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The oXigen Bootloader application is the software program which allows the user to:

1. check and update the firmware of the oXigen devices;
2. check and update the ID number of the car chip, of the controller cartridge and of the cartridge radio interface (CRI);
3. set the working mode of the car, according to the type of lane changers system type.
4. set other working parameters (not yet)

The application, driver included, works correctly on any PC running Microsoft Windows XP and later.


### ***Installation of the bootloader application***

To install the Slot.it oXigen Bootloader application, do as follows:

1. download the O2\_bootloader\_xxx.zip from Slot.it ftp site (xxx = version);
2. extract all the files from the zip archive into a directory of their own;
3. before starting the installation, make sure that you are logged in as system administrator or that you have admin privileges anyway;
4. launch the *setup.exe* program which can be found in the *Volume* directory. The oXigen bootloader installation will be launched;
5. during the installation, it is strongly recommended not to change the default setting and it is necessary to accept all the proposed licenses. A reboot may be necessary after the installation, depending on the OS.
6. after reboot, the application icon will be present on the desktop of the PC.



*Bootloader icon*

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The bootloader application works through the oXigen Dongle. Before launching the application for the first time, make sure the Dongle driver is already installed on your PC (the driver is the same one used by the oXigen chrono RMS application, so if you are already using it, you'll be OK).

If you can properly operate the RMS 'chrono' software, driver installation is fine and you can jump to the next chapter. If not, if for example you are about to use the Dongle for the first time, plug it into an USB port of your PC, and when the Operating System –Windows– asks for the driver, select the *O2\_driver.inf* file which can be found into the directory *../Users/<Your Login Name>Documents/Slotit\_O2\_Boot/Driver*.

Once installed the driver, when the Dongle is plugged into the PC, it will appear as a COM port on the peripheral devices window as shown below. The COM number assigned to the Dongle by the OS might be different from the one reported in the picture (COM17).

