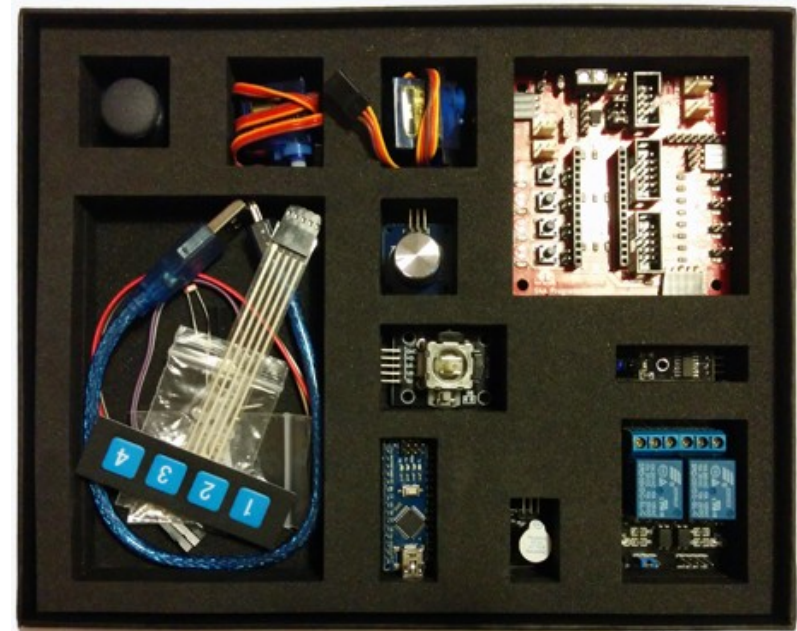


Descobreix Arduino amb Make It!



21 /juny / 2016

Jordi Binefa i Martínez

Responsable d'R+D+i a

Professor de cicles formatius a



e S4A Programming Learning Board

Entorn de l'S4A

The screenshot displays the S4A programming environment, which is based on Scratch. The interface includes a menu bar with 'Fitxer', 'Edita', and 'Ajuda'. On the left, there are buttons for 'Moviment', 'Control', 'Aspecte', 'Sensors', 'Sons', 'Operadors', 'Lapis', and 'Variables'. The main workspace shows a Scratch script for an Arduino board named 'Arduino1'.

The script consists of two 'al prémer' (when clicked) blocks, each followed by a 'per sempre' (forever) loop. The first loop checks if 'Digital2' is pressed. If yes, it sets 'Digital 13' to 'apagat' (off); if no, it sets it to 'encès' (on). The second loop checks if 'Digital3' is pressed. If yes, it sets 'Digital 12' to 'apagat'; if no, it sets it to 'encès'. A third loop checks if 'Analog5' is less than 15. If yes, it sets 'Digital 11' to 'encès'; if no, it sets it to 'apagat'. A fourth loop checks if 'Analog4' is less than 15. If yes, it sets 'Digital 10' to 'encès'; if no, it sets it to 'apagat'.

On the right, the 'pcbS4A_01' window shows the hardware monitor for 'Arduino1' connected to 'port: USB0'. It displays the following values:

Pin	Value
Analog0	628
Analog1	522
Analog2	519
Analog3	114
Analog4	1023
Analog5	1023
Digital2	true
Digital3	true

Below the monitor, there is a 'Nova animació:' section with icons for creating new animations. The 'Escenari' (Stage) area shows a small image of the Arduino board.

www.s4a.cat

e⚙ S4A Programming Learning Board

Microprogramari de l'S4A

El microprogramari és el programari del maquinari

Català

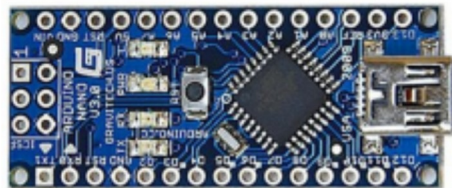
Programari
Maquinari
Microprogramari

Anglès

Software
Hardware
Firmware



Arduino Nano



```
S4AFirmware16 | Arduino 1.6.5
Eitxer Edita Sketch Eines Ajuda

S4AFirmware16

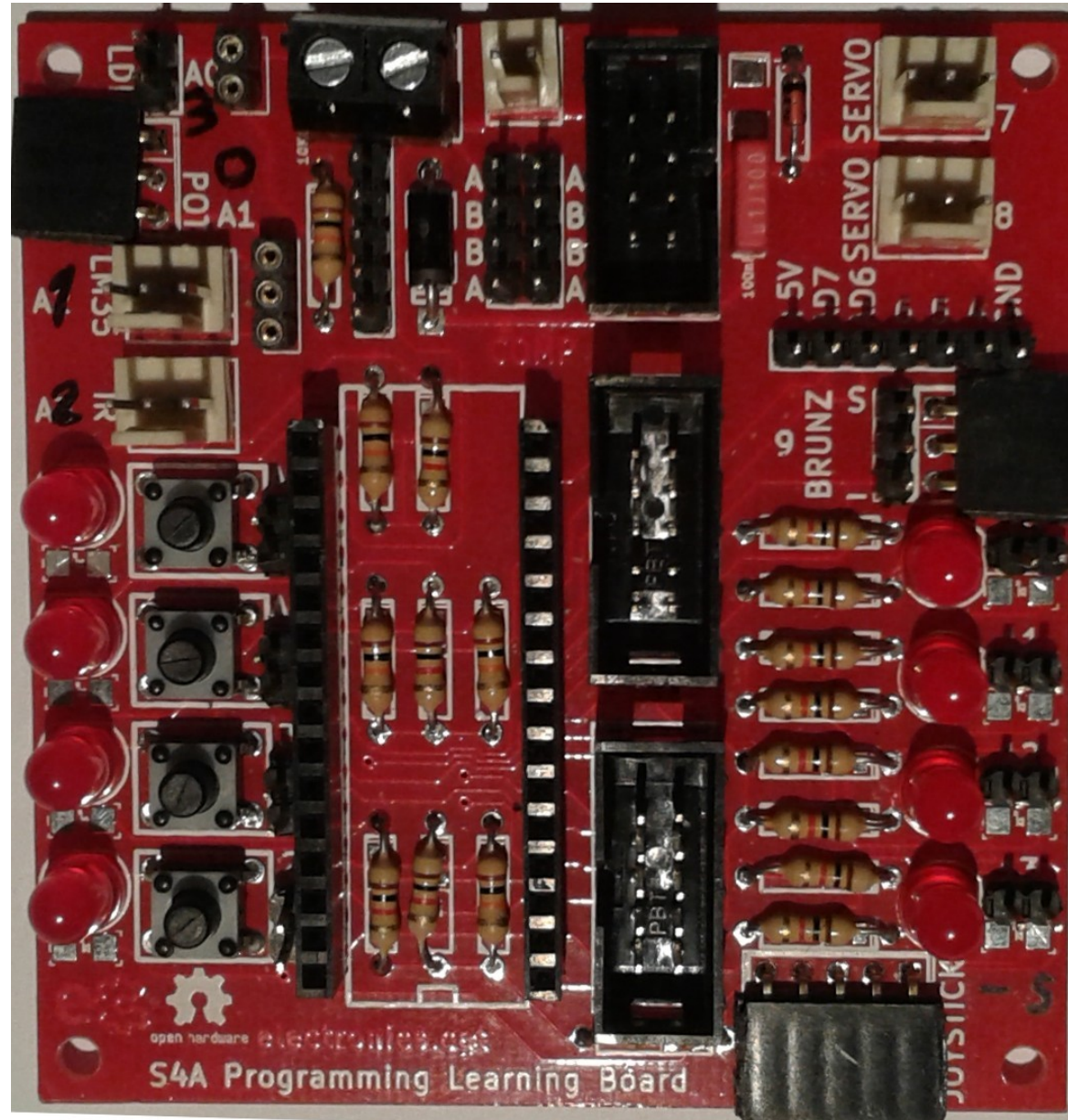
// NEW IN VERSION 1.6c (by Jorge Gomez):
// Fixed variable type in pin structure: pin.state should be bool
// Optimized speed of execution while receiving data from pins

// NEW IN VERSION 1.6b (by Jorge Gomez):
// Added new structure arduinoPins to hold the pins info
// - This makes the code easier to read and modify (IMH)
// - Allows to change the type of pin more easily to me
// - Eliminates the need of having to deal with different pin types
// - By using an enum to hold all the possible output pins
// Changed all functions using old style pin access: conPin to arduinoPins
// Fixed possible overflow every 70 minutes (2e32 us) in millis
// Some minor coding style fixes
```

Microprogramari per l'Arduino per funcionar amb l'S4A :
<http://vps34736.ovh.net/S4A/S4AFirmware16.ino>

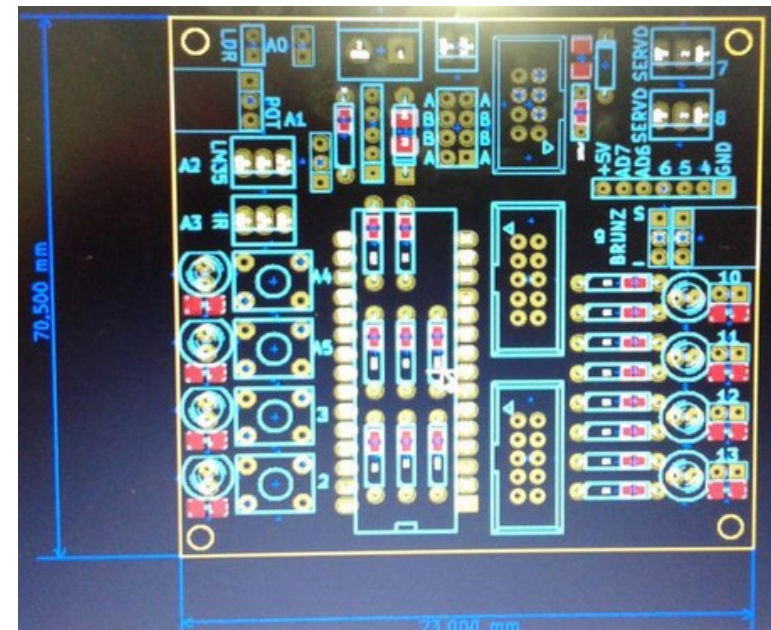
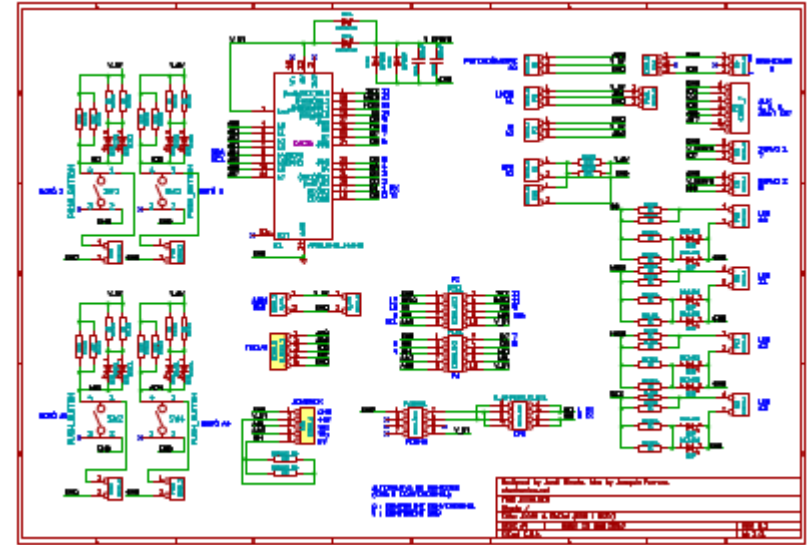
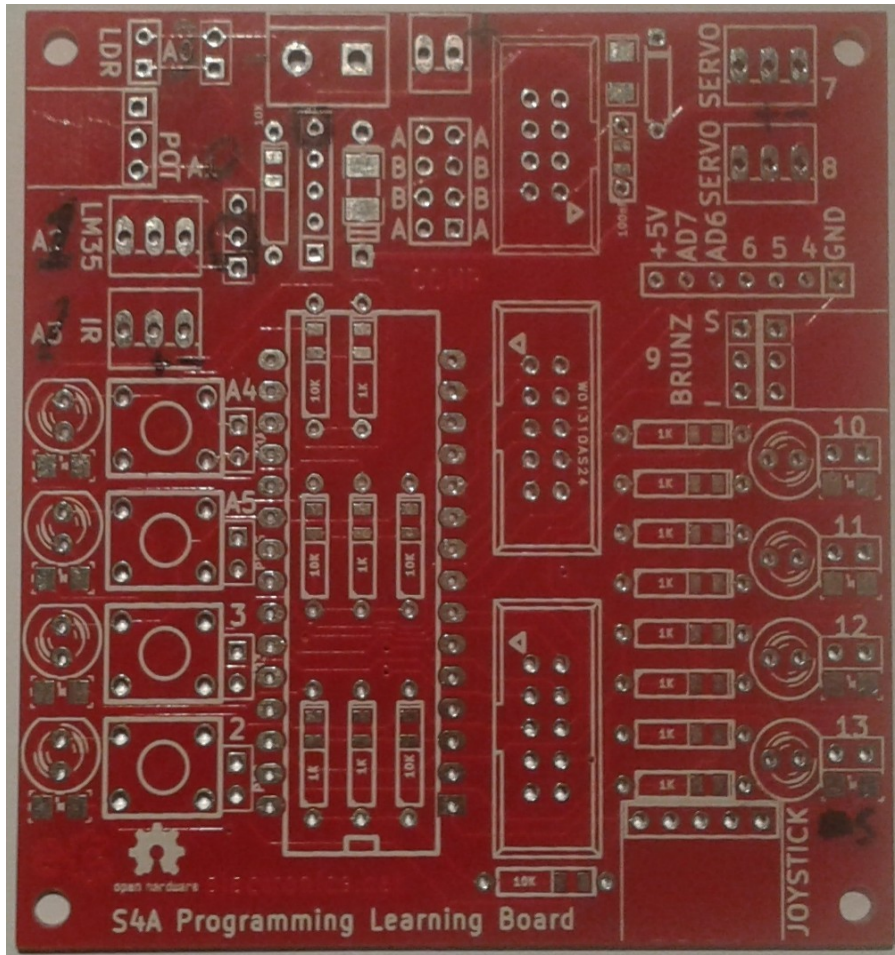
e⚙️ S4A Programming Learning Board

La placa



e⚙ S4A Progamming Learning Board

La placa

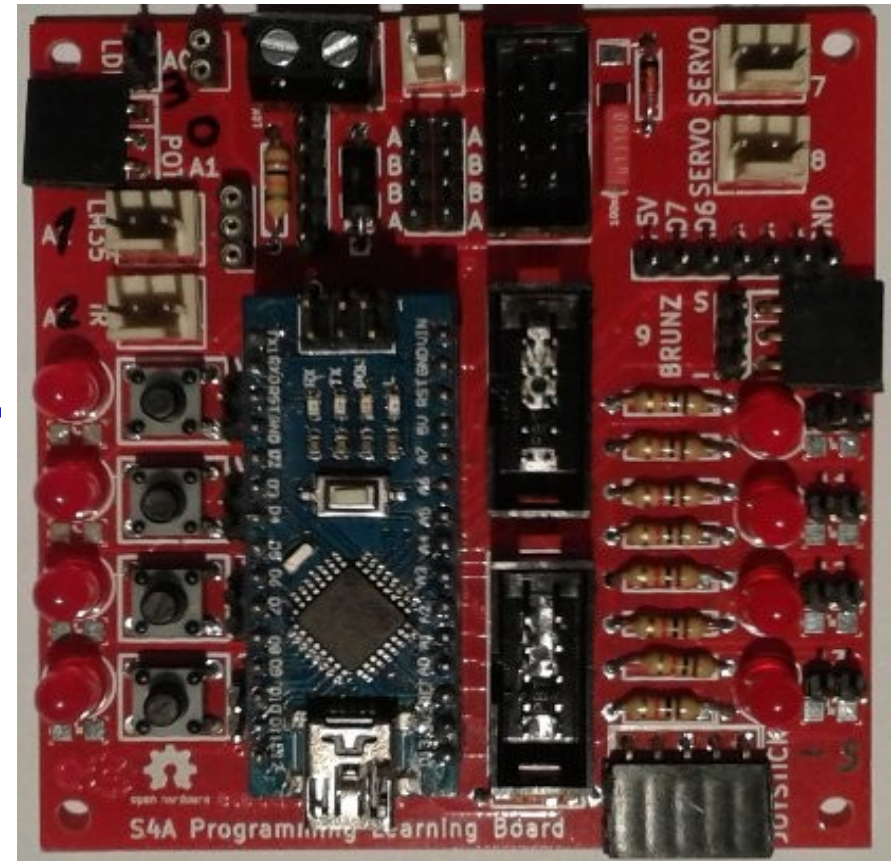


Placa desenvolupada amb l'entorn de disseny integrat de programari lliure



S4A Programming Learning Board

Botons i leds

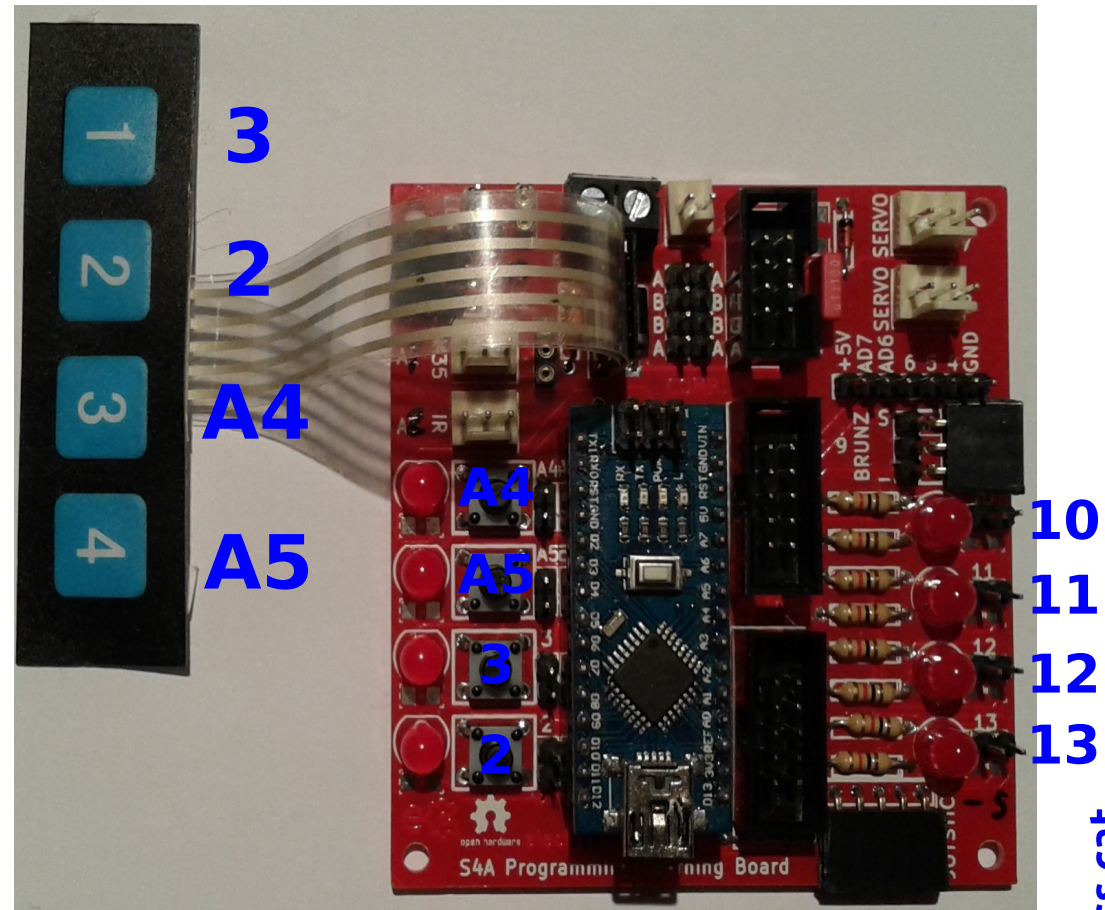
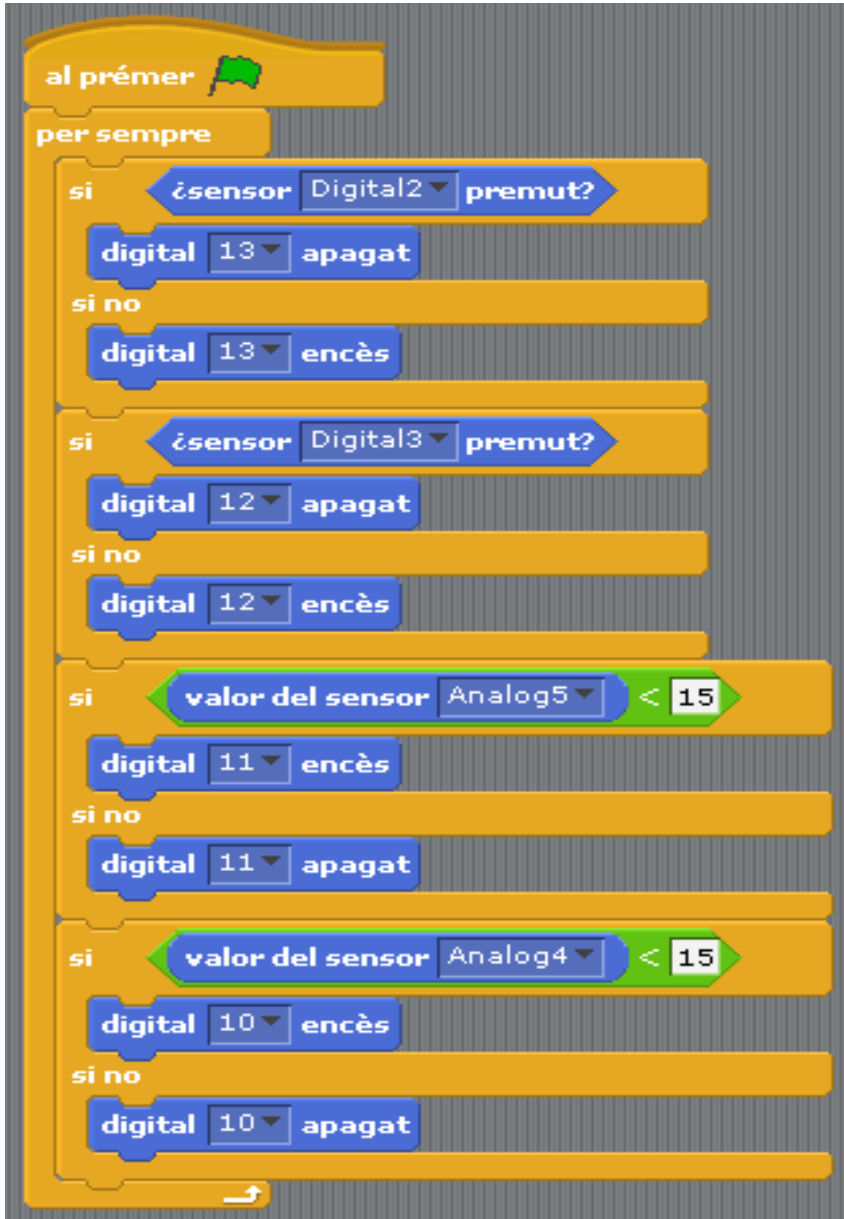


