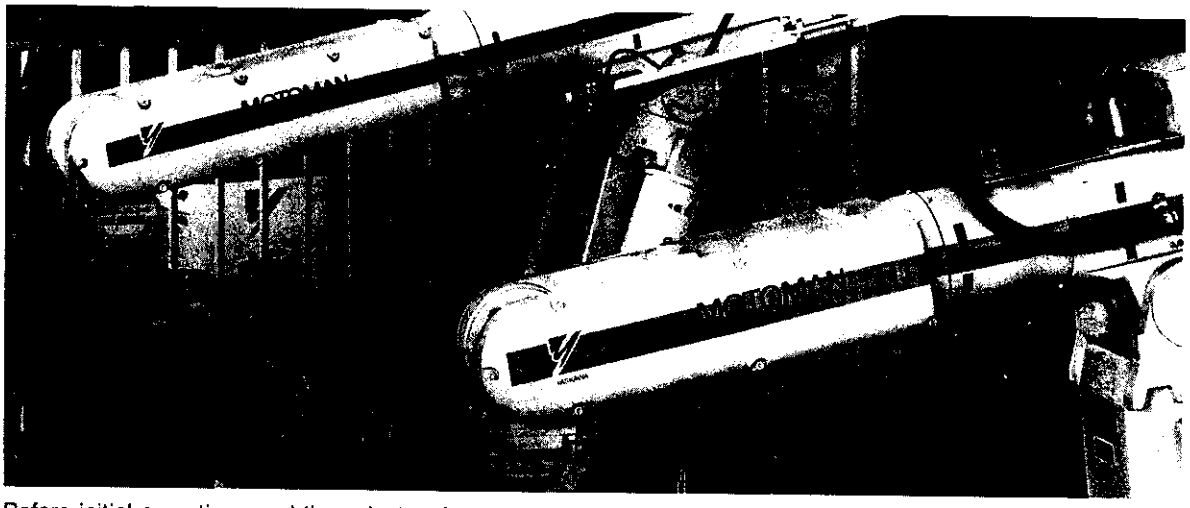
YASNAC MRC

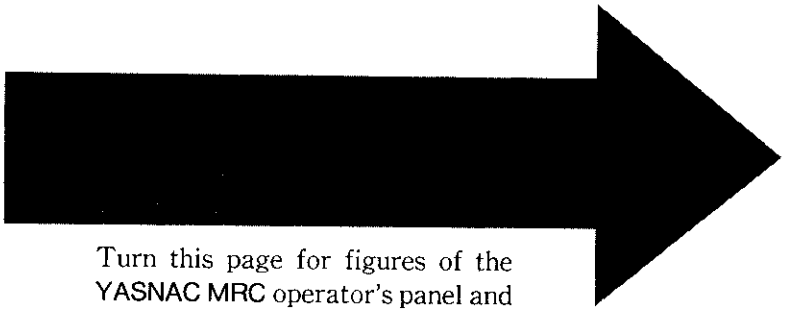
CONTROLLER FOR INDUSTRIAL ROBOT MOTOMAN

BASIC OPERATOR'S MANUAL



Before initial operation, read these instructions thoroughly, and retain for future reference.

YASKAWA



Turn this page for figures of the YASNAC MRC operator's panel and the programming pendant.

This manual illustrates graphically the basic operation procedures for MOTOMAN robots.

Refer to the standard Operator's Manual and Maintenance Manual, respectively, for details.

■ Related Publications

- Motoman Series with YASNAC MRC CONTROLLER OPERATOR'S MANUAL (TOE-C945-400 · ⬚)
- YASNAC MRC MAINTENANCE MANUAL (TOE-C945-403)

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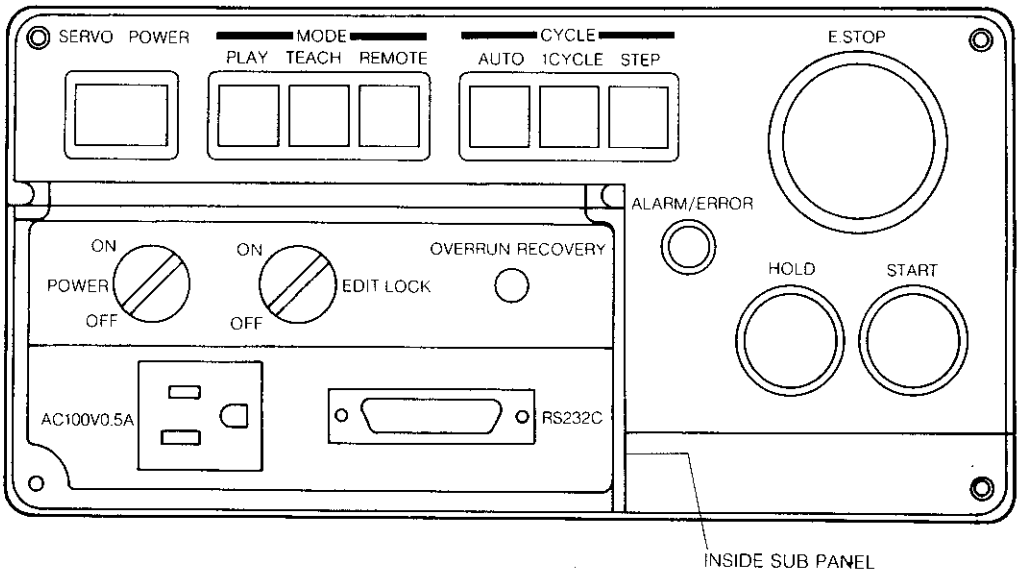
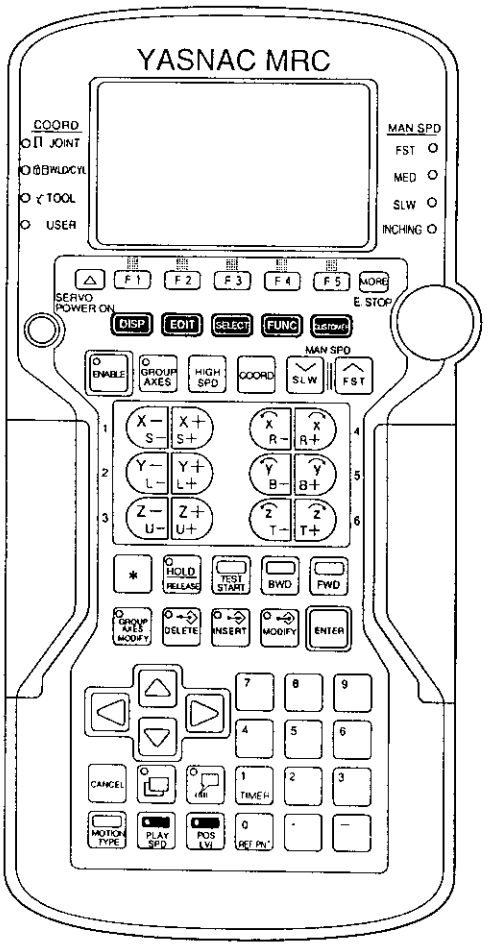
Keep this page unfolded while performing key operation.

■PLAYBACK BOX KEY FUNCTION



■PROGRAMMING PENDANT KEY FUNCTION



GUIDE OF THE MANUAL

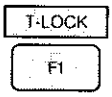
■KEYS

- Keys are enclosed in boxes.

  [Example] key is represented as follows.

  Depress [TEST START] .

- Softkey labels displayed on the screen are enclosed in brackets.

  [Example]  key is represented as follows.

  Depress [F1] [T-LOCK] .

- Keys joined by "+" means to hold down the first key, and depress second key.

  [Example] Instruction to hold down [*] and depress

  is written as follows:

  Depress [*] + [TEST START] .

- Each numerical key is assigned to a function apart from entry of the number. In this manual, a numerical key is represented by either the numeral or the word on the key top that corresponds to the objective function in the context.

  [Example] key is represented as follows.

  Instruction to enter the number "1" is written as follows:

  Depress [1] .

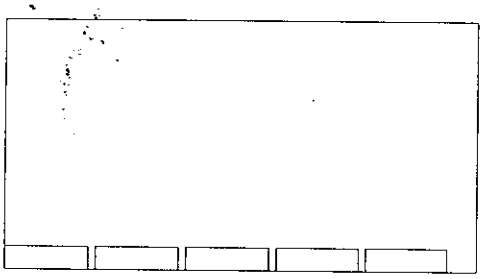
  Instruction to enter a timer instruction is written as follows:

  Depress [TIMER] .

■SCREENS

- The whole or part of the programming pendant screen is shown as follows, as required.

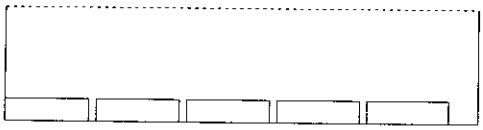
Entire screen



Upper part of the screen

Middle part of the screen

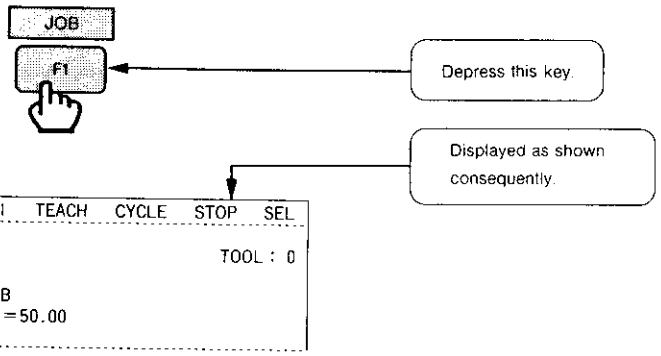
Lower part of the screen



- In the description of the operation procedures, the keys and screens are in the operating order in principle.

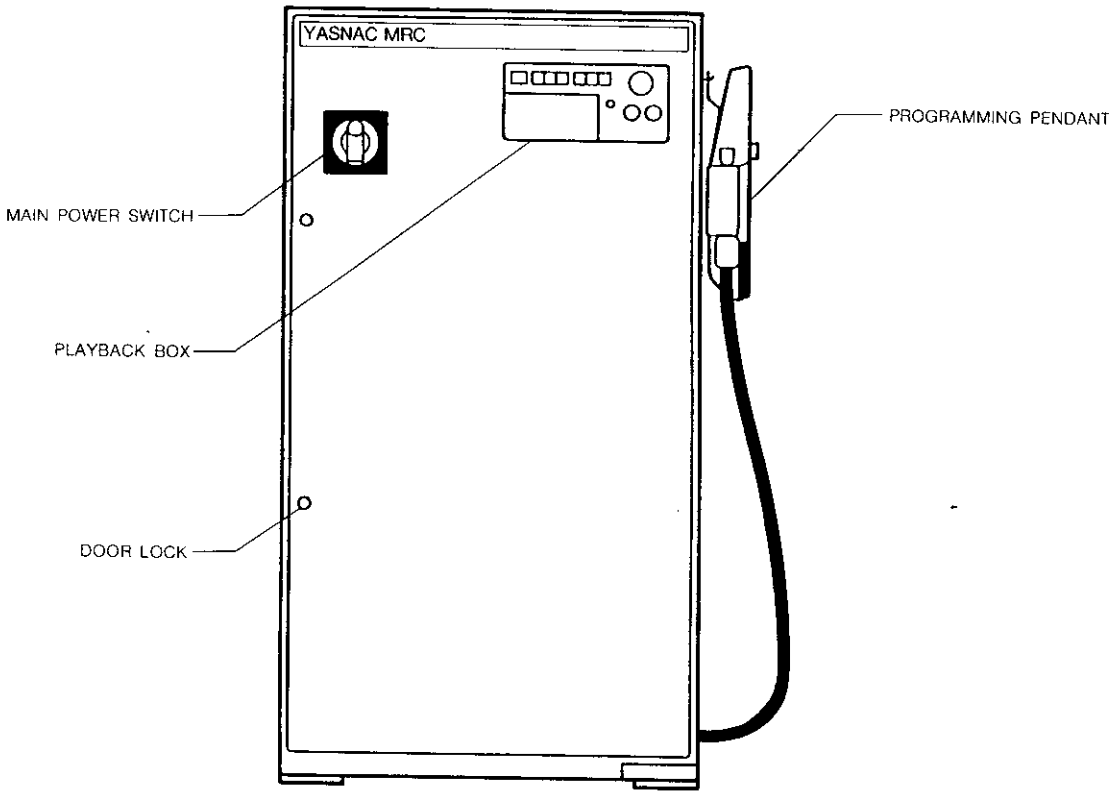
[Example]

1 Depress [F1] [JOB] .



CONTROLLER

The main power switch and the door lock are provided on the front of the YASNAC MRC controller. The playback box is mounted on the upper right part of the front face. The programming pendant is hooked on the side.



MAIN POWER SWITCH:

Turns ON and OFF control power to the YASNAC MRC.

DOOR LOCK:

Locks the front door.

PLAYBACK BOX:

Supports keys that are mainly used when playing back a job with the manipulator.

PROGRAMMING PENDANT:

Supports keys that are mainly used when teaching the manipulator.

KEY FUNCTION

■PLAYBACK BOX

E.STOP

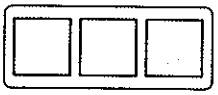
Turns OFF the servo power.

SERVO POWER

Turns ON the servo power.

MODE

PLAY TEACH REMOTE



Selects operation mode.

PLAY

Enters play mode and enables playback operation for a job to which teaching has been completed.

TEACH

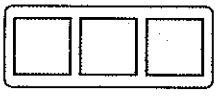
Enters teach mode and enables axis operation and editing operation on the programming pendant.

REMOTE

Enters remote mode and enables playback operation by instructions through an external computer.

CYCLE

AUTO 1 CYCLE STEP



Selects operating cycle in playback operation.

AUTO

Operates the selected job repeatedly.

1 CYCLE

Operates the selected job once.

STEP

Operates one step of the job each time the STEP key is depressed.

ALARM ERROR

This lamp lights if an alarm or error occurs.

START

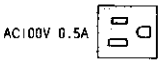
Makes the manipulator start playback operation.

HOLD

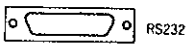
Stops operating manipulator temporarily while this button is held down.

OVERRUN RECOVERY

Depressing this key momentarily releases limit switch overruns and shock sensor trips.

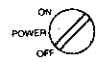


Power for floppy disk drive (FC1).



RS-232 (D-SUB) connector. Connects with an external recorder, printer, or personal computer.

(POWER)



Key-lock switch. Turns ON and OFF main power remote from the controller.
· This switch is optional.

(EDIT LOCK)

Key-lock switch. Prohibits the editing operation from the programming pendant or the operator's panel (option) at ON position.
· This switch is optional.

KEY FUNCTION

■PROGRAMMING PENDANT

E. STOP

Turns OFF servo power.

SERVO POWER ON

Turns ON manipulator drive power.

[SOFT KEYS]

F1 F2 F3 F4 F5

Corresponds to the function of soft key labels at the bottom of the screen.

MORE

Calls up the next five soft key labels of the same level while the "→" symbol appears at the lower right portion.

Moves the soft key cursor.

ENABLE

Enables the axis operation on the programming pendant while this key-lamp is lit. When this key is depressed again, the lamp goes OFF indicating that the enabled state has been cleared.

GROUP AXES

Switches the group of axes to be operated or taught.

〈Using with another key〉

[*] + [GROUP AXES]

Group axes to be operated can be selected.

DISP

Enters display mode and enables selection of various display menu.

EDIT

Enters edit mode and enables editing operation of jobs and data.

Registers a new job or calls an already registered job or sets up conditions.

FUNC

Selects optional functions.

Enables to use the customized function.

COORD

Selects coordinate system for manual operation.

〈Using with another key〉

[*] + [COORD]

The coordinate No. can be changed when tool or user lamp is lit.

MAN SPD

SLW FST

Sets the speed for manual operation (including FORWARD/BACKWARD).

〈Using with another key〉

[FST] + [SLW]

"SLOW" speed is chosen.

HIGH SPD

During manual operation, depress this key while holding down any of the axis keys. The manipulator moves at the high speed while the keys are held down. Speed changing operation can be skipped.

MOTION TYPE

Selects motion type at playback operation.

〈Using with another key〉

[*] + [MOTION TYPE]

Motion type is changed to special linear motion.

[Axis keys]

X− S− X+ S+ | X R− X R+
Y− L− Y+ L+ | Y B− Y B+
Z− U− Z+ U+ | Z T− Z T+

Moves specified axis on manipulator in specified coordinates while the key is depressed.

〈Using with another key〉

[*] + AXIS KEYS

Moves base axis when "robot axes" is selected.

[Cursor keys]

Moves the cursor on the CRT display in the direction of the arrows.

〈Using with another key〉

[↑] + [↓]	Moves the cursor to the upper-left portion of the display.
[←] + [→]	Switches the message if there are two or more messages.
[*] + [↑]	Goes to the previous page.
[*] + [↓]	Goes to the next page.
[*] + [→]	Scrolls the display toward right.
[*] + [←]	Scrolls the display toward left.

Moves the manipulator to check a series of taught steps as a continuous movement, while this key and [FWD] are depressed at the same time.

〈Using with another key〉

[TEST START] + [FWD]

The manipulator continuously moves as taught in steps.

Release [TEST START] to stop the manipulator immediately.

Moves the manipulator in the locus of taught steps, while the key is depressed.

〈Using with another key〉

[*] + [FWD]

The manipulator executes all instructions except move instructions.

Moves the manipulator moves in the locus of taught steps in the reverse direction while the key is depressed.

Halts the manipulator and the lamp lights indicating the hold state. When the key is depressed again, the lamp goes OFF indicating that the hold state has been cleared.

Changes the station axis data among already taught positon data.

Performs the following operation during playback.

- Positioning to the taught point
- Setting of positioning zone level

Sets the motion speed at playback.

Cancels erroneous input data or clears error status.

Deletes instructions' and data already taught.

Inserts new instructions and data.

Modifies position data, instructions, and data already taught.

Designates the execution of each process for registering instructions, data, current position of the manipulator.

