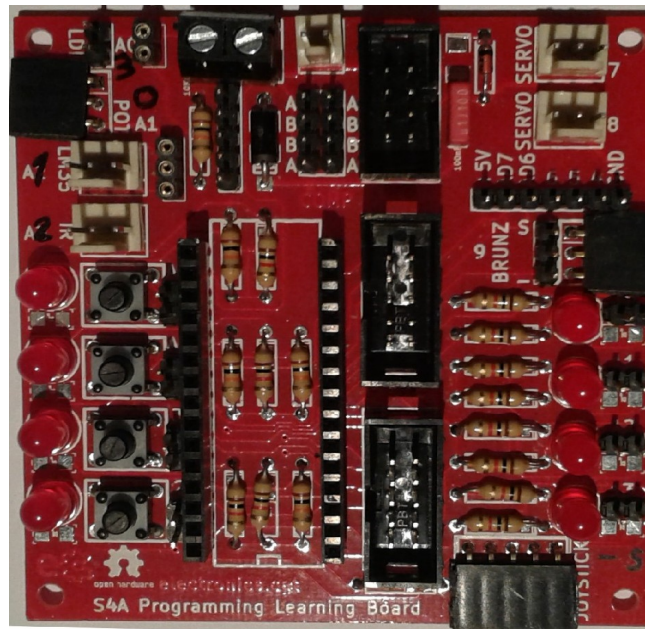


Electrònica amb S4A

S4A Programming Learning Board



Raspberry
Jam
Barcelona



WE'15
MAKE

Jordi Binefa i Martínez

Responsable d'R+D+i a

Professor de cicles formatius a



JESUÏTES El Clot
Escola del Clot

14 /novembre / 2015

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 options like '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 'Arduino1' object, with two 'al prémer' (on click) blocks. The first block contains a 'per sempre' (forever) loop with a 'si' (if) block checking '¿sensor Digital2 premut?' (Digital2 sensor pressed?). If true, it sets 'digital 13' to 'apagat' (off); if false, it sets it to 'encès' (on). The second block contains a 'per sempre' loop with a 'si' block checking '¿sensor Digital3 premut?'. If true, it sets 'digital 12' to 'apagat'; if false, it sets it to 'encès'. Below these, there are two more 'si' blocks checking 'valor del sensor Analog5 < 15' and 'valor del sensor Analog4 < 15', each with 'encès' (on) and 'apagat' (off) actions. On the right, a 'pcbS4A_01' window shows a list of sensor values: Analog0 (628), Analog1 (522), Analog2 (519), Analog3 (114), Analog4 (1023), Analog5 (1023), Digital2 (true), and Digital3 (true). Below this list is an image of an Arduino Duemilanove board. At the bottom right, there is a 'Nova animació:' (New animation:) section with a 'Arduino...' button and a 'Escenari' (Stage) area.

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

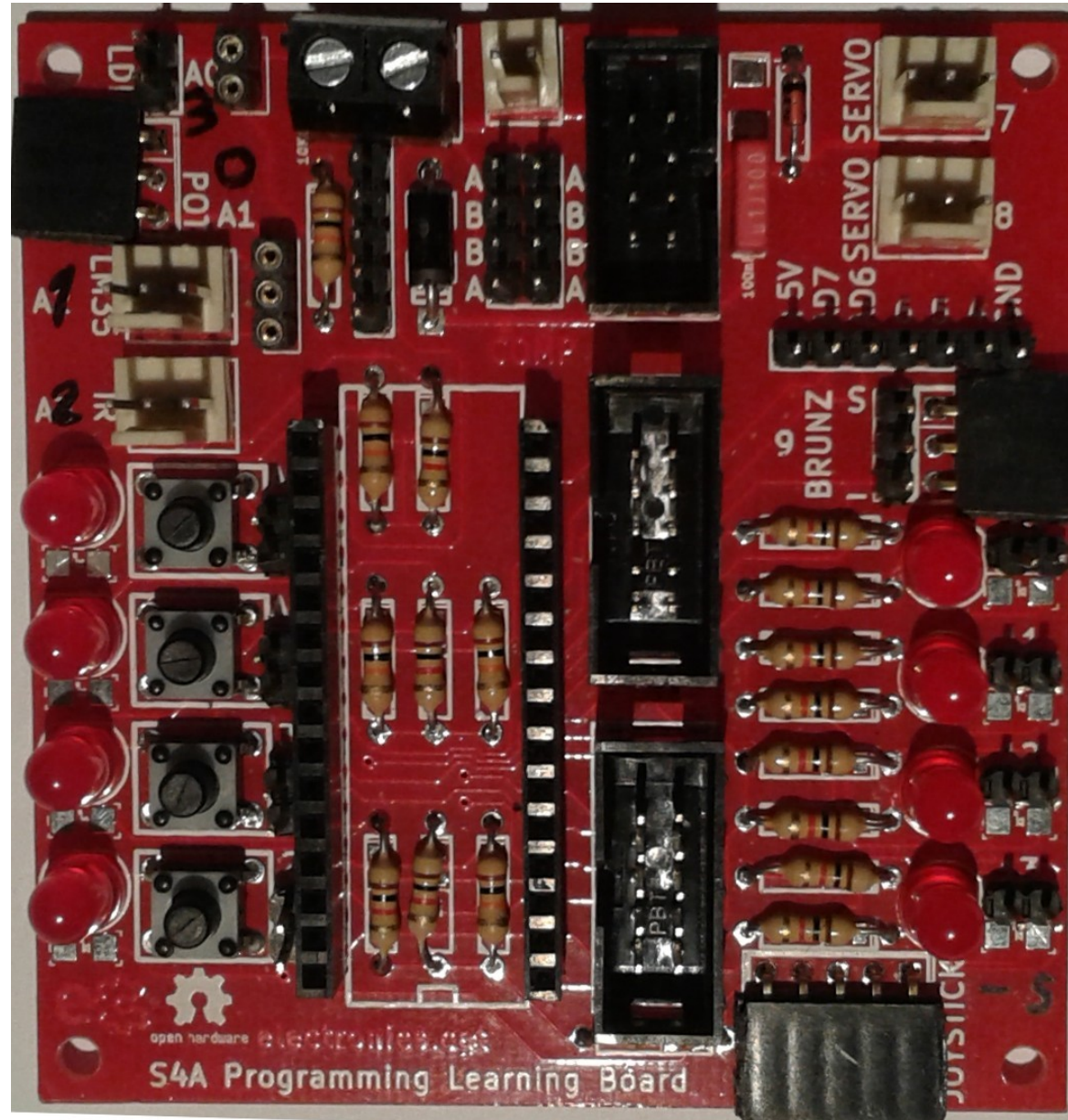
S4AFirmware16
// NEW IN VERSION 1.6c (by Jorge Gomez):
// Fixed variable type in pin structure: pin.state should be bool
// Optimized speed of execution while receiving data from S4A

// 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>

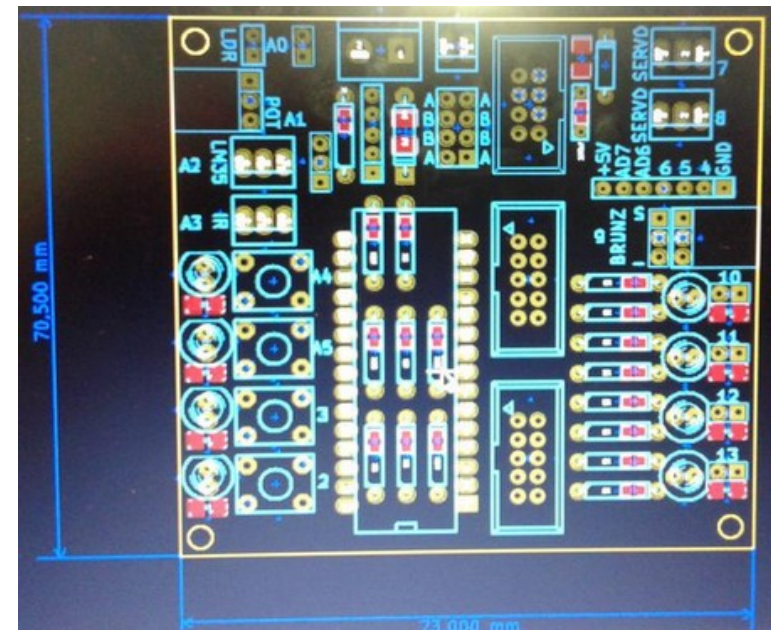
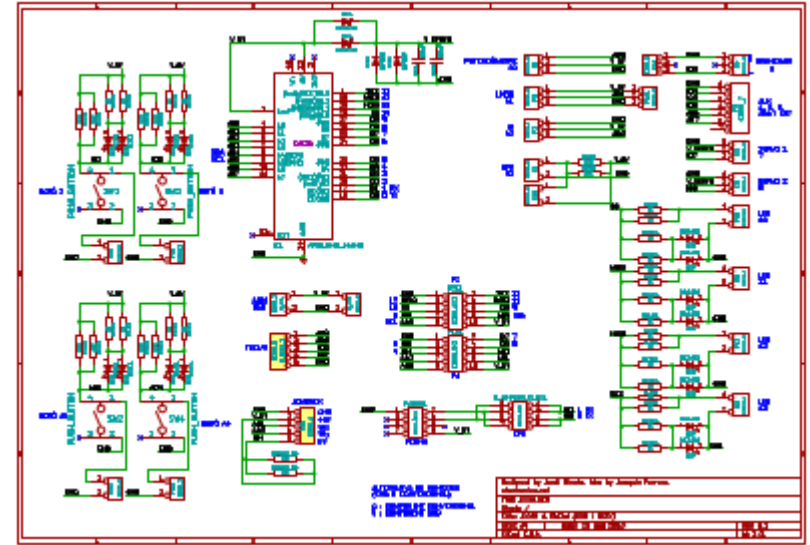
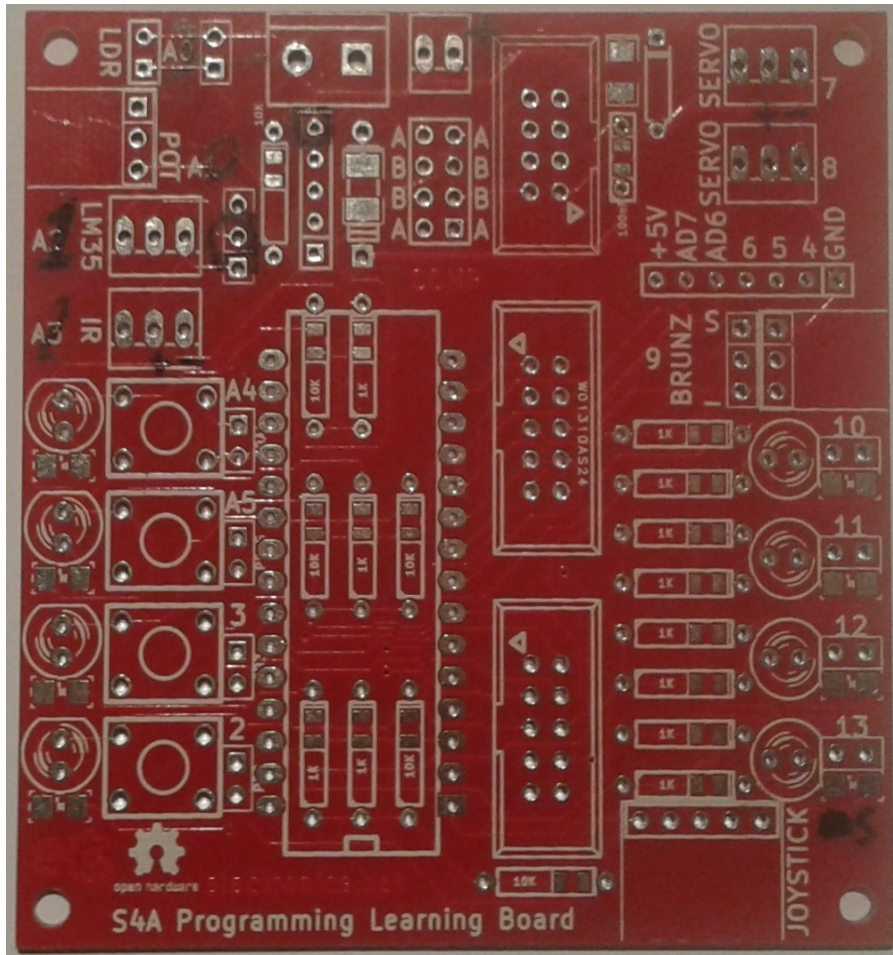
e⚙️ S4A Progamming Learning Board

