YASKAWA

YASNAC MRC
INSTRUCTIONS

CONTROLLER FOR INDUSTRIAL ROBOT MOTOMAN

CALIBRATION FOR ROBOT AND STATION AXES

After V3.0

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

YASKAWA

TOE-C945-422

CONTENTS

To perform coordinated operation between two manipulators or between a manipulator and a station, relative position of both parties have to be registered beforehand. This setting of relative position is called robot calibration or robot-station calibration.

OPERATION

PERFORMING CALIBRATION

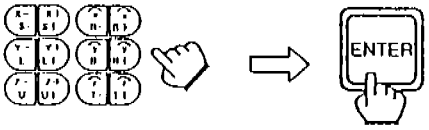
TEACHING THE CALIBRATION JOB

1

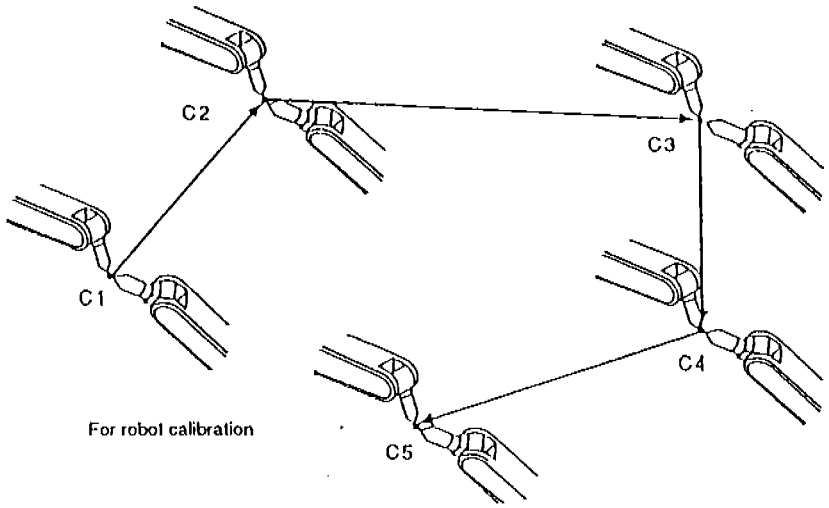
Register the new job

Coordinated job for
R□+ R□ or R□+ S□

Teach five points

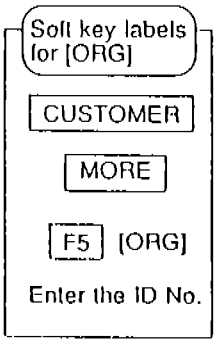


Teach the coordinated job for the calibration with the combination of desired group axes. For details, see "CALIBRATION JOBS".



PERFORMING THE CALIBRATION

2



Soft key labels for [ORG] ⇨ RB CALIB / F 5

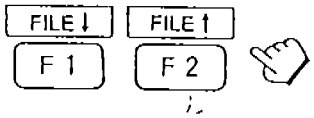
Call up the soft key labels for [ORG]. Depress F5 [RB CALIB]. The robot calibration coordinate value display appears.

```
J:WORK-A    S:012 TCH    1 CYCLE    HOLD    CUST
[ROBOT CALIBRATION COORDINATE VALUE]
 FILE No. : 01 ROBOT :  *
  X        *    mm      Rx       *    deg.
  Y        *    mm      Ry       *    deg.
  Y        *    mm      Rz       *    deg.

 FILE ↓ ‖ FILE ↑ ‖ ORG PT ‖ SET ‖ QUIT |
```

Robot Calibration (Coordinate Value) Display

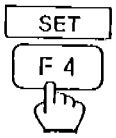
3



Depress F1 [FILE ↓] or F2 [FILE ↑] to display the file screen to register calibration data.

- To register new data, use unused file of the smallest number.
- To modify data of registered file, call up that file.

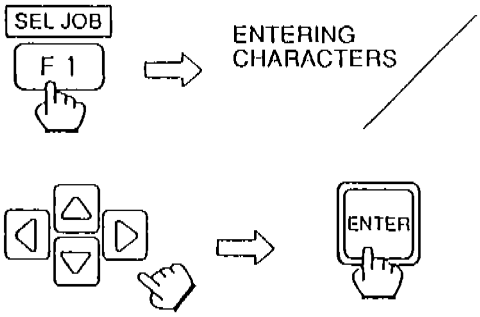
4



Depress F4 [SET] to display the soft key labels below.

```
SEL JOB ‖        ‖        ‖ DATA CL ‖ CALC |
```

5

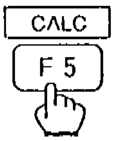


Depress F1 [SEL JOB] to display the job contents display. Call up the calibration job made in step **1** by entering characters or moving cursor.

