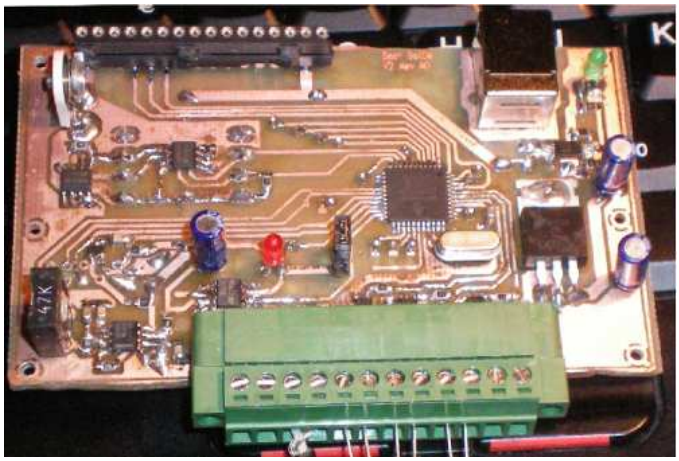
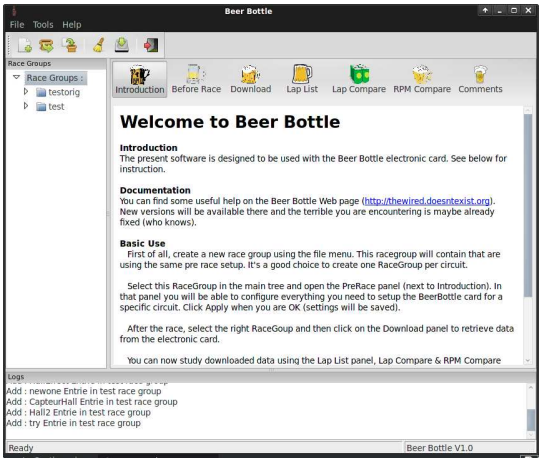
Beer Bottle

User/Guinea-Pig Manual





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1 Introduction

1.1 Specifications

The Beer Bottle project aims at providing a complete solution to bike/kart racers who want to gather in-race informations such as lap time or RPM capture.

With the Beer Bottle you can :
- Store lap times (up to 256 sublaps)
- Store RPM captures (Tech = 0,1s, offers more than 10 minutes of continuous capture)
- Configure start and stop condition (lap number) for RPM capture
- Configure a 3 states shift led panel for RPM indication
- Extend the number and the type of captors using I2C bus (2 slots provided)
- Download information into a PC (Linux & Windows)
- Compare laps (time, sublap, RPM) with classified information
- Graph the RPM capture for 1 or more laps
- Organize, export and import race data

The project is divided into 3 parts :
- the electronic card
- the embedded firmware
- the pc software

All of these parts are distributed under the terms of a free licence (GPLV2 or LGPLV2). This means that you can freely reproduce, copy or modify all the parts of the project (according to the given licence). See the COPIYNG file in each project for more details about this.

Since I only used free softwares you can download everything's necessary to modify/realize your own Beer Bottle. Just click here : `http://thewired.doesntexist.org`. You can also leave a comment there to explain how our life changed with the Beer Bottle and that you want to give me your home & car in exchange (a big bunch a money is also welcome).

1.2 Acknowledgment

The original idea was submitted by gino09 (see the Nathmania racing team).
All the usb firmware stack comes from the great VASCO P.U.F of M Pierre Gaufillet.
The firmware loader is derivated from the VASCO Downloader of M Jean-Pierre MANDON.
The beers cliparts where downloaded from the OpenClipart project.

This project is dedicated to Mimo.

2 Card Realisation

2.1 Downloading the project

The first thing to do is to download the PCB realization package from the Beer Bottle web site (`http://thewired.doesntexist.org/wp-content/BeerBottle/Current/Pack.tbz2`). This package contains everything you may need.

2.2 PCB Realisation

The previously downloaded package contains printing masks for the 2 PCB sides. I recommend the toner method for printing & HCL + H2O2 for etching. Be sure to print the top mask with the mirrored option. Theses methods are explained in details just here : `http://thewired.doesntexist.org/?p=7` & `http://thewired.doesntexist.org/?p=37`. The following picture shows what you can expect thanks to this method (that's my card).

