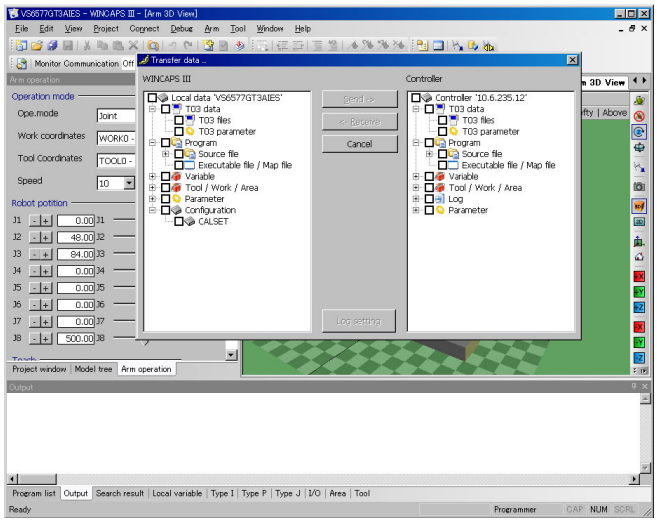
- the controller is in the teach mode,
- motors are turned OFF, and
- programs and various settings are not being edited.

Step 2

Connect WINCAPSIII in your PC to the controller.

Select **Connect | Transfer data**.

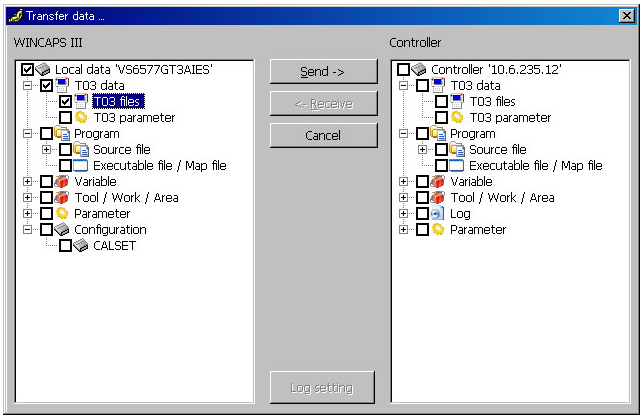
The Transfer data dialog box appears as shown below.



Step 3

Select the "T03 files" check box in the WINCAPSIII frame.

This enables WINCAPSIII to transmit data from a folder where the current WINCAPSIII project is stored, to the controller.



Note: File transfer with the "T03 files" check box being selected causes all of the base program file, interface panel configuration file, and controller error definition file to be transferred at a time.

Note: To make the interface panel configuration transferred by WINCAPSIII go into effect, restarting the controller is required.

Chapter 4
Teach-Checking and Correcting

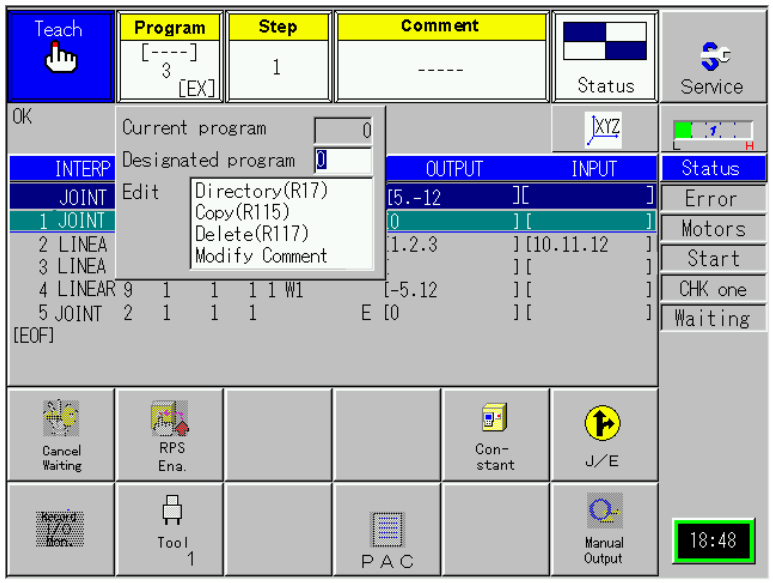
4.1 Selecting a Step

This section gives the step selecting procedure. The example below selects step 3 of program 3.

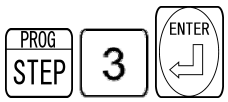
Step 1 Select the program to teach-check with either of the following keypad operation.

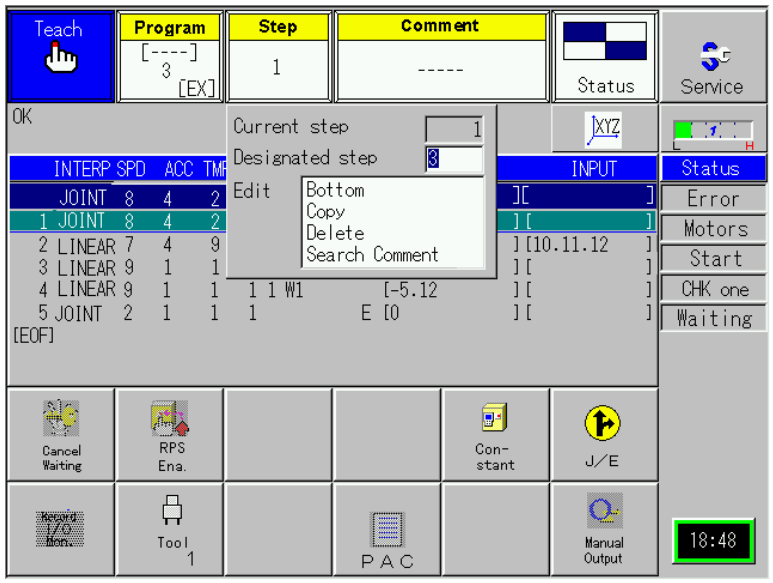
- While holding down the **ENABLE** key, press the **STEP** key. Next, press **3** and **ENTER** keys.

- Press the **Program**, **3**, and **ENTER** keys in this order.



Step 2 Press the **STEP**, **3**, and **ENTER** keys.





If the specified step does not exist, the final taught step will be selected.

If no step has been taught, step 0 will be selected.

4.2 Performing CHECK GO and CHECK BACK

Step 1

■ CHECK GO

While holding down the deadman switch, press the **CHECK GO** key.

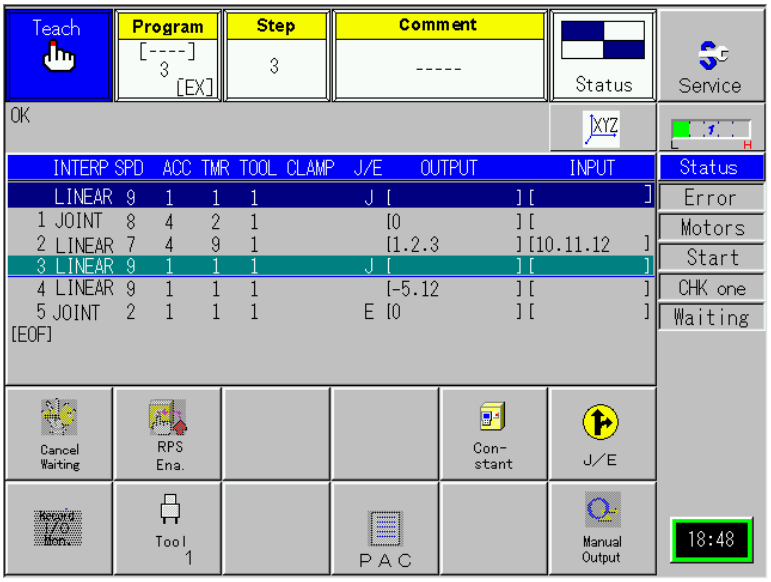
Deadman switch + CHECK GO

■ CHECK BACK

While holding down the deadman switch, press the **CHECK BACK** key.

Deadman switch + CHECK BACK

< Touch panel >

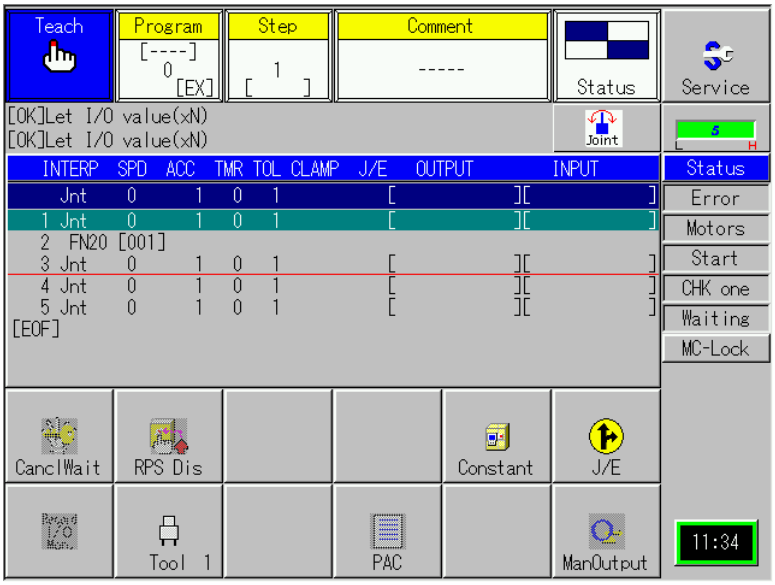


- The CHECK BACK operation reverses steps from the current step. After switching steps, the CHECK BACK operation also reverses steps.
- Continuous CHECK BACK operation is possible.
- In both CHECK GO and CHECK BACK operations, the tool end turns inwards to take a shortcut.

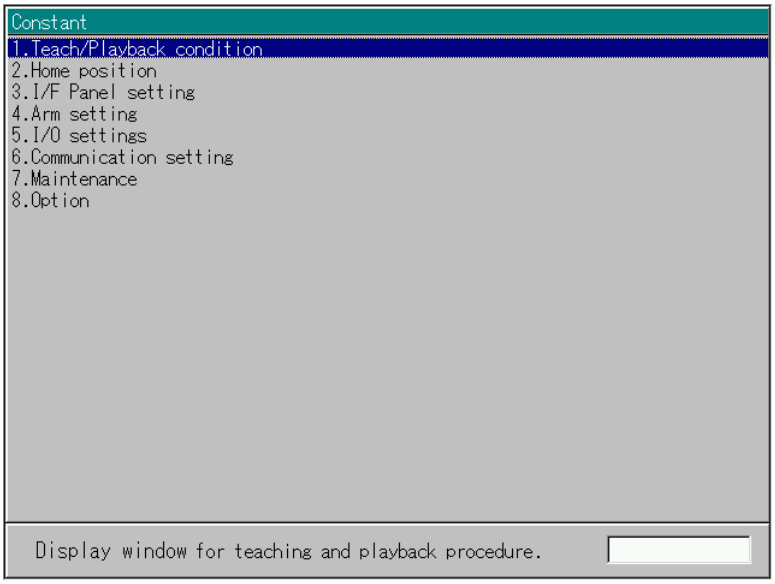
- In CHECK GO operation, the CALL_PAC transfers control to the PAC program screen and executes steps. The CHECK BACK operation skips the CALL_PAC step.

  Note: Whether or not to transfer control to the PAC program screen can be selected using the following procedure.

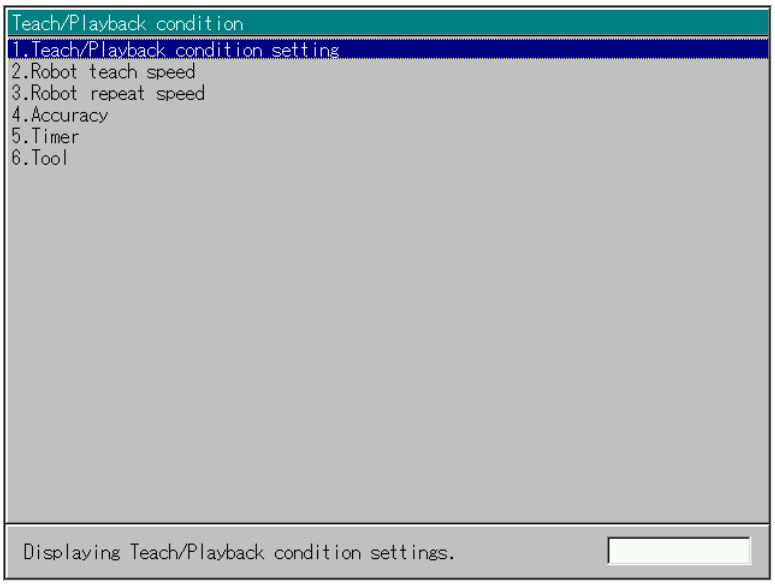
1) In the teach mode, press the **Constant** key on the top screen of the touch panel.



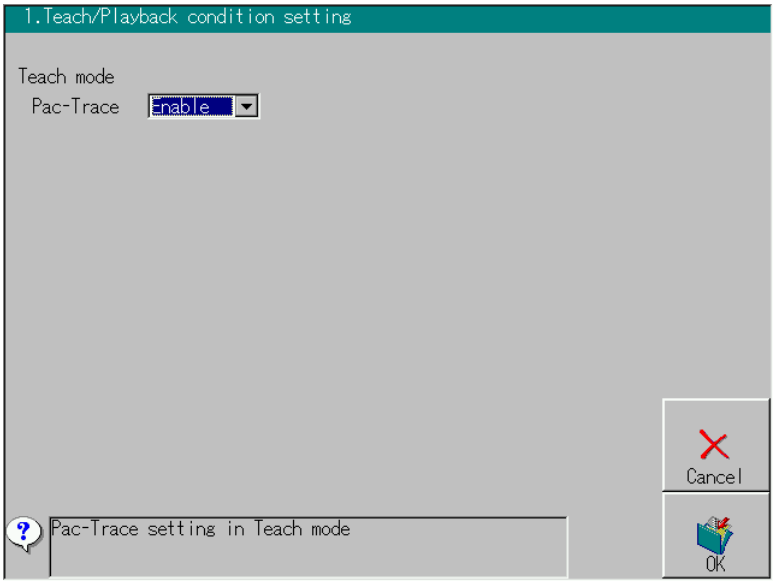
2) In the Constant screen, select "1. Teach/Playback condition."



3) In the Teach/Playback condition screen, select "1. Teach/Playback condition setting."



4) In the "1. Teach/Playback condition setting" screen, whether or not to transfer control to the PAC program screen in the teach mode can be switched.



- In a PAC program called by `CALL_PAC`, CHECK GO executes steps sequentially. After processing of the PAC program, the original program screen appears and control returns to the step immediately following the `CALL_PAC` step.

  In a called PAC program, CHECK BACK reverses steps only to the first one of the PAC program. To transfer control back to the original program, press the **CLOSE** key with the **ENABLE** key held down.

- `RUN_PAC` is not executable with CHECK GO or CHECK BACK.

4.3 Modifying a Step

4.3.1 Modifying the Position Only (with Auxiliary Data Unchanged)

Step 1

Changing the manual speed

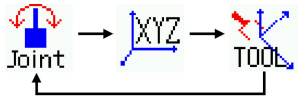
Press the **TEACH SPEED** key and then select the desired teach speed number (1 to 5).

Step 2

Changing the operation coordinates

Press the **COORD** key.

Each time the **COORD** key is pressed, the coordinate system to be applied in the manual operation cycles through the following three.

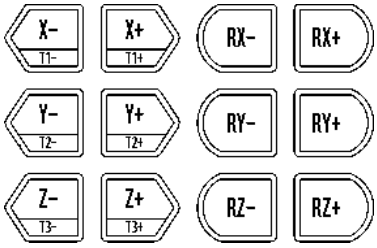


Step 3

Driving the axes manually

While holding down the deadman switch, press one of the arm traverse keys to drive the robot arm.

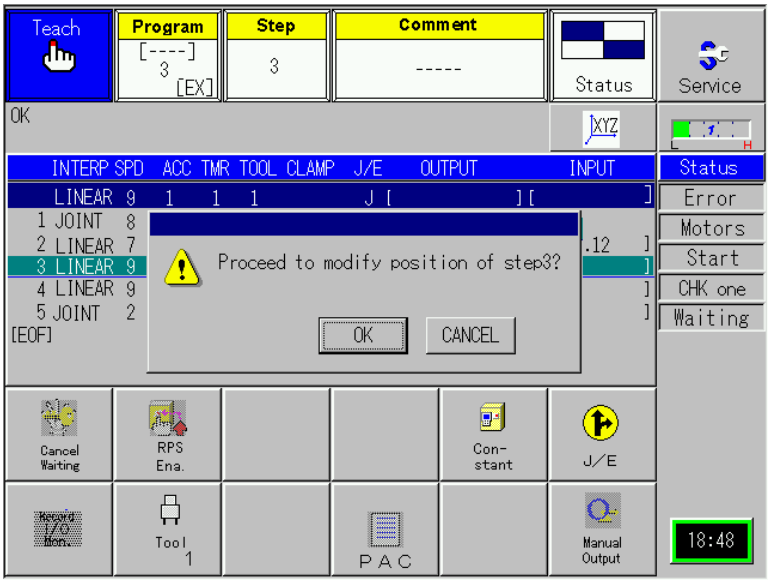
Deadman switch +



Step 4 While holding down the **ENABLE** key, press the **MOD** key.

ENABLE + MOD

The confirmation window appears as shown below.



Step 5 Select **OK** with cursor keys and then press the **ENTER** key.

ENTER

Note: The above operation does not change the auxiliary data displayed at the step.

4.3.2 Modifying (Overwriting) the Position and Auxiliary Data

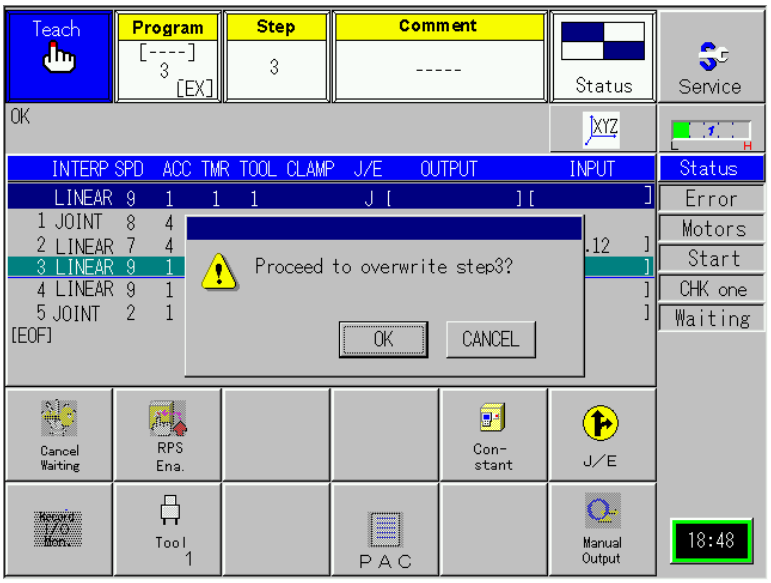
Step 1 Move the tool end to the desired position. (See Section 4.3.1.)