La placa



e S4A Progamming Learning Board

La placa



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

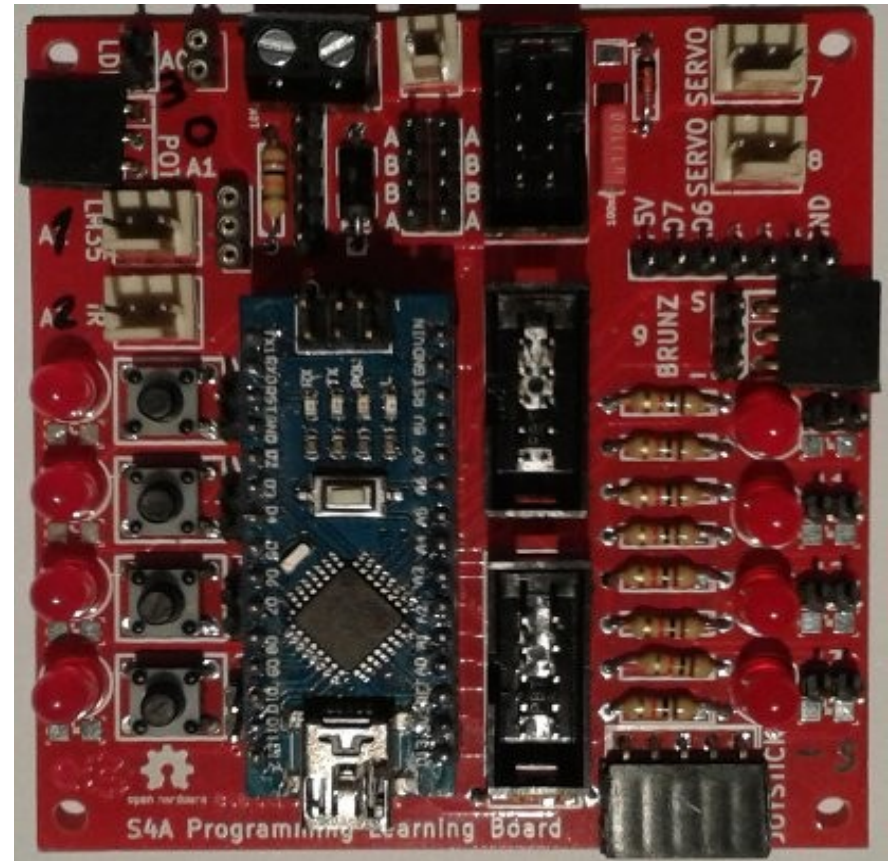


S4A Programming Learning Board

Botons i leds



A4
A5
3
2

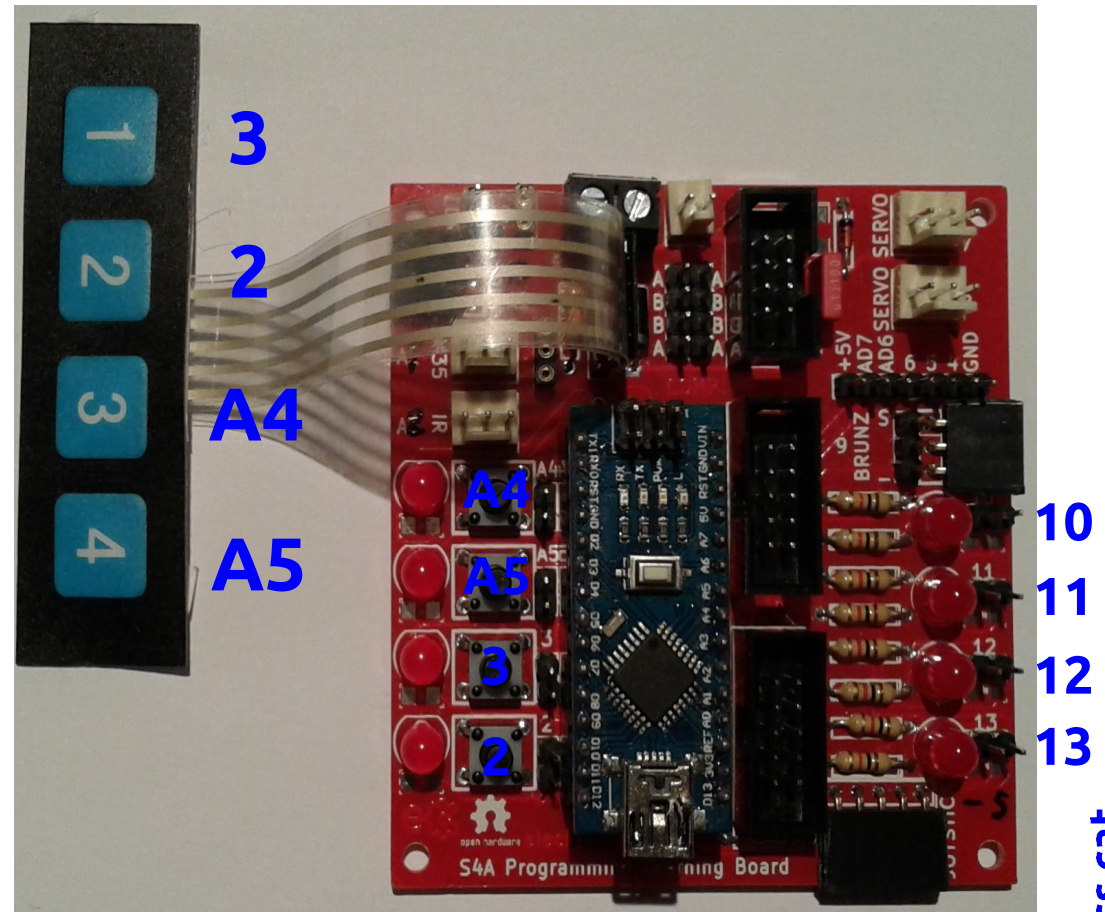
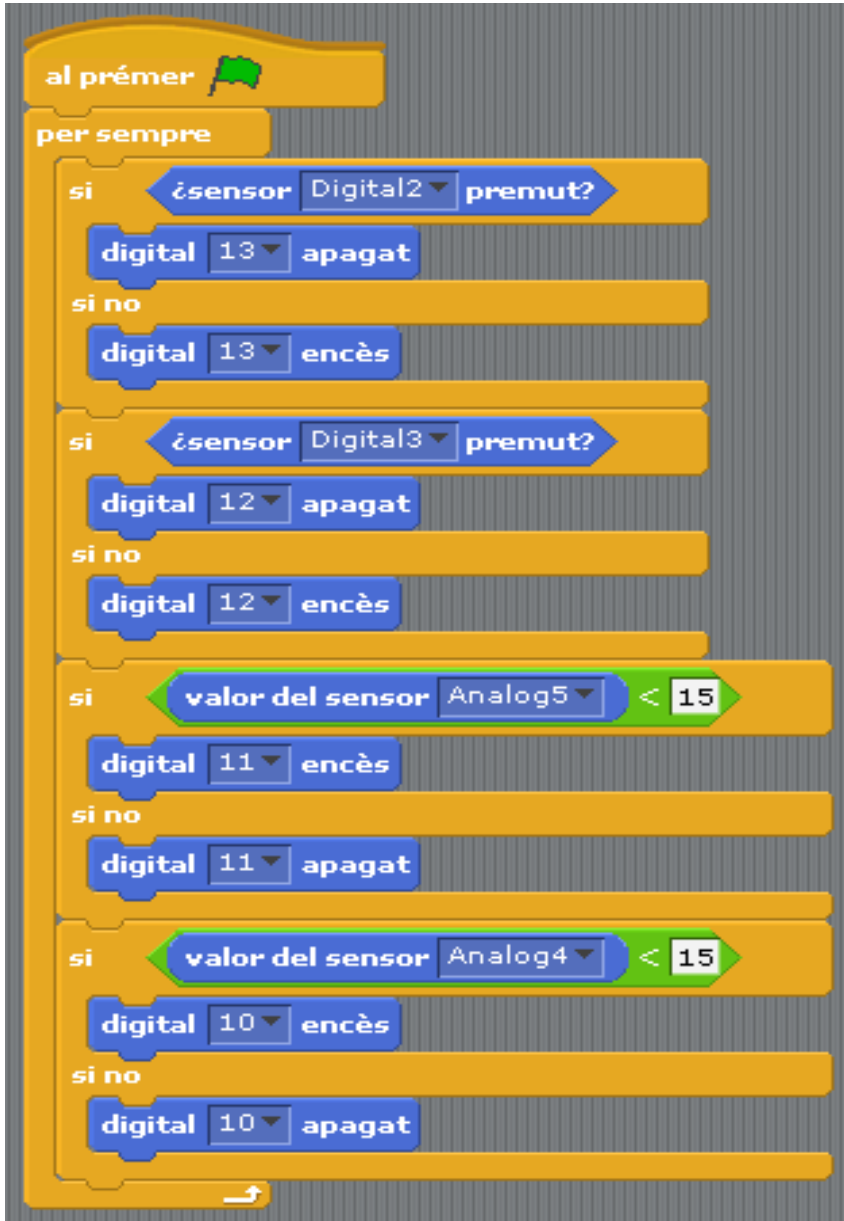


10
11
12
13



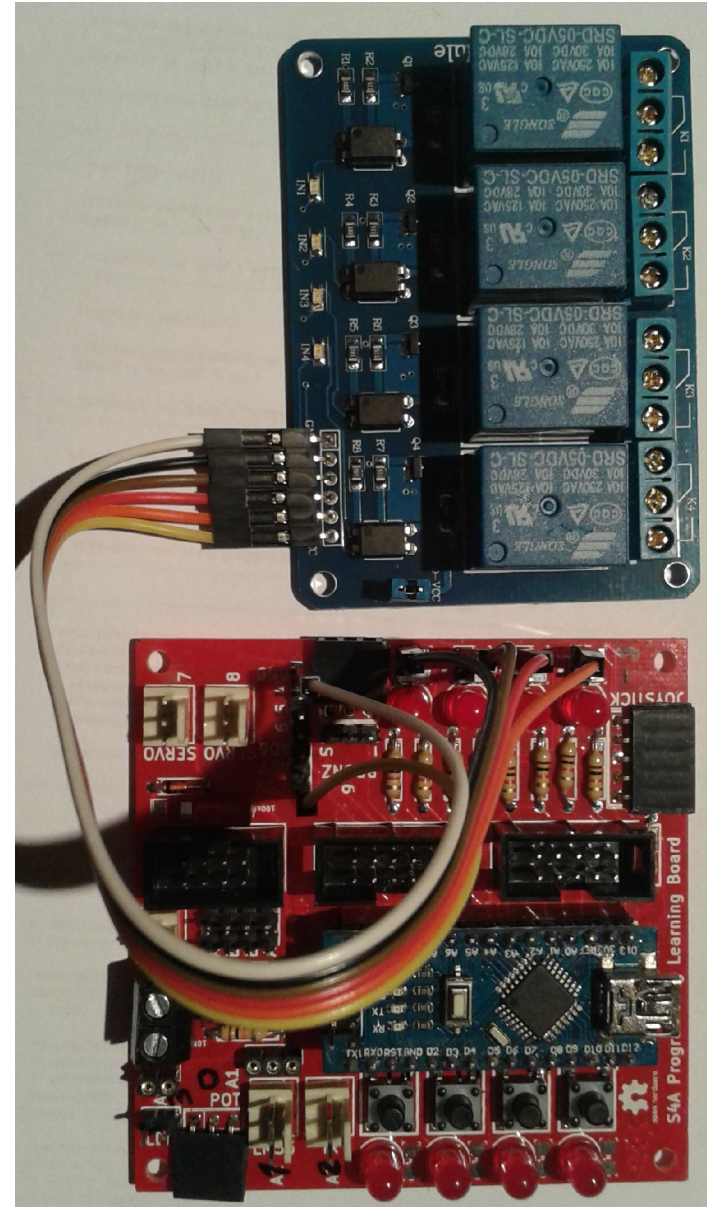
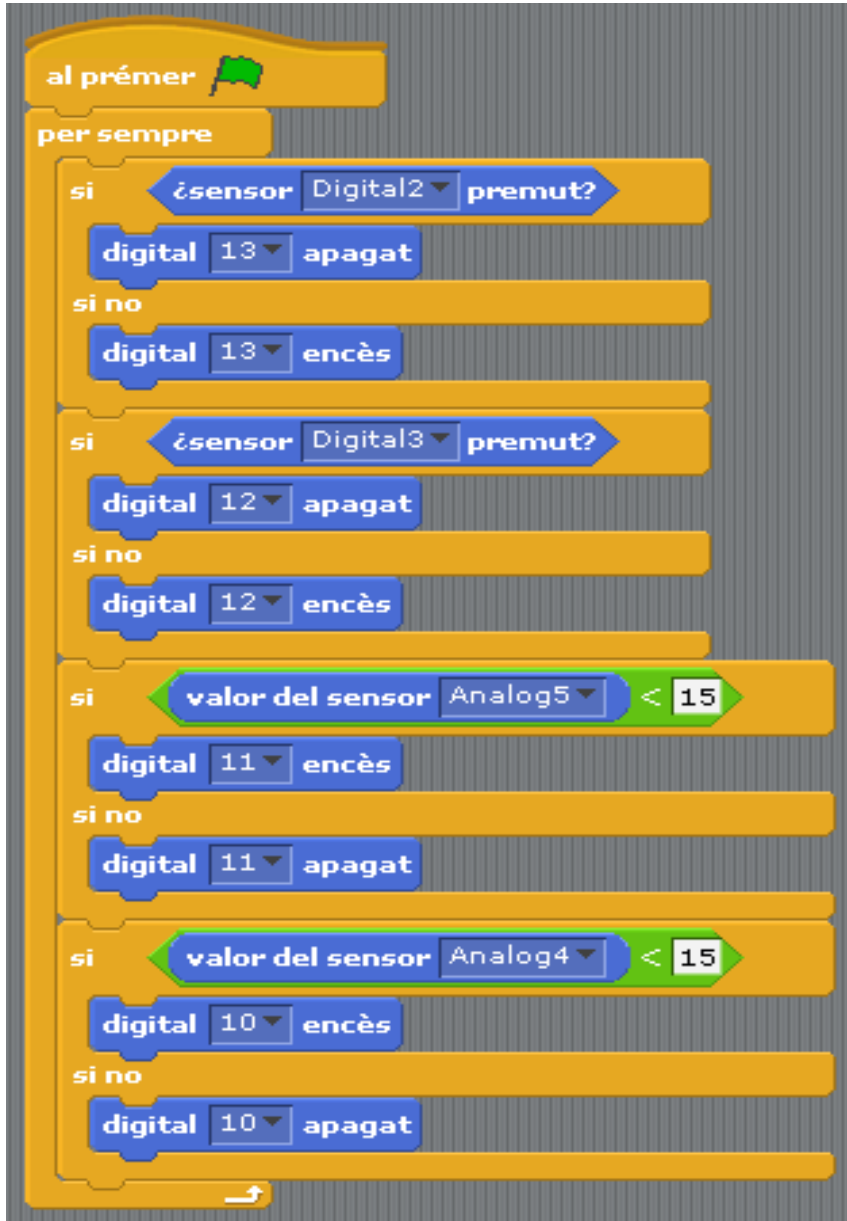
S4A Programming Learning Board