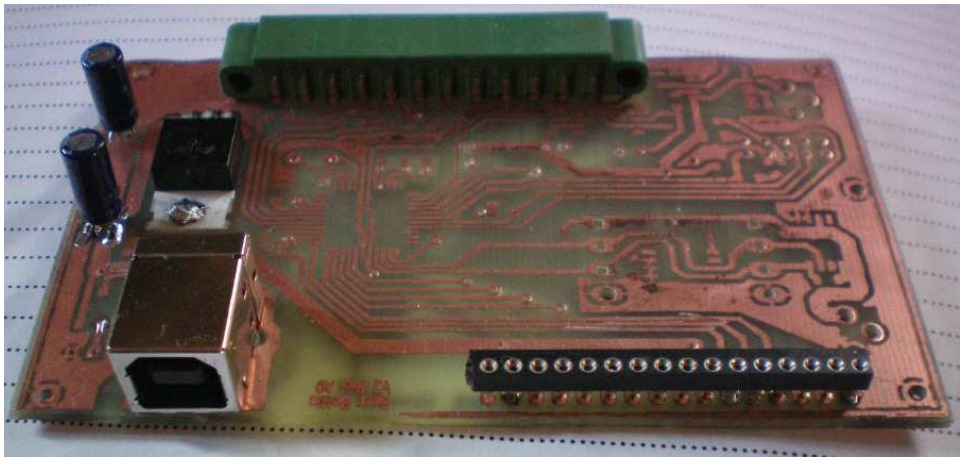

FIGURE 1 – The card at an early solder stage

2.3 Component Soldering 1/2

At first, you only have to solder the PIC18F4550 and the required components to program the bootload into the μc : D2, R12, Q2, R13, R14, Q3, C11, C13, C14, R37, P2... and U6.

2.4 Bootloader Programmation

Use your favorite pic programmer to program the 18F4550 with the following bootloader file. If the verify step is successful, go to the next step. Otherwise, check every solder and your wiring.

2.5 Component Soldering 2/2

Remove the R37 resistor.
You can now mount the other components. There is no particular order but I strongly recommend you to start with the power stage. The picture below shows the final PCB with all component placed.

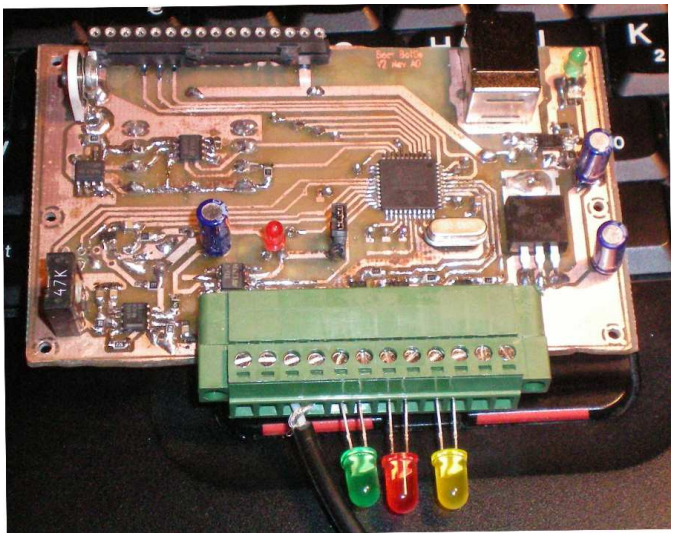

FIGURE 2 – The card fully soldered

2.6 Firmware Download

You can now use the bootloader to download the BeerBottle firmware into the 18F4550. Start by placing a jumper on the firmware load strap (see jumper in the picture below). This will enable the download of a new firmware from the Beer Bottle software.

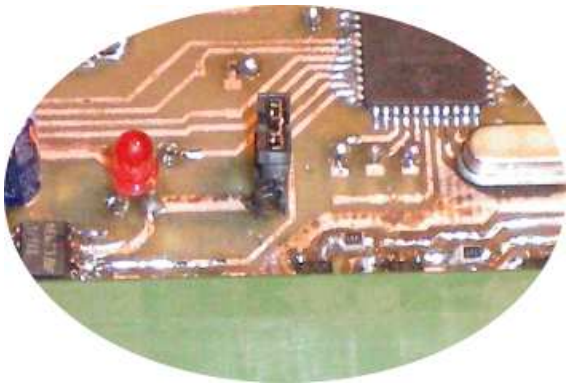

FIGURE 3 – Load Strap

2.7 1st Test

This is the moment you've been waiting for!!!!! For this test you will have to simulate the magnetic captor with a simple switch or even 2 simple wires (you can also use a real captor but this will compromise the fun in this part). Launch the BeerBottle software (see installation in the next chapter), create a new race group and configure new race settings and download them into the card. Then, reboot the card, and TEST!!!!!!!!!!!!!!!!!!!!!

2.8 Calibration

This is the most complicated task (I spent lots of hours on that subject). Start by wrapping a fake coil sensor (about 5 loops of a copper cable) around a standard AC/DC adapter. Plug it to the RPM Coil Sensor input of the main connector (see picture in the next chapter). Configure the lower RPM threshold to 2000rpm (see next chapter). Then modify the RV2

in order to find the threshold between the *inf* and the *good* led. This may take a while!! I recommend you to fix it with nail polish as soon as you find the threshold.