A4
A5
3
2

10
11
12
13

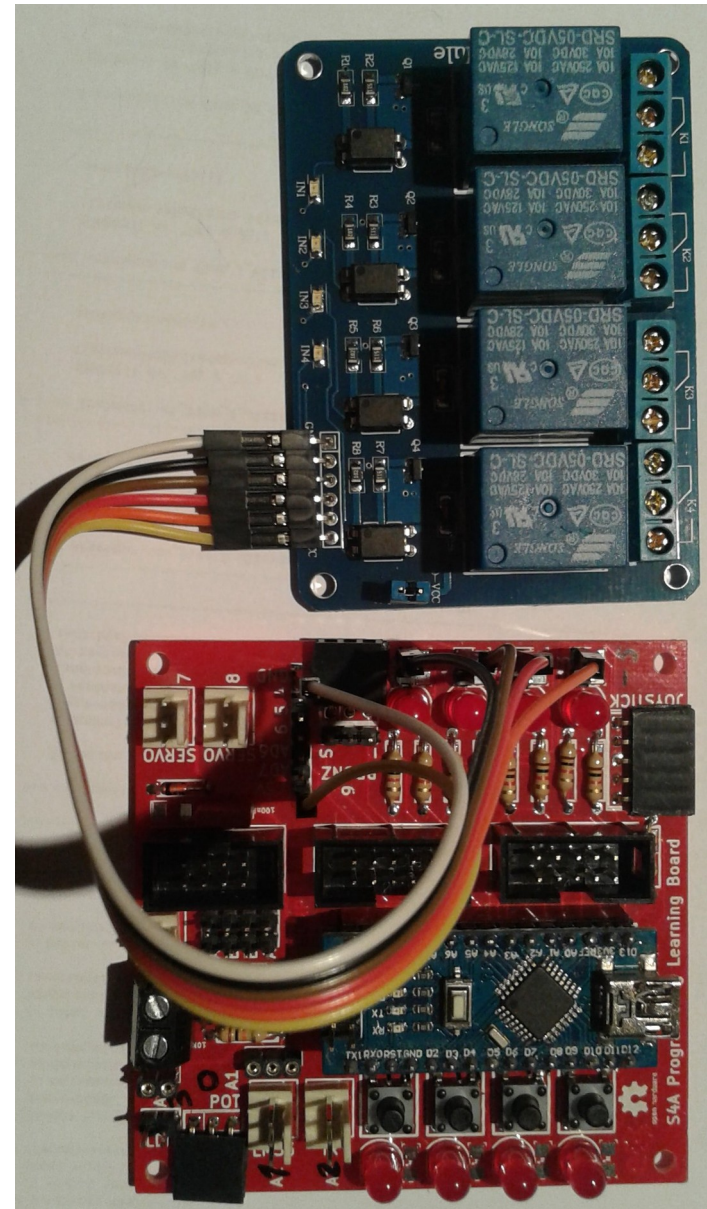
S4A Programming Learning Board

Teclat de membrana i leds



e⚙ S4A Progamming Learning Board

Botons, leds i relés



e⚙ S4A Progamming Learning Board

Concepte de relé

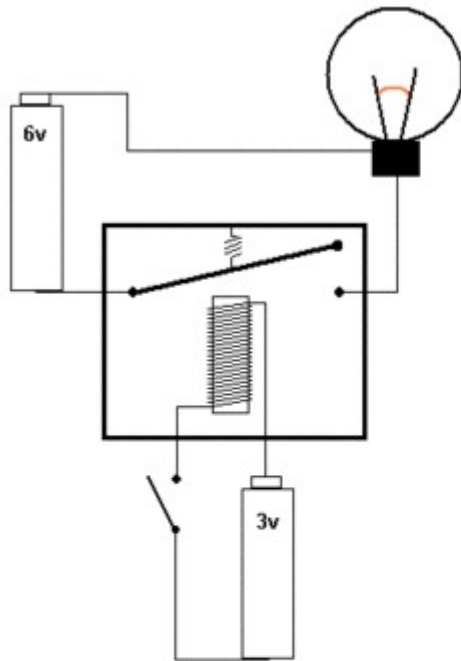


Figure 1: Relay off

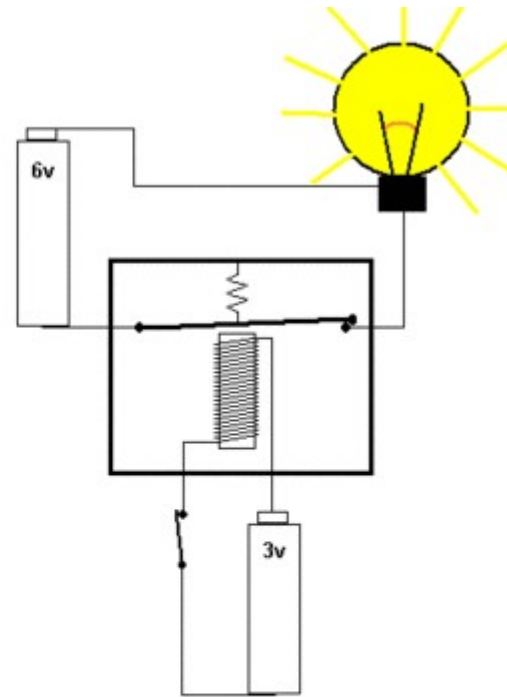
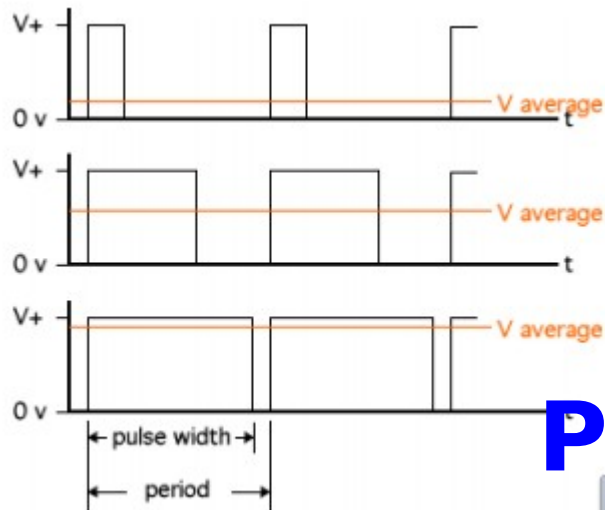


Figure 2: Relay on



S4A Programming Learning Board

Botons i brunzidor



A4

A5

3

2

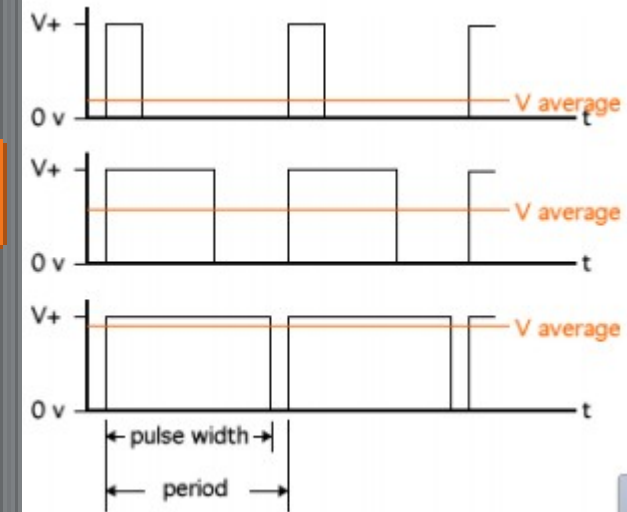
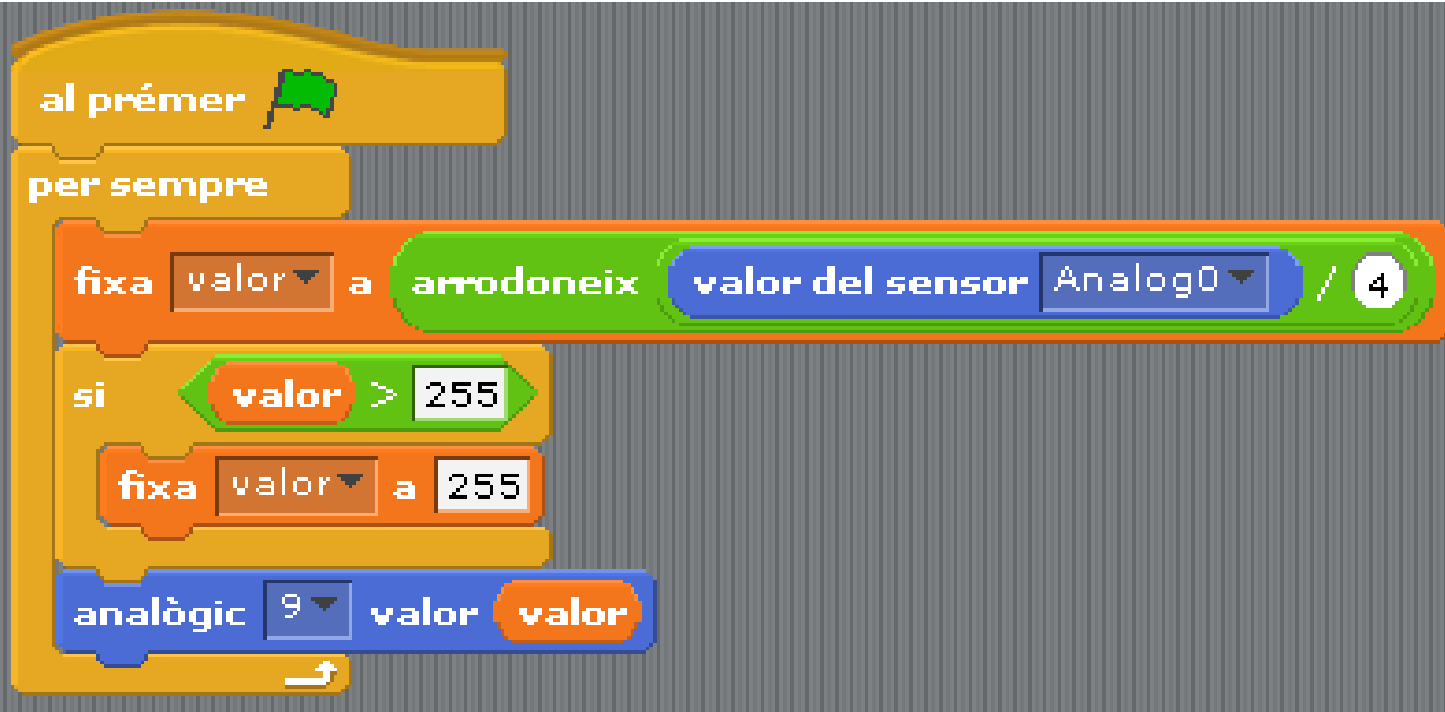
PWM



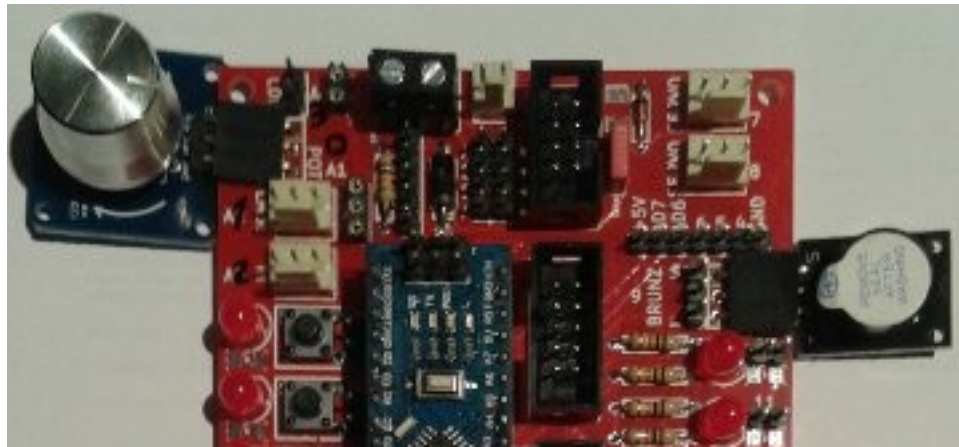


S4A Programming Learning Board

Potenciòmetre i brunzidor



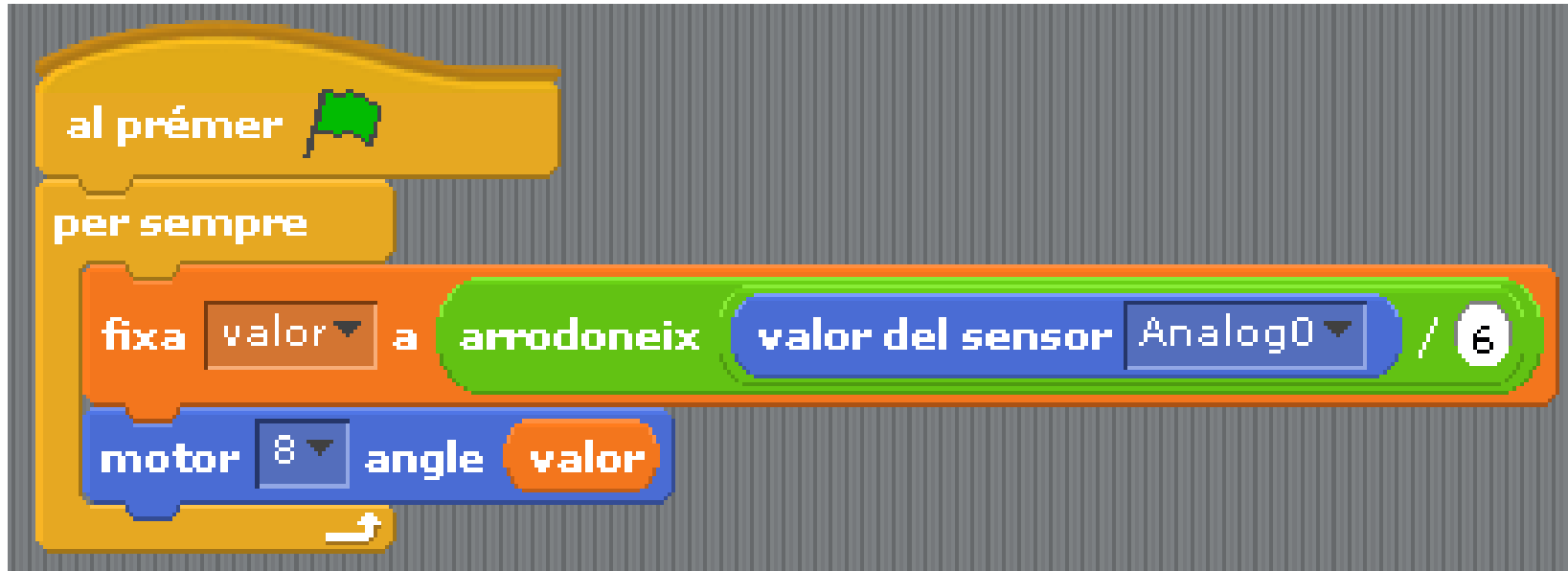
A0



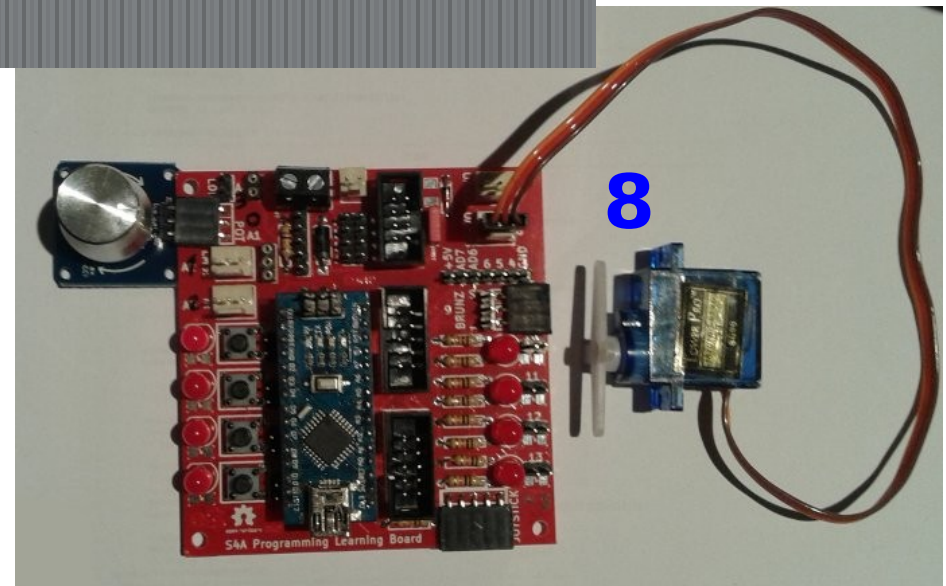
9

S4A Programming Learning Board

Potenciòmetre i servomotor

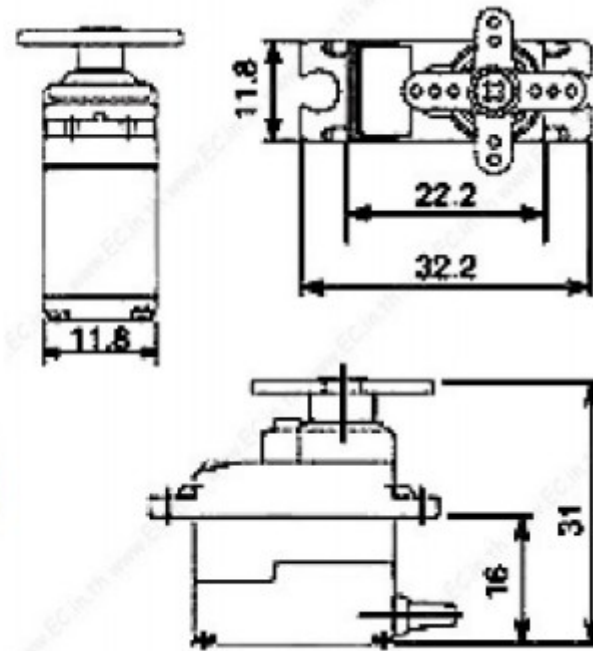


A0



e⚙ S4A Progamming Learning Board

Servo



Specifications

- Weight: 9 g
- Dimension: 22.2 x 11.8 x 31 mm approx.
- Stall torque: 1.8 kgf·cm
- Operating speed: 0.1 s/60 degree
- Operating voltage: 4.8 V (~5V)
- Dead band width: 10 μ s
- Temperature range: 0 °C – 55 °C