[Direct Open]

Displays the contents of the job or condition file on which the cursor is placed.

[Reserved Display Call]

Calls reserved display.

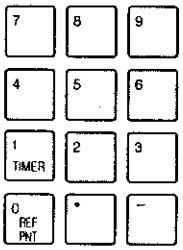
〈Using with another key〉

[*] + Reserved Display Call

The display being currently displayed is registered as a reserved display.

When this key and any of the following keys are depressed at the same time, the function of the latter key changes.

[Number keys]



Depress these keys when the ">" prompt is displayed on the input line to enter the number or symbol indicated on the upper left on the key top.

Registers the necessary reference point (wall point, corner auxiliary point, etc) to move the manipulator at weaving.

〈Using with another key〉

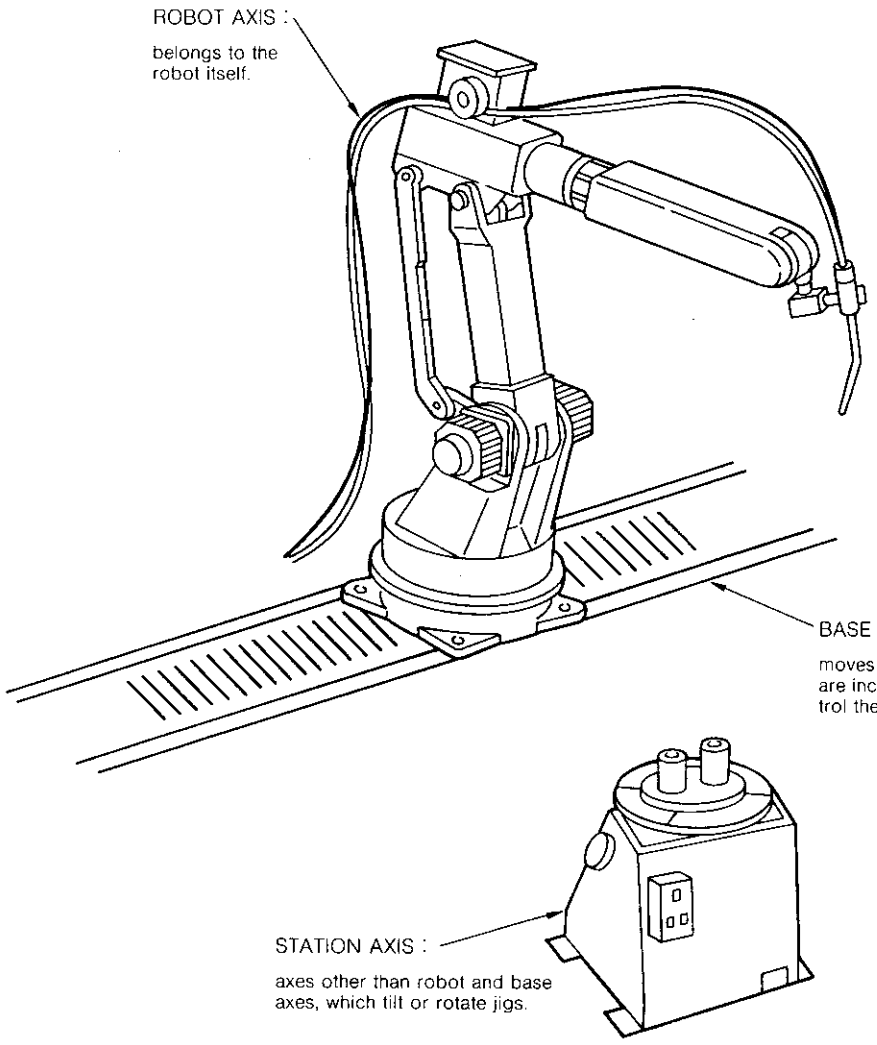
[REF PNT] + [FWD]

Moves the manipulator to the reference point.

Registers timer instructions and changes set value.

MANIPULATOR AXIS NAMES

With YASNAC MRC, external axes are classified into base and station axes.
Accordingly, individual axes of the robot system are classified by their function to robot, base and station axes.
Teaching coordinated operation to two manipulators or to a manipulator and a station became easier by dividing conventional external axes to base and station axes.



COORDINATE SYSTEMS

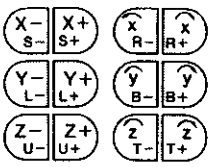
The following coordinate systems control manipulator operation.

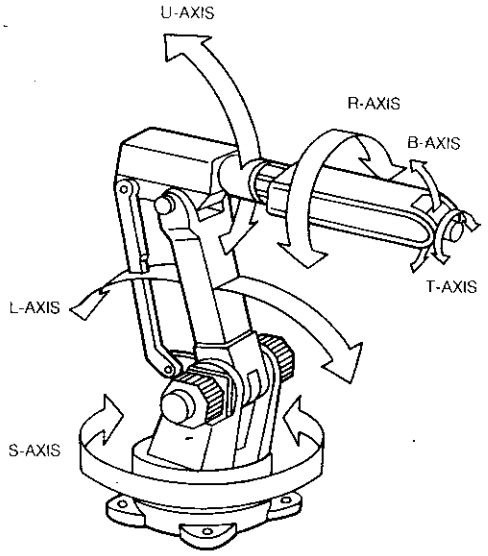
■JOINT COORDINATE SYSTEM

In joint coordinate system, each axis of the manipulator operates independently.

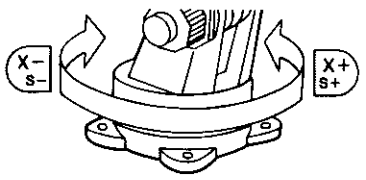
NOTE
- Depressing two or more keys results in a mixture of motion.
- None of the axes operate when two direction keys in one axis are depressed simultaneously (such as [X−] + [X+]).

Axis keys

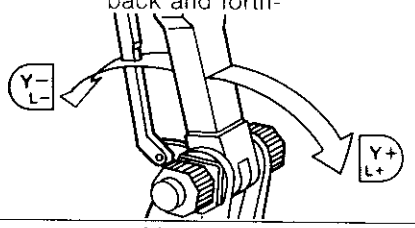




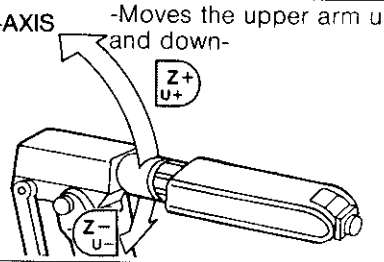
S-AXIS -Turns the body-



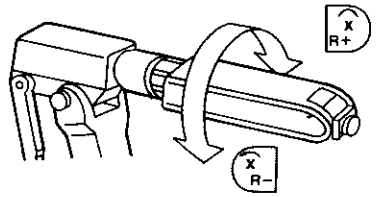
L-AXIS -Moves the lower arm back and forth-



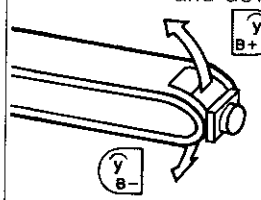
U-AXIS -Moves the upper arm up and down-



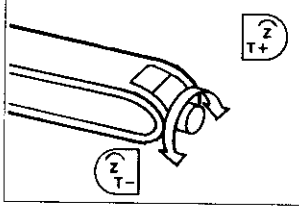
R-AXIS -Turns the upper arm-



B-AXIS -Moves the wrist up and down-



T-AXIS -Turns the wrist-



COORDINATE SYSTEMS

■RECTANGULAR COORDINATE SYSTEM

The manipulator moves in parallel to X, Y, and Z-axes.

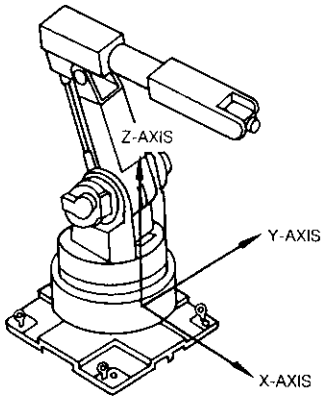
Axis keys

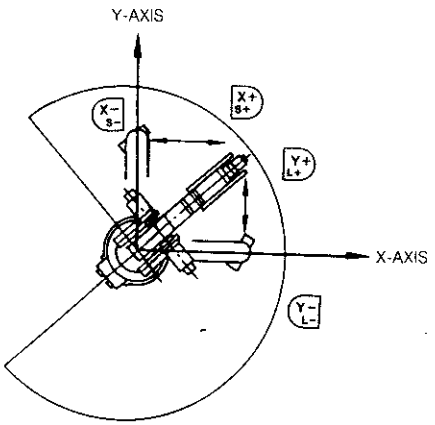
X− S− X+ S+ : X-axis : Moves in parallel to X-axis.

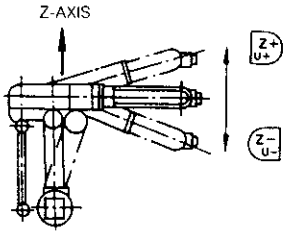
Y− L− Y+ L+ : Y-axis : Moves in parallel to Y-axis.

Z− U− Z+ U+ : Z-axis : Moves in parallel to Z-axis.

* : Wrist axis performs TCP fixed motion.







■CYLINDRICAL COORDINATE SYSTEM

The θ-axis moves around the S-axis. The r-axis moves in parallel to the L-axis arm. Z-axis makes the same movement as that of linear coordinate system.

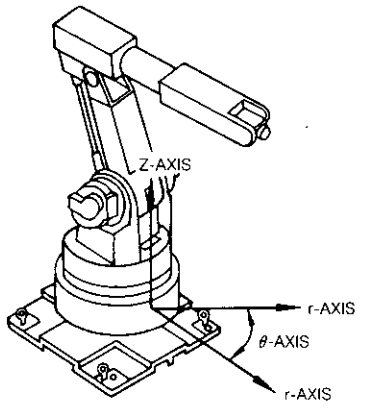
Axis keys

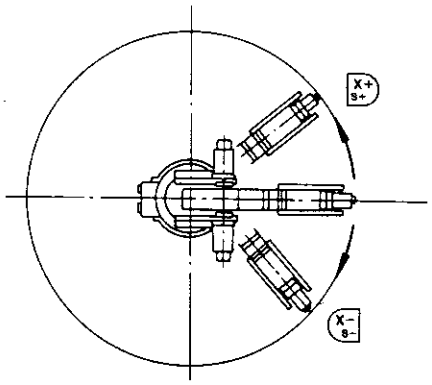
X− S− X+ S+ : θ-axis : Moves around S-axis.

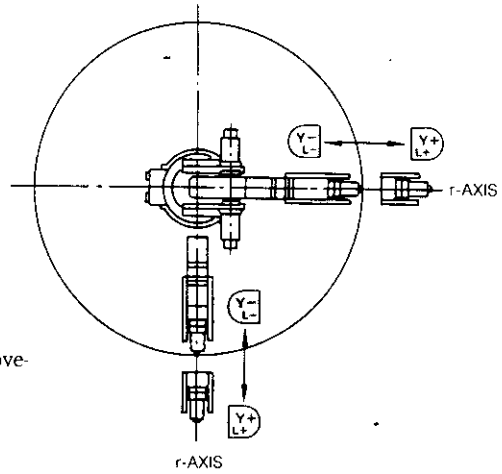
Y− L− Y+ L+ : r-axis : Moves vertically to Z-axis.

Z− U− Z+ U+ : Z-axis : Moves in parallel to Z-axis.

* : Wrist axis performs TCP fixed motion







NOTE

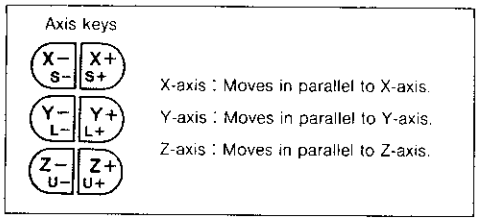
X− S−, X+ S+ makes the same movement as that of joint coordinate system.

COORDINATE SYSTEMS

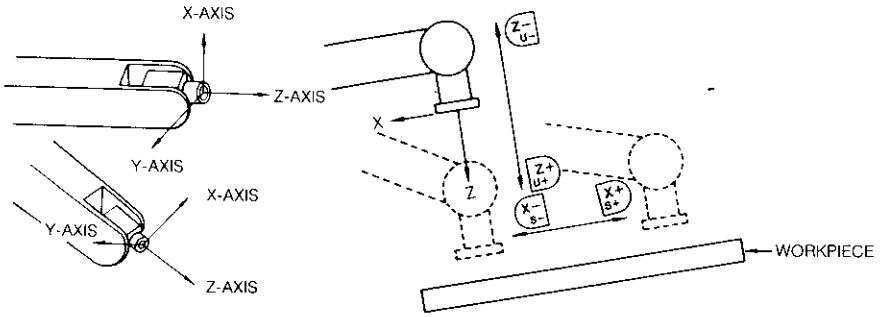
■TOOL COORDINATE SYSTEM

The tool coordinates are defined at the tip of the tool, assuming that the effective direction of the tool mounted on the manipulator wrist flange is Z-axis. Therefore, the tool-coordinate-axis direction moves with the wrist.

In tool coordinate system motions, the manipulator can be moved using the effective tool direction as a reference regardless of the manipulator position or orientation. These motions are best suited when the manipulator is required to move parallel while maintaining the tool orientation with the workpieces.

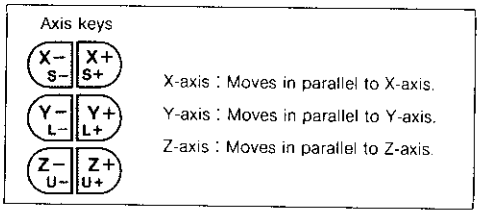


* : Wrist axis performs TCP fixed motion.

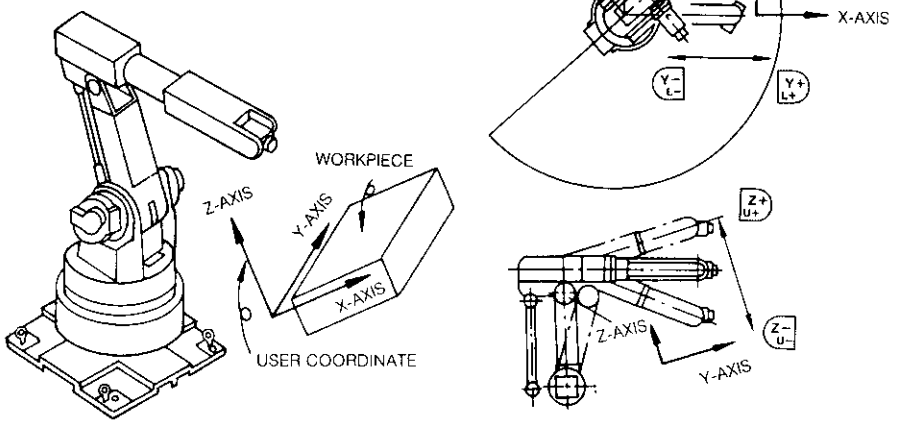


■USER COORDINATE SYSTEM

The manipulator moves in parallel to the axes of a specified user coordinate system.



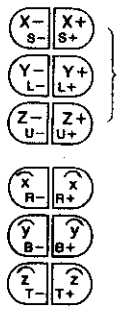
* : Wrist axis performs TCP fixed motion.

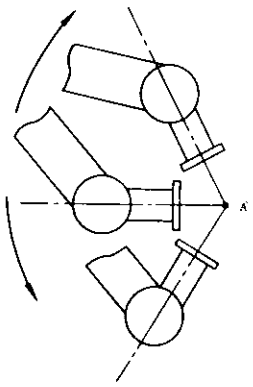


■TCP FIXED FUNCTION

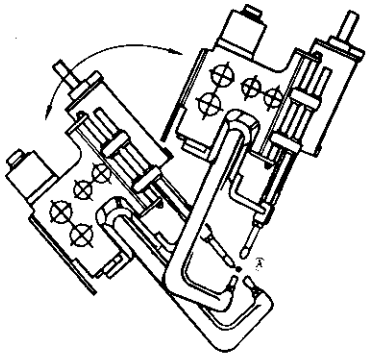
TCP fixed function is possible to change only wrist orientation at a fixed TCP position in any coordinate system except joint coordinate system.

Axis keys



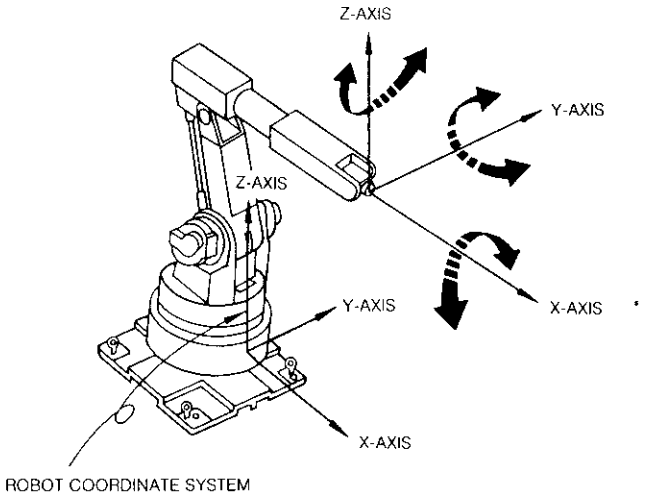


For using torch

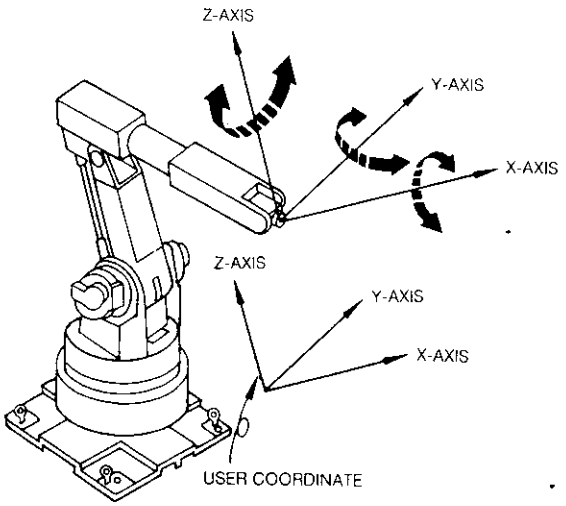


For using gunspot

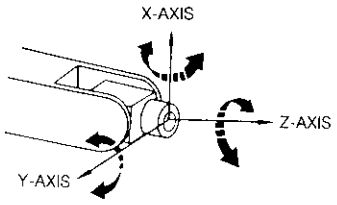
Each Axis Rotation in TCP Fixed Motion



<Rectangular/Cylinder Coordinate System>



<User Coordinate System>

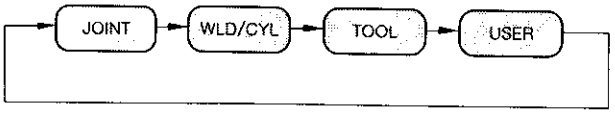


<Tool Coordinate System>

SELECTING COORDINATE SYSTEM

■SELECTING COORDINATE SYSTEM

Depress [COORD]. Each time this key is depressed, coordinate systems are switched in the following order. Verify the selection by the "COORD" lamp.



