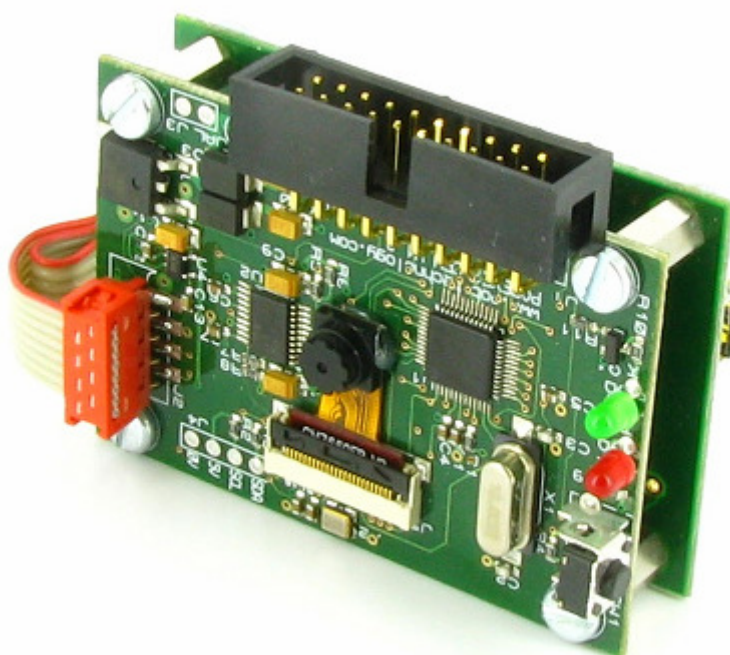




Robot maker
For Innovative Leisure and for Education



POB-EYE2 Documentation

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1 Introduction

1.1 Applications for the POB-EYE2

The POB-EYE 2 is a camera device used for real time pattern recognition. Due to its 15 I/O, its serial port and its I2C bus, POB-EYE 2 was designed to be the center application for your project.

The POB-EYE is delivered with the necessary tools for a fast and simple development.

1.2 Features

Hardware:

- Microcontroller 32 bits ARM7-TDMI.
- 128 K bytes of flash memory.
- 64 K bytes of RAM.
- 1 camera sensor which provides a 160 per 120 pixels frame in RGB color (QQVGA resolution).
- 1 USB connector (as USB to serial interface).
- 1 I2C bus connector (as master or slave).
- 1 UART free for use.
- 1 ZigBee wireless communication module in option (used the previous UART)
- 1 POB-Bus connector to connect other POB-Technology board like the POB-PROTO, the POB-LCD or the Dual-POB.
- 13 digital pins free for use (shared with the POB-Bus pins).
- Size of module: 60 mm per 40 mm.

Software:

- Risbee software with intuitive interface based on graphic icons for beginners
- C programming support with the PobTools and the GNU compiler.
- A complete software development library to manage the POB-EYE2 hardware with examples and documentations.

1.3 List of contents

- 1 USB cable
- 1 CDROM with POB-Technology software, compilers and documentation

1.4 What you need

- 1 PC with Windows 2000, XP or Vista.
- 1 power supply between 9V ~12V.

2 Installation

Before using the POB-EYE2 hardware, you have to install the USB driver and the necessary software to run the POB-EYE2 on your computer.

▪ *Install the USB Driver*

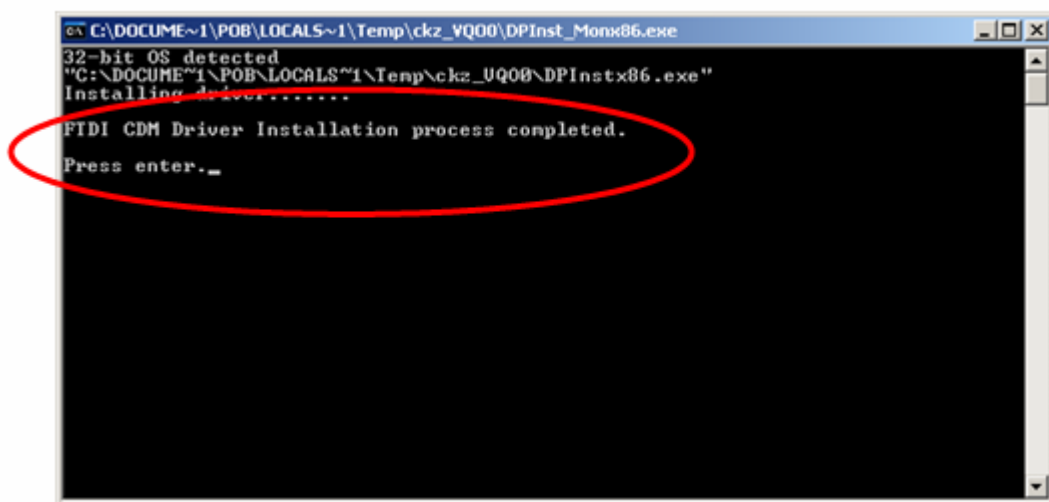
The PobTools will install on your computer all the needed software to use the POB-EYE2 with a PC under Windows.