3 Installation

3.1 The Beer Bottle Electronic Card

This section will explain how to install the Beer Bottle card on your bike/kart/car/duck. It will assume that you have correctly realised the PCB and downloaded the bootloader into the PIC18F4550. If this is not the case, please see the Beer Bottle card realisation guide lines (this is the previous chapter...are you telling me that you are not reading the WHOLE document ? ? ?).

The Beer Bottle card was designed to reduce the number of connectors. You probably won't use more than two of them (the main one & the USB). The picture below shows each connector location.

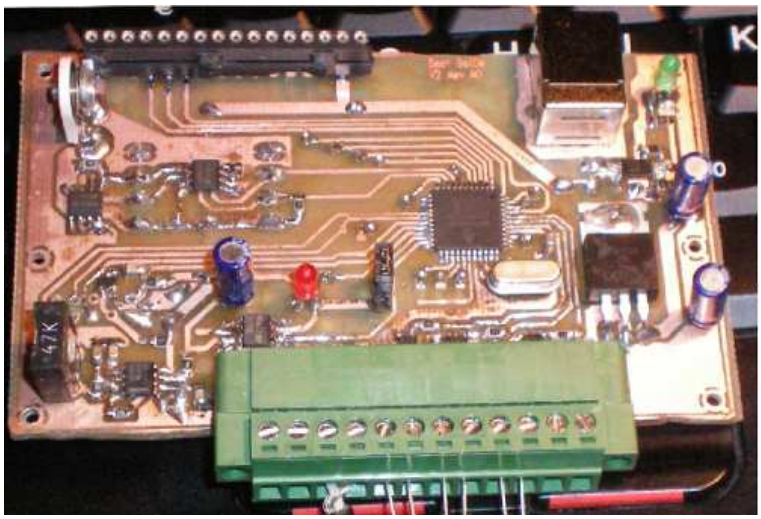

FIGURE 4 – Connectors (Top side)

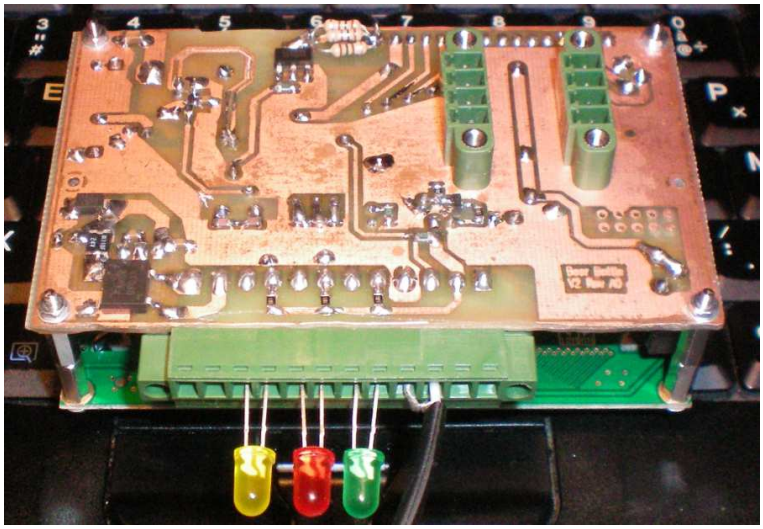

FIGURE 5 – Connectors (Bottom side)

3.2 Connection Description

3.2.1 Main Connector :

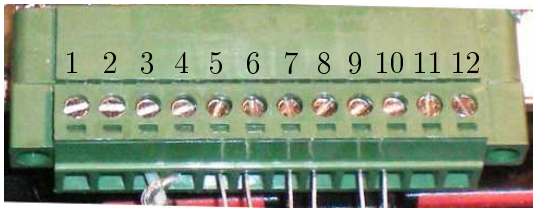

FIGURE 6 – Main Connector

Pin#	***Description***
1	RPM Sensor
2	Vcc(5V)
3	Lap Detector Input
4	GND(0V)
5	LED Sup A
6	LED Sup K
7	LED Good A
8	LED Good K
9	LED Inf A
10	LED Inf K
11	Power Supply pin 1
12	Power Supply pin 2

3.2.2 Expansion Connector :

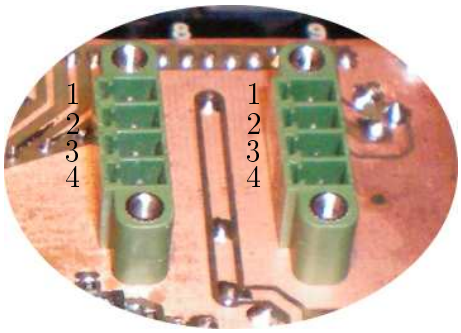

FIGURE 7 – Expention Connector

Pin#	***Description***
1	GND(0V)
2	I2C Data (SDA)
3	I2C Clock (SDC)
4	VCC(5V)

3.2.3 USB Connector :

This is a standard type B USB connector. If you need more information : Google is your friend (it seems we have common friends).