COORD
○JOINT
○WLD/CYL
○TOOL
○USER

NOTE

Different manual speeds are kept in memory for the joint coordinate system and other coordinate systems. When switching from the joint coordinate system to another coordinate system, or vice versa, manual speeds are switched at the same time.

■SELECTING RECTANGULAR/CYLINDRICAL COORDINATE SYSTEM

After selecting rectangular/cylindrical by the [COORD] key, select the rectangular or cylindrical coordinate system by the following procedure. Initial selection is the cylindrical coordinate system.

1 Depress [SELECT] on the programming pendant or [TEACH] on the playback box to display hidden softkey labels.

Programming Pendant — Playback Box

! Set required function
T-LOCK | NEW JOB | RSV JOB | SEL JOB | MJ CALL →

2 Depress [MORE], and the following soft key label is displayed.

UNLOCK | LIMIT
RLY OPN | CYCLE | MJ RGTR | COND1 | COND2 →

3 Depress [F4] [COND1].

The teach condition 1 setup display appears.

J : JOB1 S : 001 TEACH AUTO STOP SEL
TEACH CONDITION-1
● : ON ○ : OFF SET
1. RECT(●)/CYL(○) ●
2. MOVE INSTRUCTION SET
NEXT(●)/NEXT STEP(○) ○
3. JOB EDIT LOCK ON
STEP CHANGE PROHIBIT ONLY(●) ●
4. SPEED CHANGE : CONT(●)/SNGL : (○) ○
5. MASTER JOB CHNGE PROHIBIT(●) ○
! Select item using cursor keys.
ON | OFF | QUIT

4 Place the cursor on the line "1. RECT (●)/CYL (○)."

· To set Rectangular Coordinate :

Depress [F3] [ON].
"●" is entered in the "SETUP" area on the right end, indicating that the rectangular coordinate system is selected.

1.RECT(●)/CYL(○) ●

· To set Cylindrical Coordinate :

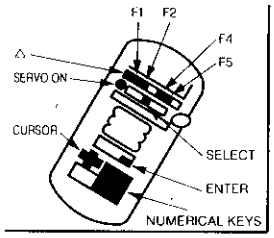
Depress [F4] [OFF].
"●" changes to "○" in the "SETUP" area on the right end, indicating that the cylindrical coordinate system is selected.

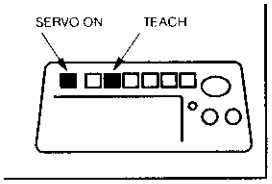
1.RECT(●)/CYL(○) ○

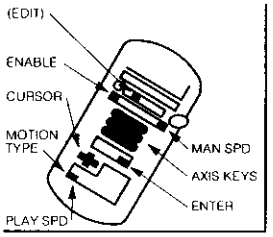
5 After setting, depress [F5] [QUIT].

FLOW OF OPERATION

This paragraph gives operation charts from when the YASNAC MRC power supply is truned ON to when it is turned OFF after job registration, teaching, etc. for convenience.







1 POWER ON TO JOB REGISTRATION

[MAIN POWER] → [SERVO POWER] → [TEACH] FOR MODE →

[F1] [T-LOCK] → [F2] [NEW JOB] →

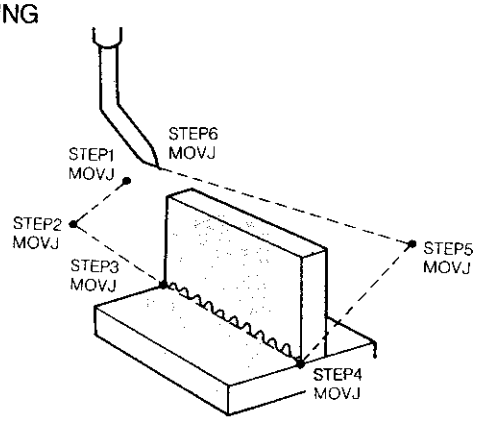
(SYSTEM WITH STATION AXIS)

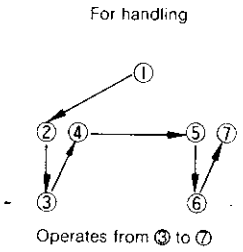
[0] ~ [9] → [ENTER] → MOVE THE CURSOR TO DESIRED ROBOT AXIS. → [ENTER]

[△] → [F1] [ABC] → [CURSOR] → [ENTER] → [F5] [QUIT]

*Edit mode enters automatically at this time.

2 TEACHING





Step 1 : Start position.

1 Verify that the edit mode is entered and depress [ENABLE].

2 Move the manipulator to a safe and convenient place for operation by using the axis keys.

3 Switch [MOTION TYPE] to JOINT and set the speed by [PLAY SPD] + [↑] or [↓]. Then depress [ENTER].

Step 2 : Near operation start position.

Use axis keys to move the manipulator to the position at which it can operate (welding or handling) and depress [ENTER].

Step 3 : Operation (welding or handling) start position.

1 Depress MAN SPD key [SLW] or [FST] and set the speed to "MED".

2 Use axis keys to move the manipulator at the positon set in Step 2 to the operation start position. Set the speed by [PLAY SPD] → [↑] or [↓] and depress [ENTER].

Step 4 : Operation completion position.

1 Determine the position to complete operation and switch [MOTION TYPE] to LINEAR.

2 Set the speed by [PLAY SPD] → [↑] or [↓] and depress [ENTER].

FLOW OF OPERATION

Step 5 : Positon away from operation end point ; jig is not bumped.

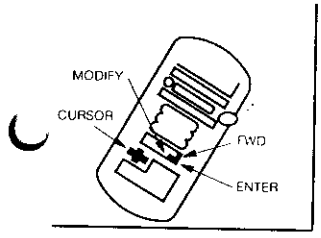
1 Depress MAN SPD key [SLW] or [FST] and set the speed to "FST".

2 Use axis keys to move the manipulator to a place where the jig is not bumped and switch [MOTION TYPE] to JOINT .

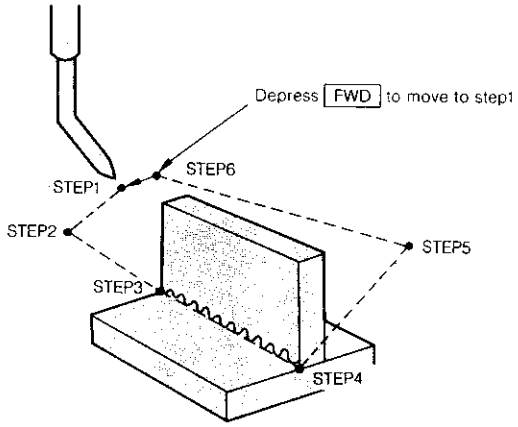
3 Set the speed by [PLAY SPD] → [↑] or [↓] and depress [ENTER] .

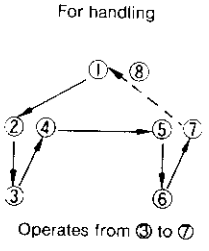
Step 6 : Near start position.

Use axis keys to move the manipulator near the start position and depress [ENTER] .



3 OVERLAPPING FIRST AND LAST STPES





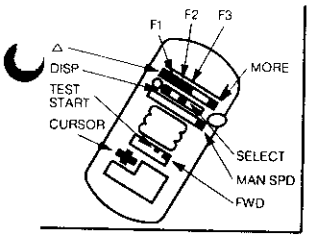
1 Return the cursor to the start of the job by [↑] + [↓] .

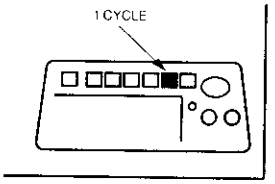
2 Depress [↓] once and move the cursor to Step 1.

3 Depress [FWD] and move the manipulator to Step 1.

4 Depress [↑] three times and match the cursor to the last step (Step 6).

5 Depress [MODIFY] → [ENTER] , and the first step (Step 1) and the last step (Step 6) are in the same position.





4 STEP VERIFICATION

1 Depress [DISP] → [F1] [JOB] to display the job text.

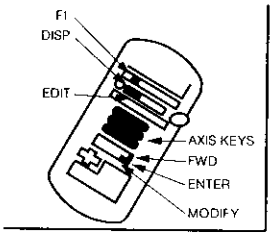
2 Return the cursor to the start of the job by [↑] + [↓] .

3 Depress [↓] once and move the cursor to Step 1.

4 Depress MAN SPD key [SLW] or [FST] and set the speed to "MED" and verify each step by using [FWD] . After verification, return the cursor to the start of the job by using [↑] + [↓] .

5 Verify that "1 CYCLE" is entered and play back all steps (1 to 6) by [TEST START] + [FWD]

NOTE If "1 CYCLE" is entered, perform the following operation.
· In programming pendant :
[SELECT] → [MORE] → [F2] [CYCLE] → [F2] [1 CYCLE]
· Depress [1 CYCLE] in playback box.



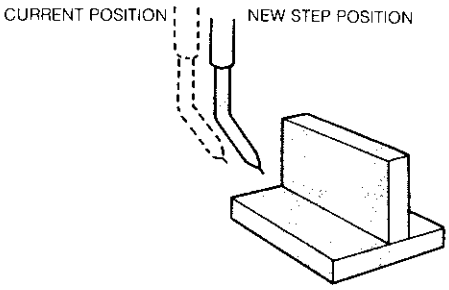
5 JOB MODIFICATION

●Before modification

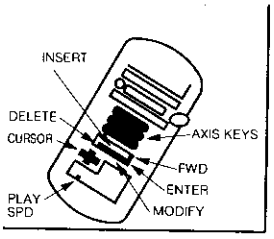
1 Depress [DISP] → [F1] [JOB] to display the job data screen.
2 Depress [EDIT] to enter the edit mode.
3 The following modification is performed.

· Modify step position data. ·····To (1)
· Add a step. ·····To (2)
· Delete a step. ·····To (3)
· Modify speed between steps. ·····To (4)

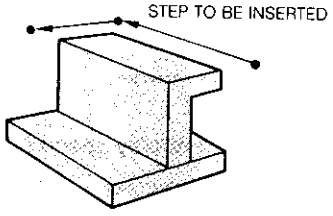
(1)Modify step position data.



1 Depress [FWD] and move the cursor to the step to be changed.
At the same time, the manipulator moves to that step.
2 Use axis keys to move the manipulator to the position to be changed and depress [MODIFY] → [ENTER].



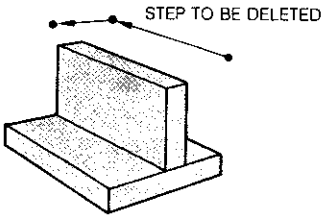
(2)Insert a step.



1 Depress [FWD] and move the cursor to the one step before the step to be inserted.
At the same time, the manipulator moves to that step.
2 Use axis keys to move the manipulator to the position where the step is to be inserted and depress [INSERT] → [ENTER].

FLOW OF OPERATION

(3)Delete a step.



1 Depress [FWD] and move the cursor to the step to be deleted.
At the same time, the manipulator moves to that step.

2 Use axis keys to verify that the cursor is at the step to be deleted and depress [DELETE] → [ENTER].

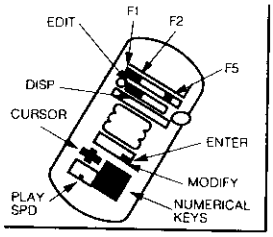
(4)Modify speed between steps.

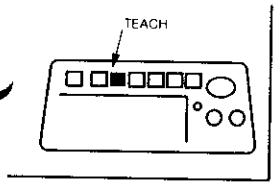
<How to change>

- Modify by [MODIFY] → [PLAY SPD] .....To (1)
- Modify according to play speed type. .....To (2)
- Modify in the ratio for current play speed. ···To (3)

1 Modify by [MODIFY] → [PLAY SPD]

①Move the cursor to the step to be changed and depress [MODIFY].
②Set the speed by [PLAY SPD] → [↑] or [↓] and depress [ENTER].





2 Modify according to play speed type (single rewrite).

①Depress [TEACH] → job text displayed → [EDIT] → [→] (when the cursor is in the address area.)
②Move the cursor to the play speed to be changed.

③[F2] [SPEED] → JOINT SPEED: [F1] [VJ] → [0] ~ [9] [ENTER] →
③[F2] [SPEED] → TCP SPEED: [F2] [V] → [0] ~ [9] [ENTER] →

(To change the speed to the same value in other steps)
[F1] [SKIP] → [ENTER] → [F5] [QUIT]

[F1] [SKIP] omitted for continuous rewrite.

3 Modify in the ratio for current play speed (1 to 200%).
(For relative change, single rewrite)

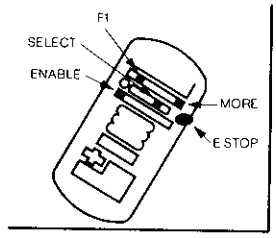
①Depress [TEACH] → job text displayed → [EDIT] → [→] (when the cursor is in the address area.)
②Move the cursor to play speed to be changed.

③ F2 [SPEED] → F5 [REL] → 0 ~ 9 (Input ratio for play speed.) → ENTER →

(To change the speed to the same value in other steps)
F1 [SKIP] → ENTER → F5 [QUIT]

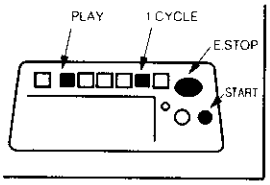
F1 [SKIP] omitted for continuous rewrite.

After completion of correction, move the manipulator near Step 1 by axis keys. Then, return the cursor to the start of the job using ↑ + ↓ .



6 RELEASING TEACH LOCK

1 Depress ENABLE to extinguish the lamp.
2 Depress SELECT → MORE → △ → F1 [UNLOCK].



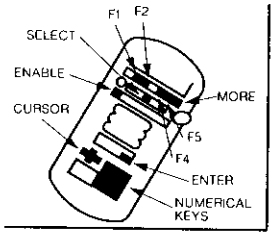
7 PLAYBACK

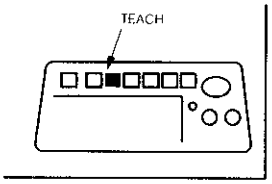
1 Verify that there is no man near the manipulator.
2 Depress PLAY → 1 CYCLE → START .

8 POWER OFF

E.STOP → MAIN POWER OFF

OTHER OPERATION (REFERENCE)





■JOB CALL

A job which has been registered is called.

[TEACH] → [F4] [SEL JOB] → JOB NAME INPUT → [ENTER]
([0] ~ [9], ALPHABET)
[CURSOR]

■JOB MASTER REGISTRATION AND CALL

Once a job is registered as a master job, it can be called easily.

1 Register a job as a master job.

[TEACH] → [MORE] → [F3] [MJ RGTR] → [F4] [RGTR] → JOB NAME INPUT → [ENTER]
([0] ~ [9], ALPHABET)
[CURSOR]

2 Call the master job.

- In teach mode → [TEACH] → [F5] [MJ CALL]
- In play mode → When depressing [PLAY] or in the play mode ;
  [SELECT] → [F2] [MJ CALL]

■JOB COPY

A registered job is copied to create another job.

- Job header screen

[EDIT] → [F1] [COPY] → Input new job name. → [ENTER] → [F5]

- Job list screen

[EDIT] → [CURSOR] → [F1] [COPY] → Input new job name. → [ENTER] → [F5]

■JOB DELETE

A registered job is deleted.

- Job header screen

[EDIT] → [F2] [DELETE] → [F5] [EXECUTE]

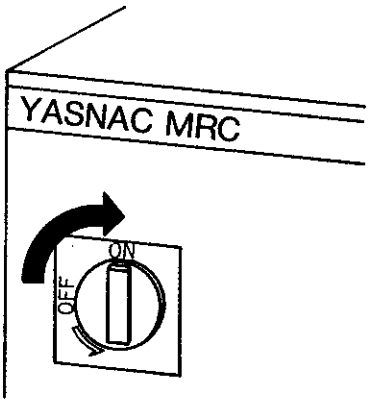
- Job list screen

[EDIT] → [F2] [DELETE] → Input job name to be deleted. → [ENTER] → [F5] [EXECUTE]
[CURSOR]

BASIC OPERATION (POWER ON)

Turn ON the main power first, then the servo power. Before turning ON the power, be sure to check that nobody is near manipulator.

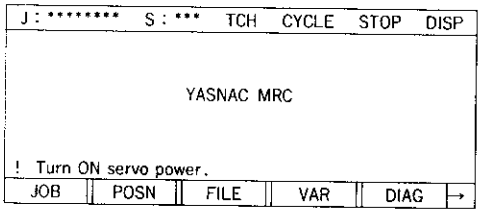
1 **Turn ON the main power.**



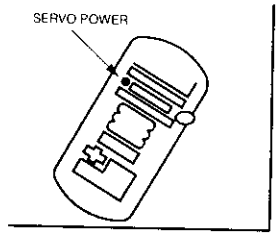
Turn ON the main power switch provided on the front of the controller.
The main power is turned ON and the playback box and the programming pendant become operable.