Step 2 Set up the record status. (See Section 3.1.)

Step 3 While holding down the **ENABLE** key, press the **O.WRITE/REC** key to overwrite the current position and record status with new ones entered in the record status line.

ENABLE + O.WRITE REC

The confirmation window appears as shown below.



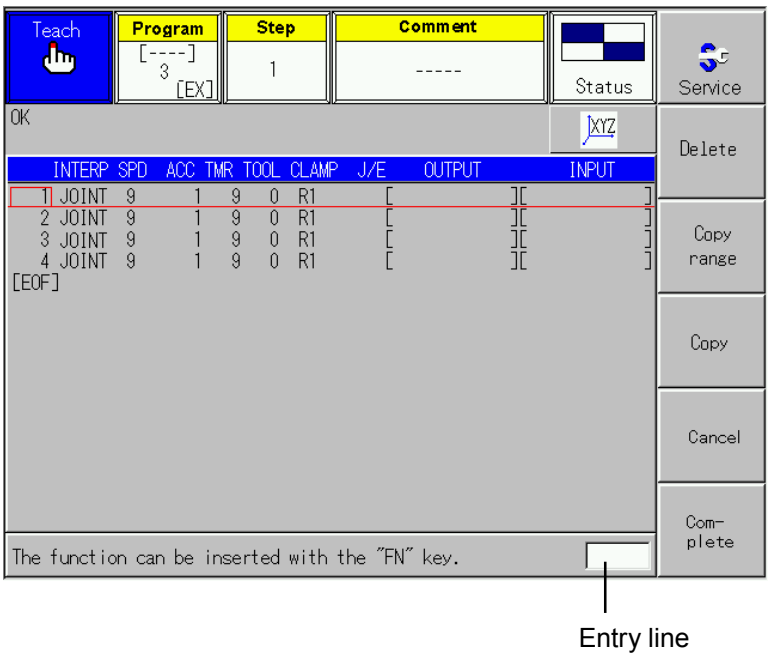
Step 4 Select **OK** with cursor keys and then press the **ENTER** key.

ENTER

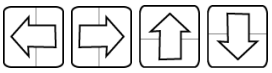
4.3.3 Modifying the Auxiliary Data Only in On-screen Editing

Step 1 Press the **EDIT** key.

The on-screen edit window appears as shown below.



Step 2 Select an item to be modified with cursor keys.

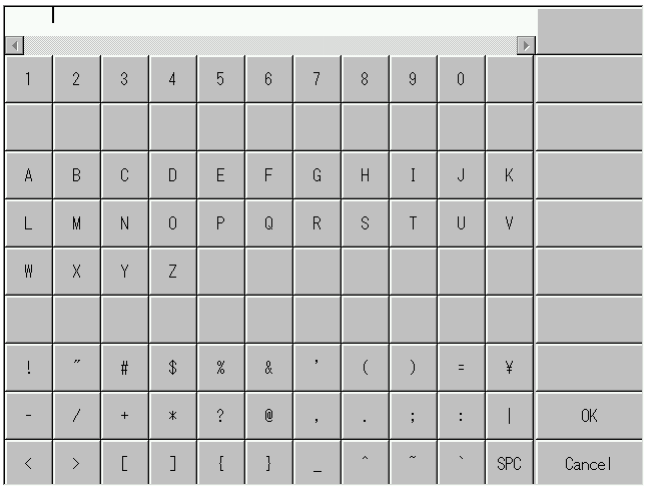


Step 3 Enter the desired value to the entry line following the guidance messages given on the next page.

Note: For entry to the OUT (O), IN (I), or Comment field, press the **ENTER** key when the cursor is positioned in the corresponding field. The setup window appears in which you make modification.

Step 4 Press the **EDIT** key to exit the on-screen edit window.

Guidance Messages

Item	Guidance messages
INTERP	Specify the interpolation. (0: JOINT, 1: LINEAR)
SPD	Specify the speed number. (0 to 9)
ACC	Specify the positioning accuracy. (0 to 4)
TMR	Specify the timer number. (0 to 9)
TOOL	Specify the tool number. (1 to 9)
CLAMP	(Not available.)
J/E	Select J (jump) or E (end) command. (0: None, 1: J, 2: E)
OUT (O)	The setup window as shown in Section 3.2 appears, displaying the current recorded states. Specify the desired output signal number.
IN (I)	The setup window as shown in Section 3.2 appears, displaying the current recorded states. Specify the desired input signal number.
Comment	The software keypad shown below appears. Enter a comment with this keypad. Numeric characters can be entered also from the keypad.  **Note:** The above software keypad are being developed so that the design is subject to change.

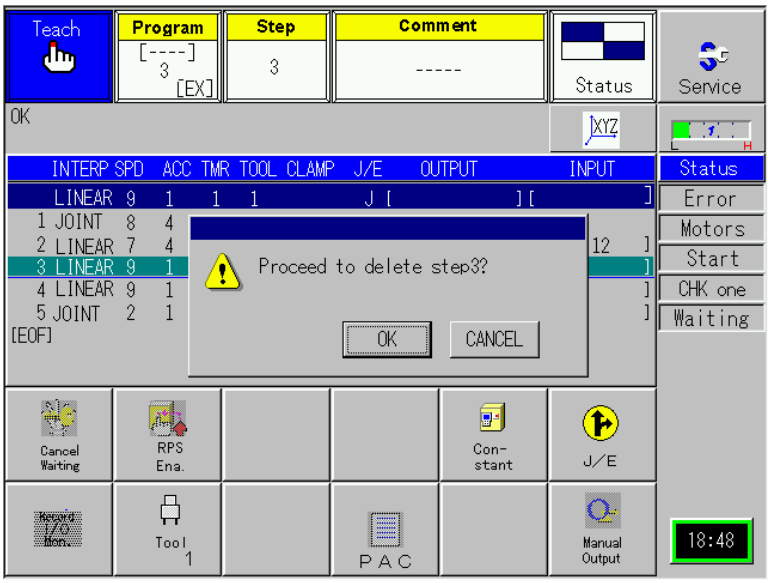
4.4 Deleting a Step

Step 1 Specify a step to be deleted. (See Section 4.1.)

Step 2 While holding down the **ENABLE** key, press the **DEL** key.

ENABLE + DEL

The confirmation window appears as shown below.



Step 3 Select **OK** with cursor keys and then press the **ENTER** key.

ENTER

4.5 Inserting a Step

The procedure below inserts a step immediately preceding the specified step.

Step 1 Specify the step that a new step should precede.

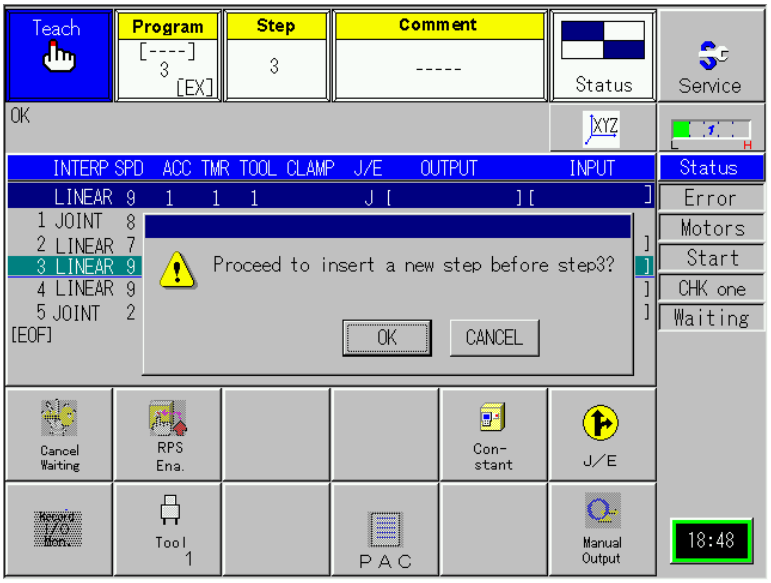
Step 2 Move the tool end to the desired position.

Step 3 Set up a record status. (See Section 3.1.)

Step 4 While holding down the **ENABLE** key, press the **INS** key.

ENABLE + INS

The confirmation window appears as shown below.



Step 5 Select **OK** with cursor keys and then press the **ENTER** key.

ENTER

Note: The above insertion operation does not increment the subsequent steps automatically. When inserting several steps in succession, therefore, rewrite step numbers each time a single step is inserted.

4.6 Outputting a User Signal Forcedly from the Teach Pendant

In the teach mode only, the following procedure manually outputs an arbitrary user signal except status-assigned signals.

Step 1 Call up the output signal monitor screen by pressing Monitor and O-signal monitor on the top screen.

Step 2 Move the cursor to the desired output signal field with cursor keys.

Step 3

■ **To turn the signal ON**

While holding down the deadman switch and **ENABLE** key, press the **1** key.

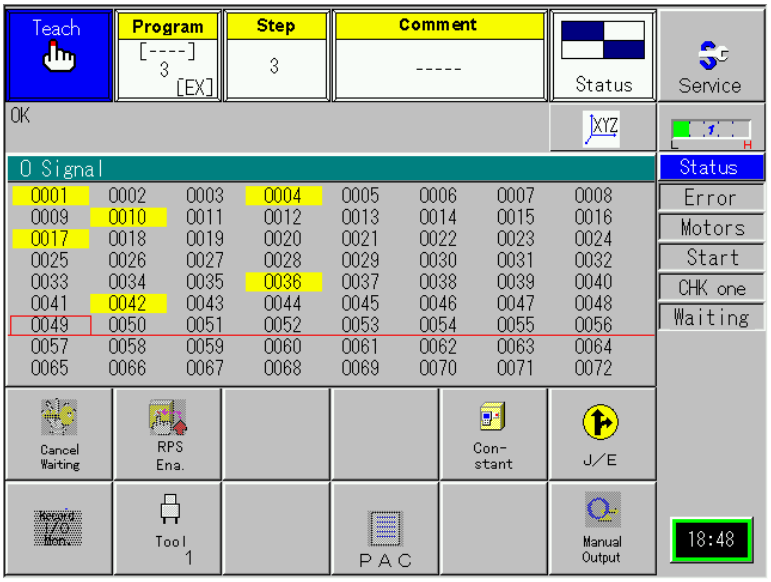
Deadman switch + [ENABLE] + [ON / 1]

The signal being ON is shown in yellow.

■ **To turn the signal OFF**

While holding down the deadman switch and **ENABLE** key, press the **2** key.

Deadman switch + [ENABLE] + [OFF / 2]

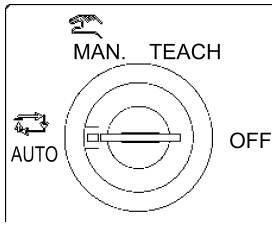


- The state of a signal forcedly turned ON or OFF with the above manual procedure will be retained until the signal is forcedly turned OFF or ON or the step taught to turn the signal OFF or ON is executed with CHECK GO, CHECK BACK, or repeating.
- The above manual procedure cannot turn two or more output signals ON or OFF at a time.

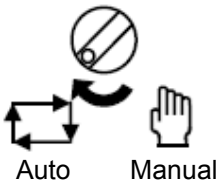
Chapter 5
Operational Check (in Individual/Auto Mode)

5.1 Operation in Individual/Auto Mode

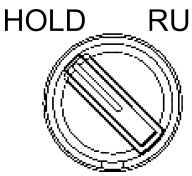
Step 1 On the operation panel, turn the mode selector switch to the MAN. or AUTO position.



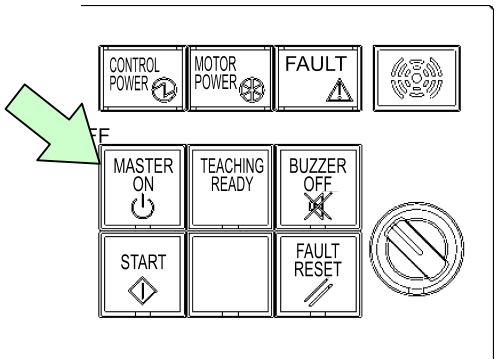
Step 2 On the teach pendant, turn the manual/auto selector switch to the auto position.



Step 3 On the operation panel, turn the HOLD/RUN switch to the HOLD position.



Step 4 On the operation panel, press the **MASTER ON** key.



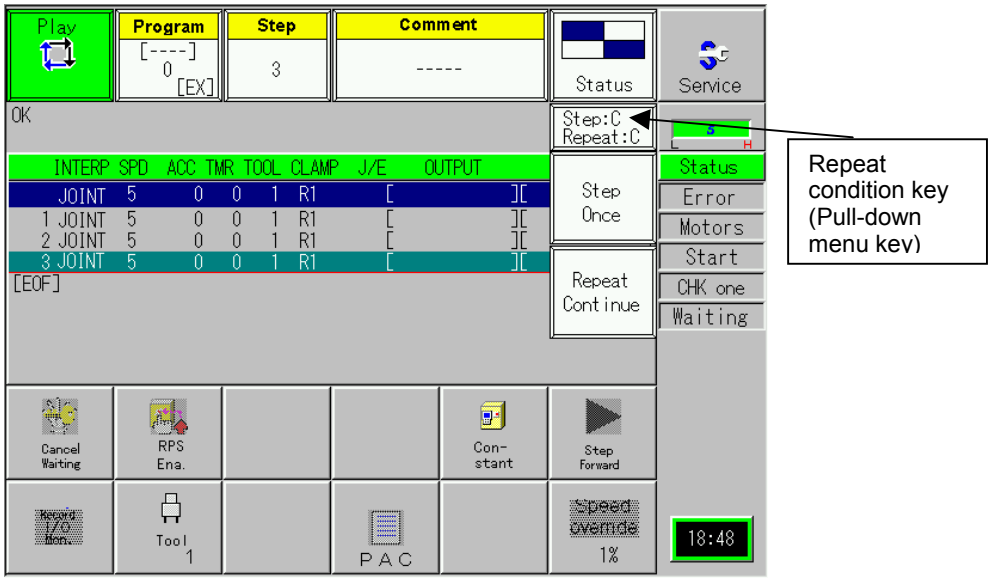
Step 5 Press the **Program** key, select the desired program, and press the **ENTER** key.

"Program number"


Step 6

Selecting whether or not to repeat steps (manual) or programs (auto)

Press the repeat condition key to show the pull-down menu as shown below.



■ **Step Once** / **Step Continue** key

Pressing this key toggles between Step Once and Step Continue.

■ **Repeat Once** / **Repeat Continue** key

Pressing this key toggles between Repeat Once and Repeat Continue.

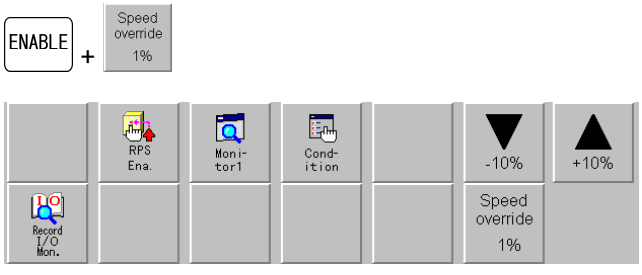
■ **RPS Ena**. / **RPS Disa**.

Pressing this key toggles between Enable PRS and Disable PRS.

Note: In the Auto mode, the RPS is unconditionally enabled; in Individual mode, you need to enable the RPS.

Step 7

While holding down the **ENABLE** key (on the keypad), press the **Speed override** key (on the touch panel).



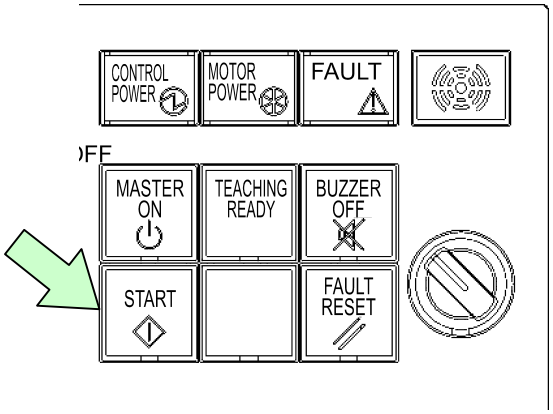
Use the 

and 

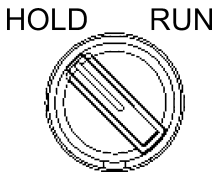
keys to decrease the playback speed to the suitable one.

The entry range is 1% and 10 to 100% in units of 10%.

Step 8 On the operation panel, press the **START** key.

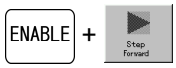


Step 9 On the operation panel, turn the **HOLD/RUN** switch to the RUN position, and the program starts running.



When the Step Once is selected, the robot comes to a halt every step.

Step 10 While holding down the **ENABLE** key (on the keypad), press the **Step Forward** key (on the touch panel) to proceed to the next step.



While confirming the safety, gradually increase the speed up to 100% in the same way as in Step 7.

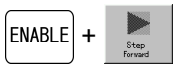
5.2 Repeat Condition

The table below shows the combination of Step (Once/Continue) and Repeat (Once/Continue).

<table>
<tr><th colspan="2" rowspan="2"></th><th colspan="2">Step forward</th></tr>
<tr><th>Once</th><th>Continue</th></tr>
<tr><td rowspan="2">Repeat (for programs)</td><td>Once</td><td> 

If the program is activated, only a single step executes and the robot comes to a halt.

Pressing the Step Forward key with the ENABLE key held down proceeds to the next step.

When the program is executed up to the final step (the highest step number or the END step), it stops.</td><td> 

If the program is activated, all steps execute continuously.

When the program is executed up to the final step (the highest step number or the END step), it stops.</td></tr>
<tr><td>Continue</td><td> 

In the same way as above, steps execute step by step.

When the program is executed up to the final step (the highest step number or the END step), control returns to the first step to allow continuous playback.

If the RPS is enabled, at the END step, the program selection signal switches control to any other program.</td><td> 

If the program is activated, all steps execute continuously.