<http://datasheet.sparkgo.com.br/SG90Servo.pdf>



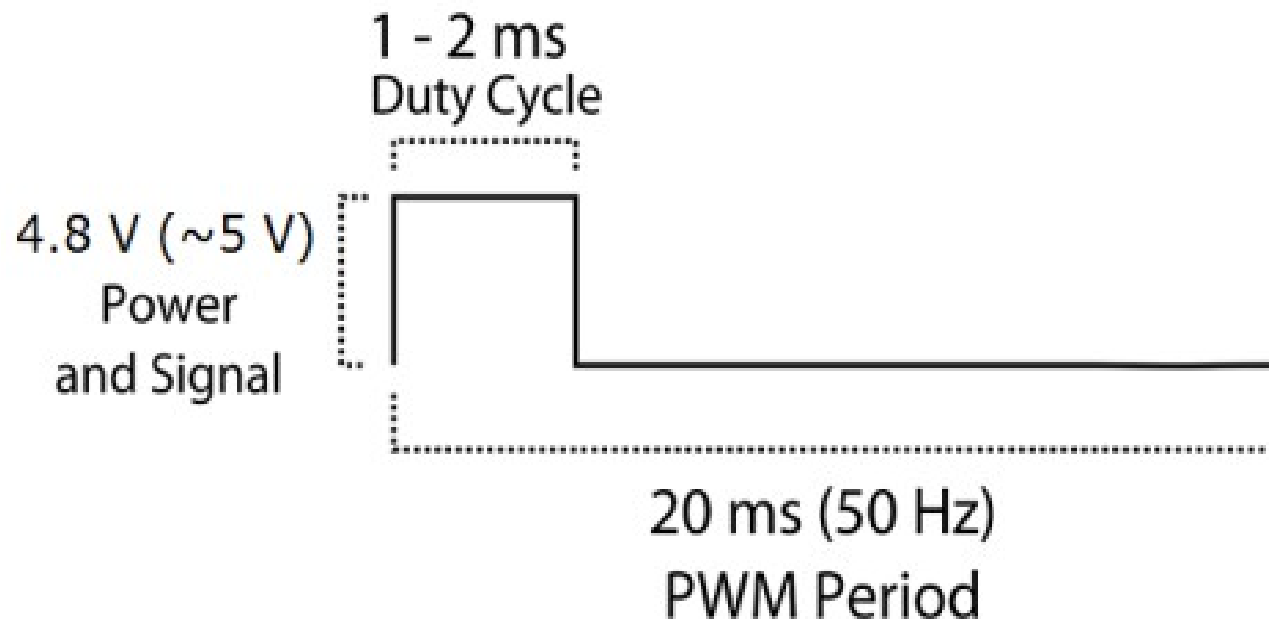
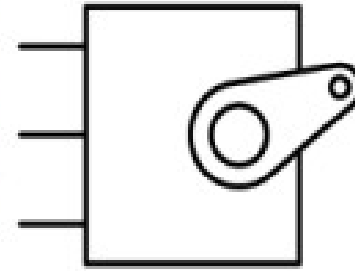
S4A Progamming Learning Board

Servo

PWM=Orange ()

Vcc = Red (+)

Ground=Brown (-)



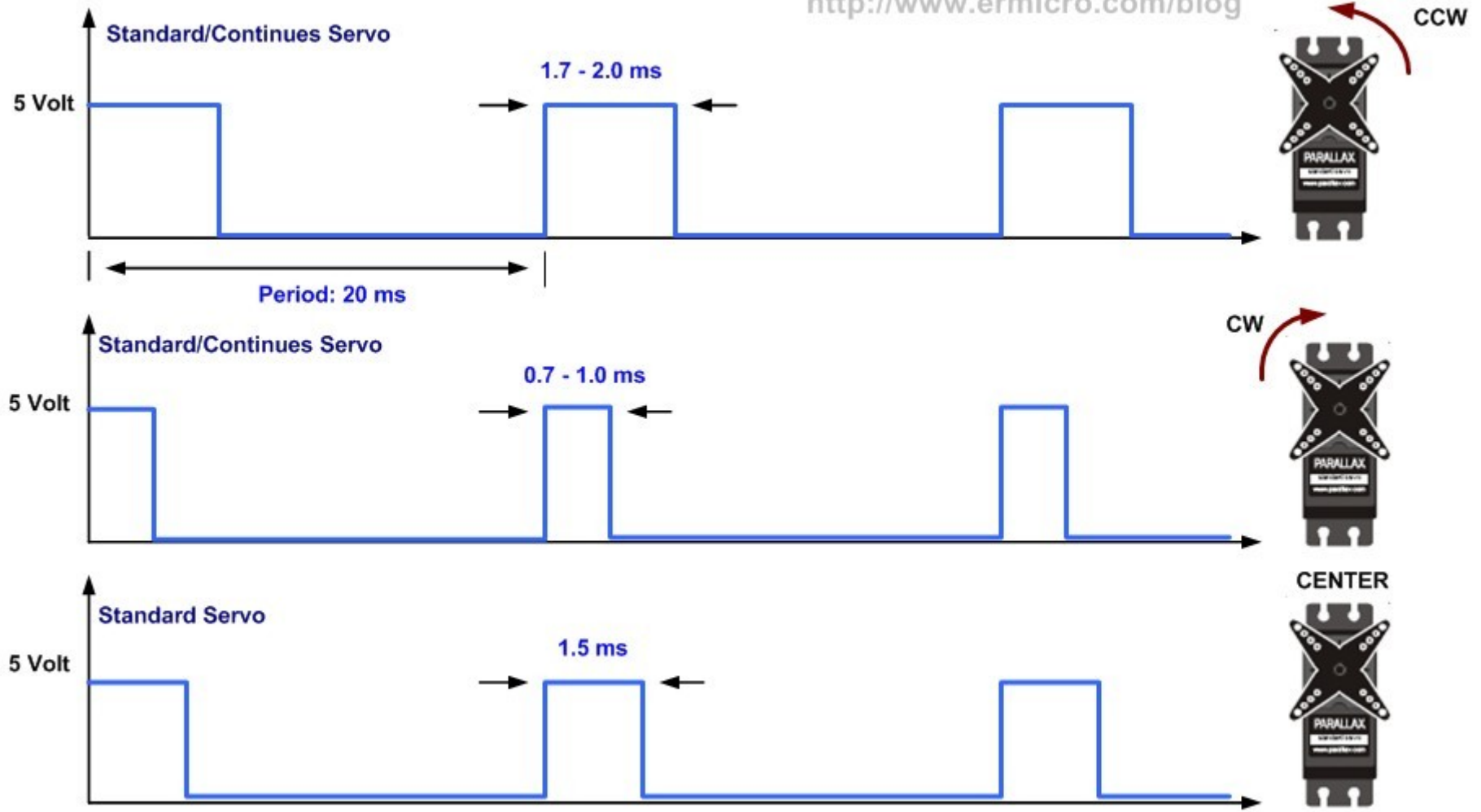
Position "0" (1.5 ms pulse) is middle, "90" (~2 ms pulse) is all the way to the right, "-90" (~1 ms pulse) is all the way to the left.

<http://datasheet.sparkgo.com.br/SG90Servo.pdf>

eS4A Progamming Learning Board

Servo

<http://www.ermicro.com/blog>

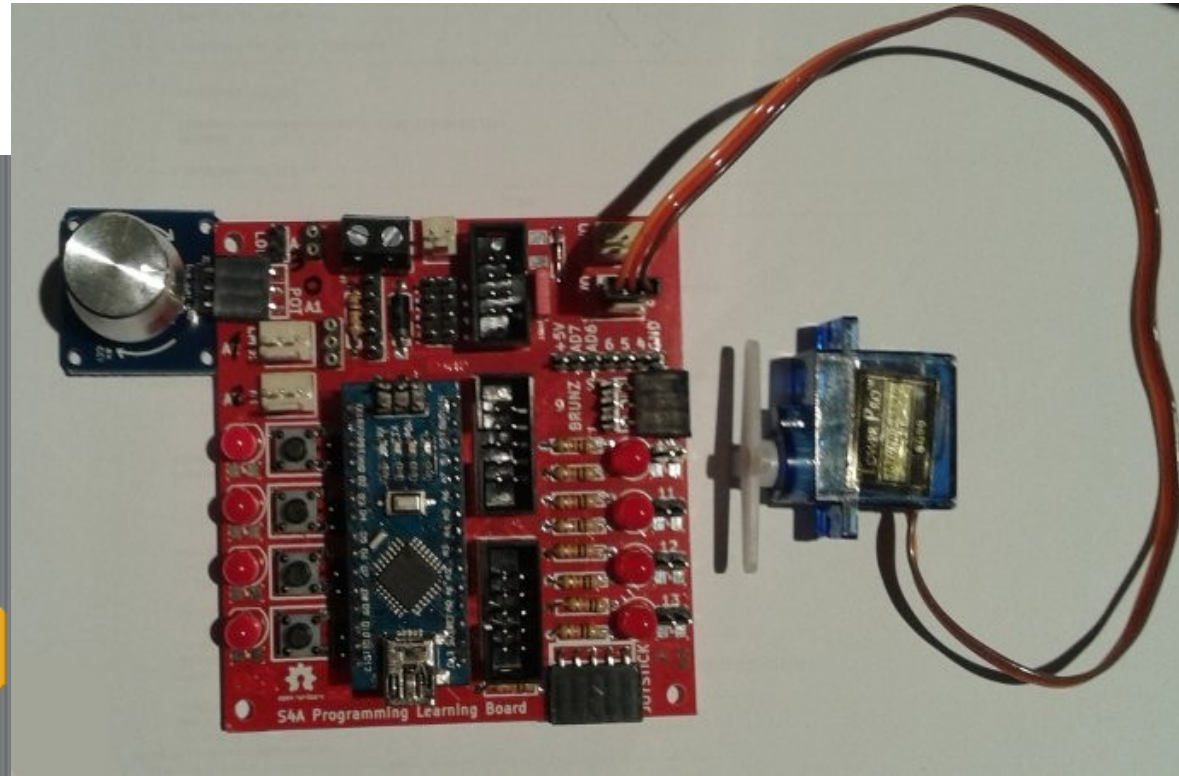
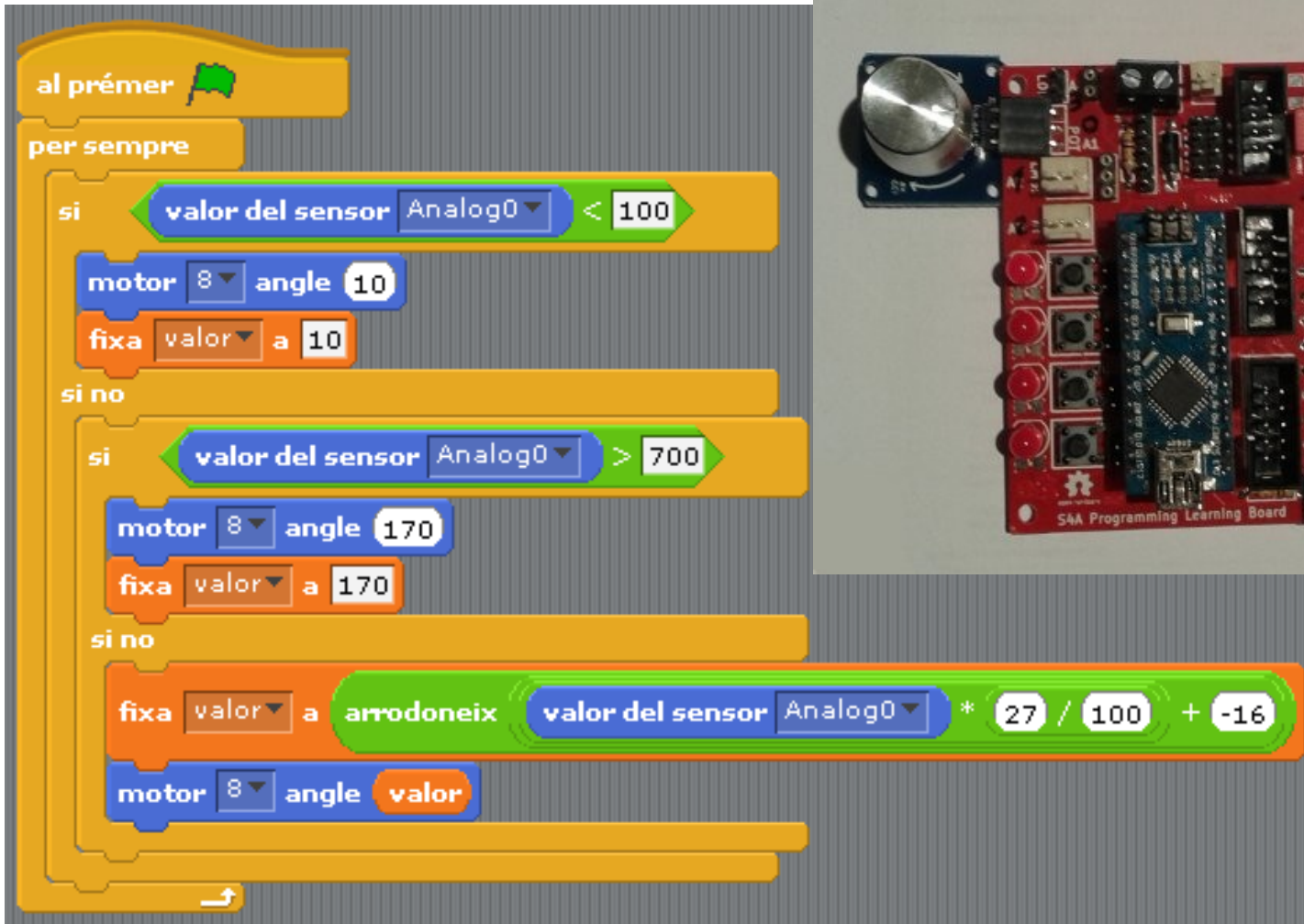


Servo Motor PWM Timing Diagram

http://www.ermicro.com/blog/wp-content/uploads/2009/02/servo_01.jpg

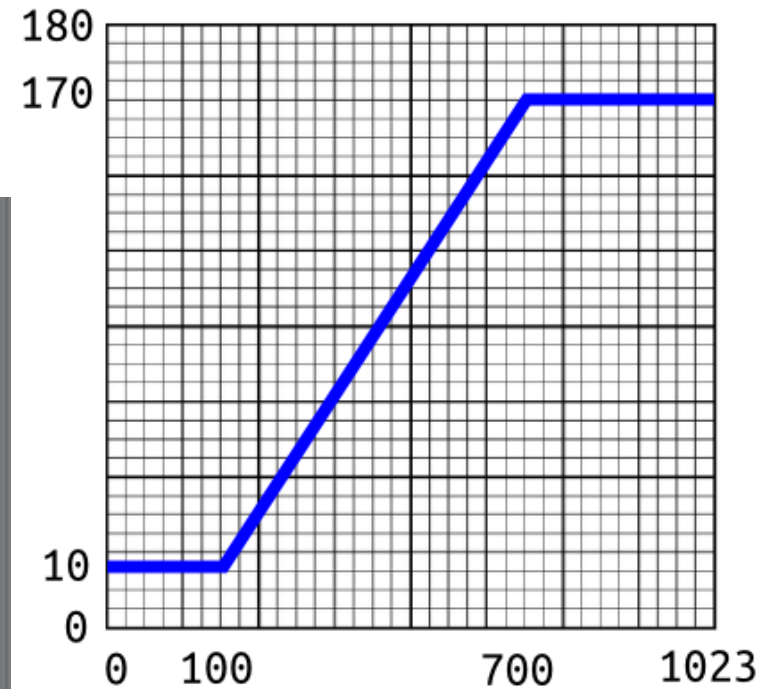
S4A Programming Learning Board

Potenciòmetre i servomotor



S4A Progamming Learning Board

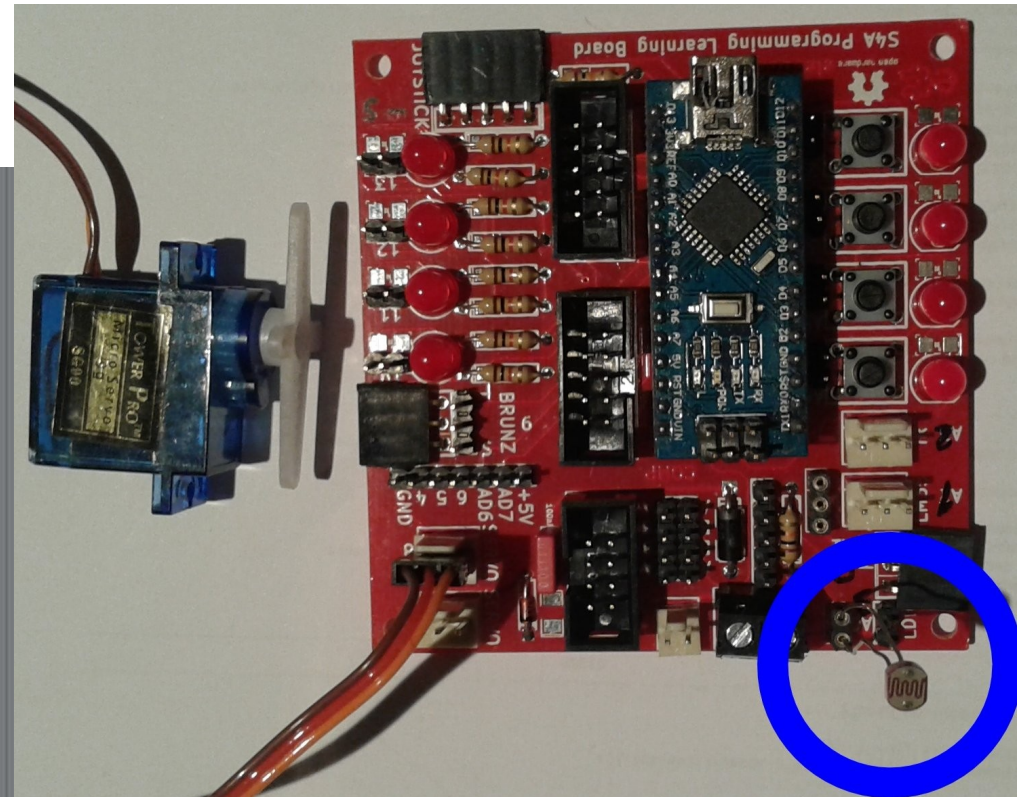
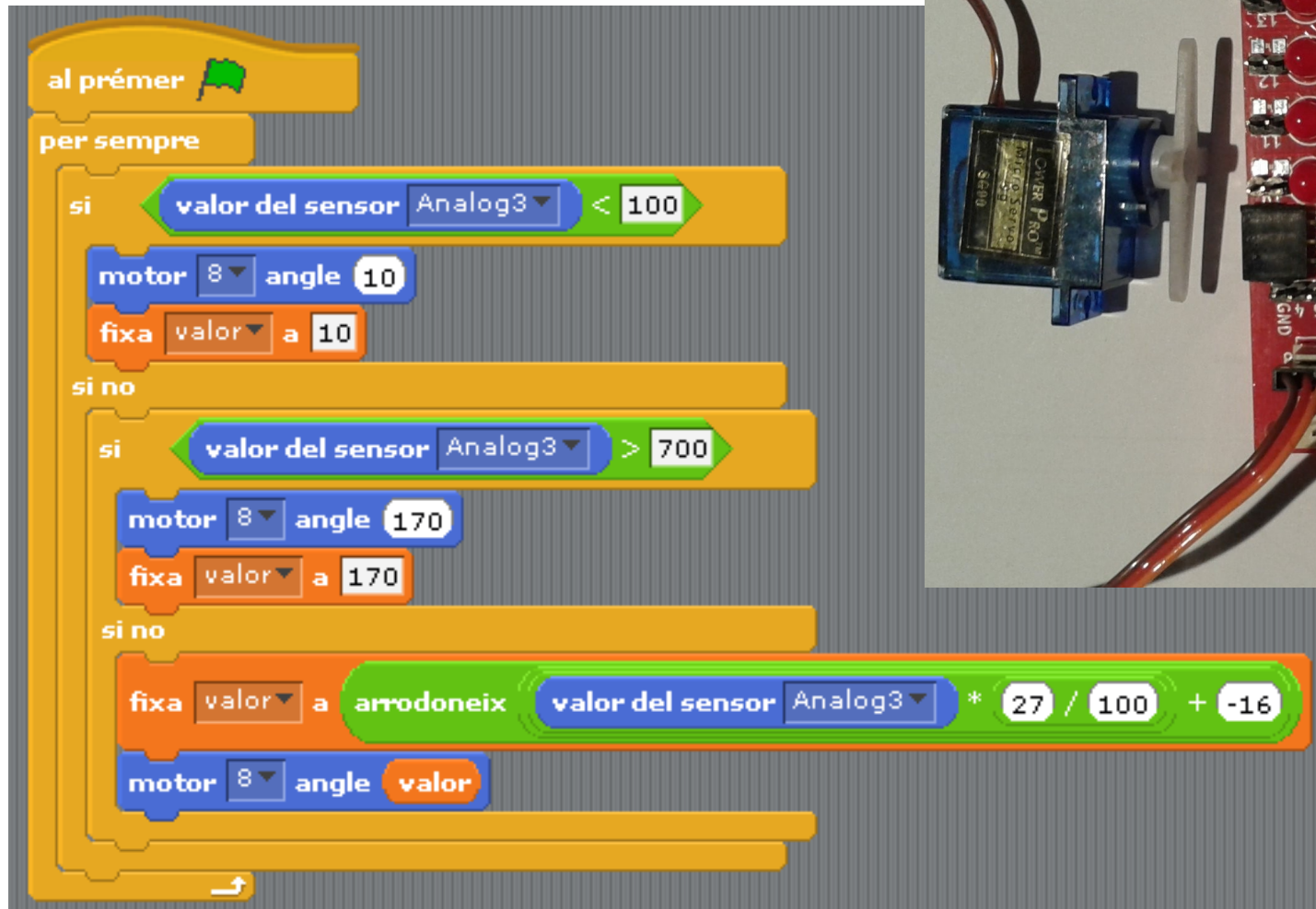
Potenciòmetre i servomotor