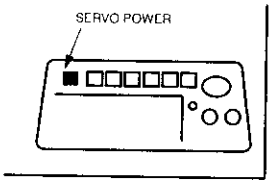
NOTE The manipulator is not yet operable.

The initial display appears as shown below.



Title Display





2 **Turn ON the servo power.**

SERVO POWER

(playback box)

Depress SERVO POWER either on the playback box or programming pendant.

or

(programming pendant)

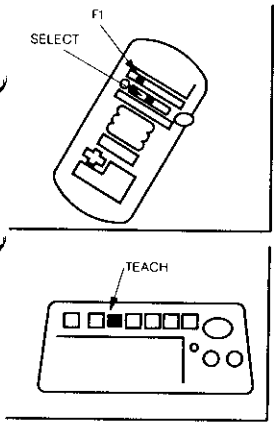
The power supply for driving the manipulator has been turned ON.

BASIC OPERATION (TEACHING)

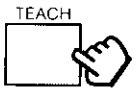
■PREPARATION FOR TEACHING

Before starting teaching, follow the steps below :

- Set the operation mode to teach mode and set up teach-lock.
- Enter a job name.
- Set the screen mode to edit mode.

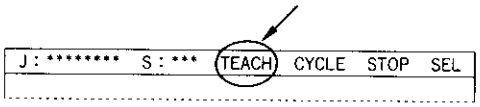


1 Enter the teach mode.

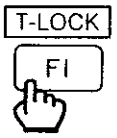


Depress [TEACH] on the playback box.

"TEACH" is displayed in the status area.

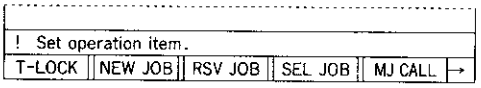


2 Enter teach-lock.

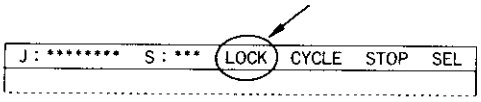


NOTE Be sure to set teach-lock for safety.

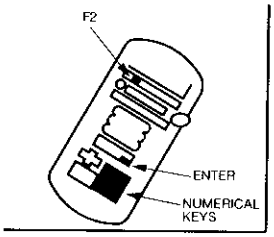
Depress [F1] [T-LOCK] .



In the status area, the indication of mode "TEACH" changes to "LOCK".



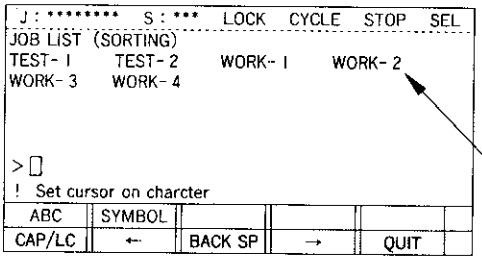
NOTE While teach-lock is set, the mode of operation is tied to teach mode and cannot be switched if attempted using the playback box or external input.



3

Enter a job name.

Depress [F2] [NEW JOB] .

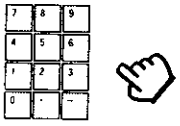


Job List Display

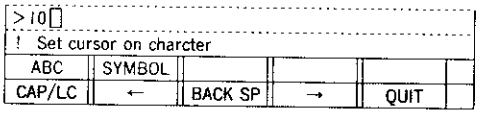
The job list appears.
Job names that have already been registered are displayed.

4

Depress [1] and [0] in that order.

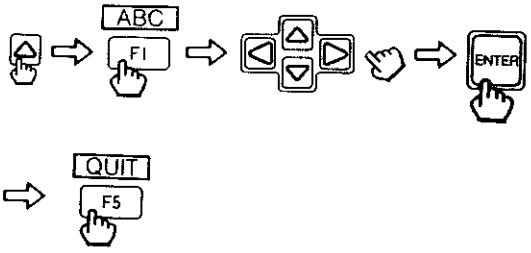


Job names can be registered using alphabets and numbers. Follow the steps to register a new job name "10A".

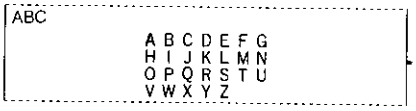


"10" is displayed on the entry line.

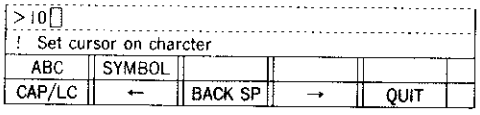
Then input "A".

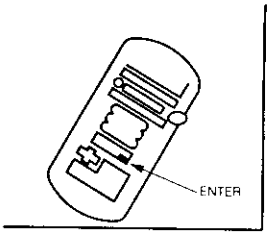


Move the cursor to "A" on the alphabet screen and depress [ENTER] .



Character entry is completed by [F5] [QUIT] .
"10A" is displayed on the entry line.





5

EDIT mode is entered automatically

```
J : 10A    S : 000    LOCK   CYCLE   STOP   EDIT
JOB CONTENT
L :  S :   INSTRUCTIONS                    TOOL : *
0000 000   NOP
0001       END

!  Select instruction group
MOTION | ARITH | SHIFT |  |  |
IN/OUT | CONTROL | DEVICE | PRIOR | SAME |
```

Depress ENTER .

When the system has no station axis :
The job name "10A" is registered in memory of YASNAC MRC and displayed in the status area.
At the same time, the job contents appear and NOP and END instructions are automatically registered.

NOTE The screen mode is changed to EDIT automatically.

When the system has station axes :
Follow steps 6 and 7 below.

6

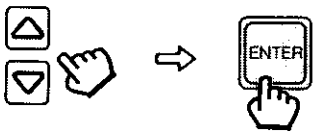
```
J : 10A    S : 000    LOCK   CYCLE   STOP   SEL
GROUP COMBINATION
  GROUP AXIS   MASTER
  R1                          NO GROUP AXIS
  R2
  R1 +S1
  R1 +R2       R1

!
```

Group Combination Select Display

For a system with station axes, the group combination select display appears after ENTER is depressed.

"R1" and "S1" stand for a manipulator (robot) axis and station axis, respectively.

7




```
J : 10A    S : 000    LOCK   CYCLE   STOP   EDIT
JOB CONTENT          R1 +R2
L :  S :   INSTRUCTIONS                    TOOL : *
0000 000   NOP
0001       END

!  Select instruction group
MOTION | ARITH | SHIFT |  |  |
IN/CUT | CONTROL | DEVICE | PRIOR | SAME |
```

Job Text Display

Move the cursor to "R1" and depress ENTER .

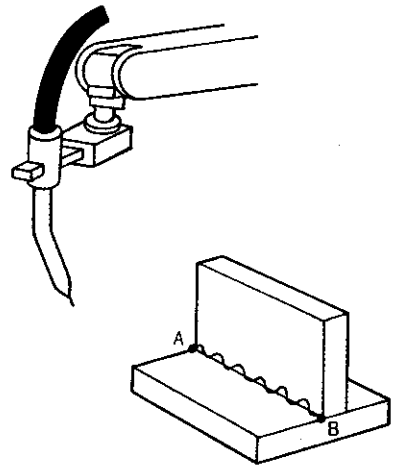
Assume that job "10A" is to be executed by the manipulator numbered as "R1" .

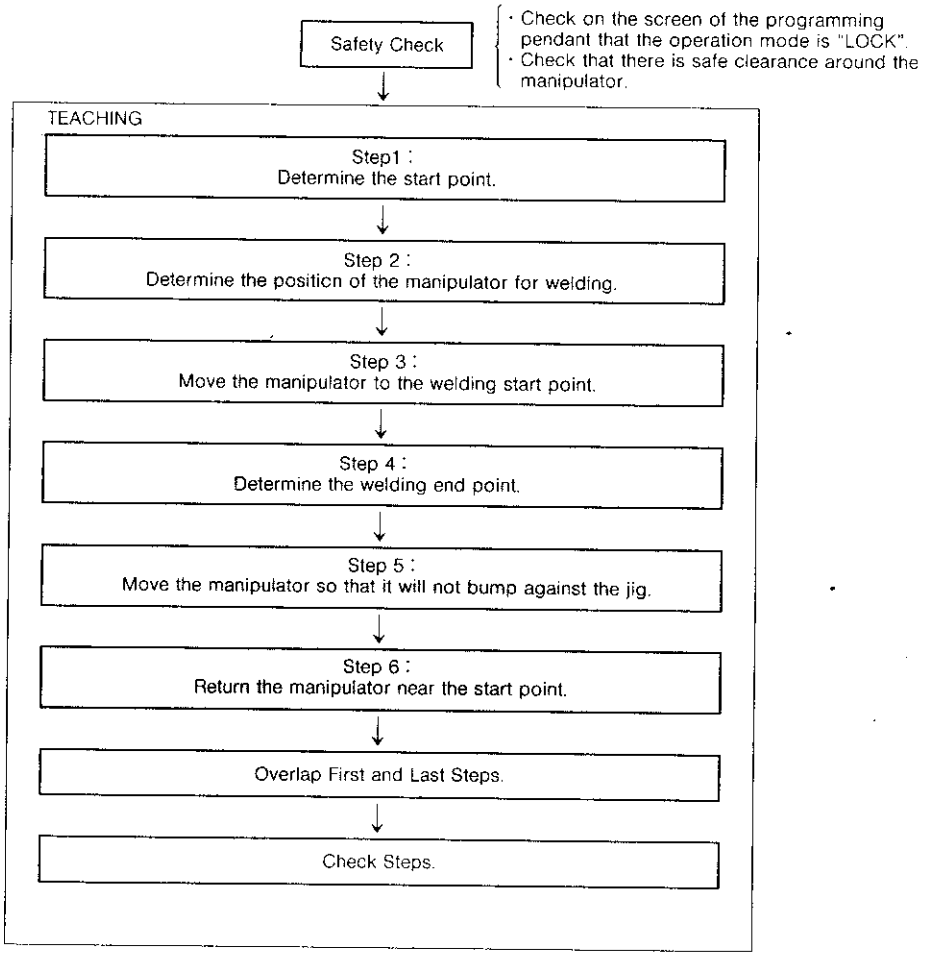
The job name "10A" is registered in memory of YASNAC MRC and the job contents appear.

The job name "10A" is displayed on the left end of the status area. NOP and END instructions are automatically registered.

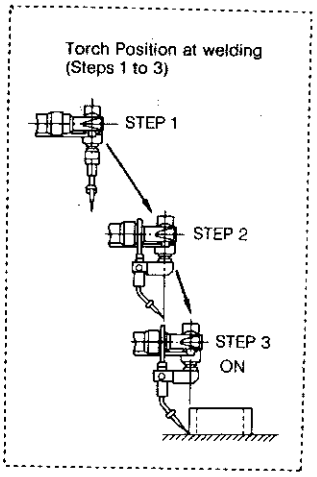
■TEACHING

In this section, a welding job from point A to point B of the workpiece shown below will be taught to the manipulator. This job consists of Step 1 to Step 6.



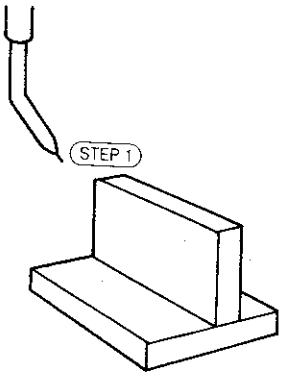


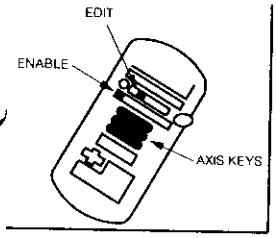
BASIC OPERATION (TEACHING)



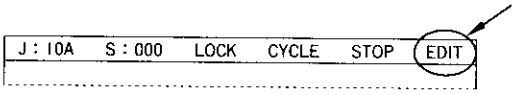
STEP 1

Step 1 is the start point. The point must be always safe and ready for starting the work.





1

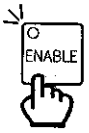


Check that "EDIT" is displayed on the right end of the status area.

NOTE If the edit mode is not entered, depress [EDIT] on the programming pendant to enter edit mode.

2

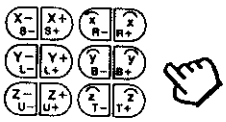
Make the manipulator operable.



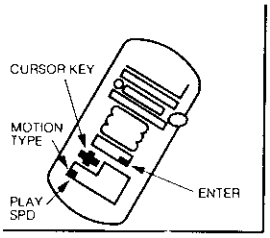
Depress [ENABLE] key.

3

Move the manipulator to the start point (step 1) using the axis keys.



NOTE The point must be always safe and ready for starting the work.



4

Choose joint motion type.

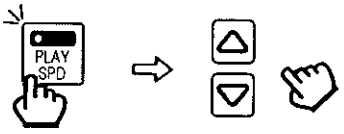
Depress [MOTION TYPE].

J : 10	S : 000	LOCK	CYCLE	JOINT	EDIT

"JOINT" is displayed in the status area.

5

Depress [PLAY SPD] to set operation speed by moving the cursor using [↑] or [↑].



SPEED TO BE SET

```
    6 :  25.00%
    7 :  50.00%
    8 : 100.00%
```

Set the speed to "7 : 50.00%".

6

Depress [ENTER].

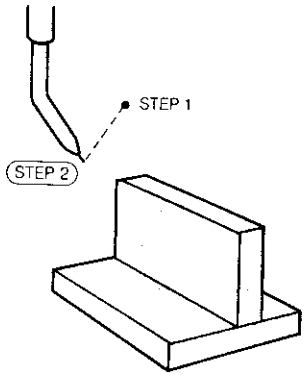
Step 1 is registered.

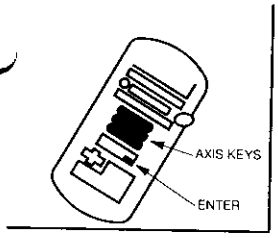
STEP 1 IS REGISTERED.

```
L :  S :  INSTRUCTIONS
0000 000  NOP
0001 001  MOVJ VJ=50.00
0002      END
```

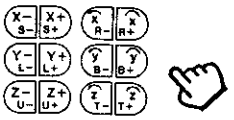
BASIC OPERATION (TEACHING)

STEP 2 Step 2 is near the welding start position. The welding posture of the manipulator is determined.





1 Set the manipulator to a welding posture (Step 2) using the axis keys.



2 Depress ENTER.

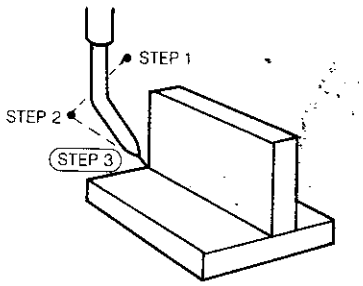
Step 2 is registered.

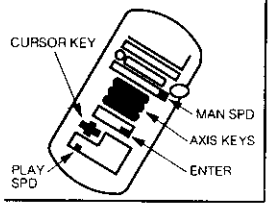
STEP 2 IS REGISTERED.

```
L:   S:   INSTRUCTIONS
0000 000  NOP
0001 001  MOVJ VJ=50.00
0002 002  MOVJ VJ=50.00
0003      END
```

STEP 3

Step 3 is the welding start point. Move the manipulator to the welding start point in the same posture as set in Step 2.





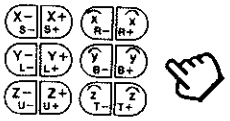
1

Set "MED" speed.

Depress manual speed keys SLW or FST.

2

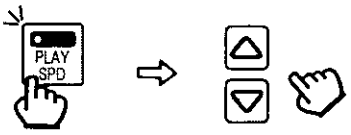
Move the manipulator to the welding start point (Step 3) using the axis keys.



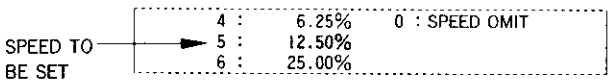
NOTE Do not change the posture of the manipulator set in Step 2.

3

Depress PLAY SPD to set approaching speed by moving the cursor using ↑ or ↓.



Set the speed to "5 : 12.50%".



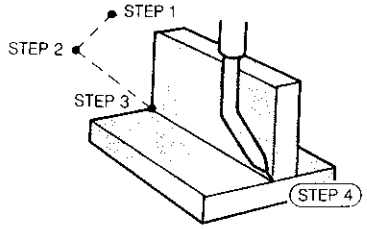
4

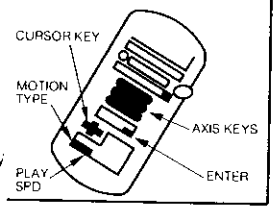
Depress ENTER.

Step 3 is registered.

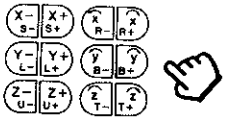
BASIC OPERATION (TEACHING)

STEP 4 In Step 4, the welding end point is determined.



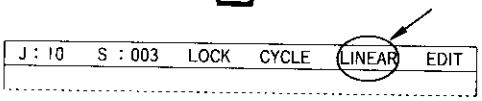


1 Move the manipulator to the welding end point (Step 4) using the axis keys.



NOTE The manipulator can be moved around the workpiece. It does not have to be moved in the actual welding path along the workpiece.

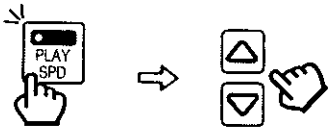
2 Depress MOTION TYPE to switch motion type to linear.

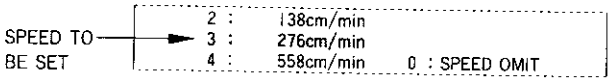


"LINEAR" is displayed in the status area.

3 Depress PLAY SPD to set welding speed by moving the cursor using ↑ or ↓.

Set the speed to "3 : 276 cm/min".



