

# Sands Technology Robotics - help sheet 2

## Instructions for Mk3, Mk4 and Mk5 controllers and ROBOFORTH II v5,6,7,8,9,10

Rev dec 2001, jan 2005

For a Cartesian calibration nest for R12/R17 see help sheet 13

### USING A NEST

A nest is a known location in the work space to which all the other locations are related. In theory all the locations are related to the calibrate position i.e. the counts in the array LIMITS. However if the robot is serviced (or even replaced with another robot having a different "signature") or in case of severe "trauma" (serious collision) the calibrate position may alter. Suppose, for example, the waist sensor were moved. All the learned positions would move also. Therefore it is necessary to drive the robot to a known location, count back to the calibrate position and over-write the values in LIMITS to these new counts.

The nest should, ideally, be a separate location to any of the positions which have been learned. For example make and mount a dummy fixture that the robot's end effector can fit onto/into with some accuracy. Teach the robot there. Type WHERE and note the (motor count) positions. Suppose this resulted in (using R17 as example):

WAIST	SHOULDER	ELBOW	L-HAND	WRIST	OBJECT
1000	2000	3000	4000	5000	
1280	2560	3480	5120	6402	
1001	2002	2999	4000	5001	

Then enter:

```
CREATE NEST 1000 , 2000 , 3000 , 4000 , 5000 , 0 , 0 , 0 ,
```

The values are entered value space comma space value etc. There should be 8 values in all so make the last three (or more) values zero.

Make sure this line goes into your text file for reloading.

**Later** you can correct errors with this procedure:

1. Move to the NEST
2. Adjust the position of the robot to fit exactly using TEACH
3. enter NEST ASSUME
4. turn off encoders with ENCOFF
5. TEACH robot clear of NEST

Use of CALIBRATE would restore previous positioning so you can change future calibration as follows:

6. enter CHECK - this seeks out the sensors in the same way as CALIBRATE but does not correct errors.

7. In Mk3 and 4 controllers un-protect memory

8. enter SETLIMITS

9. In Mk3 and 4 controllers protect memory

You have now changed LIMITS to new values to which all your learned positions are related.

10. Save the new calibration figures with file, save binary, save as name.RAM

11. In Mk5 controllers enter PSAVE

## USING A CRITICAL ROUTE POSITION AS A NEST

It is often preferable to use one of the programmed positions as a nest instead of creating a new one, for example a pick or place position which is really critical and **must** be right.

Suppose you have a route PININ which is used to insert a pin into a feature in a mold.

Let's say there are 4 positions.

1 is near the hole.

2 is just adjacent to the hole on the center-line.

3 is entering the hole

4 is fully inserted, ready to open gripper.

While 2 and 3 are the most critical they are closely related to 4.

If the robot is disturbed in any way you can reset the system to this position 4 as follows:

1. Use teach pad or existing route or procedure to get to the start of PININ.
2. PININ SLOW RUN ( assuming slow sets low speed value )
3. Adjust the position of the robot to fit exactly using TEACH, usually using gripper.  
As you grip and ungrasp there should be no discernible movement of the robot
4. enter 4 LINE ASSUME
5. turn off encoders with ENCOFF
6. 3 GOTO 2 GOTO 1 GOTO
7. Use existing routes or procedures to get clear and back to HOME. Always go at a moderate speed and avoid collisions. If you do bump into anything it is wise to start the procedure again.
8. enter CHECK - this seeks out the sensors in the same way as CALIBRATE but does not correct errors.
9. In Mk3 and 4 controllers un-protect memory.
10. enter SETLIMITS
11. In Mk3 and 4 controllers re-protect memory
12. Save the new calibration figures with file, save binary, save as name.RAM
13. In Mk5 controllers enter PSAVE