Encoder recover procedure for TH Robots

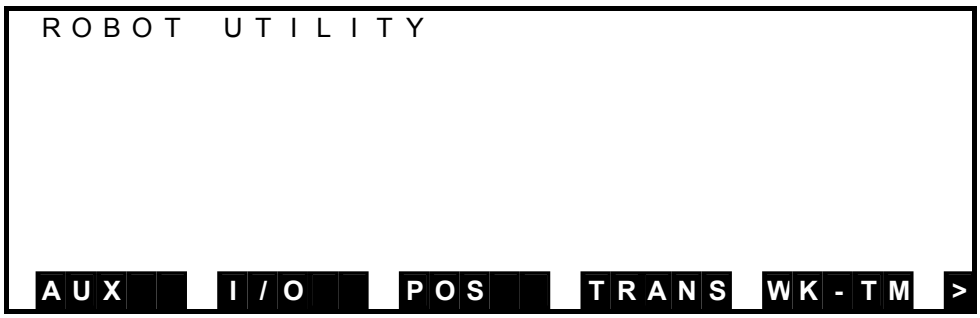
If the back up batteries of a Robot should go flat or if there has been a cabling problem or if a part has been replaced (servo motor or harmonic drive or Z axis) then the 'Zero' positions of the Robot may be lost.

Usually after battery failure or part replacement the Robot will display several fault messages. Typically these will be 'Battery Alarm', 'Encoder Abnormal', 'Encoder Type Error' or 'Soft Limit'.

To recover from these faults there are several procedures you must follow. Firstly you must put right the cause of the fault (i.e. replace the back up batteries or reconnect the encoder cables). Next you must clear the error log in the encoder memory.

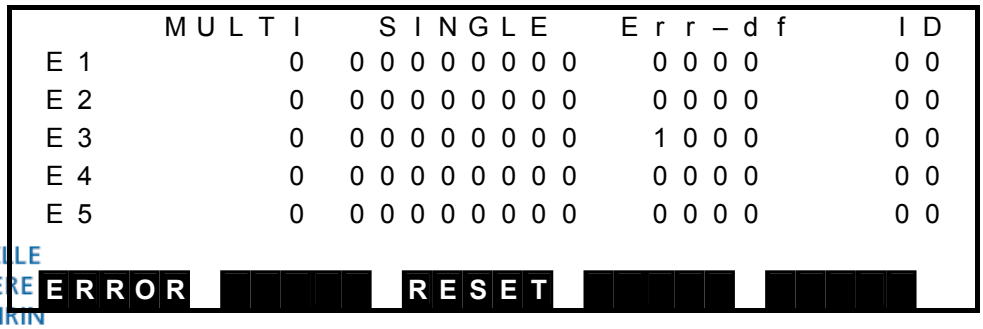
Encoder Error Reset

1. Put the controller in TEACHING mode and turn the servo power off, then press the UTILITY key.



2. Press the NEXT key.

3. Press F5 for [ENC].



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4. Press and hold the [ALT] key then press [0] (zero) to allow editing.

5. Move the cursor to the position where the “Err df” column is not "0000", using the arrow keys. Press F3 for "R E S E T" and then [EXE] to reset the error code to “0000”. This should be repeated for each line that shows an error. If the error remains after this operation then the cause of the failure has not be rectified.

The “Err df” column is a BCD value corresponding to different error codes, each of the 16 ‘bits’ represents a different error. If the error cannot be cleared you should send this error code to TM Robotics for further assistance.

Sometimes the “MULTI” column can reach extremely high values – this should normally be between +/- 50 turns. If this value is very high then some communication error has occurred and a ‘ZERO P’ procedure has to be performed to reset the multi-turn count.

Once the error has been removed and the error messages cleared you will have to restore the coordinate system for the Robot. This is set in Japan so that the arm is in a straight line when at its Zero position. There are two methods for restoring the Zero position to the factory settings.

The first method uses the HOME position values and can only be used if just the batteries have failed and no mechanical parts have been replaced (i.e. Servo Motor, Harmonic Drive, timing belts or Z shaft).

The second method is the ZERO P procedure and can be used if mechanical parts have been replaced.

Both methods are quite similar but the ZERO P is slightly more accurate.

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Restoring HOME Position Data

If the home position data has been destroyed due to battery failure then the following procedures can be used to restore it.

(1) Descriptions of HOME function

This function is useful for restoring the original home position data by memorized fixed points within the Robot work area. Four fixed points can be used, two are factory set locations and two are user settable.