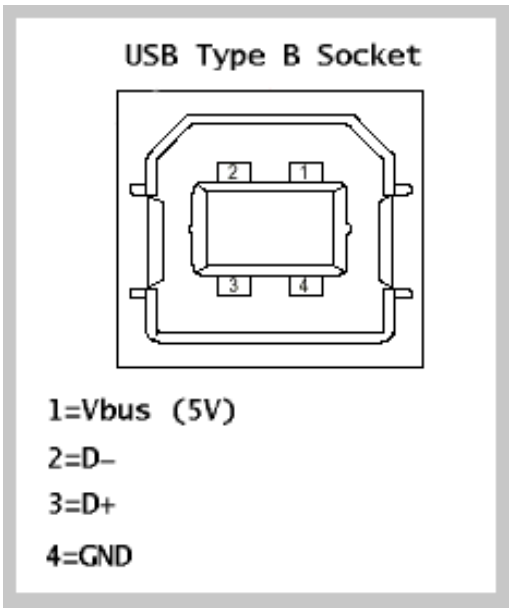

FIGURE 8 – USB Connector

3.2.4 Firmware download connector :

This connector has to be strapped by a jumper before card power is on in order to enable a firmware download.

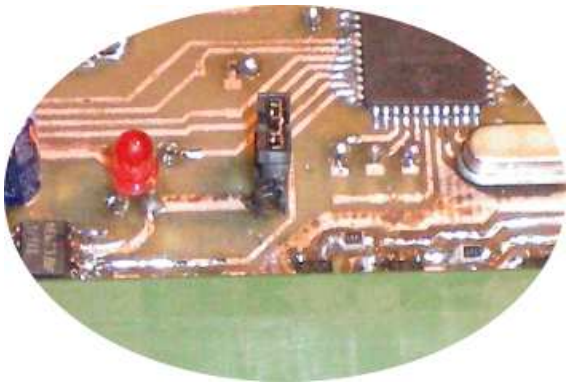

FIGURE 9 – Firmware download connector

DO NOT let the jumper in place after firmware download. Once the firmware is correctly written (the Beer Bottle software will inform you) remove the jumper. Otherwise the firmware will not start at all and will remain stuck in Firmware download mode.

4 Beer Bottle Card Connection

4.1 Power supply :

The card can be supplied by either the USB connector or the main connector (pin 11 & 12). The USB connector is meant to be used with a USB host (compliant with USB2) device. The pin 11 & 12 of the main connector have to be connected to the vehicule's batterie. The input is protected against polarity inversion (so there's no + or -, just do what you want). The input voltage range is 9V-16V and the batterie must supply at least 2.5W (which is normaly ok for a std bike).

There is no power switch on the card. It will start as soon as the power is applied either by USB or by main connector.

4.2 RPM Leds :

The Beer Bottle provides a 3 state shift leds. The user can define 2 thresholds (up & low). If the current RPM is upper than the up threshold, the **Sup** (pins 5 & 6) led lights on. If the current RPM is lower than the low threshold, the **Inf** (pins 9 & 10) led lights on. Otherwise, the **Good** (pins 7 & 8) led lights on.

You can directly plug a led to each led pins (the card includes a 170 Ohms resistor in serial with every led). Pins 5,7 & 9 are the leds' anodes whereas pins 6, 8 & 10 are the cathodes.

4.3 Lap Captor :

Lap detection is designed to be used with standard magnetic lines. You can use Hall effect sensor as well as standards ILS cells. You can also use anything else that connects pins 3 & 4 of the main connector when you cross the start line (or sublap). In fact, detection is made by applying GND from pin 4 to pin 3. A Vcc (5V) is also available on the pin 5 for more sophisticated sensors.

4.4 The RPM Sensor

Pin 1 of the main connector is dedicated to the RPM sensor. It consists in a simple copper wire wrapped around the ignition coil cable at one end and connected to the pin 1 at the other end. At first, I recommend you to wrap five turns of cable. If you encounter some holes in he capture, add 2 or 3 turns. On the contrary, if the sensor is saturated, remove 1 or 2 turns.

5 Card Mounting

You can fix the Beer Bottle card to the bike/kart/duck... using the given fixation points (see picture below). Remeber that the LCD screen also need 4 mounting spacers. For a 4x20 characters LCD screen, each side middle hole remains free.