$$\text{graus} = \text{Analog0} \frac{27}{100} - 16$$

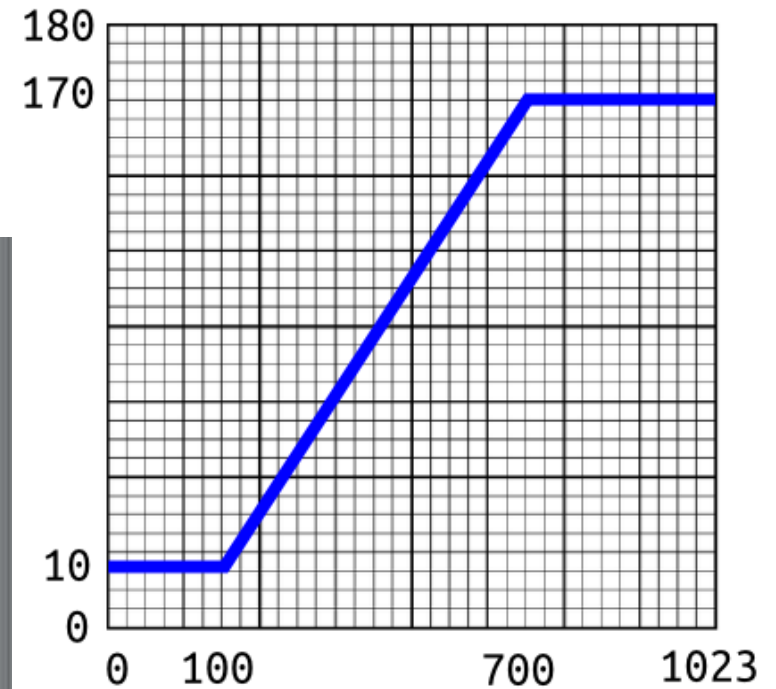
S4A Programming Learning Board

LDR i servomotor



S4A Progamming Learning Board

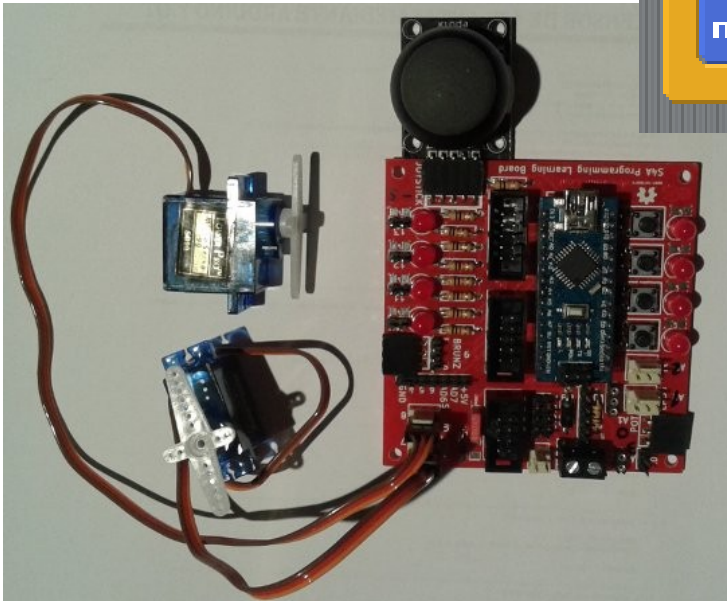
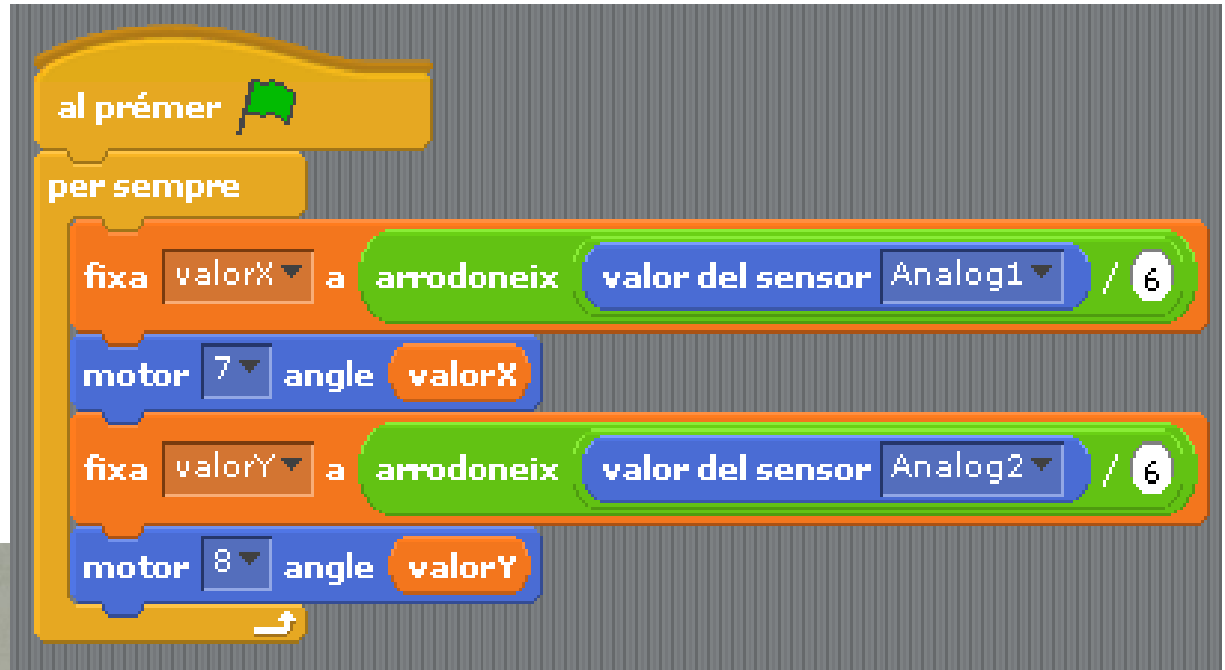
LDR i servomotor



$$\text{graus} = \text{Analog0} \frac{27}{100} - 16$$

eS4A Programming Learning Board

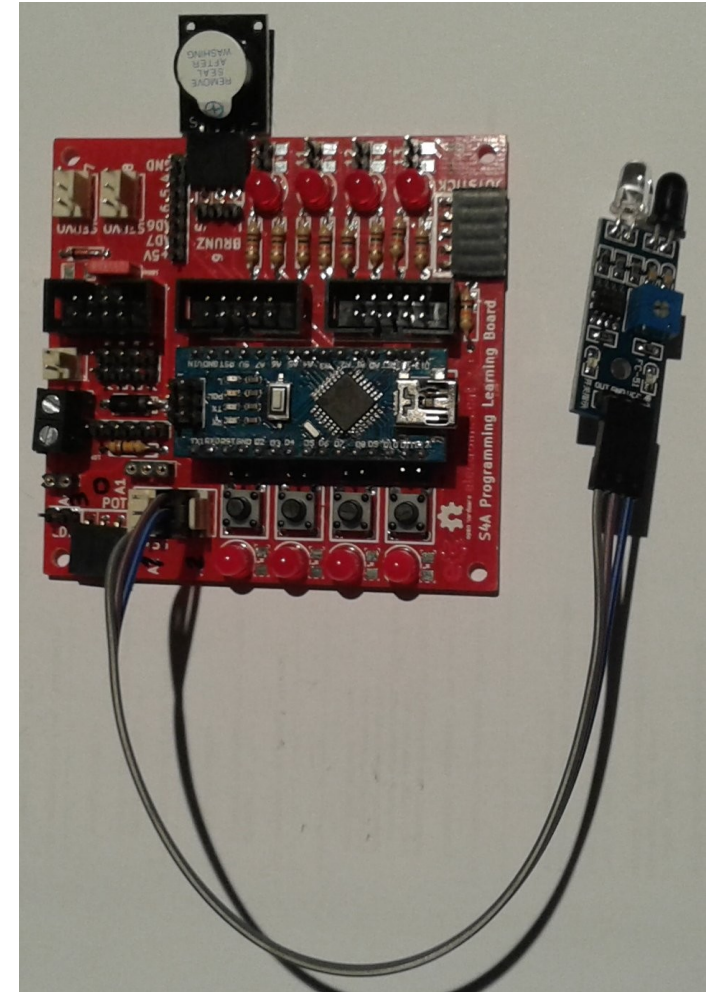
Joystick i servomotors



Per a fer servir el joystick desconnecteu el sensor de temperatura i el sensor infraroig

S4A Programming Learning Board

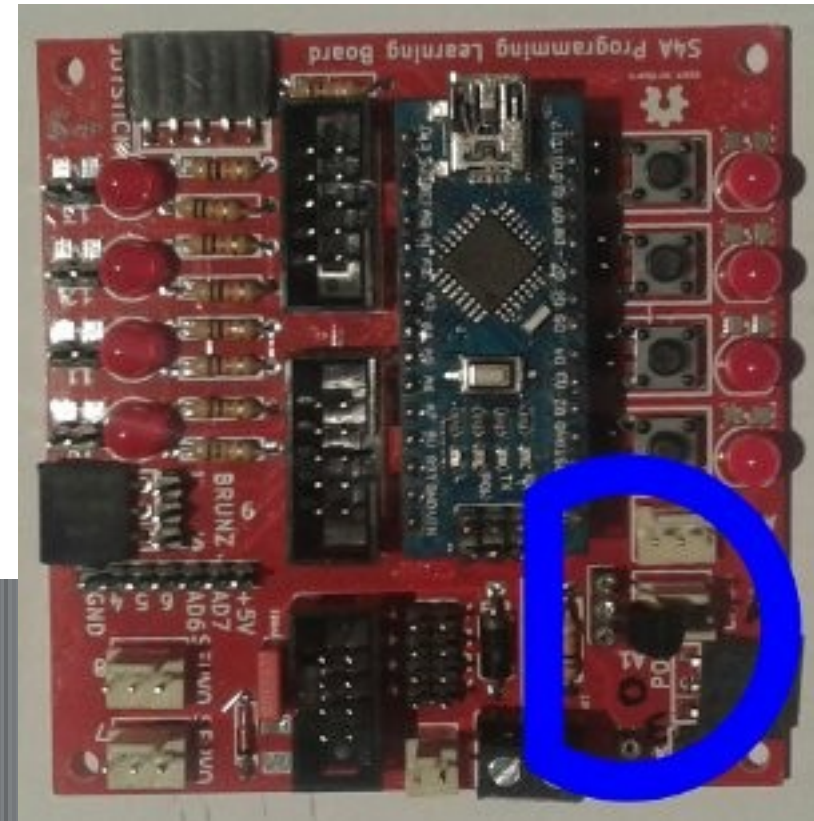
Sensor d'infrarojos i brunzidor



Per a fer servir el sensor infraroig desconnecteu el joystick

S4A Progamming Learning Board

Sensor de temperatura LM35



Per a fer servir el sensor de temperatura desconnecteu el joystick



Scratch 2 Offline Editor

ecat@debian8: ~/Baixades/scratch/s2a_fm-master

Fitxer Edita Visualitza Cerca Terminal Ajuda

Could not instantiate PyMata - is your Arduino plugged in?
ecat@debian8:~/Baixades/scratch/s2a_fm-master\$./s2a_fm.py /dev/ttyUSB0
s2a_fm version 1.5 Copyright(C) 2013-14 Alan Yorinks All Rights Reserved

Python Version 2.7.9 (default, Mar 1 2015, [GCC 4.9.2])

PyMata version 2.12 Copyright(C) 2013-16 Alan Yorinks

Opening Arduino Serial port /dev/ttyUSB0

Please wait while Arduino is being detected
Board initialized in 0 seconds
Total Number of Pins Detected = 22
Total Number of Analog Pins Detected = 8
Please wait for Total Arduino Pin Discovery additional seconds.
Arduino Total Pin Discovery completed in 0 seconds
Starting HTTP Server!
Use <Ctrl-C> to exit the extension

Please start Scratch or Snap!
Scratch detected! Ready to rock and roll...

cd /home/ecat/Baixades/scratch/s2a_fm-master

Scratch 2 Offline Editor

SCRATCH Fitxer Edita Consells Quant a

Programes Vestits Sons

Moviment Aspecte Sons Llapis Dades Esdeveniments Control Sensors Operadors Més Blocs

Crea un Bloc

s2a_fm - Scratch to Arduino

Enable Digital Pin PIN for Input

Enable Analog Pin (A) PIN for Input

DigitalWrite Set Pin PIN to 0

AnalogWrite (PWM) Set Pin PIN to

Play Tone on Pin: PIN HZ: 1000 m

Turn Tone Off for Pin: PIN

Move Servo on Pin PIN Deg: 90

Read Digital Pin PIN

Read Analog Pin (A) PIN

Personatges Nou personatge:

X: 63 Y: 180

electronics.cat

https://github.com/MrYsLab/s2a_fm



S4A Programming Learning Board

Microprogramari per l'Scratch 2

El microprogramari és el programari del maquinari

Català

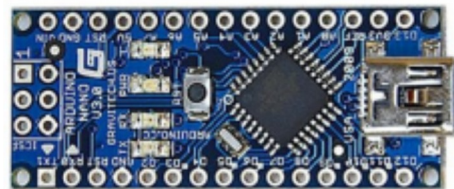
Programari
Maquinari
Microprogramari

Anglès

Software
Hardware
Firmware



Arduino Nano



```
StandardFirmata | Arduino 2:1.0.5+dfsg2-4
Fitxer Edita Sketch Eines Ajuda

StandardFirmata
* any host computer software package.
*
* To download a host software package, please click on the following
* to open the download page in your default browser.
*
* http://firmata.org/wiki/Download
*/

/*
Copyright (C) 2006-2008 Hans-Christoph Steiner. All rights reserved.
Copyright (C) 2010-2011 Paul Stoffregen. All rights reserved.
Copyright (C) 2009 Shigeru Kobayashi. All rights reserved.
Copyright (C) 2009-2011 Jeff Hoefs. All rights reserved.

This library is free software; you can redistribute it and/or
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version 2.1 of the License, or (at your option) any later version.

See file LICENSE.txt for further informations on licensing terms.

formatted using the GNU C formatting and indenting

Guardat enllestit.

1 Arduino Nano w/ ATmega328 on /dev/ttyUSB0
```

Microprogramari per l'Arduino per funcionar amb l'Scratch 2 Offline Editor:
<http://binefa.cat/php/training/s4a/StandardFirmata.tar.gz>



Scratch 2 Offline Editor

Hardware Extension

s2aio

<https://github.com/MrYsLab/s2aio/wiki>

The Arduino Hardware Extension For Snap! and the Scratch 2.0 Offline Editor



s2a_fm

Previous version of ***s2aio***

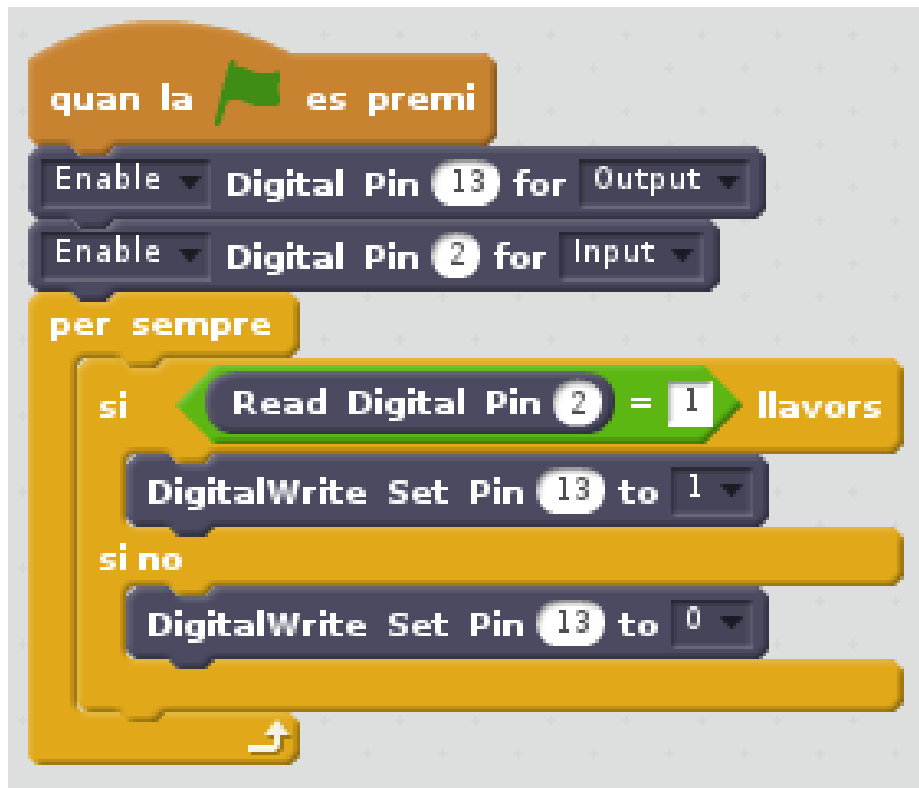
https://github.com/MrYsLab/s2a_fm



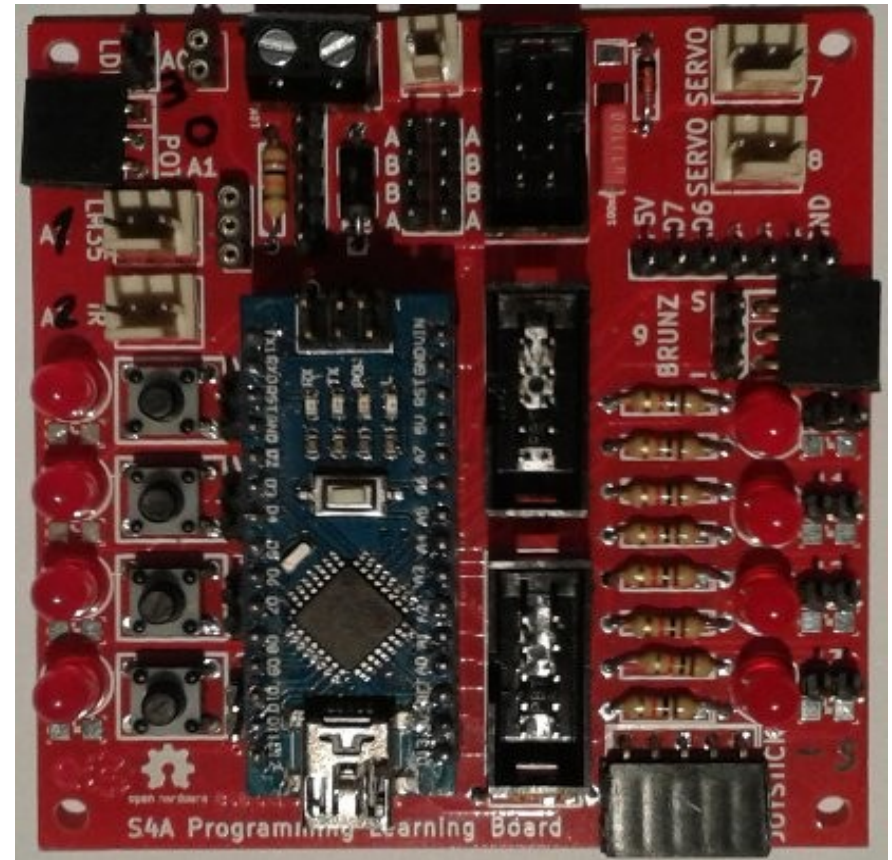
Scratch 2 Offline Editor

Hardware Extension (s2a_fm.s2e)