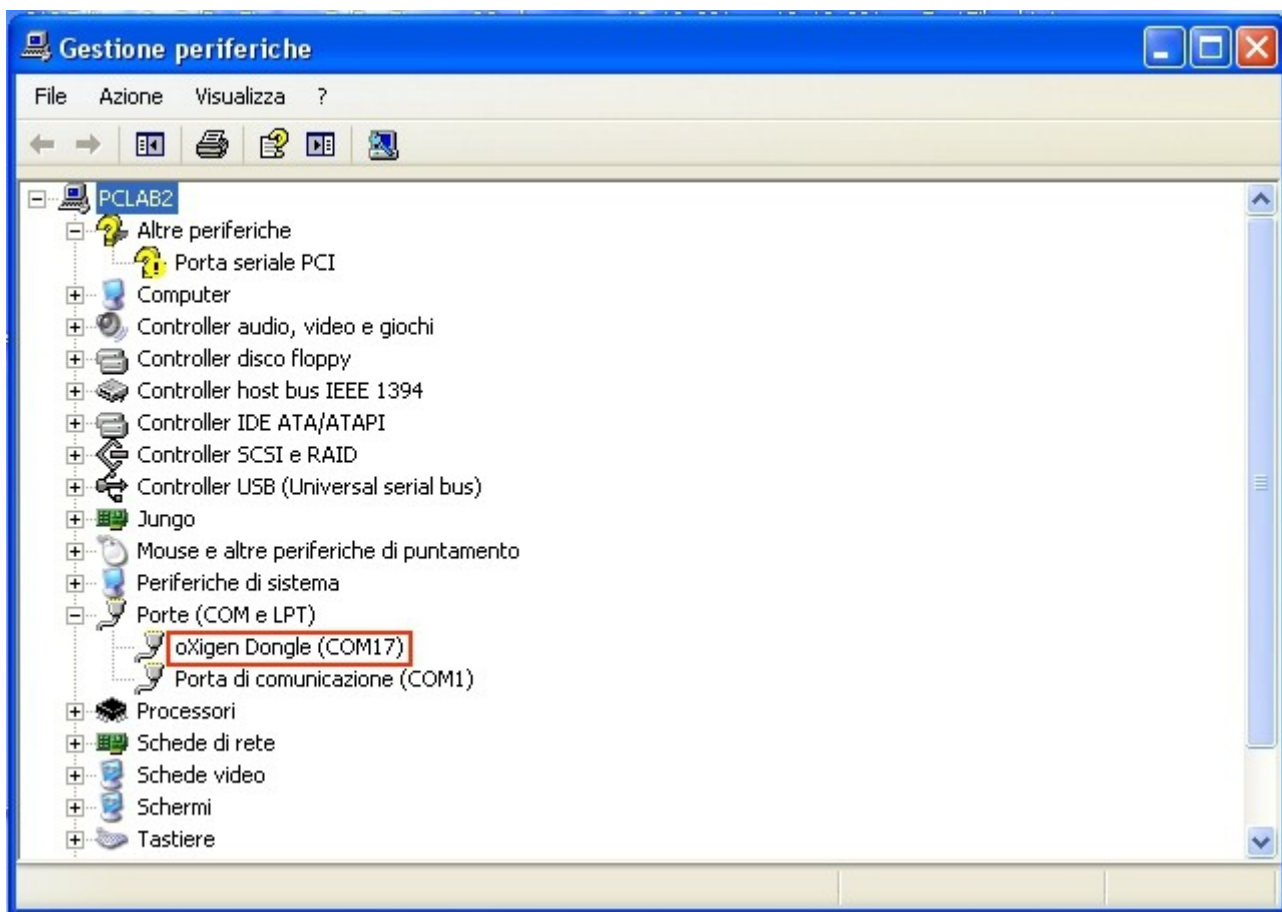

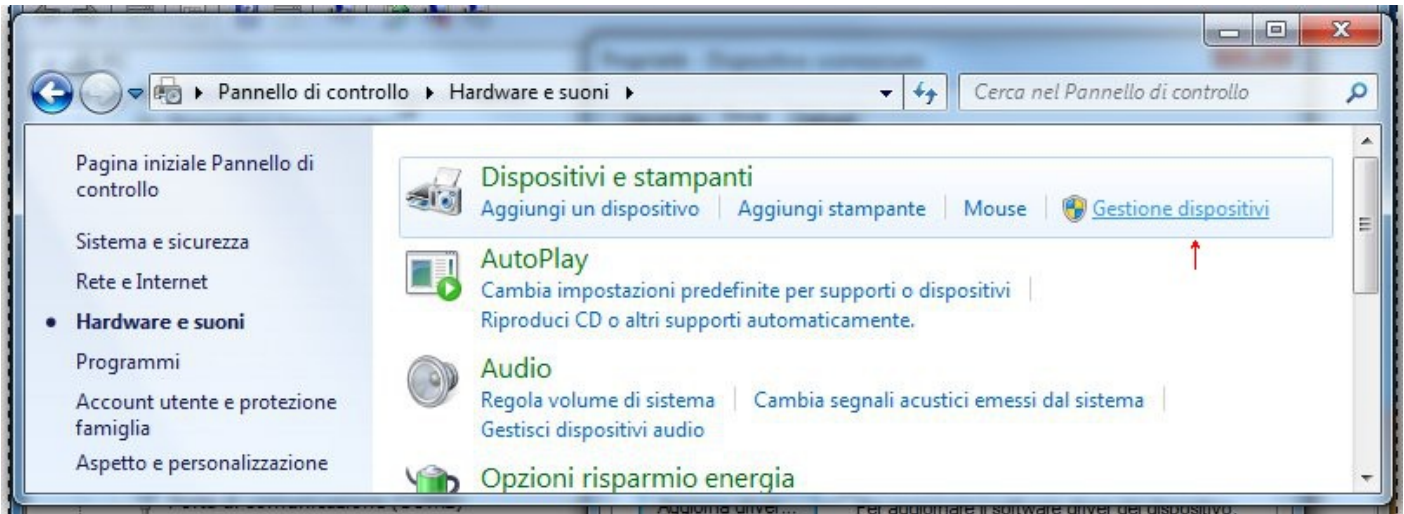


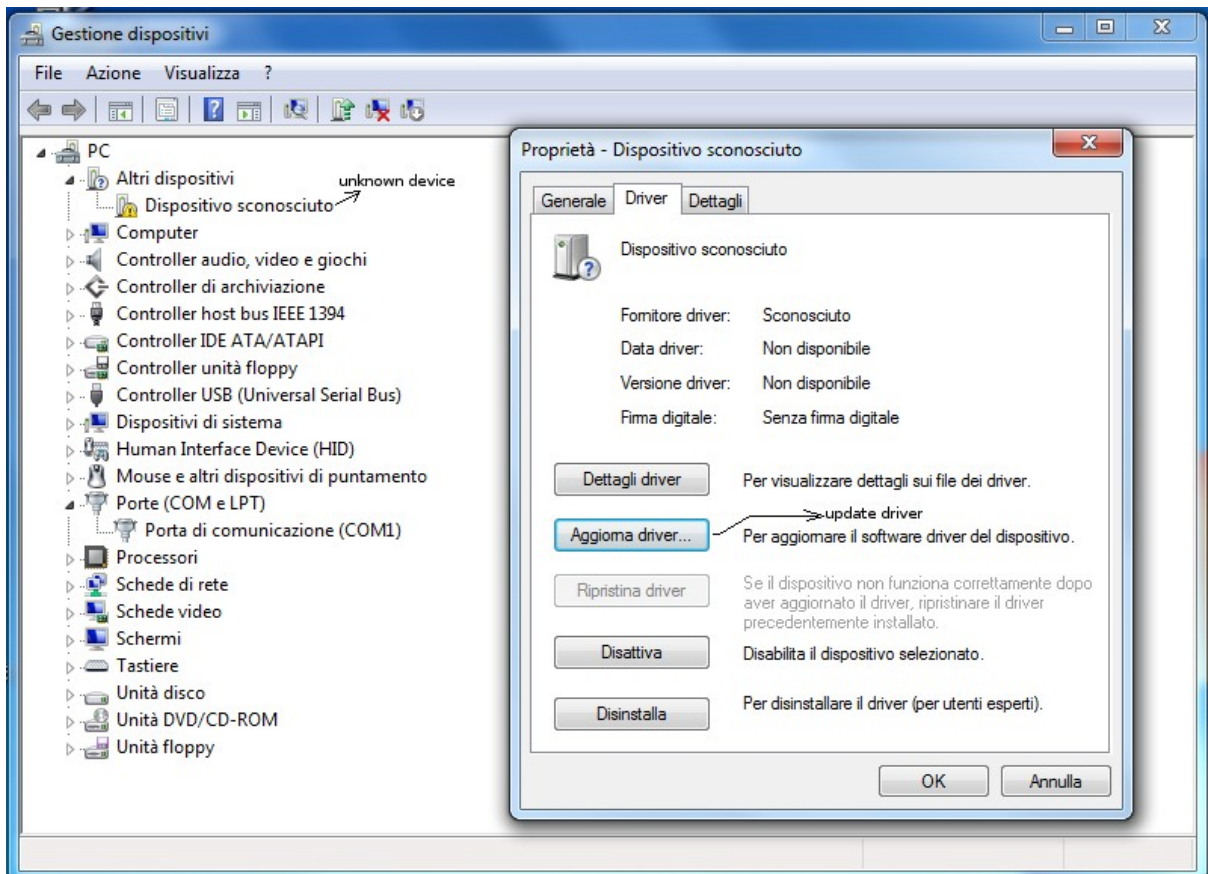
Figure 1: oXigen Dongle on peripheral devices window


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If the driver is not loaded, the dongle will report as 'unknown device'. To correct this, open the Control Panel, and select Device Manager



Then click on the 'unknown device' property and update driver, choosing the driver found into */Users/<Your Login Name>Documents/Slotit\_O2\_Boot/Driver*



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## **Bootloader application use**

To use the oXigen bootloader application, do as follows:

1. make sure all your controllers and cars are switched off.
2. plug the oXigen Dongle into an USB port of your PC;
3. launch the 'BootLoader oXigen' application;
4. select the relevant oXigen device on the Selected Device menu:

*Car*

*Controller*

*Finish line (disabled)*

*Dongle*

*Cartridge Interface*

If, for example, you want to work on a car chip, the following prompt will appear:

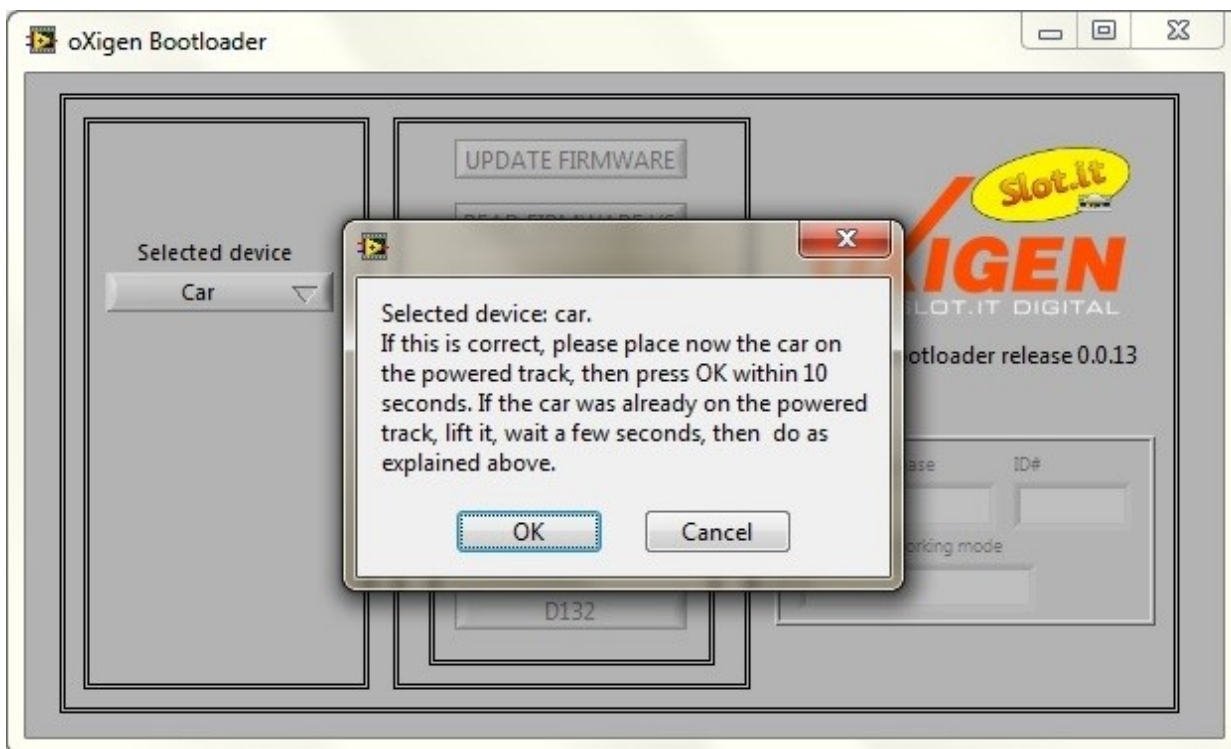



Figure 2: Selected device prompt

5. before clicking on 'YES' button, *please read the on screen instructions!* They're there to tell you what to do. In fact, the 'reflashing' or 'bootloading' procedure is a special condition that the chip can enter under certain special conditions:
  1. **Car**: apply power to the car chip (for example, put it on the powered track rails) and click on the 'YES' button within ten (10) seconds. Note that as the car can enter the 'bootloading' mode only during the first ten seconds after it's been powered on, so, if the car was *already* powered, you must switch it off first, then on again. Also note that if the car receives a valid driving command

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from its own controller, it cannot enter bootloading mode either, so make sure the controllers are switched off.

2. **Controller:** push and keep pressed the UP ARROW button together with the CIRCLE button.. Power up the controller with these two buttons pressed at the same time, and keep them pressed.. Click on 'YES' button, but keep the buttons pressed. The controller will enter into bootloading mode and the 'P' letter will be shown on the cartridge display; only now you can release the buttons. Please consider that in several cases, the controller may refuse to enter the bootloading mode. Just keep trying, the controller is a bit deaf :)
3. **Dongle:** click on 'YES' button and the device will enter in bootloading mode at any time.
4. **Cartridge Interface:** apply power to the cartridge radio interface (CRI) and click on the 'YES' button within ten (10) seconds. Note that as the CRI can enter the 'bootloading' mode only during the first ten seconds after it's been powered on, so, if the CRI was *already* powered, you must switch it off first, then on again. Also note that if the CRI receives a valid driving command from its own controller, it cannot enter bootloading mode either, so make sure the controllers are switched off.

### **Note on the naming convention of dongle sw**

The dongle sw can basically has three root names:


1.x : old version '1' software, now obsolete. Only compatible with 1.x car and controller versions. Do not use.

2.x: current version '2' software. Only compatible with 2.x car and controller versions. Use this for everyday use. You can also use it for bootloading, but if you find it difficult to upgrade the car and controller chip, you may use 9.22 for 2.x to 2.x upgrades of car and controller instead.

9.x: the '9' family is to be used for bootloading only. Dongle must be returned to 2.x afterwards.

9.12: use for upgrading software version 1.x to 2.x

9.22: use for upgrading any 2.x version to any other 2.x version

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Once the oXigen device is in bootloader mode, the following operations are available, clicking on the corresponding application button:

1. **UPDATE FIRMWARE** this launches the updating procedure of the firmware of the selected oXigen device (reflash). The firmware can be changed to a newer or older version. **Follow the instructions step by step:** select the firmware file to download into the device; turn on and off the device when required. At the end of the updating procedure, click on the **READ FIRMWARE VS** and the release number of the new firmware will show in the 'firmware release' window.
2. **READ FIRMWARE VS** this shows the current release number of the firmware loaded into the device.
3. **READ ID NUM** this shows the device ID number of the device. It represents the ordinal number with which the chrono RMS system recognizes the couple car + controller when the car crosses the finishing lane – in other words, car and controller ID. This application button doesn't apply to the Dongle.
4. **WRITE ID NUM** this changes the device ID number. In case of a car linked to a controller, to keep the link between these two devices, the ID number change has to be performed on both of them. This application button doesn't apply to the Dongle.