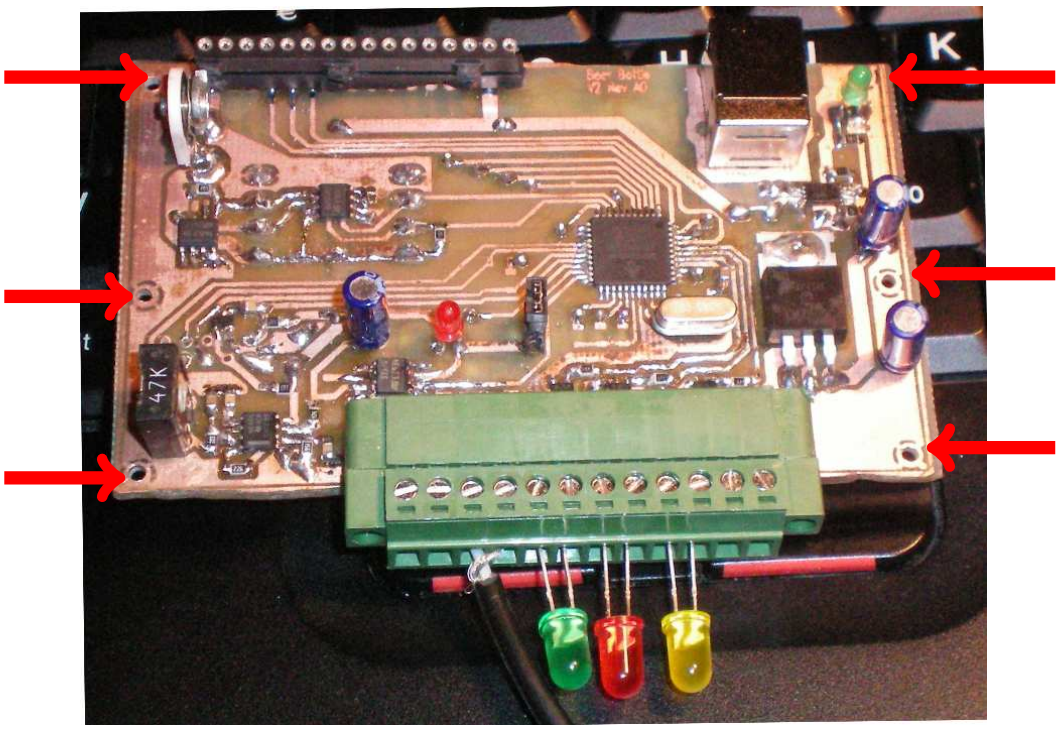

FIGURE 10 – Mounting Points

6 Software Installation

The following section will describe the program installation on a linux system (based on my debian testing (squeeze)). A debian package will be available in the next weeks, months, years (who knows). A windows port is also planned as soon as I find how to install pyUSB on that stinky OS.

Here are the software requierements (make sure you meet them before trying anything else) :

- **Python 2.6** + (not tested on python 3.0)
- **wxPython 2.8**+
- **libUSB 0.14** (not sure for 1.0.0)
- **pyUSB**

Download the udev rules file included in the puf-1.1 on the vasco web site (`http://gforge.enseeiht.`
and copy them into the /etc/udev/ and make a symb like into /etc/udev/rules.d. Follow the readme inside the puf archive.

Download the Beer Bottle program and extract it anywhere on your system (it might also work from an usb key or sd like cards). Beer Bootle is ready to be used. Wanna try : launch BeerBootle.py (use "python BeerBottle.py" or simply double click on it). You should see this :