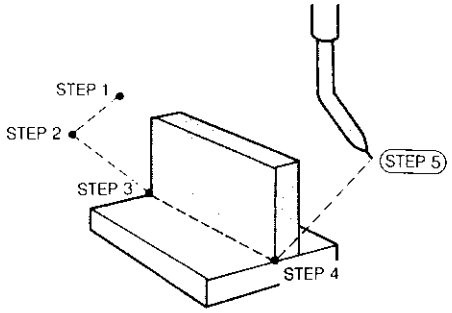


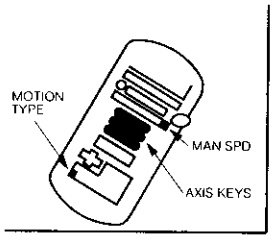
4 Depress ENTER.

Step 4 is registered.

STEP 5

In Step 5, the manipulator moves away from the welding end point so that it will not bump the jig.





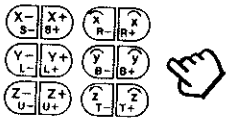
1

Set "FST" speed.

Depress manual speed key SLW or FST.

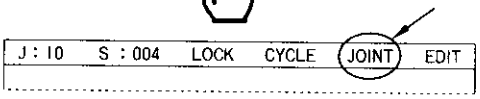
2

Move the manipulator away from the jig using the axis keys.

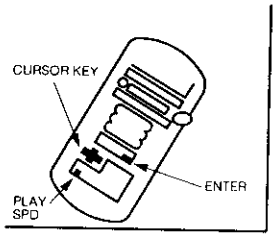


3

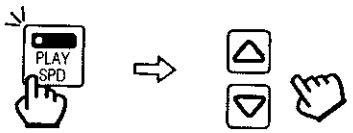
Depress MOTION TYPE to switch motion type to joint.



"JOINT" is displayed in the status area.



4



Depress [PLAY SPD] to set moving speed by moving the cursor using [↑] or [↓].

Set the speed to "7 : 50.00%".

SPEED TO BE SET

```
    6 :  25.00%
    7 :  50.00%
    8 : 100.00%
```

5

Depress [ENTER].

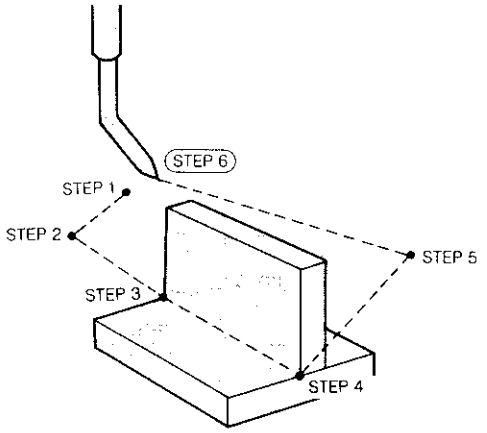
Step 5 is registered.

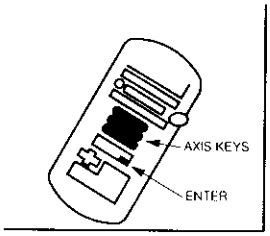
STEP 5 IS REGISTERED.

```
L :  S :  INSTRUCTIONS
0000 000  NOP
0001 001  MOVJ VJ=50.00
0002 002  MOVJ VJ=50.00
0003 003  MOVJ VJ=12.50
0004 004  MOVL V=276
0005 005  MOVJ VJ=50.00
0006      END
```

STEP 6

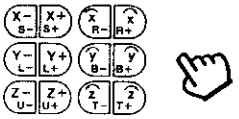
In Step 6, the manipulator returns near the start point.





1

Move the manipulator near the start point (Step 6) using the axis keys.



2

Depress ENTER .

Step 6 is registered.

STEP 6 IS REGISTERED.

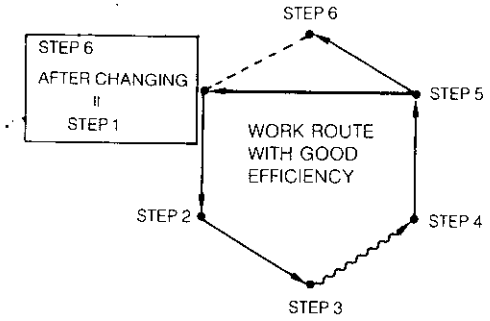
```
L:  S:  INSTRUCTIONS
0000 000 NOP
0001 001 MOVJ VJ=50.00
0002 002 MOVJ VJ=50.00
0003 003 MOVJ VJ=12.50
0004 004 MOVL V=276
0005 005 MOVJ VJ=50.00
0006 006 MOVJ VJ=50.00
0007     END
```

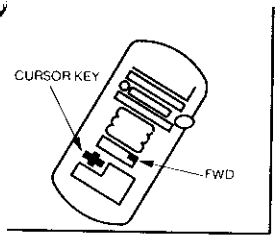
BASIC OPERATION (TEACHING)

■OVERLAPPING FIRST AND LAST STEPS

Now the manipulator stops at Step 6, near Step 1. If the manipulator directly moves from the welding end point in Step 5 to Step 1, it can immediately start welding the next workpiece and work efficiency is improved.

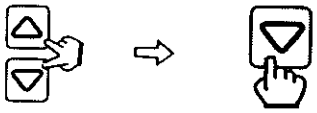
The following teaching implements this by overlapping Step 6, the last point, and Step 1, the start point.





1

Depress [↑] + [↓].



The cursor returns to the start of the job.

```
L:  S:  INSTRUCTIONS                    TOOL : 0
0000 000  NOP
0001 001  MOVJ VJ=50.00
0002 002  MOVJ VJ=50.00
```

2

Depress [↓] once.

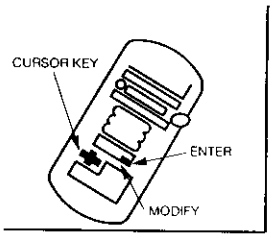
The cursor moves to Step 1.

```
L:  S:  INSTRUCTIONS                    TOOL : 0
0000 000  NOP
0001 001  MOVJ VJ=50.00
0002 002  MOVJ VJ=50.00
```

3

Depress [FWD].

The manipulator moves to Step 1.



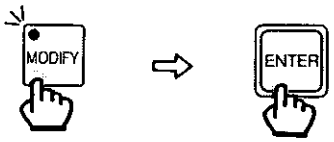
4

Depress [↑] three times to move the cursor to the last step (Step 6).

STEP 6 →
```
0005 005  MOVJ VJ=50.00
0006 006  MOVJ VJ=50.00
```

5

Depress [MODIFY] and [ENTER].



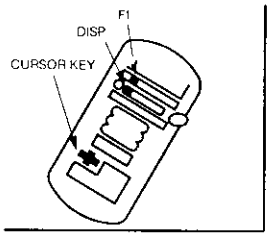
Step 6 position is changed to overlap with Step 1 position.

The job to operate is completed.

BASIC OPERATION (TEACHING)

■CHECKING STEPS

In the following, operate the manipulator to check that taught steps are correct.



1

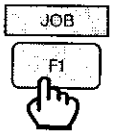
Depress [DISP].

Softkey label as shown on the left is displayed.

```
! Select display item
JOB | POSN | FILE | VAR | DIAG →
```

2

Depress [F1] [JOB].



The job contents appear.

```
JOB CONTENT
L :  S :  INSTRUCTIONS                    TOOL : 0
0000 000  NOP
0001 001  MOVJ VJ=50.00
0002 002  MOVJ VJ=50.00
0003 003  MOVJ VJ=12.50
0004 004  MOVL V=276
0005 005  MOVJ VJ=50.00
0006 006  MOVJ VJ=50.00
```

Job Content Display

3

Depress [↑] + [↓].

The cursor returns to the start of the job.

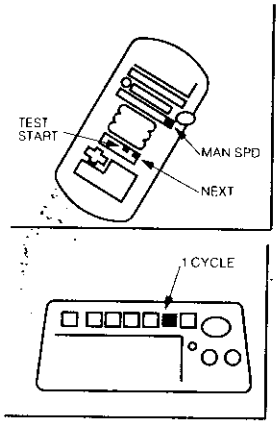
```
START OF JOB →
L :  S :  INSTRUCTIONS                    TOOL : 0
0000 000  NOP
0001 001  MOVJ VJ=50.00
0002 002  MOVJ VJ=50.00
```

4

Depress [↓] once.

The cursor moves to Step 1.

```
STEP 1 →
L :  S :  INSTRUCTIONS                    TOOL : 0
0000 000  NOP
0001 001  MOVJ VJ=50.00
0002 002  MOVJ VJ=50.00
```

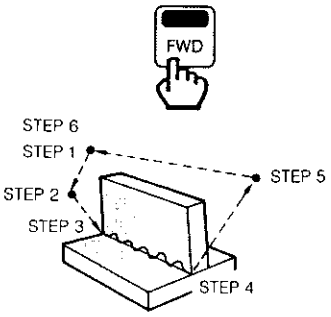


5

Set "MED" speed.

Depress manual speed keys [SLW] or [FST].

6



Depress [FWD] to check the motion of the manipulator step by step.

Each time [FWD] is depressed, the manipulator moves by single step.

7

After checking each step, depress [↑] + [↓] to move the cursor to the start of the job.

8

Perform the entire course (steps 1 to 6) all along.

Check that the operation cycle is set to "1CYCLE" and depress [TEST START] and [FWD].

*If the operation cycle is not set to "1 CYCLE", set to "1 CYCLE" by either of the following ways :

- Depress [SELECT] and [MORE] to display soft key labels, then depress [F2] [1 CYCLE] → [F2] [1 CYCLE].
- Depress [1 CYCLE] on the playback box.

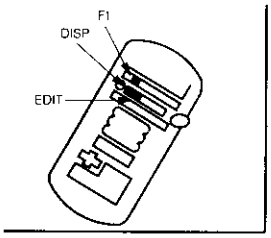
Did the manipulator move as intended ?

BASIC OPERATION (TEACHING)

■MODIFYING A JOB

After checking the motion of the manipulator in each step, positions may need to be changed, added, or deleted. To do this, follow the procedure below.

BEFORE EDITING



1

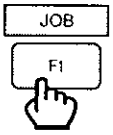
Depress [DISP].

Softkey label as shown on the left is displayed.

```
! Select display item
JOB | POSN | FILE | VAR | DIAG →
```

2

Depress [F1] [JOB].




```
JOB CONTENT
L :  S :  INSTRUCTIONS                    TOOL : 0
0000 000  NOP
0001 001  MOVJ VJ=50.00
0002 002  MOVJ VJ=50.00
0003 003  MOVJ VJ=12.50
0004 004  MOVL V=276
0005 005  MOVJ VJ=50.00
0006 006  MOVJ VJ=50.00
```

The job contents appear.

3

Enter the edit mode.

Depress [EDIT] to enter edit mode.
"EDIT" is displayed in the status area.

NOTE Check that "LOCK" is displayed.

```
J : 10   S : 000   LOCK   CYCLE   STOP   EDIT
```

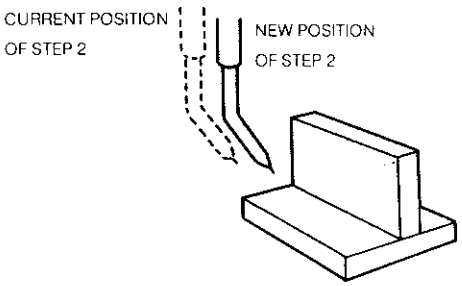
The following modification can be performed.

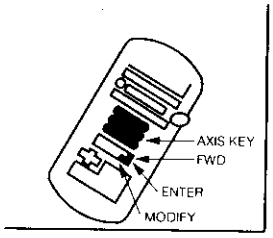
- Modifying step position data ·····41
- Inserting a step ·····42
- Deleting a step·····44
- Modifying speed between steps ·····45

MODIFYING STEP POSITION DATA

Modify the position registered in Step 2, using the following steps.

Depress [↑] + [↓] and depress [↓] once to move the cursor to step 1 (refer to page 38). Depress [FWD], and the manipulator moves to step 1 and step 2 in the order.





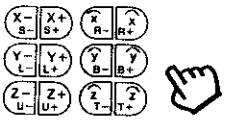
1

Depress [FWD] to move the cursor to Step 2, which is to be modified.

```
0001 001 MOVJ VJ=50.00
0002 002 MOVJ VJ=50.00
0003 003 MOVJ VJ=12.50
```

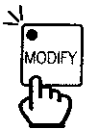
Each time [FWD] is depressed, the manipulator moves by a single step.

2



Move the manipulator to the modified position (new Step 2 position) using the axis keys.

3



Depress [MODIFY].

4

Depress [ENTER].

The position data are changed in the step.

POSITION DATA ARE CHANGED

```
0001 001 MOVJ VJ=50.00
0002 002 MOVJ VJ=55.00
0003 003 MOVJ VJ=12.50
```

INSERTING A STEP

Assume that the workpiece is changed as shown in Fig. A. If the job that has been taught is executed as it is, the manipulator will bump against the workpiece. To avoid this, one step must be added as shown in Fig. B. Add the step as explained in the following.

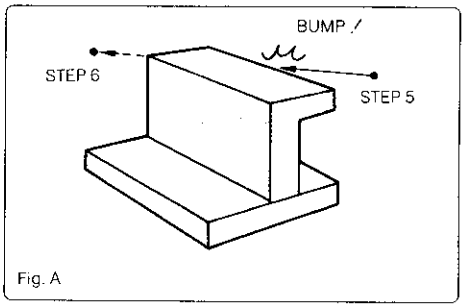


Fig. A

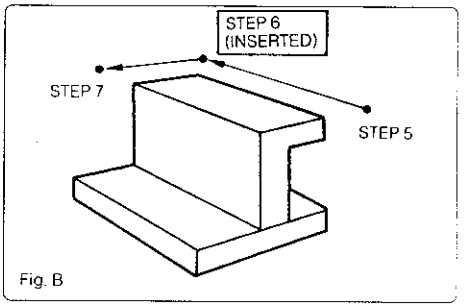
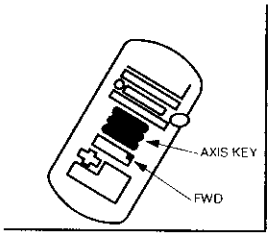


Fig. B



1

Depress FWD to move the cursor to where the additional step is to be inserted.

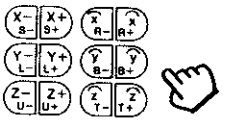
Each time FWD is depressed, the manipulator moves by a single step.

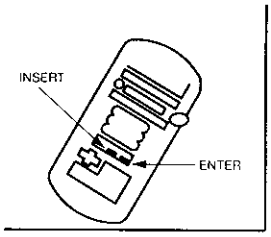
ONE STEP BEFORE STEP TO BE INSERTED

```
0004 004 MOVL V=276
0005 005 MOVJ VJ=50.00
0006 006 MOVJ VJ=50.00
0007 007     END
```

2

Move the manipulator to the position to be inserted using the axis keys.





3 Depress INSERT .

4 Depress ENTER .

A Step is inserted. Each time a step is added, the step numbers automatically increase.

INSERTED STEP

STEP NO. IS AUTOMATICALLY INCREASED.

```
0004 004 MOVL V=276
0005 005 MOVJ VJ=50.00
0006 006 MOVJ VJ=50.00
0007 007 MOVJ VJ=50.00
0008     END
```

DELETING A STEP

Delete the step that has been inserted, in the following steps. Delete one step from Fig. A.

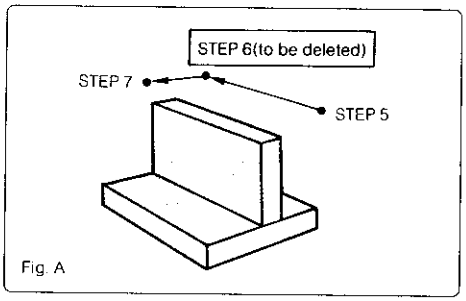


Fig. A

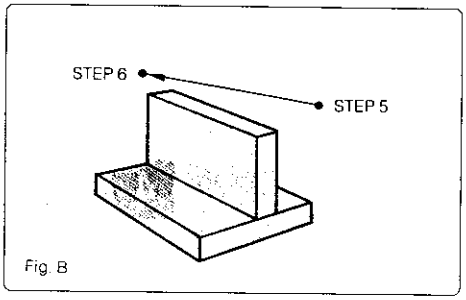
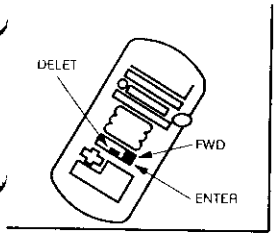


Fig. B



1

Depress [FWD] to move the cursor to the step to be deleted.

Each time [FWD] is depressed, the manipulator moves by a single step.

STEP TO BE DELETED →

```
0004 004 MOVL V=276
0005 005 MOVJ VJ=50.00
0006 006 MOVJ VJ=50.00
0007 007 MOVJ VJ=50.00
0008     END
```

2

Confirm that the cursor is at the step to be deleted.
Depress [DELETE].

3

Depress [ENTER].

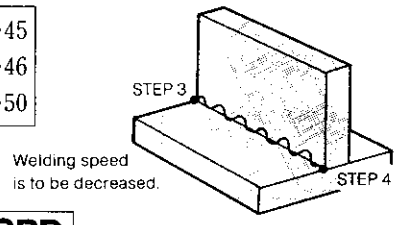
Each time a step is deleted, the step numbers automatically decrease.

```
0004 004 MOVL V=276
0005 005 MOVJ VJ=50.00
0006 006 MOVJ VJ=50.00
0007     END
```

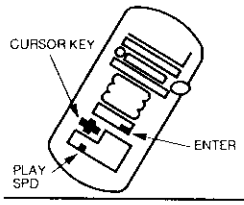
MODIFYING SPEED BETWEEN STEPS

Change the speed at which the manipulator moves in the following steps.
The welding speed from Step 3 to Step 4 is to be decreased.
There are three ways to modify as follows :

· Modify by MODIFY → PLAY SPD . ·····45
· Modify according to play speed type. ·····46
· Modify in the ratio for current play speed. ·····50



● Modify by MODIFY → PLAY SPD .



1

Move the cursor to Step 4 by the cursor keys.

```
0003 003 MOVJ VJ=12.50
0004 004 MOVL V=276
0005 005 MOVJ VJ=50.00
```
STEP 4 →

2

Depress MODIFY .

3

Depress PLAY SPD to set the speed by moving the cursor.

Set the speed to "2 : 138cm/min".

```
                1 :   66cm/min
SPEED TO →      2 :  138cm/min
BE CHANGED      3 :  276cm/min
```

4

Depress ENTER .

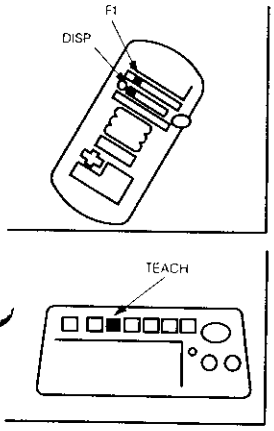
The speed is changed.

SPEED IS CHANGED.

```
0003 003 MOVJ VJ=12.50
0004 004 MOVL V=138
0005 005 MOVJ VJ=50.00
```

● Modify according to play speed type. (Single rewrite)

This paragraph describes how to modify speed using play speed type VJ(joint speed) or V(control point speed) as an example.



1 Enter the teach mode.

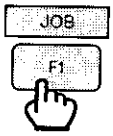
Depress [TEACH].

2 Depress [DISP].

! Select display item					
JOB	POSN	FILE	VAR	DIAG	→

Softkey label shown on the left is displayed.

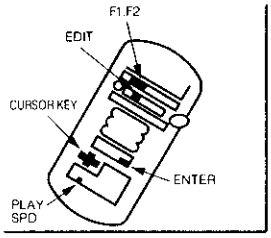
3 Depress [F1] [JOB].




```
JOB CONTENT
L :   S :   INSTRUCTIONS                    TOOL : 0
0000 000    NOP
0001 001    MOVJ VJ=50.00
0002 002    MOVJ VJ=50.00
0003 003    MOVJ VJ=12.50
0004 004    MOVL V=276
0005 005    MOVJ VJ=50.00
0006 006    MOVJ VJ=50.00
```

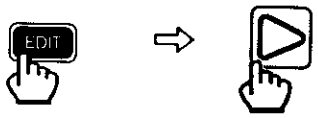
Job Content Display

The job contents appear.



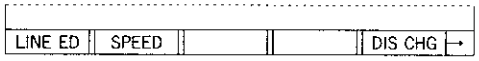
4

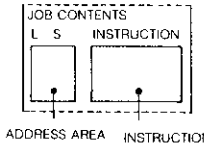
Enter the edit mode.



Depress [EDIT].

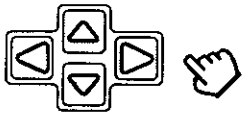
When the cursor is in the address area, depress [→] to move the cursor to the instruction area.

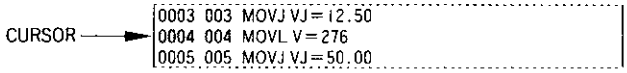




5

Move the cursor to the line of play speed to be modified using the cursor key.

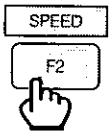


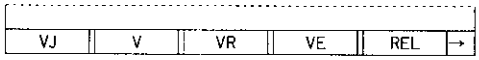


Steps below the cursor line are to be modified.

6

Depress [F2] [SPEED].

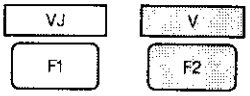




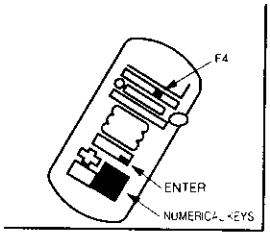
The softkey label of play speed types is displayed.

7

Select the type of play speed to be modified.

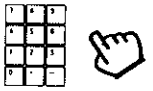


Depress either [F1] [VJ] or [F2] [V].



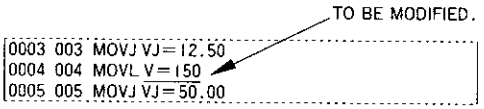
8

Enter the desired play speed using the number keys.

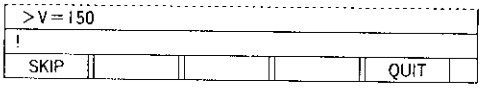


9

Depress [ENTER].



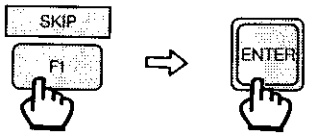
The play speed at the cursor is modified.



The softkey label is as shown on the left.

10

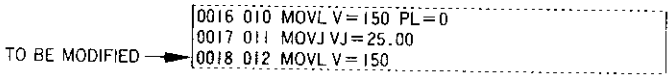
To change the speed in the other steps to the same value, perform the following steps.



Depress [F1] [SKIP] to move the cursor to the next step to be modified.

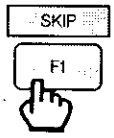
NOTE [F1] [SKIP] is omitted for continuous rewrite.

(Example)



Depress [ENTER] to modify the play speed at the cursor.

※When the play speed at the cursor line (for example, Step 18) is not modified, depress [F1] [SKIP] .



(Example)

```
0017 011 MOVJ VJ=25.00
0018 012 MOVL V=150
0019 013 MOVL VJ=28.00
```

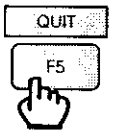
TO BE MODIFIED
NEXT

The cursor moves to the next step to be modified.

By repeating **10** , the play speed in the other steps can be changed to the same value.

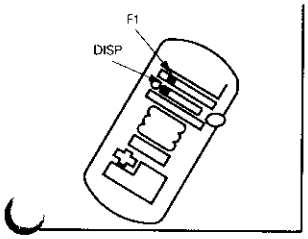
11

Depress [F5] [QUIT] .

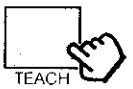


● Modify in the ratio for current play speed. (For relative change, single rewrite)

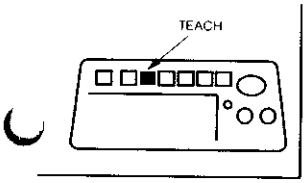
Relative change is the method to specify the ratio (1 to 200%) for current speed and change the speed to the value decreased according to the ratio.
All steps can be changed disregarding to play speed type.



1 Enter the teach mode.



Depress [TEACH].

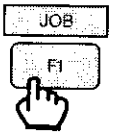


2 Depress [DISP].

! Select display item					
JOB	POSN	FILE	VAR	DIAG	→

The softkey label shown on the left is displayed.

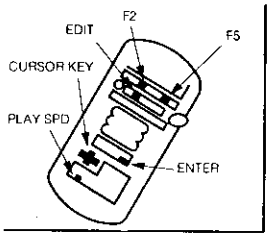
3 Depress [F1] [JOB].




```
JOB CONTENT
L :   S :   INSTRUCTIONS                    TOOL : 0
0000 000   NOP
0001 001   MOVJ VJ=50.00
0002 002   MOVJ VJ=50.00
0003 003   MOVJ VJ=12.50
0004 004   MOVL V=276
0005 005   MOVJ VJ=50.00
0006 006   MOVJ VJ=50.00
```

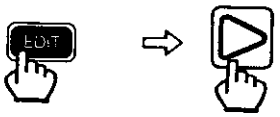
Job Content Display

The job contents appear.

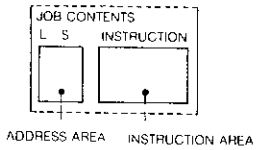


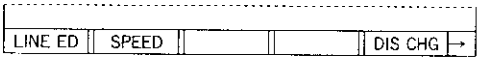
4

Enter the edit mode.



Depress [EDIT].

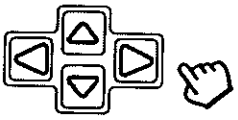


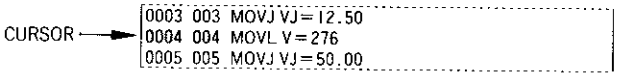


When the cursor is in the address area, depress [→] to move the cursor to the instruction area.

5

Move the cursor to the line of play speed to be modified using the cursor key.

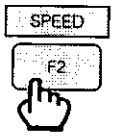


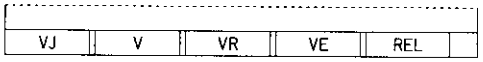


Steps below the cursor line are to be modified.

6

Depress [F2] [SPEED].

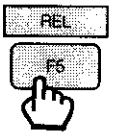


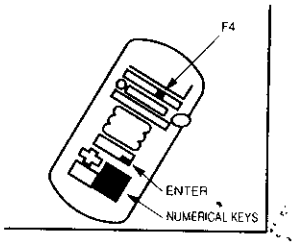


The softkey label of play speed types is displayed.

7

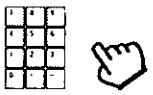
Depress [F5] [REL].





8

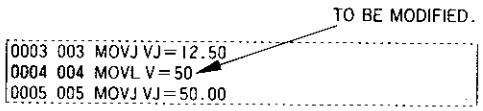
Enter the ratio for the current play speed using the number keys.



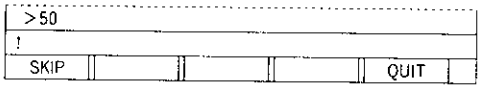
The ratio must be a value between 1 to 200 (%).

9

Depress [ENTER].



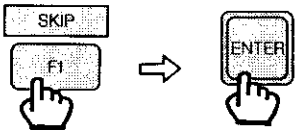
The play speed at the cursor is modified.



The softkey label changes as shown on the left.

10

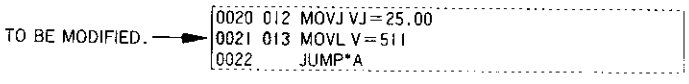
To change the speed in the other steps to the same value, perform the following steps.



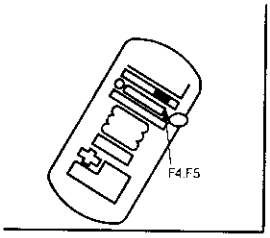
Depress [F1] [SKIP] to move the cursor to the next step to be modified.

NOTE [F1] [SKIP] is omitted for continuous rewrite.

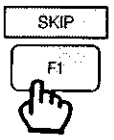
(Example)

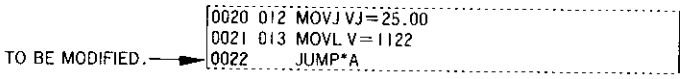


Depress [ENTER] to modify the play speed at the cursor.



※When the play speed at the cursor line (for example, Step 21) is not modified, depress [F1] [SKIP] .



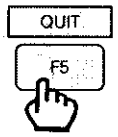


The cursor moves to the next step to be modified.

By repeating [10] , the play speed in the other steps can be changed to the same value.

11

Depress [F5] [QUIT] .



Next basic operation is playback.

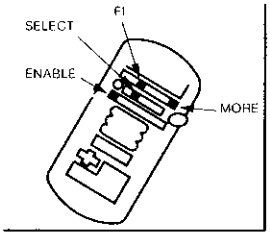
Before playback, be sure to perform the following so that the manipulator will not start moving from a half-way step.

①Move the manipulator near Step 1 using the axis keys.
②Depress [↑] + [↓] to return the cursor to the start of the job.

BASIC OPERATION (PLAYBACK)

■RELEASING TEACH-LOCK

Before playback operation, release teach-lock.



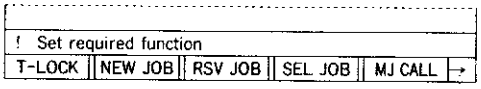
1

Depress [ENABLE], and check that the [ENABLE] lamp is OFF.

NOTE Be sure to check that [ENABLE] lamp is OFF.

2

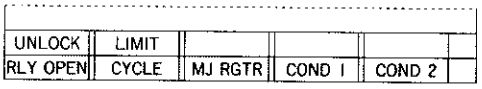
Depress [SELECT].



The softkey label on the left is displayed.

3

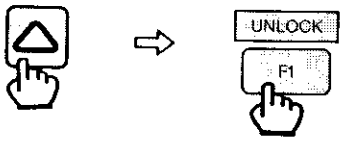
Depress [MORE].

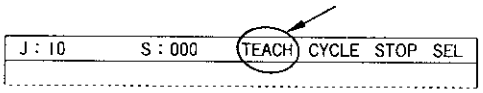


The softkey label on the left is displayed.

4

Depress [↑] and [F1] [UNLOCK].

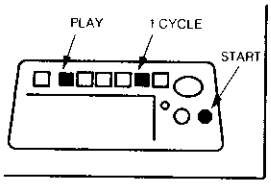




In the status area, mode indication "LOCK" is changed to "TEACH".

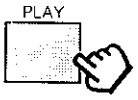
■PLAYBACK

Let's move the manipulator from the beginning.
Before starting, make sure there is nobody around the manipulator for safety reasons.

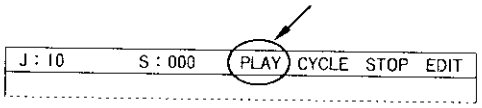


1

Enter the play mode.



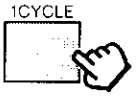
Depress [PLAY] on the playback box.

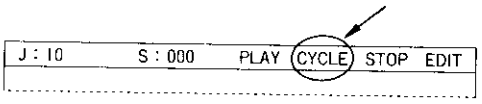


In the status area, mode indication "TCH" is changed to "PLAY".

2

If the operation cycle is not one-cycle, depress [1 CYCLE] on the playback box.





In the operation cycle field of the status area, "CYCLE" is displayed.

3

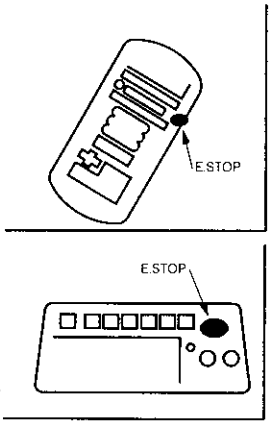
Depress [START] on the playback box.

The manipulator moves the taught steps for a single cycle, then stops.

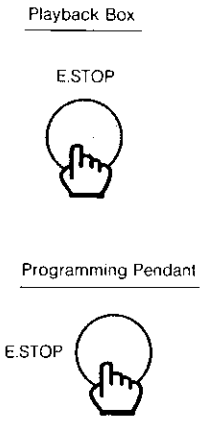
Did the manipulator move just as it was taught ?

BASIC OPERATION (POWER OFF)

After operation, turn the power OFF.

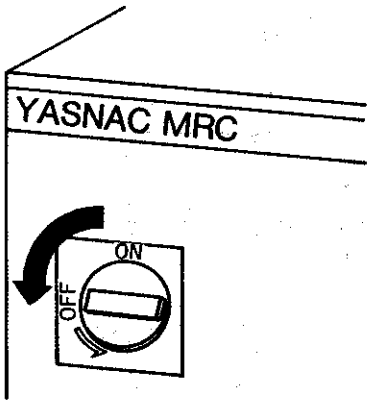


1 Turn OFF the servo power.



Depress either E. STOP button on the playback box or the programming pendant. When the servo power is turned OFF, the mechanical brake is activated and the manipulator stops.
E. STOP can be applied anytime, in any mode.

2 Turn OFF the main power.



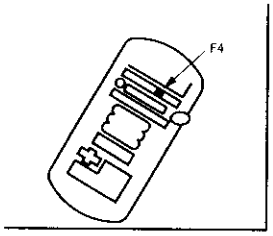
Turn OFF the main power switch on the controller.

Now, all the basic operation has been completed.

OTHER OPERATION

■JOB CALL

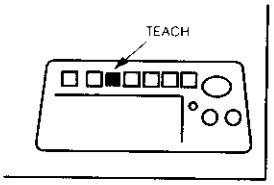
A job which has been registered is called.



1

Enter the teach mode.

Depress [TEACH].




```
! Set required function
T-LOCK | NEW JOB | RSV JOB | SEL JOB | MJ CALL |→
```

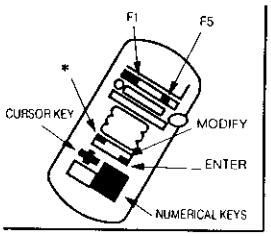
The softkey label shown on the left is displayed.

2

Depress [F4] [SEL JOB].

```
J : ******** S : ***  TEACH  CYCLE  STOP  SEL
JOB LIST (SORTING)
10A    TEST-1    TEST-2    WORK-B
WORK-C

>
! Set cursor on character
ABC | SYMBOL |  |  |  |
CAP/LC | ← | BACK SP | → | QUIT |
```

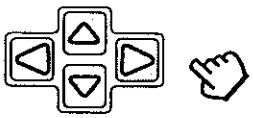
The job list display appears.



[*]+[↓] : Next page displayed
[*]+[↑] : Previous page displayed

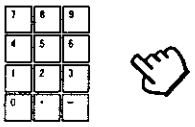
3 Select a job to be called.

• Cursor Key

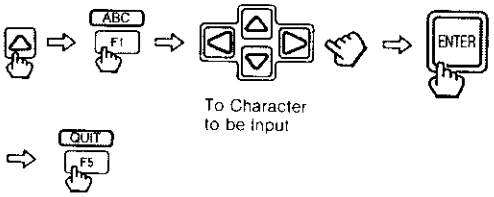


Input the job name by moving the cursor to the job or by character input operation.

• Character Input



Or



4 Depress [ENTER].

```
J : 10A    S : 000   TEACH   CYCLE   STOP   SEL
JOB CONTENT
L :  S :  INSTRUCTIONS                  TOOL : 0
0000 000  NOP
0001 001  MOVJ VJ=50.00
0002 002  MOVJ VJ=50.00
0003 003  MOVJ VJ=12.50
0004 004  MOVL V=276
0005 005  MOVJ VJ=50.00
0006 006  MOVJ VJ=50.00
0007      END
! Select item
T-LOCK | NEW JOB | RSV JOB | SEL JOB | MJ CALL →
```

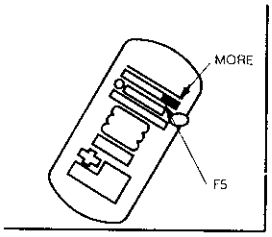
Job Content Display

The selected job is called and the job contents appear.

