A Guide to Measuring the Power of Jetson Nano by Using an HV Power Monitor

Introduction:

This guide provides step-by-step instructions for measuring the power of Jetson Nano using an HV power monitor.

Materials Required:

1. Jetson Nano Development Kit
2. HV Power Monitor
3. Micro USB Cable
4. Laptop or Desktop Computer

Steps

1. **Software Preparation**
   Download PowerTool software.
   Link: https://www.msoon.com/hvpm-software-download
   Power Monitor End User Manual
   Link:http://msoon.github.io/powermonitor/PowerTool/doc/Power%20Monitor%20Manual.pdf

   The Power Monitor can measure data on three channels: Main, USB, and Auxiliary. And the Main channel is what most users will use for the measurements.

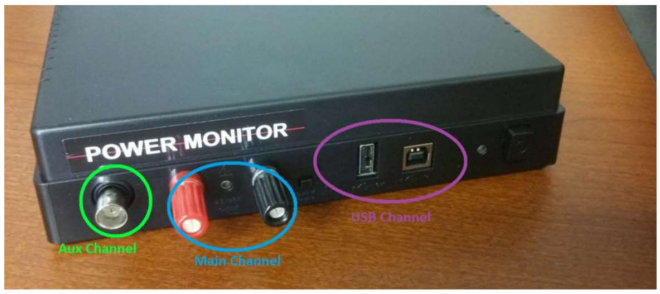

Fig.1 The Three channels with Power Monitor

   On a development workstation that is compliant with Full-Speed USB 2.0, connect a USB cable to the USB connector on the back of the Power Monitor hardware, and connect the other end of the USB cable to the development workstation (Your laptop or PC).

Fig.2 Back view: Power connector and USB connector

The green light-emitting diode (LED) is connected directly to the internal power of the Power Monitor.

Fig.3 Engaged power button and powered-up green LED.

You should install the Power Tool Software, Drivers, and Connect to the Power Monitor Hardware. (See Power Monitor End User Manual for details).
In this assignment, we use the main channel to measure the power of Jetson Nano.

2. Power on the Jetson Nano with an HV Power Monitor

Jetson Nano 2GB Developer Kit User Guide
Link: https://developer.nvidia.com/embedded/learn/jetson-nano-2gb-devkit-user-guide#id-.JetsonNano2GBDeveloperKitUserGuidevbatuu_v1.0-40-PinHeader(J6)
The 40-pin header of Jetson nano provides access to power, ground, and interface signal pins.

SoC GPIO	Linux GPIO #	Alternate Function	Default Function			Default Function	Alternate Function	Linux GPIO #	SoC GPIO
			3.3 VDC	1	2	5 VDC			
PJ.03	75	GPIO	I2C1_SDA	3	4	5 VDC			
PJ.02	74	GPIO	I2C1_SCL	5	6	GND			
PBB.00	216	AUD_CLK	GPIO	7	8	UART1_TXD	GPIO	48	PG.00
			GND	9	10	UART1_RXD	GPIO	49	PG.01
PG.02	50	UART1_RTS	GPIO	11	12	GPIO	I2S0_SCLK	79	PJ.07
PB.06	14	SPI1_SCK	GPIO	13	14	GND			
PY.02	194		GPIO	15	16	GPIO	SPI1_CS1	232	PDD.00
			3.3 VDC	17	18	GPIO	SPI1_CS0	15	PB.07
PC.00	16	SPI0_MOSI	GPIO	19	20	GND			
PC.01	17	SPI0_MISO	GPIO	21	22	GPIO	SPI1_MISO	13	PB.05
PC.02	18	SPI0_SCK	GPIO	23	24	GPIO	SPI0_CS0	19	PC.03
			GND	25	26	GPIO	SPI0_CS1	20	PC.04
PB.05	13	GPIO	I2C0_SDA	27	28	I2C0_CLK	GPIO	18	PC.02
PS.05	149	CAM_MCLK	GPIO	29	30	GND			
PZ.00	200	CAM_MCLK	GPIO	31	32	GPIO	PWM	168	PV.00
PE.06	38	PWM	GPIO	33	34	GND			
PJ.04	76	I2S0_FS	GPIO	35	36	GPIO	UART1_CTS	51	PG.03
PB.04	12	SPI1_MOSI	GPIO	37	38	GPIO	I2S0_DIN	77	PJ.05
			GND	39	40	GPIO	I2S0_DOUT	78	PJ.06

Fig.4 40-Pin Header (J6)

The two 5V pins (pin2 and pin4) can be used to power the developer kit at 2.5A each. (Notice: Do not power the developer kit via these pins and USB-C connector at the same time.)
The Jetson nano developer kit supports USB-C power supplies of 5V ± 5%, 3A.
So, we set 5 volts as the output voltage of the Power Monitor.
If the power-up with Power Monitor is successful, the green Vout LED indicator in the Figure below will power up. This LED is connected directly to Vout.