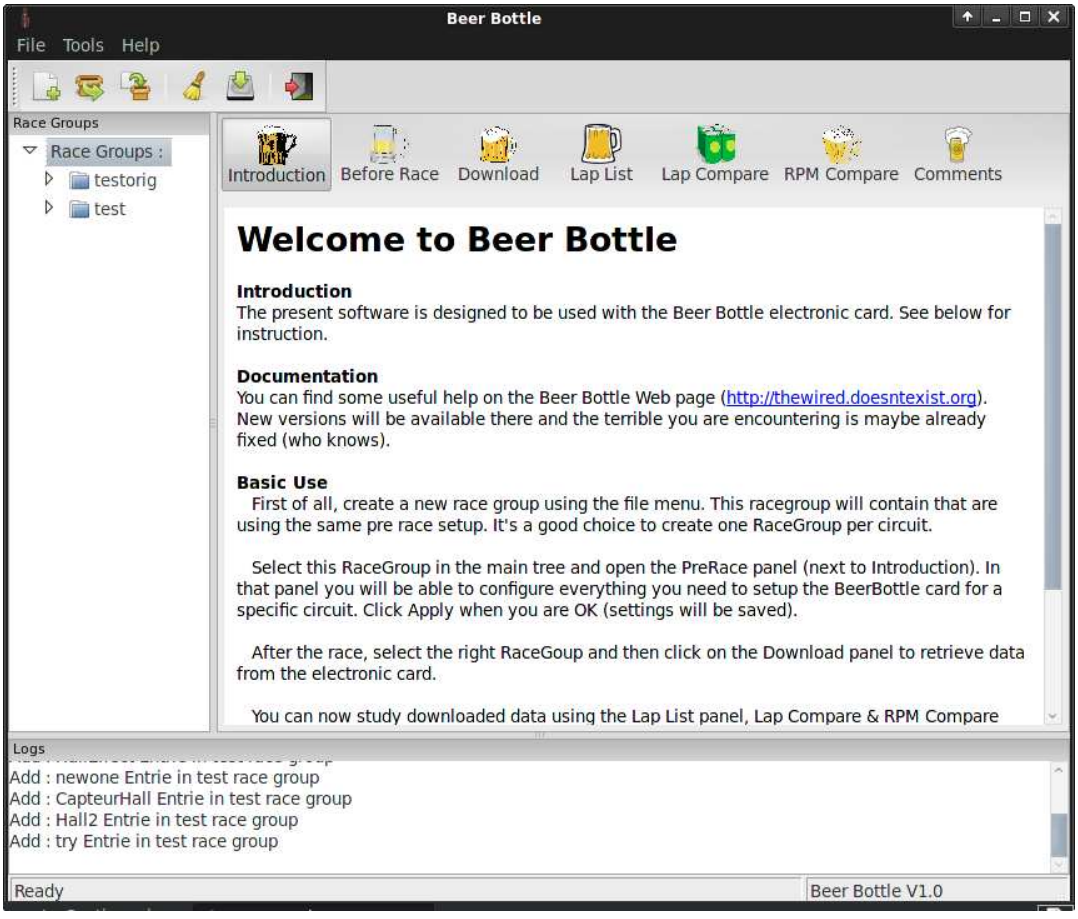

FIGURE 11 – The Beer Bottle software

7 Example Of Use

The Beer Bottle software is divided into several panels. It is designed to use these panels sequentially.

7.1 Pre-Race Setup

The first thing to do is setup the BeerBottle. In this panel you can configure in-race display and global parameters such as sublap number, RPM capture ... (see screen capture below). You can save parameters for futur use if you click the save button. You can also save and upload paramters into the BeerBottle card if you click the Save & Upload. In this case, the program will ask you to plug the BeerBottle to the PC using the USB cable (just follow on screen instructions).

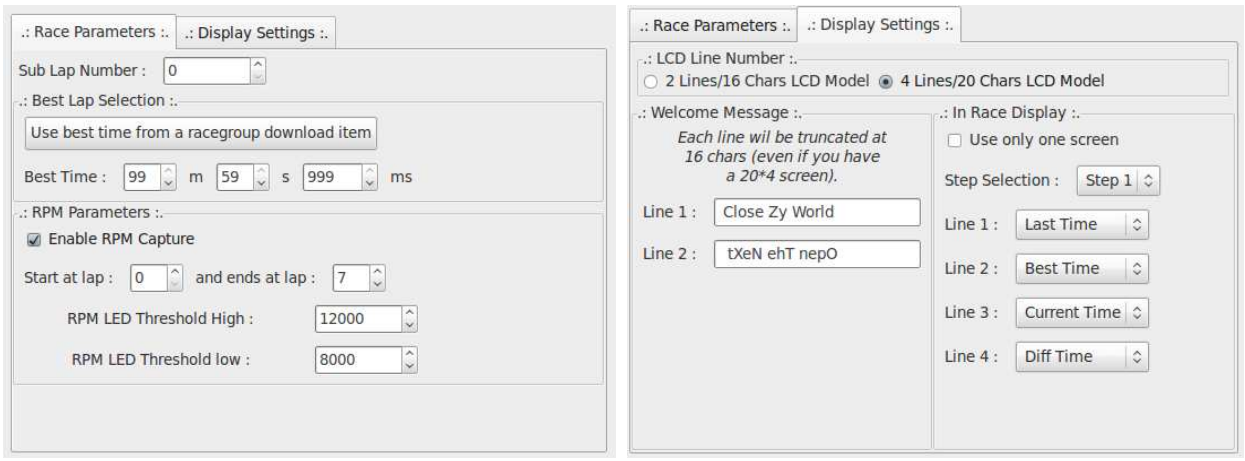

FIGURE 12 – Pre-Race Setup

7.2 Circuit

You can assosiate a circuit with the current pre-race setup. The BeerBottle uses the nathmania circuits page([Todo] : Mettre une lien ici) as Database.