Note : Not necessary if the current eiditing job is for calibration.

```
J:CALIB 001 S:000 TCH     1 CYCLE     HOLD     CUST
JOB CONTENT
L :       S :  INST            TOOL :  0
0000      000  NOP
```

6



Depress [F5] [CALC] to display the calibration contents display. Check the contents.

```
ROBOT CALIBRATION
 FILE No.  : 01
 NAME      : CALIB 001
 STEP      :   5
 ROBOT     : R1+R2

          ||        ||        || CANCEL || EXECUTE |
```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7.

Depress [F5] [EXECUTE] to calculate the calibration data and to switch to the robot calibration coordinate value display.

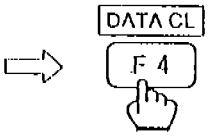
To cancel calculating, depress [F4] [CANCEL].

```
J:CALIB 001 S:000 TCH     1 CYCLE     HOLD     CUST
ROBOT CALIBRATION COORDINATE VALUE
 FILE No.  : 01 ROBOT : R1+R2
  X          2114.72 mm        Rx        -0.09 deg.
  Y            -9.98 mm        Ry         0.15 deg.
  Y           -30.15 mm        Rz      -179.62 deg.
```

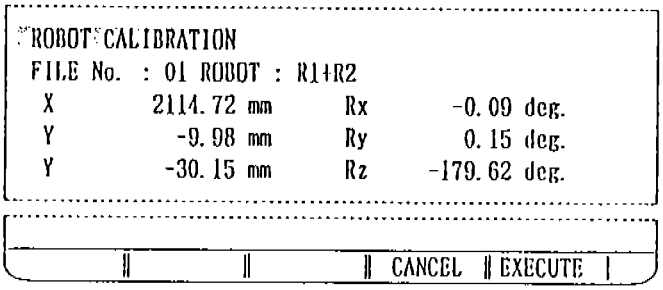
DELETING CALIBRATION DATA

1

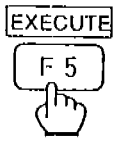
ROBOT CALIBRATION DISPLAY



Call up the robot calibration display following step **2** to **4** at "PERFORMING CALIBRATION".
Depress F4 [DATA CL].



2



Depress F5 [EXECUTE] to delete calibration data for displayed file.

To cancel deleting, depress F4 [CANCEL].

CHECKING CALIBRATION POSITIONS

To check calibration positions, call up the calibration job and execute FWD operation.

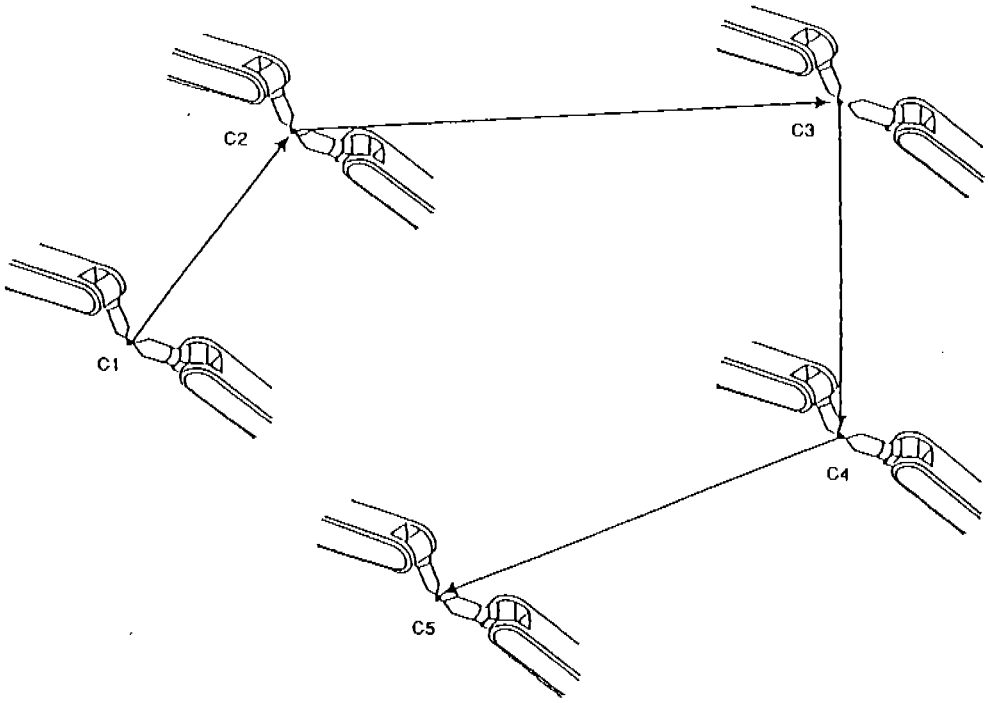
CALIBRATION JOBS

ROBOT CALIBRATION (R□+R□)

Align control points of both manipulators at five points and register those positions. In the explanation below, C1 to C5 are arbitrarily selected positions.

