

## Calibration programs

### EV3:

Compass calibration programs for EV3 and NXT are included in the sample programs at the link below:

[http://www.mindsensors.com/index.php?controller=attachment&id\\_attachment=146](http://www.mindsensors.com/index.php?controller=attachment&id_attachment=146)

### NXC:

Ensure latest firmware on your NXT, and install following programs on your NXT:

Compass Calibration:	IMU-x-cmps-calib
Accelerometer Calibration:	IMU-x-accl-calib
Gyro Calibration	IMU-x-gyro-calib
Reset Calibrations	IMU-resetCalib

You can download these programs from following url:  
(The programs are available as source as well as pre-compiled executables, download what suits you best):

[http://www.mindsensors.com/index.php?controller=attachment&id\\_attachment=148](http://www.mindsensors.com/index.php?controller=attachment&id_attachment=148)

## Calibration Order:

Generally you do not need to calibrate Accelerometer and Gyro, however you should calibrate Compass for your environment.

If you need to calibrate all the sensors, calibrate in following order:

1. Accelerometer,
2. Gyro,
3. Compass.

Upon completion of each of these programs, disconnect the device from NXT and reconnect.



### NOTE

Reset calibration program will remove calibration data of all the sensors, and you should calibrate all the sensors in the order mentioned above.

## Calibrating Accelerometer:

Start the program on your NXT and follow on-screen instructions. While calibrating, you should hold the device steady with respective axis pointing up or down vertically.

Ensure that:

For axes X and Y, the device is exactly vertical. The arrow marks on the device are self-explanatory.

For axis Z, the device is exactly horizontal.

For the Z axis to be pointing up, the printed surface of your device should be facing down.

For the Z axis to be pointing down, the printed surface of your device should be facing up.



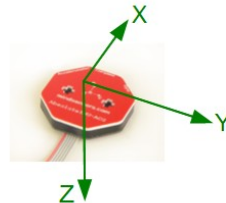
### NOTE

In particular when the Z axis is pointing down, keep the Gray cable coming out of the bottom edge off the flat surface, as just keeping the device on a flat surface will prevent it from being horizontal due to the Gray cable.

## Calibrating Compass:

Start the program on your NXT and follow on-screen instructions.

You should rotate the device along all 3 axes vertically and horizontally (see adjacent picture for axes).



1. Point the X axis vertical, and rotate the device along that axis in clockwise as well as anti-clockwise direction, restoring to original position before you change the axis.
2. Repeat for Y axis, begin with pointing Y axis vertical.
3. Repeat for Z axis. (Note: to point the Z axis vertical, the printed surface of the device should be facing down).
4. Point X axis horizontal and repeat the rotations.
5. Point Y axis horizontal and repeat the rotations.
6. Point Z axis horizontal and repeat the rotations.

After completion of these rotations, press the orange button on your NXT to commit the calibration data in permanent memory of the device.

## Calibrating Gyro:

Start the program on your NXT and follow on-screen instructions.

You should keep the device absolutely stationary during calibration.

### **Verifying after Calibration:**

To verify upon calibration, ensure that the accelerometer values are be reasonably close the gravitational acceleration (within  $\pm 100$  of 1000 milli-g).

To check, keep the sensor on flat horizontal surface, (standard table surface is fine) with Red (Yellow for AC model) face up, i.e. your Z axis is pointing down to center of earth.

In this case, your Z acceleration value should be about 1000 milli-g, now flip the sensor over and measure the Z reading (value should be about -1000)

Do the same for X and Y, (for X and Y there are arrows marked on the sensor).

To check compass, ensure that sensor is away from any stray magnetic field (such as metal legs of tables, magnets in motors, etc).

Then orient sensor to your North (point the word 'Compass' on your sensor towards North), now see that you get compass reading close to 0 (or 360).