- Insert the supplied CDROM with the POB-EYE2
- Click on “*Install PobTools*” and follow the instructions.

TODO insert picture

Select “**Install USB Driver**” (1) and press “**Finish**” (2) button to run the driver installation.

At the end of the driver installation, press enter on your keyboard:



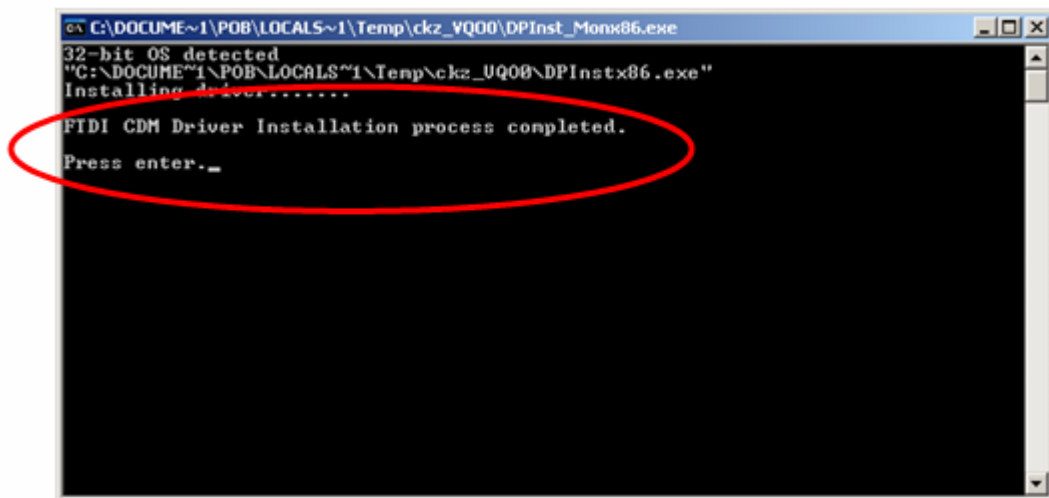
- After installing, you can find in “Start → *Programs* → *POB-Technology* → *POB-TOOLS*” a repertory with all POB-EYE2 resources, documentations and programs.

■ *Install the USB Driver*

If you didn't install the USB Driver during POB-TOOLS installation process, simply follow the instructions to install the USB drivers:

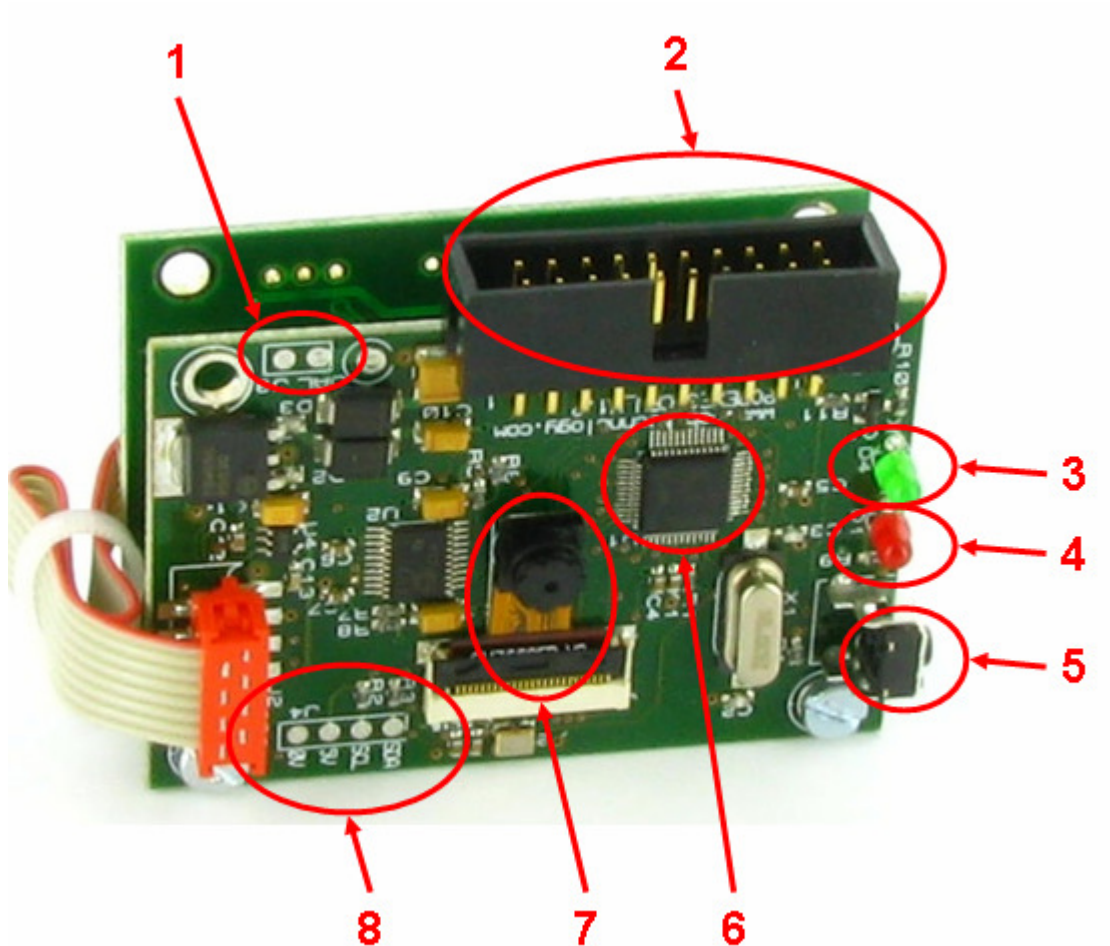
- In Windows, Run the application <Repertory of POB-TOOLS>/ressources/CDM 2.04.16.exe

At the end, press enter on your keyboard.