Fig.5 Vout LED indicator

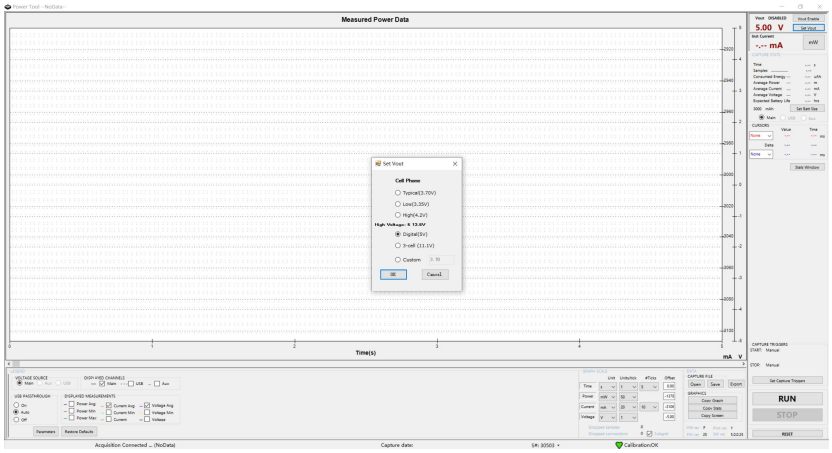

Fig.6 Powerup 5volts Vout in Power Monitor

To power the Jeton Nano developer kit by connecting the 40-pin header's 5V pins with Power Monitor, we connect the red test lead on the Power Monitor to Pin2 (5V pin) of Jetson Nano and connect the black test lead to Pin39 (GND pin).
When enabling the voltage with Power Monitor(5V), we can notice the power led on Jetson nano is light-on.
The state of power led indicate System Sleep/Wake (Off when the system is in sleep mode)

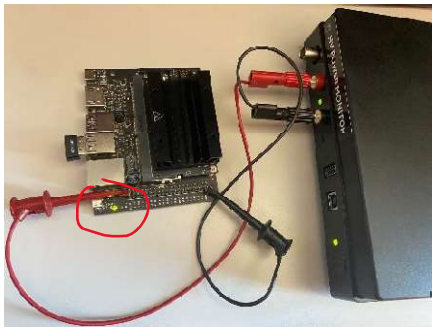

Fig.7 Power led on Jetson nano is on

By connecting Jetson nano to an external monitor with an HDMI cable, we can enter the Ubuntu desktop successfully.
At this point, the power supply operation of the entire Jetson Nano is completed.

Fig.8 Enter the desktop of Ubuntu 18.04.6 LTS.

3. Power Measurement

In Powertool, the Legend dialog box controls which channels are displayed, and what kind of data is shown in the graph, as well as the USB Passthrough Mode.

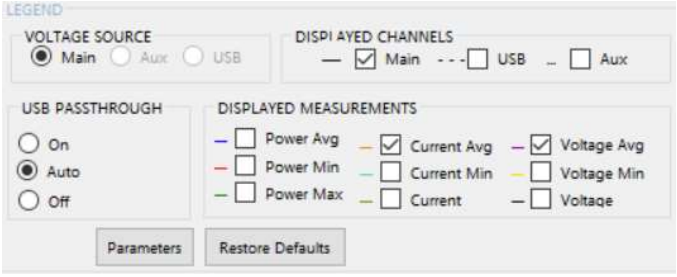

Fig.9 Dialog box for the display of Legend

In this case, we select the current average and voltage average from the main channel. To begin sampling data, click the Run button. To stop sampling, press the Stop button.

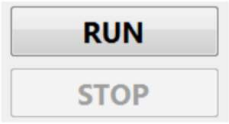

Fig.10 Run and Stop toggle button.

And we can get the power trace, current trace, and statistics value with other parameters from the screen display. (Battery life, current, and power statistics for the selected channel are visible in the STATS area of the UI)

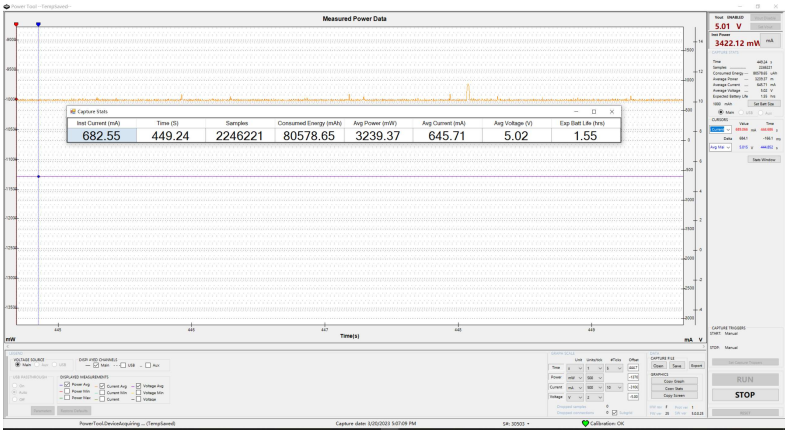

Fig.11 The Capture Stats box

Appendix

Hardware and Software Requirements for the Development Workstation with Power Monitor

1. **Windows Vista, Windows 7, Windows 8, or Windows 10 [XP support discontinued after 4.0.4.11] HVPM is only supported on Windows 8 or later.**
2. **1024x768 or greater screen resolution**
3. **3.2 GHz 32-bit (x86) processor**
4. **4 GB of system memory**
5. **40 GB hard drive with at least 15 GB of available space**
6. **Versions 4.0.4.12 and 5.0.0.0 require .Net 4.5. Version 4.0.4.11 requires .Net 4.0. Versions 4.0.4.0-4.0.4.10 require .Net 3.5.**
7. **Full Speed USB 2.0 – integrated chipset or PCI/PCI Express add-in card.**
8. **USB 3.0 or Downstream Charging ports are recommended for Front-panel connections Hubs, including monitor hubs, should not be used with the Power Monitor for optimal performance.**