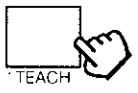
■JOB MASTER REGISTRATION AND CALL

REGISTERING A JOB AS MASTER JOB

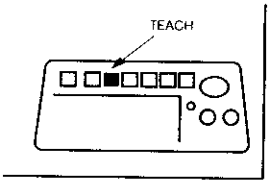
It is convenient to register a frequently playback job as the master job.



1 Enter the teach mode.



Depress [TEACH].



! Set required function					
T-LOCK	NEW JOB	RSV JOB	SEL JOB	MJ CALL	→

The softkey label shown on the left is displayed.

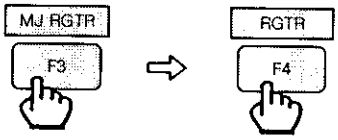
2 Depress [MORE].

UNLOCK	LIMIT				
RLY OPN	CYCLE	MJ RGTR	COND 1	COND 2	

The softkey label shown on the left is displayed.

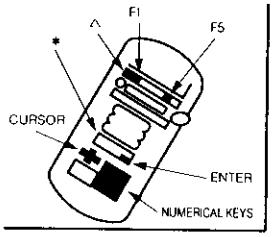
[*]+[↓] : Next page displayed
[*]+[↑] : Previous page displayed

3 Depress [F3] [MJ RGTR] and then [F4] [RGTR].



J : ******** S : *** TEACH CYCLE STOP · SEL				
JOB LIST (SORTING)				
TEST-1	TEST-2	10A	WORK-B	
WORK-C				
>				
! Set cursor on character				
ABC	SYMBOL			
CAP/LC	←	BACK SP	→	QUIT

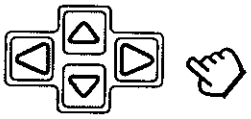
The job list display appears.



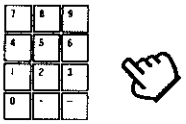
4

Select a job to be registered as a master job.

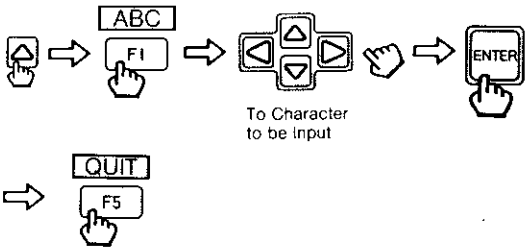
• Cursor Key



• Character Input



Or



Input the job name by moving the cursor to the job or by character input operation.

5

Depress ENTER .

```
J : 10A   S : 000   TEACH   CYCLE   STOP   SEL
JOB CONTENT
L :  S :  INSTRUCTIONS                TOOL : 0
0000 000  NOP
0001 001  MOVJ VJ=50.00
0002 002  MOVJ VJ=50.00
0003 003  MOVJ VJ=12.50
0004 004  MOVL V=276
0005 005  MOVJ VJ=50.00
0006 006  MOVJ VJ=50.00
0007      END
! Select item
T-LOCK | NEW JOB | RSV JOB | SEL JOB | MJ CALL →
```

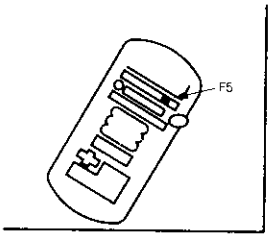
Job Content Display

The selected job is registered as a master job and the job contents appear.

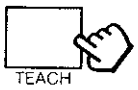
CALLING UP THE MASTER JOB

The job registered as a master job can be called by easier operation than "JOB CALL". The operation mode can be either teach or play mode.

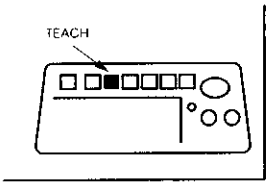
● Teach Mode



1 Enter the teach mode.



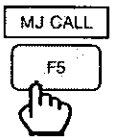
Depress [TEACH].



The softkey label shown on the left is displayed.

```
! Set required function
T-LOCK | NEW JOB | RSV JOB | SEL JOB | MJ CALL →
```

2 Depress [F5] [MJ CALL].



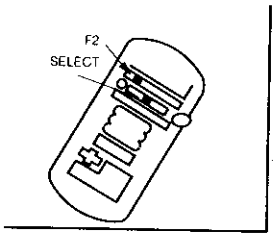

```
J : 10A    S : 000    TEACH    CYCLE    STOP    SEL
JOB CONTENT
L :  S :   INSTRUCTIONS                    TOOL : 0
0000 000   NOP
0001 001   MOVJ VJ=50.00
0002 002   MOVJ VJ=50.00
0003 003   MOVJ VJ=12.50
0004 004   MOVL V=276
0005 005   MOVJ VJ=50.00
0006 006   MOVJ VJ=50.00
0007       END
! Select item
T-LOCK | NEW JOB | RSV JOB | SEL JOB | MJ CALL →
```

Job Content Display

The master job is called and the job contents appear.

OTHER OPERATION

● Play Mode



1 Enter the play mode.

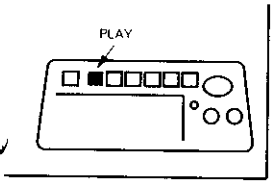
(Play Mode)

Depress [SELECT] in the play mode.

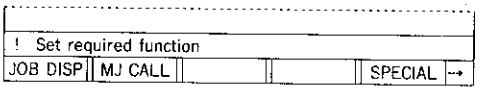
Or

or

Depress [PLAY] on the playback box.

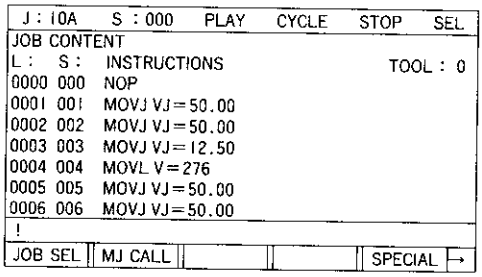


The mode indication in the status display area changes from "TEACH" to "PLAY".



The softkey label shown on the left is displayed.

2 Depress [F2] [MJ CALL] .



Job Content Display

The master job is called and the job contents appear.

■JOB COPY

JOB HEADER DISPLAY :
Displays and edits comments, registering date, edit prohibited status, etc.

JOB LIST DISPLAY :
(Sorting, Recording)
Displays the registered jobs by in the character code order or displays them in the registering order.

A new job is created by copying a registered job. Job copying is available when the job header display or job list is displayed.

JOB HEADER DISPLAY

The job being edited is used as the source job on the job header display.

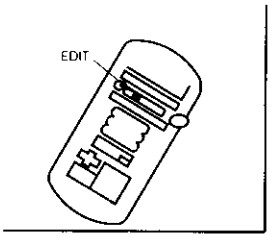
How to Display

1 When any job is not selected, perform the following operation.
[TEACH] → [F4] [SEL JOB] → [CURSOR] or character input operation to select a job (refer to page 61).
→ [ENTER] (job content display) → to 2

2 When a job is selected, perform the following operation.
[DISP] → [F1] [JOB] → [F1] [DIS CHG] → [F1] [HEADER]
→ job header display

J : WORK-A S : 003 LOCK CYCLE STOP DISP
JOB HEADER
JOB NAME : WORK-A
COM : [100mmjob]
DATE : 1992.12/11 10:00
CAP : 1024BYTES
LINES : 30LINES STEPS : 20STEPS
EDIT LOCK : [OFF]
TO SAVE TO FLOPPYDISK : NOT DONE
GROUP SET : R1 +S1
! Select item
SUB HD | CAP | | | |
HEADER | JOB TXT | CMD POS | LIST 1 | LIST 2 |

Job Header Display



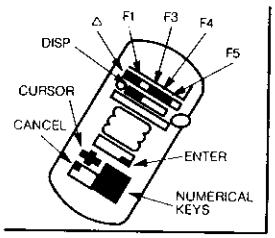
1

Enter the edit mode.

Depress [EDIT].

COPY	DELETE	ED LOCK	JOB NAME	CMT NAM

The softkey label shown on the left is displayed.



2

Perform copy operation.

Depress [F1] [COPY] .

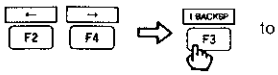
J : 10A S : 000 LOCK CYCLE STOP EDIT				
JOB COPY				
ORIGINAL 10A → DESTINATION				
> 10A				
! Enter new JOB name				
ABC	SYMBOL			
CAP/LC	←	I BACKSP	→	QUIT

Job Copy Display

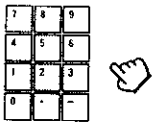
The job copy display appears.

3

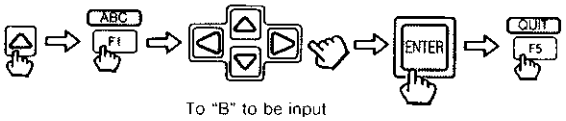
Input a new job name.



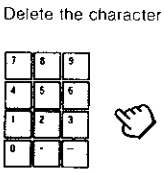
to delete the characters



Or

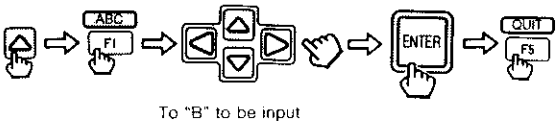


To "B" to be input



Delete the character by [CANCEL]

Or



To "B" to be input

> 10B

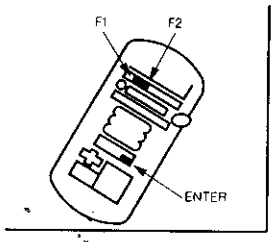
〈When using the job name on the input line〉

Move the cursor to the character to be modified, delete it and input a new job name.

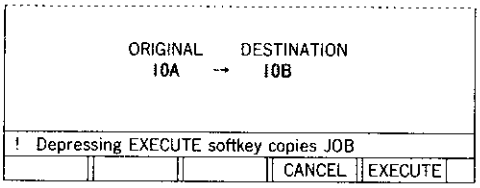
〈When not using the job name on the input line〉

Depress [CANCEL] to delete the character in the input line and input a new job name.

The character is input.

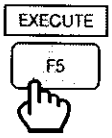


4 Depress [ENTER].

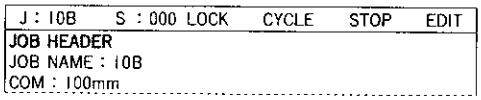


The job name in the input line is displayed in the "DESTINATION" area.

5 Depress [F5] [EXECUTE].



Job copy starts.



After completion of job copy, the job header display of the copy destination job appears.

Depressing [F4] [CANCEL] stops job copy.

OTHER OPERATION

JOB LIST DISPLAY

The source job is selected from stored jobs on the job list display (sorting, recording).

How to Display

1 When a job is not selected, perform the following operation.
[TEACH] → [F4] [SEL JOB] → [CURSOR] or character input operation to select a job (refer to page 61). → [ENTER] (job content display) → to 2

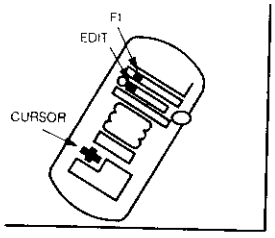
2 When a job is selected, perform the following operation.
[DISP] → [F1] [JOB] → [F1] [DIS CHG]
[F4] [LIST 1] → Job list display (sorting order)
[F5] [LIST 2] → Job list display (registering order)

```
J : WORK-A   S : 003   LOCK   CYCLE   STOP   DISP
JOB LIST (SORTING)
JOB-1     JOB-2     TEST140     WORK-A
WORK-B
```

Job List Display (Sorting)

```
J : WORK-A   S : 003   LOCK   CYCLE   STOP   DISP
JOB LIST (RECORDING)
NO.    JOB NAME    CAP (POS)    DATE      SAVE
00001 : TEST140    100(024)   10/11 08:45   ●
00002 : JOB-1      238(105)   10/11 14:19   ●
00003 : WORK-A     555(110)   10/15 09:03   ○
00004 : WORK-B     309(084)   10/22 11:25   ●
00005 : JOB-2      201(040)   10/23 15:30   ○
```

Job List Display (Recording)



1

COPY	DELETE	ED LOCK	JOB NAME	CMT NAME

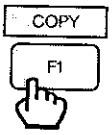
Enter the edit mode.

Depress [EDIT].

2

Move the cursor to the job to be copied.

3



Let's start copy operation.

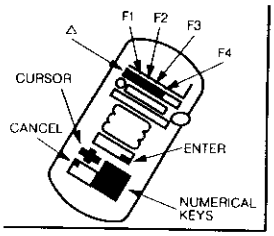
Depress [F1] [JOB COPY].

```
J : 10A    S : 000 LOCK    CYCLE    STOP    EDIT
JOB COPY

              ORIGINAL     DESTINATION
                10A    →

>10A
! Enter new JOB name
```

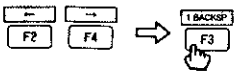
ABC	SYMBOL			
CAP/LC	←	I BACKSP	→	QUIT

Job Copy Display

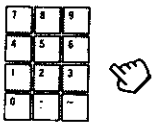
The job copy display appears.



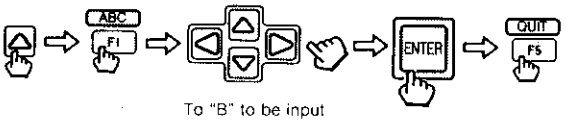
4



to delete the characters

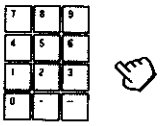


Or



To "B" to be input

Delete the character by CANCEL



Or

To "B" to be input

>10B

Input a new job name.

〈When using the job name on the input line〉

Move the cursor to the character to be modified, delete it and input a new job name.

〈When not using the job name on the input line〉

Depress CANCEL to delete the character in the input line and input a new job name.

The character is input.

5

Depress ENTER .

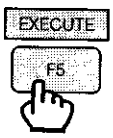
ORIGINAL 10A → DESTINATION 10B

! Depressing EXECUTE softkey copies JOB

CANCEL EXECUTE

The job name in the input line is displayed in the "DESTINATION" area.

6



Depress F5 [EXECUTE] .

Job copy starts. After completion of job copy, the job list display appears.
Depressing F4 [CANCEL] stops job copy.

OTHER OPERATION

■JOB DELETION

Registered jobs can be deleted. Job deleting is available when the job header display or job list is displayed.

JOB HEADER DISPLAY

The job being edited is deleted on the job header display.

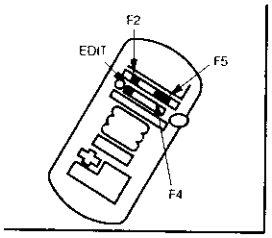
How to Display

1 When any job is not selected, perform the following operation.
[TEACH] → [F4] [SEL JOB] → [CURSOR] or character input operation to select a job (refer to page 61). → [ENTER] (job content display) → to 2

2 When a job is selected, perform the following operation.
[DISP] → [F1] [JOB] → [F1] [DIS CHG] → [F1] [HEADER] → job header display

```
J : WORK-A   S : 003   LOCK  CYCLE  STOP  DISP
JOB HEADER
JOB NAME : WORK-A
COM : [100mmjob]
DATE : 1992.12/11  10:00
CAP : 1024BYTES
LINES : 30LINES   STEPS : 20STEPS
EDIT LOCK : [OFF]
TO SAVE TO FLOPPYDISK : NOT DONE
GROUP SET : R1 +S1
! Select item
SUB HD | CAP |  |  |  |
HEADER | JOB TXT | CMD POS | LIST 1 | LIST 2 |
```

Job Header Display



1

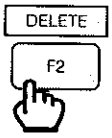
Enter the edit mode.

Depress [EDIT].

```
COPY | DELETE | ED LOCK | JOB NAME | CMT NAM
```

The softkey label shown on the left is displayed.

2

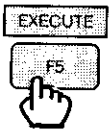


Depress [F2] [DELETE].

```
CANCEL | EXECUTE
```

The softkey label shown on the left is displayed.

3



Depress [F5] [EXECUTE].

```
J : ******** S : ***  LOCK  CYCLE  STOP  EDIT
JOB LIST (SORTING)
TEST-1   TEST-2   WORK-B   WORK-C
```

Job List Display (Sorting)

The edit job is deleted.
At completion of deletion, the job list (sorting) appears.
In the status display area, "******" is displayed for the job name, indicating that no job is called up for editing.

Depressing [F4] [CANCEL] stops job deletion and the job list display is returned.

JOB LIST DISPLAY

The job to be deleted is selected on the job list display.

How to Display

1 When a job is not selected, perform the following operation.
TEACH → F4 [SEL JOB] → CURSOR or character input operation to select a job (refer to page 61). → ENTER (job content display) → to 2

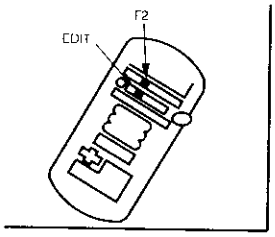
2 When a job is selected, perform the following operation.
DISP → F1 [JOB] → F1 [DIS CHG]
F4 [LIST 1] → Job list display (sorting order)
F5 [LIST 2] → Job list display (registering order)

```
J : WORK-A  S : 003  LOCK  CYCLE  STOP  DISP
JOB LIST (SORTING)
JOB-1    JOB-2    TEST140    WORK-A
WORK-B
```

Job List Display (Sorting)

```
J : WORK-A  S : 003  LOCK  CYCLE  STOP  DISP
JOB LIST (RECORDING)
NO.   JOB NAME   CAP (POS)   DATE        SAVE
00001 : TEST140  100(024)  10/11 08:45  ●
00002 : JOB-1    238(105)  10/11 14:19  ●
00003 : WORK-A   555(110)  10/15 09:03  ○
00004 : WORK-B   309(084)  10/22 11:25  ●
00005 : JOB-2    201(040)  10/23 15:30  ○
```

Job List Display (Recording)



1 Enter the edit mode.

Depress EDIT.

