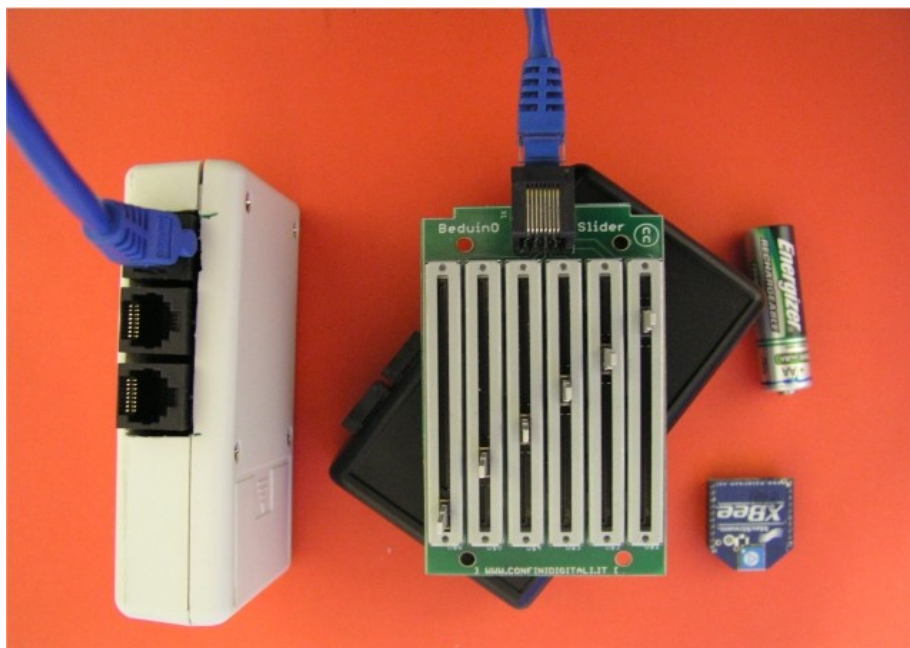


Beduino

manual version 0.9



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1. About - What is a Beduino?

Beduino is an open source instrument, designed to simplify the process of creating electronic based art projects. Contained in a small plastic enclosure, it has 18 lines available, this including analog and digital inputs and outputs, individually programmable.

Those lines are available on 3 RJ45 sockets, to make connections easier and more stable.

It can be used for music controllers, VJ controllers, MIDI instruments, dance triggers and body suits, interactive installations, driving LEDs, motor and robotic controls and much more...

It is based on the well-known Arduino platform, but intended to be used even without writing a single line of code. Anyway, Beduino keeps compatibility with the Arduino platform, so it can be reprogrammed, hacked and used just like a "normal" Arduino.

Beduino comes with a Max/Msp patch for configuration, possible and free to use with all major operating systems.

Beduino runs from a wall-mart power supply or from a couple of AA batteries; it can be used with a USB connection or even wirelessly, with an USB dongle adapter on the PC side.

The Beduino Xtensions make the use of the Beduino platform even easier: just plug a cable and use it!

Beduino is an open source device, this meaning that all the material to it related is and will be released and made available to everyone, in order to make the project grow and improve with user's experiences.

All project's materials (both software and hardware) are released under a Creative Commons License (*attrib./non comm./shake-alike*).



2. Usage:

As stated before, Beduino was designed to be a “plug&play” device, as simple as possible. To use it, you have to follow some simple steps:

1. Power the board, using the power switch: you can choose if use 2 AA batteries or an USB cable (mini-A connector)
2. Connect the board to your computer. Beduino has 2 working modalities: wired or wireless. For both versions you need to have installed the FTDI FT232 drivers for your platform, freely downloadable from <http://www.ftdichip.com/Drivers/D2XX.htm>
Once downloaded and installed, connect the Beduino to your PC via USB cable (wired version) or via Xbee dongle. Be sure to have selected the correct mode with the serial switch.
3. Configure the Beduino: launch the configurator, and in few clicks the Beduino is ready to roll. (*see Software section of this manual*)
4. Connect some peripherals to Beduino's RJ sockets. You can use your own peripheral or a Beduino Xtension, as you prefer.
5. Configure your software (Max, Pure Data, Processing, Isadora, Flash, ...) to receive data from the Beduino.
6. Enjoy (and, if possible, share) it!