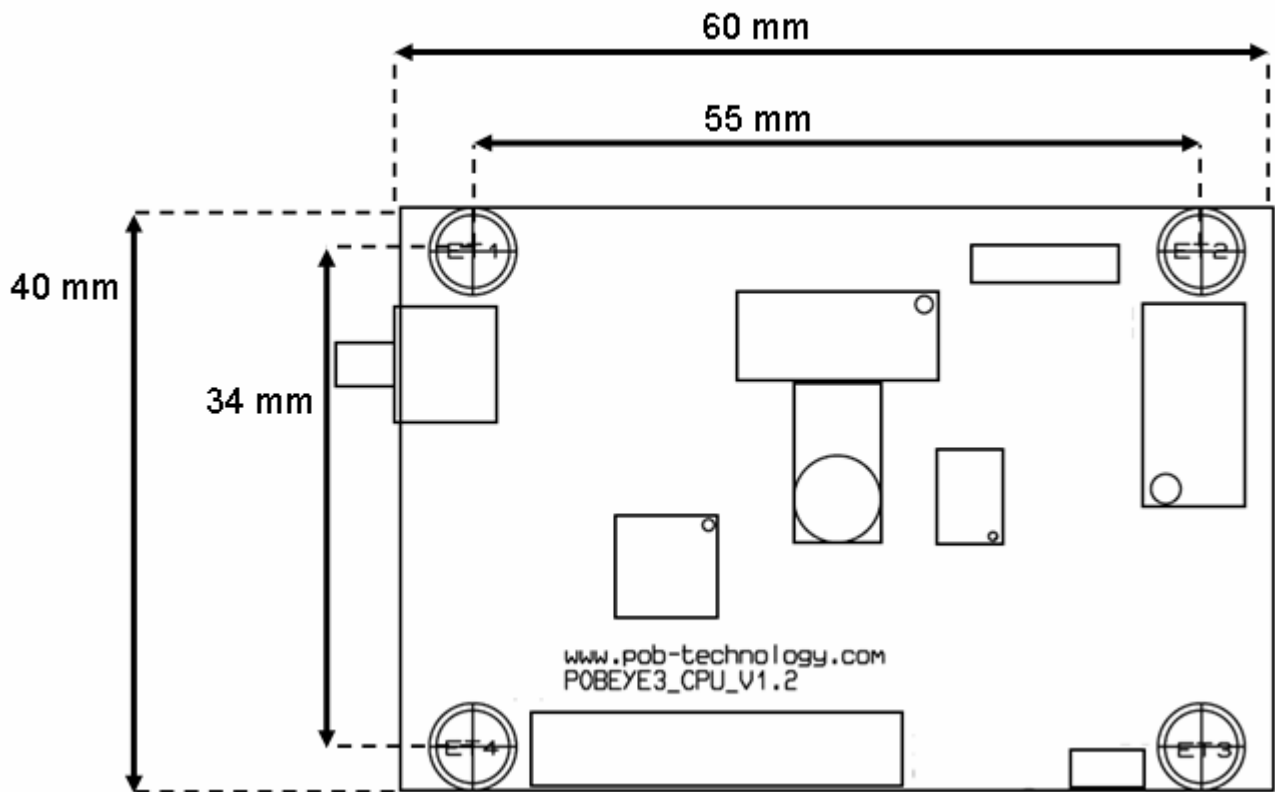
```
C:\DOCUME~1\POB\LOCALS~1\Temp\ckz_VQ00\DPInst_Monx86.exe
32-bit OS detected
"C:\DOCUME~1\POB\LOCALS~1\Temp\ckz_UQ00\DPInstx86.exe"
Installing driver.....
FIDI CDM Driver Installation process completed.
Press enter._
```


3 Functional description



- 1 Power supply connector
- 2 HE10 connector (POB-BUS and free digital pins)
- 3 Free LED for user
- 4 Power LED
- 5 Programming button
- 6 Microcontroller ARM7TDMI
- 7 Color camera
- 8 I2C connector

▪ *Mechanical dimensions*



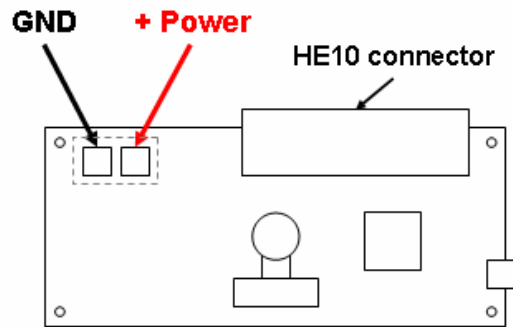
POB-EYE2 Documentation

■ Power

The power supply have to be between 6 ~ 12Volts. There are two ways of supplying the POB-EYE2 module:

- By the Power supply connector

+ Power must be between 6 ~12 Volts.



Warning:

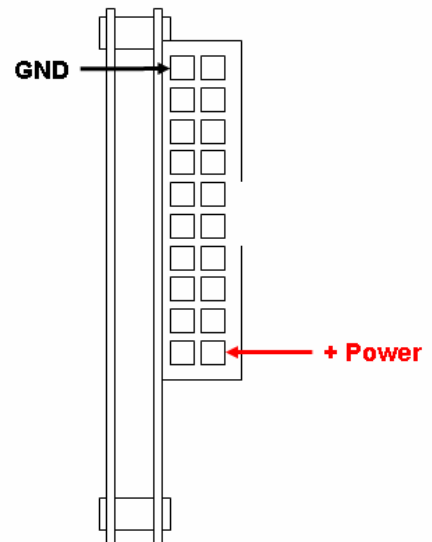
If you have a POB-BOT, don't use the power supply connector!

- By the POB-BUS connector

You can supply POB-EYE2 module with a daughterboard through HE10 connector.

If you use POB-BOT from POB-Technology, the power is supplied by the POB-PROTO.

+ Power must be between 6 ~12 Volts.



Remarks:

Once the POB-EYE2 module is power on, the Power LED comes on.



Warning:

Make sure to not supply power by the POB-BUS and the power connector at the same time: otherwise you might destroy the POB-EYE2 module!

■ *CPU and Memory*

The POB-EYE2 CPU is an ARM7TDMI from NXT. This microcontroller works at 60 MHz.

The CPU memory contains:

- 64 Kbytes of RAM
- 128 Kbytes of flash memory for store your firmware.
-

Remarks:

The flash memory contains 8K bytes of boot code: for your application you have only 120K bytes free.

Boot loader notes for developers:

- *The bootloader is a small program that allows you to upload and launch your application made with PobTools.*
- *If you don't want use POB-Technology program, you can use the lpc21isp program to upload new program to the POB-EYE2. See the website: <http://lpc21isp.sourceforge.net/>*

■ *Programming Button*

To upload your application into the POB-EYE2 memory, you have to set the POB-EYE2 in programming mode.

To go in the programming mode, you have to:

- Power off POB-EY2 module.
- Press the “Programming button” and power on the POB-EYE2.
- Release the “Programming button”: the POBEYE2 is in programming mode, you can now download your application with POB-TOOLS.

To go in running mode, you have to power on the POB-EYE2 module (Or power off and power on).

■ *Camera sensor*

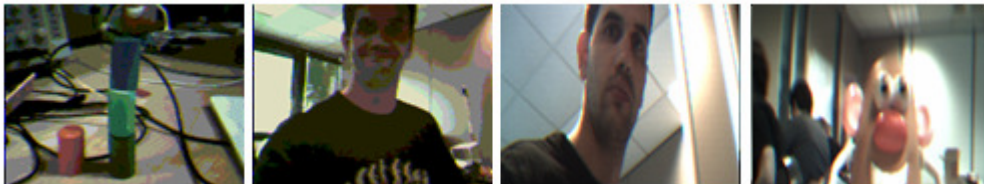
The camera sensor of the POB-EYE 2 module provides a 160 per 120 pixels of RGB color (**QQVGA** resolution) at a speed up to 9 ~ 10 frames per second.

The camera sensor improves the image quality by eliminating (or reducing) lighting / electrical sources of image contamination to produce a clean color image.

By default, the camera works in **compressed mode**: the RGB pixels are compressed into the POB-EYE 2 memory and take only 19 200 bytes of memory.

You have for your algorithm 46 335 bytes free (the POB-EYE2 has 64K bytes of memory).

Examples of RGB frame:



Remarks:

You can work with uncompressed frame if you want but it will take 57600 bytes of memory (160 x 120 for one color component, then for red/green/blue = 160 x 120 x 3)!

■ *USB connector: USB to UART*

The USB connector (a mini-B female connector) allows you to upload a new firmware and to communicate with the POB-EYE2 by a serial port with your computer: The POB-EYE2 converts the USB link to a serial link.

The USB driver works with the following operating system:

- Windows Vista (and Vista x64)
- Windows XP (and XP x64)
- Windows Server 2003 (and x64)
- Windows 2000
- Windows ME and Windows 98
- Linux
- Mac OS X
- Mac OS 9 and Mac OS 8
- Windows CE.NET (Version 4.2 and greater)

You can check the drivers for your operating system on this web site:

<http://www.ftdichip.com/FTDrivers.htm>

Notes for developers:

The driver creates a new virtual com port on your computer, you can communicate with the POB-EYE2 by using the default serial API on your operating system.

For example, to use the serial port on windows system, you can read the following articles:
<http://msdn2.microsoft.com/en-us/library/ms810467.aspx>.

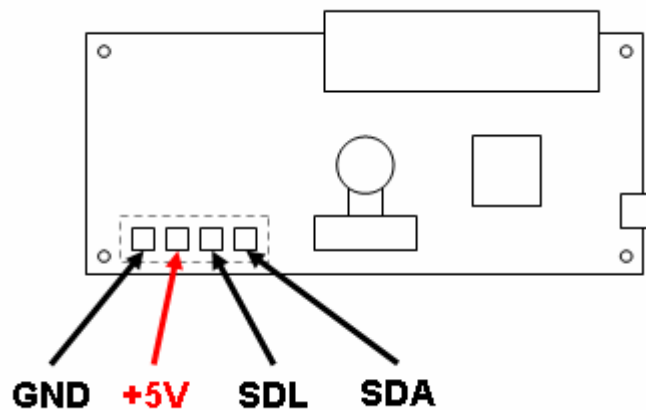
On Linux system, you can read this article:
http://en.wikibooks.org/wiki/Serial_Programming:Serial_Linux

On the POB-EYE2, the USB link is used as a serial port (connected to UART0 on the POB-EYE2 CPU).