7.3 Race ! ! ! !

Install the Beer Bottle card on your vehicle as described above in this document. And then power it up before starting-up your engine (in order to perform an RPM captor calibration). You can do up to 16 race sessions without having to connect the card to your PC.

7.4 Download

After the race, launch the Beer Bottle program, select the desired race group in the tree (you can create a new one using the File/New menu). Choose the Download panel, click on the Download button and follow the instructions (in fact, just plug the Beer Bootle card at the right moment). The program will ask you a name for the new race group. Be a good boy and do as it wants. Please, do not use special characters for the name unless you really think your file system is able to handle it.

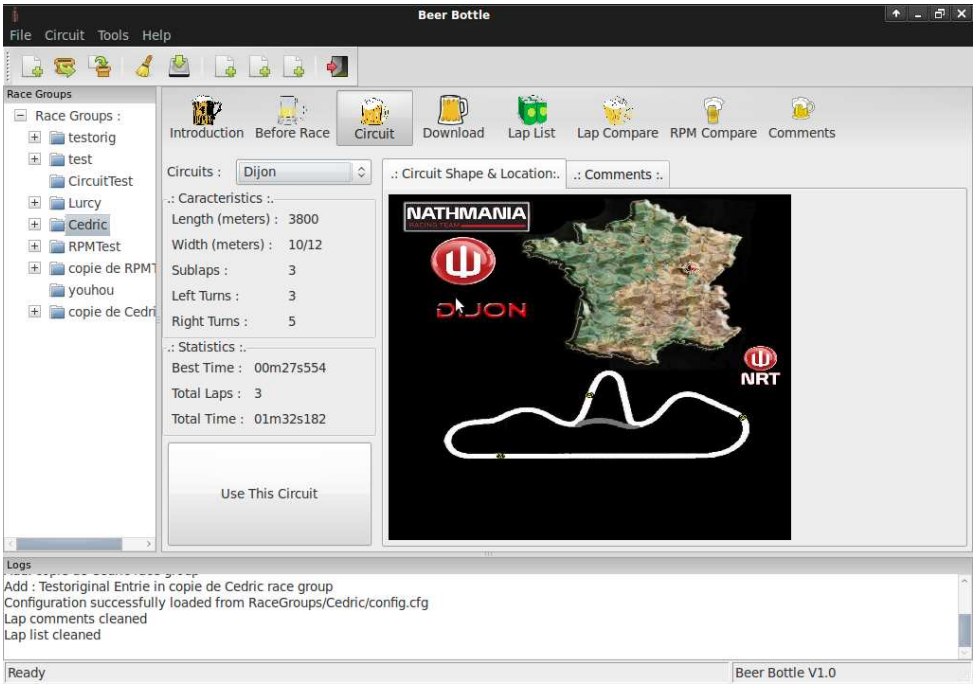

FIGURE 13 – Pre-Race Setup

7.5 Compare

The BeerBottle software, allows you to compare laps using two separate panels. The first one (Compare Panel) is dedicated to sublap analysis. The second one will display RPM graph of the selected laps. You can select lap to be compared from the lap list panel (see screenshot below).

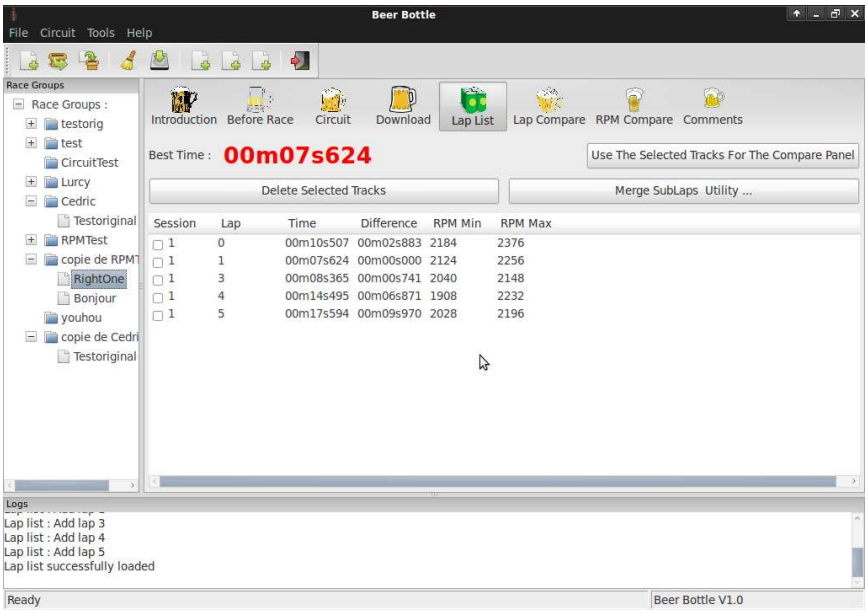

FIGURE 14 – Lap List Panel

7.6 Compare Panel

The compare panel (orphan screenshot below), will display the detailed information about the selected laps in the LapListPanel. This panel displays time & RPM min/max by section

(sublaps).

