# Box 2020

## Current SB-12 situation:

The following are needed to conduct standard EEG experiments in SB-12:

* **The SR-boxes:** connects to PC via DB-9 serial cable.
  + Main functions:
    - Receives input from 8 external buttons and sends denounced button-press events PC.
  + Less often used functions:
    - Microphone triggering.
    - SR-box’s own buttons.
    - SR-box’s own LEDS.
* **Patch-box** 
  + Only function:
    - Combine 8-bit LPT markers from PC and signals from 8 button presses into a single output for the BIOSEMI (DB-25?).

## Other equipment:

* **Chronos:** E-Prime introduced an update to the SR-Box, which is a hassle to use, but features the following useful upgrades:
  + Main new functions:
    - Analog input and channels.
    - Digital input and output channels.
    - Serial over USB interface, instead of DB9.
  + Less often used new functions:
    - Built in sound card w/ high audio precision in terms on sound onset, and full stereo separation.
* **Evert Gadget:** PCs, and especially laptops, can increasingly no longer feature LPT cards, so Evert build an USB-serial LPT marker generator:
  + Serial over USB interface.
  + 8-bit digital output.
  + Analog output.
  + Light now.
  + Some other secret features?
* **Timing Tester Thing:** A contraption was built using a BIOPAC, an SRBOX and some random electronics to test the timing delays between screen-stimuli, sound and markers. This was then upgraded by Evert into a proper machine.
  + Used to test timing.
* **Marker Spoofer thing:**
  + A toggle switch box was built to manually produce LPT markers, which is handy when testing or debugging equipment that has to receive markers.

## New Box 2020 requirements

The new buttons box should fulfill all main requirements of the SR-box, and the patchbox, but should also combine the marker generating capabilities, from Everts gadget, and preferably include some Analog input and output channels, like the Chronos and Everts gadget. It should work via USB-serial.

Maybe: it would be nice if it could be used to test screen sound delays, like the new timing tester.

Maybe: it would be nice if it has some buttons that could be pushed to manually toggle markers. This is handy for testing equipment, like the current spoofer. But also to see if the markers arrive in ActiView, suggesting that if they don’t during an experiment, the task is not programmed right.

### Proposed Inputs:

* 8 inputs for participant buttons
  + These must be directly rerouted to an output for use w/BIOSEMI (replacing part 1 of the patch-box functionality).
  + These inputs must also be collected, debounced, and sent to the PC as button press events (replacing the SR-box functionality).
* 1 - 3 analog input channels:
  + For use as microphone/sound triggers.
  + For timing testing: to connect photo sensor and sound input.
  + Collection other random analog signals.
* OPTIONAL: 8 bit input:
  + So that the box can also receive markers (not sure about the use cases for this though).

### Proposed Outputs:

* 8 output for participant buttons:
  + These outputs connect straight to the participant button input, like the current patchbox. Mainly for use with the BIOSEMI.
* 8 digital outputs
  + These outputs must be settable via the serial interface, and thus this mimics Evert Gadget’s functionality. This means that PCs w/o LPT ports can be used with BIOSEMI/BIOPAC or anything that requires a digital input.
* 1 - 2 analog output channels:
  + For controlling special equipment for which developing custom hardware is not worth it (e.g. Iliana’s vibrator, fake webcam lights that go on for those social anxiety experiments, sending markers to Tobii glasses, etc. etc. etc.).
* 5 V output.
  + For stuff.

### Interfaces:

* **Marker adapters:**
  + The new box, as proposed, will have a marker output that is generated via serial; but some researchers might want to use the LPT port. So perhaps a special cable can be made that splits into two DB-25s, and you can connect one to the buttons, and the other to the box if you want serial markers, or to the PC, if you want LPT markers sent to the BIOSEMI.
* **Lights:**
  + LED lights indicating the state of each button (for debugging).
  + LED lights indicating the state of the markers (like Evert’s gadget 2.0).

## Old patchbox:

