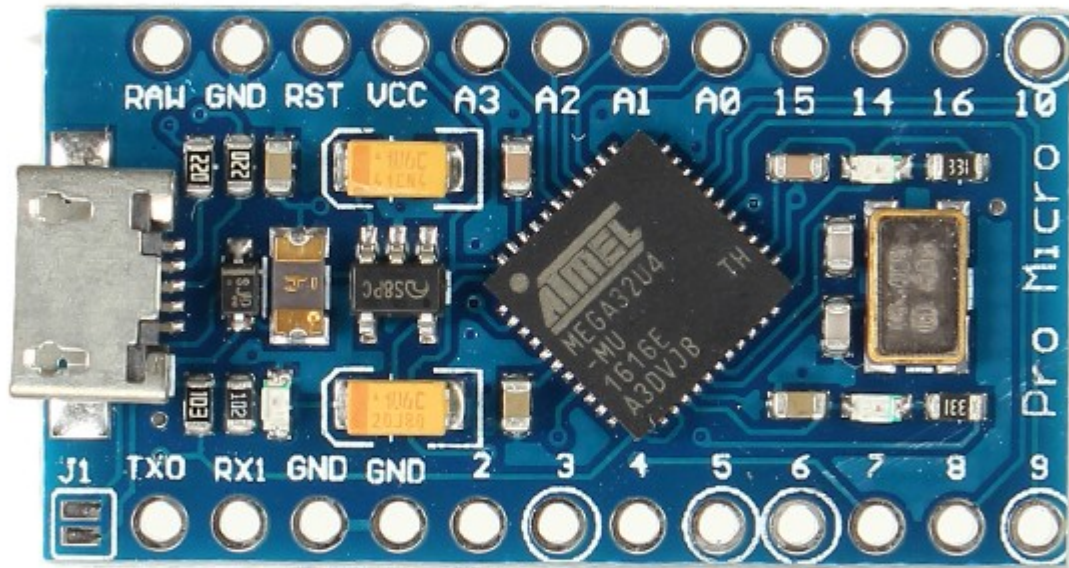


# Arduino Controller



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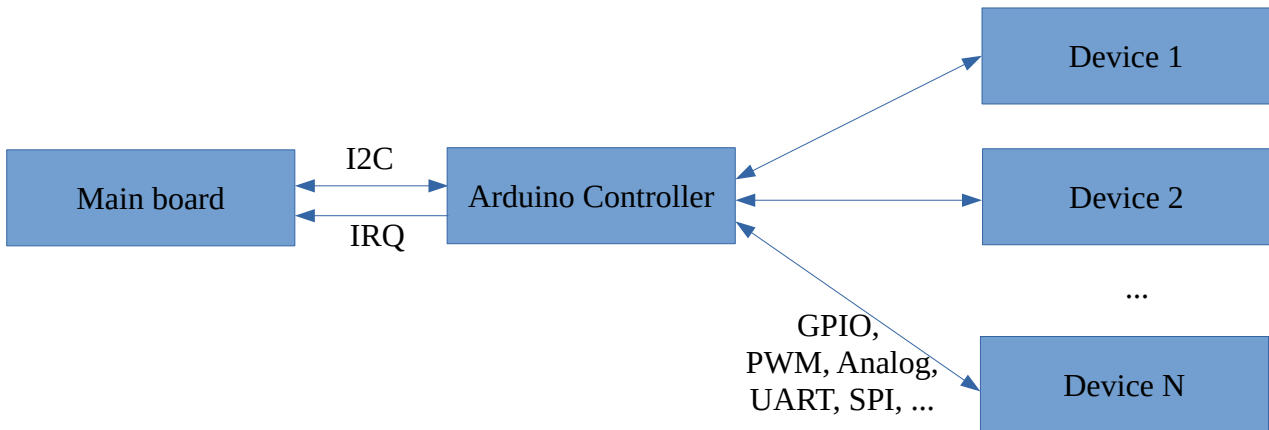
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# 1 Presentation

## 1.1 Introduction

Arduino Controller allows a main board (Raspberry Pi Arduino, or any micro with I2C interface) to control multiple devices with an Arduino (or any other micro-controller). The following image shows the overall architecture.



To communicate with the Arduino Controller, the [I2C](#) interface and an optional IRQ are used. I2C is the main protocol used to communicate. All commands and status packets are sent or received from the I2C. The IRQ allows the Arduino Controller to tell the main board that the status of a device has changed.

On the other hand, the Arduino Controller is connected to several devices that can be controlled using different methods: a simple GPIO, PWM, Analog output, UART, SPI... The list of the devices available is specific to the implementation of the Arduino Controller, see example in Annexe A with Robot HMI.

## 1.2 I2C configuration

### 1.2.1 Specification

The Main board is the I2C master and the Arduino Controller is a slave with an address between 0x61 and 0x69.

The default I2C speed of Arduino Controller is 400 kbit/s (Fast Mode).

### 1.2.2 Communication

To control or get information, the main board sends Command packets and the Arduino Controller sends Status packets.