3. Software

Beduino is configured by mean of a Max/Msp patch (*Pure data patch coming soon*).

The Max/Msp runtime, needed to run the patch, can be downloaded for free from <http://www.cycling74.com/products/maxmsp>.

The configuration window appears like this (*Mac Os X screenshot*):

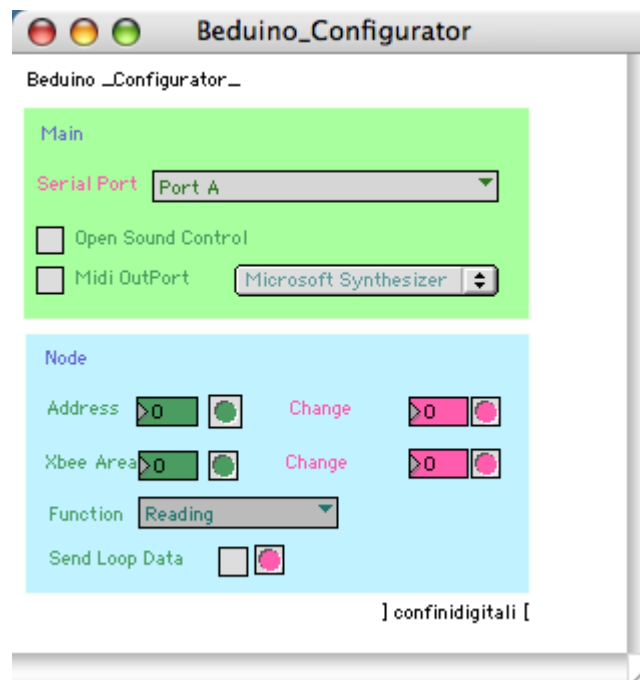


Fig.1: Beduino configuration window (Max/Msp patch)

The window is divided into 2 sections: the first (green) is the main configuration. It sets the serial port used and the desired output protocol. Please note that if you have a Beduino connected straight to your PC via USB, you will receive data only from that board; if you have an Xbee dongle and a remote (wireless) Beduino, you will receive data from all Beduinos belonging to the same area.

The second section (light blue) is the node configuration. It is possible to set the node's address and its area (for wireless mode), to change them once setted, and the function of the Beduino. You can choose between different activity modes.

Send Loop data means that the Beduino is sending datas in continuous mode, without the need to ask for them.

4. Hardware:

Beduino mainboard is a 59.1x68.6 mm board, contained in a plastic (ABS) enclosure (dimensions: 112x66x28 mm). It features an Atmel microcontroller, an ATmega168 in smd package (TQFP32), fed at 5V with a 16Mhz clock.

The 5V power supply can be given by an USB cable (both from USB port or wallmart power supply with USB output) or by 2 AA batteries, whose voltage is stepped-up with a boost regulator.

All files are available at www.confinedigitali.it, under "Beduino" section.

In the following picture you can see the different functional areas of Beduino board:

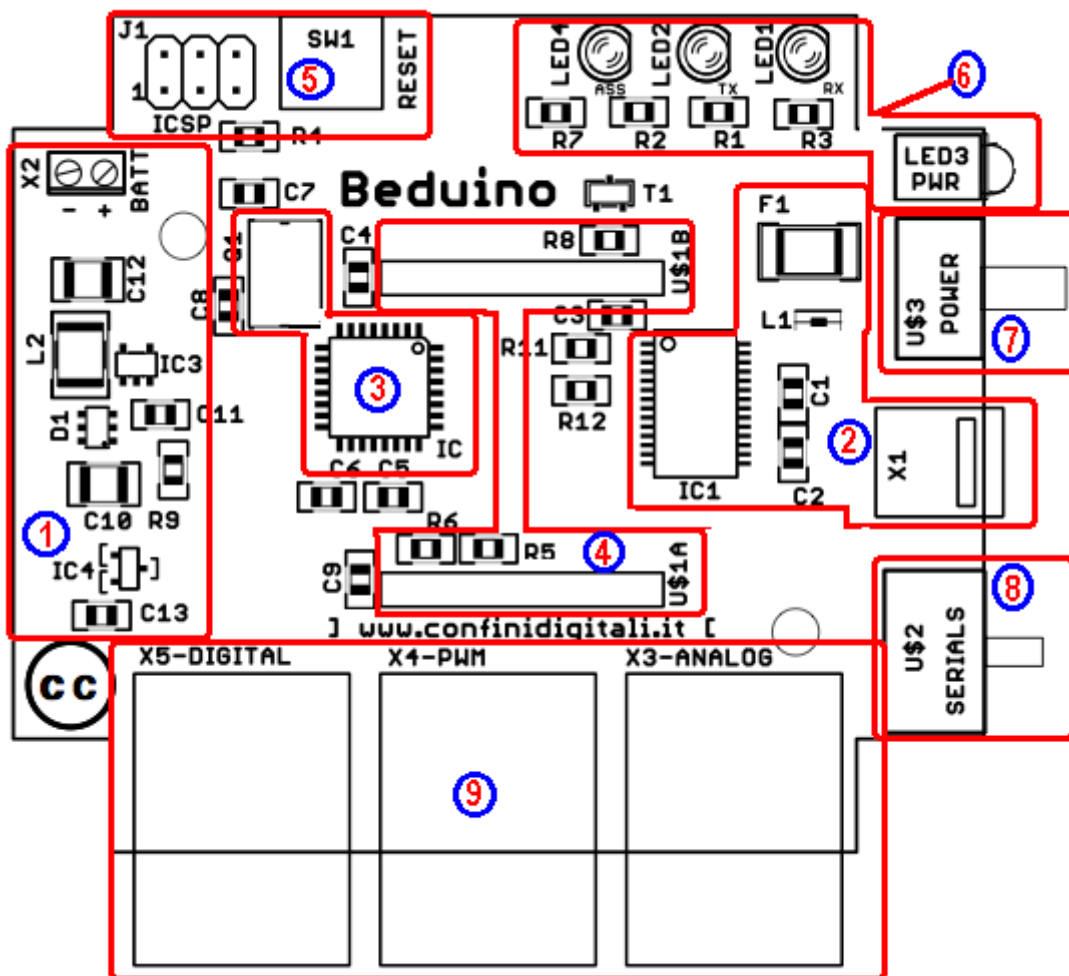


Fig.2: Beduino Board layout and its functional areas

In detail:

1. Boost regulator and 3V3 supply area: here the 2AA's voltage is stepped-up to the 5V needed for the ATmega, and a LDO regulator provides the 3.3V needed for the wireless stage.
2. USB area: an FT232 IC from FTDI gives a fully compliant USB interface to the Beduino. The board can be reprogrammed using the open-source Arduino environment and this connection.
3. ATmega168: the microcontroller and its 16Mhz quartz.
4. Wireless area: the Beduino board features a socket for an Xbee module form Maxstream (<http://www.maxstream.net/products/xbee/xbee-oem-rf-module-zigbee.php>). Both an Xbee and XbeePro module can be mounted.
5. ICSP & reset button: with a standard 6-pin connector the microcontroller can be reprogrammed with any compatible programmer.
6. LEDs: LED3, the one visible on the front panel, is the power on led. LED1 and LED2, respective, indicates RX and TX activity on USB lines. LED4 is for association of the Xbee module.
7. Power switch: a switch for toggling power to the board.
8. Serial switch: with this switch you can choose if use Beduino in wired (USB) or wireless (Xbee) mode.
9. Connector area: the 3 RJ45 sockets used for taking out the ATmega's pins.

The microcontroller lines are taken out by the use of 3 RJ45 sockets, to provide to the user a more reliable and stable connection between the mainboard and the peripherals. Each of these sockets has 6 signal lines plus VCC and GND.