Teclat de membrana i leds



S4A Progamming Learning Board

Botons, leds i relés



e⚙ S4A Progamming Learning Board

Concepte de relé

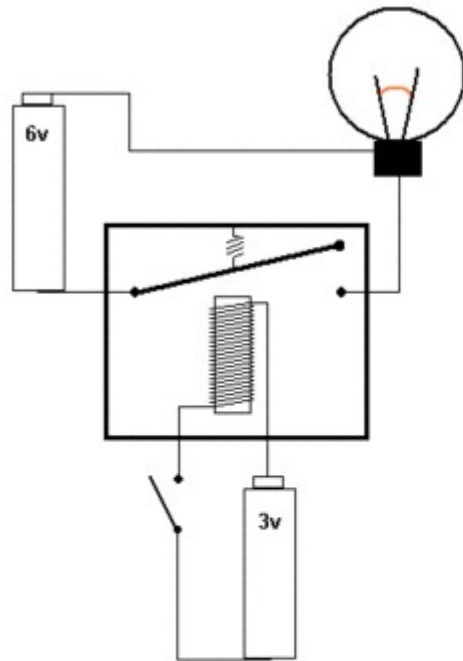


Figure 1: Relay off

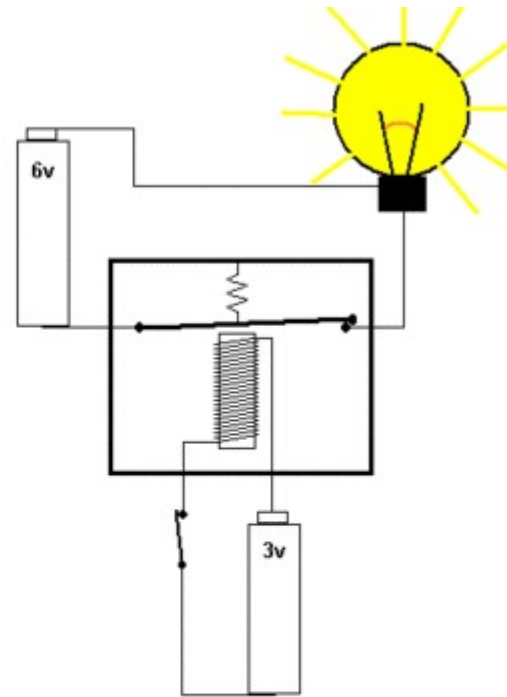
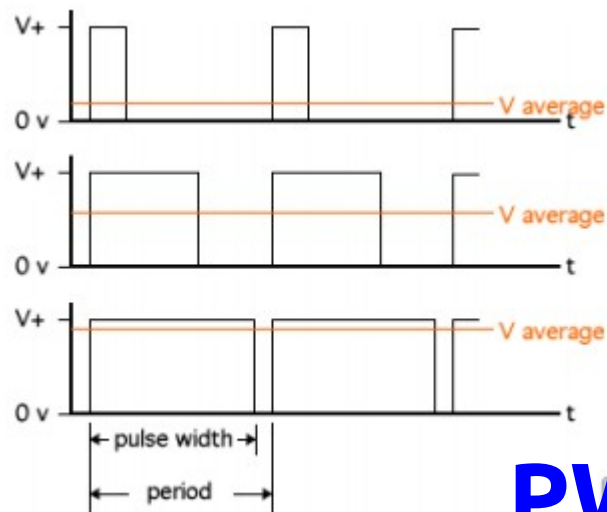


Figure 2: Relay on



S4A Programming Learning Board

Botons i bronzidor



A4

A5

3

2

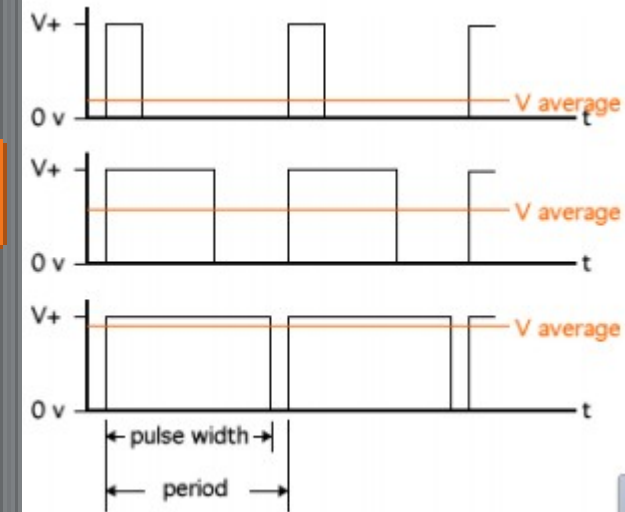
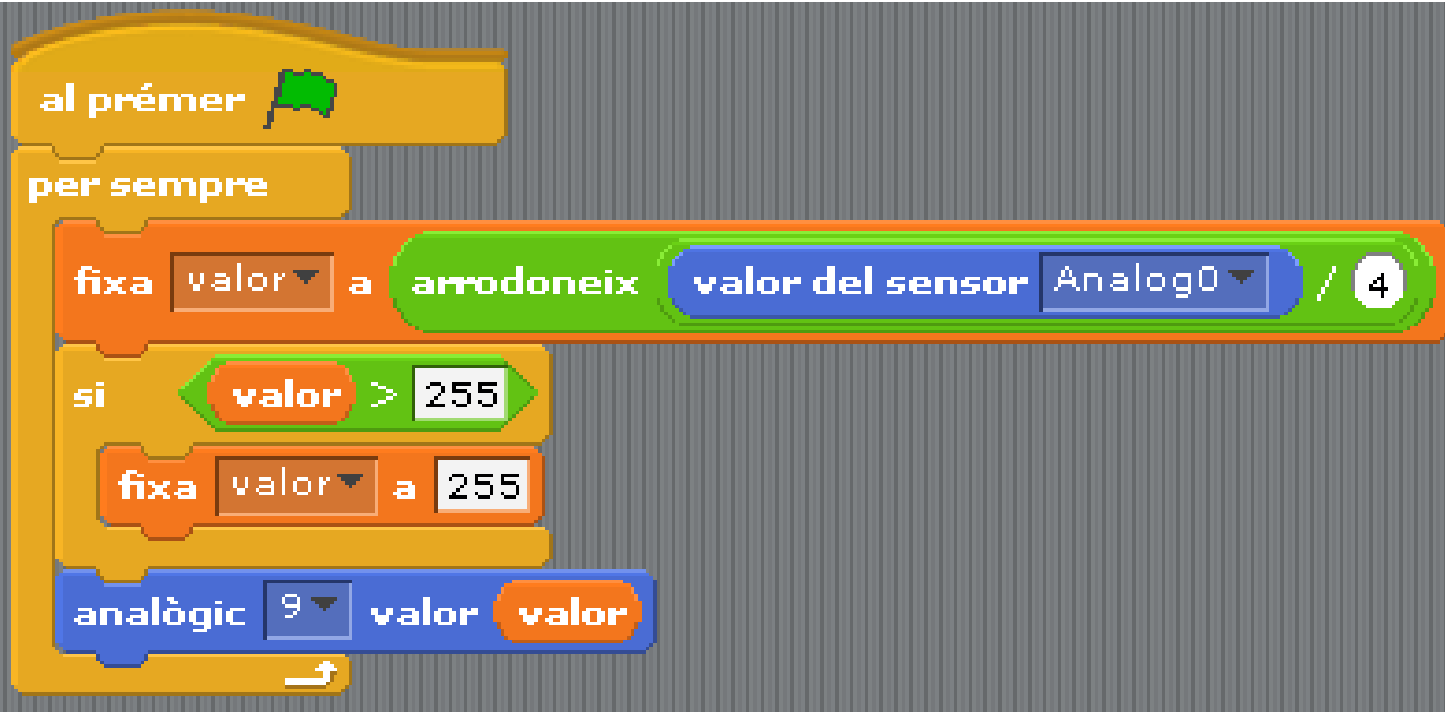
PWM