sc2_prova00.sb2



A4
A5
3
2



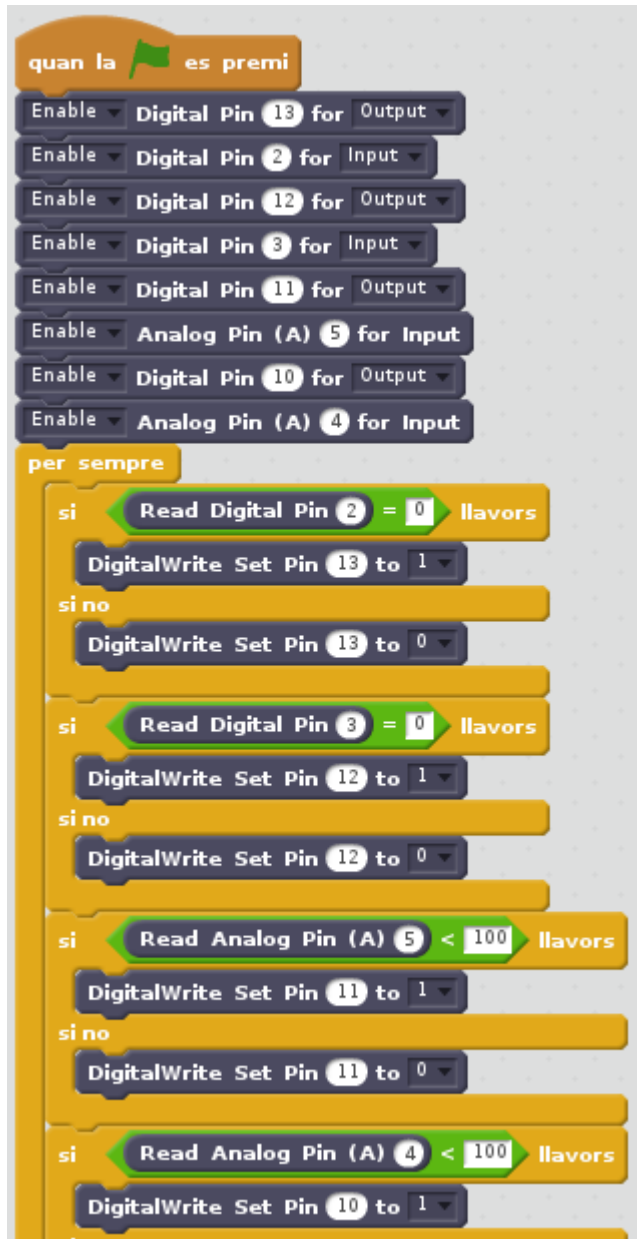
10
11
12
13



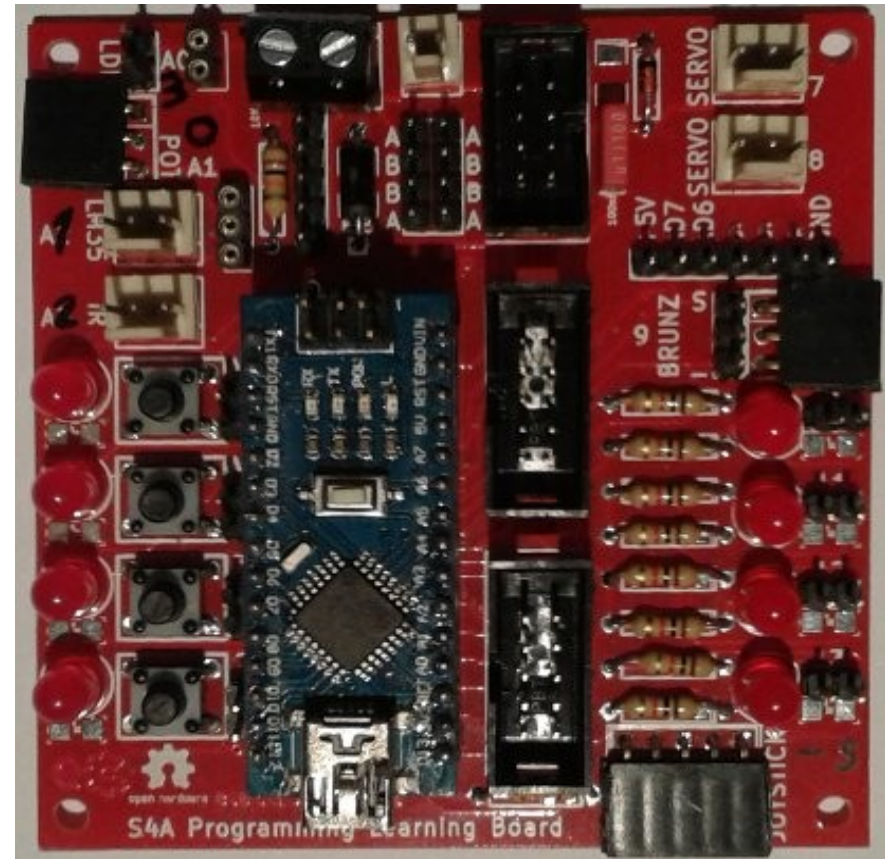
Scratch 2 Offline Editor

Hardware Extension (s2a_fm.s2e)

sc2_prova01.sb2



A4
A5
3
2



10
11
12
13

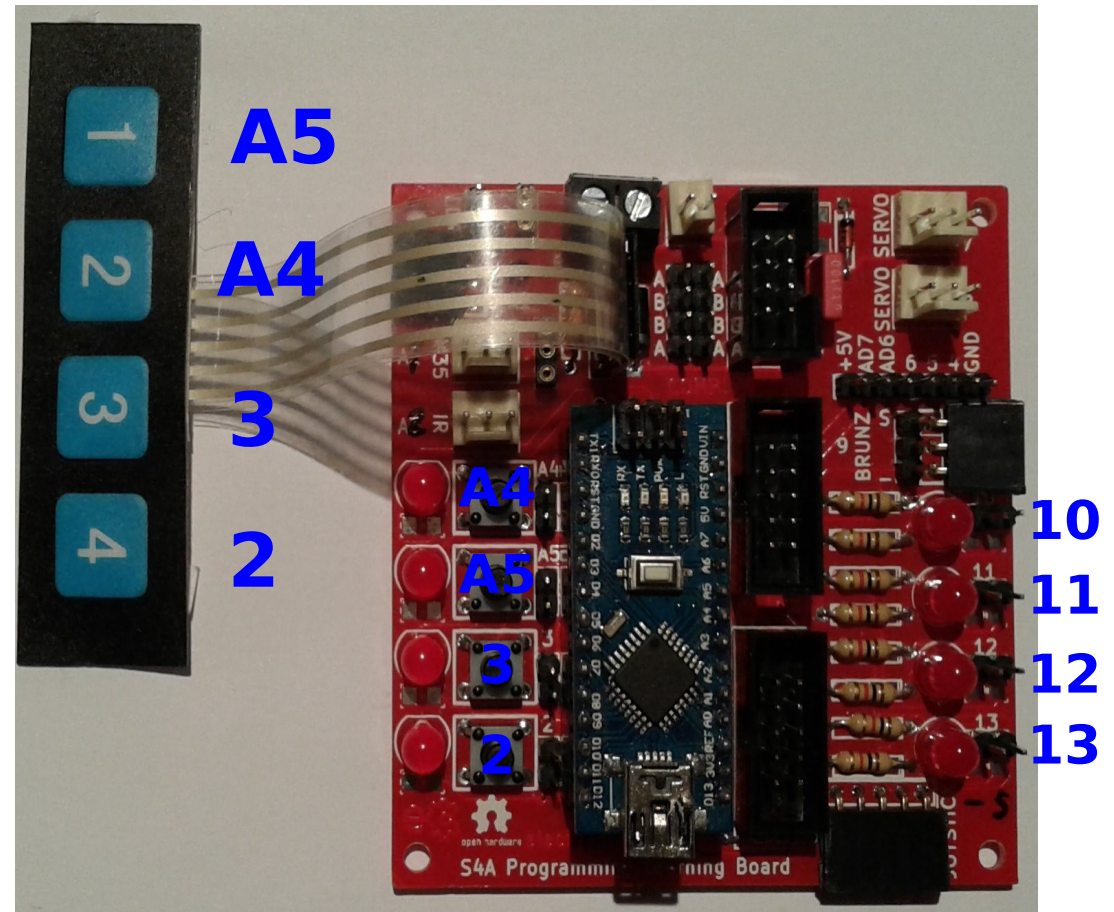
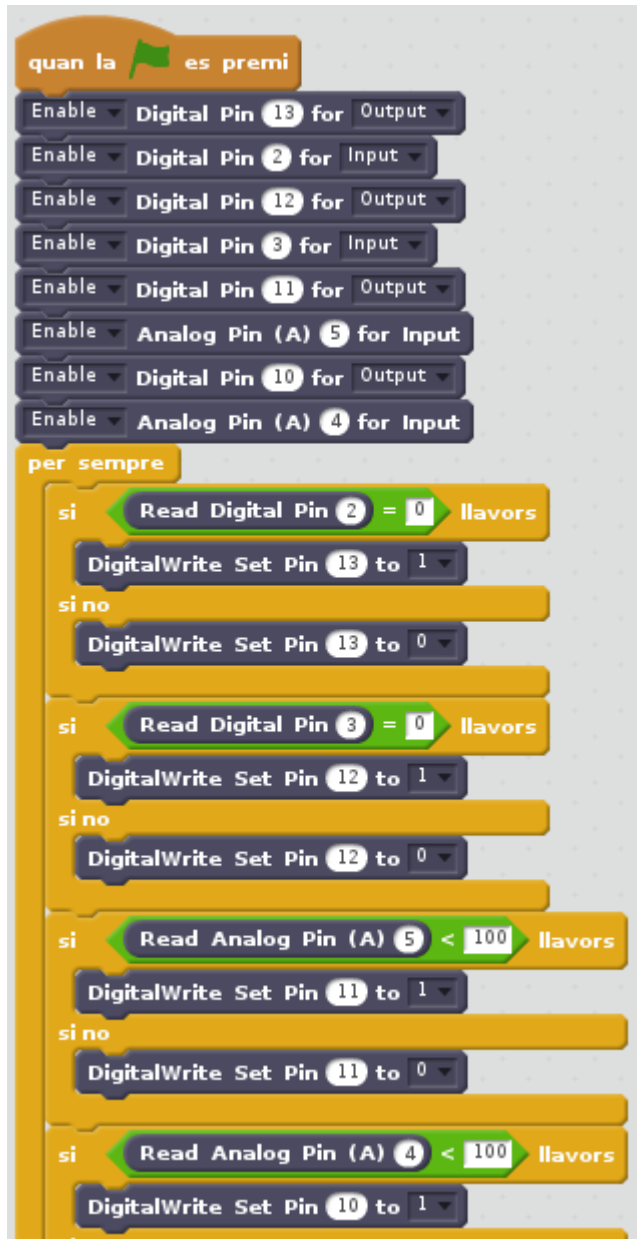
<http://binefa.cat/php/training/s4a/codi.tar.gz>



Scratch 2 Offline Editor

Hardware Extension (s2a_fm.s2e)

sc2_prova01.sb2



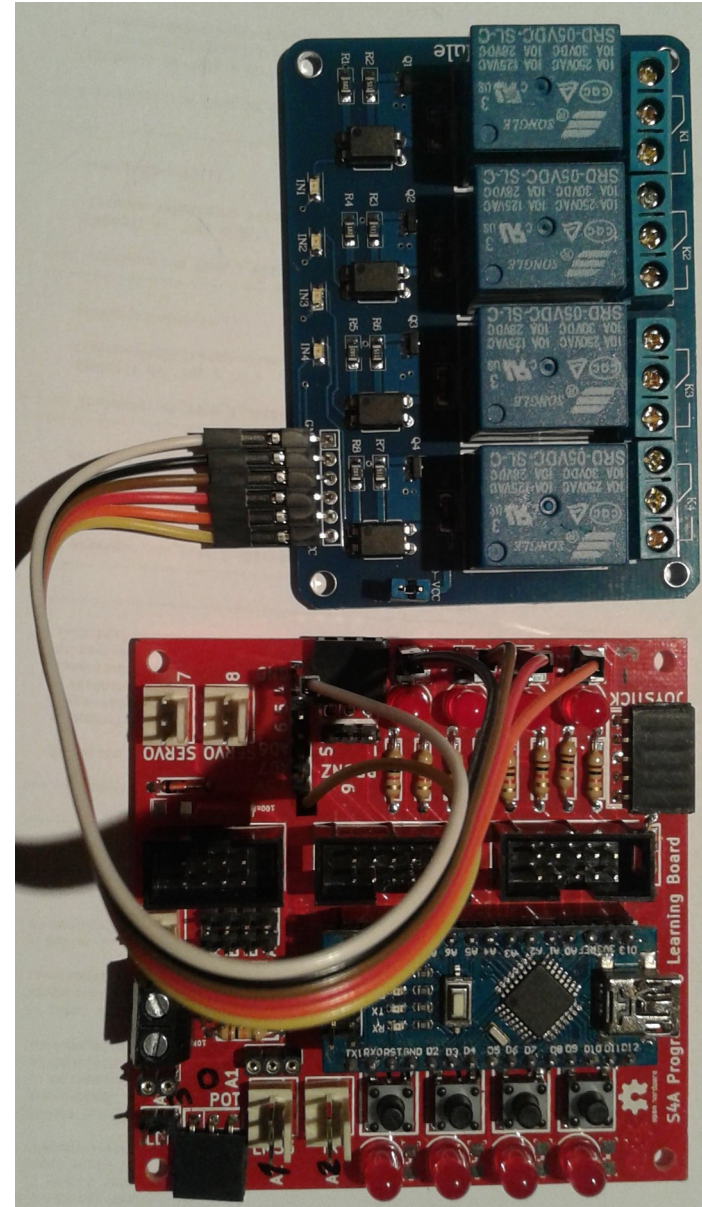
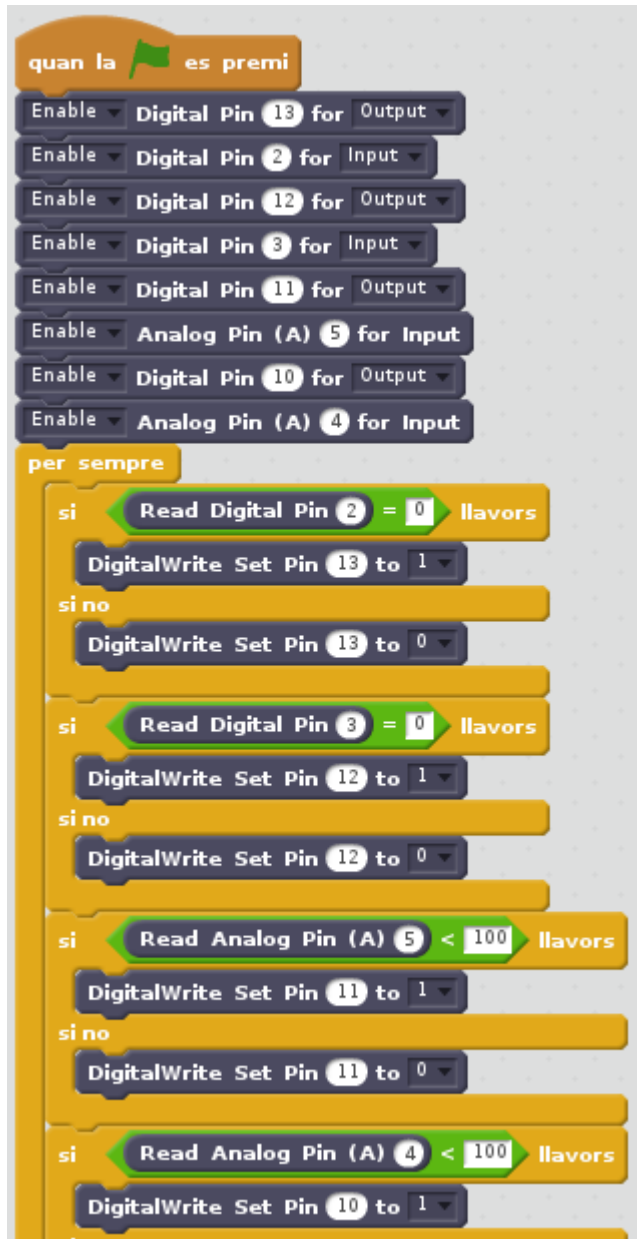
<http://binefa.cat/php/training/s4a/codi.tar.gz>



Scratch 2 Offline Editor

Hardware Extension (s2a_fm.s2e)

sc2_prova01.sb2



<http://binefa.cat/php/training/s4a/codi.tar.gz>

S4A Progamming Learning Board

Concepte de relé

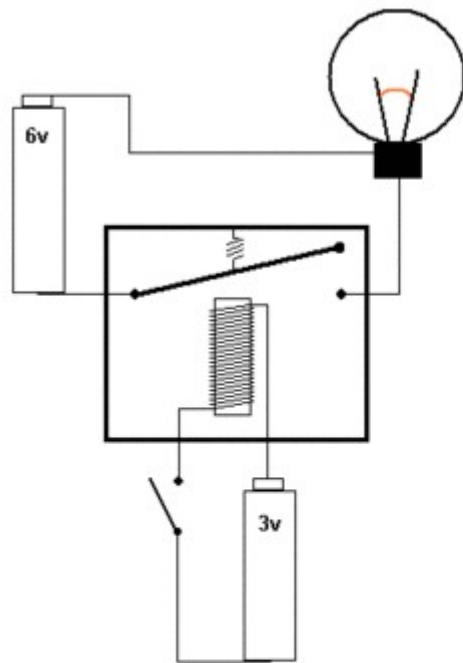


Figure 1: Relay off

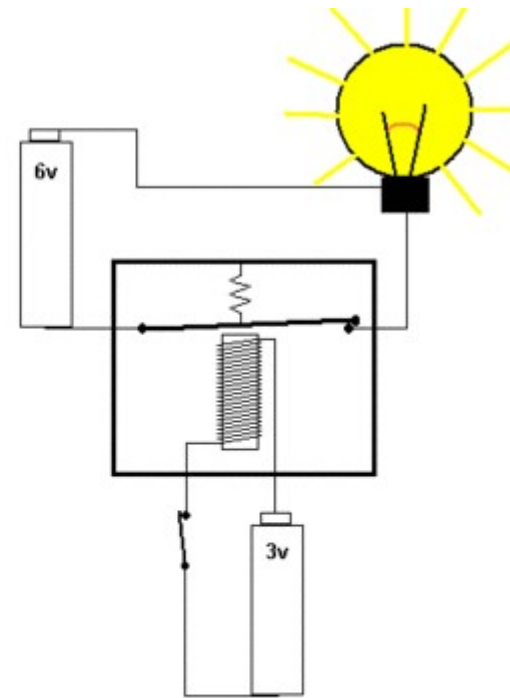
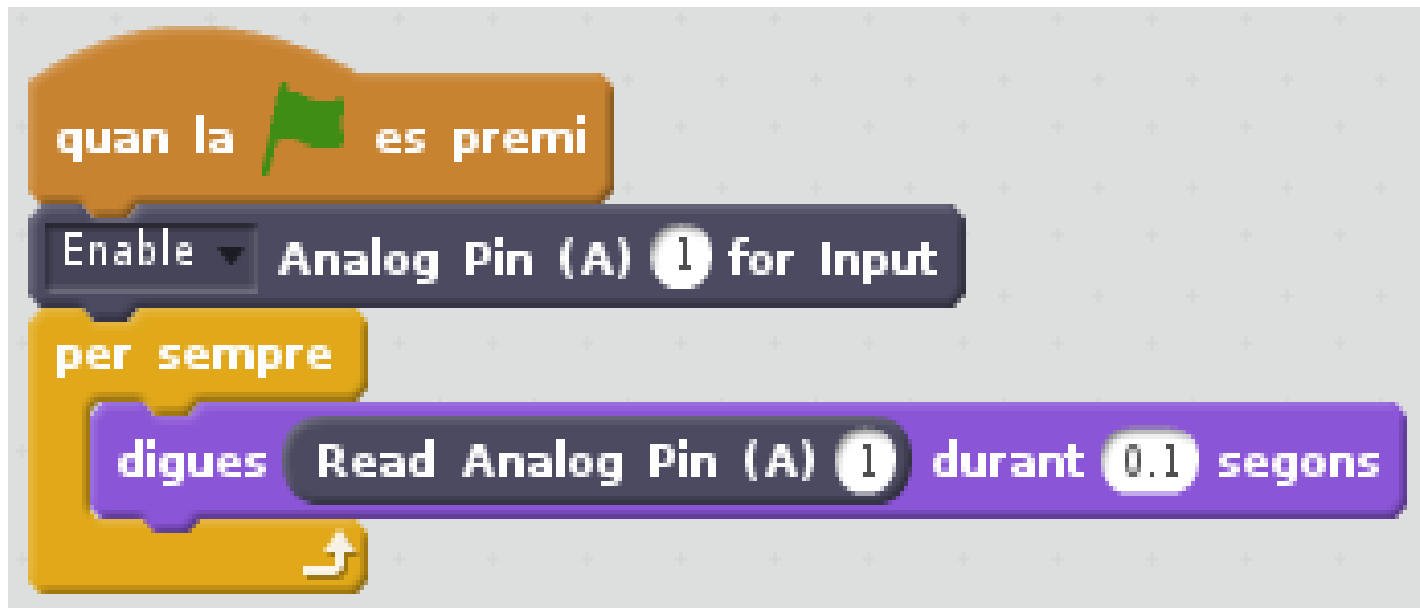


Figure 2: Relay on

Scratch 2 Offline Editor

Hardware Extension (s2a_fm.s2e)

sc2_prova04_potA1.sb2



<http://binefa.cat/php/training/s4a/codi.tar.gz>

Scratch 2 Offline Editor

Hardware Extension (s2a_fm.s2e)

sc2_prova05_Arkanoid.sb2

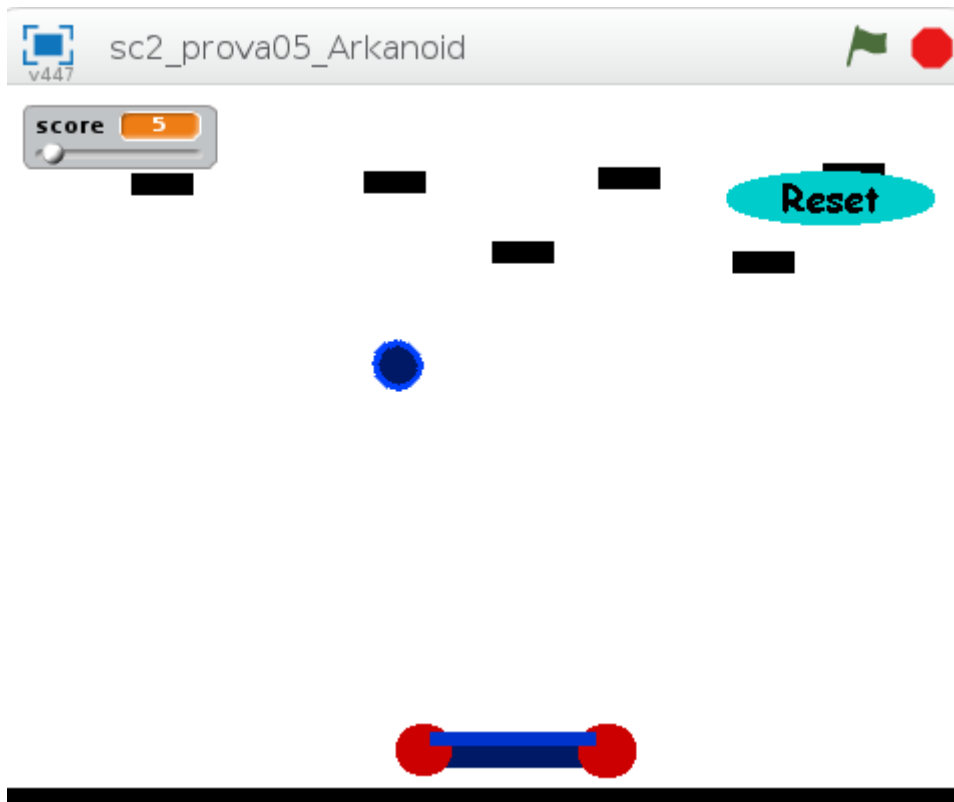
The screenshot shows the Scratch 2 Offline Editor interface for a project named 'sc2_prova05_Arkanoid'. The main stage displays a game scene with a paddle at the bottom, a ball in the center, and several bricks at the top. A 'Reset' button is visible on the right. The 'Programes' panel on the right shows a script for the ball's movement, including a 'per sempre' loop for volume, a 'quan rebi' event for the Reset button, and a 'quan la bandera es premiada' event for the game's main loop. The 'Personatges' panel at the bottom shows the objects used in the game.



