USER NOTE TO USE GRIP DEVICES

In-house grip force device at the MBB lab

We currently have 2 kinds of in-house devices for grip force. Both systems get force estimates with pneumatic grips. Indeed, it is easy to build pneumatic grips that are compatible with the MRI, using plastic or wood craft.
The grips are the same for the two devices, but the electronics and interface with the computer differ.

	UsbCED	SerialMBB
Origin	Imported by Mathias Pessiglione from UCL (London, UK)	Developed at the ICM (Laurent Hugueville, Christophe Gitton, Florent Meyniel)
Electronics	1) a pressure / voltage transducer returns an analog signal on a BNC wire 2) an amplifier and analogic-digital converter: the CED1401 (high precision but, 6000€!)	A single device converts pressure into voltage and return 2 outputs in parallel: an analog signal (BNC) and a digital signal (serial port)
Interface with the computer	USB	BNC or serial port
Interface with Matlab	relies completely on a DLL (matced, found on the Cambridge Electronic Design website)	The current solution uses PsychToolBox (more specifically, the IOPort function).
Restrictions (as of 2012, May)	windows 32-bit only	Fine on any Windows or Linux, 32-bit or 64-bit. NB1: easy to complete the toolbox for Mac NB2: On Windows, PsychToolBox can currently not be run on a 64-bit Matlab. Easy work-around: install the 32-bit compatible Matlab version corresponding to you 64-bit Matlab.

Which device to use?

- Both devices work on our Experiment Laptops Roma & Ristretto
- SerialMBB is installed in box 1.031
- SerialMBB (and not UsbCED) works on any Windows and Linux currently installed in the lab.
- Serial MBB is much smaller and easier to move than UsbCED.
- A SerialCED is currently installed in the MRI.

What is GripCompatFunc?

GripCompatFunc is a compatibility wrapper toolbox to use UsbCED or SerialMBB in Matlab with the same functions:

- InitializeGrip: to initialize the device
- ReadGripValue: to get force data
- CloseGripDevice: to stop the use of the device.

No matter which device you use, all you need is to specify the name of the device at the beginning of you script. Your code therefore works for either device!

What is MatOs?

MatOs is an example script to show you how to use in Matlab the grip functions. Plus: it is a usual function to check that your device works and to adjust the hardware settings.
MatOs mimics an oscilloscope window, to plot the data flow from the device. The offset and gain of the display can be modified, as well as the channel plotted and the sampling frequency.

To use it, set the Matlab current directory (or set it into your path) to the MatOs folder and launch MatOs.m as you would do for any other script. Just specify 'SerialMBB' or 'UsbCED' at the beginning of the script.

Hardware settings and pitfalls

Specifically to the SerialMBB

This device offers you the possibility to set the gain and offset of the signal for each of the two channels. The offset is the baseline level of the signal. The gain scales the output signal. These settings are useful because not all subjects have the same strength (change the gain) and the baseline level fluctuates a lot due to the room temperature and to the ambient air pressure (change the offset).
Prior to starting an experimental session, make sure that you are in an appropriate range. As a rule of thumb, change the offset and gain to get a baseline level at 300 and amplitude of maximal force around 200. This makes pretty sure that you have a god resolution and that you are away from saturation of the system.

For both device

Sampling frequency. There should be not problem working at 20 to 30Hz with SerialMBB. Higher performance can be achieved but it depends on the computer. But be cautious that running both the stimulation and acquiring data constrains your sampling rate! In this case, the highest frequency is theoretically the refresh rate of your screen!

Avoid temperature change
Have in mind that the devices are pneumatic… so do not be surprised if sudden changes of temperature produce strange data. Be aware that any warm source on the path of the air tube (battery, computer air fan …) will introduce noise in your data. Also beware of the sunlight that can produce similar disturbance.

Beware of leaks!
Priors to your experiment, make sure that the system is air-proof. To do so, launch MatOs and check that the signal actually corresponds to the force you exert. For instance, if the signal drops down when it should plateau as you sustain your effort, there must be a leak in the system. Check all the connections.
A likely source of leak is the silicon seal at the end of the tube. If so, change it (remove the old one, introduce the new one and wait at least 24h for consolidation).

Bugs
If you encounter a bug in acquiring the data, e.g. that Matlab crashes with errors that point toward the grip functions, the easiest way to recover is to stop the device (cut off the power), quit Matlab, disconnect the USB (for UsbCED), and restart everything.
This may not be completely rational, though efficient in most cases.

Take care of our material!
These devices are the lab's common good. So please, be gentle in connecting them (especially for the serial port of SerialMBB) and unplug the power cable after your experiment.