

What is NXTHID

NXTHID is a NXT based Human Interface Device. Using this device you can send HID input events (such as keyboard key presses) to host computer. These events can be received by any program that can run on your PC (such as Notepad, MS-Excel, etc.).

Connections

Connect it to your PC using a standard USB cable. NXTHID can be connected to any of the four sensor ports of NXT by using standard Cables from NXT set.



NOTE: First connect NXTHID to PC on USB port, and wait a few seconds to allow the device to enumerate on your PC and then connect it to NXT.

Programming Techniques for reading in I2C mode

NXT-G:

Download the NXT-G block available in the NXT-G Blocks Repository at Mindsensor's website, at following location:

http://www.mindsensors.com/index.php?module=documents&JAS_DocumentManager_op=viewDocument&JAS_Document_id=121



Also download sample program from following location, and modify to suit your needs.



NOTE: While using with NXT-G, ensure to use firmware version 1.05.

RobotC:

Download library file and sample program from following location, and modify the sample program to suit your needs. Or include the library file in your own program by include directive as:

```
#include "NXTHID-lib.c"
```

NXC:

Download the sample programs and library file available at following location, and include the library file it in your program by #include directive.

http://www.mindsensors.com/index.php?module=documents&JAS_DocumentManager_op=viewDocument&JAS_Document_id=118

Read the included **NXTHID-README-nxc-api.html** for explanation of supported APIs.

I2C Operations

NXTHID is operated by loading the registers with appropriate values (described below), and then issuing a Transmit command to send the data to your host.

The data registers are reset after executing command. If you need to send the same data again, you need to re-write the data in the registers.

Supported Command(s)

Commands		Action
ASCII	Hex	
T	0x54	Transmit data to host computer
A	0x41	Setup device for Ascii data mode.
D	0x44	Setup device for Direct data mode.

I2C Registers:

The NXTHID appears as a set of registers as follows:

Register	Read	Write	Modes used in.
0x00-0x07	Software version - <i>V1.01</i>	-	
0x08-0x0f	Vendor Id - <i>mndsnsrs</i>	-	
0x10-0x17	Device ID - NXTHID	-	
0x41	-	Command	
0x42	-	Modifier (see Direct Data Mode below)	D
0x43	-	Keyboard data	D, A

Ascii String Mode:

In this mode you can send printable text to your host.

At a time one printable character can be sent. Non printable characters are not supported in this mode (e.g. CRLF, Tab, control characters, etc).

Direct Data Mode:

In this mode you can send non-printable keys to your host.

At a time one key (with modifier) can be sent. You could use this mode to send printable characters as well. Use the key codes described in Appendix A along with appropriate Key modifiers.

Supported Modifiers:

None	0x00
Left Ctrl	0x01
Left Shift	0x02
Left Alt	0x04
Left GUI	0x08
Right Ctrl	0x10
Right Shift	0x20
Right Alt	0x40
Right GUI	0x80

If you need to send several modifiers, for a key, you can send combined modifier (by XOR operation - see example).

Examples:

Desired Keys to Send	Modifier and Data to use
F1	Key Modifier: None, Key: 0x3A
Ctrl+S	Key Modifier: Left Ctrl Key: 0x16
Alt-F	Key Modifier: Left Alt Key: 0x09
A	Key Modifier: Left Shift Key: 0x04
a	Key Modifier: None Key: 0x04
Ctrl+Alt+Delete	Key Modifier: Left Ctrl XOR Left Alt Key: 0x4C

Current Consumption

Average measured current profile is as follows:

Current Consumption	Situation
25mA	When USB is connected, the power is drawn from USB host. When USB is disconnected, power is drawn from NXT.

I2C Bus address

Factory Default Address: 0x04

Changing the I2C Bus Address:

The I2C bus address of this device 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 the address change and scan functions from our website at www.mindsensors.com. These functions are written in RobotC.

Alternately, you can download NXT executable programs from following location: http://www.mindsensors.com/index.php?module=documents&JAS_DocumentManager_op=viewDocument&JAS_Document_id=91

Troubleshooting NXTHID



What the lights on NXTHID mean:

Light	Meaning
Fast alternate	The device is connected and operating

blinking of LED 1 and LED 2	correctly.
LED 2 is steady ON.	Device is powered but not communicating (possibly not connected to USB).
LED 2 is fast blinking	Data is being transmitted.
LED 1 is slow blinking	Device is in Bootload mode.
Both LEDs Fast blinking	USB connection interrupted.

Upgrading NXTHID firmware:

The NXTHID is shipped with latest stable firmware, however for advanced operations or experimental purposes, if you need to upgrade the firmware. (Before you do this, you may need to get new firmware file from Mindsensors Technology team).

1. Download bootloader program and instructions from following location: http://www.mindsensors.com/index.php?module=documents&JAS_DocumentManager_op=viewDocument&JAS_Document_id=117
2. Note the location of 'Button 1' on your NXTHID device.
3. Disconnect the device from NXT as well as PC.
4. Using a bent paperclip, press the button 1 down, and while the button is held down, connect NXTHID to your PC using USB cable.
5. At this point, ensure that LED 1 is blinking slowly (about once per second).
6. Now the device is ready in Bootload mode.
7. Follow instructions provided with bootloader to upgrade the firmware.