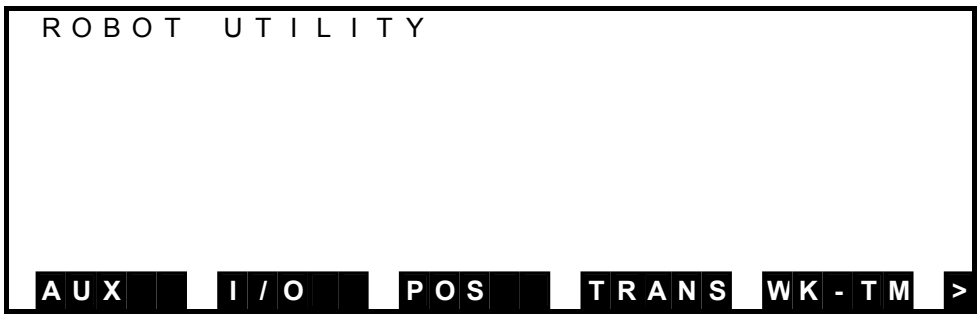
The set positions are assigned to HOME1 ~ 4.

HOME3 and HOME4 are the factory set points and use the plus (+) side mechanical stop positions of axes 1 ~ 3 and the minus (–) side mechanical stopper positions of axes 1 ~ 3 respectively. The axis 4 (rotation) is set at the 0° position according to the match-mark on the Robot shaft.

HOME1 and HOME2 are the user specified positions. These positions should be set to a memorable place within your machines working area before the machine is shipped. i.e. HOME1 and HOME2 can only be used to restore the coordinate system if they have been set prior to battery failure.

HOME position restoration

1. With servo power turned off press the UTILITY key.



2. Press the NEXT key.

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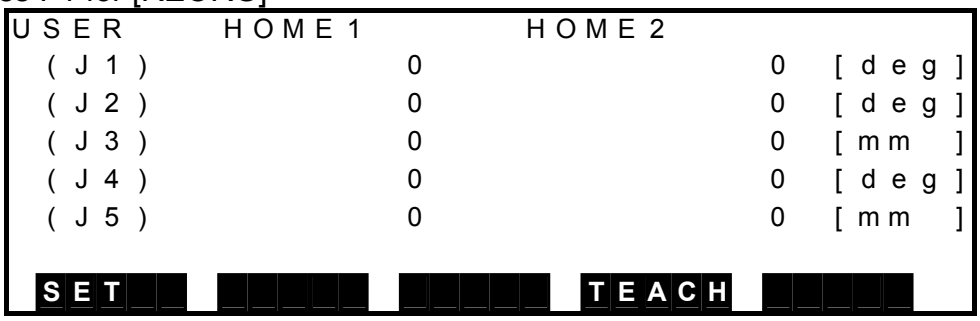
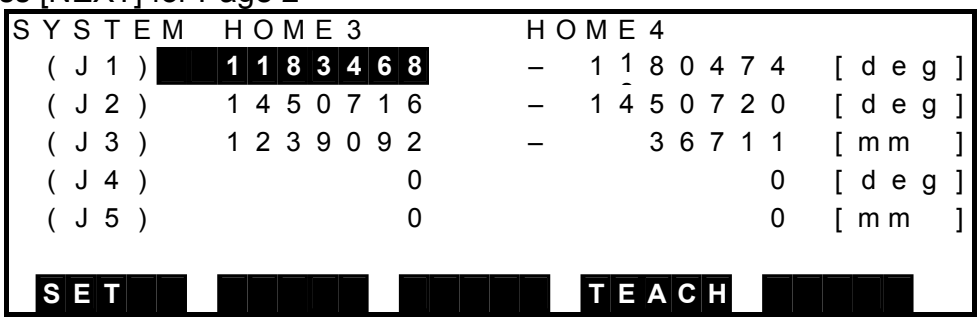
3. Press F1 for [REORG]