▪ *I2C bus connector*

The I2C is a serial bus that can work at 100 Kbits/s to 400 Kbits/s. You can use the POB-EYE2 as a slave i2c device or as a master i2c device.

I2C connector schematic:



- GND Ground
- +5V +5 volt
- SCL I2C Clock
- SDA I2C Data

Remarks:

The i2c bus on the POB-EYE2 has already its pull up resistance.

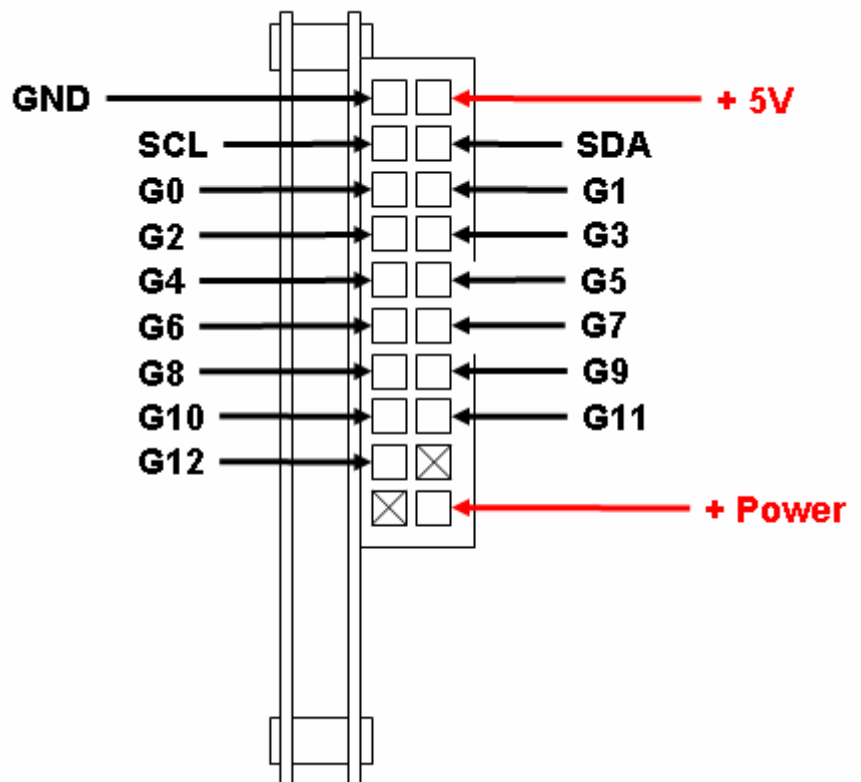
The POB-EYE2 camera use the i2c bus at startup for configuration: The i2c slave address of the camera is equal to 0x42 (in hexadecimal).

■ HE10 connector: Input/Output

The HE10 connector give you access to the I2C bus (named SCL and SDA), 13 free digital pins (named G0 to G12), the +5 volts and the ground.

The **+ Power** pin allows you to power on the POB-EYE2 module by your own device (see Power supply chapter).

HE10 digital input output schematics



Remarks:

The voltage of the input/output pins is 3.3 volts. Despite a 5 volts tolerance, a current more than 10 mA is not possible.



Warning:

Before connecting a device on the POB-BUS, power off the entire device!

POB-EYE2 Documentation

Input/Output description

Name	Description
GND	Ground
+5V	Output +5V provided by the POB-EYE 2
SCL	I2C Clock
SDA	I2C Data
G0	Input/Output
G1	Input/Output
G2	Input/Output
G3	Input/Output
G4	Input/Output
G5	Input/Output
G6	Input/Output
G7	Input/Output
G8	Input/Output
G9	Input/Output
G10	Input/Output
G11	Input/Output
G12	Input/Output OR free led for user.
Power	Input supply power of POB-EYE 2

▪ *HE10 Connector: POB-BUS*

If you use the POB-BOT, the 13 digital pins are used as an address and data bus to communicate with the dc motor, servomotor, acquire analog value...