Figure 3: Available operation for car chip

**NOTE:** if for whatever reason the bootloading procedure fails, the software will recover itself from a previously known state. In this case, the only enabled application button is the **UPDATE FIRMWARE** one. A successful firmware updating procedure has to be completed to have all the application operations available.

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## Car working mode

If the selected device is Car, three extra application buttons are available:

5. **SSD**

the car chip will be set up to work as an SSD car. This means that the user can control the SSD lane changers pushing one of the arrow buttons, or both, on the controller and the car is recognized on the finishing line as if it was an SSD one by the power base. This applies for the cars with an ID number in the range from 1 to 6.


Cars with an ID number greater than 6, i.e. from 7 to 20, do not differ from cars 1 to 6 as far as lane changing is concerned. However, lap counting is different: since the original SSD system cannot handle more than 6 cars, cars above 6 rely on a suitable O2 dongle to be present for lap counting, and also need a finish line magnet to be present under the track. Upon detection of such magnet, the car chip will mask any SSD LED transmission for 200ms for cars above 6 whereas the SSD LED transmission is not affected for cars 1-6. Hence, place the finish line magnets just before the SSD Power Base LEDs to make sure that cars 7-20 do not interfere with lap counting, provided that the car itself crosses the finish line of the SSD PB within 200 ms (no LC is possible for 200ms past the magnets). Hence, this row of magnets performs a double task: it is used as finishing line by the oXigen chrono, which should be used for cars 7-20, and tells the car to mask its ID code for 200ms.

Note that Start/Stop commands from the Power Base are not recognized by the O2 cars.
6. **oXigen**

the car chip will be set up to work as an oXigen car, that is, only the lane changers driven by the oXigen lane changer chip on every type of track will work in selective lane changing mode as described in the LC manual. To manage racing, the oXigen chrono application must be used, and cars are recognized on the finishing line accordingly to their ID number in the range from 1 to 20. The finishing line is made by placing magnets on the bottom of the piece of track used as reference for the lap counting, according to the instructions found in the O2 reference manual.
7. **D132**


the car chip will be set up to work as a Carrera car. This means that the user can control the Carrera lane changers pushing one of the arrow buttons, or both, on the controller and the car is recognized on the finishing line as if it was an Carrera one by the power base. This applies for the cars with an ID number in the range from 1 to 6.

Cars with an ID number greater than 6, i.e. from 7 to 20, do not differ from cars 1 to 6 as far as lane changing is concerned. However, lap counting is different: since the original Carrera system cannot handle more than 6 cars, cars above 6 rely on a suitable O2 dongle to be present for lap counting, and also need a finish line magnet to be present under the track. Upon detection of such magnet, the car chip will mask any Carrera LED transmission for 200ms for cars above 6 whereas the Carrera LED transmission is forced, according to the arrow buttons status, for cars 1-6: this make possible the car recognition by the Carrera power base. Hence, place the finish line magnets just before the Carrera Power Base LEDs to make sure that cars 7-20 do not interfere with lap counting, provided that the car itself crosses the finish line of the Carrera PB within 200 ms (no LC is possible for 200ms past the magnets). Hence, this row of magnets performs a triple task: it is used as finishing line by the oXigen chrono, which should be used for cars 7-20; tells the car to mask its ID code for 200ms for cars above 6 and makes possible the cars recognition for cars 1-6.

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Note that Start/Stop commands from the Power Base are not recognized by the O2 cars.  
The default Car working mode is **oXigen**.



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## Example: Full system upgrading :2.xx to 2.yy software

As an example, we'll detail a complete system upgrade, from a 2.xx software to a 2.yy software. It is strongly recommended to keep the system updated to the latest firmware available; please refer to [http://www.slot.it/INGLESE/Oxigen\\_Firmware.html](http://www.slot.it/INGLESE/Oxigen_Firmware.html) web page for reference.

The dongle is the master of bootloading, that is, it takes control of the car chip or the CRI or the cartridge, sends new code, and the device under operation reflashes itself.

### Dongle

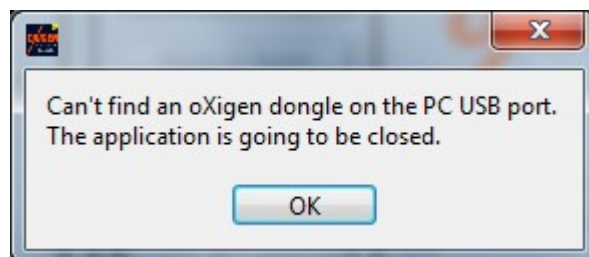
As bootloading master, the dongle has to be the first device that has to be kept updated. The dongle updates itself through the oXigen Bootloader application.

So, do as follows:


1. insert the dongle in the USB port
2. launch the O2 Bootloader application. If the dongle is there, the following window will appear:

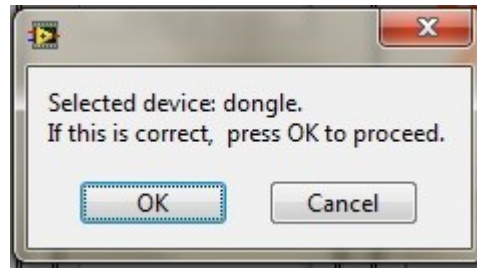


else, an error message will appear:



3. Select 'Dongle' from the menu under 'Selected Device', and follow the instructions:

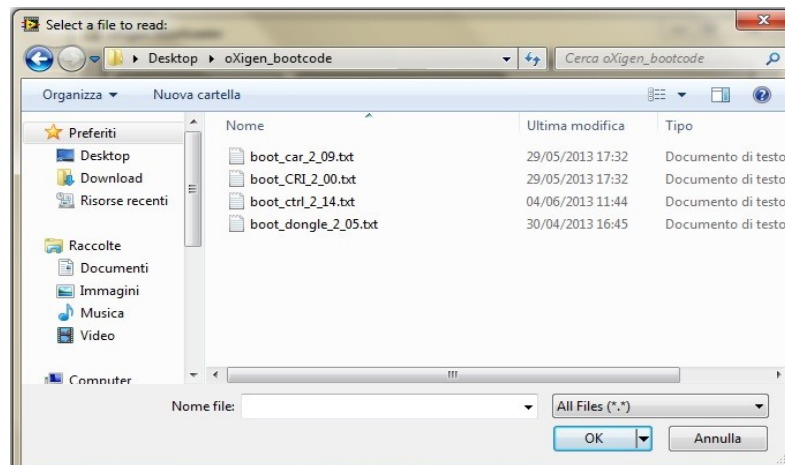
	<b>oXigen system</b>	Doc.
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press OK on screen to proceed:



- Two operations are available: current firmware release checking and firmware updating. For the updating, just click on 'Update Firmware' and select the file which is correct for the device and the version you want to upgrade to: in this case, dongle, boot\_dongle\_2\_05.txt:

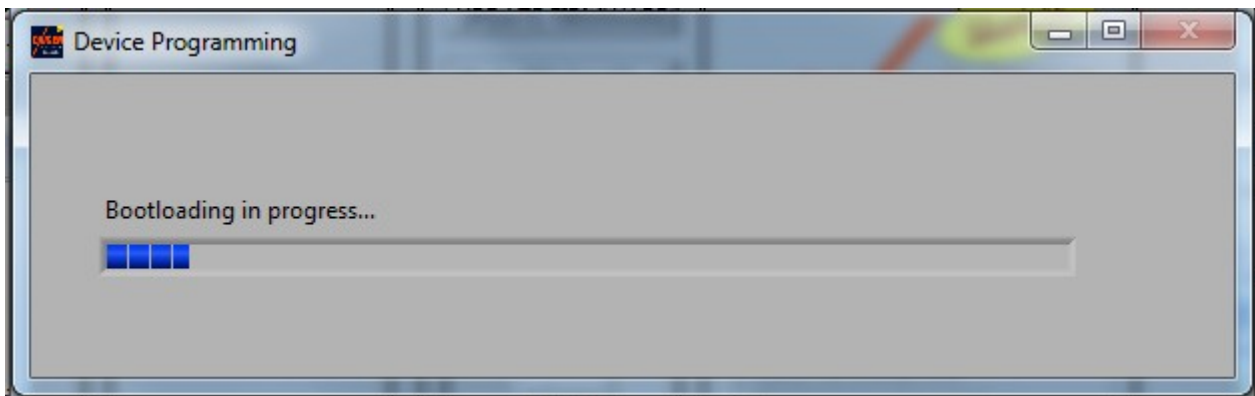


- You are now ready to start the reflashing operation:

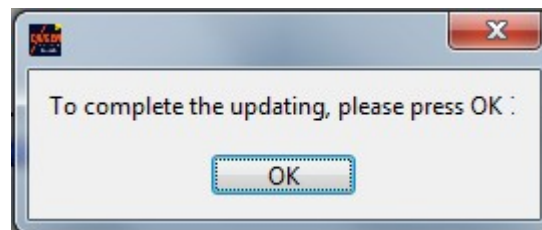
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6. Click YES to start the updating.



7. The updating procedure is made of two phases. For the car chip, CRI and cartridge, at the end of the phase 1 it is necessary to turn off and on the device before starting the phase 2. Contrariwise, the dongle will complete its updating, running phase 1 and 2, without any adding request operation by the user. In case the procedure fails, unplug the dongle from the USB port and start from the beginning. When bootloading is about to finish, the final message will pop up



8. Press OK and, after a while, it will be shown the first screen for dongle. Now it is possible to do a new bootloading operation on the dongle or to use it for other devices updating or with RMS software to manage an O2 race.

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## Car chip

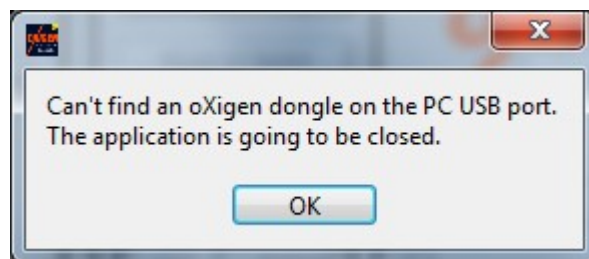
Make sure you can power the car chip on and off. If the chip is inside the car, simply placing it on and off a powered track will do. During the first ten seconds after a power on, the car monitors whether the controller it is linked to is active, or if any bootloading commands are received from the dongle. If the controller is detected, the car cannot enter bootloading, so make sure controllers are off. Actually, it is better to switch off any oXigen devices other than those interested in reflashing.


To reflash the chip inside your car, do as follows:

5. remove the car from the track
6. insert the dongle in the USB port
7. launch the O2 Bootloader application. If the dongle is there, the following window will appear:

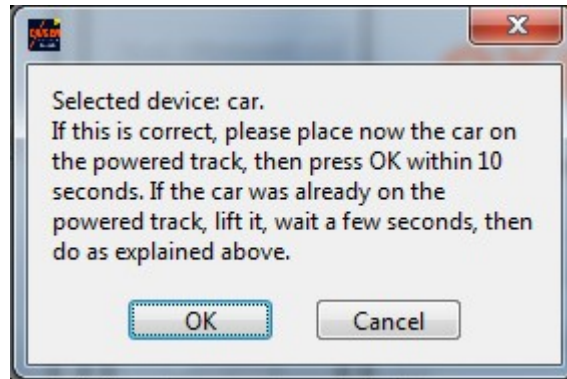


else, an error message will appear:



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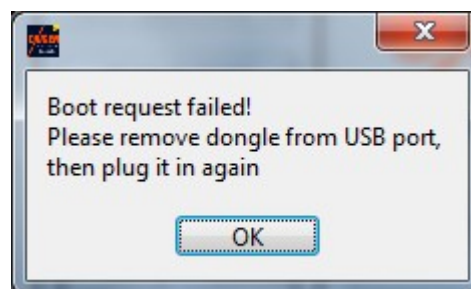
8. Select 'car' from the menu under 'Selected Device', and follow the instructions:




9. Now it's time to either place the car on the powered track, or power up the naked chip. Then, within 10 seconds, press OK on screen. If the car is properly contacted, you'll see the following



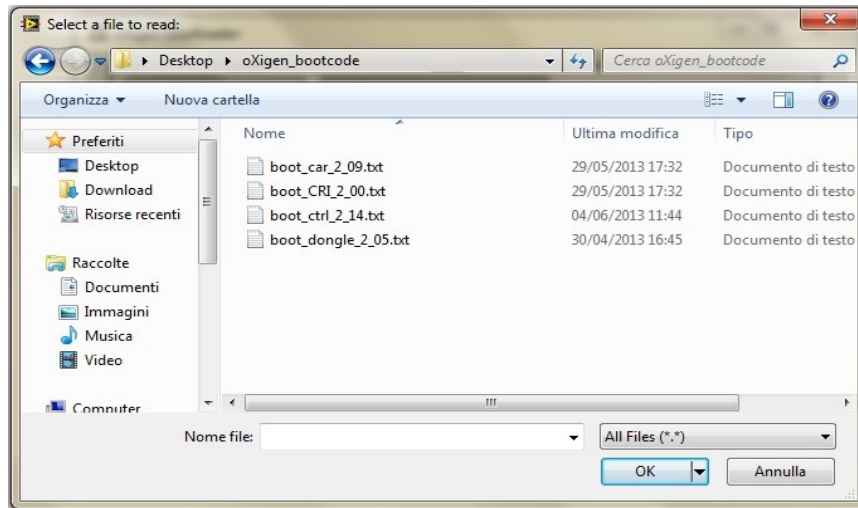
else, if the car is not in bootloader mode, an error message will appear



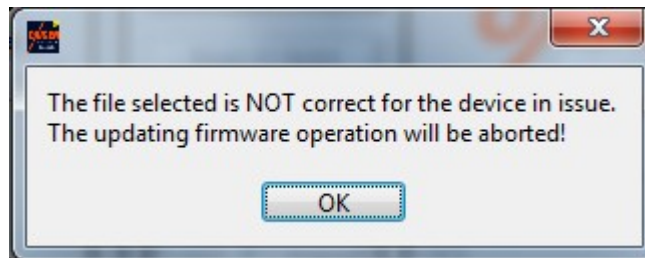
In this case, remove car from track, remove dongle, and start from the beginning

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10. Some operations are available: current firmware release checking, firmware updating, ID checking/writing, car working mode changing. For software updating, just click on 'Update Firmware' and select the file which is correct for the device and the version you want to upgrade to: in this case, car, boot\_car\_2\_09.txt:




Should you select a file which is no good for the device which is undergoing reflashing, the following message will appear:

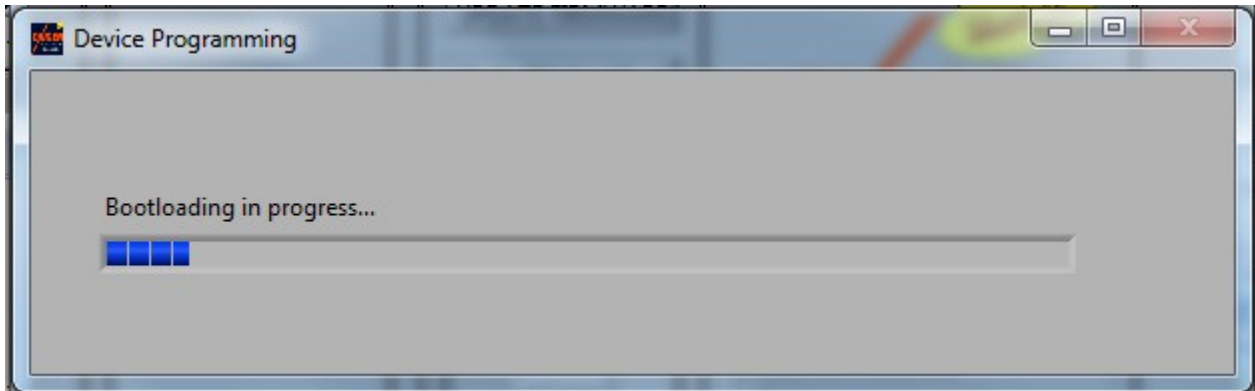


11. You are now ready to start the reflashing operation:



12. Click YES to start the updating. The procedure is made of two phases: phase 1 of the process will start.

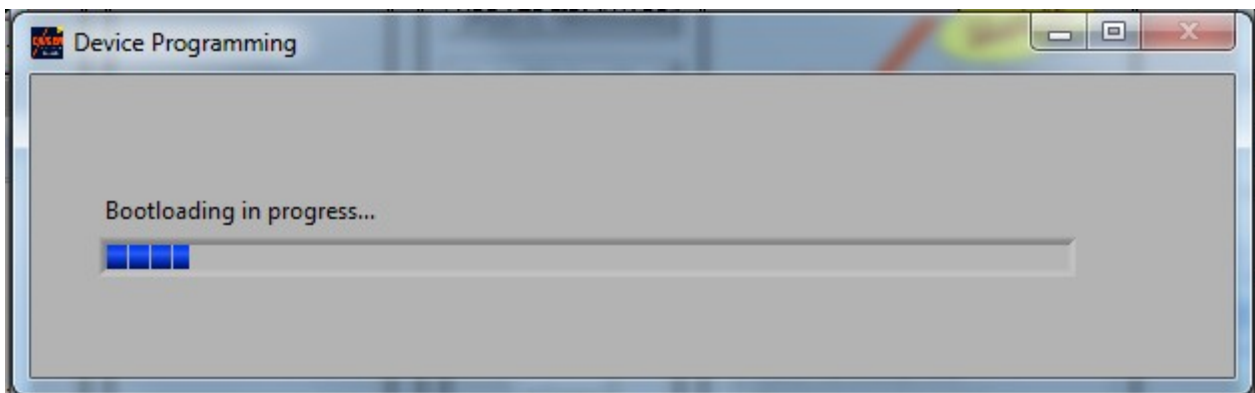
	<b>oXigen system</b>	Doc.
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13. If phase 1 completes correctly, the following message will appear