The ATmega pins are grouped according to their function, as in the Arduino board; we have:

- * Analog port: Arduino analog inputs
- * PWM port: Arduino PWM pins
- * Digital port: Arduino Digital pins

The exact connections between Arduino's original pinout (and Atmega's pins) and Beduino's connectors are described in the following table:

Digital Connector (X5)

Beduino Digital Conn. Pin	ATMega 168 Pin	Arduino Pin
1	D2	PIN 2
2	D4	PIN 4
3	D7	PIN 7
4	B0	PIN 8
5	B4	PIN 12
6	B5	PIN 13
7	VCC	VCC (+5V)
8	GND	GND

PWM Connector (X4)

Beduino PWM Conn. Pin	ATMega 168 Pin	Arduino Pin
1	D3	PIN 3
2	D5	PIN 5
3	D6	PIN 6
4	B1	PIN 9
5	B2	PIN 10
6	B3	PIN 11
7	VCC	VCC (+5V)
8	GND	GND

Analog Connector (X3)

Beduino Analog Conn. Pin	ATMega 168 Pin	Arduino Pin
1	C0	ANALOG 0
2	C1	ANALOG 1
3	C2	ANALOG 2
4	C3	ANALOG 3
5	C4	ANALOG 4
6	C5	ANALOG 5
7	VCC	VCC (+5V)
8	GND	GND