The pins G0 to G7 are the data bus. The pins G11 to G12 are the address bus. To complete the bus, there are 3 signals:

- G8 pin: « R/W » signal indicates a read/write to the device. If G8 is in low state, POB-EYE2 writes data to the extension board. If G8 is in up state, POB-EYE2 reads data from the device.
- G9 pin: « ENABLE » signal, allows signals validation on the bus.
- G10 pin: « ACK » signal, allows to know device states (the device is ready to communicate)



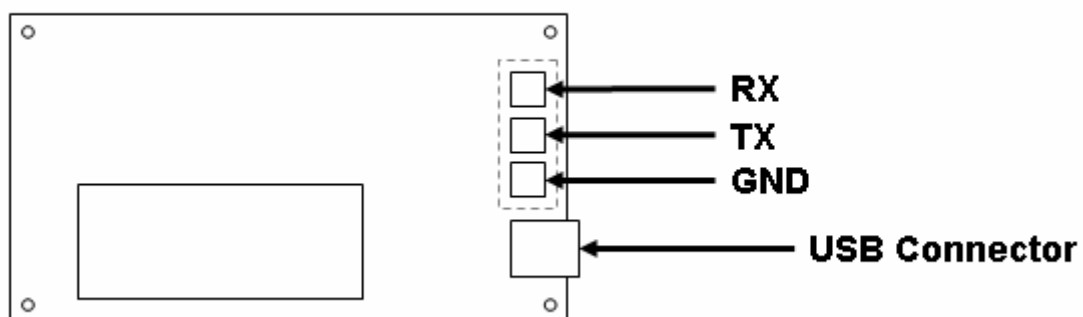
Warning:

Before connecting a device on the POB-BUS, power off the entire device!

■ *UART1*

The POB-EYE2 comes with a second UART, named UART1. You can use them freely in your application.

UART1 schematics:



- RX UART1 reception of POB-EYE 2
- TX UART1 transmission of POB-EYE 2
- GND Ground

Remarks:

The voltage level of the UART1 is 3.3 volts.

■ *Zigbee*

The ZigBee is a wireless radio network. On POB-EYE 2, the ZigBee module is an optional module.

The ZigBee module used is an XBee XB24 from Maxstream:

- Module range: 30 meters indoor and 100 meters outdoor.
- Radio frequency 2.4 GHz.
- Configuration by AT command or by API function.
- Serial baud rate range: 1200 to 115200 bps.
- Connected to the UART1 of POB-EYE2.

4 Develop in C language for the POB-EYE2

This chapter is for advanced user who want develop in C language on the POB-EYE2.

4.1 Install developer software

Before develop with the POB-EYE2 board, you have to install the PobTools and the YAGARTO compiler.

To install the YAGARTO compiler:

- Insert the supplied CDROM
- Install the YAGARTO compiler.
- Follow the instructions to install YAGARTO: **Keep the default parameters.**

4.2 Compile and Upload

▪ *Compile your program*

The compilation process use the YAGARTO compiler (a Gcc based compiler), click on the “Compile” button in PobTools.

▪ *Upload your program to POB-EYE2*

Set the POB-EYE2 into Programming mode:

- Power off the POB-EYE2
- Press the “Programming button” and power on the POB-EYE2
- Release the “Programming button”.

The POB-EYE2 is in Programming mode, you can now upload a new program into the POB-EYE 2 memory.

▪ *Run your program*

To run your program, you have to power off and then power on the POB-EYE2.

4.3 Software library

The POB-EYE2 comes with a complete software developer library. The default location of the library is “<**POBTOOLS repertory**>\sdk\pobeye2” or by clicking on the Help button in PobTools software.

4.4 Examples

The POBEYE2 comes with complete source code examples to manage uart, POB-LCD, recognition process, POB-BOT...

The source code can be found at **<POB-TOOLS repertory>/sdk/pobeye2/examples** or by clicking on the Help button in PobTools and select the Examples.

Contact POB-Technology

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