When the program is executed up to the final step (the highest step number or the END step), control returns to the first step to allow continuous playback.

If the RPS is enabled, at the END step, the program selection signal switches control to any other program.

This setting applies to the usual practical operation.</td></tr>
</table>

5.3 Execution of O/I

Signal	Signal specifications
O (Output signals)	(1) The execution timing is different between ON and OFF instructions. - Both single and batch ON instructions execute immediately after axis position matching at the step. - Single OFF instructions execute after the time specified by the timer and the waiting time for input signal and immediately before proceeding to the next step. (2) At steps with neither ON nor OFF written, no signal change occurs. (3) If two or more output signals are written in an OUTPUT field, all of them batch-execute. (Note that the execution timing of those signals varies by I/O scanning time according to the CPU processing capability.) (4) To specify the execution order, write signals in two or more steps. (5) When ON and OFF instructions are written in the same step, a minimum pulse output time of 0.1 second should be assured.
I (Input signals)	(1) After axis position matching at the step with the input signal written, the program starts checking the input signal. (2) If two or more input signals are written in an INPUT field, the program ANDs all of those input signals to check. The conditions or the combination of AND and OR are not available. (3) To specify the execution order, write signals number in two or more steps.

5.4 Execution of J/E

5.4.1 J (Jump) Command

■ If the RPS is disabled, the program does not execute a J command and proceeds to the next step.

■ If the RPS is enabled, the jump ON and OFF signals execute as listed below.

		Jump OFF signal	
		ON	OFF
Jump ON signal	ON	A jump ON signal has priority over a jump OFF signal in processing. A jump ON signal triggers the read-in of "Program No. Selection" signal and jumps to that program. Jump-to program number: 0 to 999 If the selected program number does not exist, the program causes an error and terminates playback. (Motor power OFF)	
	OFF	The program proceeds to the next step.	The program stops at the step with these signals written and waits for either one of them to turn ON.

5.4.2 E (End) Command

■ If the RPS is disabled, the program does not execute the E command and proceeds to the first step. (Even if any steps exist following the E command, the program proceeds to the first step.)

■ If the RPS is enabled, the E command executes as shown below.

An RPS ON signal triggers the read-in of "Program No. Selection" signal and jumps to that program.

Jump-to program number: 0 to 999

If the selected program number does not exist, the program causes an error and terminates playback. (Motor power OFF)

5.5 Priority Order among Timer, J/E, and O/I

When a timer, J/E, and O/I are written at one step, they execute in the following priority order.

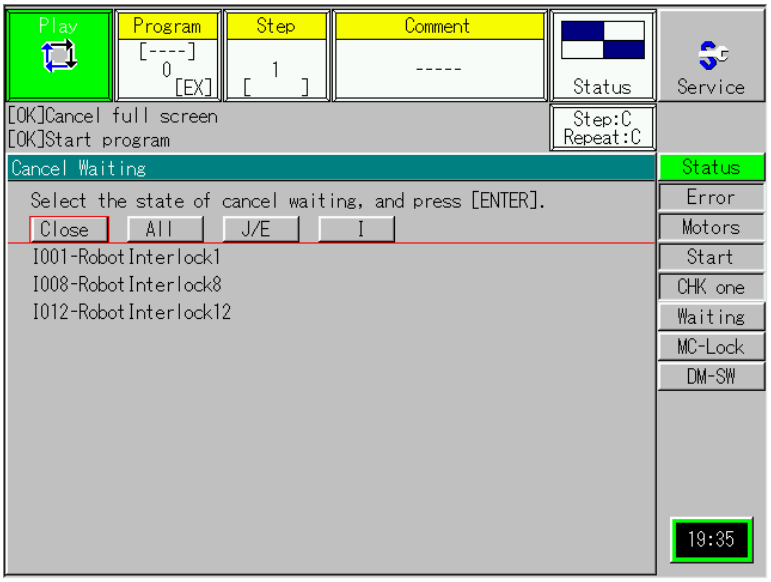
Priority order	Content
1	Axis position matching (Arrival of the tool end at the target position)
2	Timer, O (ON signal only), I, and J/E commands start executing at once. Note: J/E commands read in an external program No. selection signal also.
3	The program waits for an I signal if the waiting condition is not cleared. After that, the O command (OFF signal) executes.
4	J/E commands execute for read-in programs. If no J/E command exists, the tool end starts moving to the target position written at the next step.

5.6 Canceling the Waiting Conditions

Step 1 While holding down both the deadman switch and **ENABLE** key, press the **Cancel Waiting** key.

Deadman switch + ENABLE + 

The following entry screen, which also works as a real-time monitor, appears.

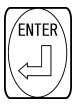


Yellow marking indicates that the signal is ON.

The waiting conditions are not displayed in PAC language.

Step 2 The entry screen shown above displays the waiting conditions not satisfied.

Move the cursor to the waiting condition to cancel and press the **ENTER** key.



The waiting condition will be forcedly canceled. The canceled condition is displayed in red.

Step 3 To cancel all of the waiting conditions of J/E and I commands all at once, select the **ALL** and press the **ENTER** key.

Step 4 Select the **CLOSE** and press the **ENTER** key to close the window.

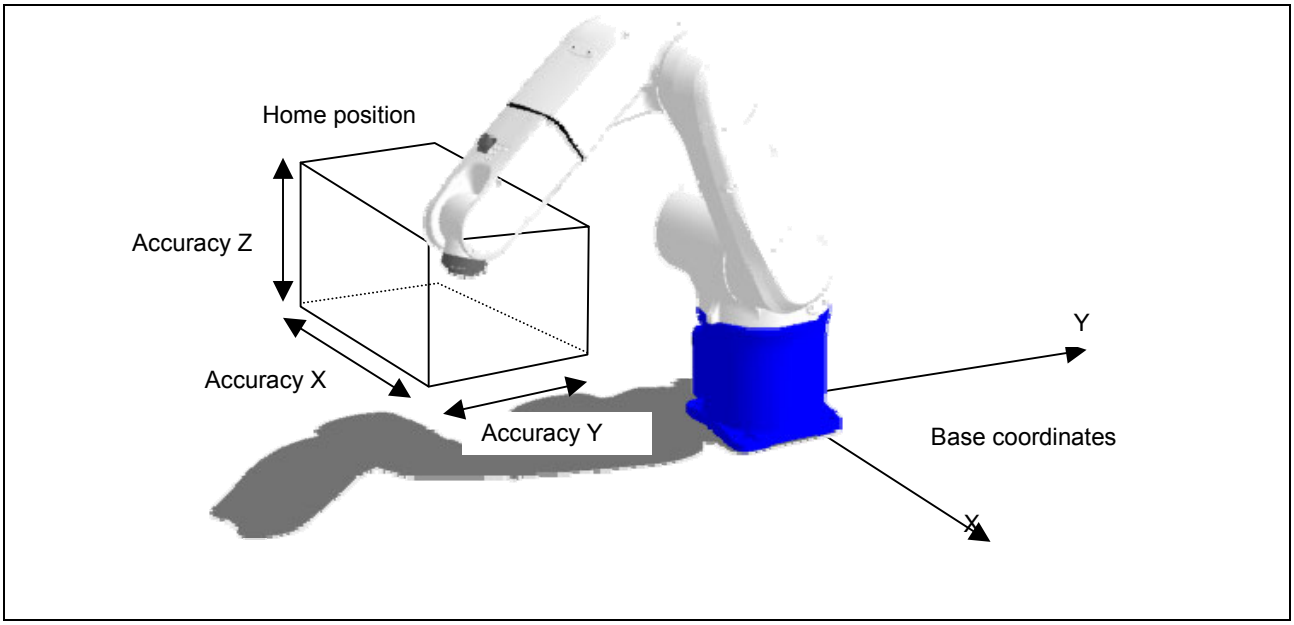
If waiting conditions no longer exist, the window automatically closes the moment the program proceeds to the next step, without this window close operation.

5.7 Registering the Home Position

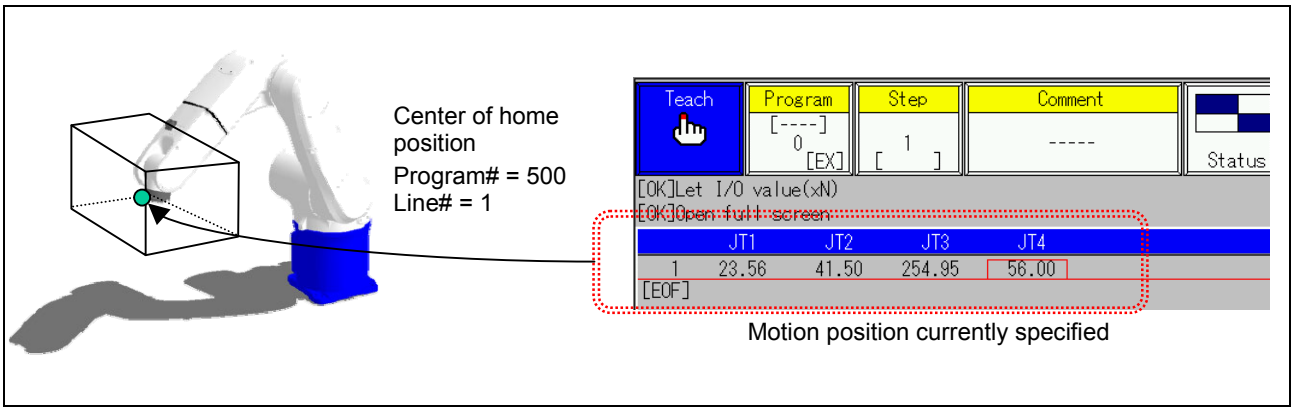
What is home position?

Four home positions (Home positions 1 to 4) can be specified.

A home position is defined as a rectangular parallelepiped having accuracy ranges X, Y and Z, which is parallel to the base coordinates.



The center of the home position is defined by referring to the motion position specified in a motion command in a base program.



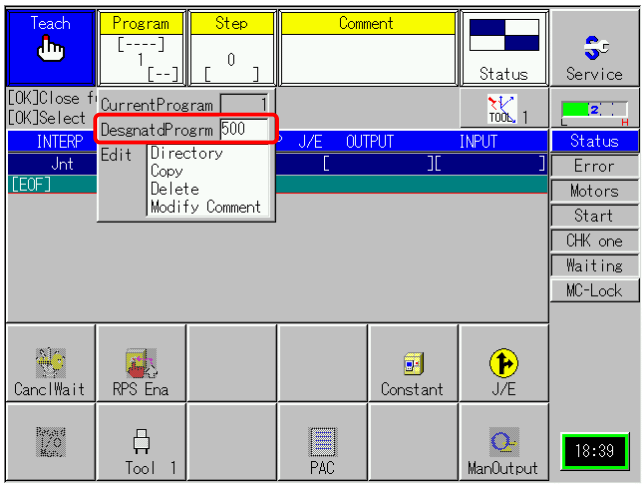
Home position registration procedure

The following procedure is for registering the home position.

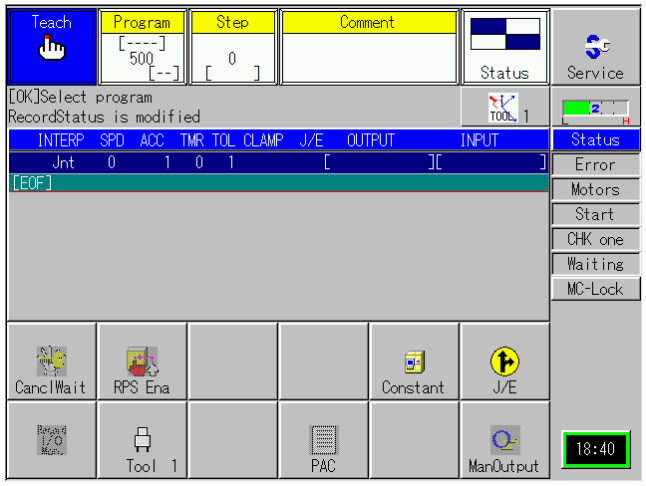
1) Creating a home position registration program
2) Teaching a motion position for home position registration
3) Registering a home position using the created program's number and the step number containing a motion command

Creating a home position registration program

Step 1 Press the **Program** key with the **ENABLE** key held down to enter a program number not used yet (500 in this example) to the Designated Program field.



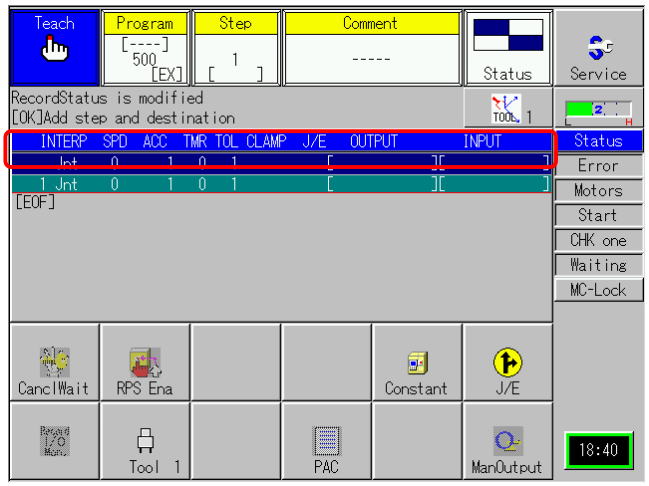
Step 2 Wait for a new program window (Program 500) to open.



Teaching a motion position for home position registration

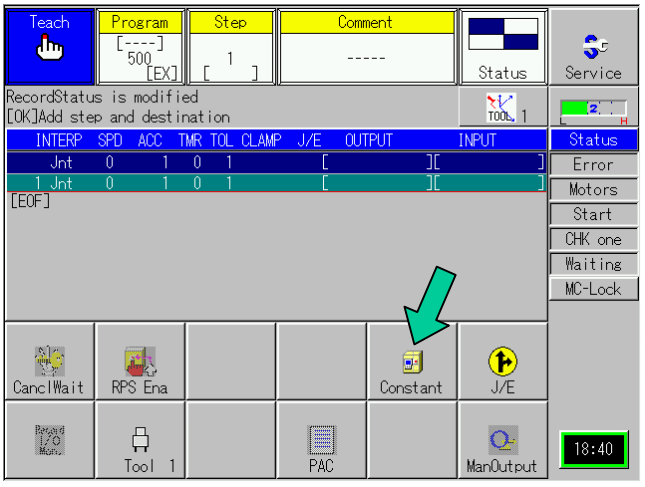
Step 3 Use the teach pendant to move the robot arm to a home position to register.

Step 4 Press the **ENTER** key to enter the current TCP position into a motion command (which is contained in Step 1 of Program 500 in this example).

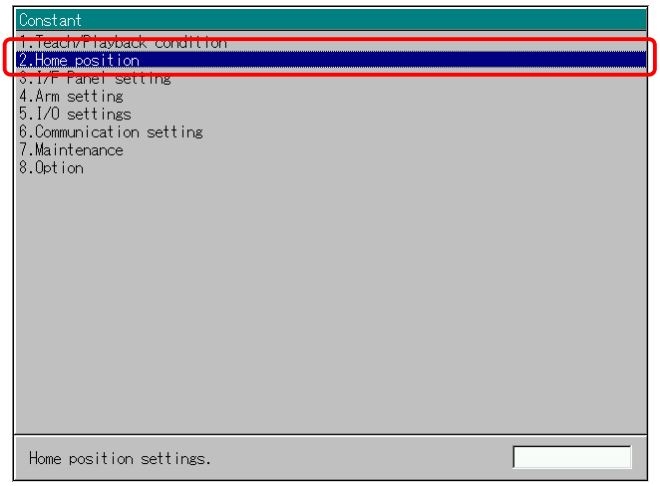


Entering the taught values into a home position

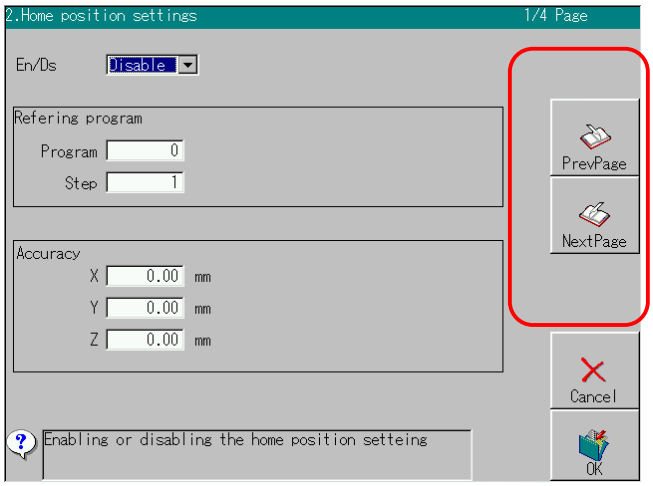
Step 5 Press the **Constant** key.



Step 6 Wait for the Constant window to open and then select the Home position menu.



Step 7 Wait for the Home position settings window to open and then press the **Previous Page** or **Next Page** key to select a desired home position number (any of 1 to 4).



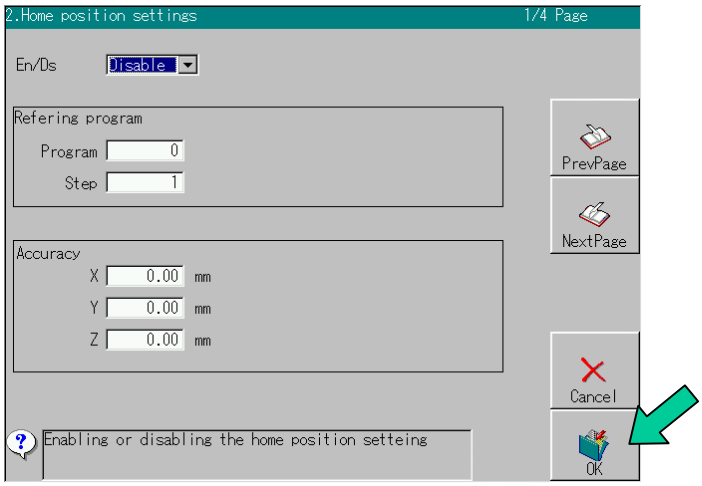
Step 8

Select Enable from the En/Ds pull-down list.

In the Referring program area, enter the program number and step number which are specified in Step 4.

Enter accuracy ranges. The home position is defined with the preset TCP position and accuracy ranges.