Scratch 2 Offline Editor

Hardware Extension (s2a_fm.s2e)

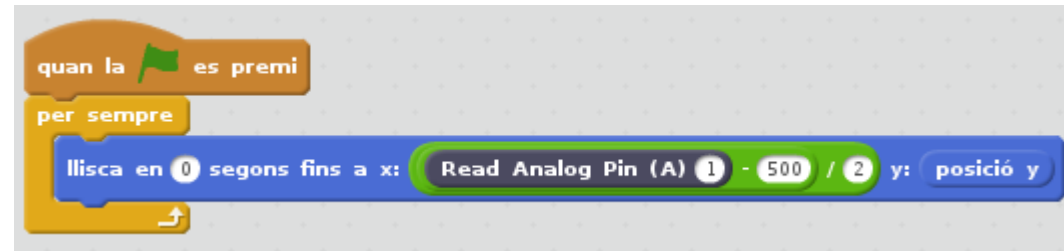
sc2_prova05_Arkanoid.sb2



Scratch 2 Offline Editor

Hardware Extension (s2a_fm.s2e)

sc2_prova06_ScratchArkanoid.sb2

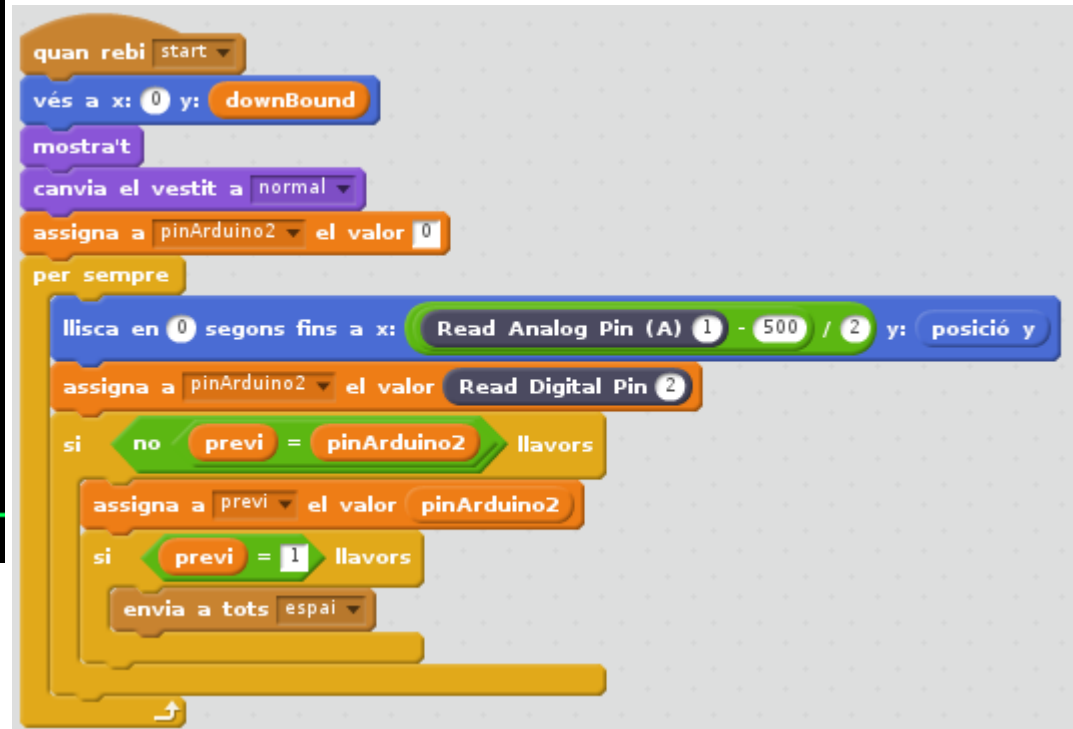




Scratch 2 Offline Editor

Hardware Extension (s2a_fm.s2e)

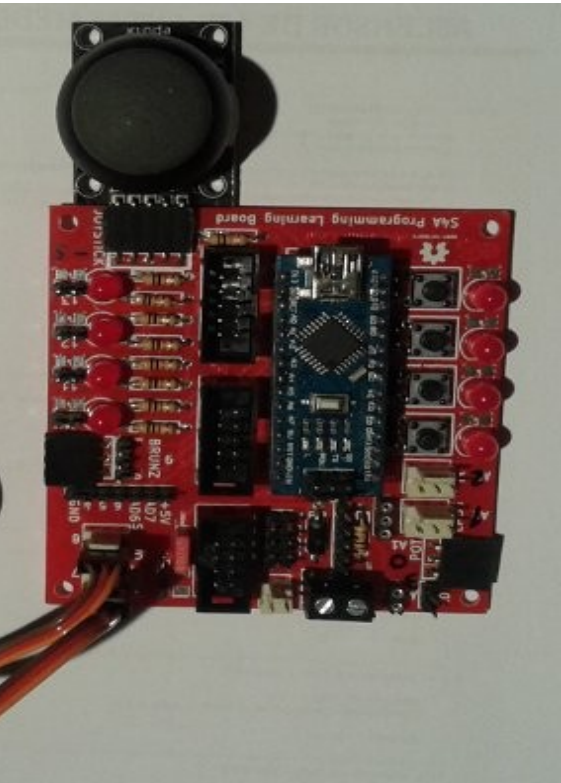
sc2_prova07_SpaceInvaders1.4.sb2



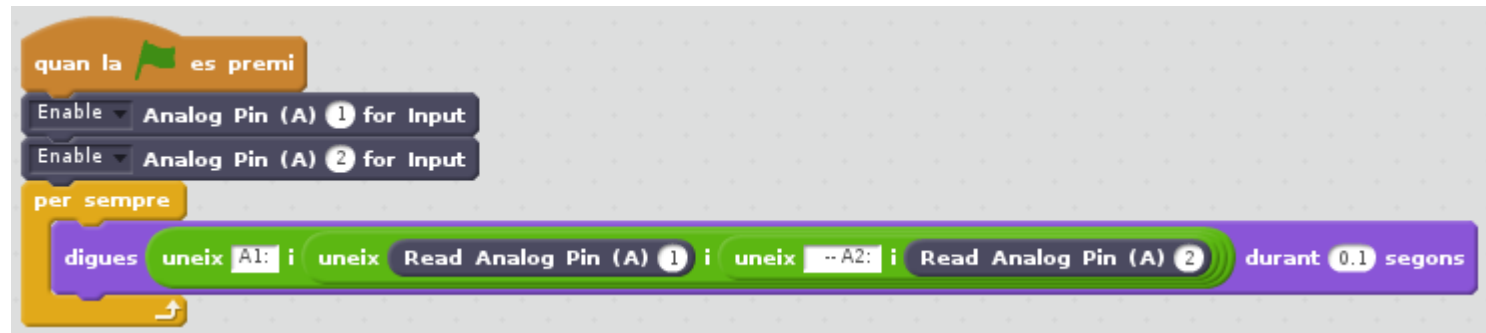


Scratch 2 Offline Editor

Hardware Extension (s2a_fm.s2e)



sc2_prova08_JoystickA1A2.sb2





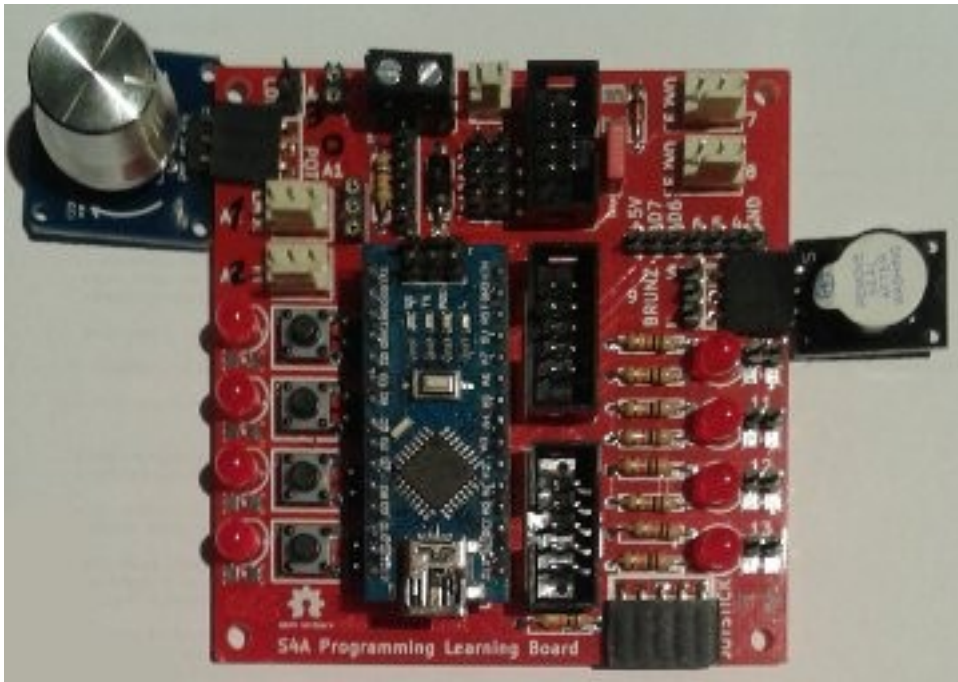
Scratch 2 Offline Editor

Hardware Extension (s2a_fm.s2e)

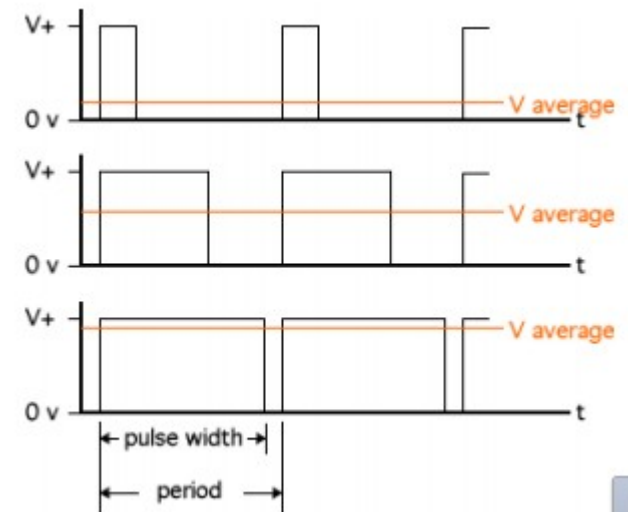
sc2_prova09_potA1brunz.sb2



A1



9



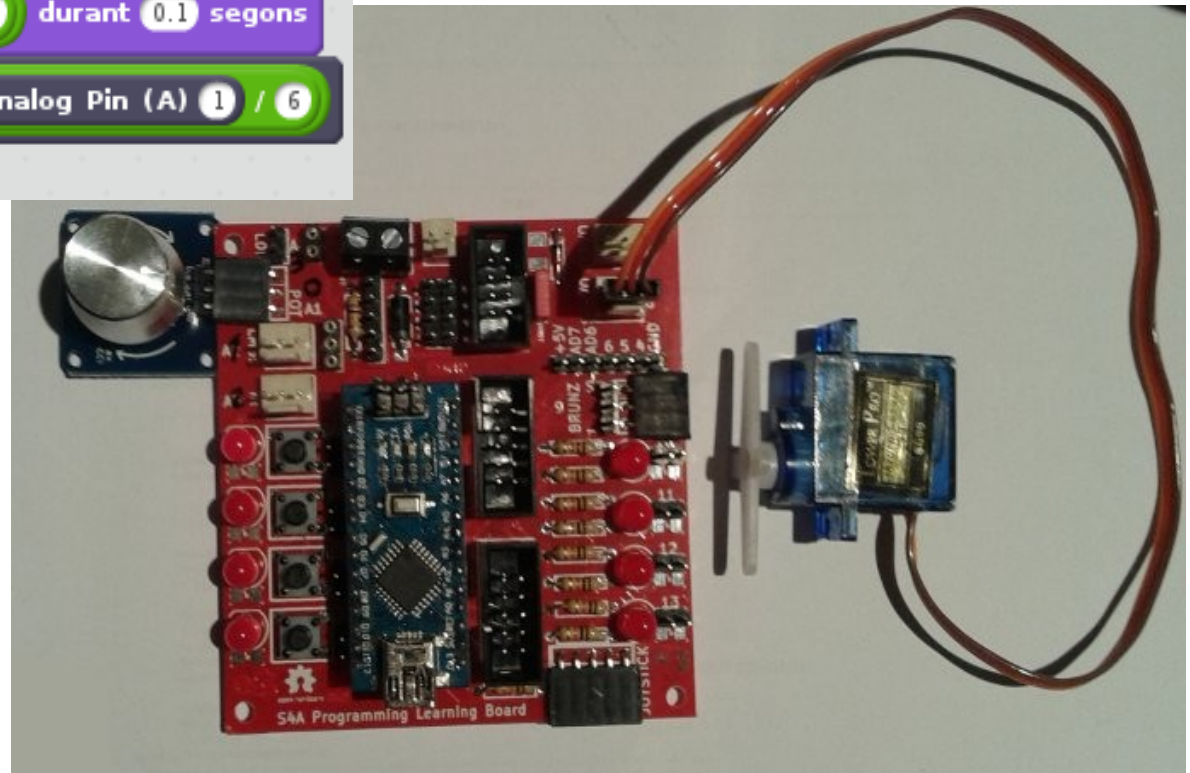
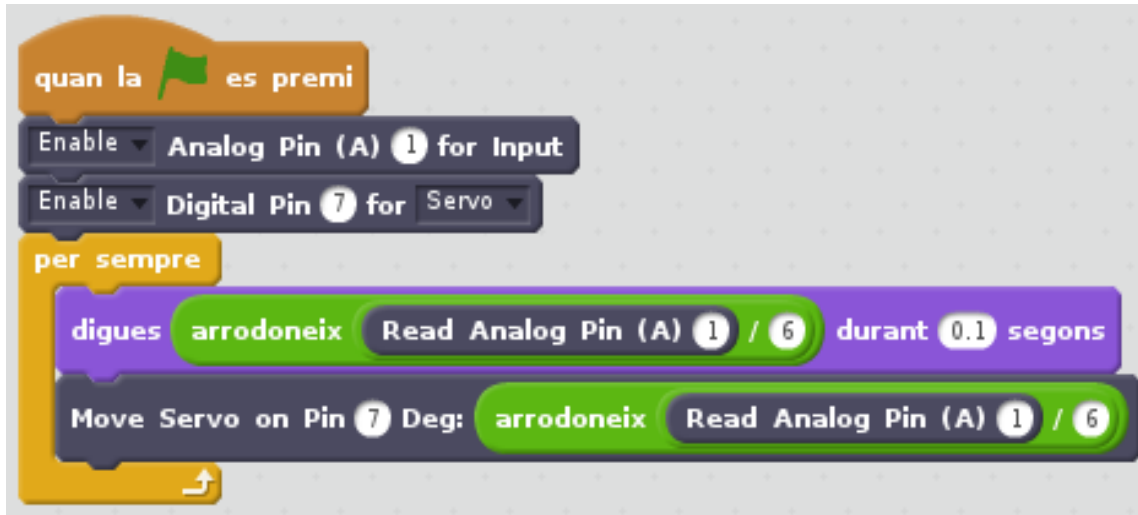
<http://binefa.cat/php/training/s4a/codi.tar.gz>



Scratch 2 Offline Editor

Hardware Extension (s2a_fm.s2e)

sc2_prova10_potA1_servo7.sb2



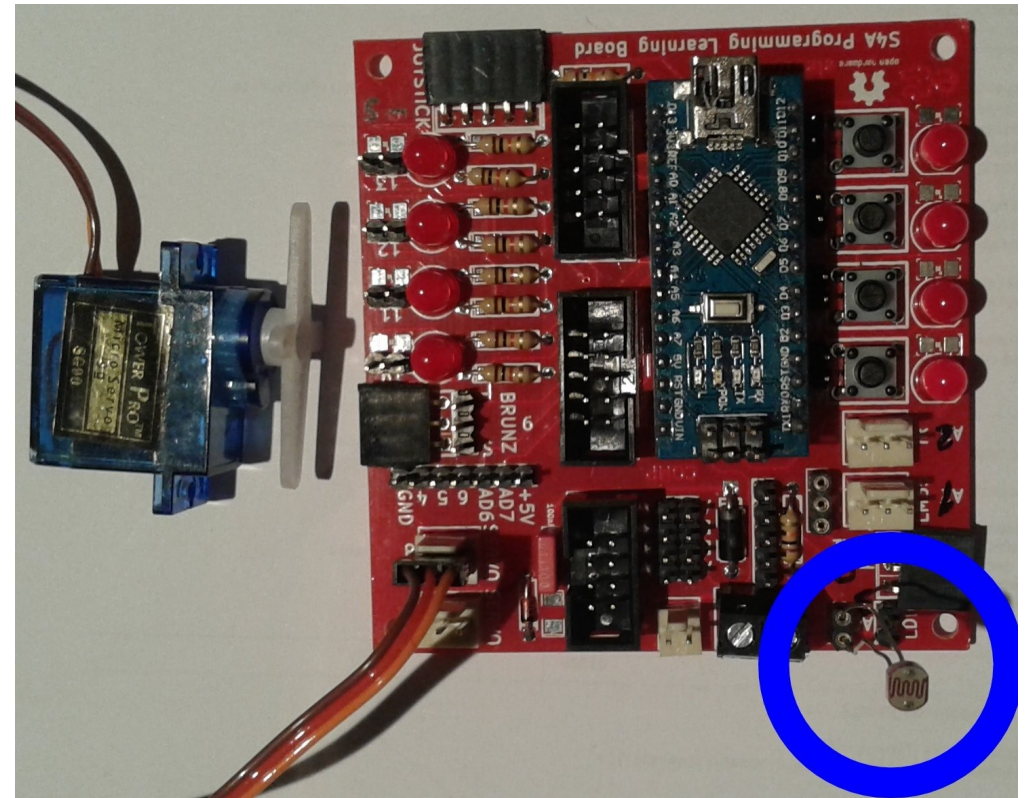
<http://binefa.cat/php/training/s4a/codi.tar.gz>