① Teach C1. Move either manipulator to any position. Move axes to align the control point of the other manipulator to that control point of the first manipulator. Register the position as a step.

② Repeat step ① to register positions C2 to C5.



Notes :

- Use of universal tool is recommended to minimize teaching error.
- Set up tool dimensions properly. Tool calibration is recommended.
- When registering C2 and succeeding positions, keep the posture of both tools as they were at C1 as far as possible.
- Recommended distance between neighboring steps (between C1 and C2, C2 and C3, and so on) is about 1 m.
- Arrange C1 to C5 to form a pentagon, not a straight line.
- Do not teach positions with the L and U axes extremely extended or contracted. Otherwise, calibration accuracy deteriorates.

ROBOT-STATION CALIBRATION (R□+S□)

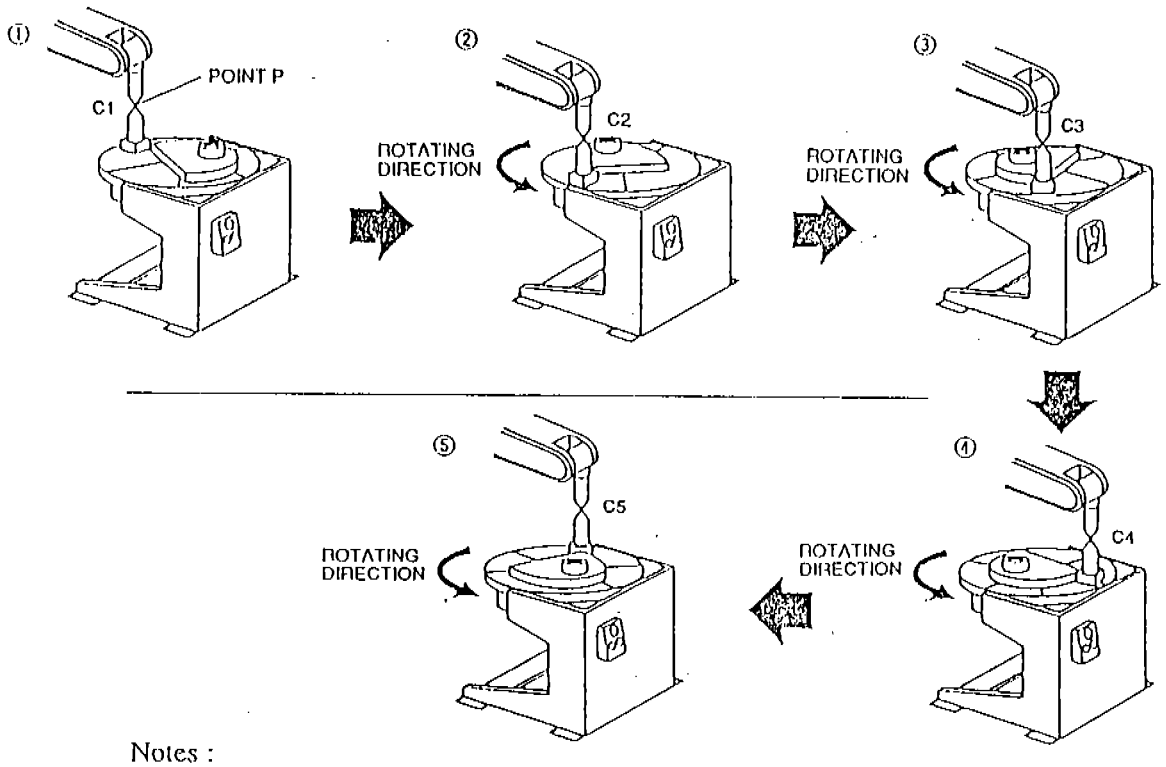
FOR STATION WITH A SINGLE ROTARY AXIS

① Determine an arbitrary point P on the turntable of the station axis. Point P must not be near the center of the turntable. Align the control point of the manipulator to point P and register the position as C1.

② Turn the station axis about 30°. Rotating direction does not matter. Align the control point of the manipulator to the moved point P and register the position as C2.

③ Turn the station axis again in the same direction, align the control point of the manipulator to the moved point P and register the position as C3.

④, ⑤ Repeat step ③ to register C4 and C5.



