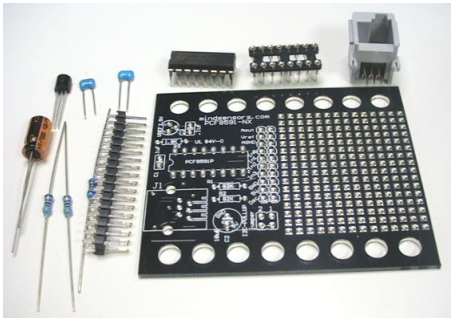
What is PCF8591-Nx

PCF8591-Nx is an analog kit to interface PCF8591 chip to NXT. It contains all the basic parts needed along with general-purpose prototyping area on the PCB. This kit can be used to design analog custom sensor or IO device with NXT. Following sections provide basic assembly instructions for this Kit.

PCF8591-Nx Connections



PCF8591-Nx can be connected to any of four sensor of NXT by using standard NXT cables.

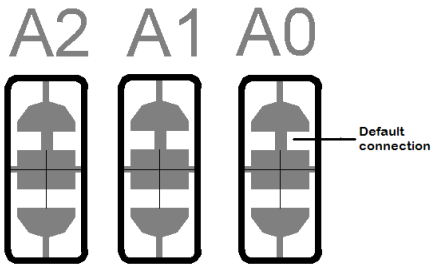
Tools you will need

To assemble these components, you will need a soldering iron, solder, pliers, and wire cutter to cut the resistor and capacitor wires to desired length.

⚠ **NOTE**

The maximum voltage that can be read or supplied by PCF8591 chip is 2.5 Volts. Do not apply more than 2.5 volts on IN-x pins.

Assembly and I2C address



Connect all the components as shown on the PCB silk screen. You can connect NXT style socket to J1 and solder them in place. Below the J1 area on the other side of the board are address change jumpers. The default I2C address with unchanged jumpers is 0x90. If you desire to change this address, you can do so by changing the PCB jumpers A0 and/or A1 and/or A2 from logic low to logic hi. Changing the jumpers will add numbers as follows to the above mentioned address, allowing you 7 different combinations for address selection. To change the jumper, carefully observe the existing connections between jumper pads, and break the existing connection and solder together other pads within that jumper.

The Jumpers 1 and 2 are designed to bypass the pull up resistors in case you are daisy chaining multiple of these kits.

For more details on address selection refer to the PCF8591 datasheets.

