Run Micro-leads MUX to Switch Ripple Stimulation Channels

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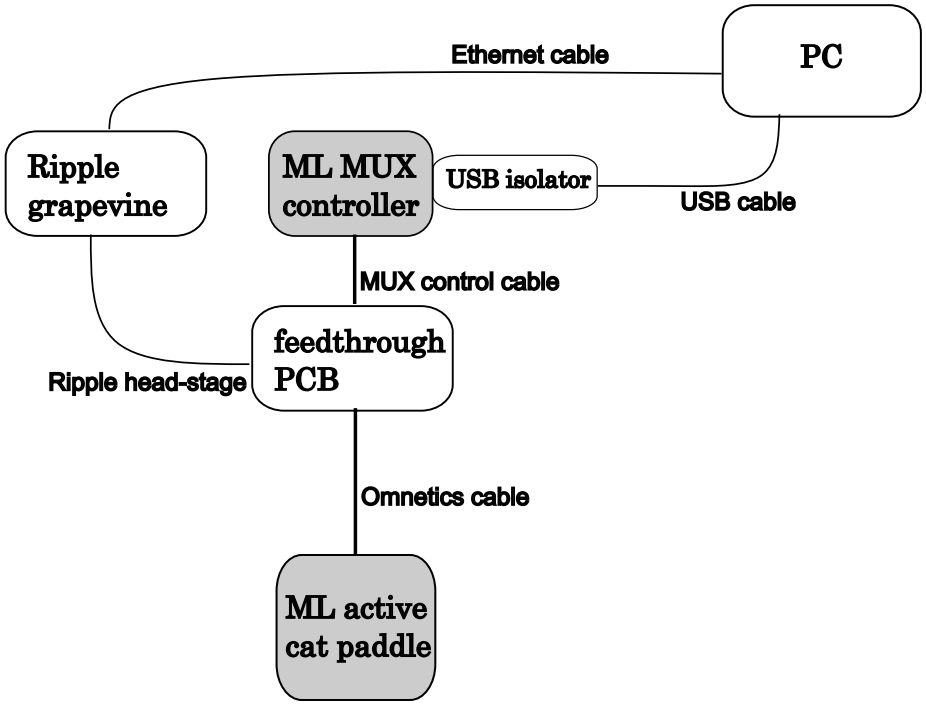
You only need a few functions in this MATLAB software package to send commands to ML MUX controller box, which in turn controls Micro-leads MUX ASIC embedded in the active cat paddle.



The goal is to be able to "switch" MUX ASIC so that Ripple stimulation currents can be routed to different electrodes in the active cat paddle for neural stimulation (see the system diagram above).

Contents

Connect the Hardware

Connect all the hardware according to the diagram above. Plug in the USB cable **last**. Because there is no power on/off button, you can plug/unplug the USB cable to power/un-power the ML MUX controller box. The USB isolator is to isolate (or "float") the ML MUX controller box from the connected PC power supply "ground".

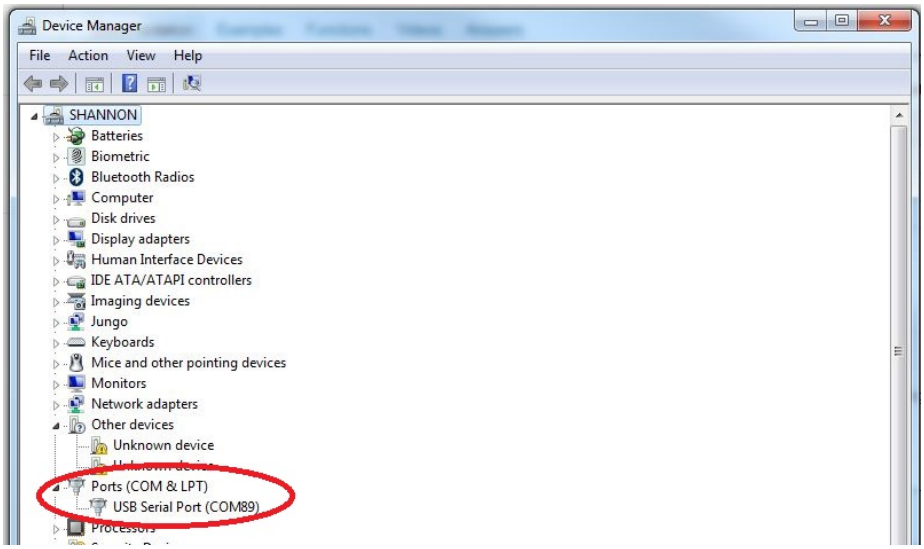
A BLUE LED lights up when ML MUX controller box is powered up and finishes its internal check-up sequence. This may take several seconds after USB plug-in.