Notes :

- Use of universal tool is recommended to minimize teaching error.
- Set up tool dimensions properly. Tool calibration is recommended.
- It is recommended to mount a pointed tool as shown in the figure onto the station axis and use the pointed tip as the control point to be taught to minimize teaching error.
- When registering C2 and succeeding positions, keep the posture of both tools as they were at C1 as far as possible.
- When teaching, place the L axis of the manipulator in a vertical position and U axis in the horizontal position. If the layout inhibits, do not stick to this rule.
- Do not teach positions with the L and U axes extremely extended or contracted. Otherwise, calibration accuracy deteriorates.

FOR STATION WITH TWO ROTARY AXES

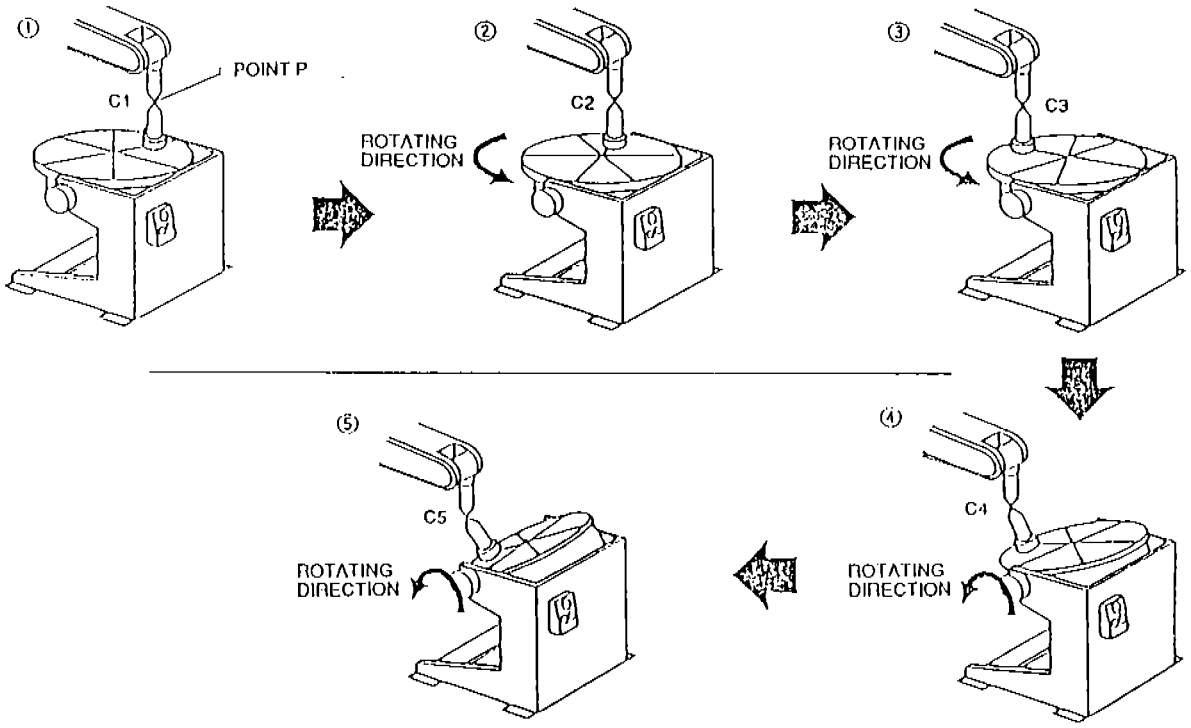
① Determine an arbitrary point P on the turntable of the station axis. Point P must not be near the center of the turntable. Lay the first station axis in the horizontal position, align the control point of the manipulator to point P, and register the position as C1.

② Turn the second station axis about 30°. Align the control point of the manipulator to the moved point P and register the position as C2.

③ Turn the second station axis another 30° in the same direction, align the control point of the manipulator to the moved point P and register the position as C3.

④ Then turn the first axis about 30°. Align the control point of the manipulator to the moved point P and register the position as C4.

⑤ Turn the first station axis another 30° in the same direction, align the control point of the manipulator to the moved point P and register the position as C5.



Notes :

- Use of universal tool is recommended to minimize teaching error.
- Set up tool dimensions properly. Tool calibration is recommended.
- It is recommended to mount a pointed tool as shown in the figure onto the station axis and use the pointed tip as the control point to be taught to minimize teaching error.
- When registering C2 and succeeding positions, keep the posture of both tools as they were at C1 as far as possible.
- When teaching, place the L axis of the manipulator in a vertical position and U axis in the horizontal position. If the layout inhibits, do not stick to this rule.
- Do not teach positions with the L and U axes extremely extended or contracted. Otherwise, calibration accuracy deteriorates.
- Keep the second station axis in the same position when registering C1, C2, and C3.
- Keep the first station axis in the same position of C3 when registering C4, and C5.

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