References

<http://www.microsoft.com/whdc/archive/scancode.msp>

Additional Information

Average rate of sending Keyboard data

The Average measured speed to send keyboard data was about 17.5 milliseconds per key. The tests were conducted with a NXC program and NXT 1.05 firmware. It's possible to get different results with different firmware and programming environments.

Appendix A

Keyboard codes for Direct Data mode:

Key Name	HID Usage ID (hex value)
System Power	81
System Sleep	82
System Wake	83
No Event	00
Overrun Error	01
POST Fail	02
ErrorUndefined	03
a A	04
b B	05
c C	06
d D	07
e E	08
f F	09
g G	0A
h H	0B
i I	0C
j J	0D
k K	0E
l L	0F
m M	10
n N	11
o O	12
p P	13
q Q	14
r R	15
s S	16
t T	17
u U	18
v V	19
w W	1A
x X	1B
y Y	1C
z Z	1D
1 !	1E
2 @	1F
3 #	20
4 \$	21
5 %	22
6 ^	23
7 &	24
8 *	25
9 (26
0)	27
Return	28

Escape	29
Backspace	2A
Tab	2B
Space	2C
- _	2D
= +	2E
[{	2F
] }	30
\	31
Europe 1	32
; :	33
' "	34
` ~	35
, <	36
. >	37
/ ?	38
Caps Lock	39
F1	3A
F2	3B
F3	3C
F4	3D
F5	3E
F6	3F
F7	40
F8	41
F9	42
F10	43
F11	44
F12	45
Print Screen	46
Scroll Lock	47
Break (Ctrl-Pause)	48
Pause	48
Insert	49
Home	4A
Page Up	4B
Delete	4C
End	4D
Page Down	4E
Right Arrow	4F
Left Arrow	50
Down Arrow	51
Up Arrow	52
Num Lock	53
Keypad /	54
Keypad *	55
Keypad -	56
Keypad +	57
Keypad Enter	58
Keypad 1 End	59

Keypad 2 Down	5A
Keypad 3 PageDn	5B
Keypad 4 Left	5C
Keypad 5	5D
Keypad 6 Right	5E
Keypad 7 Home	5F
Keypad 8 Up	60
Keypad 9 PageUp	61
Keypad 0 Insert	62
Keypad . Delete	63
Europe 2	64
App	65
Keyboard Power	66
Keypad =	67
F13	68
F14	69
F15	6A
F16	6B
F17	6C
F18	6D
F19	6E
F20	6F
F21	70
F22	71
F23	72
F24	73
Keyboard Execute	74
Keyboard Help	75
Keyboard Menu	76
Keyboard Select	77
Keyboard Stop	78
Keyboard Again	79
Keyboard Undo	7A
Keyboard Cut	7B
Keyboard Copy	7C
Keyboard Paste	7D
Keyboard Find	7E
Keyboard Mute	7F
Keyboard Volume Up	80
Keyboard Volume Dn	81
Keyboard Locking Caps Lock	82
Keyboard Locking Num Lock	83
Keyboard Locking Scroll Lock	84
Keypad , (Brazilian Keypad .)	85
Keyboard Equal	86

Sign	
Keyboard Int'l 1 ろ (Ro)	87
Keyboard Intl'2 かたかな ひらがな ローマ字 (Katakana/Hiragana)	88
Keyboard Int'l 2 ¥ (Yen)	89
Keyboard Int'l 4 前候補 変換 (次候補) 全候補 (Henkan)	8A
Keyboard Int'l 5 無変換 (Muhenkan)	8B
Keyboard Int'l 6 (PC9800 Keypad ,)	8C
Keyboard Int'l 7	8D
Keyboard Int'l 8	8E
Keyboard Int'l 9	8F
Keyboard Lang 1 한/영 (Hanguel/English)	90
Keyboard Lang 2 한자 (Hanja)	91
Keyboard Lang 3 かたかな (Katakana)	92
Keyboard Lang 4 ひらがな (Hiragana)	93
Keyboard Lang 5 半角/全角 (Zenkaku/Hankaku)	94
Keyboard Lang 6	95
Keyboard Lang 7	96
Keyboard Lang 8	97
Keyboard Lang 9	98
Keyboard Alternate Erase	99
Keyboard SysReq/Attention	9A
Keyboard Cancel	9B
Keyboard Clear	9C

Keyboard Prior	9D
Keyboard Return	9E
Keyboard Separator	9F
Keyboard Out	A0
Keyboard Oper	A1
Keyboard Clear/Again	A2
Keyboard CrSel/Props	A3
Keyboard ExSel	A4
RESERVED	A5-DF
Left Control	E0
Left Shift	E1
Left Alt	E2
Left GUI	E3
Right Control	E4
Right Shift	E5
Right Alt	E6
Right GUI	E7