Shorting Jumper	Added integer to 0x90
A0	1
A1	2
A2	4

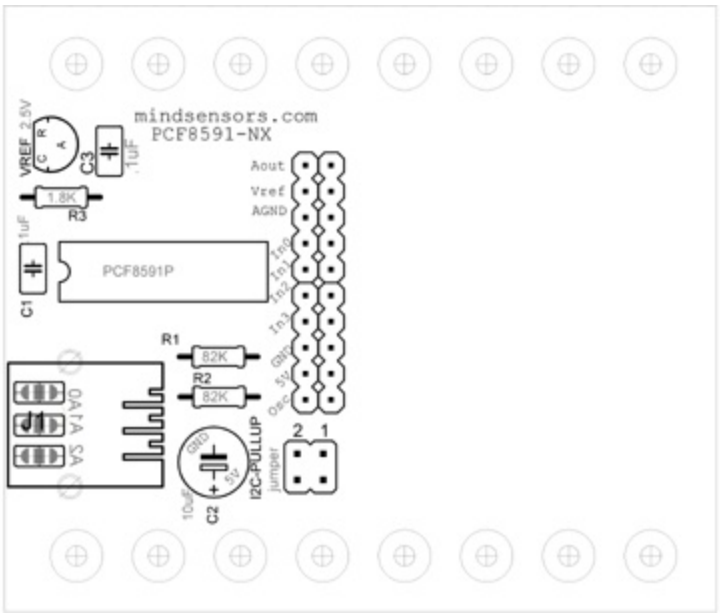


Figure 1 PCB Silk Screen

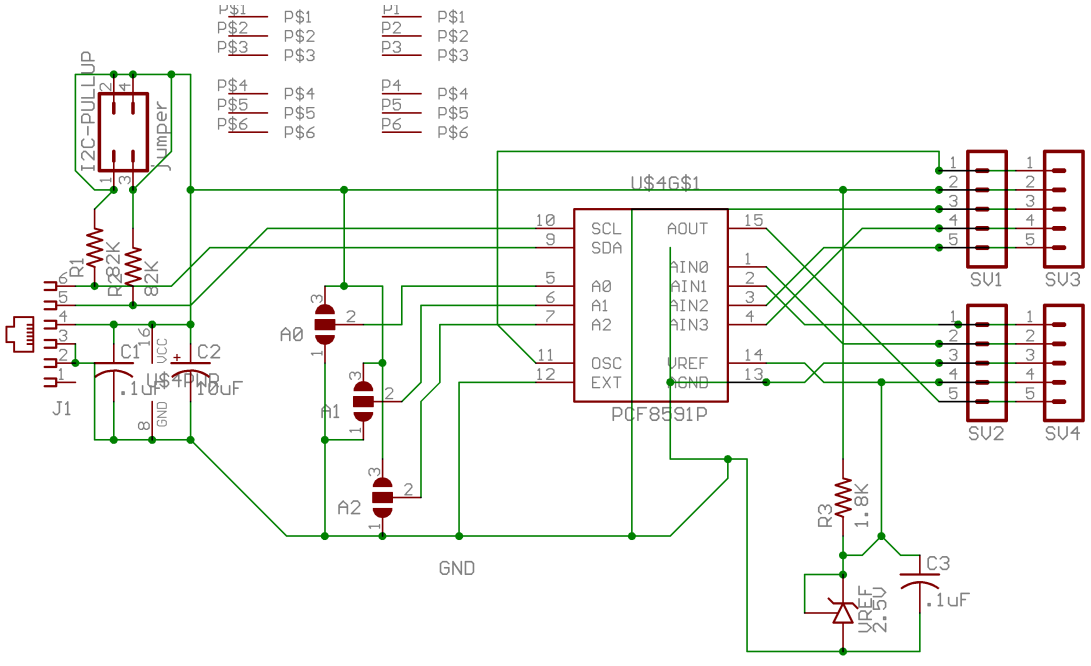
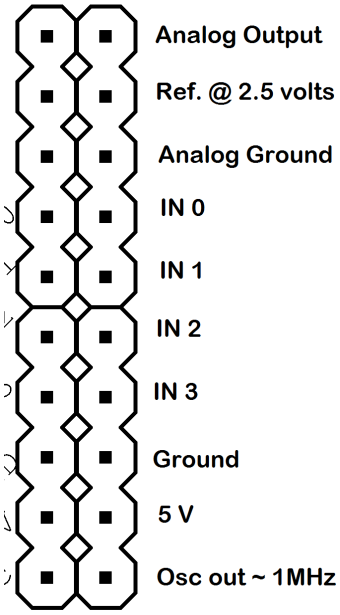


Figure 2 Schematic Diagram

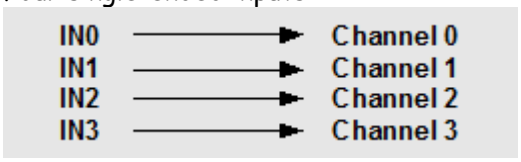
I/O Pins



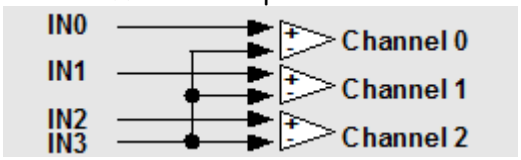
Supported Modes for Analog input

The PCF8591-Nx supports 4 modes for analog input as follows. These modes can be selected using the API while programming.