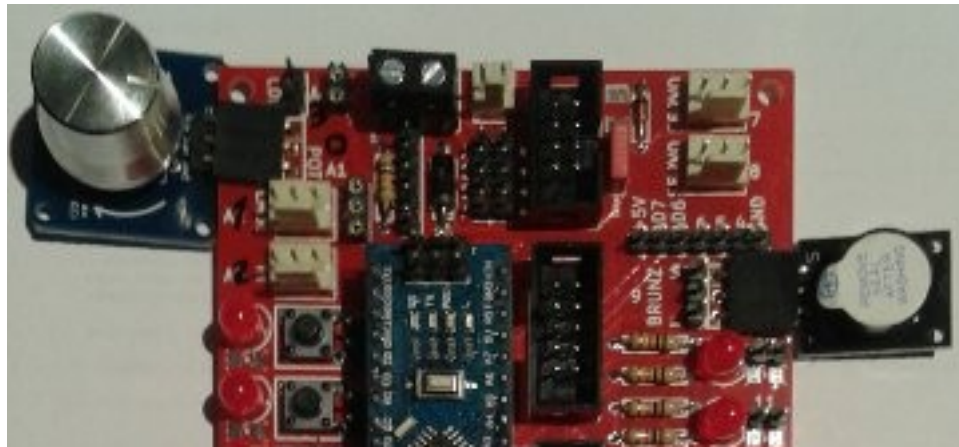


S4A Programming Learning Board

Potenciòmetre i brunzidor



A0

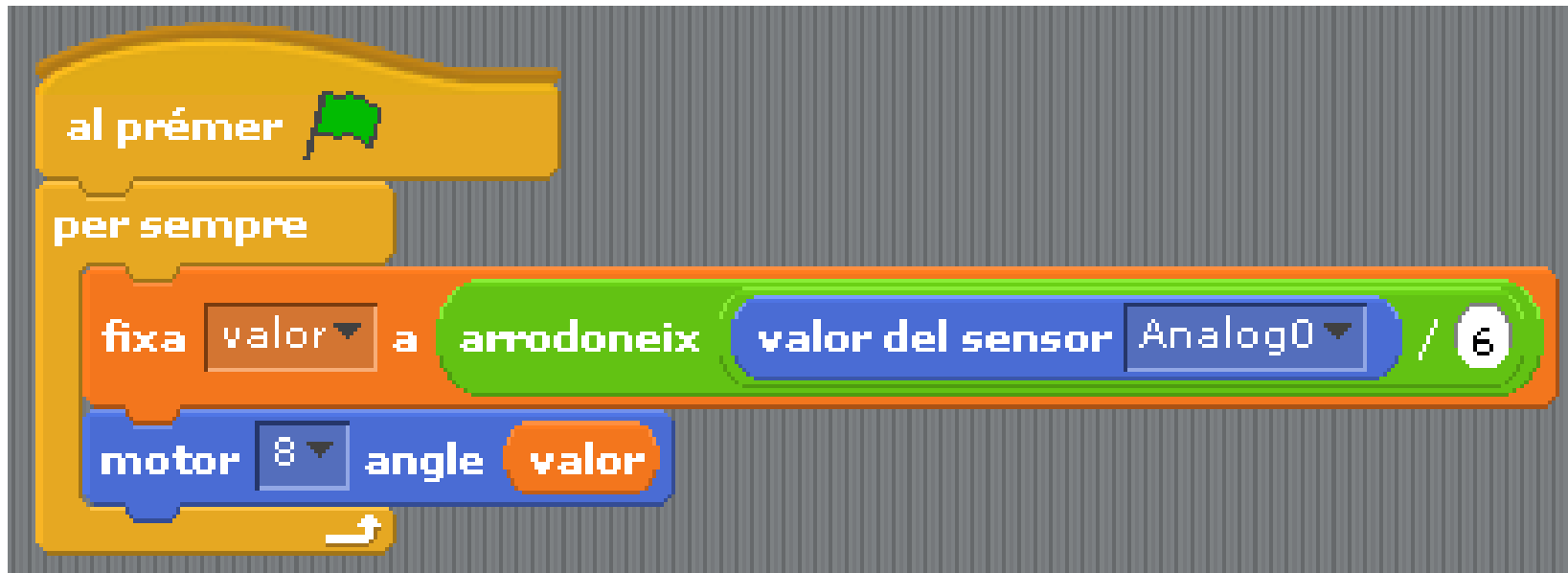


9

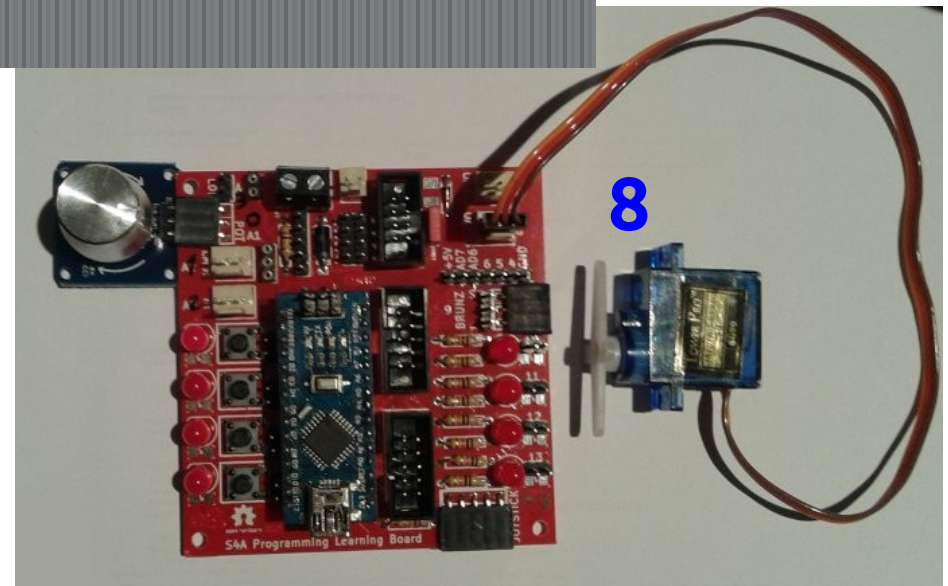


S4A Programming Learning Board

Potenciòmetre i servomotor



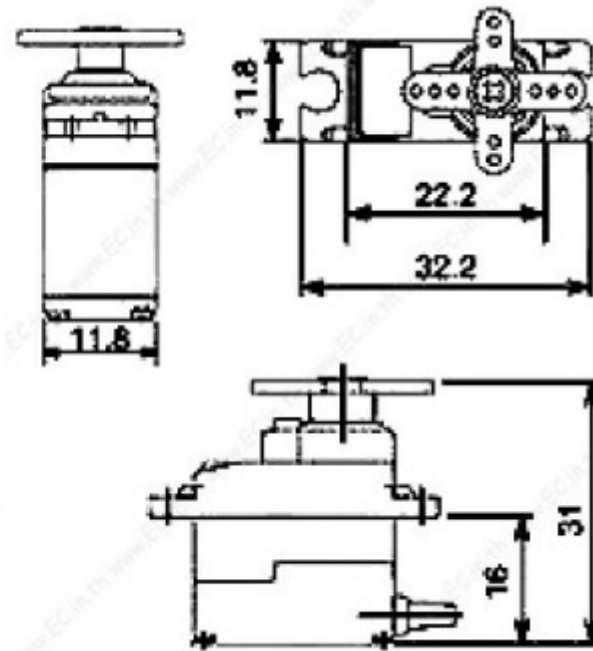
A0





S4A Programming Learning Board

Servo



Specifications

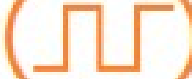
- Weight: 9 g
- Dimension: 22.2 x 11.8 x 31 mm approx.
- Stall torque: 1.8 kgf·cm
- Operating speed: 0.1 s/60 degree
- Operating voltage: 4.8 V (~5V)
- Dead band width: 10 μ s
- Temperature range: 0 °C – 55 °C

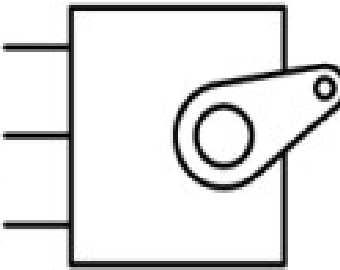
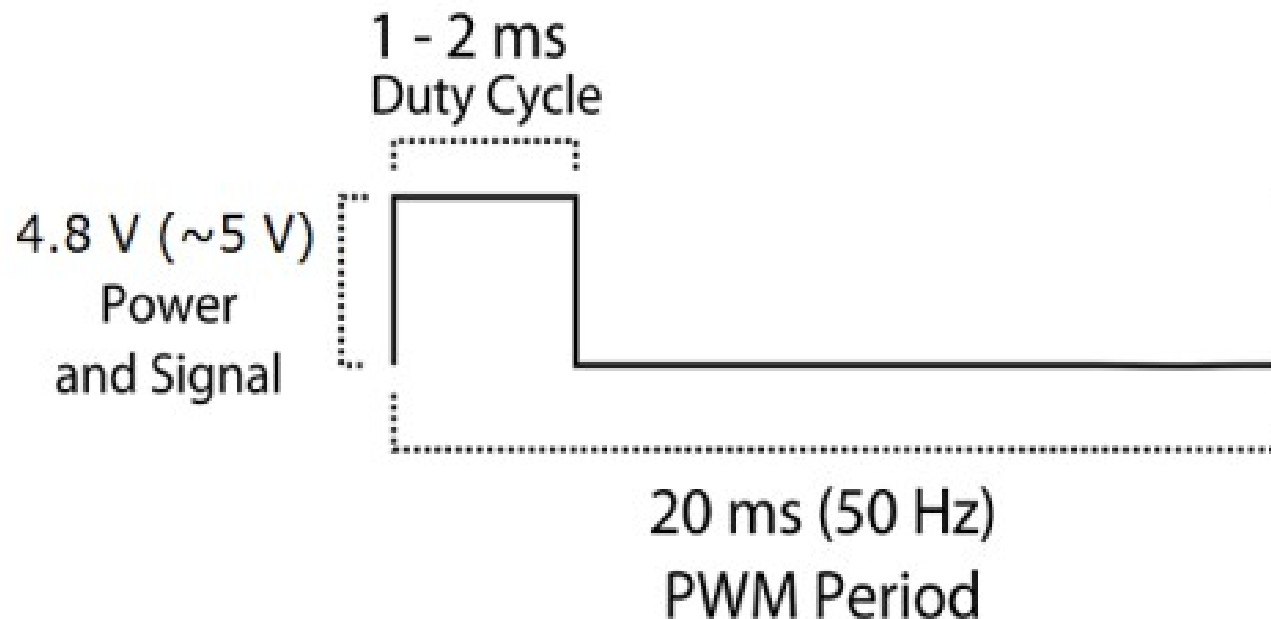
<http://datasheet.sparkgo.com.br/SG90Servo.pdf>



S4A Programming 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.

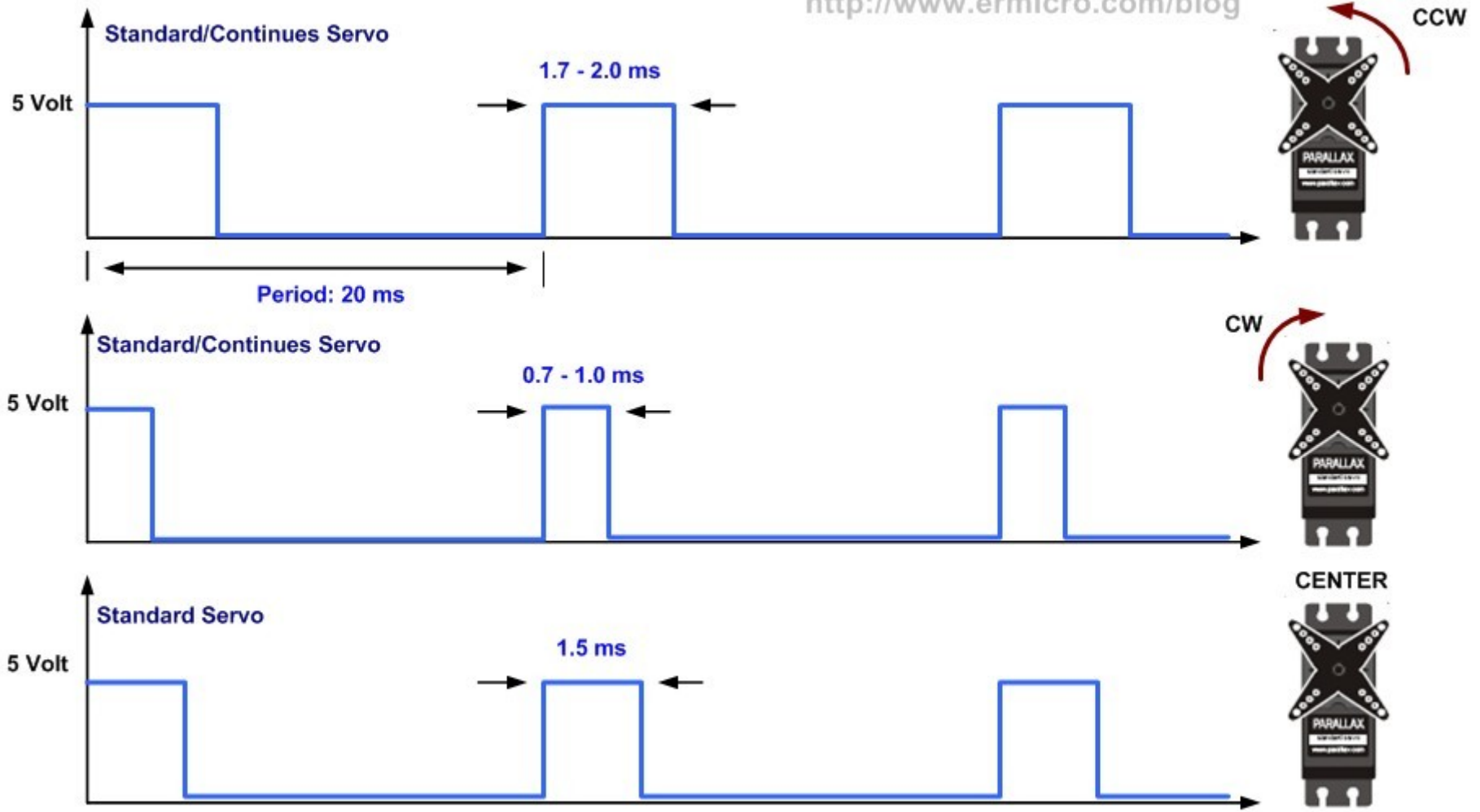
<http://datasheet.sparkgo.com.br/SG90Servo.pdf>



S4A Programming Learning Board

Servo

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



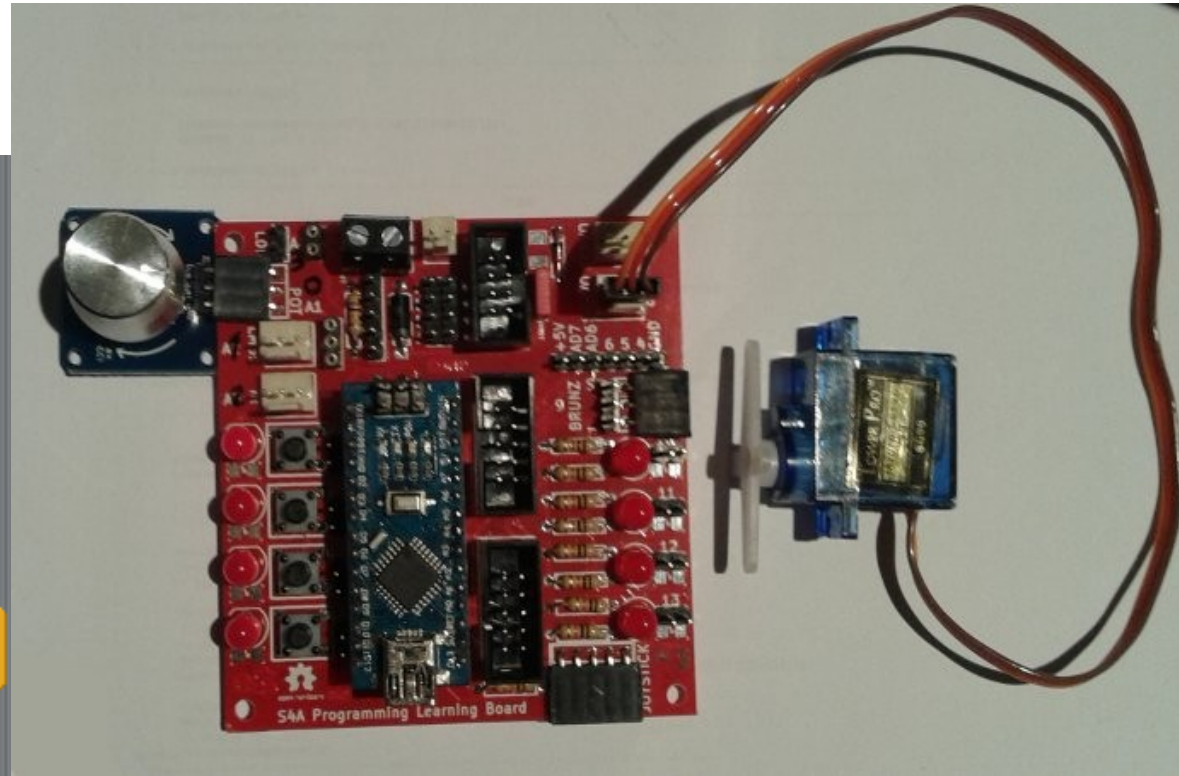
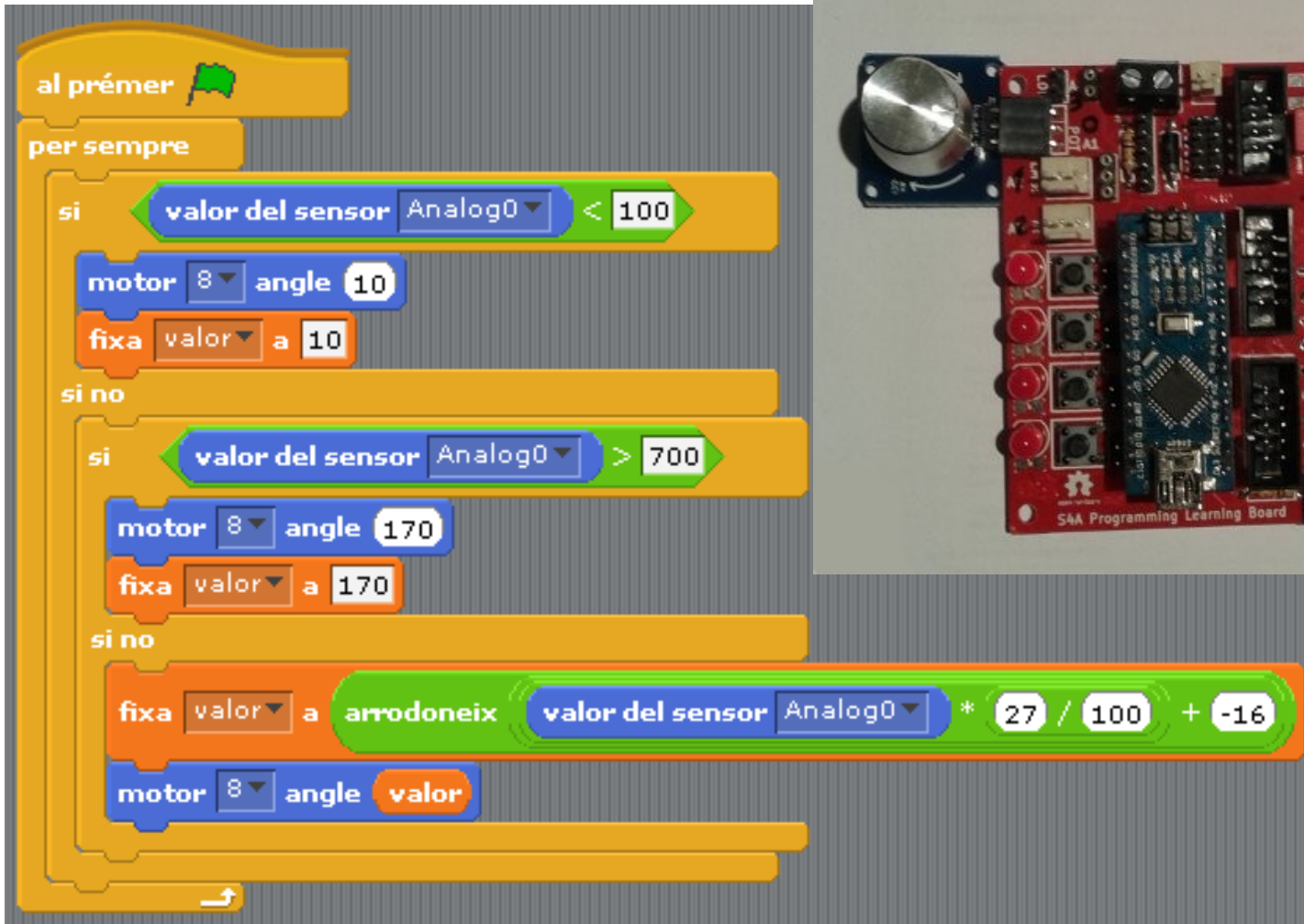
Servo Motor PWM Timing Diagram