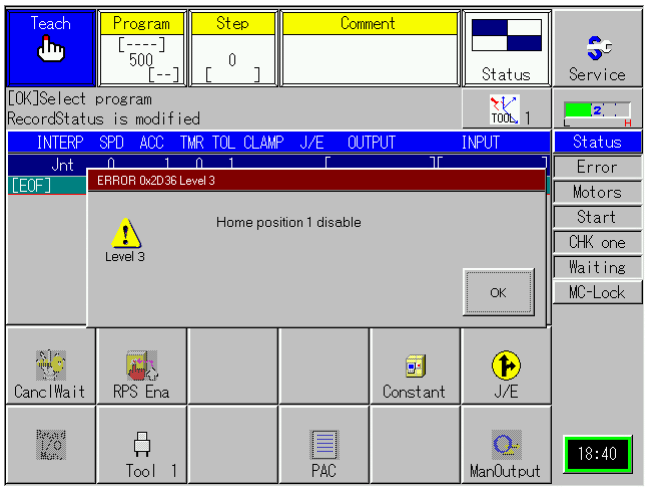
Press the **OK** button to complete the home position registration procedure.



Notes in using home position setting

If a motion command for the home position is deleted, the home position settings that refer to the motion command become invalid. This is because the center of the home position is defined by referring to the motion position specified in a motion command in a base program.

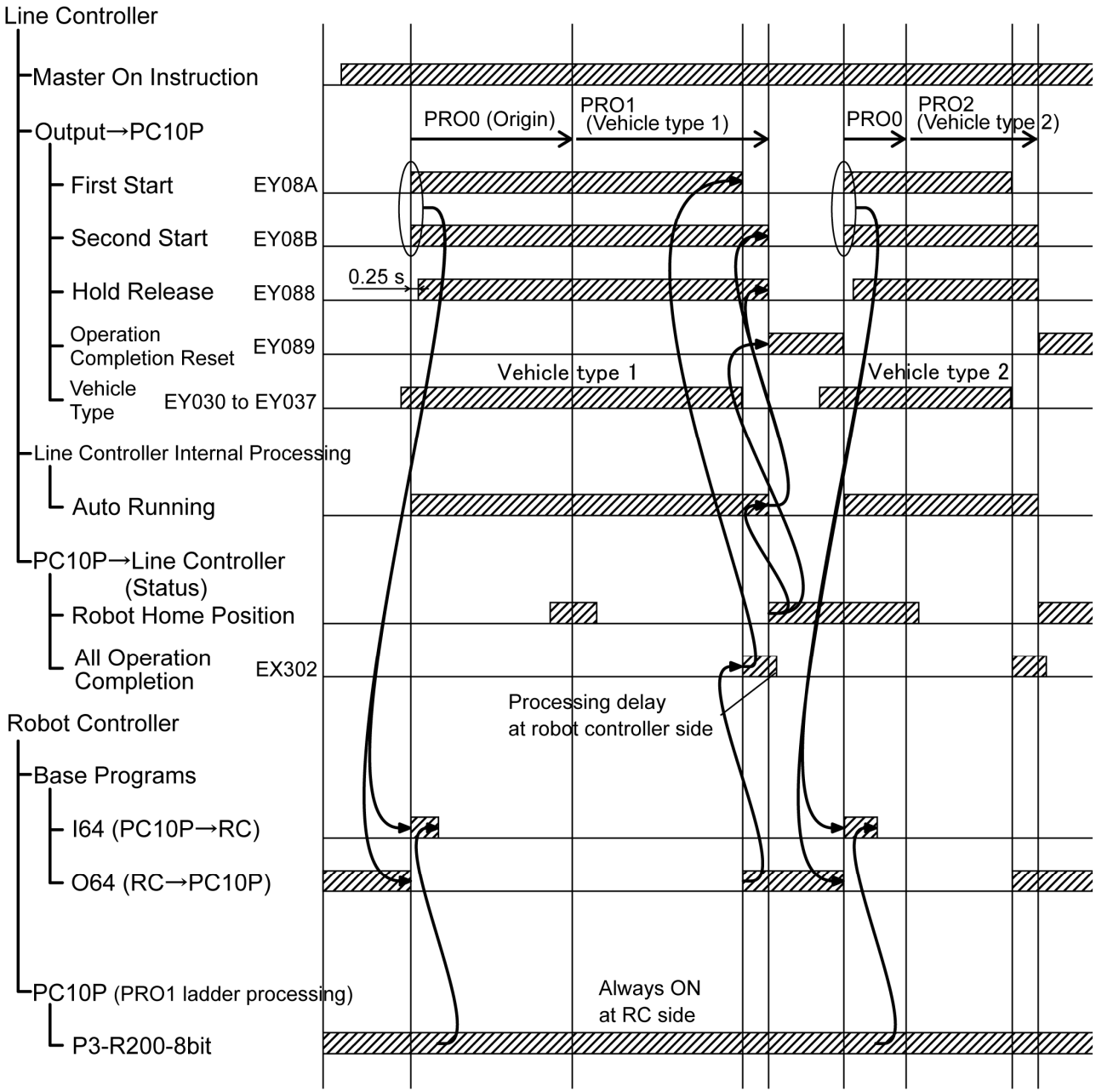
Deleting a program that is referred to for home position settings displays an error message as shown below.



If a step number of a motion command is changed, the step number for the home position settings will automatically be changed accordingly.

5.8 Automatic Starting Sequence

The figure below shows the automatic starting sequence.



5.9 Restoration Function

What is the restoration function?

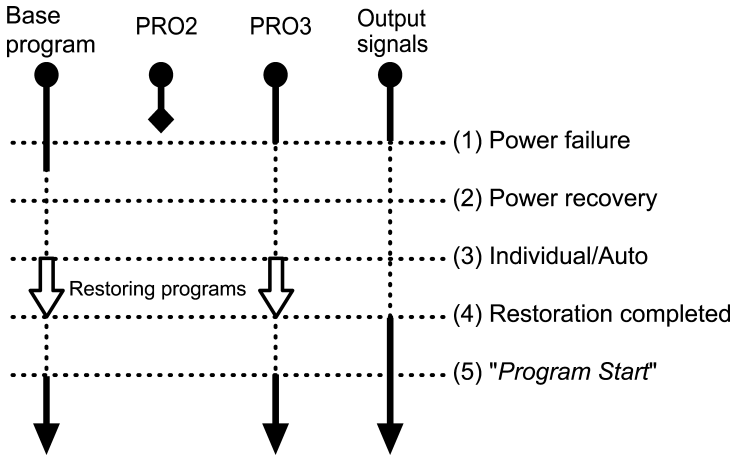
At the time of power recovery after an unexpected power-off (due to a power failure or other reasons) that occurred during automatic operation, the restoration function restores the robot system so that the programs can restart from that step at which the power failure occurred.

Without the restoration function, at the time of power recovery, all programs start from the first step so that it is necessary to revert surrounding equipment, workpiece conditions and others back to the initial states beforehand. Using the restoration function eliminates such requirements.

Note: Before restarting the robot with this restoration function, be sure to thoroughly check that the restart from the step at which the power failure occurred does not affect other equipment. It is very dangerous to restart the robot carelessly.

Restarting programs after restoration

With the restoration function, the programs return to the status in which the power failure occurred. To restart the subsequent operation, use the "*Program Start*" signal. All of the programs being executed at the time of the power failure will restart running. The figure below shows an operation example of the restoration function.



(1) At the time of the power failure, the base program and PRO3 are being executed and the execution of PRO2 was completed.

(2) The power is restored.

(3) When the operation mode is switched to Individual or Auto, the programs are restored to the step at which the power failure occurred.

(4) After the program status has been restored, the output signals are also restored to the state in which the power failure occurred.

Now the robot system is ready to restart.

Signal type	Output signals to be restored
O signal output	01-096
L signal output	L000-L3FF
R signal output	R000-R2FF

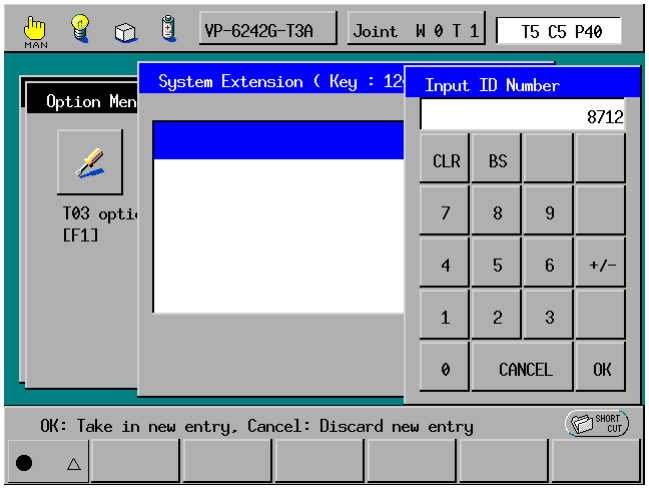
(5) To restart the robot, use "*Program Start*." In this example, the base program and PRO3, which were being executed at the time of the power failure, will restart.

Enabling the restoration function

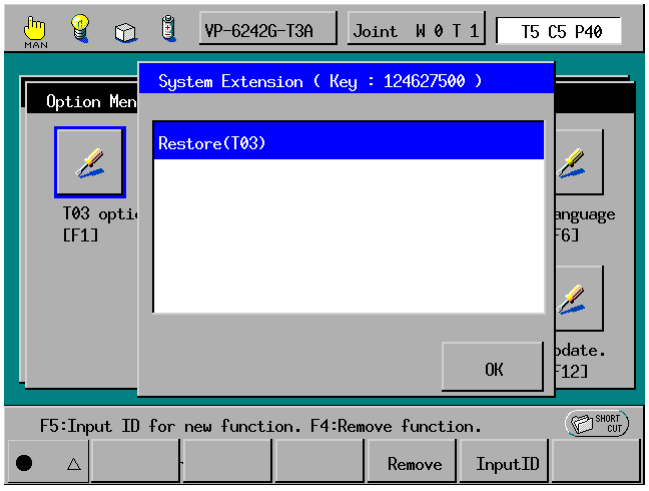
Call up the System Extension window by pressing [ExtScrn]—[Set]—[Options.]—[Extnsion] from the top screen of the teach pendant.

Press [InputID] to call up the numeric keypad as shown below.

Enter the ID code 8712 and then press OK.



The "Restore (T03)" appears in the System Extension window, which means that the restoration function has been enabled.



Conditions for allowing the restoration function

Satisfying the following conditions allows the restoration function to be activated.

(1) At the time of a power failure

1) The restoration function has been enabled.
("Restore (T03)" enabled in the System Extension window. ID code =8712)
2) One to 32 robot programs are in execution.

Note: Programs that have been temporarily stopped by Halt or Step Stop cannot be restored. Programs specified and started after power recovery will run from the first step.

3) The Disable restoration command is not in execution.

Some commands being in execution at the time of a power failure disable the restoration function for safety. For details, refer to the "Restrictions on the use of the restoration function."

(2) After the time of power recovery

1) No "*Program Start*" cancel operation is performed before the use of "*Program Start*."
2) When the automatic position correction is performed, the positional error between the tool end position at the time of a power failure and that at the time of receipt of the "*Program Start*" is within the allowable range.
3) No editing of programs, modification of steps, or `CHECK GO/BACK` has been performed before the use of "*Program Start*."

Restrictions on the use of the restoration function

The restoration function restarts the robot programs from the step at which a power failure occurred, so the robot and peripheral equipment should be well interlocked with each other with regard to their positions and I/O signals.

Therefore, if a power failure occurs during execution of commands involving timing control between the robot and peripheral equipment, the restoration function is disabled for safety.

Restricted by commands being executed

(1) RS-232C input/output control statements

1) `INPUT`, `LINEINPUT` *(Restoration not allowed)*

If a power failure occurs during data receiving, the restoration function is not allowed. After power recovery, the robot system displays an error message and disables the restoration function.

2) `PRINT`, `WRITE` *(Restoration allowed)*

After completion of the restoration sequence, the robot system restarts programs from the step immediately following the `PRINT` or `WRITE` command. Since the data may not be output to the end, check the output data at the receiving side and add any data resend processing, if necessary.

(2) Vision control statements

1) When obtaining the visual process priority *(Restoration not allowed)*

The restoration function is not allowed if a power failure occurs during execution of commands written between `TAKEVIS` and `GIVEVIS`. As with the `INPUT` command, the robot system displays an error message after power recovery.

2) When releasing the visual process priority *(Restoration allowed)*

The restoration function is allowed except case 1) above. However, investigate the vision control programs for any problem before using them.

(3) Error interruption

If a power failure occurs during execution of an interruption routine defined by the `ON ERROR GOTO` statement, the robot system causes an error when the `RESUME` command at the end of the error handling routine is encountered, stopping the programs.

(4) Compliance control statements

- Compliance control function enabled *(Restoration not allowed)*

  If a power failure occurs during execution of any compliance control library (`SetCompControl` to `ResetCompControl`), the restoration function is not allowed.

(5) Free curve interpolation control statements

- Interpolation through free curve motion viapoints

  If a power failure occurs in the process of such interpolation, the restoration function is not allowed.

- Free curve commands

  If a power failure occurs during execution of any free curve command (`SetSplinepoint` to `CLRSplinepoint`), the restoration function is not allowed.

(6) If a power failure occurs when the supervisory task is enabled ("Use Supervisor TASK" parameter is selected), the restoration function is not allowed.

Other restrictions

(1) During execution of a program holding semaphore

Programs that perform task control with semaphore cannot be restored. To synchronize programs when the restoration function is enabled, use the internal I/O.

Shown below is a program sample in which the 128th internal I/O is used as a synchronization flag.

```
PROGRAM PRO1
RESET IO[128]
RUN PRO2            'Run PRO2
RUN PRO3            'Run PRO3
END

PROGRAM PRO2
'
                    'Wait until the 128th IO becomes 0
    *LOOP1:
                    'While checking synchronization, it is
                    'necessary to defend the task
DEFEND ON           'Defend own task
IN I0001=IO[128]
IF I0001=0 THEN GOTO *LOOP2
DEFEND OFF          'Release the defend of own task
GOTO *LOOP1
                    'Obtain the execution priority and release it
                    'after completion of the processing
    *LOOP2:
SET IO[128]         'Obtain the execution priority
DEFEND OFF          'Release the defend of own task
'
RESET IO[128]       'Release the execution priority
'
END
PROGRAM PRO3

(Write PRO3 in the same way as PRO2.)
```

(2) Commands with timer parameters

If a power failure occurs during execution of BUZZER, DELAY and WAIT, which monitor elapsed time, the robot system treats these commands as listed below after completion of restoration sequence.

Command	Operation upon restoration after power failure
BUZZER	Start program execution from the next step
DELAY	Execute DELAY command again for the specified period
WAIT	Execute WAIT command again for the specified period

(3) Priority of tasks being stopped

The restoration function restores only programs being executed when a power failure occurred. Even if the priority of tasks being stopped is changed with the teach pendant, the priority reverts to the default setting after power recovery.

(4) Restoration of robots having an extended-joint(s)

Robots having an extended-joint(s) can use the restoration function when:

- There is only a single arm group whose arm semaphore is obtained.
- The arm group whose arm semaphore is obtained contains a robot axis.

Others

Operations that cancel the restoration function

If any of the following operations is performed before "*Program Start*" after power recovery, the restoration function is canceled so that programs start from the first step.

(1) Canceling "*Program Start*"

Any "*Program Start*" cancel operation such as changing the program status cancels the restoration function.

(2) Program reset

Regardless of the program status, executing Program reset cancels the restoration function.

If an error occurs during the restoration sequence

The restoration function backs up the necessary data at the occurrence of a power failure, and uses it to restore the program status after power recovery. If an error has occurred during the data backup, at the time of power recovery, the robot system displays an error code* and cancels the restoration function.

* Any of 27C0 to 27CF and 2D43 to 2D47. For details, refer to Appendix 1 "Error Code Tables."

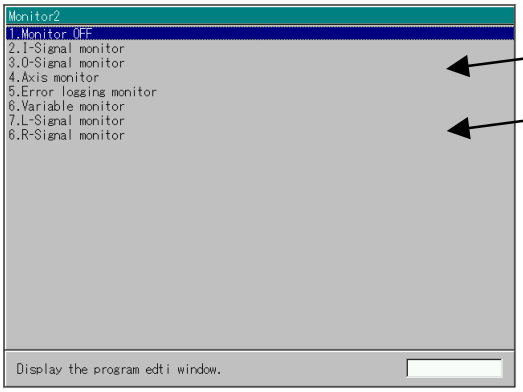
Chapter 6
Interface Panel Screen

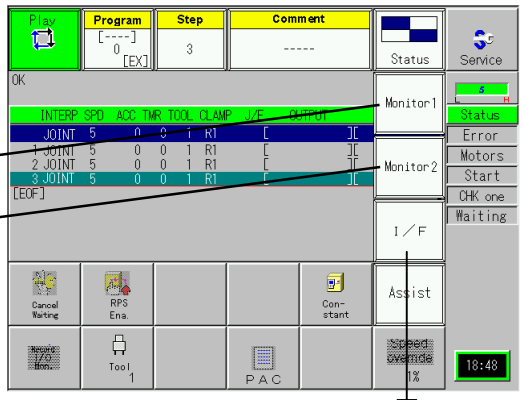
6.1 Interface Panel Overview

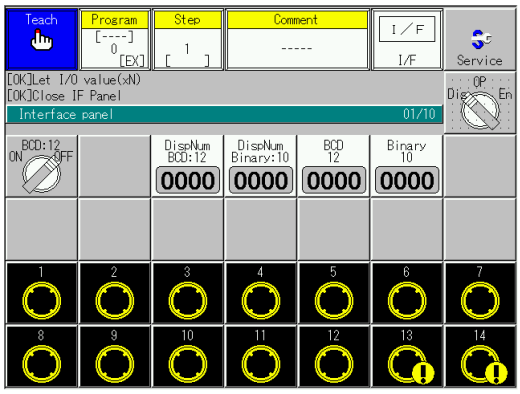
This section shows layout samples of the interface panel screen.

In the teach or playback mode, press Status to show the pull-down menu and choose I/F, and the interface panel screen appears.