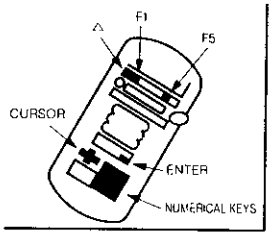
COPY	DELETE	ED LOCK	JOB NAME	CMT NAME

The softkey label shown on the left is displayed.

2 Depress F2 [DELETE].

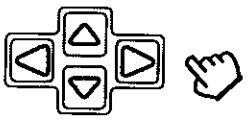
! Enter new JOB name				
ABC	SYMBOL			
CAP/LC	←	BACK SP	→	QUIT

The softkey label shown on the left is displayed.



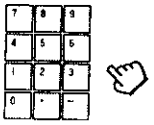
3 Input a job name to be deleted.

• Cursor Key

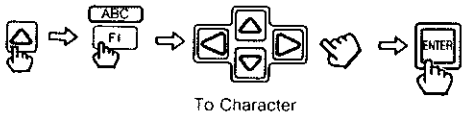


Select a job to be deleted by cursor key or character input operation.

• Character Input



Or



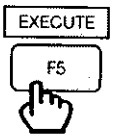
To Character to be Input

Depress F5 [QUIT] to complete character input operation.

The job to be deleted is reversely displayed.

4 Depress ENTER .

5 Depress F5 [EXECUTE] .



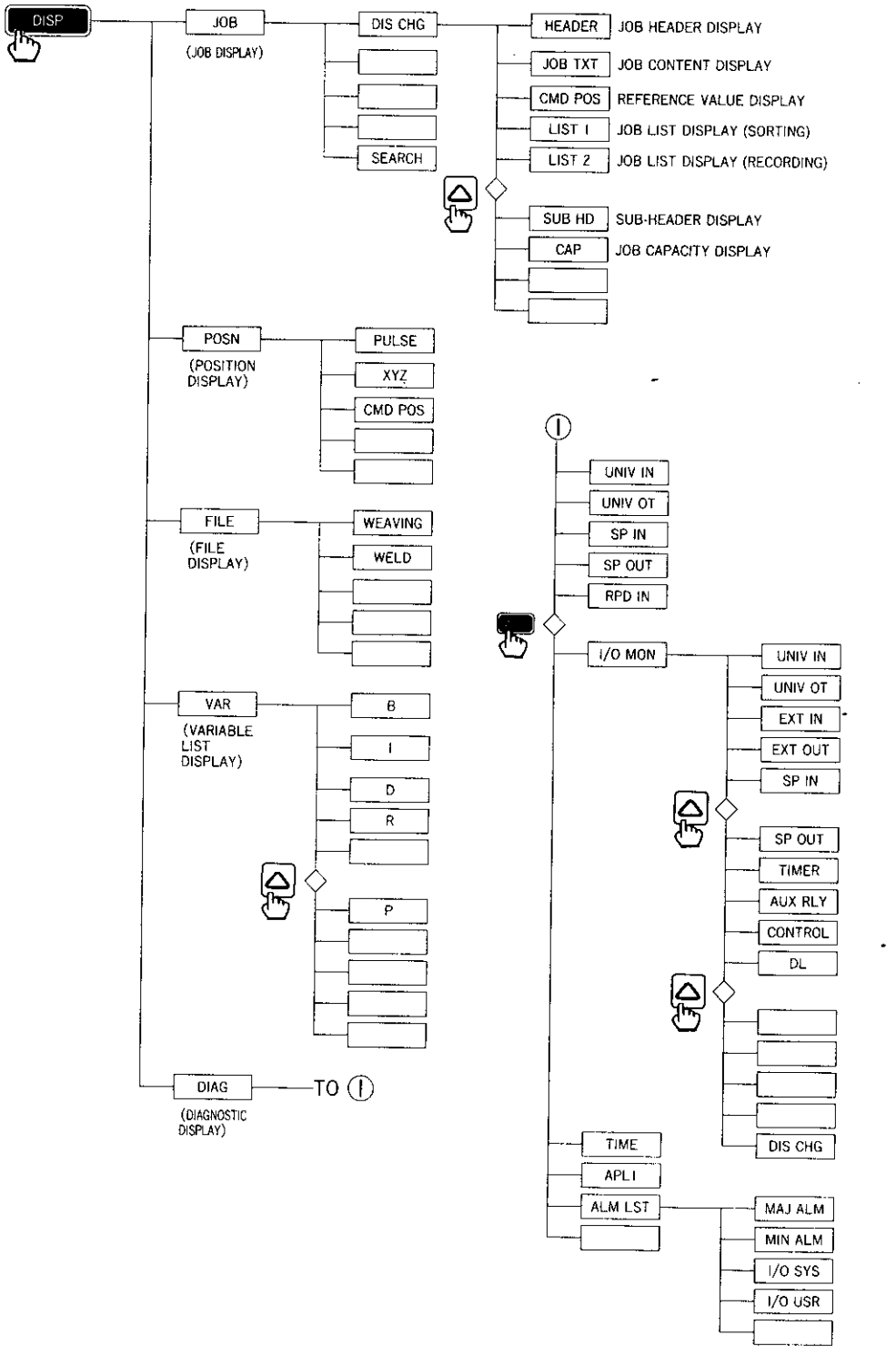
The selected job is deleted.

At completion of deletion, the job list display (sorting) appears.
Depressing F4 [CANCEL] stops job deletion and the job list display appears.

SOFT KEY TREE

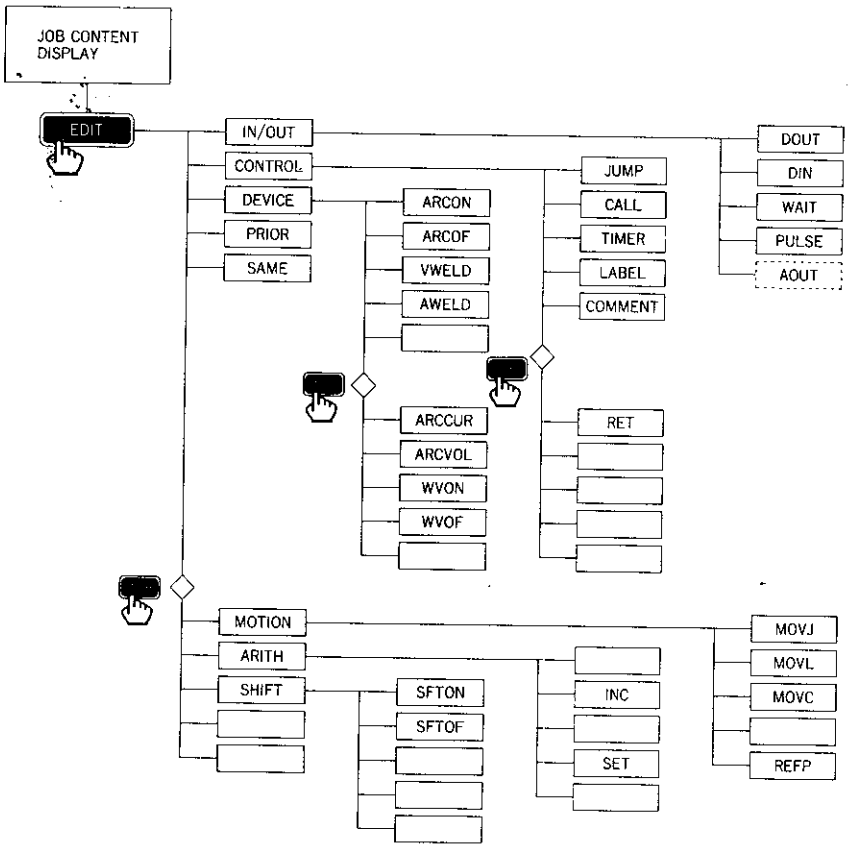
The following shows one basic operation tree for reference.

●When DISP is depressed

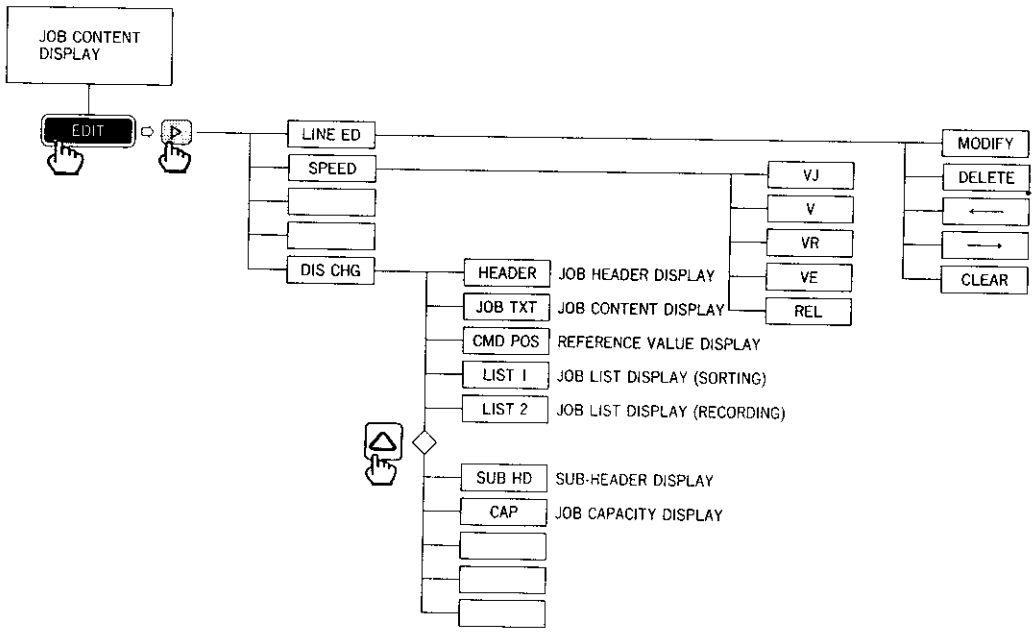


SOFT KEY TREE

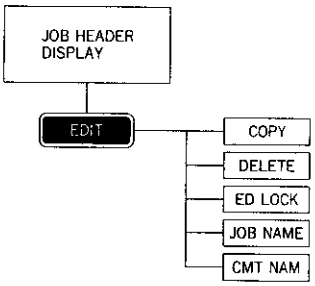
●When EDIT is depressed during job content display.



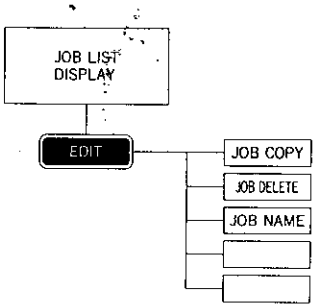
●When EDIT ⇨ ▷ is depressed during job content display.



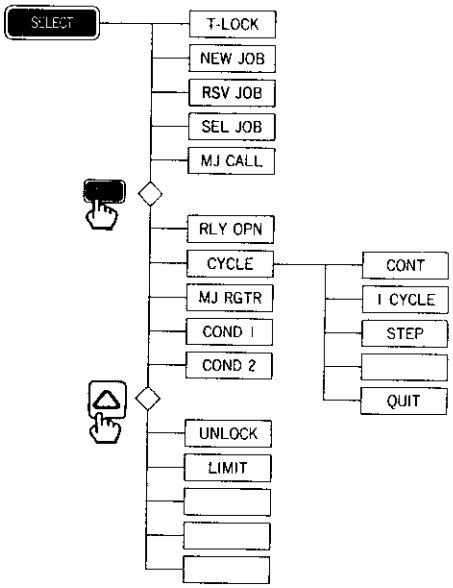
●When EDIT is depressed during job header display



●When EDIT is depressed during job list display.



●When SELECT is depressed in teach mode



INSTRUCTIONS FOR ARC WELDING

NOTATION

1. 〔 〕 : Not displayed in the screen
2. 〈 〉 : Numerical or character data
3. —/··· : Selection item (Select one)

● Move Instructions

Instruction	Function	Format	Example
MOVJ (Move, Joint)	Moves to the teach point by joint interpolation.	[Position data][Base axis position data] [Station axis position data] VJ = 〈Play speed〉 VJ = 〈Position level〉 UNTIL Syntax NWAIT	MOVJ VJ=PL=2 UNTIL IN#(16) ON NWAIT
MOVL (Move, Linear)	Moves to the teach point by linear interpolation.	[Position data][Base axis position data] [Station axis position data] V =〈Play speed〉 VR=〈Wrist orientation play speed〉 VE=〈Ext. axis play speed〉 PL =〈Positioning level〉 NWAIT	MOVL V=138 PL=2 UNTIL IN#(16) ON NWAIT
MOVC (Move, Circular)	Moves to the teach point by circular interpolation.	[Position data][Base axis position data] [Station axis position data] V =〈Play speed〉, VR=〈Wrist orientation play speed〉, VE=〈Ext. axis play speed〉 NWAIT	MOVC V=138 NWAIT
REFP (Reference, Point)	Specifies wall point of weaving	[Position data][Base axis position data] [Station axis position data] 〈No.〉 ↑ (Wall point 1 to weaving=1, wall point 2 of weaving=2)	REFP1

● I/O Instructions

Instruction	Function	Format	Example
DOUT (Digital, Out)	Turns ON/OFF external output signal.	OT#(〈Output No.〉) OG#(〈Output group No.〉) 〈Status〉 B〈Variable No.〉	DOUT OT#(12) ON DOUT OG#(02) 24
PULSE	Outputs pulse to external output signal.	OT#(〈Output No.〉) T=〈Time〉 ↑ (0.10 to 3.00S) Note : If no specification, 0.3S is set.	PULSE OT#(10)T=0.60
DIN (Digital, In)	Reads input signal.	B〈Variable No.〉 IN#(〈Input No.〉) IG#(〈Input group No.〉), OT#(〈Univ.output No.〉), OG#(〈Univ.output group No.〉), SIN#(〈Special input No.〉), SOT#(〈Special output No.〉)	DIN B16 IN#(16) DIN B02 IG#(02)
WAIT	Waits until input relay coincides with specified status.	IN#(〈Input No.〉), IG#(〈Input group No.〉), 〈Status〉,B〈Variable No.〉 T=〈Time〉	WAIT IN#(12) ON T=10.00 WAIT IN#(12) B02

● Control Instructions

Instruction	Function	Format	Example
JUMP	Jumps to specified label or job.	<Label No.> JOB : <Job name> IG#(<Input group No.>) B<Variable No.> IF syntax	JUMP JOB : TEST1 IF IN#(14) OFF
* (Asterisk)	Label indicated position to be jump.	Within 8 characters (half-size)	*123
CALL	Calls up specified job.	<JOB : Job name> IG#(<Input group No.>) B<Variable No.> IF syntax	CALL JOB : TEST1 IF IN#(24) ON
RET (Return)	Returns to the called job.	IF syntax	RET IF IN#(12) OFF
END	End of job.		END
NOP	No operation.		NOP
TIMER	Stops manipulator for specified time.	T=<Time> ↑ (0.01 to 327.67S)	TIMER T=12.5
IF Syntax	Determines a variety of conditions.	<Comparison element 1> =, <>, <=, >=, <, > <Comparison element 2>	JUMP *12 IF IN#(12) OFF

● Shift Instructions

Instruction	Function	Format	Example
SFTON (Shift, On)	Starts the shift operation.	P<Variable No.> RF, TF, UF#(<User frame No.>) EX<Variable No.> {RF : Robot coordinate TF : Tool coordinate UF : User coordinate}	SFTON P12
SFTOF (Shift, Off)	Stops the shift operation.		SFTOF

● Operating Instructions

Instruction	Function	Format	Example
INC	Adds one to the contents of specified variable	B<Variable No.> I<Variable No.>	INC 143
CLEAR	· Data are cleared on variable data specified at Tag 1 and onward. The cleared number is the setting number in Tag 2. · When ALL is set in Tag 2, all variables following the specified variable in Tag 1 are cleared. · When STACK is set at Tag 1, all job call stacks are cleared.	B<Variable No.> I<Variable No.> D<Variable No.> R<Variable No.> STACK<Number data> ALL	CLEAR BOO ALL CLEAR STACK

● Other Instructions

Instruction	Function	Format	Example
' (Apostrophe)	Displays comments registered in job header display.	<Comment> (Within 32 characters, half-size)	Job to draw a square of 100mm dia.

● Working Instructions for Arc Welding

Instruction	Function	Format	Example
ARCON (Arc On)	Outputs arc ON instruction.	AC=<Current output> AV=<Voltage output> AVP<Ratio to appropriate voltage output> T=<Time> V=<Welding speed> ASF#(<Welding condition start file No.>) RETRY (RETRY : Sets retry function)	ARCON ARCON ASF#(1) ARCON AC=230 AVP=90 T=1.00 V=150 RETRY
ARCOF (Arc Off)	Outputs arc OFF instruction.	AC=<Current output> AV=<Voltage output> AVP<Ratio to appropriate voltage output> T=<Time> AEF#(<Welding condition end file No.>) ANTSTK (ANTSTK : Antistick, sets welding release function)	ARCOF ARCOF AEF#(2) ARCOF AC=300 AVP=92 T=1.00 ANTSTK
ARCCUR (Arc current)	Specifies the current output for welding.	AC=<Current output>	ARCCUR AC=200
ARCVOL (Arc voltage)	Specifies the voltage output for welding.	AV=<Voltage output> AVP=<Ratio to appropriate voltage output>	ARCVOL AV=20 ARCVOL AVP=100
AWELD	Outputs the current instruction value for welding.	<Current instruction value> (−14.1A to +14.0A)	AWELD 12
VWELD	Outputs the voltage instruction value for welding.	<Voltage instruction value> (−14.1V to +14.0V)	VWELD 2.5
WVON (Weave On)	Starts the weaving operation.	WEV#(<File No.>)	WVON WEV#(12)
WVOF (Weave Off)	Stops the weaving operation.	–	WVOF

YASNAC MRC

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