In case you haven't plugged in the DB9 MUX control cable, there is no electrical connection to ML active cat paddle or the breakout MUX tester, RED LED will start flashing.

RED LED flashing indicates a missing communication link between ML MUX controller box and the MUX ASIC. To establish or re-establish this link, you need to follow the steps below.

Open Serial Port

1. Find the USB Serial Port number from your "System/Device Manager" (for example COM89 in the screen shot below)



2. Open the serial port with **YOUR serial port number** (probably not COM89 in your case) and set baudrate = 9600; Now "ser" is the handle to that serial port that is used to communicate to the MUX controller box.

```
ser = serial("COM4", "BaudRate",9600)
fopen(ser)
```

Initialize/Re-initalize MUX

To power up MUX ASIC properly, run "start_mux" function with the serial port #.

The RED LED flashing should be extinguished after calling this function

```
start_mux(ser)
```

The communication link between the MUX controller box and the MUX ASIC is constantly monitored. Whenever the link is broken, run this function immediately to re-establish the link.

MUX ASIC will **NOT** function when RED LED is flashing.

If the USB cable is unplugged and re-plugged, the "serial" port needs to be re-opened as well.

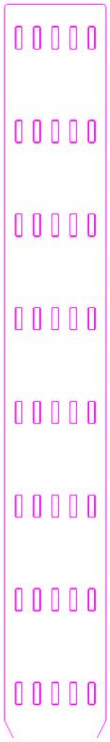
Assign Stimulation Channels

You select the list of electrodes from the paddle (see paddle electrode sites mapping) to be stimulated, as the input to "mux_assign" function.

Electrode Array Sites

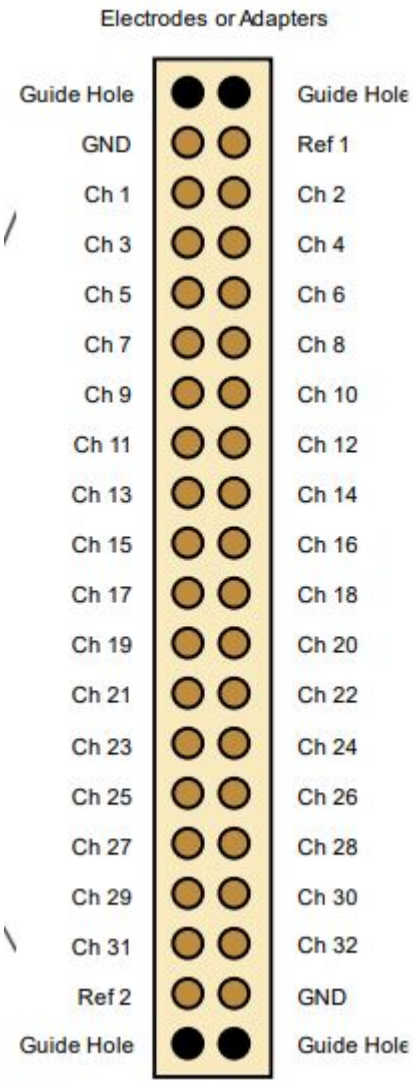
E18	E1	E5	E17	E37
E32	E8	E2	E6	E27
E28	E0	E4	E16	E26
E19	E9	E3	E7	E31
E39	E20	E23	E15	E51
E50	E34	E21	E24	E42
E40	E11	E13	E35	E46
E45	E10	E22	E25	E41

Viewing Back of Paddle (Stim Sites Down)



The output "e" should match your input, indicating the assignment completed successfully.

The output "s" are the corresponding Ripple stimulation channels to be turned on for stimulation (see Ripple connector pinout mapping)



The output "p" are the command bytes to be sent to MUX controller box

```
[e,s,p] = mux_assign([1,8,0,9])
```

In the example above, the selected electrode sites are list [1,8,0,9]. The corresponding Ripple channels are list [3, 1, 9, 15]. Note: the order of these two lists indicates one-to-one relationship

- Ripple_channel 3 == Paddle_e_site 1
- Ripple_channel 1 == Paddle_e_site 8
- Ripple_channel 9 == Paddle_e_site 0
- Ripple_channel 15 == Paddle_e_site 9

Switch MUX

Once the assignment completes successfully, you can perform the experiment by following the last two steps:

1. send the command "p" to ML MUX Controller box to activate the switching

```
switch_mux(ser, p)
```

2. send stimulation to the corresponding Ripple channels, as the list in "s"

```
fprintf("Ripple ch%d <==> E%d \n", [s;e])
```

```
% NOTE: << add your Ripple commands to send stimulations on channels "s" >>
```

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