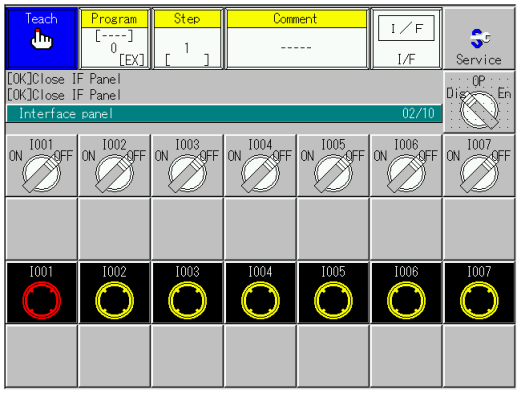
Only on the top screen in the teach or playback mode, pressing the shortcut key I/F on the keypad toggles the interface panel screen ON (display) and OFF (hide).





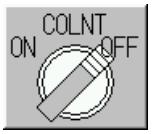


ENABLE



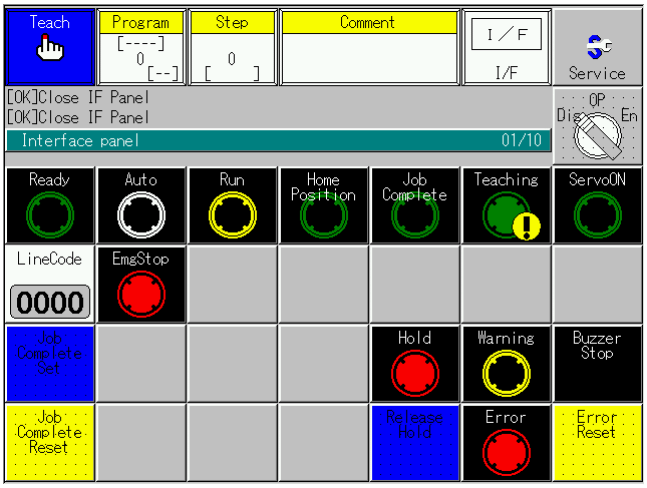
1. Monitor OFF
   Stops monitoring and returns to the Program display window.
2. I-Signal monitor
   Displays a list of I signals.
3. O-Signal monitor
   Displays a list of O signals, where it is possible to turn signals on and off.
4. Axis monitor
   Displays the robot arm position and axis information.
5. Error logging monitor
   Displays a list of error logs.
6. Variable monitor
   Displays a list of variables.
7. L-Signal monitor
   Displays a list of L signals.
8. R-Signal monitor
   Displays a list of R signals.

6.2 Interface Panel Components

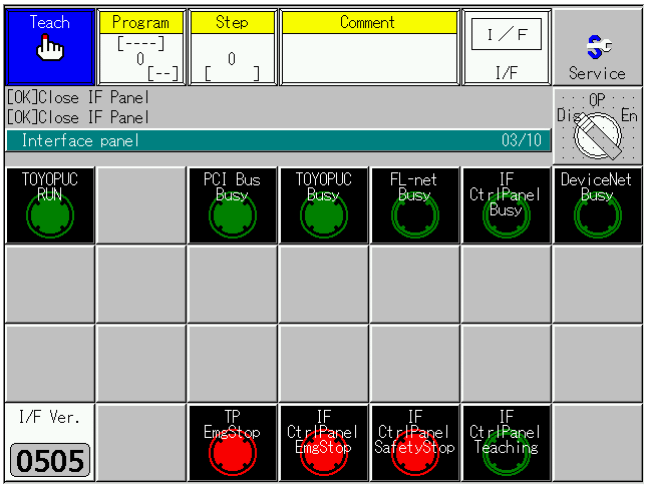
Component type	Component sample	Function
Lamp		A lamp shows the state of a signal specified by a number and the label name. • When the lamp is ON, the whole round lamp lights in the specified color; when it is OFF, only the frame of the lamp lights in the specified color. • If a warning/caution symbol is specified, the ! appears depending upon the signal ON/OFF state.
Illuminated push-button - Momentum type - Alternate type		This button turns a signal specified by a number ON and OFF. • It provides two choices: Momentum and alternate types. - Momentum type: The signal is ON while the button is held down. - Alternate type: Pressing the button toggles the signal ON and OFF. • The button background turns to the specified color depending upon the signal ON/OFF state.
Selector switch		Pressing this switch toggles (reverses) a signal specified by a number ON and OFF.
Numeric value display		A display shows the states of consecutive signals with a three-digit numeric value. • The interface panel screen software gets the states of the consecutive signals starting from the specified signal, converts them into a three-digit numeric value, and shows it on the display. • In conversion to a numeric value, the software offers two choices: usual binary notation and binary-coded decimal (BCD) notation. • If usual the binary notation is selected, the software handles up to 10 consecutive signals; if the BCD notation is selected, it handles up the 12 consecutive signals.
Numeric value entry field		The states of consecutive signals can be entered to the field with a numeric value. • Entering a four-digit value turns the consecutive signals previously specified ON and OFF. • If usual the binary notation is selected, the software handles up to 10 consecutive signals; if the BCD notation is selected, it handles up the 12 consecutive signals.

6.3 Default Interface Panel

The default interface panel when the robot system leaves the factory is shown below.



Interface panel screen (1st page), Status display



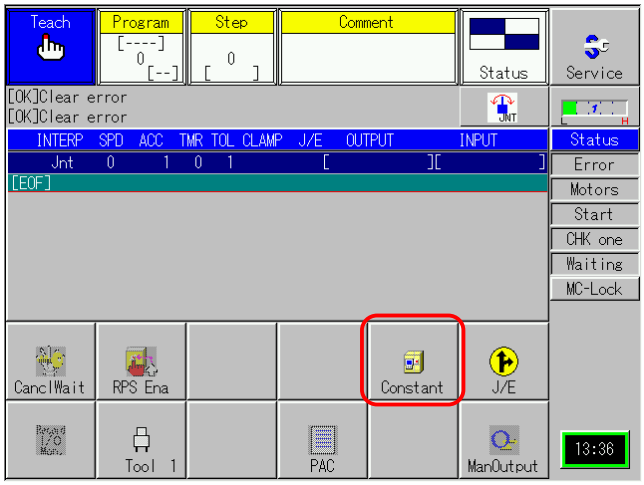
Interface panel screen (3rd page), Diagnosis management

6.4 Editing the Interface Panel

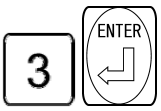
The interface panel can be edited in the interface panel setting screen.

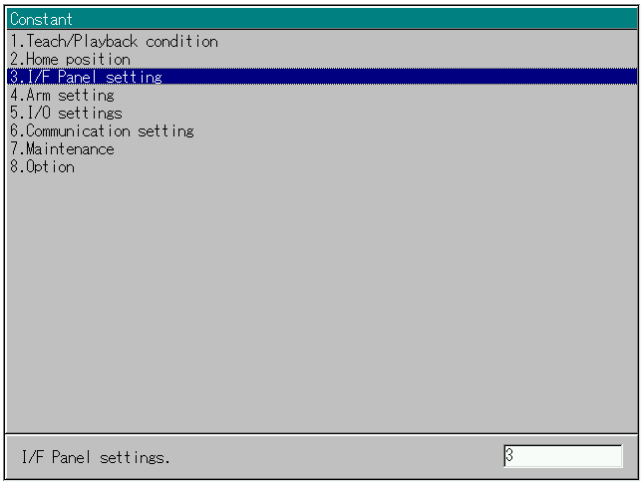
Calling up the interface panel setting screen

Step 1 Press the **Constant** key.

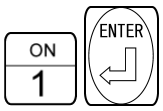


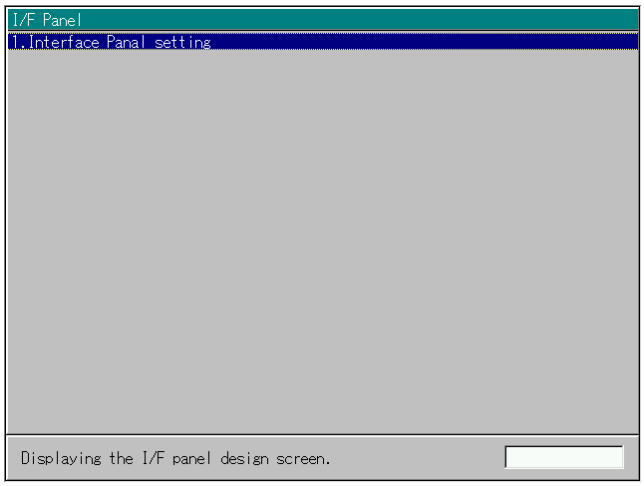
Step 2 Select the IF Panel setting in the Constant window.



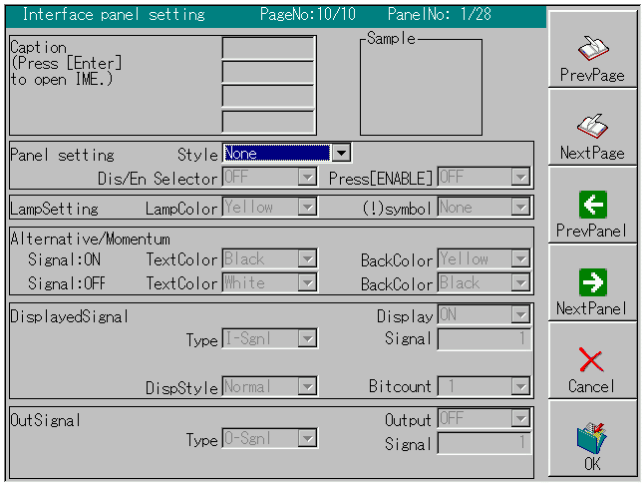


Step 3 In the I/F Panel window, select the Interface Panel setting.



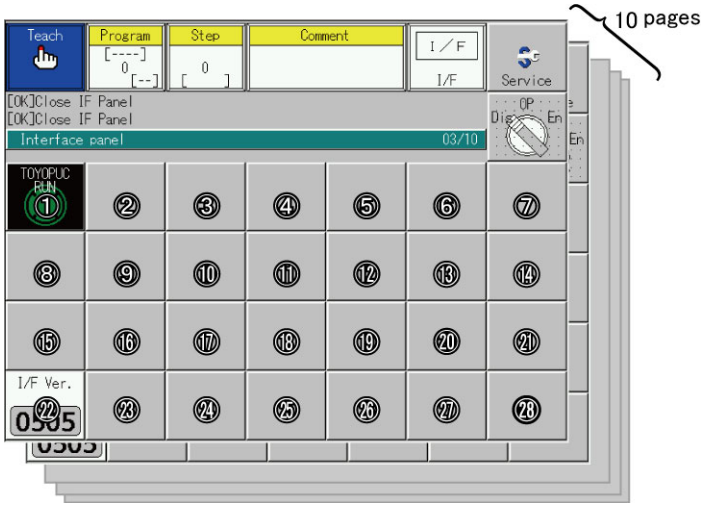


Step 4 Wait for the Interface panel setting window to appear.



Editing on the interface panel setting screen

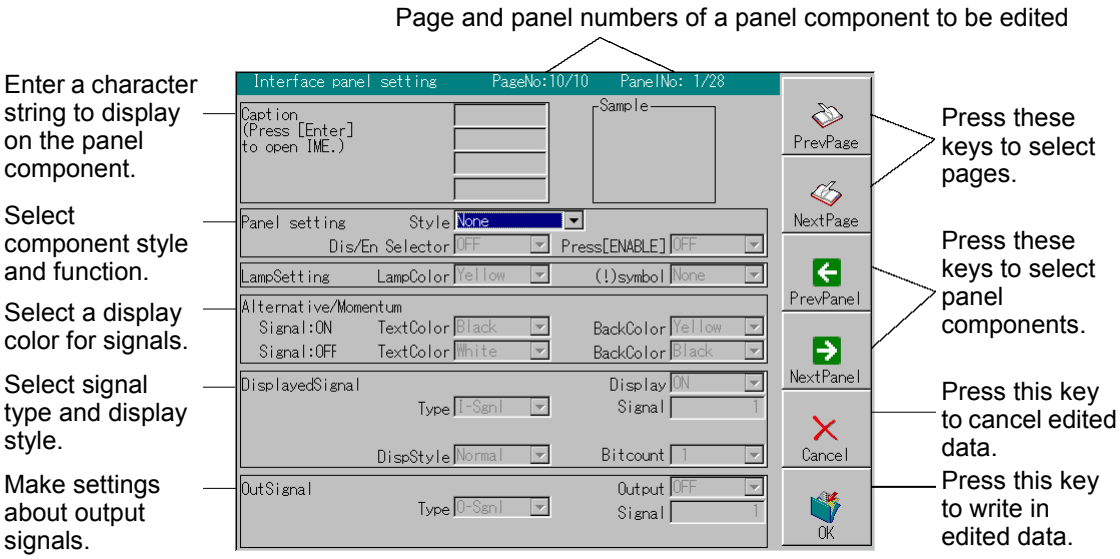
The interface panel consists of a total of 10 pages, each of which has 28 panel components numbered 1 through 28 starting from the upper left corner.



■ Selecting a panel component to edit

Panel components should be configured one by one on the interface panel setting screen.

First select a page to be edited, using the **Previous Page** and **Next Page** keys. Then select a panel component to be edited, using the **Previous Panel** and **Next Panel** keys. Check the page and panel numbers on the screen to confirm that the target panel on the target page is selected.

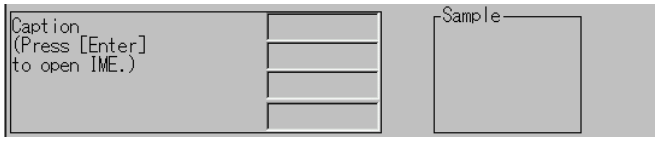


■ Editing a panel component

Caption and sample

Specify a caption to display on the selected panel component. A caption should be a maximum of 5 characters per line and consists of a maximum of 4 lines.

The Sample area shows a panel component image you are editing.

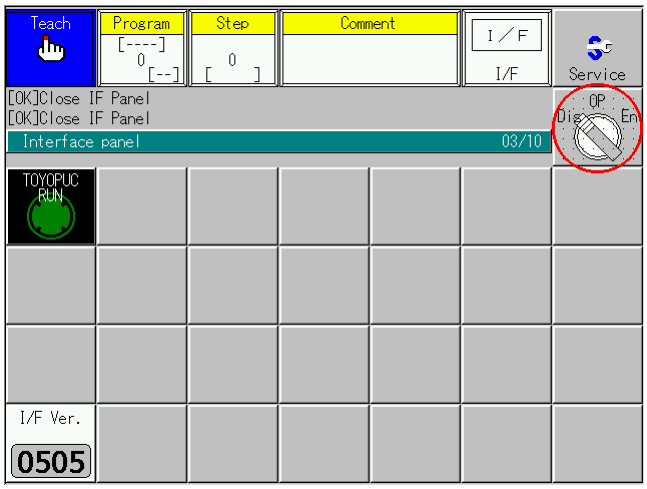


Panel settings

Select the type of a panel component and the usage of the component.

Style: Select a desired component type from this pull-down list. For details about the component type, refer to Section 6.2, "Interface Panel Components." Selecting None displays nothing.

Dis/En Selector: If this selector is enabled, it is necessary to turn the OP Dis/En switch on the screen shown below to the En position.



Press [ENABLE]: If this parameter is set to ON, operating the interface panel requires holding down the **ENABLE** key.

Lamp settings

Make lamp settings.

Lamp color: Select a desired lamp color from white, red, green, blue and yellow.

(!) symbol: Select whether an exclamation mark (!) should be displayed as shown below, depending upon the signal state specified in the Displayed Signal Settings window below.

This parameter provides the following three choices.

- None No exclamation mark (!) appears.
- At ON An exclamation mark (!) appears when the IO is ON.
- At OFF An exclamation mark (!) appears when the IO is OFF.

Alternative/momentum settings

Configure the alternative and momentum buttons.

Text color and back color: Select a text color and background color of buttons when the signal specified in the Displayed Signal Settings window is ON and OFF each.

Displayed Signal Settings

Specify signals to be displayed on the interface panel.

Type: Select a signal type from I-signal, O-signal, L-signal, and R-signal. If the "Momentum" is selected, only L-signal and R-signal are available.

Display Style: Select the signal display format from Normal, BDC, and Binary.

Display: Select whether the specified signal should be displayed. Selecting OFF displays no signal on the panel.

Signal (Register No.): Specify a target signal number (register number) to be monitored or operated. The entry range differs with signal types.

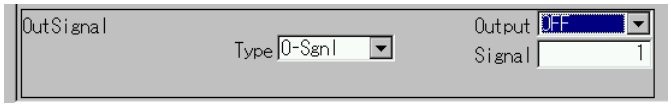
Signal	Entry range
I-signal	1 to 96
O-signal	1 to 96
L-signal	0 to 2047
R-signal	0 to 895

Only when R-signal is selected from the Type pull-down list, the Register No. and Bit No. appear instead of Signal as shown below.

Bit count: Specify the bit count to display when the display format is BCD or binary.

Output Signal Settings

Make output signal settings.



Type: Select a signal type from I-signal, O-signal, L-signal, and R-signal. If the "Momentum" is selected, only L-signal and R-signal are available.

Display: Select whether the specified signal should be displayed. Selecting OFF displays no signal on the panel.

Signal (Register No.): Specify a target signal number (register number) to be monitored or operated. The entry range differs with signal types.

Signal	Entry range
I-signal	1 to 96
O-signal	1 to 96
L-signal	0 to 2047
R-signal	0 to 895

Only when R-signal is selected from the Type pull-down list, the Register No. and Bit No. appear instead of Signal as shown below.

Bit No.: Specify the number of bits to output.

Saving interface panel configuration data

Transfer the interface panel configuration data between the robot controller and the PC using WINCAPSIII according to the transfer procedures given in Sections 3.5.1 and 3.5.3.

File transfer causes all of the base program file, interface panel configuration file, and controller error definition file to be transferred at a time.

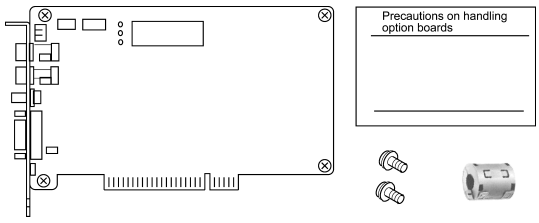
Those files transferred to the robot controller will be enabled at the next starting up.

