

SMU INSTALLATION AND USE

This guide contains some useful reference information to help get you started with the two-channel USB source/measure unit (SMU) that you will be using for most of the labs this semester.

0.1 Notes on Using the SMU

Please bear in mind the following things when you use the SMU:

- The red and black leads of the SMU channels are *not* interchangeable. The red lead should always connect to the device or circuit under test and the black lead should always be connected to a power supply or a stable reference voltage.
- No current flows through the black lead of the SMU channels—each of them serves as a voltage reference for either the voltage measurement or the voltage source for its channel. You *must* have the black lead of the +5 V fixed supply connected to your breadboard so the current from the SMU channels can return to the SMU board.
- Positive current flows out of the red lead of the SMU channels. It is perfectly legitimate to change the sign of the measured currents in Matlab.

0.2 Using the SMU in Matlab

This section contains some basic information about how to use the SMU software interface from Matlab.

- When you start Matlab, create a new SMU object by typing (with the SMU connected to your computer)

```
>> Some_Descriptive_SMU_Name = smu();
```

Matlab should automatically associate this object with the connected SMU.

- Through this object, you can access a wide range of data acquisition functions. To get a list of all of the magical things the SMU can do, type

```
>> methods(Some_Descriptive_SMU_Name)
```

- The `smu_display` Matlab GUI provides a virtual front panel for the SMU. With it, you can use the SMU channels as you would a digital multimeter to measure voltage and current in your circuit. To launch it, type

```
>> smu_display(Some_Descriptive_SMU_Name)
```

- The `smu_take` Matlab GUI allows you to perform nested current-voltage and/or voltage-current sweeps. To launch it, type

```
>> smu_take(Some_Descriptive_SMU_Name)
```

- The source/measurement names in `smu_take` can be any valid Matlab variable name (i.e., a sequence of letters, numbers, and underscores that cannot start with a number). The source values can be any valid expression that results in a row vector. Please note that you *must* specify names and values for both sources even if you are only using one source in your experiment. If you do not want to take measurements from one of the channels, you can omit the measurement name for that one.
- Once a given run of `smu_take` completes, the source and measurement values will appear as variables in your Matlab workspace. Please note that, if you use the same source/measurement names as variables currently in your workspace, they will be overwritten.
- In theory, you should be able to run `smu_display` and `smu_take` simultaneously. It seems that doing so results in some spurious data points probably due to collisions between requests to the SMU from both programs.