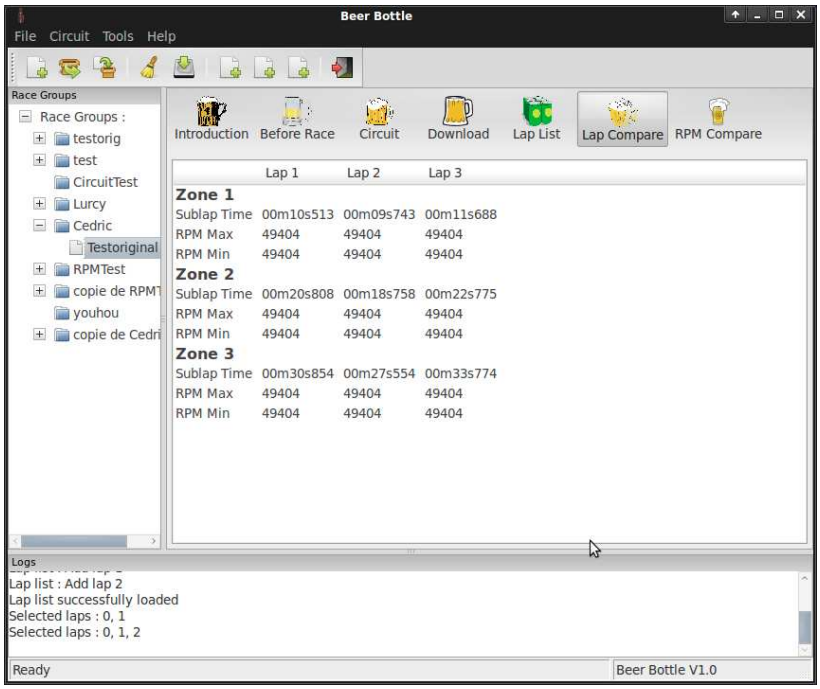

FIGURE 15 – Compare Panel

7.7 Compare RPM

This panel only draws RPM variations of the selected laps. You can zoon and scroll the graph using a mouse click.

7.8 Comments

This panel allows you to leave a comment that will be associated to the current Race Group item.

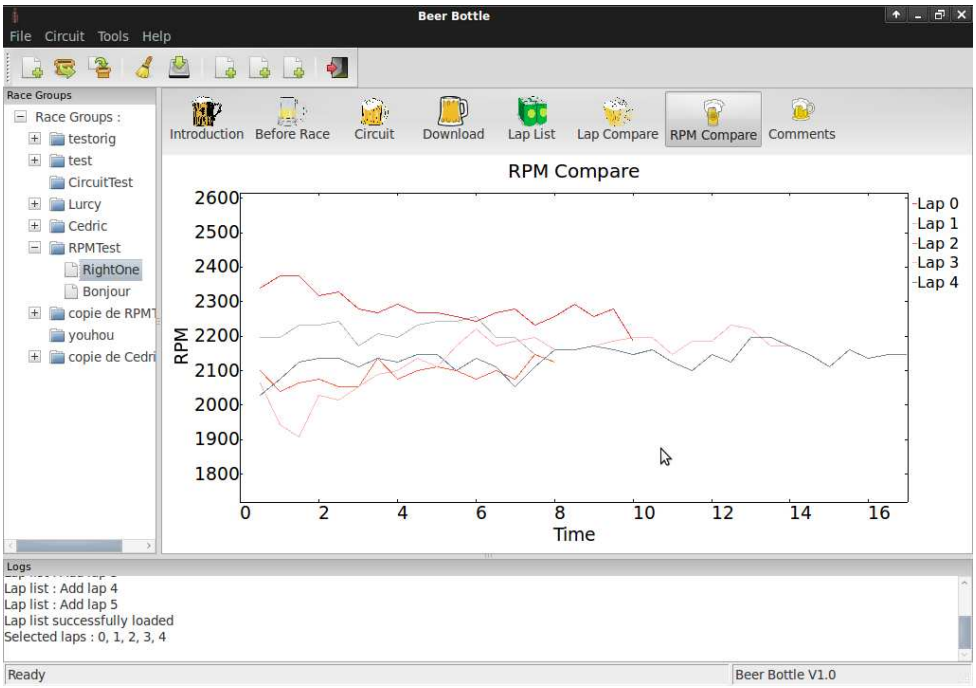

FIGURE 16 – Compare RPM Panel

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