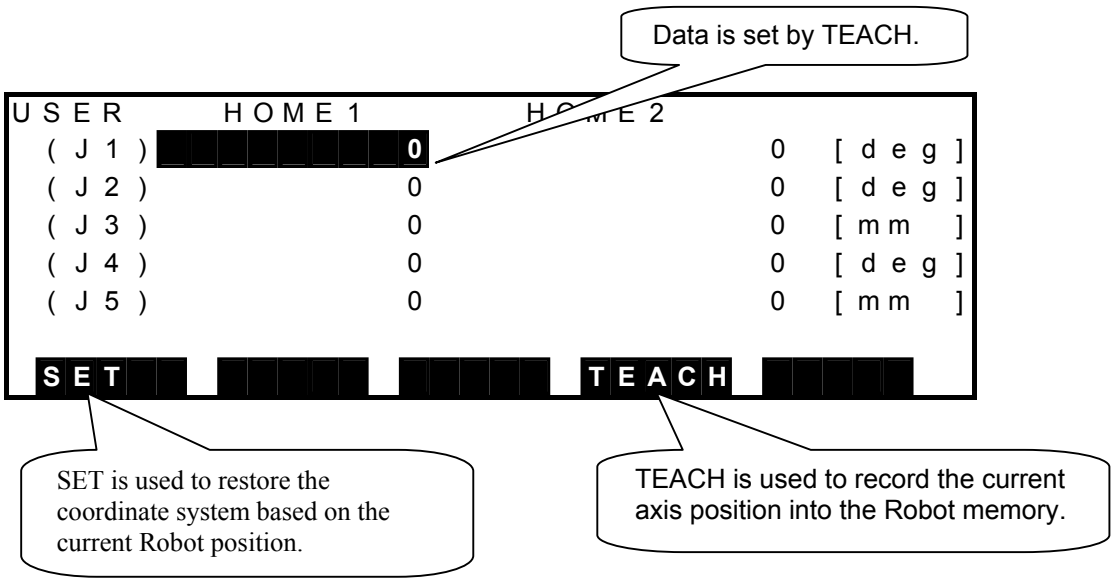
Press [NEXT] for Page 2



Operating procedures

How to TEACH the data for HOME1 (or HOME2):

[1] Move the robot to a desired position that will not change within the machine.



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[2] Use this screen to memorize the Robot position for each axis by moving the cursor from J1 to J4 then pressing the F4 [TEACH] key followed by [EXE].

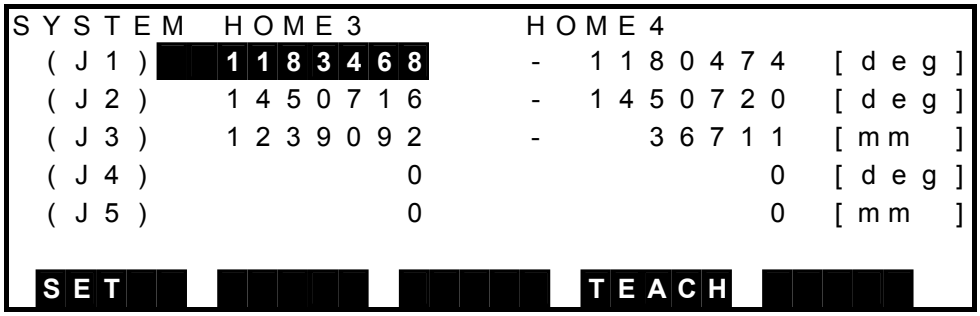
How to restore (SET) the coordinate system using HOME1 (or HOME2):

[1] Move the robot to the position used for HOME1 or HOME2.
[2] Open the REORG screen in UTILITY
[3] Press F1 for [SET] key and then [EXE] to restore coordinate system.
[4] Repeat for J1, J2, J3 and J4

How to restore (SET) the coordinate system using HOME3 (or HOME4):

The plus (+) side mechanical stopper positions of axes 1 ~ 3 are factory-set in HOME3, and the minus (–) side mechanical stopper positions of axes 1 ~ 3 are factory-set in HOME4. The axis 4 is set at the 0° position according to the match-mark.

[1] Open the REORG screen in UTILITY
[2] Press the NEXT key to display Page 2.



[3] Move axis 1 of the robot to the plus (+) side mechanical stopper by hand.
[4] Move the cursor to (J1) of HOME3, then press the [SET] key.
[5] Move axis 2 of the robot to the plus (+) side mechanical stopper by hand.
[6] Move the cursor to (J2) of HOME3, then press the [SET] key.
[7] Press the [ESC] key to escape from the REORG screen once.