Scratch 2 Offline Editor

Hardware Extension (s2a_fm.s2e)

sc2_prova11_ldrA0_servo7.sb2



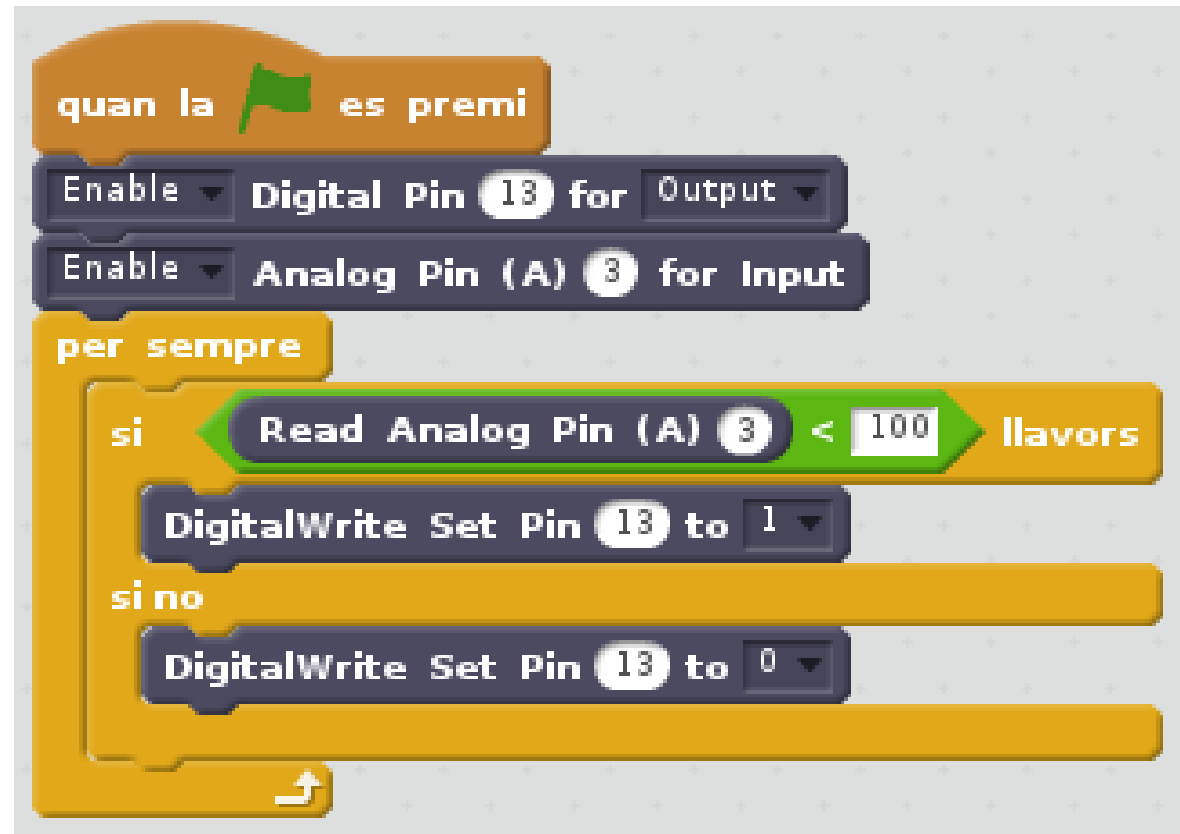
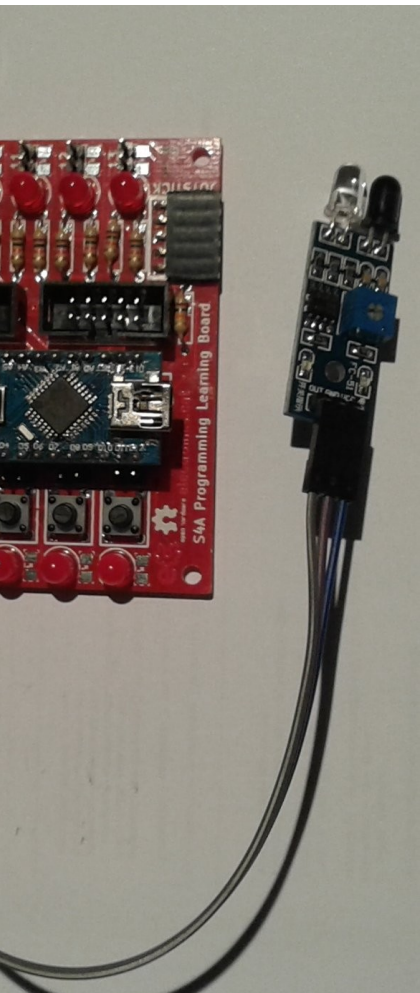
<http://binefa.cat/php/training/s4a/codi.tar.gz>



Scratch 2 Offline Editor

Hardware Extension (s2a_fm.s2e)

sc2_prova12irRelay.sb2



<http://binefa.cat/php/training/s4a/codi.tar.gz>

S4A Programming Learning Board

Ús d'ArduBlock

The screenshot displays the ArduBlock software interface for programming an Arduino board. The sidebar on the left lists various function categories: Control, Pins, Tests, Math Operators, Variables/Constants, Generic Hardware, Communication, SCoop (Multitask), Storage, Networking, Code Blocks, TinkerKit, DFRobot, Seeed Studio Grove, DuinoEDU Grove Add, Adafruit, Makeblock, Insect Bot, 4Drawing, LittleBits, and Keenlon.

The central workspace shows a block-based programming project. A yellow 'do' loop block contains the following sequence of blocks:

- set digital pin # 13 to HIGH
- serial println LED ON
- delay MILLIS milliseconds 1000
- set digital pin # 13 to LOW
- serial println LED OFF
- delay MILLIS milliseconds 1000

The code editor on the right shows the corresponding C++ code for the project:

```

provesArduBlock | Arduino 1.6.5
Fitxer Edita Sketch Eines Ajuda

provesArduBlock

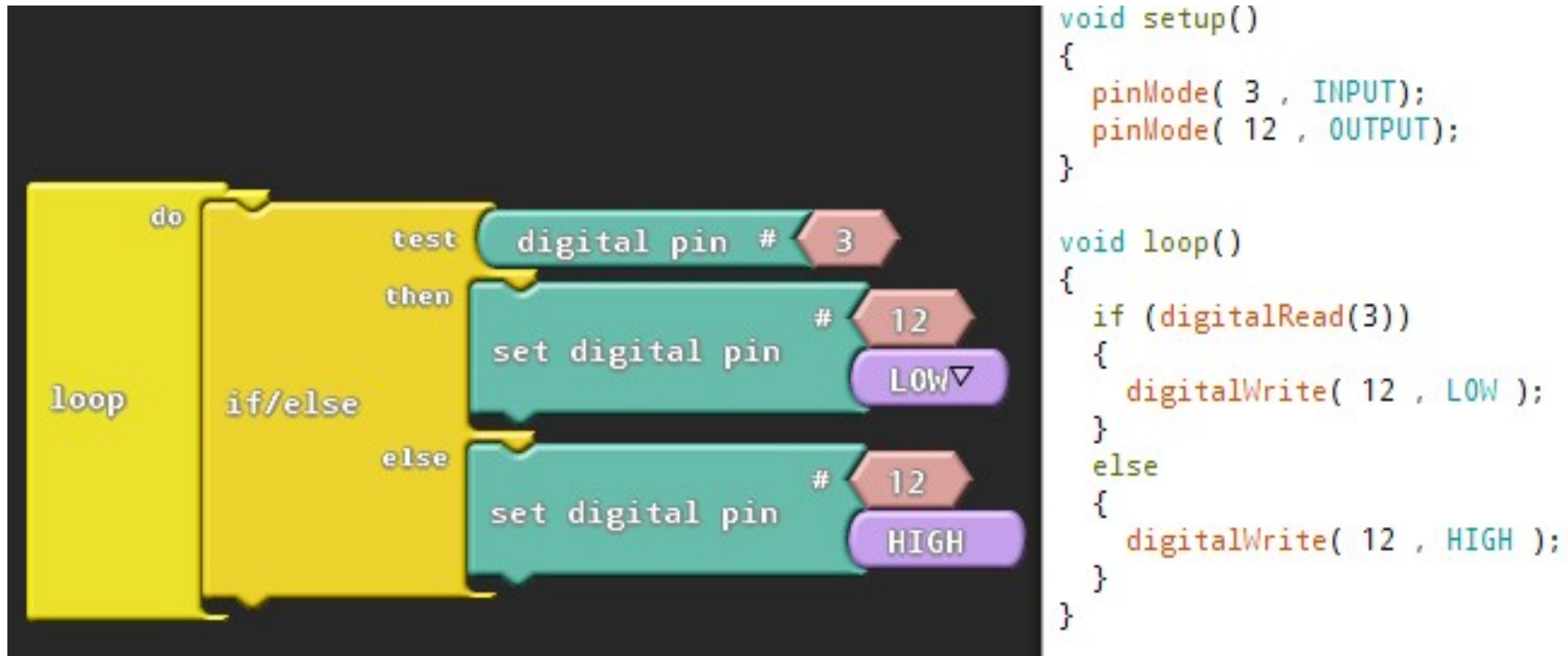
void setup()
{
  pinMode( 13 , OUTPUT);
  Serial.begin(9600);
}

void loop()
{
  digitalWrite( 13 , HIGH );
  Serial.print("LED ON");
  Serial.println();
  delay( 1000 );
  digitalWrite( 13 , LOW );
  Serial.print("LED OFF");
  Serial.println();
  delay( 1000 );
}
  
```



S4A Programming Learning Board

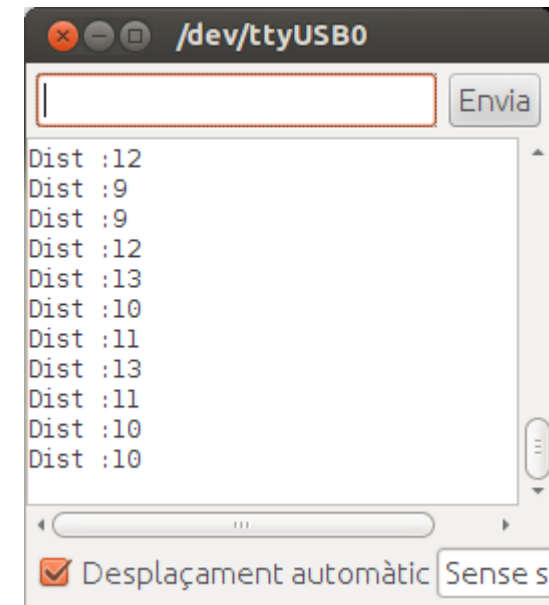
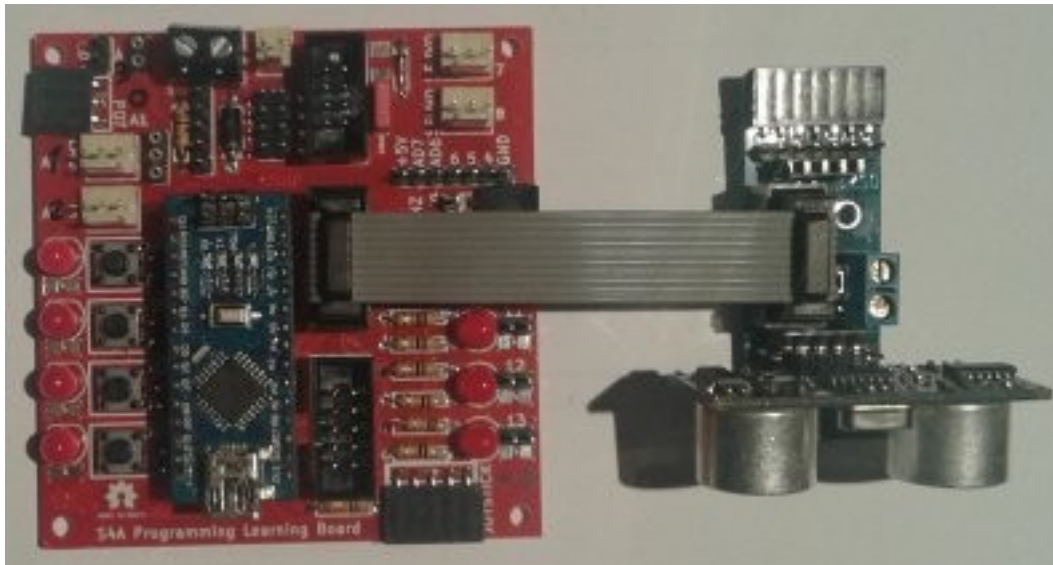
Ús d'ArduBlock





S4A Programming Learning Board

Ús d'ArduBlock



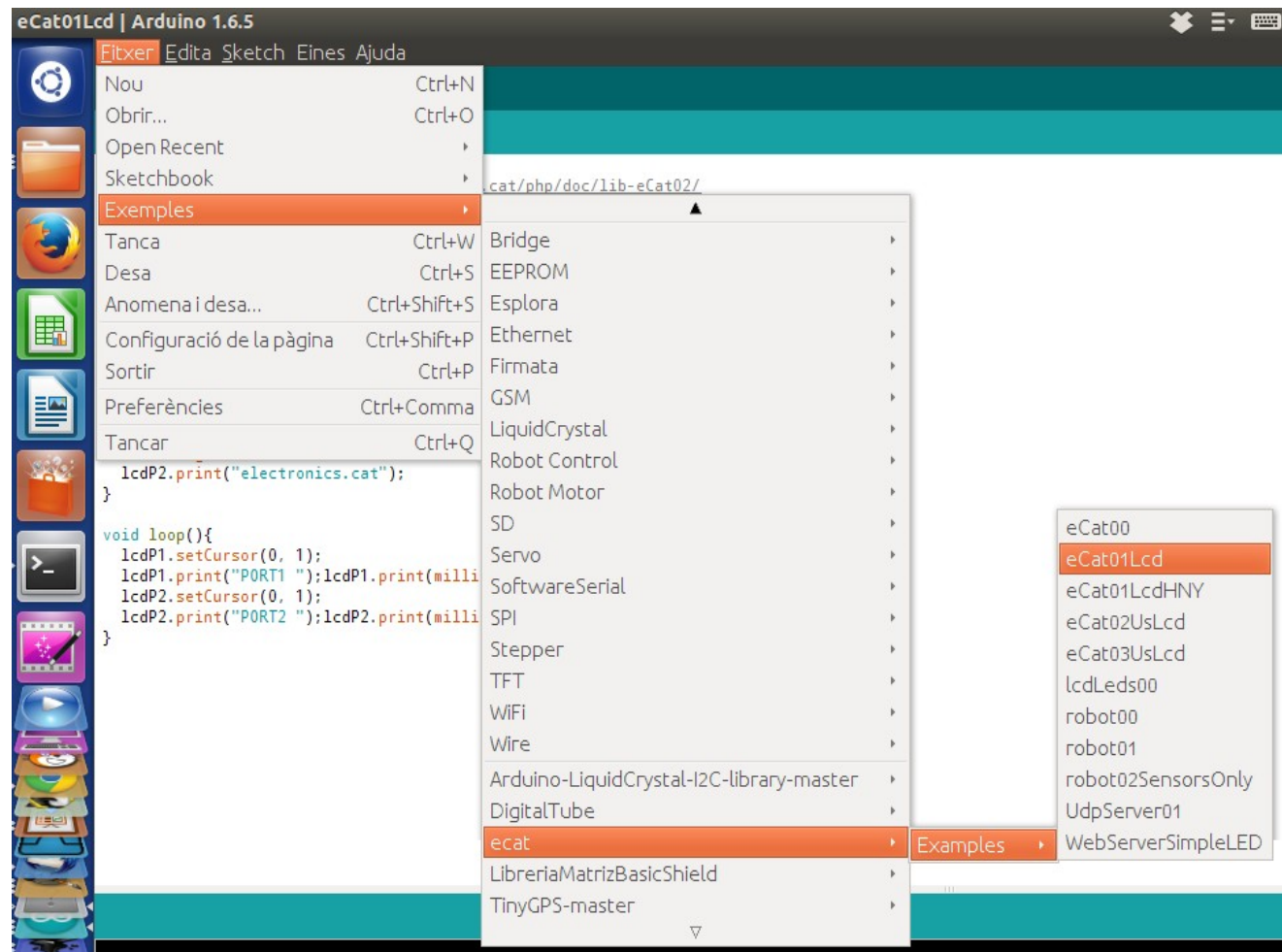
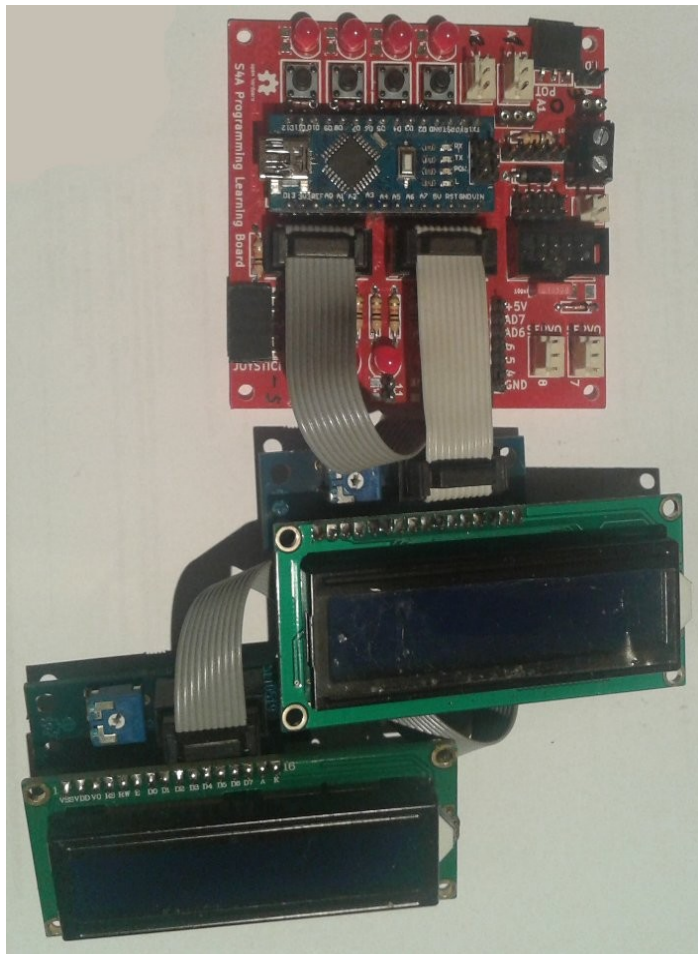
<http://www.binefa.cat/php/arduino/ardublock/pr05ultrasons.abp>

<http://www.binefa.cat/php/doc/pr002/>



S4A Programming Learning Board

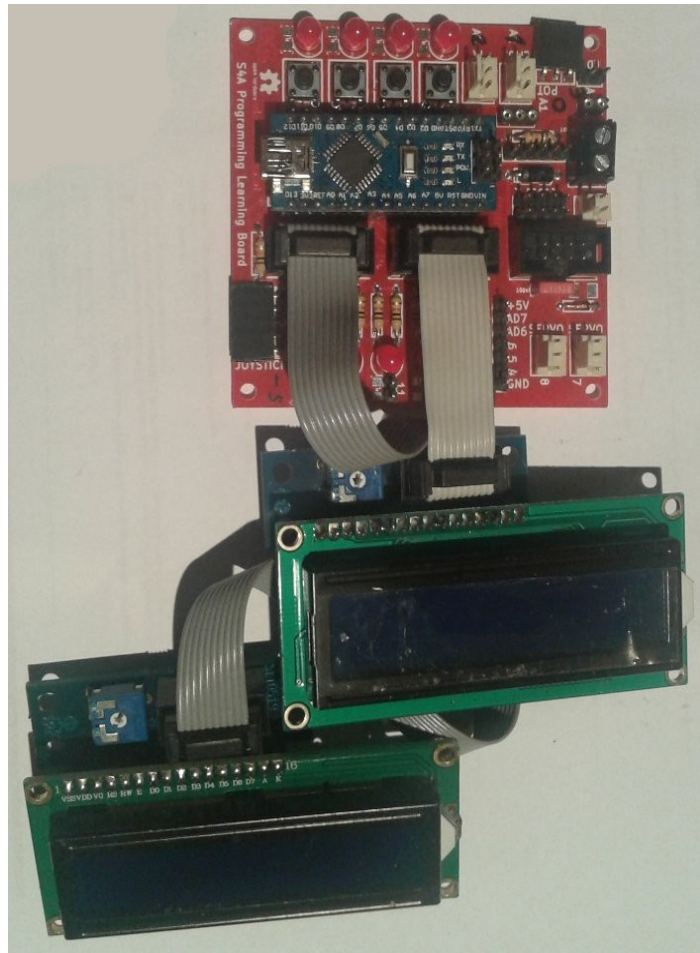
Ús de la biblioteca ecat.h





S4A Programming Learning Board

Ús de la biblioteca ecat.h



```

/*
Connection schematic at http://www.binefa.cat/php/doc/lib-eCat02/
*/

#include <ecat.h>
#include <LiquidCrystal.h>

Ecat ecat;
lcdP1_init();
lcdP2_init();

void setup(){
  lcdP1.begin(16, 2);
  lcdP1.print("ecat.h - v");lcdP1.print(ecat.fVersion());
  lcdP2.begin(16, 2);
  lcdP2.print("electronics.cat");
}

void loop(){
  lcdP1.setCursor(0, 1);
  lcdP1.print("PORT1 ");lcdP1.print(millis()/1000);lcdP1.print(" seconds");
  lcdP2.setCursor(0, 1);
  lcdP2.print("PORT2 ");lcdP2.print(millis()/1000);lcdP2.print(" seconds");
}