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



S4A Programming Learning Board

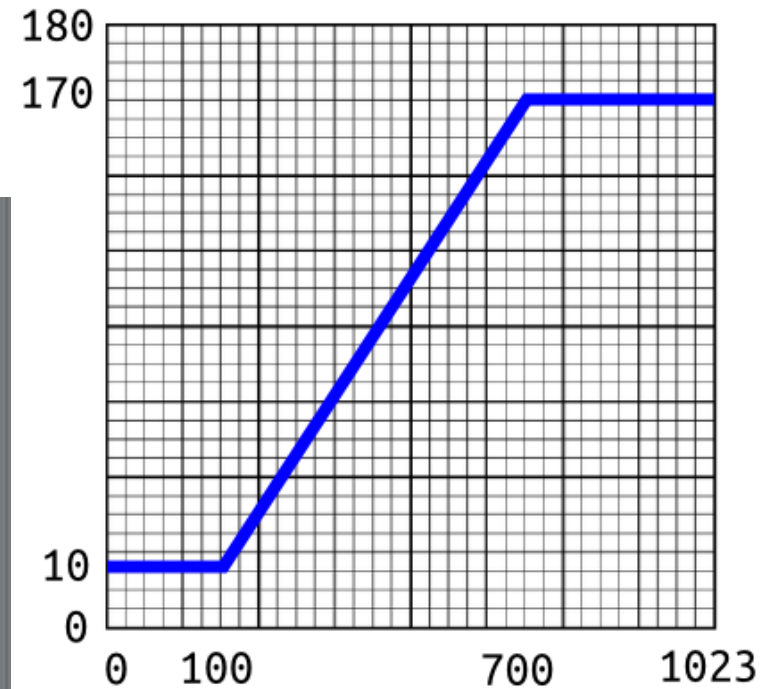
Potenciòmetre i servomotor





S4A Progamming Learning Board

Potenciòmetre i servomotor

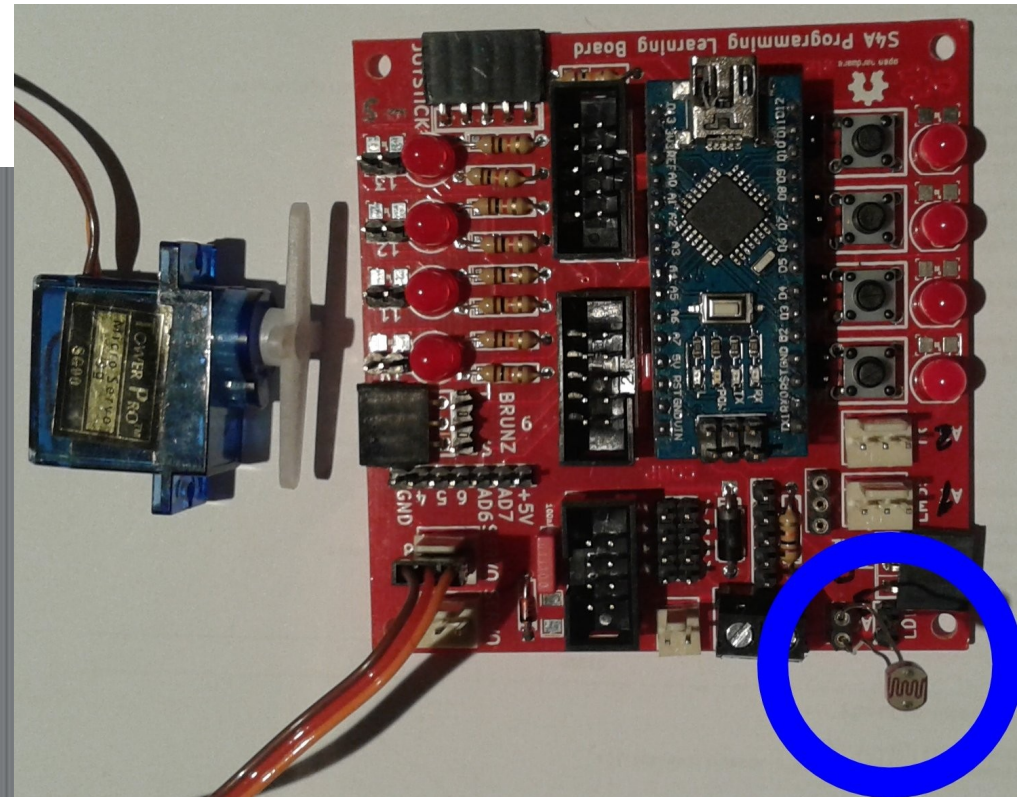
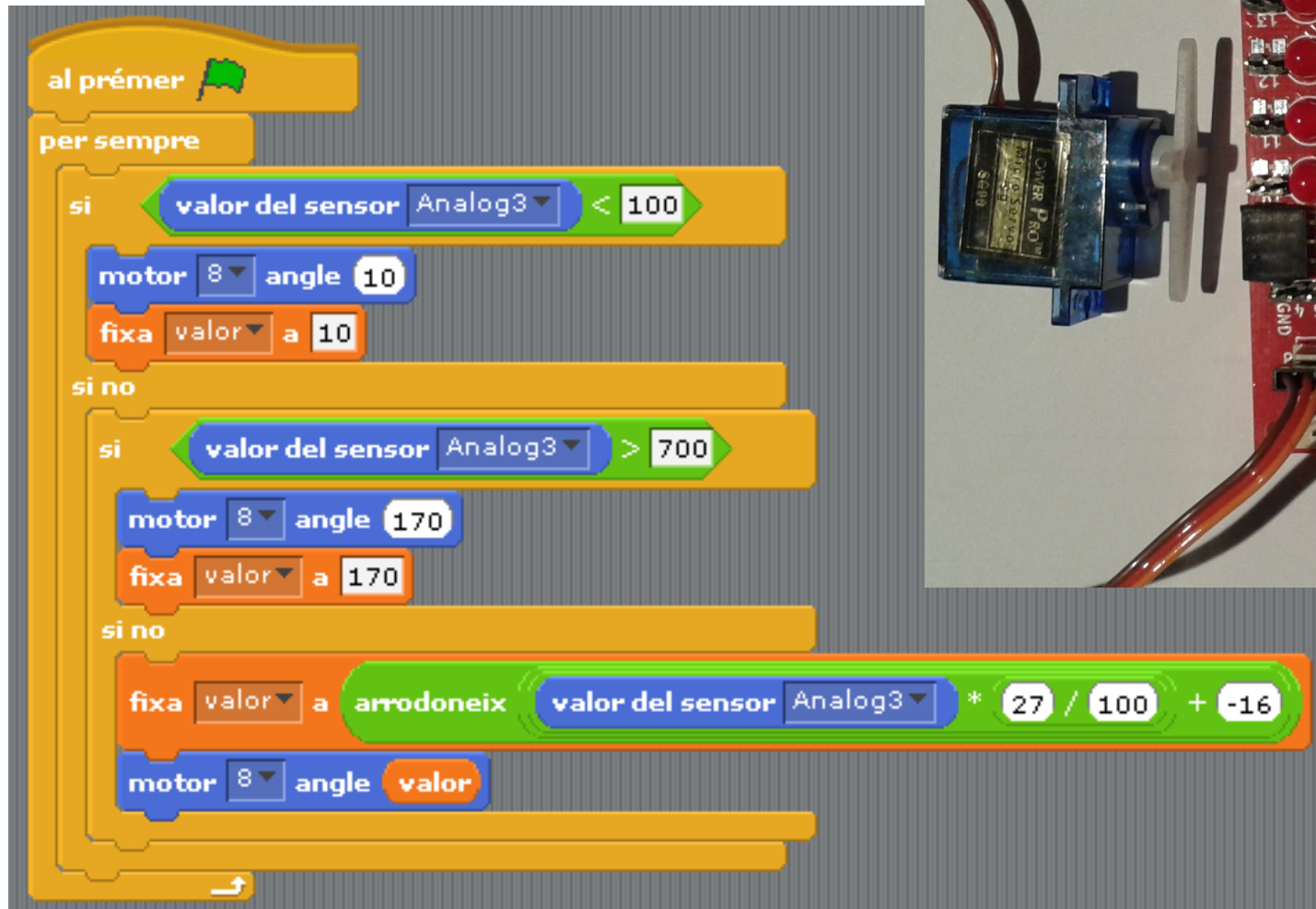