Fig.3: relationship and connections between ATMega's pins and Beduino connectors

5. Schematic:

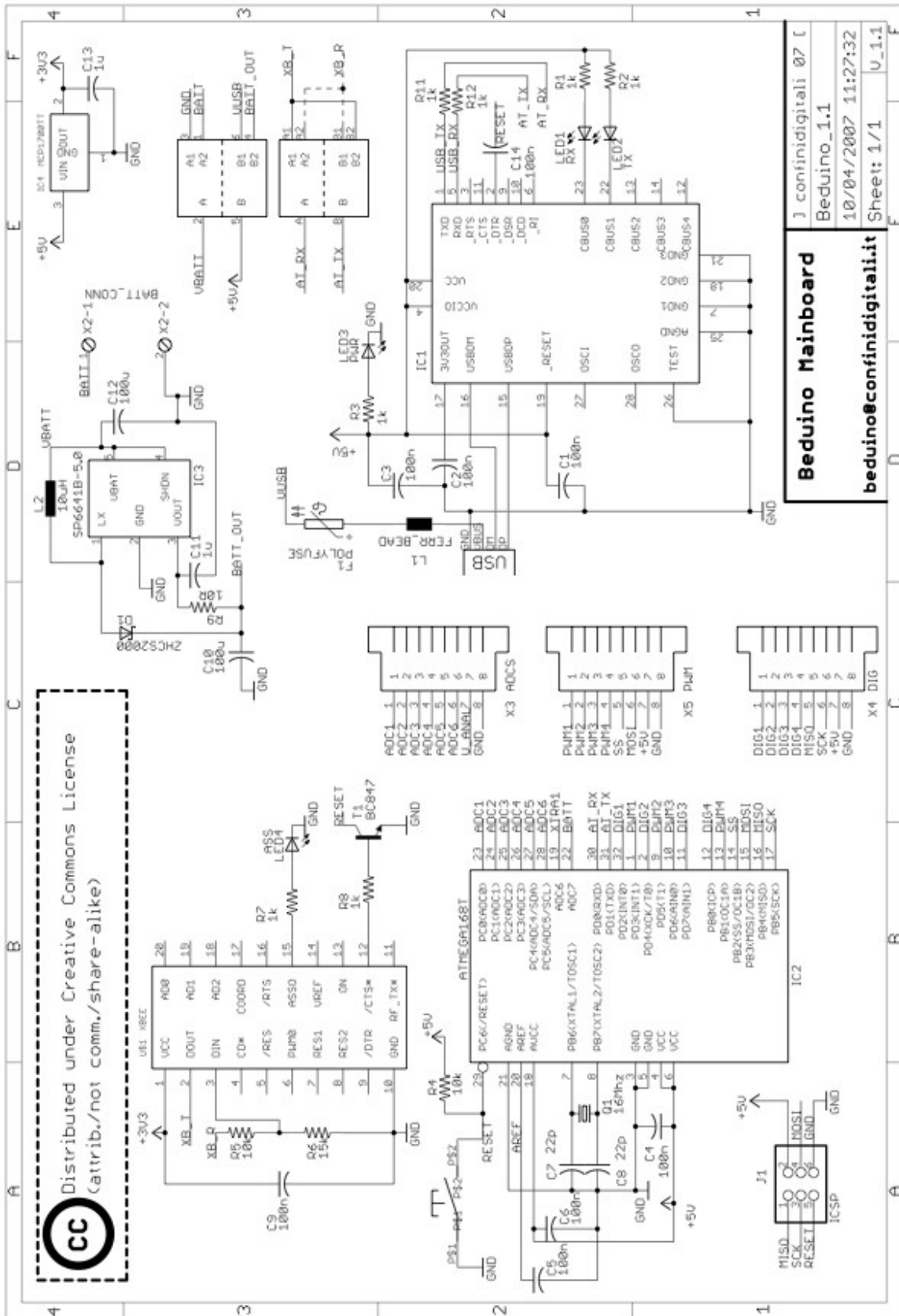


Fig.4: Beduino Board schematic

6. FAQs:

* Q: Is it "plug and play"?

A: Yes. You connect devices to Beduino using its RJ45 sockets. This manual provides diagrams which show you how to wire in many popular sensors and devices. Then, configuration is a snap using the provided software.

* Q: I have no programming experience. Will I be able to use Beduino?

A: Beduino was ideated to not require any programming experience. You can use it as an input to any program or device that receives MIDI/OSC, and you can drive its outputs from any program or device that sends MIDI/OSC. The supplied software allows you to configure the device for the needs of your program or device.

* Q: I have no electronics experience. Will I be able to use Beduino?

A: The Beduino documentation has (will have) sections to guide people without electronics experience. We also provide references to several excellent Internet resources for learning the basics of hooking up electronics.

* Q: Does it work with Max/MSP?

A: Yes, very well. It works with the standard MIDI/OSC input and output objects (no special objects required), and the examples and configuration software are written in Max. We provide a Max patch for configuration of the board. You can use Beduino also with other softwares such as Isadora, Flash, Processing, and so on.

* Q: Do you sell pre-wired sensors and devices?

A: Yes! The Beduino Xtensions (coming) are a wide range of peripherals of the Beduino board to be used in a "plug & play" way. All of them will have a standard RJ45 socket so that you can use a standard straight ethernet cable to connect them with the Beduino board.

7. Xtensions:

Beduino Xtensions are a set of peripherals designed to let Beduino become a real plug&play device. Every Xtension has an RJ45 socket, to be connected to one of the three Beduino's ports (Analog/Digital/PWM), in order to give "ready to use" functionalities to the user.

Each time that a new peripheral is released, its functionality will be added in the configuration system (the Max/Msp patch), to have the simplest way of configure the Beduino.

Until now we have developed some Xtensions, which are currently under test. Among them there are:

- DMX: a DMX512 controller for light & sound applications.
- Sliders: 6 sliders for a nice analog control.
- Relay: 4 relay for ON/OFF control of electrical loads.
- RFID: an RFID reader/writer, both 125Khz and 13.56 Mhz.
- Arduino Shield: plug it in a standard Arduino to transform it in a Beduino compliant device and use wireless (Xbee) and Xtensions.
- LedMatrix: a nice 8x8 led matrix, bicolour leds.
- ProtoBoard: a small protoboard with the standard RJ45 socket for custom projects.
- RGB Sensor: a sensor capable of recognizing the RGB components of any object in front of it.
- Rotary Encoder: easy to use, already assembled and boxed rotary encoder.

The pictures of these boards, among with other Beduino products, can be found at:

<http://www.flickr.com/photos/confinidigitali>

8. Connecting schemes

[coming soon]