```



S4A Programming Learning Board

BUS : Sistema digital que transfereix dades entre dispositius electrònics

GND	b7
b6	b5
b4	b3
b2	b1
b0	+5V

Cable pla
5x2 a 5x2
(0104A)



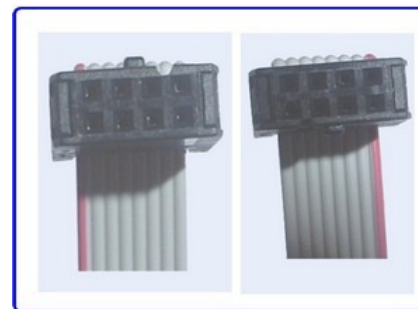
CTS / RTS

TX / RX

RX / TX

+5V	o
CTS / RTS	o X
TX / RX	o X
RX / TX	o GND

Cable pla
4x2 a 4x2
(0311)



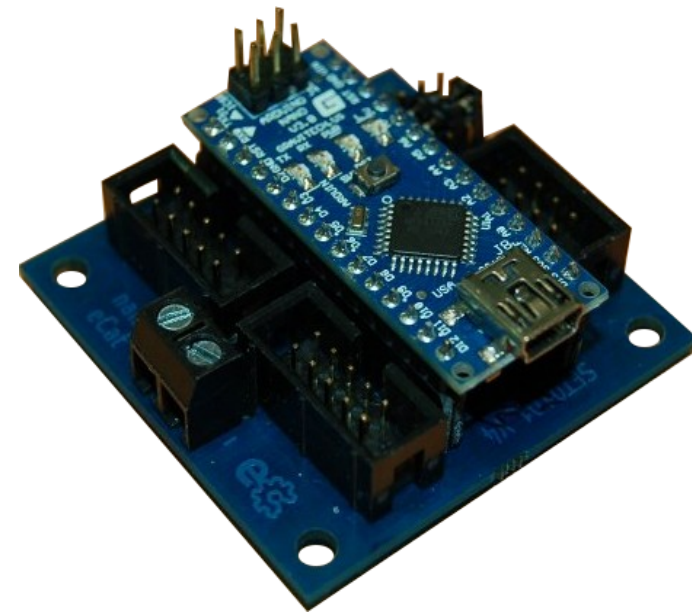
eCat System : Dues tipologies de BUS, dades (8 bits) i comunicacions

eS4A Programming Learning Board

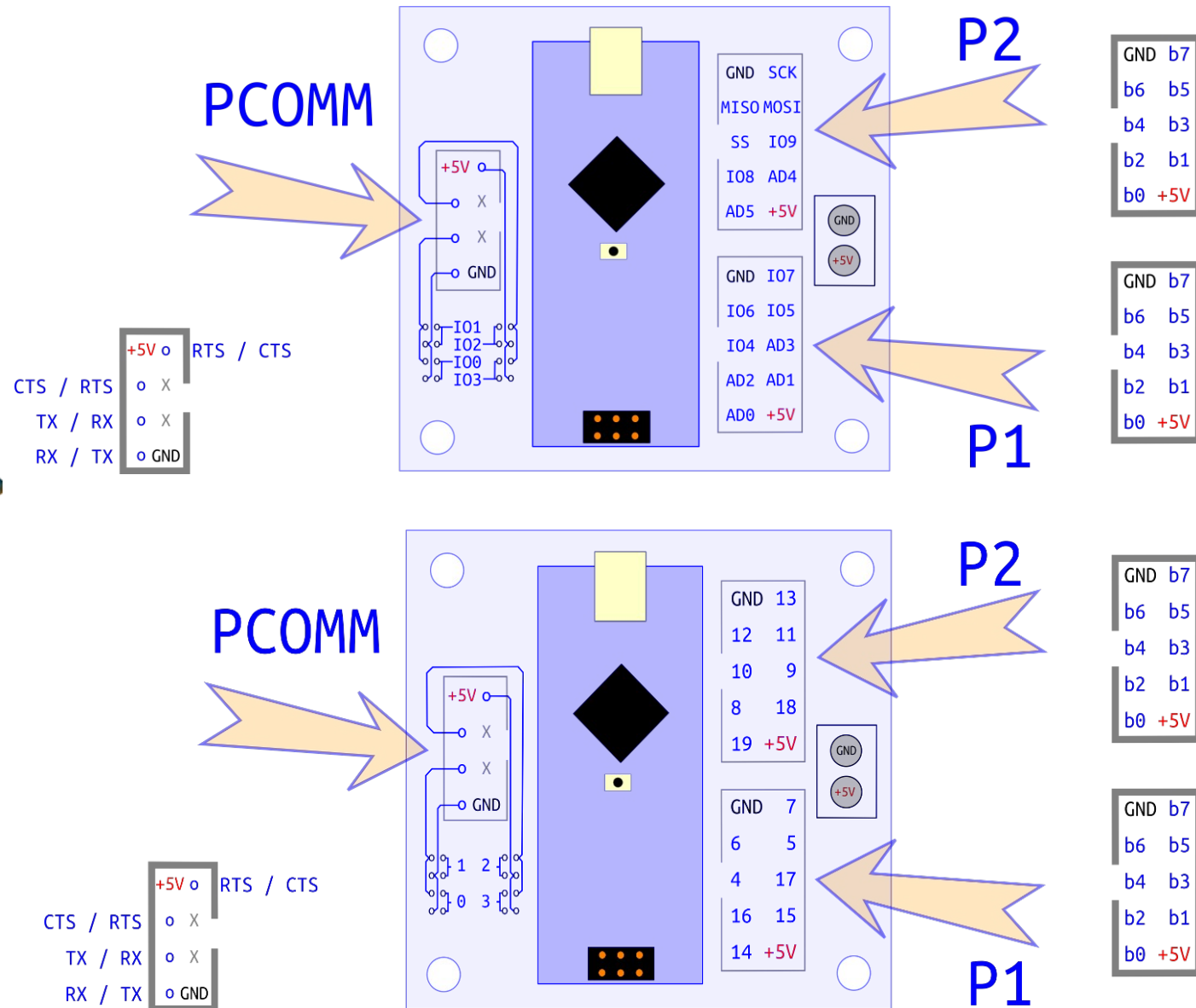
Plaques amb sistema de bus lliure eCat

nano-eCat

Placa 0101 v4



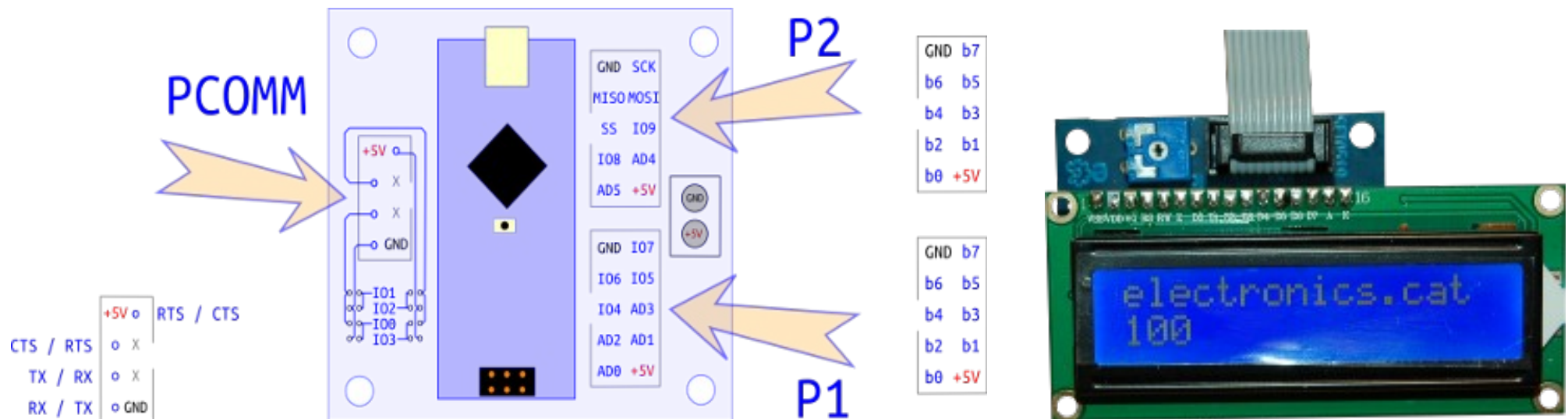
Placa convertidora de l'Arduino Nano al sistema de bus lliure eCat System



e⚙️ S4A Programming Learning Board

LCD

Afegiu el mòdul de l'LCD a P1 de la nano-eCat :



<http://www.binefa.cat/php/arduino/serialWrRd04LcdP1.zip>

e⚙️ S4A Programming Learning Board

Instal·lació de l'Scratch for Arduino (S4A)

Paquet de l'S4A per a Debian / Ubuntu

Es pot instal·lar fent servir el gestor de paquets per defecte o escrivint al terminal :

```
sudo dpkg -i S4A16.deb
```

e♣ S4A Programming Learning Board

Instal·lació d'ArduBlock

Des del navegador web descarregueu-vos **ardublock-beta-20140828** :
<http://sourceforge.net/projects/ardublock/files/ardublock-beta-20140828.jar/download>

A les versions de l'IDE d'Arduino prèvies a la versió 1.6.1 :

Copieu **ardublock-beta-20140828.jar** a : ~/sketchbook/tools/ArduBlockTool/tool

A la versió de l'IDE d'Arduino 1.6.1 o superior :

Copieu **ardublock-beta-20140828.jar** a : ~/Arduino/tools/ArduBlockTool/tool



Altres maquinari lliure

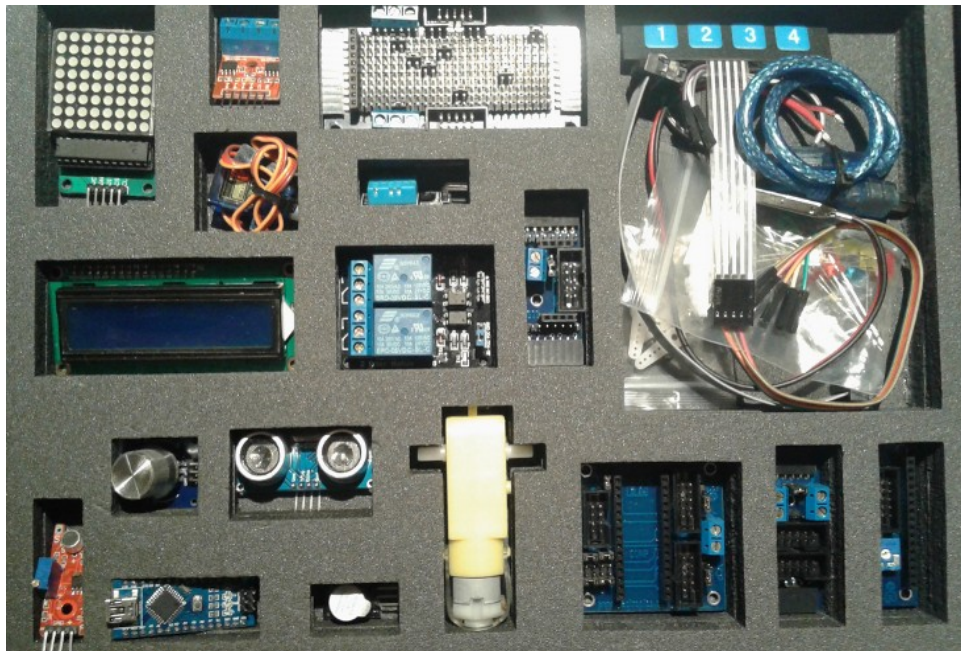
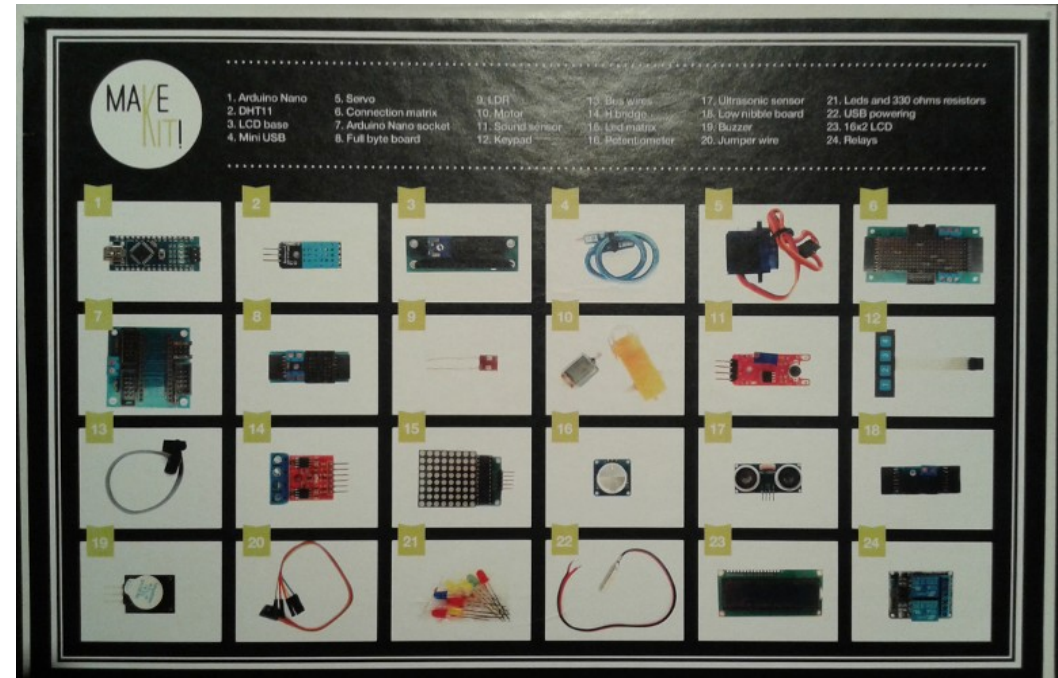
Make It!





Altres maquinari lliure

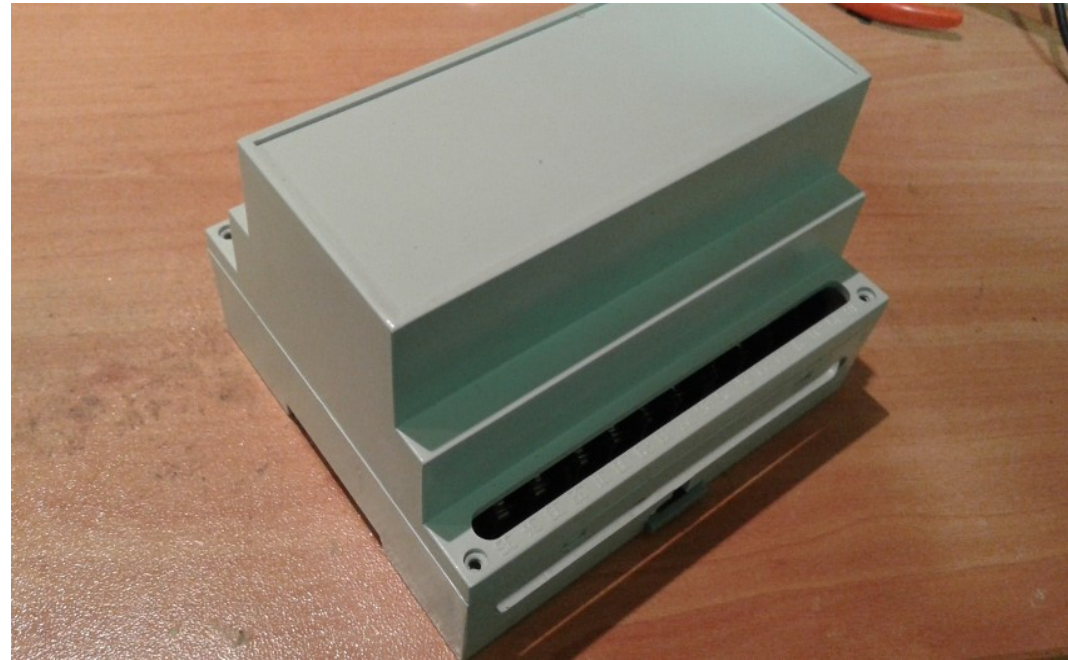
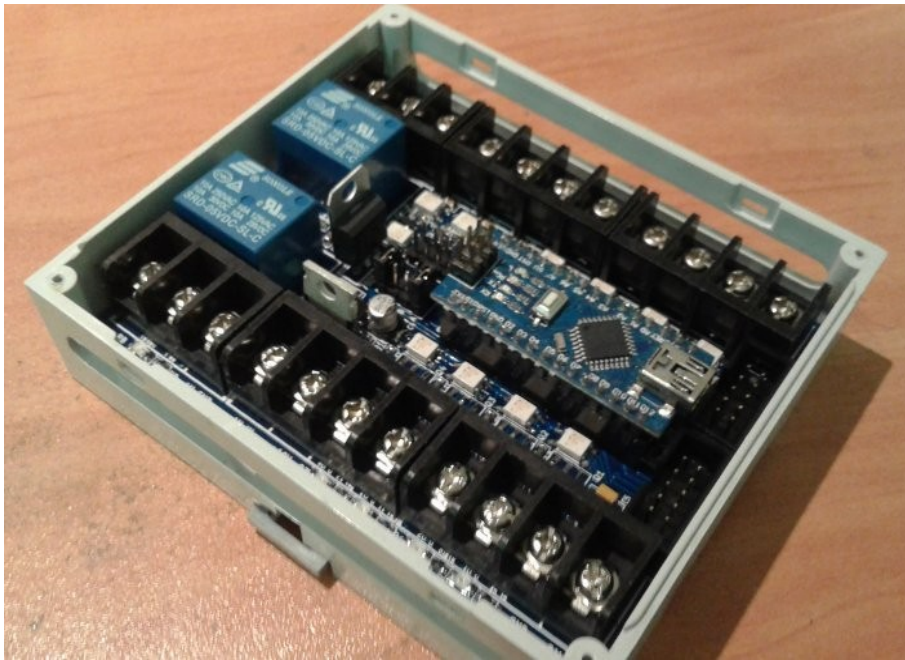
Make It!





Altres maquinari lliure

petitPLC



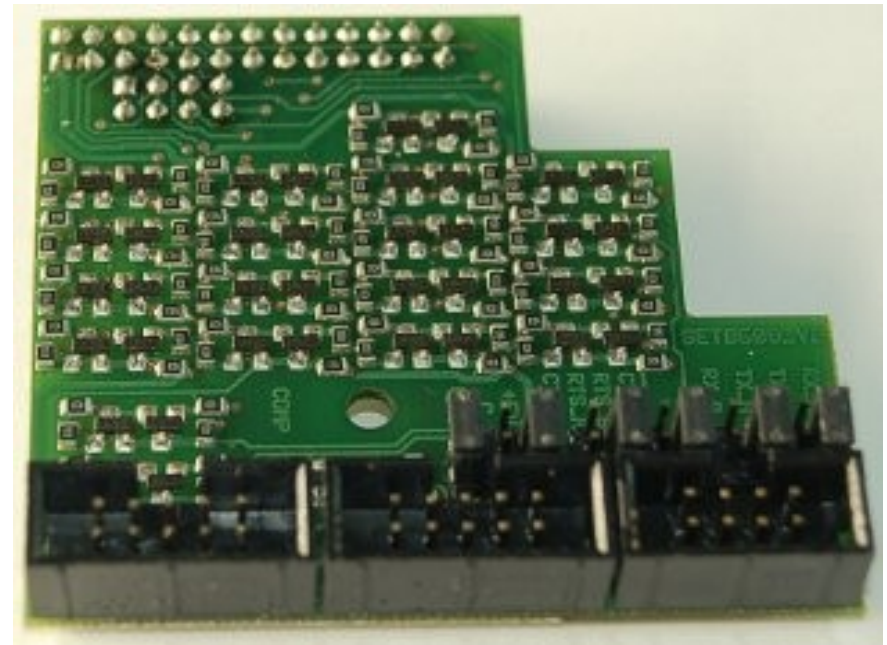


Altres maquinari lliure

3Bpi - Pi de les Tres Branques

Placa traductora de nivells per a Raspberry Pi

Placa set05_08_v2



Torn de preguntes ...



... i sessió pràctica.

COMIAT

Presentació descarregable a :

<http://binefa.cat/blog/?p=330>

Correu electrònic de contacte : jordibinefa@electronics.cat

Twitter



<https://twitter.com/electronicscat>

<https://twitter.com/JordiBinefa>



<http://makeit.cat/>

<http://es.linkedin.com/pub/jordi-binefa/13/717/90b>

Kits disponibles a la botiga:



Comandes de plaques S4A PLB : oshwt@electronics.cat

Moltes gràcies per la vostra assistència

<http://www.electronics.cat> / <http://makeit.cat/>