$$\text{graus} = \text{Analog0} \frac{27}{100} - 16$$



S4A Programming Learning Board

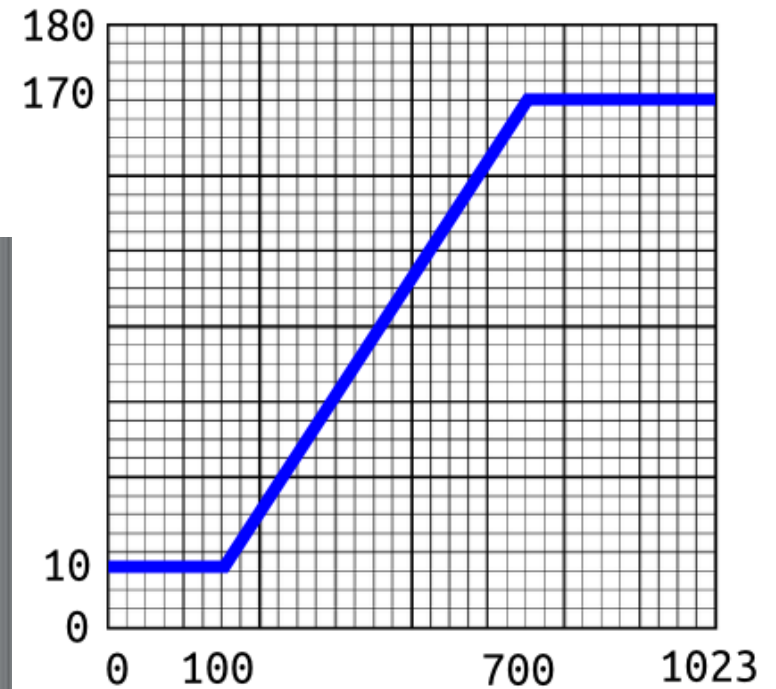
LDR i servomotor





S4A Programming Learning Board

LDR i servomotor

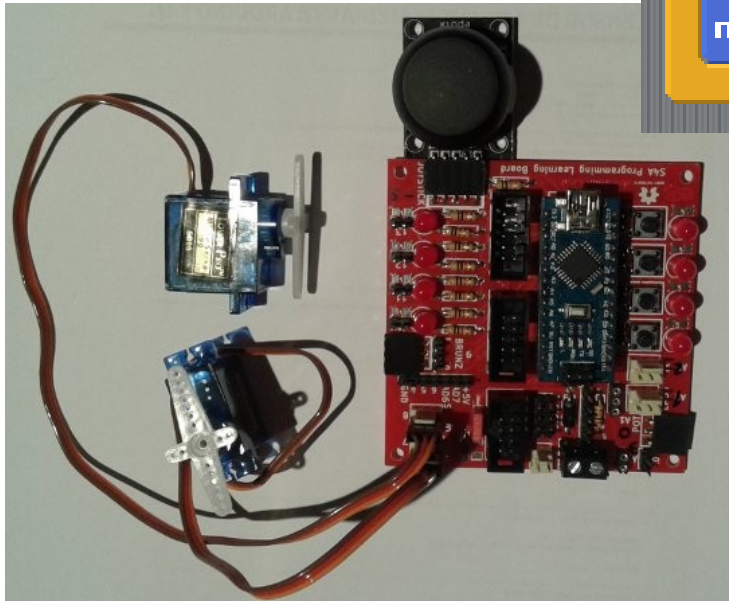
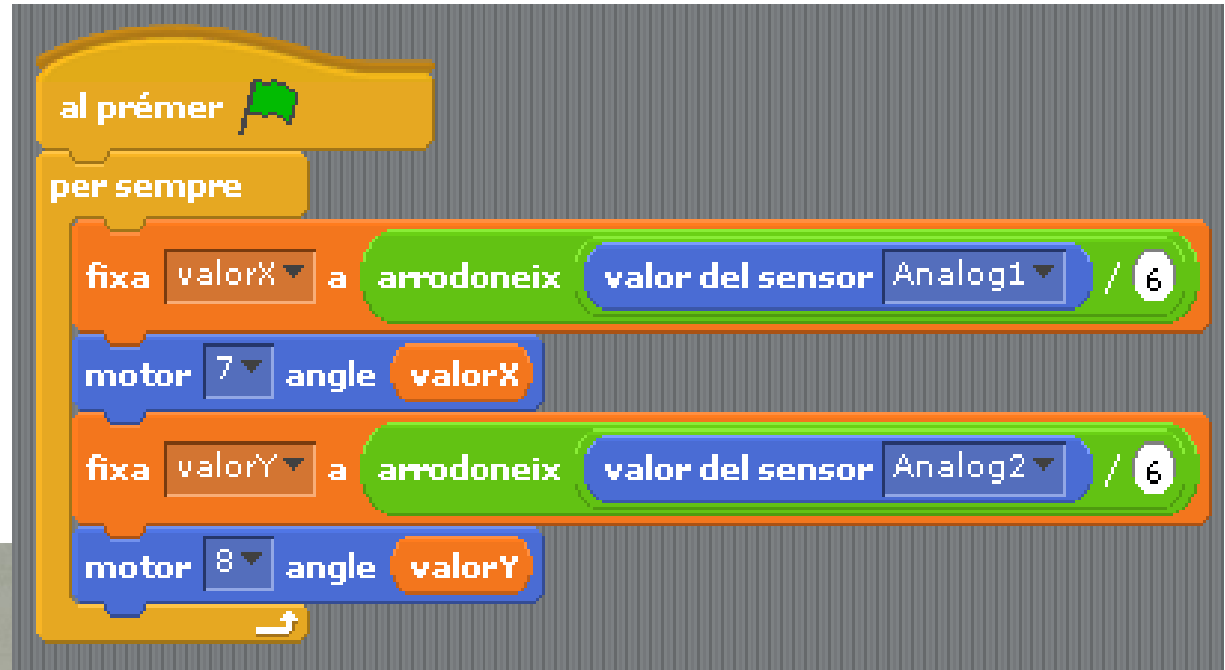