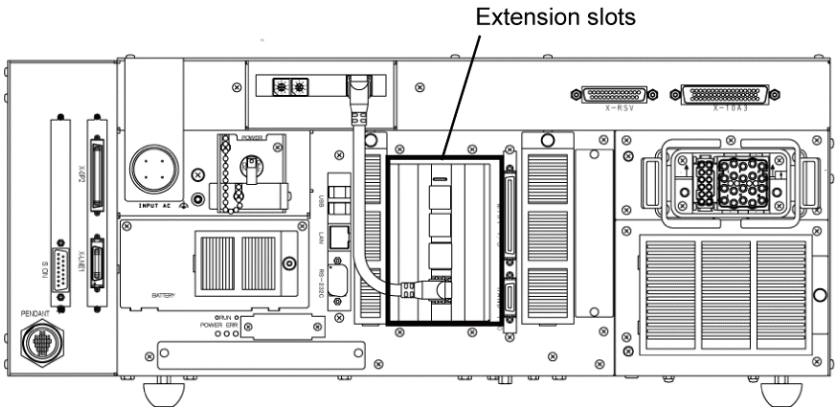
Chapter 7
Options

7.1 μVision Board

7.1.1 μVision Board and Mounting Position

The μVision board is shipped as a part integrated in the controller or shipped alone as a spare part. It should be mounted in any of the extension slots.

Name	Part number	Remarks	μVision board and its accessories (when shipped as a spare part)
μVision board	410010-4150	Integrated in the controller when shipped	
	410010-4160	Shipped alone as a spare part	



7.1.2 μVision Board Specifications

Image processing commands are already incorporated and no special operations or programming is required.

μVision Board Specifications

Item	Specifications
CPU	SH7750R 240 MHz
Image storage memory for processed images	512 (H) × 480 (V) pixels, 8 bits × 4 screens
Overlay memory for drawn images	640 (H) × 480 (V) pixels, 2 bits × 2 screens
Search model registration memory	1 MB, 255 (H) × 255 (V) × 8 models Up to 100 models registrable **(Note 1)**
Image input, number of channels	RS-170 (NTSC) monochrome, 256 gradations, 2 channels

Item	Specifications
Image output	RS-170 (NTSC) monochrome, 256 gradations, 1 channel
Image processing	Binary feature extraction (area, center of gravity, main axis angle, and luminance integration), histogram, edge detection, image-to-image operation, filtering, labeling, light/dark image search, code recognition (QR Code)
Processing range specification (window)	Up to 512 windows registrable (Shape: straight line, rectangle, circle, ellipse, sector)
Self-diagnosis function	Memory check, input error, processing range error, camera connection failure, etc.
Error display	Errors will be displayed on the teach pendant (option).
Power source	5 VDC, 12 V (supplied via controller PCI bus) **(Note 2)**
Environmental conditions (in operating)	Temperature: 0 to 40°C Humidity: 90 % RH or less (without dew condensation)

(Note 1) The number of registrable models differs depending upon the model image or size.

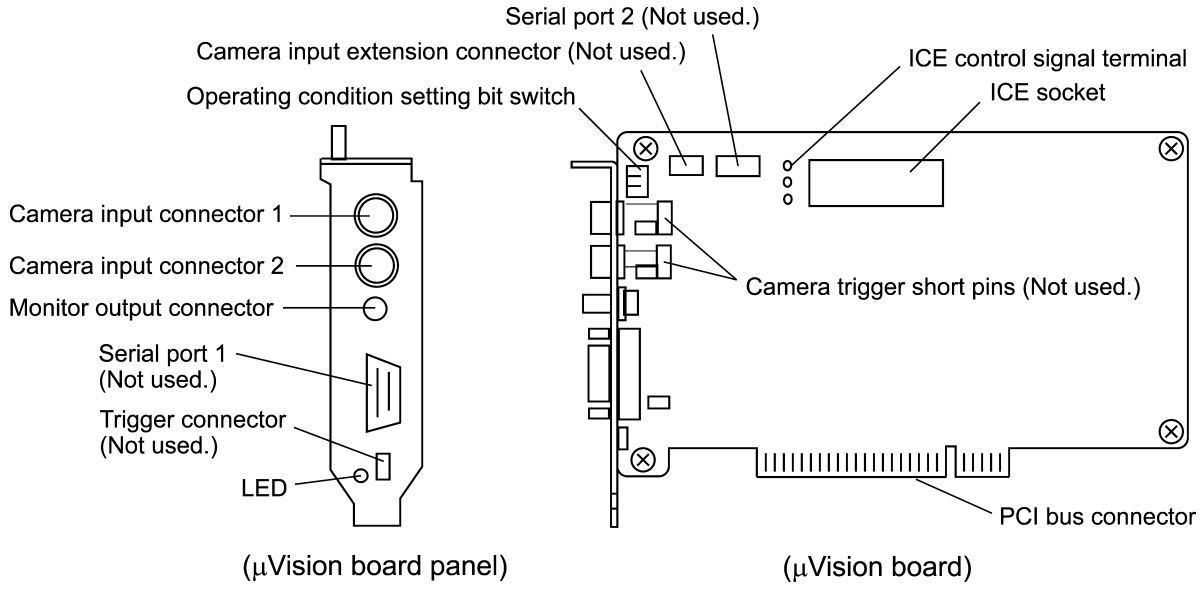
(Note 2) Since the power is internally supplied from the robot controller, no external power source is required.

7.1.3 Names and Functions of Connectors

The connectors on the panel of the μVision board and the pin assignments are shown below.

Connectors on the Panel of the μVision Board

Connectors on the panel of μVision board	Function
Camera input connector 1 (C1)	Used for connection with camera 1 (12-pin, round connector).
Camera input connector 2 (C2)	Used for connection with camera 2 (12-pin, round connector).
Monitor output connector (VO)	Used for connection with the monitor (BNC).
Serial port 1 (S1)	RS-232C port (Not used.)
Trigger connector (IO)	TTL level input/output, 1 point each (Not used.)



Note 1 Switches and short pins on the μVision board have been configured at the factory. Do not change the configuration. Changing it results in a failure.

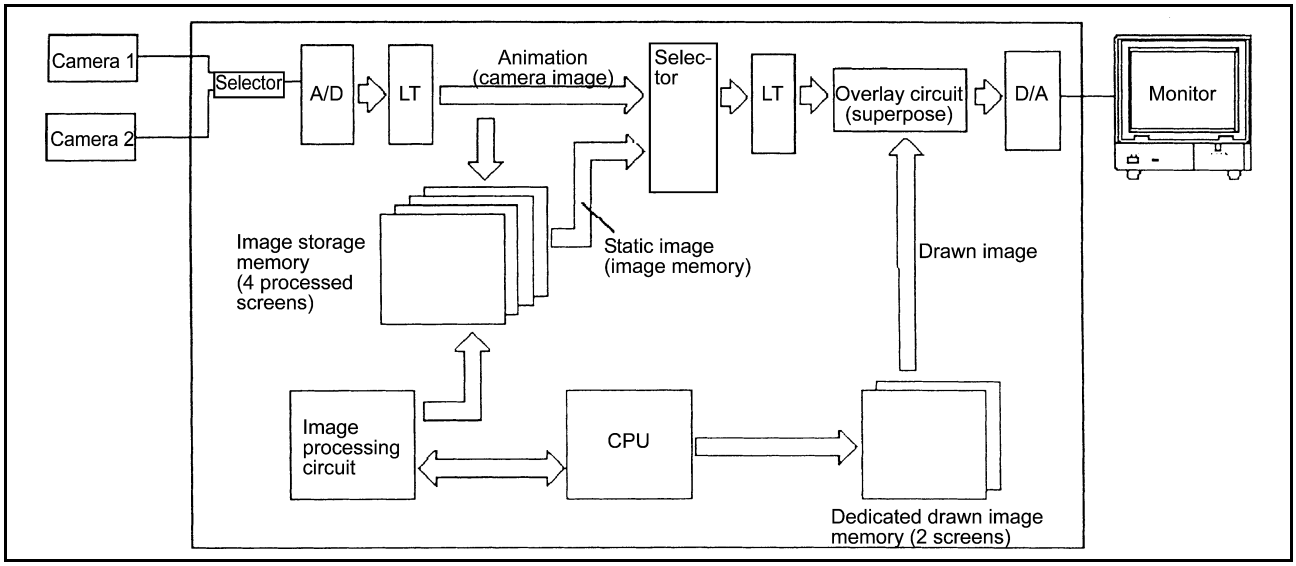
Note 2 Do not connect anything to the "Not used" connectors on the board. A failure may result.

Note 3 Serial port 1 and trigger connector on the panel are unusable. Do not connect anything to them. A failure may result.

Camera Input Connector Pin Layout (Hirose Electric HR10A-10R-12S or equivalent)

Pin No.	Signal name	Remarks
1	GND	Camera power GND
2	+12V	Camera power 12V
3	GND	Camera power GND
4	VIDEO	Video signal
5	HDGND	Horizontal synchronous signal GND
6	HD	Horizontal synchronous signal
7	VD	Vertical synchronous signal
8	NC	Not connected
9	NC	Not connected
10	NC	Not connected
11	TRIG	Trigger signal (not used)
12	VDGND	Vertical synchronous signal GND

7.1.4 Block Diagram and Internal Configuration of μVision Board

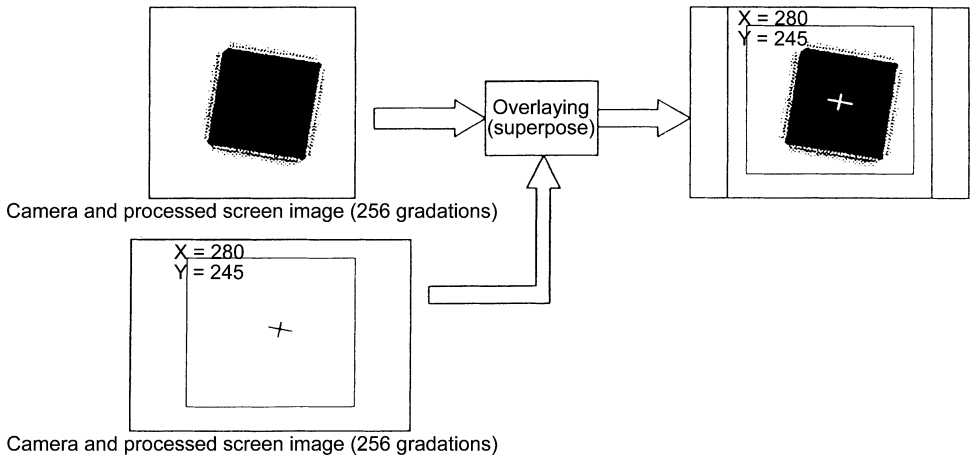


Block Diagram of μVision Board

The above figure illustrates the processing flow of the μVision board as a reference. The actual circuit configuration is different from this diagram.

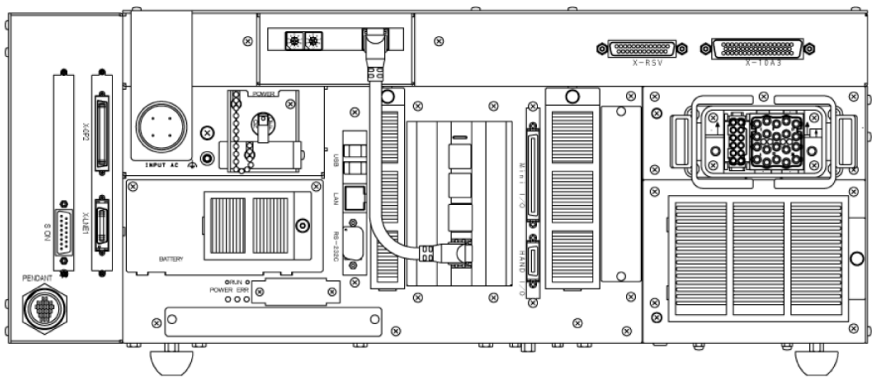
Configurators on the Block Diagram

Configurators	Function
Camera selector	Switches between cameras 1 and 2.
A/D	Converts analog signals into digital signals (8-bit).
Monitor selector	Selects whether to display the camera live image or static image on the monitor.
LT	Converts 8-bit data values using the appropriate table.
Overlay circuit	Overlays a drawn image, which is stored in the dedicated drawn image memory, on the camera live image or static image.
D/A	Converts digital signals into analog signals.
Image storage memory	Stores camera live images. When outputted onto the monitor screen, those images will be handled as static images. Up to four screens can be stored on this board.
Dedicated drawn image memory	Stores drawn images of characters and figures. Those images can be displayed on the monitor screen via the overlay circuit. Up to two screens can be stored on this board.
Image processing circuit	Processes images.
CPU	Manages the entire system.

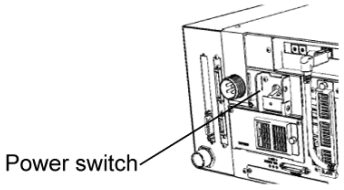


7.1.5 Mounting I/O Extension Boards

This section describes how to mount I/O extension boards.

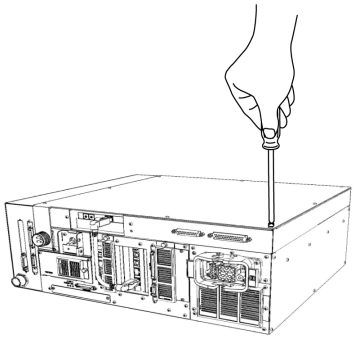


Step 1 Turn the controller power OFF.

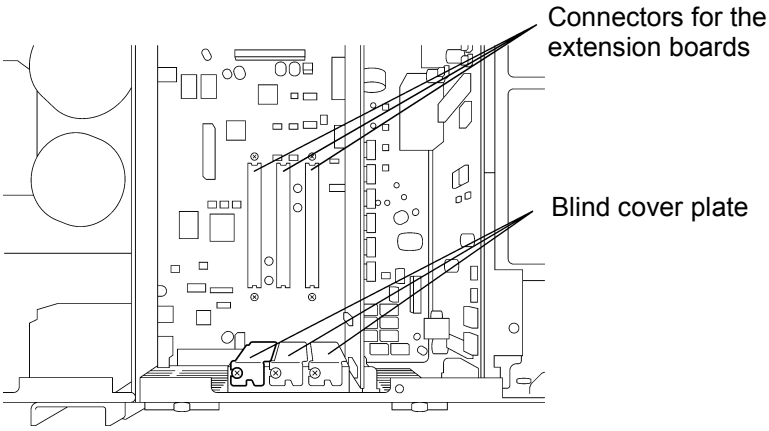


Step 2 Remove the upper cover from the controller by unscrewing four screws.

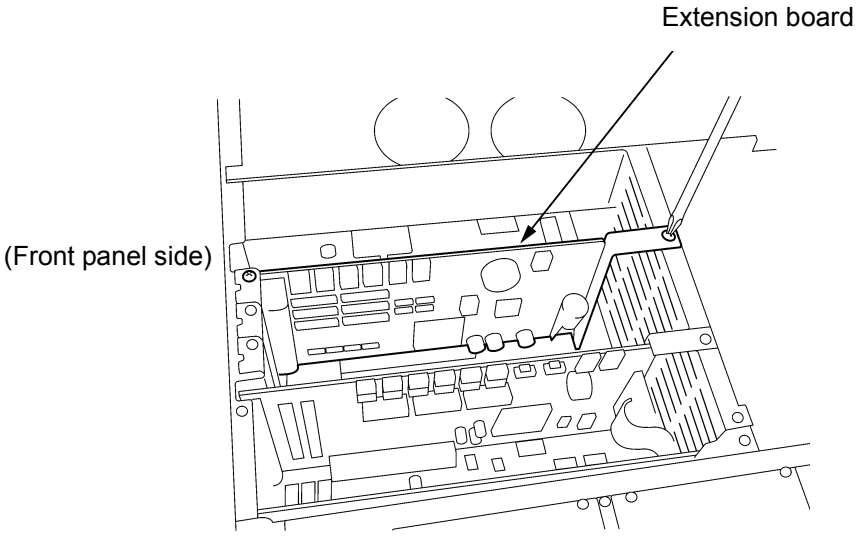
> **⚠Warning** **Before removing the controller upper cover for maintenance and inspection or other purposes, be sure to turn the controller power OFF, disconnect the power supply connector (CN6), and then wait at least three minutes. Otherwise, electric shock may occur.**
>
> **As long as the power supply connector (CN6) is connected, the power is supplied to the circuit protector via fuses even if the power switch is OFF. Touching the fuses may cause electric shock.**



Step 3 Use the extension slots starting from the left one (viewed from the front panel side).
Loosen the screw on the blind cover plate for the target extension slot and remove the plate.

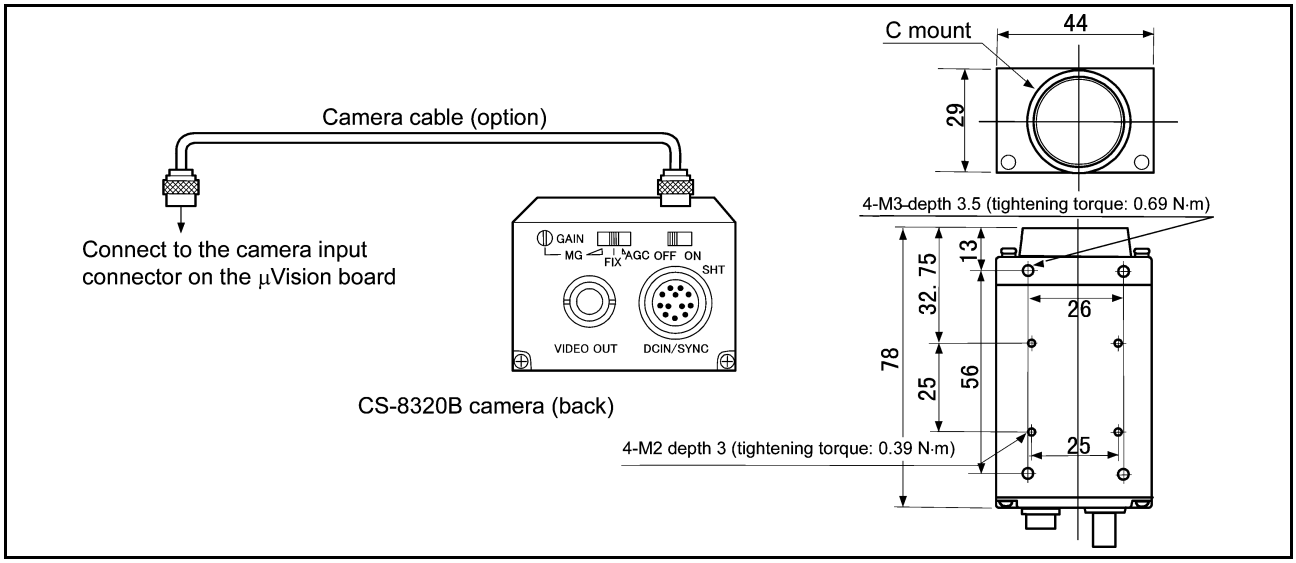


Step 4 Fully insert the extension board into the target connector, then secure the extension board stay with two screws.
(The illustration given below shows a mounting example of a parallel I/O board.)