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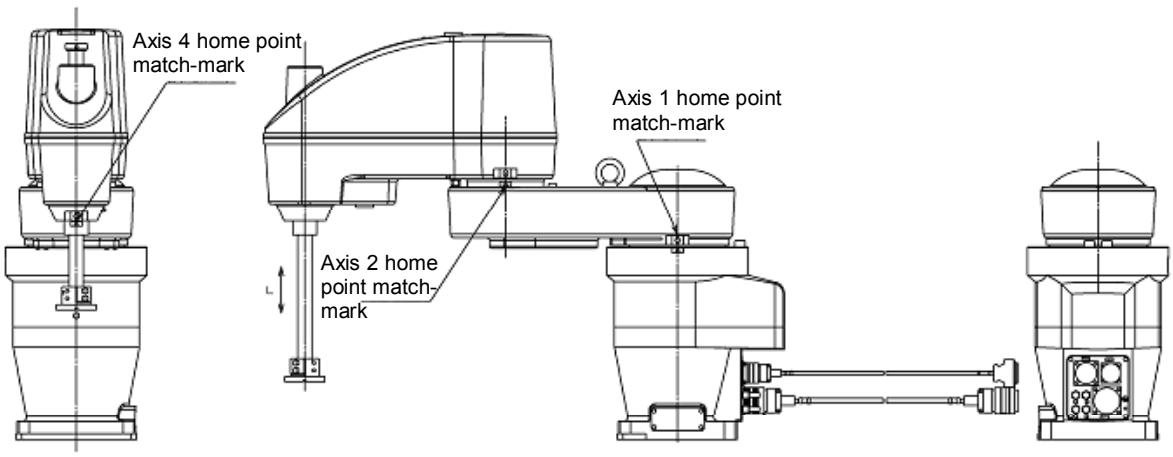
[8] Turn on the servo power, and set the axes 3 and 4 in the servo-free state.
[9] Set the axis 4 to the match-mark.
[10] Move axis 3 down to the plus (+) side mechanical stopper by hand then raise it by approximately 5mm.
[11] Turn off the servo power.
[12] Return to the HOME3 screen again.
[13] Move the cursor to (J4) of HOME3, then press the [SET] key.
[14] Move the cursor to (J3) of HOME3, then press the [SET] key.
[15] Press the [ESC] key to escape from the HOME screen.

The operation is now complete – test your program positions before starting.

'Zero-P' Procedure for resetting the zero position of each axis.

This procedure is an alternative to the REORG/HOME setting procedure. It is particularly useful if a mechanical part has been replaced.

1) Put the controller in TEACHING mode. Move all the axes to the marked zero position (you may need to use FREE mode for the vertical axis or press the red button).



2) The Zero Position for the Z axis is with the shaft nearly fully down. This has to be measured to ensure the zero position and travel of the Z axis is correctly set. Below is a list of values for each Robot when the Z axis is in the Zero Position:

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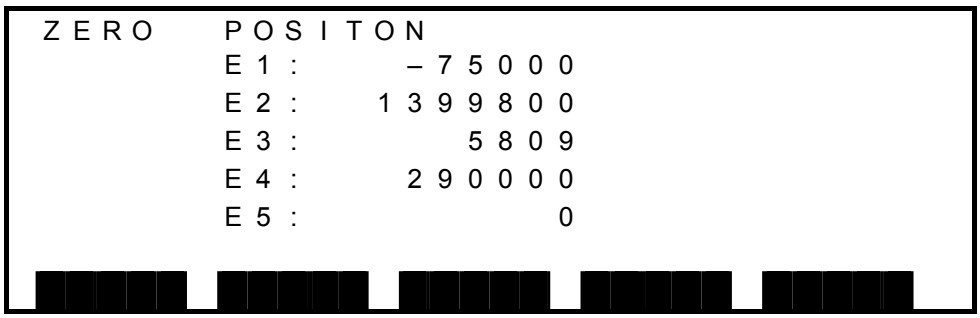
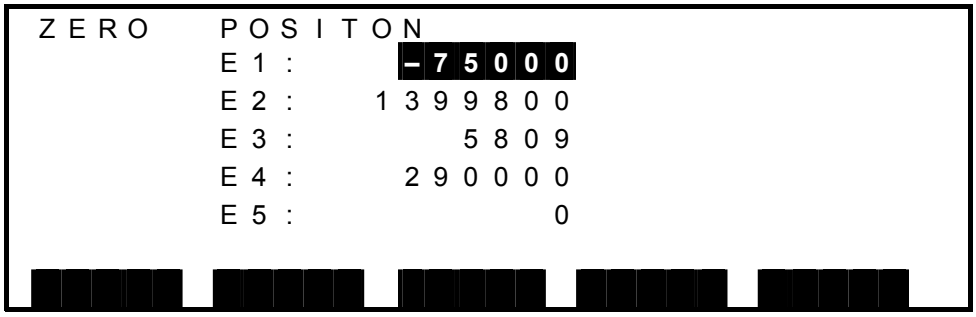
TH250/TH350 - Z axis is 18.5mm above the mounting base of the Robot
TH450/TH550 - Z axis is 20mm below the mounting base of the Robot.
TH650/TH850/TH1050 – Z axis is 100mm above the mounting base of the Robot.

