

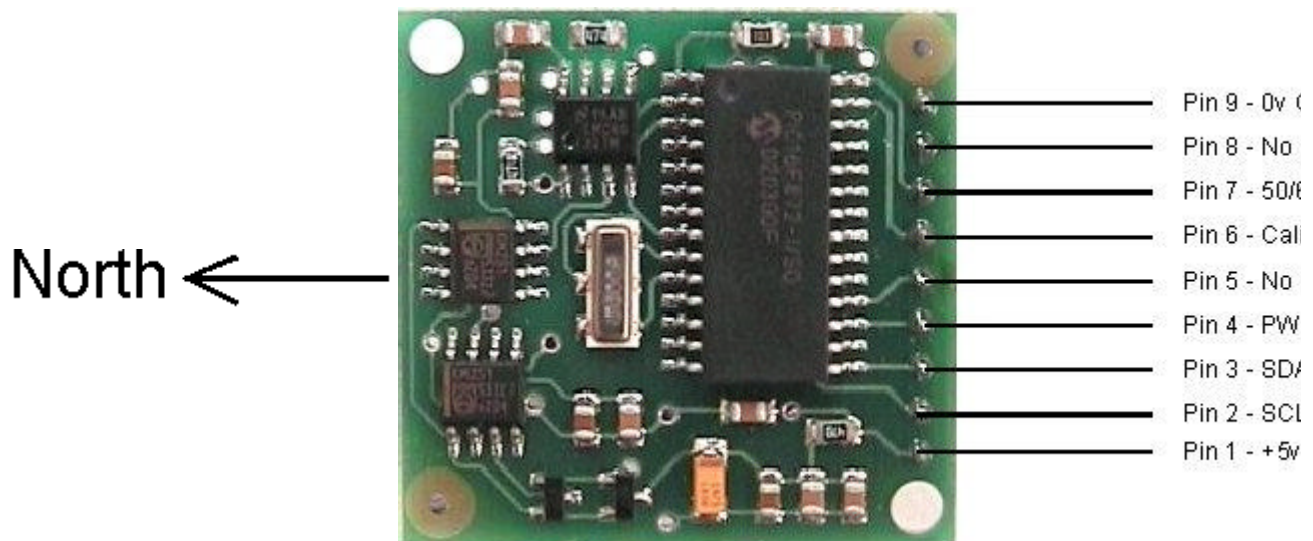
## Calibrating the CMPS01, CMPS03 Robot Compass Modules

CMPS03 - Calibration procedure is the same as CMPS01 Rev 7.

CMPS01 - As from Software revision 7, the calibration procedure has changed. Both methods are detailed below

Calibration only needs to be done once - the calibration data is stored in EEPROM on the PIC16F872 chip. You do not need to re-calibrate every time the module is powered up. The module has already been calibrated in our workshop for our [inclination](#), which is 67 degrees. If your location is close to this, you may like to try the compass without re-calibrating at all.

Compass module orientation to produce 0 degrees reading.



### Register Function

- 0 Software Revision Number
- 1 Compass Bearing as a byte, i.e. 0-255 for a full circle
- 2,3 Compass Bearing as a word, i.e. 0-3599 for a full circle, representing 0-359.9 degrees.
- 4,5 Internal Test - Sensor1 difference signal - 16 bit signed word
- 6,7 Internal Test - Sensor2 difference signal - 16 bit signed word
- 8,9 Internal Test - Calibration value 1 - 16 bit signed word
- 10,11 Internal Test - Calibration value 2 - 16 bit signed word
- 12 Unused - Read as Zero
- 13 Unused - Read as Zero
- 14 Calibration Done Flag - Zero in calibrate mode when un-calibrated, 255 otherwise - unused in Rev 7 software & CMPS03
- 15 Calibrate Command - Write 255 to enter calibrate mode, write zero to exit. See text.

Register 0 is the Software revision number (originally 3, now 7 with new calibration routines and 8 for the CMPS03).

Registers 14 & 15 are used to calibrate the compass. The procedure changed with Rev 7 software.

Full calibration information is here

**IMPORTANT** - The compass module must be kept flat (horizontal and parallel to the earth's surface) with the components on top and for the CMPS01 the sensors underneath. Keep the module away from metallic - especially magnetic - objects.

**Calibrating Rev 3 Software** - Recognized by lack of revision number on CPU chip, or read revision number from register 0

#### **I2C Method**

To calibrate the compass using the I2C bus, you only have to write 255 to register 15 and rotate the module very slowly through 360°. Writing zero to register 15 will store the calibration values in the processor's internal EEPROM. Readings are taken by the processor at four compass points and these values are used to generate the calibration values. Register 14 reads 255 during normal operation. It reads zero when Calibrate mode is entered and 255 again when the four compass points have been measured. Register 14 will therefore indicate that the four points have been acquired and that zero can be written to register 15 to store the calibration and return to normal operation. It is necessary to rotate the compass very slowly during calibration to avoid missing the required compass points and to keep it horizontal to ensure the calibration figures are accurate.

#### **Pin Method**

Pins 5,6 are used to calibrate the compass. The calibrate input (pin 6) has an on-board pull-up resistor and can be left unconnected after calibration. To calibrate the compass you only have to take the calibrate pin low and rotate the module very slowly through 360°. Taking the calibrate pin high will store the calibration values in the processor's internal EEPROM. Readings are taken by the processor at four compass points and these values are used to generate the calibration values. The CalDone output pin (pin 5) is high during normal operation. It goes low when the Calibrate pin is pulled low and high again when the four compass points have been measured. The CalDone pin will therefore indicate that the four points have been acquired and that the Calibrate pin can be raised high again. It is necessary to rotate the compass slowly during calibration to avoid missing the required compass points and to keep it horizontal to ensure the calibration figures are accurate.

**Calibrating Rev 7 Software** - Recognized by revision number label on CMPS01 CPU chip, or read revision number from register 0.

Also applies to **Calibrating the CMPS03 Module**.

Note that pin 5 (CalDone) and register 14 (Calibration Done Flag) are not used with Rev 7 software or the CMPS03. Pin 5 should be left unconnected and register 14 ignored. When calibrating the compass, you must know **exactly** which direction is North, East, South and West. Don't guess at it. Get a magnetic needle compass and check it.

#### **I2C Method**

To calibrate using the I2C bus, you only have to write 255 (0xff) to register 15 for each of the four major compass points North, East, South and West. The 255 is cleared internally automatically after each point is calibrated. The compass points can be set in any order, but all four points must be calibrated. For example

1. Set the compass module flat, pointing North. Write 255 to register 15
2. Set the compass module flat, pointing East. Write 255 to register 15
3. Set the compass module flat, pointing South. Write 255 to register 15
4. Set the compass module flat, pointing West. Write 255 to register 15

That's it.

#### **Pin Method**

Pin 6 is used to calibrate the compass. The calibrate input (pin 6) has an on-board pull-up resistor and can be left unconnected after calibration. To calibrate the compass you only have to take the calibrate pin low and then high again for each of the four major compass points North, East, South and West. A simple push switch wired from pin6 to 0v (Ground) is OK for this. The compass points can be set in any order, but all four points must be calibrated. For example

1. Set the compass module flat, pointing North. Press and release the switch

2. Set the compass module flat, pointing East. Press and release the switch
  3. Set the compass module flat, pointing South. Press and release the switch
  4. Set the compass module flat, pointing West. Press and release the switch
- That's it.