

What is CMPS-Nx

CMPS-Nx is a digital compass sensor designed for NXT. This can be used to detect deviation from magnetic north pole (heading). You can use this on your robot to track a certain heading or follow paths with reference to magnetic north.

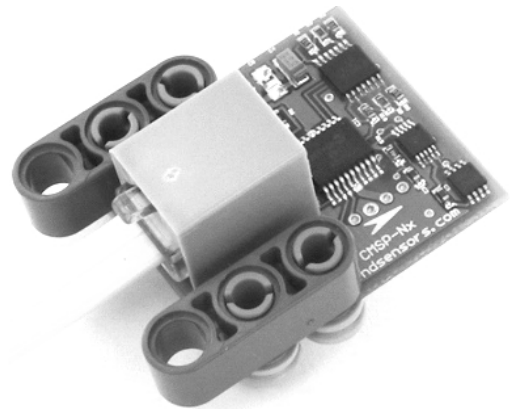
Following sections provide operation commands and output format.

CMPS-Nx Feature List

- Uses NXT compatible I2C protocol for communications.
- Detects magnetic heading using multiple reading mode, byte (1.4 degree resolution) and integer (close to 0.1 degree resolution)
- Supports dual sampling frequency - European and North American.
- Capable of in-situ calibration to adjust to the local magnetic fields.
- Supports **Auto Detecting Parallel Architecture (ADPA)** for sensors. This means that CMPS-Nx can coexist with LEGO or third party digital sensors on a single NXT port. This enables user to employ several sensors on the same port without the need of external sensor multiplexer, reducing the overall size and cost.

Connections

Can be connected to any four ports of NXT by using standard Cable from NXT set.



Calibration

CMPS-Nx is capable of calibrating in-situ to be able to supply reliable high resolution heading information. To calibrate CMPS-Nx, issue **Calibration** command and turn around at least twice while taking 20 second or more per turn. Issuing calibration **Done** command ends the calibration mode and resumes normal operation.

All the calibration constants are stored in internal nonvolatile memory. i.e. the data is retained while it is powered off.

I2C Operations

Pins used: SDA(1), GND(2), SCL(3), +5V(4)

Following table lists the heading calculations, calibration and setup commands:

Commands		Action
ASCII	Hex	
A	0x41 0x02	Set AutoTrig mode On (default)
S	0x53 0x01	Set AutoTrig mode Off
B	0x42	Compassing Mode: Result in Byte (0-360 mapped to 0-255) (default for Lego Sonar compatible mode)
I	0x49	Compassing Mode: Result in Integer (0-360 mapped to 0-3600) (default for advanced mode)
E	0x45	Compassing Mode: Set Sampling frequency to 50Hz (Europe standard)
U	0x55	Compassing Mode: Set Sampling frequency to 60Hz (USA standard)
N	0x4E	Set ADPA mode On
O	0x4F	Set ADPA mode Off (default)
C	0x43	Begin Calibration mode
D	0x44	Calibration Done
L	0x4C	Load user Calibration Value

I2C Registers:

The CMPS-Nx appears as a set of 12 registers.

Register	Read	Write
0x00-0x07	Software version - <i>V2.00</i>	-
0x08-0x0f	Vendor Id - <i>mndsnsrs</i>	-
0x10-0x17	Device ID - <i>CMPS</i>	-
0x40	-	-
0x41	-	Command
0x42	lsb heading data	-
0x43	msb heading data	-
0x44	X_offset low byte	X_offset low byte
0x45	X_offset high byte	X_offset high byte

0x46	Y_offset low byte	Y_offset low byte
0x47	Y_offset high byte	Y_offset high byte
0x48	X range low byte	X range low byte
0x49	X range high byte	X range high byte
0x4A	Y range low byte	Y range low byte
0x4B	Y range high byte	Y range high byte
0x4C	X raw low byte	-
0x4D	X raw high byte	-
0x4E	Y raw low byte	-
0x4F	Y raw high byte	-

Heading registers (register 1 through 2) contain the reading based on the command used in little Endian format.

Mode	Description
B	Single byte in register 1
I	R1, R2 contain 16 bit integer
N	This mode allows multiple sensors to be connected on the same bus. This mode is not available for default address of 0x02

Current Consumption

Average measured current profile is as follows:

Operation	Current Consumption	Duration
Auto Trig ON	12mA	Continuous

I2C Bus address

Factory Default Address: 0x02

Changing the I2C Bus Address:

The I2C bus address of CMPS-Nx can be changed. To set an address different from default address, send sequence of following commands on the command register:

0xA0, 0xAA, 0xA5, <new I2C address>

Note: Send these commands with no break/read operation in between. This new address is effective immediately. Please note down your address carefully for future reference.

You can download address change and scan functions from website www.mindsensors.com written in RobotC.

Programming Techniques for reading in I2C mode

NXT-G Method:

You can use CMPS-Nx with Lego Ultrasonic sensor block. In this mode you can use the sensor with limited capabilities. To enable advanced capability please use custom NXT block.

RobotC Method:

You can use example program in C and robotC compiler to use CMPS-Nx on your NXT robot.

NBC Method:

You can use example program in NBC and NBC compiler to use CMPS-Nx on your NXT robot.

Mounting CMPS-Nx using Lego Technic Parts

You can use standard Lego pins and bushings to mount CMPS-Nx on your Lego robot

