What is ACCL-Nx-v3

ACCL-Nx-v3 is a digital acceleration sensor designed for Lego mindstorms NXT. This can be used to measure static and dynamic acceleration in different axis. You can use this on your robot as tilt sensor or to track the velocity profile.
Following sections provide operation commands and output format.

ACCL-Nx-v3 Feature List

- Uses NXT compatible I2C protocol for communications.
- Detects acceleration as small as 10mg (depending on sensitivity and two axis or three axis versions)
- Various options available to select from like 2 axis or 3 axis and available in different sensitivity.
- Supports **A**uto **D**etecting **P**arallel **A**rchitecture (ADPA) for sensors. This means that ACCL-Nx-v3 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

All ACCL-Nx-v3 are pre calibrated to provide reliable high-resolution acceleration information. However if required ACCL-Nx-v3 can be in-situ calibrated in expert mode. To calibrate ACCL-Nx-v3, issue Calibration command (***X*** or ***Y*** or ***Z*** for related axis – note the upper case of the command) 72 times for a revolution (i.e. one command for every 5 degree interval) while revolving the sensor along that axis in vertical plane. The revolution should take about 1 minute to finish. Complete the process with command (***x*** or ***y*** or ***z*** for related axis – note the lower case of the command) to resumes normal operation. After calibration, power off the sensor (by powering off the NXT) before using.

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

Factory calibration values can be recalled at any time by issuing appropriate command.

I2C Operations

Tilt registers provide Tilt from the horizontal plane with 128 set to zero (When sensor is leveled in horizontal plane tilt reading are 128). Acceleration register is signed integer and reads the acceleration value in m**g**, where **g** is acceleration due to gravity =9.81m/S^2 .

Following table lists the Tilt and Acceleration calculations, calibration and setup commands:

Commands		Action
ASCII	Hex	
X	0x58	Acquire **X point** calibration
x	0x78	Acquire **X point** calibration and end calibration
Y	0x59	Acquire **Y point** calibration
y	0x79	Acquire **Y** point calibration and end calibration
Z	0x5A	Acquire **Z** point calibration
z	0x7A	Acquire **Z** point calibration and end calibration
R	0x52	Reset to factory set calibration
N	0x4E	Set ADPA mode On
O	0x4F	Set ADPA mode Off (default)

I2C Registers:

The ACCL-Nx-v3 appears as a set of 22 registers.

Register	Read	Write
0x00-0x07	Software version – *V2.10*	-
0x08-0x0f	Vendor Id - *mndsnsrs*	-
0x10-0x17	Device ID – *ACCL-NX*	-
0x19	Current configured Sensitivity	
0x41	-	Command for Sensitivity: 2.5G - '1' (ascii) 3.3G – '2' 6.7G – '3' 10.0G - '4' After issuing

		command, allow 50 milliseconds for the sensor to reconfigure itself.
0x42	X Tilt data	-
0x43	Y Tilt data	-
0x44	Z Tilt data	-
0x45	X accel data LSB	-
0x46	X accel data MSB	-
0x47	Y accel data LSB	-
0x48	Y accel data MSB	-
0x49	Z accel data MSB	-
0x4A	Z accel data MSB	-
0x4B	X_offset LSB	X_offset LSB
0x4C	X_offset MSB	X_offset MSB
0x4D	X_range LSB	X_range LSB
0x4E	X_range MSB	X_range MSB
0x4F	Y_offset LSB	Y_offset LSB
0x50	Y_offset MSB	Y_offset MSB
0x51	Y_range LSB	Y_range LSB
0x52	Y_range MSB	Y_range MSB
0x53	Z_offset LSB	Z_offset LSB
0x54	Z_offset MSB	Z_offset MSB
0x55	Z_range LSB	Z_range LSB
0x56	Z_range MSB	Z_range MSB

Current Consumption

Average measured current profile is as follows:

Current Consumption	Duration
3.5mA	Continuous

I2C Bus address

Factory Default Address: 0x02

Changing the I2C Bus Address:
The I2C bus address of ACCL-Nx-v3 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:

You can use the ACCL-Nx-v3 with Lego Ultrasonic sensor block. In this mode you can use the sensor with limited capabilities (only X Tilt available). To enable advanced capability please use custom NXT block.

RobotC:

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

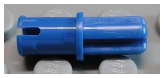
NXC:

You can use example program in NXC and NXC compiler (or NBC compiler) to use ACCL-Nx on your NXT robot. (You can also use Bricxcc IDE.)

Robolab:

You can use example program and drivers Vi in Robolab 2.9 compiler to use ACCL-Nx on your NXT robot.

Mounting ACCL-Nx-v3 using Lego Technic Parts



The holes on ACCL-Nx-v3 enclosure are designed for a tight fit of Technic pins (or axles) with '✚' cross section. The holes however are not designed for repeated insertions/removals of these pins.

To mount NXTCam v2 on your contraption we suggest that you use two dark gray 'Technic Axle 3 with Stud' as shown. Insert axles from the top of the ACCL-Nx-v3 and secure with a bushing on the back or mount it on your contraption directly.