FANUC Robotics

ENGINEERING BULLETIN NUMBER:	03372		
Release Date:	04/01/04	Document Status:	Released
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Robot Accuracy Enhancement Techniques Software Engineering Bulletin

ROBOT MODEL SUPPORTED	SOFTWARE REQUIRED	AUTHORIZED EXTERNAL DISTRIBUTION
All Six Axis Robots	All V3.XX and Later Versions	→ All Customers

SOURCE OF INFORMATION:	FANUC FRA SEB - Software Engineering Bulletin

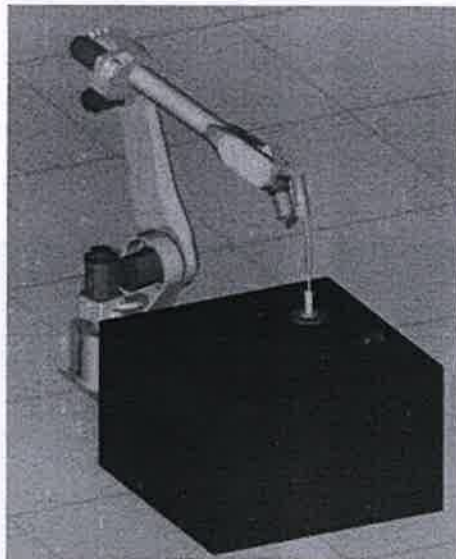| REASON FOR ENGINEERING BULLETIN		
Error Correction → N/A	Material Availability	Mechanical Guidelines
Product Improvement → N/A	New Product Release	Electrical Guidelines
Other	Information	Software Guidelines

1. SETUP

- Make TCP for Reference.
- And use it for master calibration Tool =1. In program. (Shift + coordinate)
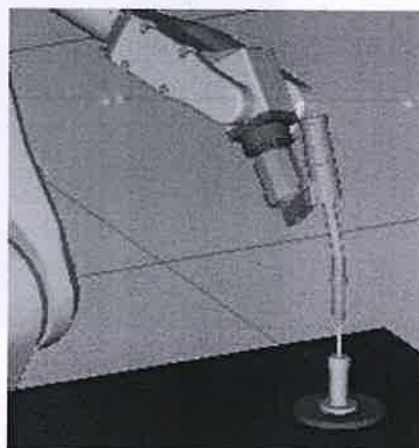
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2. CALIBRATE J5

- Create TP program "J5"
- Make reference point shown below image and record P (1).
- Record P [2] at the same location
- Go to Position configuration (F3 key) of P [2] from F to N or from N to F
- Move to P [2]
- In JOINT jog mode jog ONLY J5 so the TCP is as close as possible to the pointer
- Record P [3]
- Go to position of P [2] and P [3] to JOINT
- Find the average value for J5 axis between P [2] and P [3]Value = (P [2]. J5 + P [3]. J5) / 2
- Go to Menu + Next + [System] + Variables + Master Enable (0 to 1) +Type + Master/Calibrate).
- Select "4 SINGLE AXIS MASTER"
- Change "MSTR POS" for J5 to the value calculated above
- Change "(SEL)" value for J5 (0 to 1) and press ENTER.
- Press F4 "EXEC" softkey
- Wait for the "(SEL)" value of J5 to change from 1 to 0
- Press "[Prev]" hard key
- Select "6 Calibrate"
- After Calibrate cross verify value of particular axis with calculated value.
- Select "[Edit]" hard key
- TOUCHUP P [2] and P [1] to current location
- Go to the position of P [1] to Cartesian (x, y, z) and change configuration from N to F or F to N
- Move to P [1] and verify the TCP touches the pointer in both configurations
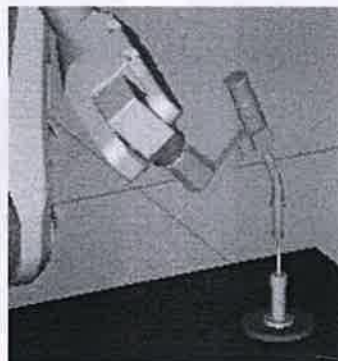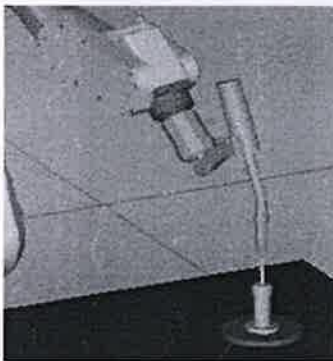
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3. CALIBRATE J4

- Create TP program "J4"
- Make reference point shown below image and record P(1).
- Put J4=0 and J6=0 and forward point P 1.
- Now delete point 1.
- In JOINT jog mode, Jog J1,J2, and J3 so that the TCP touches the pointer and record P[1]
- In JGFRM jog mode, rotate about +Z (r value) axis approximately 90 degrees
- Jogging ONLY JGFRM X-Y and JOINT J4, jog so the TCP touches the pointer and Record P[2], and make a note of J2 and J3 angles
- In JGFRM jog mode, rotate about -Z (r value) axis approximately -180 degrees until J2 and J3 angles matchthat of P[2],
- Jogging ONLY JGFRM X-Y and JOINT J4, jog so the TCP touches the pointer and Record P[3]
- Go to position of P[2] and P[3] to joint
- Find the correction value for J4 by the following formula
     Value = (P[3].J4 – P[2].J4) / 2.0
- Go to Menu + Next + [System] + Variables + Master Enable (0 to 1) +Type + Master/Calibrate).
- Select "4 SINGLE AXIS MASTER"
- Change "MSTR POS" for J4 to the value calculated above
- Change "(SEL)" value for J4 (0 to 1) and press ENTER
- Press F4 "EXEC" softkey
- Wait for the "(SEL)" value of J4 to change from 1 to 0
- Press "[Prev]" hardkey
- Select "6 Calibrate"
- After Calibrate cross verify value of particular axis with calculated value.
- In JGFRM jog mode, rotate about +Z (r value) axis by 180 degrees
- Verify that jogging ONLY JGFRM X-Y the TCP can touch the pointer and repeat the above steps ifnecessary

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4. CALIBRATE J2 & J3 (ONLY ON SOME ROBOTS)

- Create TP program "J23"
- Make reference point shown below image and record P(1).
- Record P[2] at the same location
- Go to position configuration (F3 Key) of P[2] from U to D and T to B
- Move to P[2]
- In JOINT jog mode jog ONLY J2 and J3 so the TCP is as close as possible to the pointer
- Record P[3]
- Go to position of P[2] and P[3] to JOINT
- Find the average value for J2 and J3 axes between P[2] and P[3]

    ValueJ2 = (P[2].J2 + P[3].J2) / 2
    ValueJ3 = (P[2].J3 + P[3].J3) / 2

- Go to Menu + Next + [System] + Variables + Master Enable (0 to 1) +Type + Master/Calibrate).
- Select "4 SINGLE AXIS MASTER"
- Change "MSTR POS" for J2 and J3 to the values calculated above
- Change "(SEL)" value for J2 and J3 to 1 and press ENTER
- Press F4 "EXEC" softkey
- Wait for the "(SEL)" values of J2 and J3 to change from 1 to 0
- Press "[Prev]" hardkey
- Select "6 Calibrate"
- After Calibrate cross verify value of particular axis with calculated value.
- Select "[Edit]" hardkey
- TOUCHUP P[2] and P[1] to current location
- Go to the position of P[1] to Cartesian and change configuration from D to U and B to T
- Move to P[1] and verify the TCP touches the pointer in both configurations