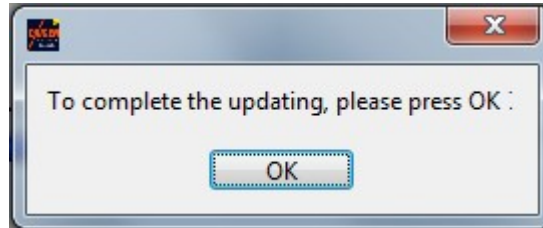


Follow instructions, that is: lift car from track, then put it back on track, and click OK. Bootloading will resume from phase 2



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14. When bootloading is about to finish, the final message will pop up



15. Press OK, wait a little, while the eeprom is written, and you're ready to go on.





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16. What happens if for some reason, the bootloading procedure fails? We've made sure that the process is safe, that is, it is recoverable from a known state. If the reflashing procedure is aborted, an error message pops up, like this:

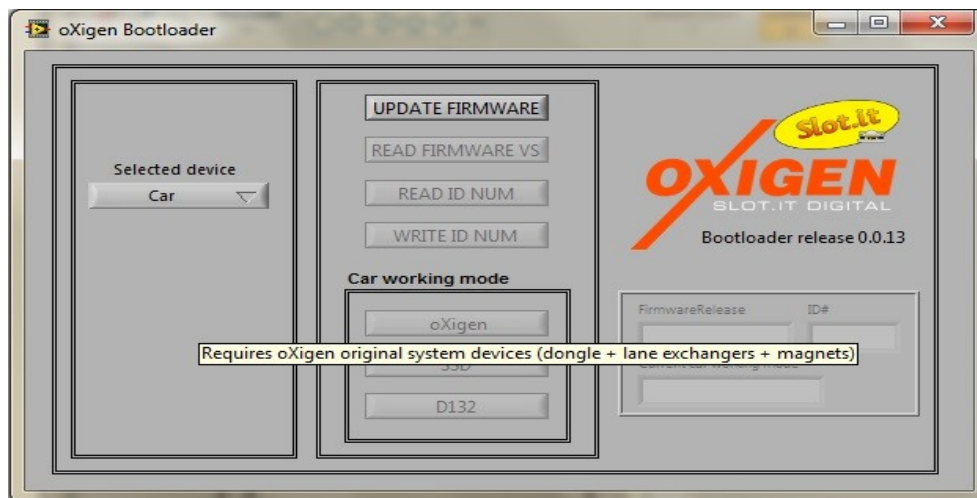



You need to restart the procedure from start. The software can rollback to a known state and start a new reflashing.

17. If the procedure is interrupted, the device cannot be used unless a new firmware is transferred. Restarting the procedure from the start, a warning message will pop up.



18. Hence, the 'bootloader' PC application will only allow you to proceed with a firmware upgrade, all other options being greyed out:



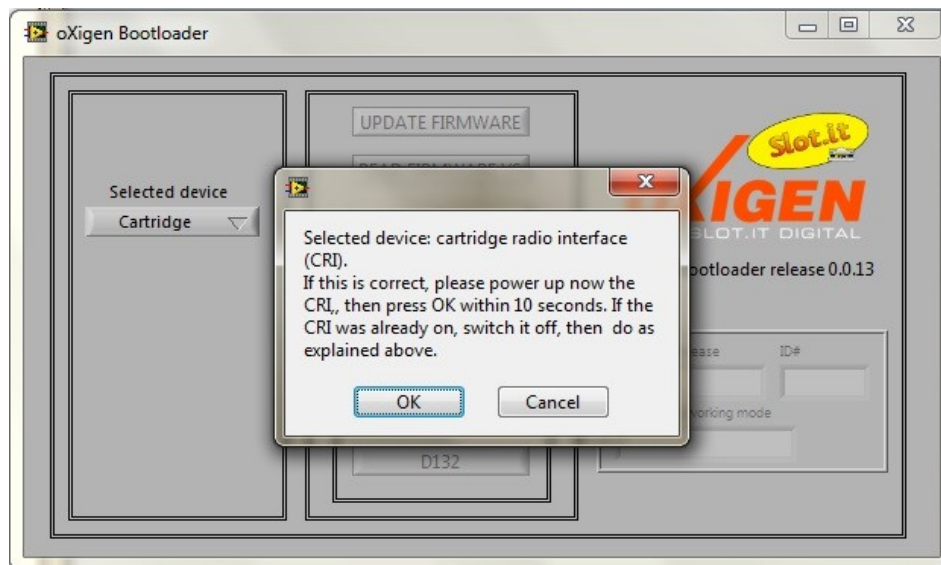
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## Cartridge Radio Interface (CRI)


Reflashing the CRI is quite similar to reflashing the car chip. The CRI can only be put in bootloading mode if any bootloading commands are received from the dongle during the first ten seconds after a power up and the the controller it is linked to is not active. If the controller is detected, the CRI, such a car chip, cannot enter bootloading, so make sure controllers are off. Actually, it is better to switch off any oXigen devices other than those interested in reflashing.