3) Turn Servo Power off and press the UTILITY key then press the NEXT key twice.

4) Press the [F3] key on the teach pendant to select the ZEROP mode.



5) Press and hold the ALT key then press 0 to allow editing.



6) Press the EXE key on the teach pendant, and the value of "E1" is displayed at the lower left side. Delete the value with the BS key and enter "0" then press the EXE key. Then the E1 value becomes "0".

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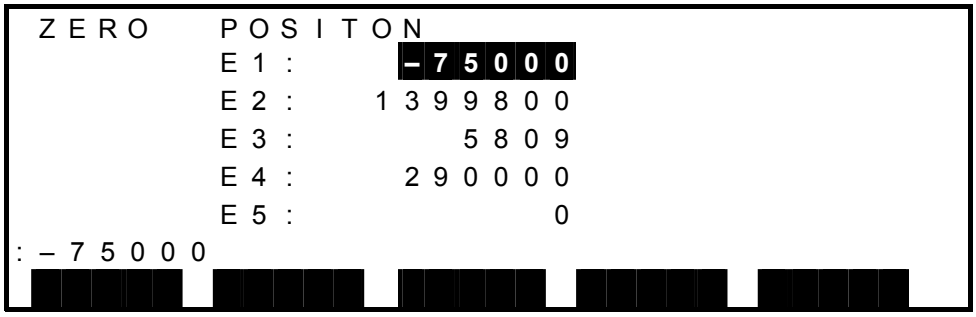
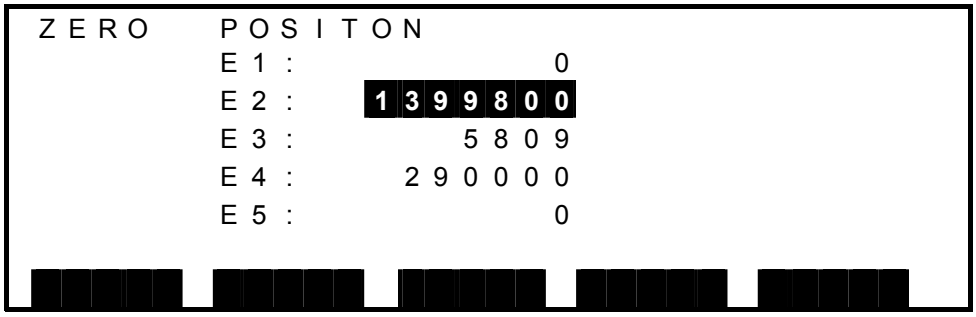


7) Repeat the procedure for E1>>E2>>E3>>E4 in order.



8) Now new Zero-P positions have been set for all axes. Once this has been done the Factory HOME3 and HOME4 setting will no longer be correct and any taught HOME1 and HOME2 settings will also be incorrect.

9) Press ESC to complete the procedure.

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Checking the Zero Positions

10)

You can use the Teach Pendant to ensure that the Zero-P positions have been taught correctly. Press UTILITY and POS – this will display the current positions of each joint axis. With the Robots arm straight in front the X and Y values should be zero.

The match marks are only an approximate visual check. You can ensure the zero position is symmetrical by pushing each axis to its mechanical stop and checking the POS value in both directions, you should also get the 'soft limit' alarm before reaching the mechanical stop. If the positive and negative values are different then the arm is not square – this can lead to problems with the coordinate system of the Robot.
Use these values to put the axis in the correct zero position and repeat the Zero-P operation again.

The Z axis can be checked in a similar method. Moving the Z axis fully down you should get the '+ soft limit' alarm before reaching the mechanical stop. Moving the Z axis fully up you should get the '- soft limit' alarm before reaching the mechanical stop.

It is very difficult to test the zero position of the C axis as there is no mechanical stop. The position should be checked against some taught position and it is recommended any changes be performed by rotation the gripper mounting plate on the shaft rather than re-teaching the Zero P position.

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