SparkFun USB-C Power Delivery Board

- do this prior to the assembly -

We use the SparkFun USB-C Power Delivery Board.

SparkFun provides a Hookup Guide for the USB-C Power Delivery Board.

Hookup

Connect the SparkFun USB-C Power Delivery Board with a SparkFun Qwicc cable to the SparkFun Redboard Turbo Development Board, and then the SparkFun Redboard Turbo Development Board with a micro USB to USB cable to the **host computer**. Alternatively, you can use the NVIDIA Jetson Xavier NX instead of the host computer.

After the configuration, you can disconnect the SparkFun Qwiic cable from the SparkFun USB-C Power Delivery Board. It was only required for the configuration, not during operation.

Arduino IDE

We use the Arduino IDE for the SparkFun Redboard Turbo Development Board on the host computer to configure the SparkFun USB-C Power Delivery Board.

The Arduino IDE can also be installed using the optional software setup on the host computer.

Download Arduino IDE 1.8.13

Firefox: https://www.arduino.cc/en/software
> Click on **Linux 64 bits**
> Click Download
~/Downloads/arduino-1.8.13-**linux64**.tar.xz
> Right-click Extract to …
> Browse to sw/SparkFun_RedBoard_Turbo/ArduinoIDE

Create a **portable version**
$: mkdir sw/SparkFun_RedBoard_Turbo/ArduinoIDE/arduino-1.8.13-linux64/arduino-1.8.13 /**portable**

An already downloaded and modified copy can be found here:
sw/SparkFun_RedBoard_Turbo/ArduinoIDE/**arduino-1.8.13-linux64**

Install Arduino IDE
$: sudo apt install libcanberra-gtk0 libcanberra-gtk-module libgtk-3-dev

$: sudo mkdir -p /opt/SparkFun_RedBoard_Turbo
$: sudo chmod 777 /opt/SparkFun_RedBoard_Turbo
$: sudo cp -r sw/SparkFun_RedBoard_Turbo/ArduinoIDE/arduino-1.8.13-linuxaarch64/arduino-1.8.13 /opt/SparkFun_RedBoard_Turbo/
$: cd /opt/SparkFun_RedBoard_Turbo/arduino-1.8.13
/opt/SparkFun_RedBoard_Turbo/arduino-1.8.13$: sudo bash **install.sh**
/opt/SparkFun_RedBoard_Turbo/arduino-1.8.13$: bash **arduino-linux-setup.sh $USER**
$: sudo mkdir -p /opt/SparkFun_RedBoard_Turbo/Arduino
$: sudo chmod -R +666 /opt/SparkFun_RedBoard_Turbo
Arduino IDE
$: sudo arduino
> Select File>Preferences
> Enter Sketchbook location: **/opt/SparkFun_RedBoard_Turbo/Arduino**

Install Arduino's SAMD Board Add-Ons
Arduino IDE
$: sudo arduino
> Select Tools> Board: "Arduino Uno"> Board Manager...
> Select **Arduino SAMD Boards (32-bits ARM Cortex-M0+)**
> Click **1.8.11** Install

Install SparkFun's SAMD Board Add-Ons
Arduino IDE
$: sudo arduino
> Select File>Preferences
> Copy following text into the Additional Board Manager URLs text box
https://raw.githubusercontent.com/sparkfun/Arduino_Boards/master/IDE_Board_Manager/package_sparkfun_index.json
> Click OK
> Select Tools> Board: "Arduino Uno"> Board Manager...
> Select **SparkFun SAMD Boards (dependency: Arduino SAMD Boards 1.8.1)**
> Click **1.8.3** Install
> Select Tools>Board: "Arduino Uno"> SparkFun SAMD (32-bits ARM Cortex M0+) Boards>**SparkFun Redboard Turbo**
> Select Tool>Port>**/dev/ttyACM0**

$: sudo usermod -a -G dialout $USER
$: sudo chmod -R +666 /opt/SparkFun_RedBoard_Turbo

The **Arduino IDE** is installed under **/usr/local/bin**.
The **preferences** and **board specific information** are stored under /opt/SparkFun_RedBoard_Turbo/**arduino-1.8.13/portable**.
Arduino libraries are stored under /opt/SparkFun_RedBoard_Turbo/**Arduino/libraries**.

We use the SparkFun STUSB4500 Library.

Open Arduino IDE
$: sudo arduino
> Select Sketch>Include Library>Manage Libraries…
> Select **SparkFun STUSB4500**
> Click **1.1.3** Install
$: sudo chmod -R +666 /opt/SparkFun_RedBoard_Turbo

An already downloaded copy of the SparkFun STUSB4500 library can be found here:
sw/SparkFun_RedBoard_Turbo/SparkFun_USB-C_Power_Delivery/
SparkFun_STUSB4500_Arduino_Library-master.zip

The library is installed under
/opt/SparkFun_RedBoard_Turbo/Arduino/libraries/**SparkFun_STUSB4500**.

Configure the USB-C Power Delivery

We communicate with the SparkFun USB-C Power Delivery Board over **I2C** using **address 0x28**.

We use the USB-C Power Delivery Board to provide up to 30W (20V@1.5A) to the NVIDIA Jetson Xavier NX, that in turn powers the entire SensorBox, using a USB-C Power Bank as the source that can provide 60W (20V@3A).

Power Data Object (PDO) parameters:

Number of Power Data Objects (PDO) 1-3	2
Power Data Object (PDO)	2
Voltage 5-20V	20V
Current 0-5A	1.5A
Over Voltage Tolerance 5-20%	5% (~21V)
Under Voltage Tolerance 5-20%	10% (~18V)

Configure the USB-C Power Delivery
$: sudo cp -r sw/SparkFun_RedBoard_Turbo/SparkFun_USB-C_Power_Delivery/**configure_usb-c_power_delivery** /opt/SparkFun_RedBoard_Turbo/Arduino
$: sudo chmod -R +666 /opt/SparkFun_RedBoard_Turbo

Arduino IDE
$: arduino
> File>Sketchbook>**configure_usb-c_power_delivery**
> Click Serial Monitor icon
> Select 115200 baud
> Click Upload icon (until flash is successful)

SparkFun USB-C Power Delivery Board

New Parameters:

PDO Number: 2

Voltage1 (V): 5.05
Current1 (A): 2.50
Lower Voltage Tolerance1 (%): 0
Upper Voltage Tolerance1 (%): 15

Voltage2 (V): 20.05
Current2 (A): 1.50
Lower Voltage Tolerance2 (%): 10
Upper Voltage Tolerance2 (%): 5

Enable Power Only Above 5V: 1