Step 5 Set the controller's upper cover back into place.

7.1.6 Peripheral Device (Camera)



Camera Dimensions and its Parts Names

Camera Specifications

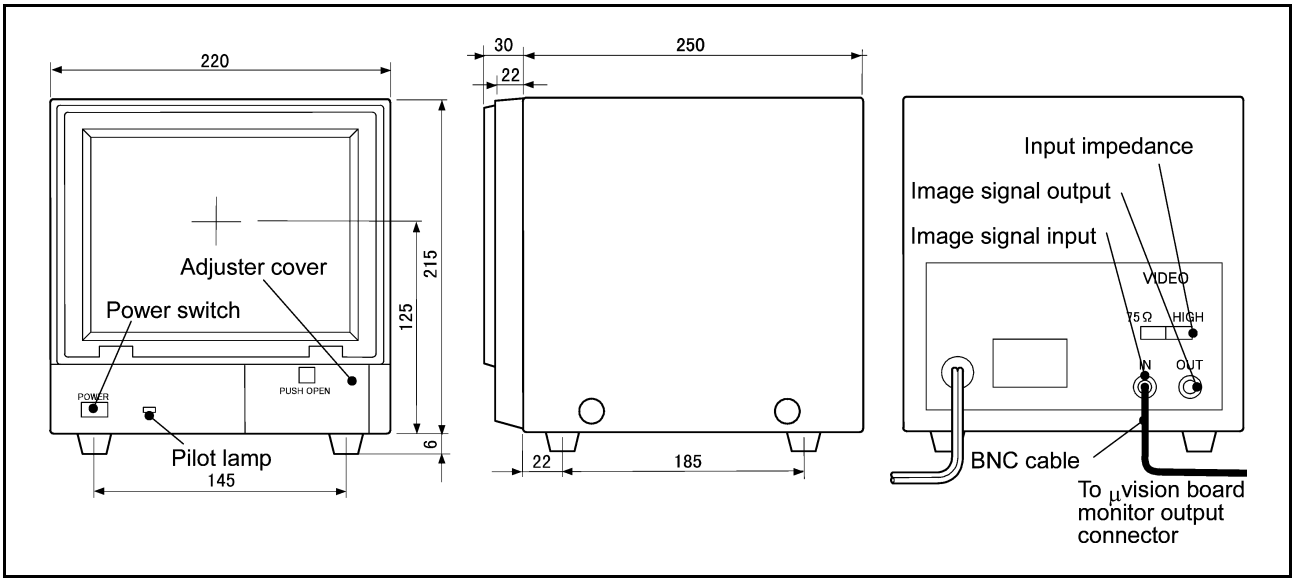
Item	Specifications
Manufacturer	Tokyo Electronic Industry Co., Ltd.
Manufacturer's model	CS8320B
Image pickup interline transfer system	CCD pixels: 768 (H) × 493 (V)
Lens mount	C mount
Image output NTSC signal	1.0 Vp-p/75Ω
Power source, Ambient temperature	Supplied from power adapter, 0 to +40°C
Weight	120 g
Vibration-proof	98 m/s, 10G (10 to 50 Hz, 30 minutes in each of X, Y and Z directions)

Cables (Option)

Cable length	Camera cable model
3 m	CPC3440-03
5 m	CPC3440-05
15 m	CPC3440-15

Caution
(1) When mounting the camera to the equipment, tighten the screws securely to the specified torque as shown above.
(2) Do not apply a strong impact or vibration to the camera. A failure may result.
(3) When opening the camera top cover and changing the settings, be sure to turn the controller power off or disconnect the camera cable.
(4) For setting up of cameras, refer to the instruction manual that comes with the camera.

7.1.7 Peripheral Device (Monitor)



Monitor Dimensions and Parts Names

Monitor Specifications

Item	Specifications
Manufacturer	Chuo Musen Co., Ltd.
Manufacturer's model	TMP-232-03
Cathode-ray tube (CRT)	9-inch, monochrome
Image input NTSC signal	0.7 Vp-p (straight polarity)
Power supply	100 VAC, 50/60 Hz
Power consumption	Approx. 30 W
Ambient temperature	0 to 40°C
Humidity	90% or less (without dew condensation)

Cables (Option)

Cable length	BNC coaxial cable type
1 m	3CV-PP (1)
3 m	3CV-PP (3)
5 m	3CV-PP (5)

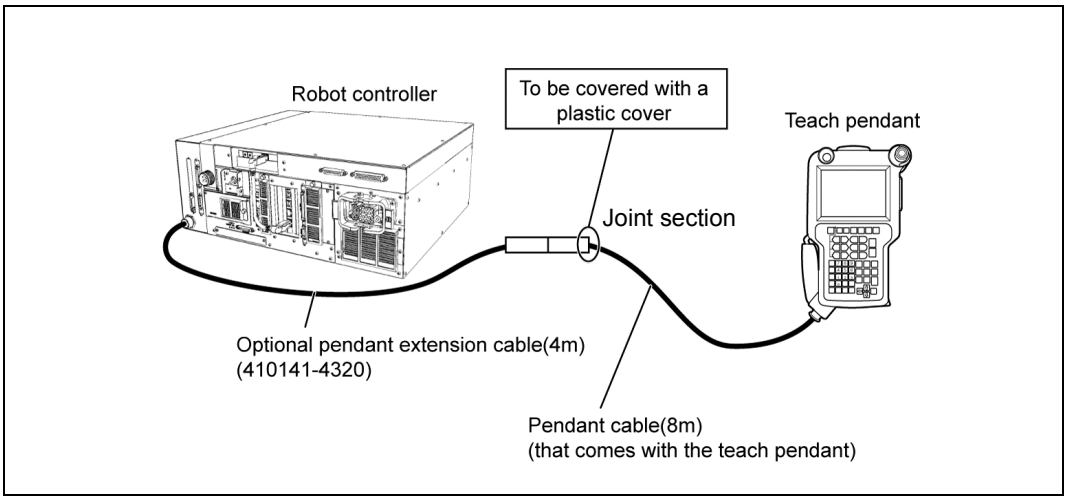
Caution (1) NEVER disassemble the monitor.

(2) Be sure to set a ferrite core clamp (ZCAT1518 manufactured by TDK) that comes with the μVision board, to the BNC cable at the monitor output connector side.

7.2 Pendant Extension Cable

An extension cable is optionally available for the teach pendant. It should be connected as shown below.

The extension cable kit contains an extension cable and its accessories (plastic cover, bolts, nuts, etc.). Before connecting the extension cable to the pendant cable, cover the end of the pendant cable with the plastic cover as instructed in Section 7.2.1. (The end of the extension cable has been covered with a plastic cover when shipped.) Those plastic covers prevent the joint section from being caught on a projection on the floor.



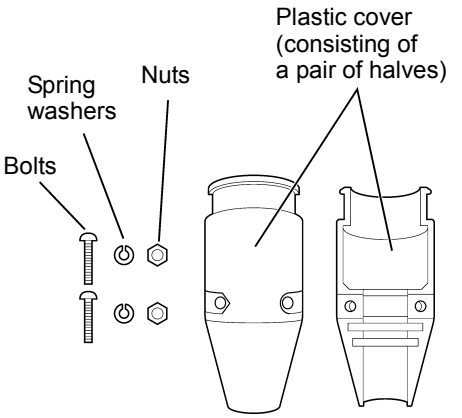
7.2.1 Covering the End of the Pendant Cable with Plastic Cover

Step 1

Check that the extension cable kit contains the following accessories together with an extension cable.

- Plastic cover consisting of a pair of halves
- 2 nuts
- 2 bolts (M3 x 14)
- 2 spring washers

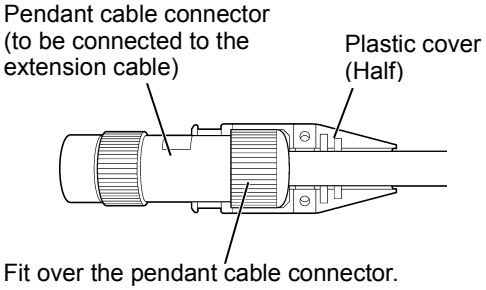
Accessories in the extension cable kit



Step 2

Fit one of the halves of a plastic cover over the pendant cable connector.

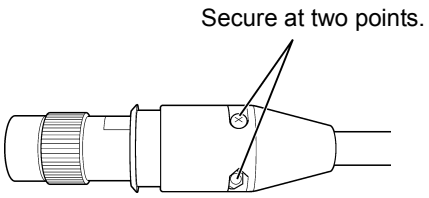
The pair of halves has the same shape.



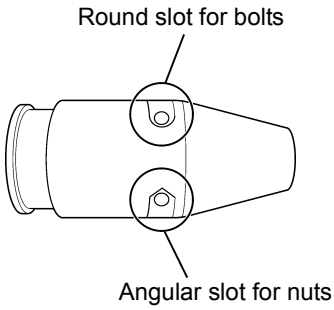
Step 3

Combine another half of the plastic cover with the half fitted in Step 2 and then secure them with two bolts, spring washers, and nuts as shown at right.

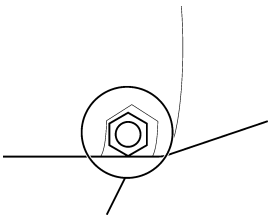
Recommended tightening torque:
50 to 60 N•m



Note: Set the spring washers on the bolt side, not on the nut side.



Note: As shown at right, be sure to set nuts into the angular slots that are designed to prevent nuts from getting loose. Setting nuts into the round slots will idle the nuts, making it difficult to tighten them firmly.



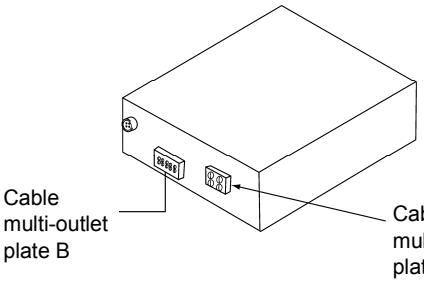
7.3 Controller Protective Box

The controller protective box protects the controller from dust, dirt and oil mist existing in the factory. It is equipped with a heat exchanger for cooling the air warmed up by the controller inside the box down to the ambient temperature.

7.3.1 Configuration

The controller protective box and its accessories are shown below.

Protective Box



Accessories for Cable Multi-outlet Plate B

Name printed	Applicable cable dia.	Shape
P0		
P4	ϕ4 to ϕ6	
P6	ϕ6 to ϕ8	
P8	ϕ8 to ϕ10	
P10	ϕ10 to ϕ12	

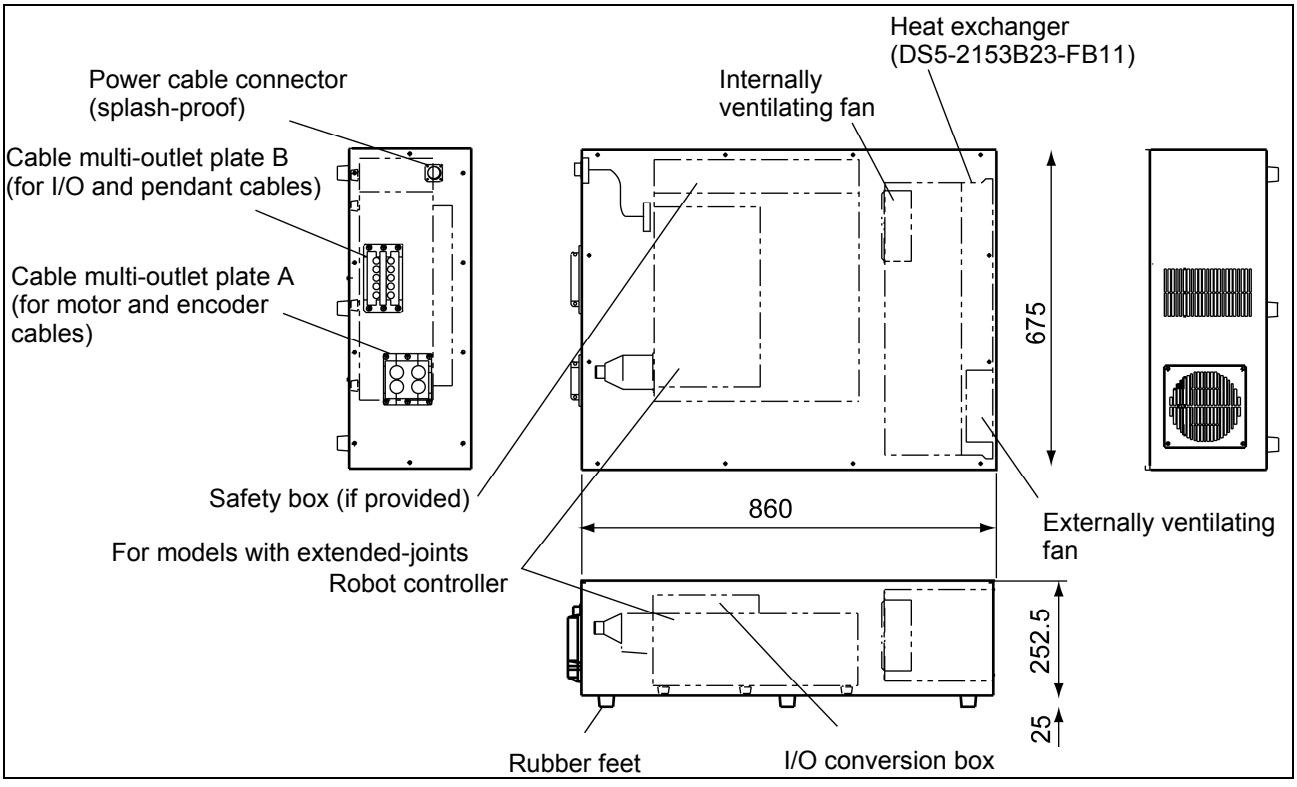
Option

Rubber packing set for extended-joint cables

Part No. 410169-2140

7.3.2 Component Names and External Dimensions

The figure below shows the names of the protective box components and the external dimensions.



Controller Protective Box (with the upper cover removed)

7.3.3 Specifications

The table below lists the specifications of the controller protective box.

Item		Specifications
Protective box model		FB-11
Applicable controller		RC7M controller (The controller equipped with an I/O conversion box is also applicable.)
Power cable		410141-3570 (used for the global type) recommended **Note:** Using the power cable 410141-3570 provides higher sealing capability than 410141-0010 (used for the domestic, standard type).
Environmental conditions (Temperature and humidity)	In operation	0 to 40°C, RH 90% or below (dew condensation not allowed)
	In storage or during transportation	-10 to 60°C, RH 75% or below (dew condensation not allowed)
Enclosure		IP54
Weight (Mass)		Approx. 32 kg
Heat exchanger	Model	DS5-2153B23-FB11 (NIHON KAGAKU SANGYO CO., LTD)
	Fans	Internally and externally ventilating fans (US7556KX-TP manufactured by ROYAL ELECTRIC CO., LTD.)
	Cooling power	31 W/K (temperature change 1°C, calculated value)
	Power supply	Supplied from the controller power (Single-phase, 200 VAC distributed on the terminal board)
	Power consumption	80 W (60 Hz), 72 W (50 Hz)
	Rated current	0.54 A (60 Hz), 0.46 A (50 Hz)

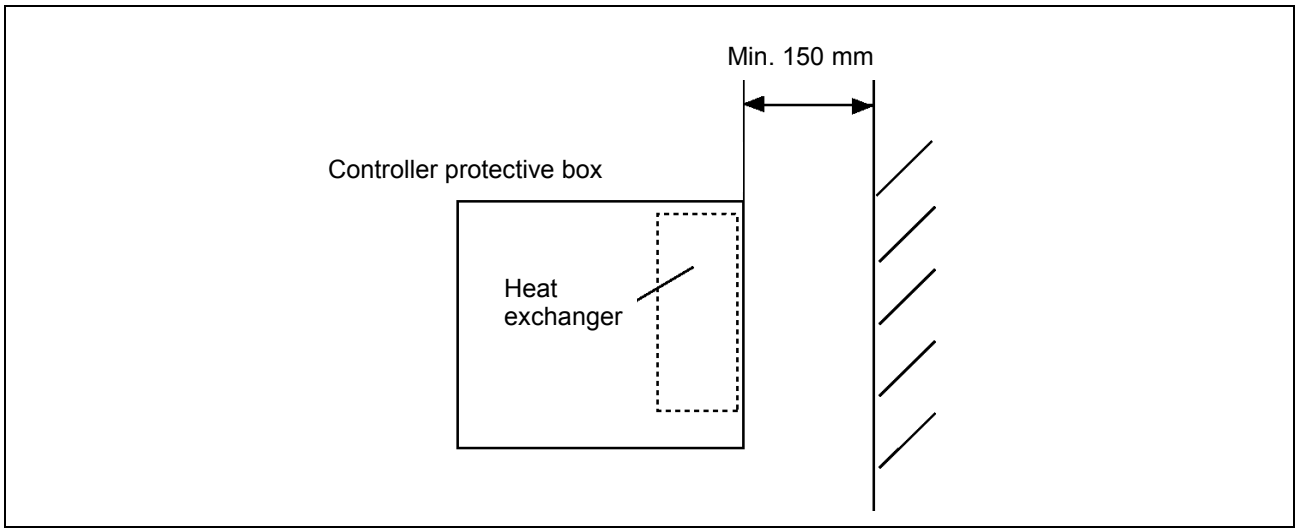
7.3.4 Usage

[1] Installation Environment

(1) Place the protective box indoors.

(2) Place the protective box on a horizontal plane.

(3) Keep a space of min. 150 mm at the heat exchanger side of the protective box.