## 2 Command packet

[Device] [ID] [Command] [Parameter 1] ... [Parameter N]

[Device]                      The device family to send the command (led, gpio, servo, switch, ...)  
[ID]                          Id of the device to send the command  
[Command]                  Command device to execute  
[Parameter 1 ... N]        Associated command parameter

A command packet without parameter is a read request and the status packet will return the value of each parameter.

When a command is tag with RO (Read-only), only a read request can be done.

## 3 Status packet

Return the status of the last command received:

[Device] [ID] [Status]

In case of a read request, the status of the command and the value of each parameter is returned:

[Device] [ID] [Status] [Value 1] ... [Value N]

List of the status.

Value	Name	Comment
0x00	OK	No error
0x01	ERROR	Device error
0x02	INVALID_COMMAND	Invalid command received
0x03	INVALID_ID	Device id not supported
0x04	UNSUPPORTED_COMMAND	Command not supported by the device

## 4 Devices

The following table list all the devices available.

Device	Name	Comment
0x00	SYSTEM	Internal instruction to the Arduino Controller
0x01	GPIO	Simple gpio input or output
0x02	LED	LED monicolor
0x03	LED_RGB	LED RGB
0x04	SWITCH	Simple push switch or switch
0x05	SERVO	Servo controlled by PWM
0x06	AX12	Servo dynamixel AX12

0x07	7SEG_4DIG	7 segments display with 4 digits
0x08	MOTOR	Drive a CC motor
...		
0xFF	IRQ	Reserved for IRQ mask

## 4.1 LED

The following table list the commands supported by the LED device.

Command	Name	Parameters	Comment
0x01	POWER	[power]	power boolean: 0 = off other value = on
0x02	INTENSITY	[intensity]	intensity [0 – 255]: 0 = 0% 255 = 100%
0x03	BLINK	[period MSB] [period LSB] [duty cycle]	period in ms [0-65535] duty cycle [0-255]: 0 = 0% 255 = 100%

## 4.2 LED\_RGB

The following table list the commands supported by the LED\_RGB device.

Command	Name	Parameters	Comment
0x01	POWER	[power]	power boolean: 0 = off other value = on
0x02	COLOR	[color]	Color ( <a href="#">wikipedia</a> ): 0 = none 1 = red 2 = orange 3 = yellow 4 = green chartreuse 5 = green 6 = green spring 7 = cyan 8 = blue azure 9 = blue 10 = violet 11 = magenta 12 = rose 13 = white
0x03	PWM	[red] [green] [blue]	pwm red, green and

			blue [0 – 255]: 0 = 0% 255 = 100%
0x04	BLINK	[period MSB] [period LSB] [duty cycle]	period in ms [0-65535] duty cycle [0-255]: 0 = 0% 255 = 100%

### 4.3 BUTTON

The following table list the commands supported by the BUTTON device.

Command	Name	Parameters	Comment
0x01 (RO)	STATUS	[status]	power boolean: 0 = unpress other value = press

SWITCH are IRQ compatible.

### 4.4 7SEG\_4DIG

The following table list the commands supported by the 7SEG\_4DIG device.

Command	Name	Parameters	Comment
0x01	POWER	[power]	power boolean: 0 = off other value = on
0x02	INTENSITY	[intensity]	intensity [0 – 255]: 0 = 0% 255 = 100%
0x03	CHAR	[dig0] [dig1] [dig2] [dig3]	Dig{0,1,2,3} are ASCII characters
0x04	RAW	[dig0] [dig1] [dig2] [dig3]	Dig{0,1,2,3}: bit0 = seg a bit1 = seg b bit2 = seg c bit3 = seg d bit4 = seg e bit5 = seg f bit6 = seg g bit7 = seg dot
0x05	BLINK	[period MSB] [period LSB] [duty cycle]	period in ms [0-65535] duty cycle [0-255]: 0 = 0% 255 = 100%

# 4.5 IRQ

Only a read command is supported for IRQ.

Command	Name	Parameters	Comment
0x01 (RO)	READ	[value]	Reset after each reading

## Annex A: Robot HMI v1

The Robot HMI I2C address is 0x61.

### Pinmux of the Robot HMI

Device	ID	PIN	Comment
LED	0x00	A0	LED yellow
LED	0x01	A1	LED green
LED	0x02	A2	LED blue
LED_RGB	0x00	5 / 6 / 9	LED RGB
BUTTON	0x00	7	Starting cord
BUTTON	0x01	0	Push button 1
BUTTON	0x02	1	Push button 2
BUTTON	0x03	4	Push button 3
BUTTON	0x04	A3	Rocker switch 1
BUTTON	0x05	14	Rocker switch 2
7SEG_4DIG	0x00	10 / 16 / 15	Display controlled by MAX7219 connected by SPI

### IRQ mask

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
		BUTTON 0x06	BUTTON 0x05	BUTTON 0x04	BUTTON 0x03	BUTTON 0x02	BUTTON 0x01