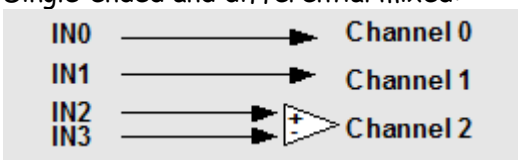
Four single-ended inputs:



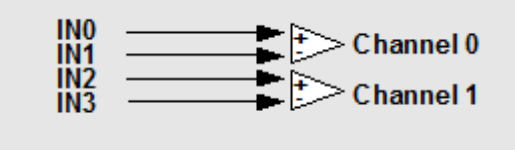
Three differential inputs:



Single-ended and differential mixed:



Two differential inputs:



Programming Techniques for reading in I2C mode

NXT-G:

You can use the PCF8591-Nx with PCF8591-NX sensor block. You can download this block from 'Download' section of mindsensors.com website. (This requires Dynamic block update patch installed on your NXT-G).

⚠ **NOTE**

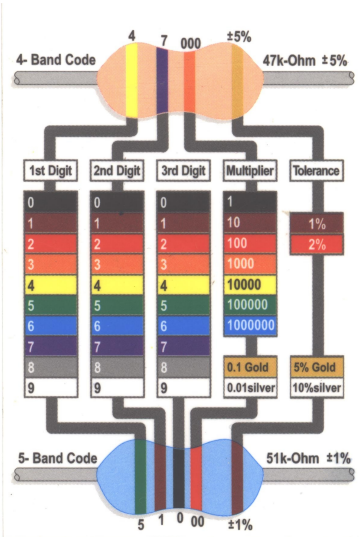
Ensure to use LEGO firmware 1.05 on NXT while using NXT-G blocks.

Frequently Asked Questions (FAQ)

How do I identify a resistor?

Each color band on a resistor is associated with a number as follows:

Color	Number
Black	0
Brown	1
Red	2
Orange	3
Yellow	4
Green	5
Blue	6
Purple	7
Gray	8
White	9

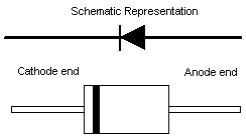


On a 4-band resistor, third band is the multiplier band. The adjacent picture shows how to read the bands on the resistor.

How do I read the pins on an IC?

Pin no. 1 on the IC is usually marked with an engraved dot. Hold the IC such that the pins are facing away from you, and number the pins anticlockwise, beginning at pin with the dot. Alternately, the IC may have a notch instead of a dot, if so, hold the IC such that notch is at the top (with pins facing away from you) and the pin 1 is on top left.

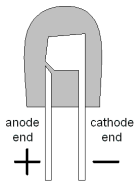
How do I identify a diode and it's direction?



Diodes normally have glassy casing, and are marked with a band on one end. The band end is the 'cathode' and the other end is the 'anode'. Within the diode, the current flows from anode to cathode.

On the Schematic, the cathode end is represented as the tip of the arrow.

How do I identify LED polarity?



Hold the LED against the light, and when you look at the metal elements inside, you will notice that one half is bigger than the other and looks like a flag, this is the 'cathode' (or negative) end of the LED.

How do I connect the LEDs?
Hold your LED against the light and inside, the cathode end inside (as shown in above picture) should match up with the flat side on PC board marking (silkscreen).

How do I distinguish C1 and C2?
C2 is the larger capacitor, whereas C1 is the smaller capacitor.

Assembly tips

- The pins can be bent suitably to attach on the PCB.
- While assembling, solder the components with many pins first, (such as IC) and then solder components with lesser number of pins. Finally solder the connecting wires.

Further reading

How to read a diode:
http://www.americanmicrosemi.com/tutorials/diode.htm

How to read resistor
http://www.aikenamps.com/ResistorColorCode.htm
http://www.eidusa.com/Electronics_Resistors.htm

Tips on soldering
http://library.thinkquest.org/2784/inspire/soldering_hints.html

How to read schematics
http://www.learn-c.com/schemat.htm

Books

Beginners Guide to Reading Schematics, by Robert J. Traister, Anna L. Lisk.

Warnings

- Wear Eye protection gear while assembling the kit.
- Soldering iron is hot, and be careful while handling it.
- While soldering, do not heat components any longer than 10 seconds, it may damage the components.
- The fumes generated while soldering may be harmful. Work in a well ventilated area and do not breathe the fumes.
- The soldering metal may contain lead. So wash your hands thoroughly with soap after handling such materials.
- When fully assembled, test with a 9 volts non-RCX power before attaching to RCX.

- Improper assembly may damage kit components.