$$\text{graus} = \text{Analog0} \frac{27}{100} - 16$$



S4A Programming Learning Board

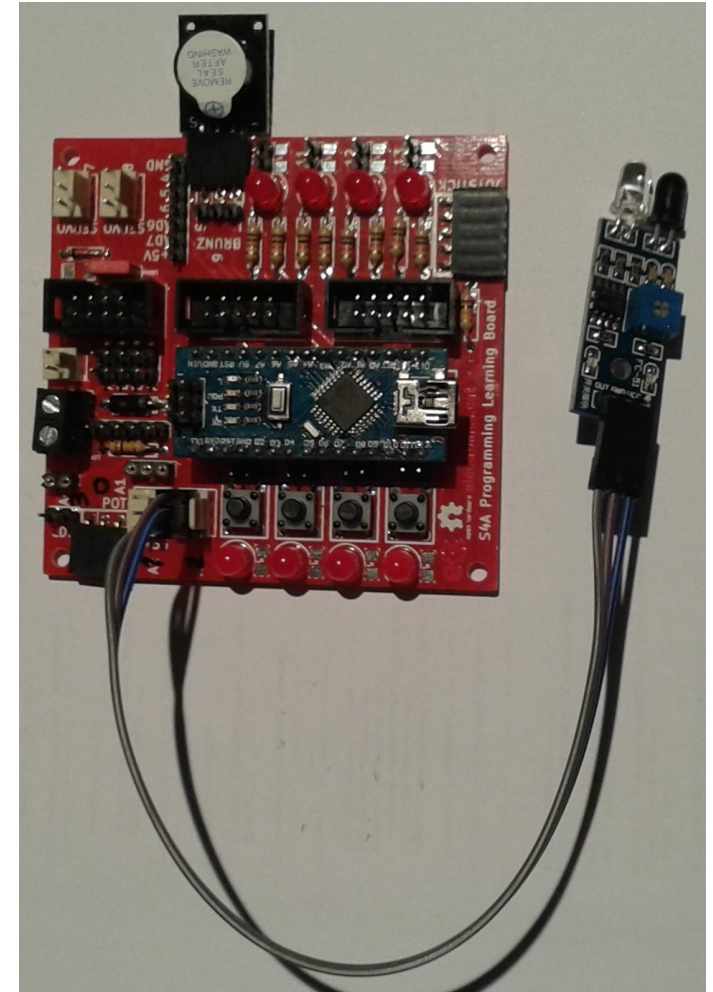
Joystick i servomotors



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

e⚙ S4A Progamming Learning Board

Sensor d'infrarojos i brunzidor

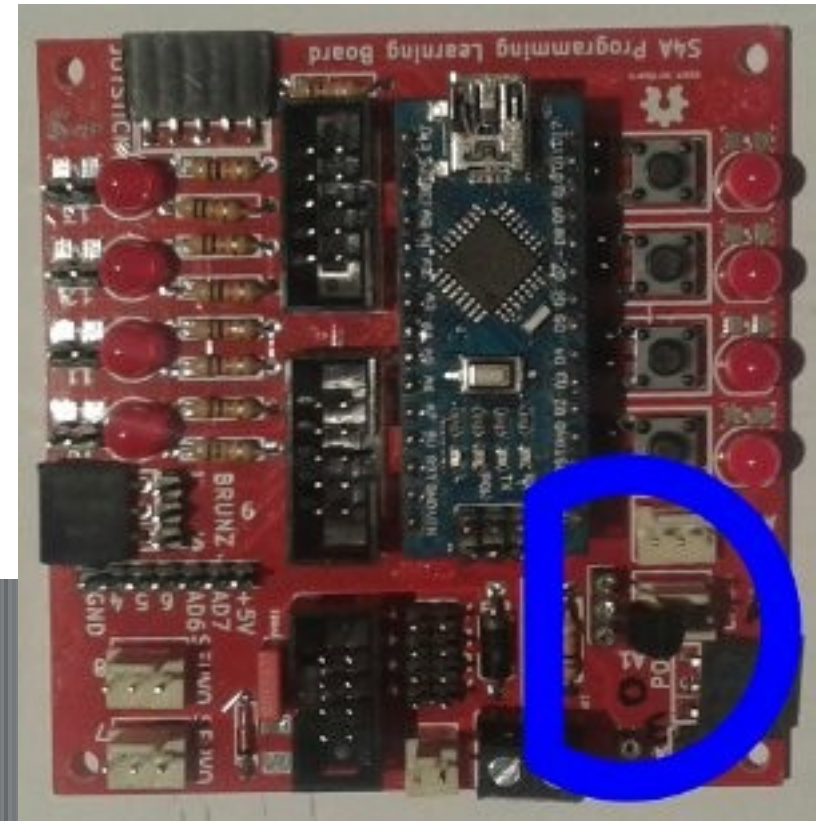


Per a fer servir el sensor infraroig desconnecteu el joystick



S4A Progamming Learning Board

Sensor de temperatura LM35



Per a fer servir el sensor de temperatura desconnecteu el joystick



S4A Programming Learning Board

Ús d'ArduBlock

The screenshot displays the ArduBlock software interface. On the left is a sidebar with various category buttons: 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 main workspace shows a block-based program with a 'do' loop containing the following blocks: 'set digital pin # 13 HIGH', 'serial println LED ON', 'delay MILLIS milliseconds 1000', 'set digital pin # 13 LOW', 'serial println LED OFF', and 'delay MILLIS milliseconds 1000'. On the right, a window titled 'provesArduBlock | Arduino 1.6.5' shows the corresponding C++ code:

```

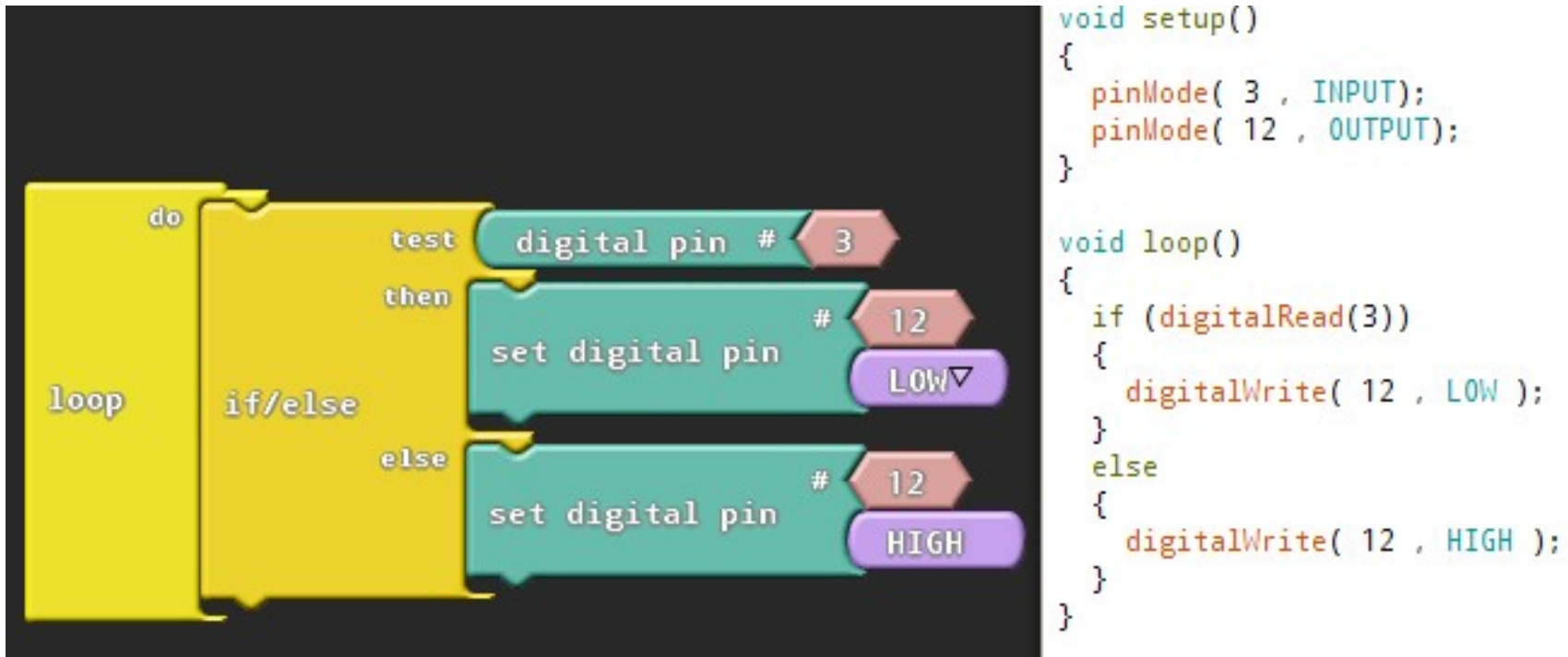
provesArduBlock
void setup()
{
  pinMode( 13 , OUTPUT);
  Serial.begin(9600);
}

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

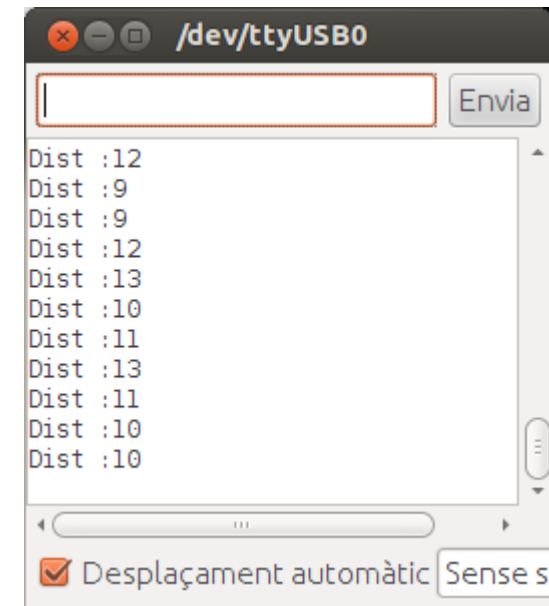
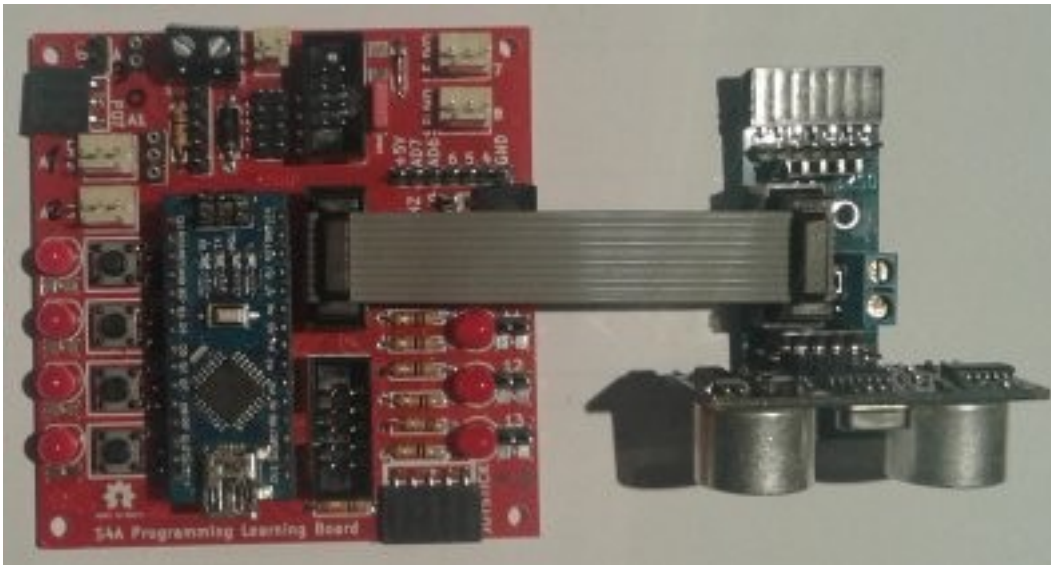
Ús d'ArduBlock





S4A Programming Learning Board

Ús d'ArduBlock



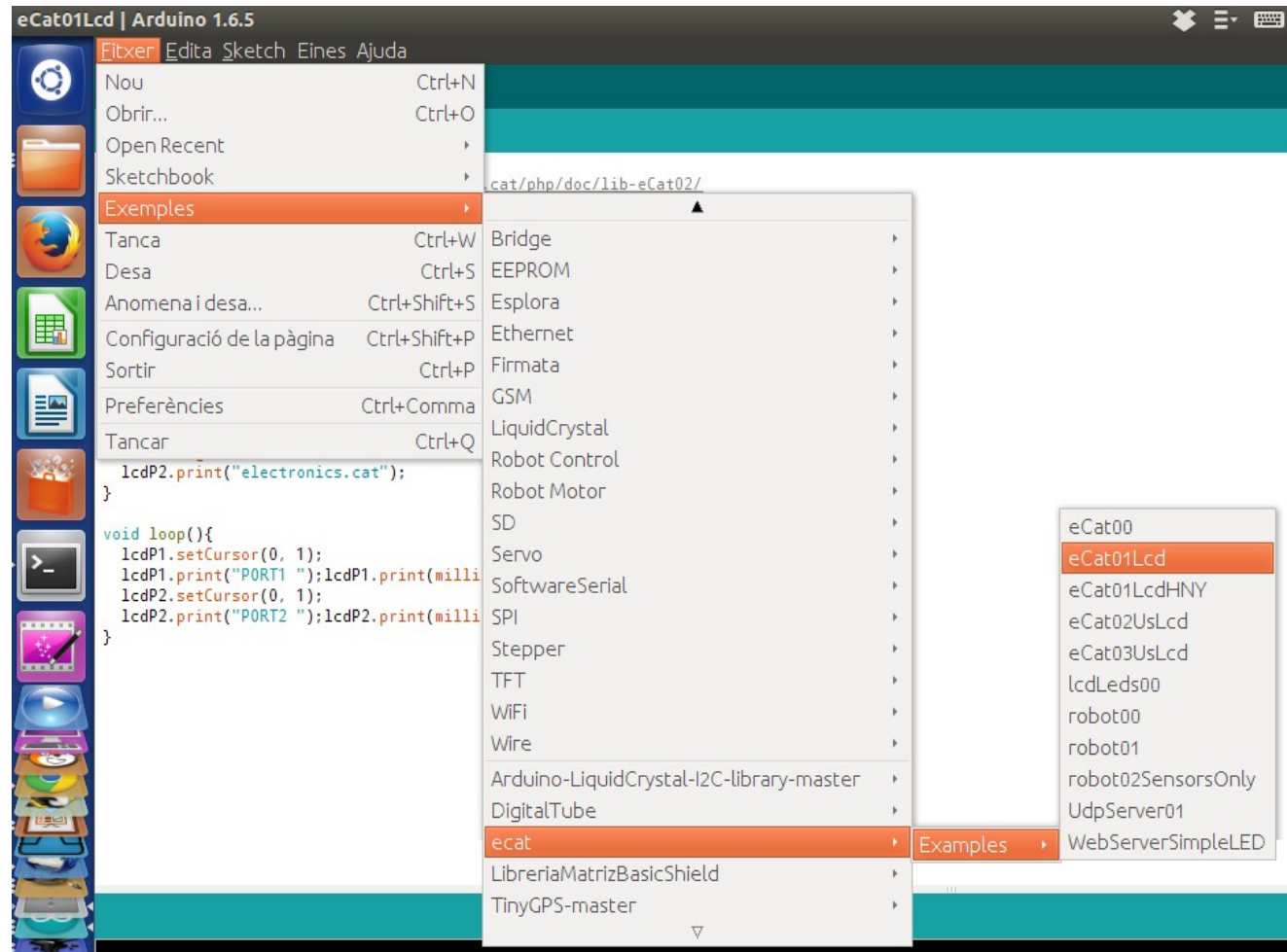
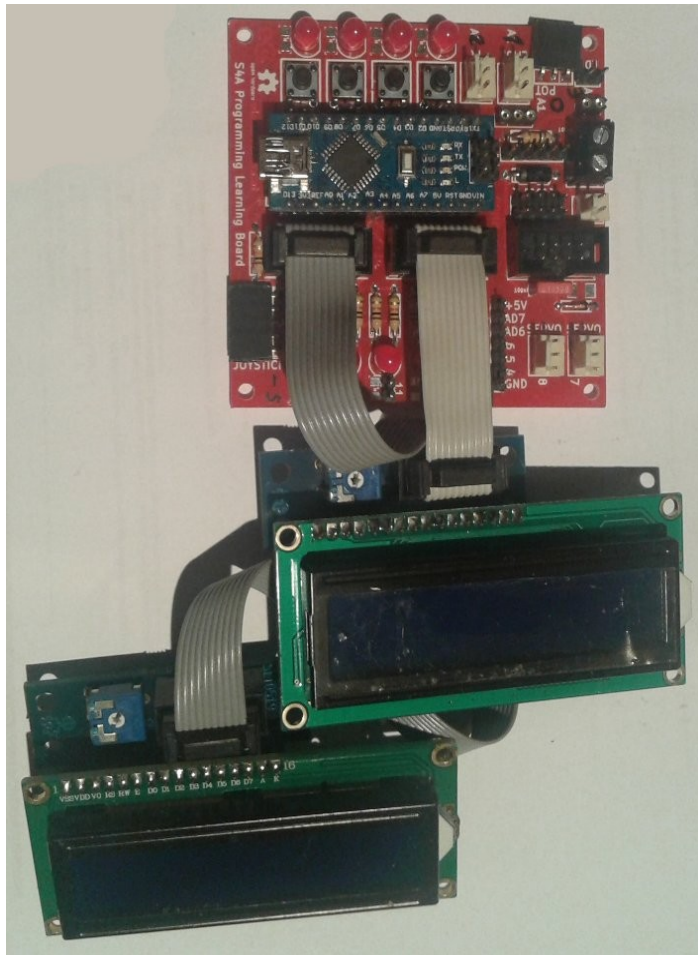
<http://www.binefa.cat/php/arduino/ardublock/pr05ultrasons.abp>

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



S4A Programming Learning Board

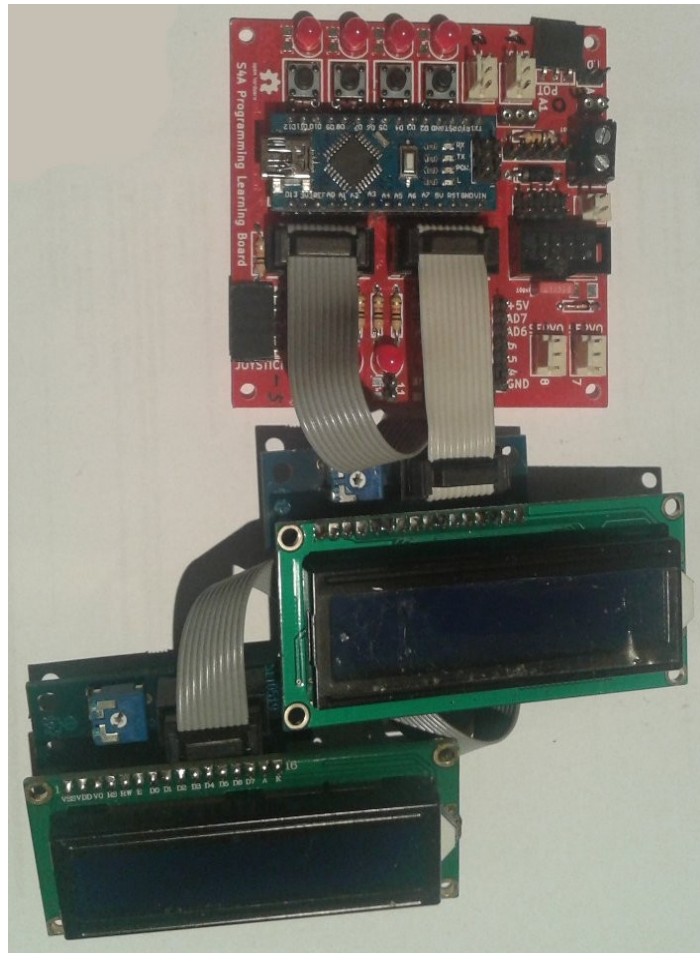
Ús de la biblioteca ecat.h





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

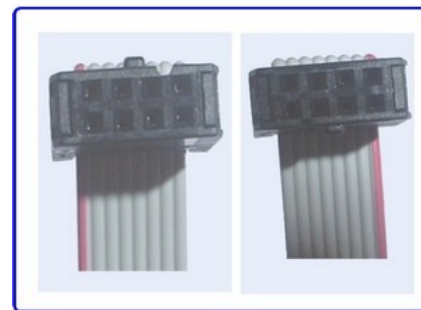
TX / RX

RX / TX

+5V	o
o	X
o	X
o	GND

CTS / RTS

Cable pla
4x2 a 4x2
(0311)



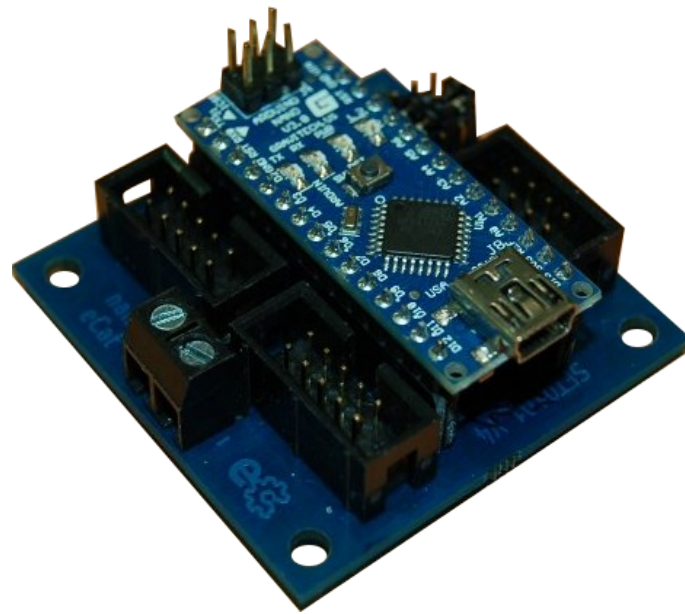
eCat System : Dues tipologies de BUS, dades (8 bits) i comunicacions

eS4A Progamming Learning Board

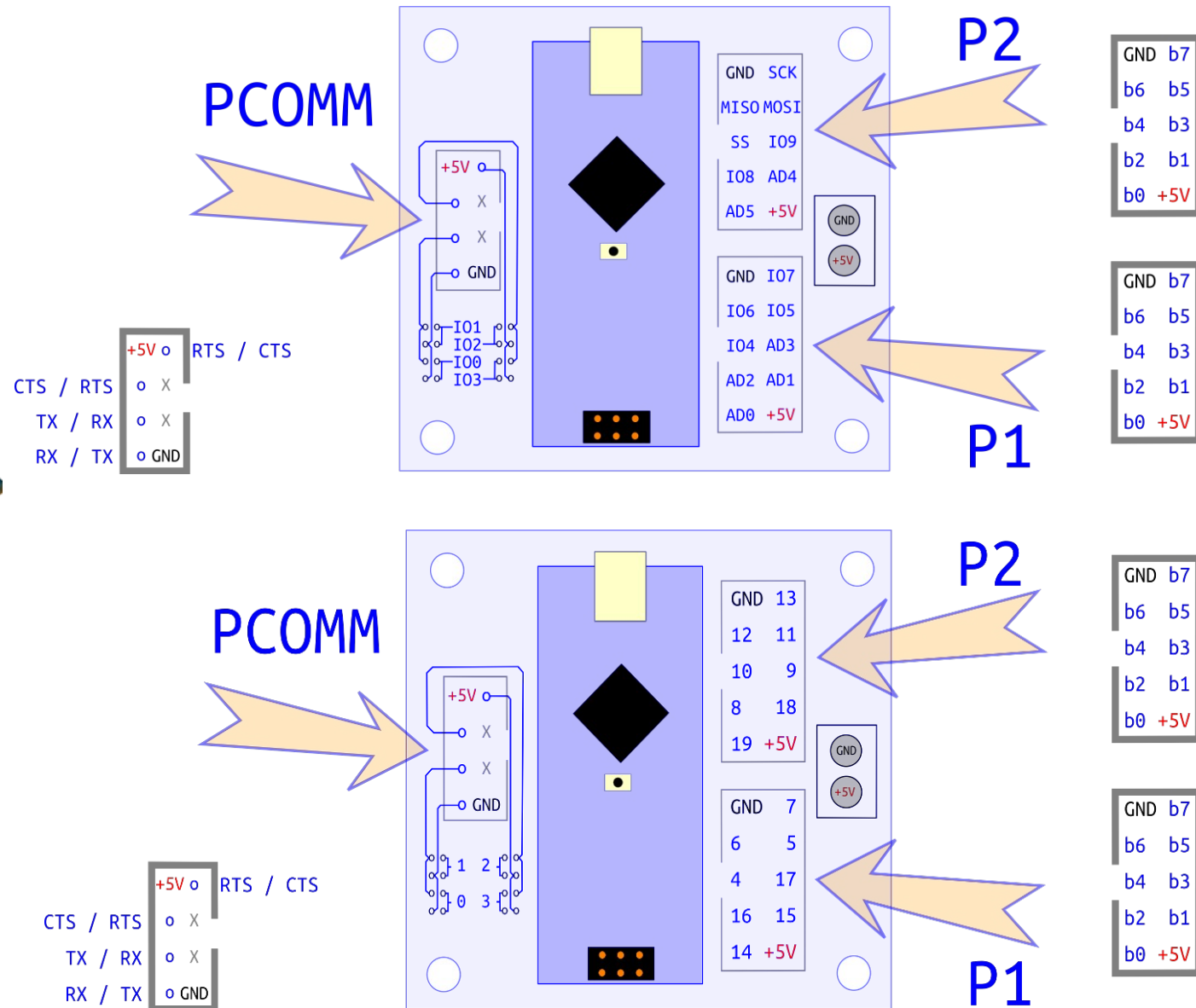
Plaques amb sistema de bus lliure eCat

nano-eCat

Placa 0101 v4



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

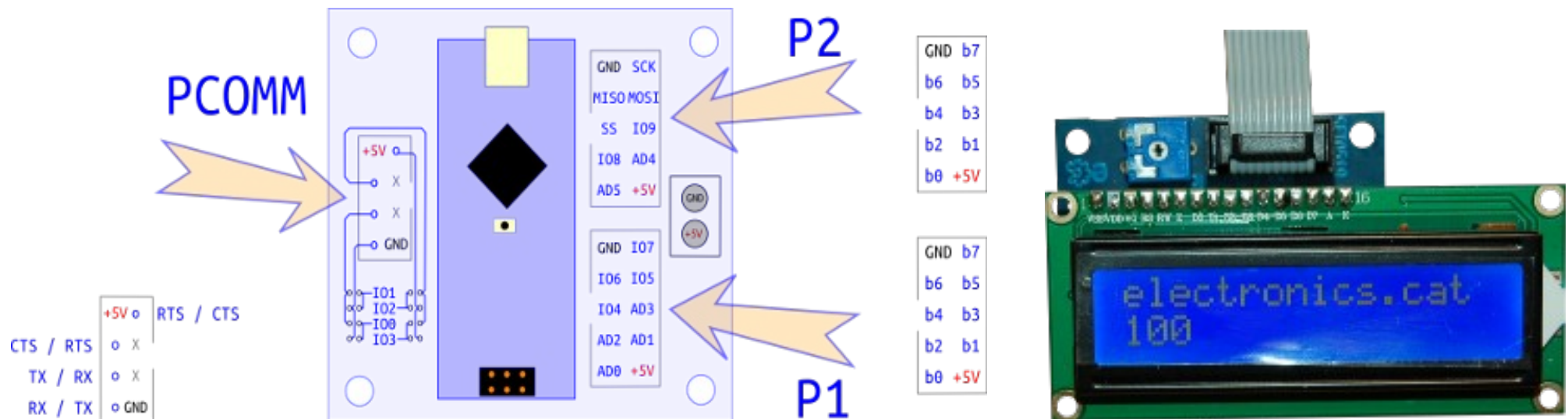




S4A Progamming Learning Board

LCD

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



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



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
```