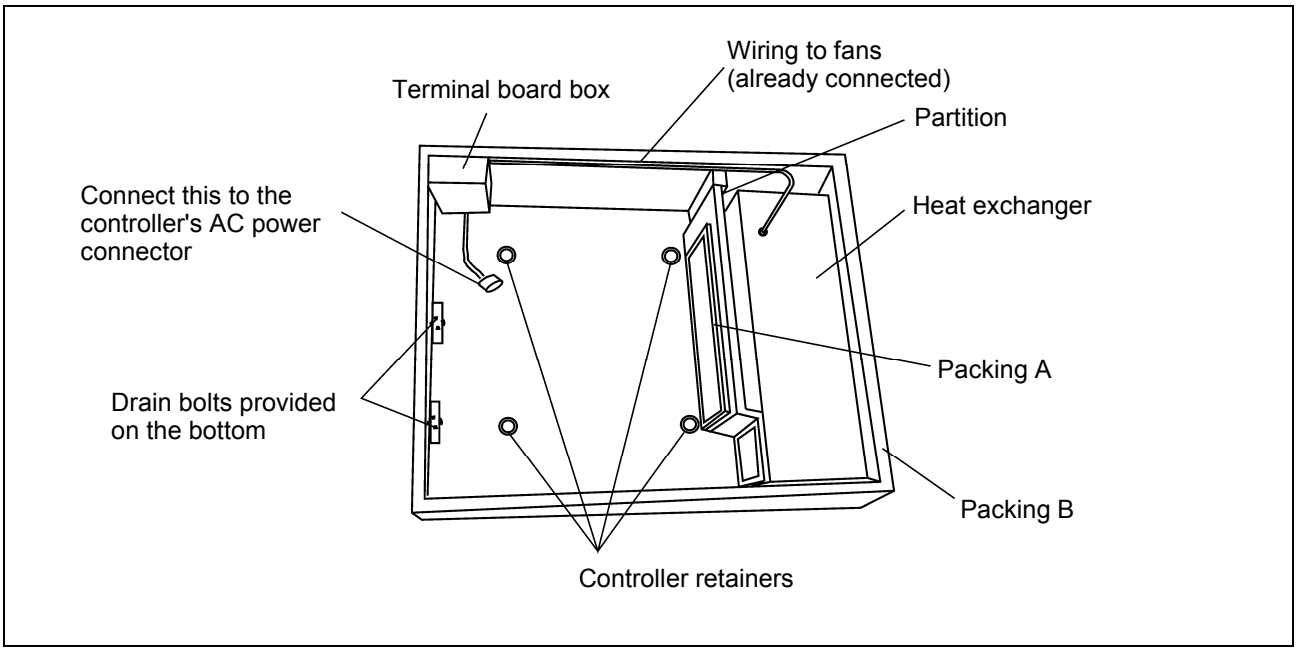
[2] Placing the Robot Controller in the Protective Box

(1) Remove the upper cover from the protective box and peel off tapes from packings A and B.

(2) Place the robot controller in the protective box so that controller's rubber feet fit in the retainers provided in the protective box.

(3) Connect the cable coming from the terminal board box to the power connector (CN5) on the controller.

Note: The wiring to the heat exchanger's fans has been done via a 0.5 A glass fuse with single-phase 200 VAC distributed on the terminal board. If the fan(s) is not working, check this fuse.



[3] Cabling to the Robot Controller

The cables to be connected to the controller should be passed through the cable multi-outlet plates on the front panel of the protective box and then connected to the controller.

To pass the cables through the cable multi-outlet plates, remove those plates from the protective box, pass the cables through them, and then set those plates back into place.

(1) Connect the power cable 410141-3570 (used for the global type, recommended) to the power cable connector on the protective box.

(2) Pass the robot control cable (motor and encoder cables) through the cable multi-outlet plate A mounted on the protective box.

(3) Replace the rubber packings currently mounted on the cable multi-outlet plate B with the ones suitable as listed below, then pass the cables through the plate B.

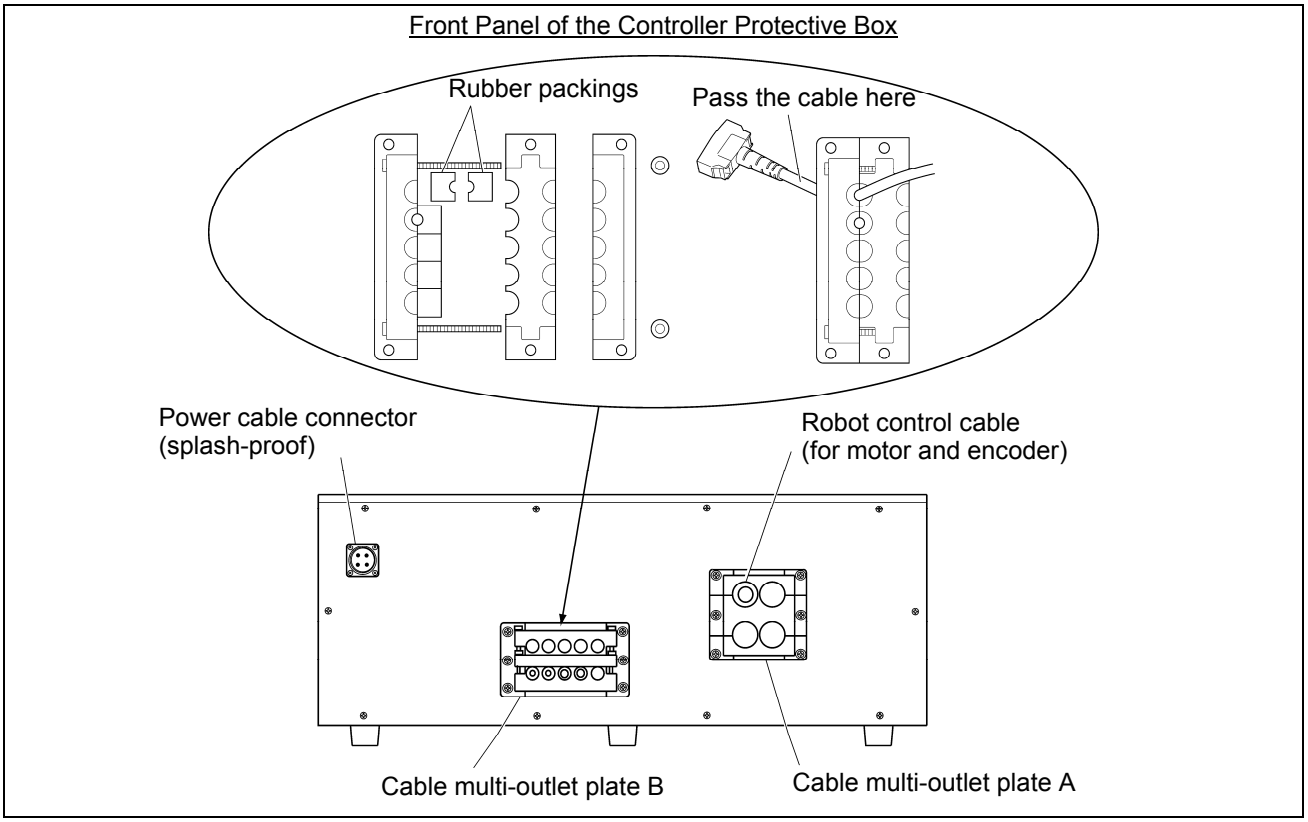
Rubber Packing Set (that comes with the protective box) for Cable Multi-outlet Plate B

Model	Applicable cable dia.	Application	No. of sets (2 pieces per set)
EMSP0	No cable holes	To be used as a blind cover	2
EMSP4	ϕ4 to ϕ6		1
EMSP6	ϕ6 to ϕ8	Pendant cable, hand I/O cable, and safety I/O cable	1
EMSP8	ϕ8 to ϕ10	Mini I/O cable	2
EMSP10	ϕ10 to ϕ12	Extended parallel I/O cable	1

Rubber Packing Set for Extended-Joint Cables

Model	Applicable cable dia.	Application	No. of sets (2 pieces per set)
EM28P8	ϕ8 to ϕ10	Extended-joint motor cable	1
EMSP8	ϕ8 to ϕ10	Extended-joint encoder cable	1

Note 1: Replace the rubber packings currently mounted on the cable multi-outlet plate A with the ones for extended-joint motor cable (EM28P8), then pass the extended-joint motor cable through the plate A.
Note 2: Replace the rubber packings currently mounted on the cable multi-outlet plate B with the ones for extended-joint encoder cable (EMSP8), then pass the extended-joint encoder cable through the plate B.



7.3.5 Notes

(1) The controller protective box is a dust- and splash-proof structure equivalent to IP54. However, it has not been designed to withstand explosions, so avoid installing the protective box in any environment where:

- there are any flammable gases or liquids,
- there are any acidic, alkaline or other corrosive gases,
- there are any large-sized inverters, high output/high frequency transmitters, large contactors, welders, or other sources of electrical noise,
- the ambient temperature is out of the range from 0°C to 40°C,
- the protective box is directly exposed to rains,
- the protective box is directly exposed to water, oil, grinding chips or shavings,
- there are any grinding or machining chips or shavings, or
- any machining oil not specified in this manual is in use.
  Note: Yushiron Oil No. 4C (non-soluble) is specified.

(2) When using the controller protective box in an environment where there is much oil mist, perform sealing on the mounting face and around the screws. Also periodically clean the fins to prevent oil sludge from accumulating on the fins.

(3) If oil mist accumulates inside the controller protective box, remove the drain bolts to drain oil.

(4) The controller protective box has no power switch, so externally turn the controller power on and off.

Chapter 8 Appendices

8.1 System- and User-Defined Errors (PLCERROR.EPL)

Transferring the controller error definition file "PLCERROR.EPL" to the controller from your PC with WINCAPSIII enables the controller to display error messages defined in that file.

In addition to system-defined errors stored in the error definition file, the user can describe user-defined errors.

Note: After the controller is set up, it automatically creates the controller error definition file in the same language as that of the teach pendant first connected to the controller. To initialize the error definition file, use the "program" at the [ExtScrn]—[Set]—[Save!]—[DataClr] of the teach pendant. This operation initializes not only the error definition file but also all of the programs and the interface panel configuration file data.

8.1.1 Error Format

The controller error definition file (PLCERROR.EPL) is a text file consisting of the following four blocks.

(1) Header `<PLCErrorDefinition>`
(2) System alarm code `<SystemAlarmCode>`
(3) User alarm code `<UserAlarmCode>`
(4) Sub code `<SubCode>`

The `<PLCErrorDefinition>`, `<SystemAlarmCode>`, `<UserAlarmCode>`, and `<SubCode>` are identifiers for blocks.

When the controller is powered on, it reads the error definition file. If the file has no `<PLCErrorDefinition>` at the header block, the controller does not recognize it as an error definition file, terminating the reading process with a read error.

Lines following an identifier `<SystemAlarmCode>`, `<UserAlarmCode>`, or `<SubCode>` are recognized as system alarm codes, user alarm codes, or sub codes, respectively. Note that an error definition file cannot contain more than one same identifier for `<SystemAlarmCode>`, `<UserAlarmCode>`, and `<SubCode>` each. Two or more same identifiers in a file causes an error, terminating the reading process.

Each of `<SystemAlarmCode>`, `<UserAlarmCode>`, and `<SubCode>` should be described in the following format.

```
[numeral], "[character string]"
```

If there is a line described in a different format, the controller terminates the reading process with an error.

The entry range of `[numeral]` is listed below.

	[numeral]	
	Alarm code	Sub code
System-defined error	1 to 64	1 to 1024
User-defined error	1 to 64	1025 to 2048

If a value out of the above entry range is specified, the controller terminates the reading process with an error.

`[character string]` can have up to 40 characters. If it exceeds the limit, the controller terminates the reading process with an error.

Given below is an example of error definition file.

```
--------------- < Start of "plcerror.epl" file > --------------------
<PLCErrorDefinition>
<SystemAlarmCode>
1,"PNOZmulti base unit error"
2,"PNOZmulti external module error"
3,"Safety signal input error"
4,"PC10JP-CPU error"
5,"PC10JP communications error"
6,"Equipment preparation error"
7,"Robot motion error"

<UserAlarmCode>
0,"R1 robot error"
1,"WPS1 control power source error"
2,"WPS1 CPU error"
3,"WPS1 DeviceNet error"
4,"WPS1 Output error"
5,"R1 welding circuit error"
6,"R1 arc welding error"
7,"R1 welding environmental requirements error"
8,"R1 voltage/current requirements error"
9,"R1 average requirement output error"
10,"R1 material handling error"

<SubCode>
1,"PNOZm1p mounting failure"
3,"PNOZm1p output connection defective"
4,"PNOZm1p CPU internal error"
5,"PNOZm1p input section internal error"
6,"PNOZm1p output section internal error"
7,"PNOZm1p input section external error"
8,"PNOZm1p input section FB external error"
17,"PNOZmo4p-1 output external error"
18,"PNOZmo4p-1 internal error"
19,"PNOZmo4p-2 output external error"
20,"PNOZmo4p-2 internal error"

---------------<End of ”plcerror.epl” file>--------------------
```

8.1.2 Transfer of Controller Error Definition File

The controller error definition file (PLCERROR.EPL) can be transferred between the controller and the PC using WINCAPSIII.

For the transfer procedure, see Section 3.5.1. The procedure transfers all of the base program file, interface panel configuration file, and controller error definition file at a time.

Those files transmitted to the robot controller will be enabled at the next starting up.

8.1.3 Language for Interface Panel and User-defined Error Messages

Interface panel and user-defined error messages displayed on the teaching pendant can be created and edited by user.

For these settings, Japanese and English samples are provided as default.

The language for the interface panel or user-defined error messages is automatically selected according to the language that has been selected when a controller is connected to a pendant for the first time after shipping. Once the language is set, it is not changed even if the pendant screen language is switched. To change the language, edit the messages in your desired language, or initialize the interface panel or user-defined error messages.

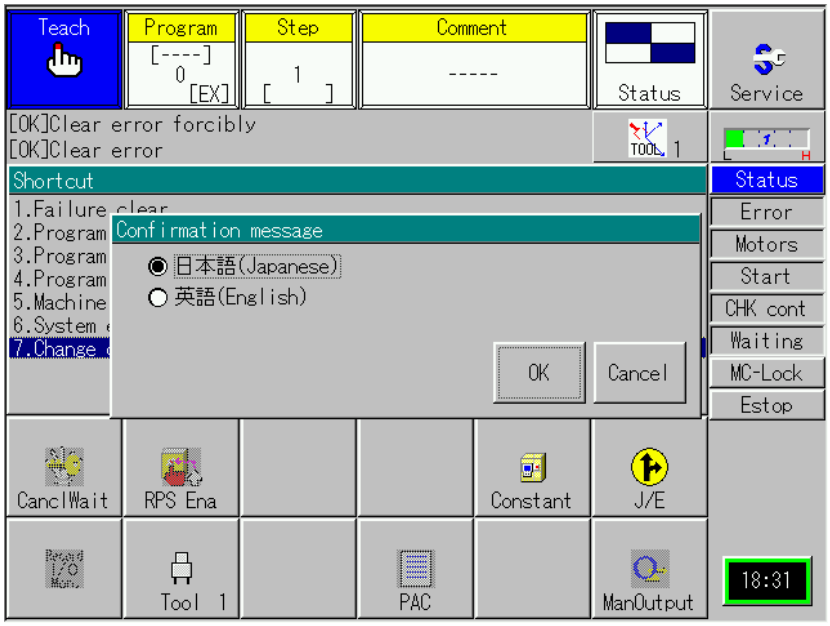
The initialization procedure is as follows.

> Note: Initialization clears the user settings on the interface panel or error messages.

STEP 1

Switch the language to your desired language.

Access: RESET R → [7. Change displaying language]



STEP 2

To initialize the interface panel, select

[Constant] → [8.Opt.] → [F1 T03 Opt.] → [F7 IntIFPnl]

A confirmation message appears on the screen.

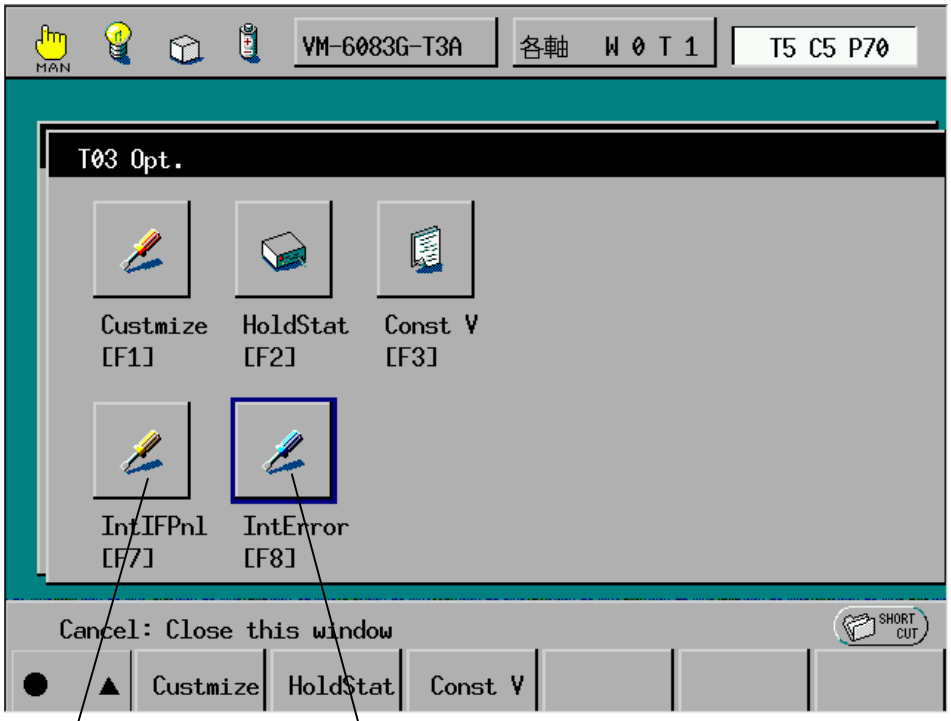
Pressing [OK] initializes the interface panel in the language selected in STEP 1.

To initialize user-defined error messages, select

[Constant] → [8.Opt.] → [F1 T03 Opt.] → [F8 IntError]

A confirmation message appears on the screen.

Pressing [OK] initializes the user-defined error messages in the language selected in STEP 1.



For initialization of user-defined error messages

For initialization of the interface panel

STEP 3

Restart the controller to apply the initialization.

8.1.4 Notes in Using WINCAPSIII

When WINCAPSIII runs for T03 series of robots, the following functions are not available.

- Online debugging
- A part of logging
  - Trace logging (for single-line execution/multitasking program)
  - Variable logging
  - I/O logging

Vertical articulated V*-G-T SERIES
Horizontal articulated H*-G-T SERIES

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DENSO WAVE INCORPORATED

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The purpose of this manual is to provide accurate information in the handling and operating of the robot. Please feel free to send your comments regarding any errors or omissions you may have found, or any suggestions you may have for generally improving the manual.