To reflash the CRI, do as follows:

1. power off the CRI
2. insert the dongle in the USB port
3. launch the O2 Bootloader application
4. select 'CRI' from the menu under 'Selected Device', and follow the instructions:

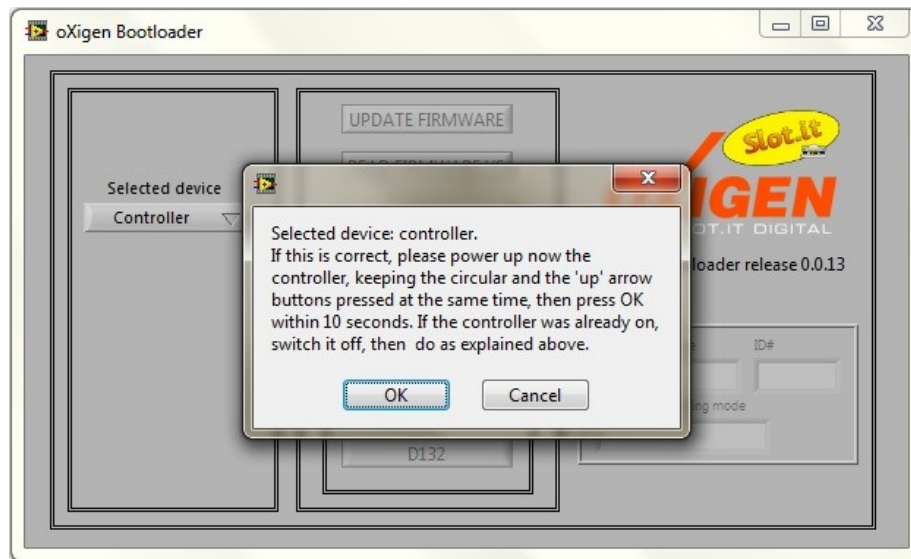



5. power up the CRI and, within 10 seconds, press OK. If the CRI is properly contacted, the bootloading screen will be shown. Some operations are available: current firmware release checking, firmware updating, ID checking/writing. For the updating, just click on 'Update Firmware' and select the file. From now on, the procedure is exactly like the one for the car.
6. follow the on screen instruction. You will be asked to turn off and on the device at the end of the phase 1 of the programming procedure. If the bootloading fails, the procedure has to be repeated from the beginning, such as the car chip.
7. When the updating procedure is completed, you are ready to go on.

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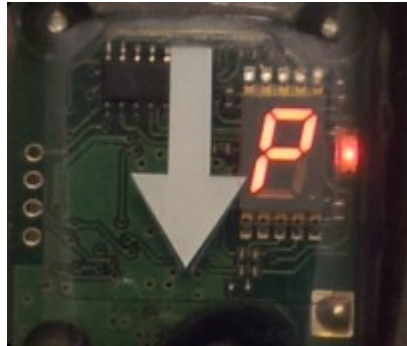
## Cartridge

Reflashing the cartridge is quite similar to reflashing the car chip or the CRI. However, the cartridge is only put in bootloading mode if it is powered while keeping the 'UP' arrow, and the 'Brake' round button, pressed. These buttons must be kept pressed until the controller shows a red 'P' in the cartridge display.

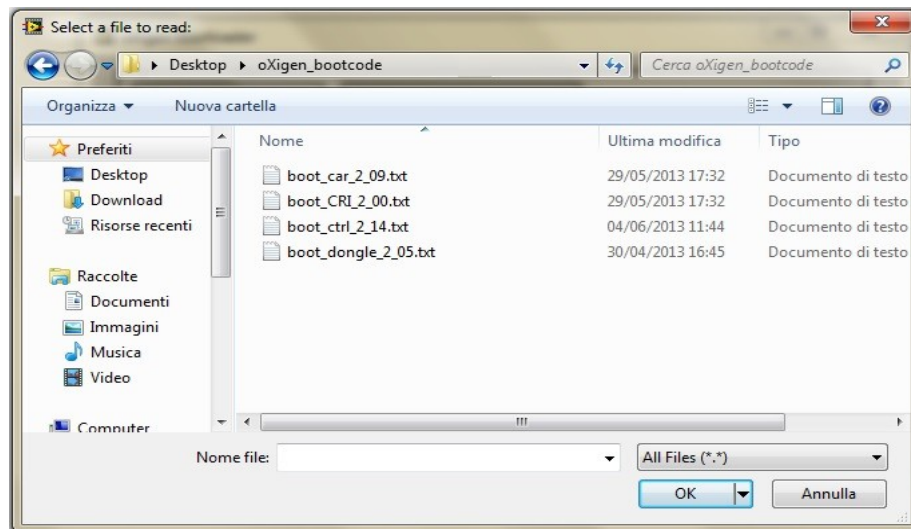


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If the controller is properly in bootloading mode, then the cartridge display will show a 'P':



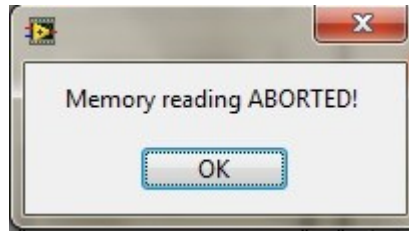
From now on, the procedure is exactly like the one for the car: select the software,



and follow the on screen instruction telling you when to turn on and off the device. Note that, when asked to turn off and on the controller, in the middle of the programming procedure, there is no need to press the buttons while powering up: the cartridge will go straight to the 'P' mode. This is also true if the bootloading fails: the cartridge will remain in 'bootloading' mode, as shown by the 'P' on the display, so no need to press the buttons.

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There is a *caveat* though: the controller is known to be more troublesome to program. You may come across this error



at the beginning of the operation, when trying to connect to the controller. It may take you a few repeated attempts to reflash it. Keep trying, until the operation terminates properly.

Once done, before switching off power, you can check the current firmware version.

Before pairing the controller to the car, please do the following: switch on the controller, completely press the trigger, then switch it off. Now the controller is ready.

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## Troubleshooting

- 1. The controller / car hangs during the bootloading operation:**  
Restart operation from the beginning
- 2. The controller reports 'lock flash byte read failed'**  
It's a known bug - restart from the beginning
- 3. I've programmed my car, controller, to version 2.x, and now they don't seem to communicate with the dongle.**  
v.1.x and v.2.x are not compatible: make sure that your dongle is also version 2.x  
Remember that version 91.2 is only good to reflash from v1 to v2 (not viceversa) and cannot be used for anything else.
- 4. My dongle is version 2.x, I have old controller / car version 1.x, and I can't reprogram them:**  
Reflash your dongle to v. 91.2, then reflash your old 1.x car chips and controllers to 2.x, then reflash your dongle to 2.x