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

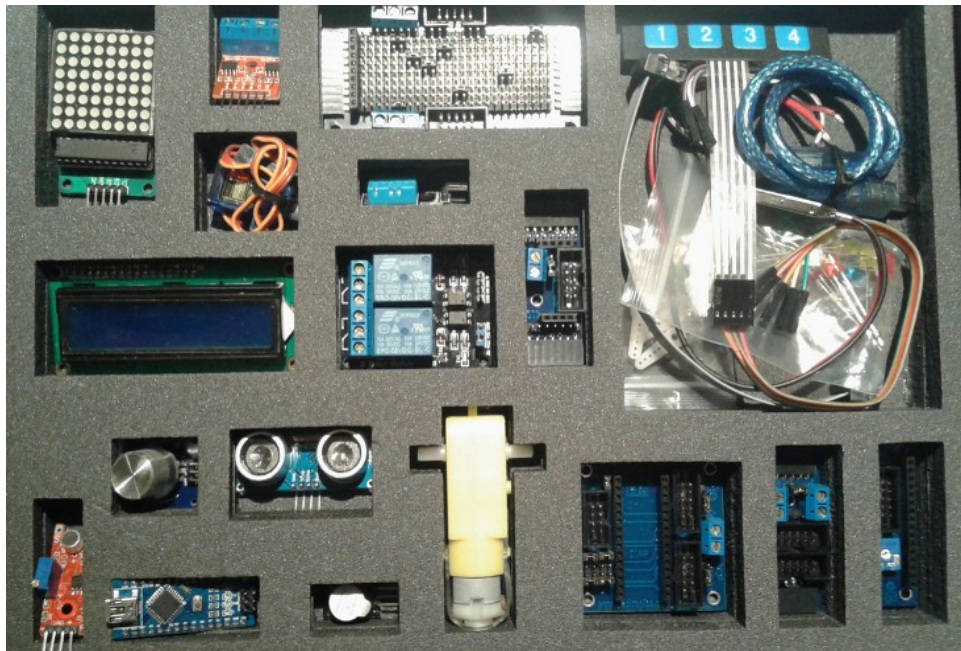
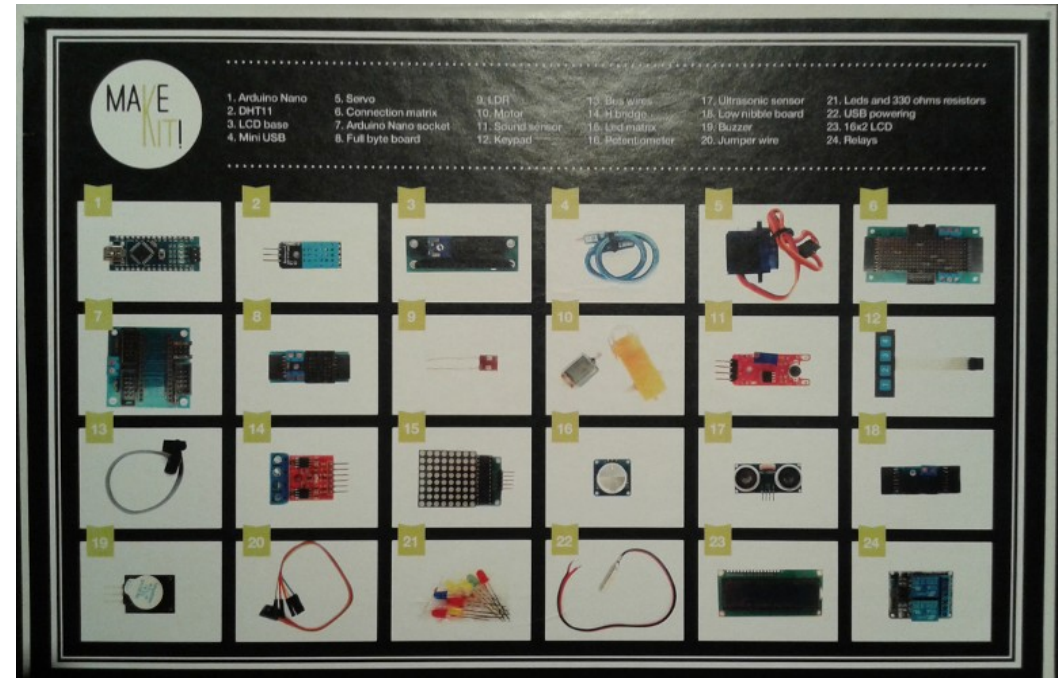
Make It!





Altres maquinari lliure

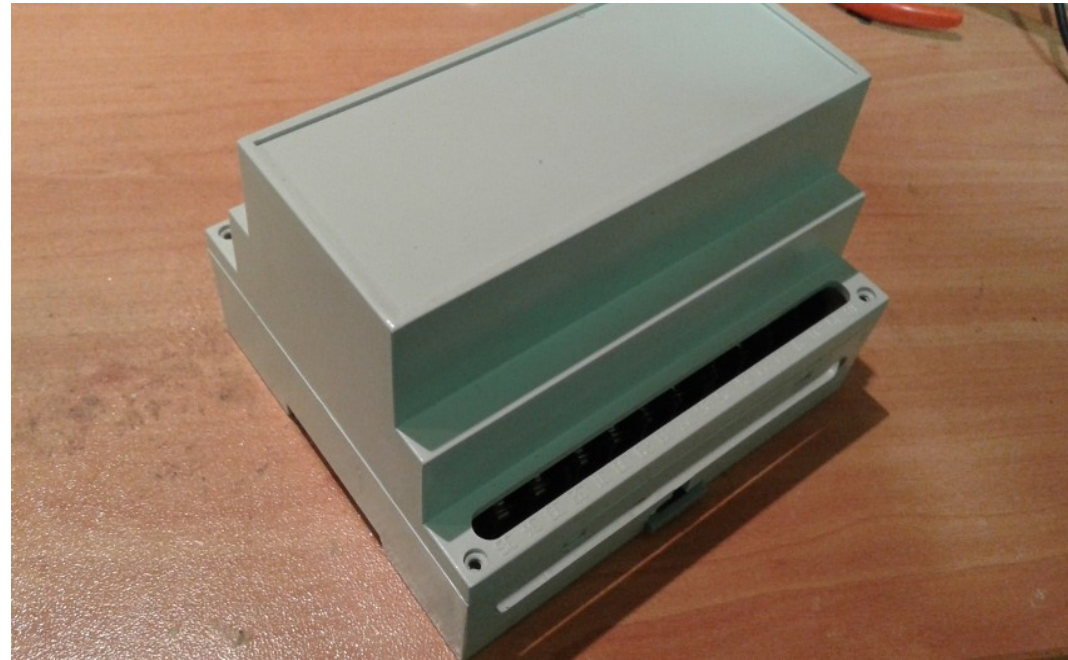
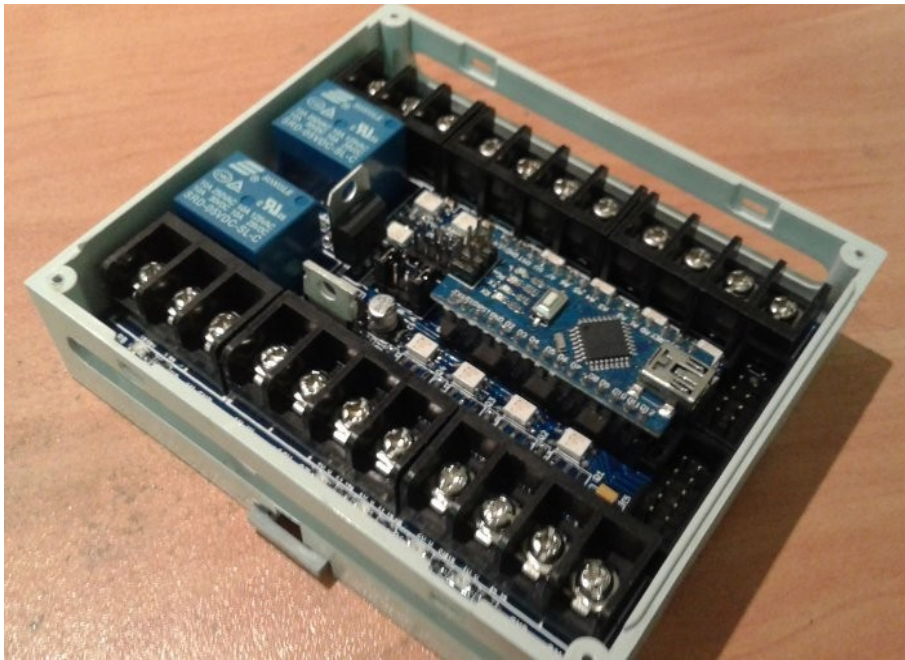
Make It!





Altres maquinari lliure

petitPLC



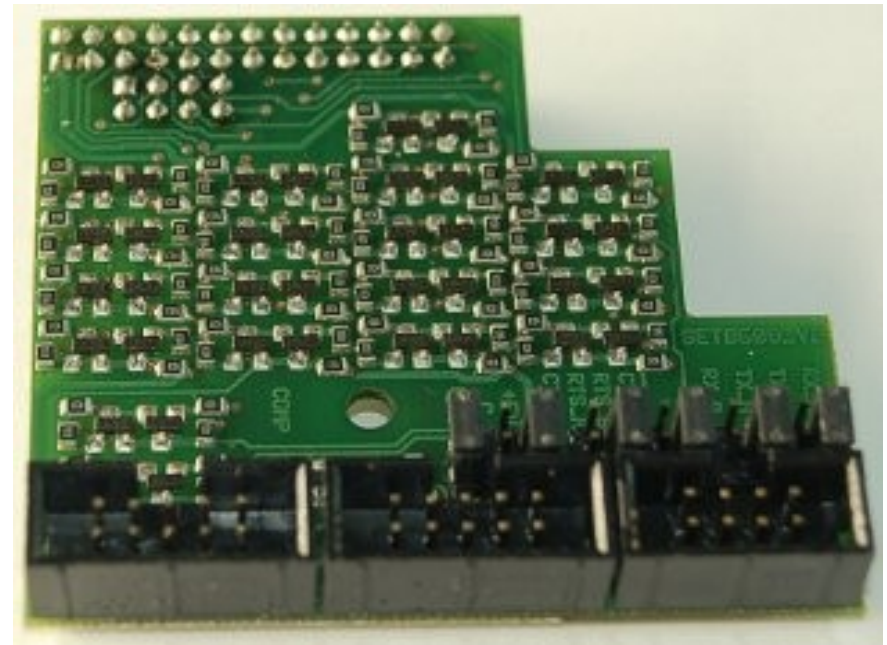


Altres maquinari lliure

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=264>

Correu electrònic de contacte : jordibinefa@electronics.cat

Twitter



<https://twitter.com/electronicscat>

<https://twitter.com/JordiBinefa>

LinkedIn

<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>