AUVIDEA

SOFTWARE

SETUP GUIDE

SCOPE OF WORK
Help you to flash your Auvidea carrier board system for the first time and get everything up and running.

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Contents

SECTION 1   Document revisions and changes

Document version	Changes
1.1	Document overhaul of quick starter guide, internal verification process
1.2	Small fixes
1.3	Fixed spelling, cleaner Headings
1.6	Surpassed QuickStart guide version number to better indicate that the Software_Setup_Guide should be used in the future
1.7	Integration of the SSD-Boot flashing instructions, formally Appendix D from the technical manuals

SECTION 2   Simple flashing guide (recommended)

This section describes how to flash your Auvidea carrier board system so it can boot and run. With this guide everything you need is included in the download package from Auvidea. This flashing guide is recommended for the Auvidea carrier board series.

2.1   Before you start

- Please make sure to use a Linux host PC with Ubuntu 18.04 LTS or Ubuntu 20.04 LTS (other versions may work but some caused problems in the past!) operating system. Please use a native setup (no virtual machine). This Host PC should have a high bandwidth internet connection for the download of 3GByte+ installation file in the following steps.
- You will also need a high-quality standard USB 2.0 Type A to micro-USB 2.0 cable.

2.2   Download installation file from Auvidea

1) Download the installation file for your setup from Auvidea. JNxxx means the carrierboard series starting with JN, for example JN30D. Pleas check the description to download the right file for your module (NX, TX2,…)

Link	https://auvidea.eu/firmware/
Auvidea webpage (example)	

	Date	Product	Version	Description
	Feb 2022	JNxxx (4.05 GB) firmware for Jetpack 4.6	1.0	supports: all Auvidea JNxxx carrier boards with Xavier NX compute module (8GB) please check **quick start guide** for installation instructions (this firmware is required to enable SPI, CSI-2 and SD card)
	Feb 2022	JNxxx (4.05 GB) firmware for Jetpack 4.6	1.0	supports: all Auvidea JNxxx carrier boards with TX2 NX compute module please check **quick start guide** for installation instructions (this firmware is required to enable SPI, CSI-2 and SD card)
	Feb 2022	JNxxx (4.05 GB) firmware for Jetpack 4.6	1.0	supports: all Auvidea JNxxx carrier boards with Nano compute module (B01) please check **quick start guide** for installation instructions (this firmware is required to enable SPI, CSI-2 and SD card)
	Feb 2022	Xxxx (4.09 GB) firmware for Jetpack 4.6	1.0	supports: all Auvidea Xxxx carrier boards with AGX Xavier 32GB compute module (e.g. X220, X221, X221D, and X400) please check **quick start guide** for installation instructions (this firmware is required to enable 2nd HDMI, CSI-2, 2nd GbE, and PCIe x1)

2) Open a terminal window (CTRL + ALT + T) on your Linux host PC and navigate to your download location.

Host PC	`cd <path_to_downloadeded_tar>`

3) Extract the tar.gz file you just downloaded.

Host PC	`tar xvzf bootloader.tar.gz`

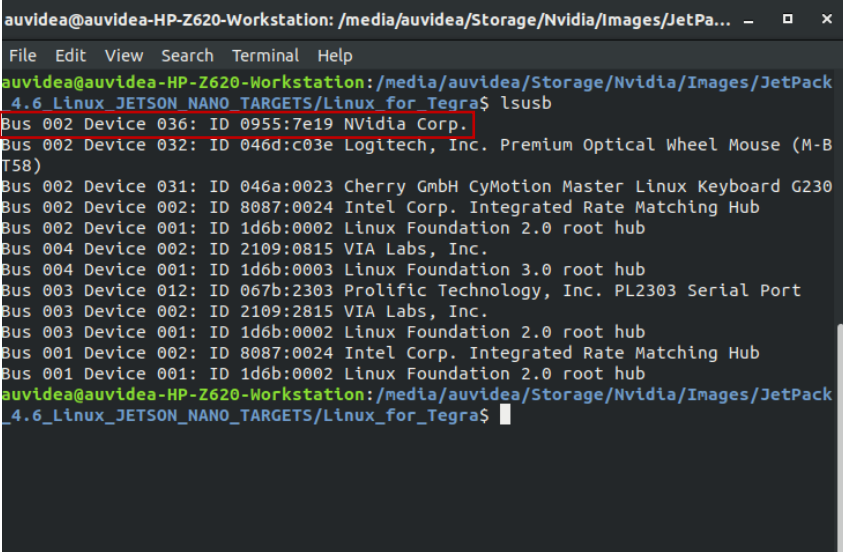| Terminal host PC (example)	auvidea@auvidea-HP-Z620-Workstation: ~/Downloads
	File Edit View Search Terminal Help
	auvidea@auvidea-HP-Z620-Workstation:~/Downloads$ tar xvzf bootloader.tar.gz
	./bootloader/
	./bootloader/nv_boot_control.conf
	./bootloader/mkbctpart
	./bootloader/kernel_tegra210-p3448-0002-p3449-0000-b00.dtb.sb
	./bootloader/flash.xml.sb
	./bootloader/initrd
	./bootloader/rp4.blob
	./bootloader/flash_win.bat
	./bootloader/tegrasign_v3_internal.py
	./bootloader/eks.img
	./bootloader/BUP_generator.py
	./bootloader/nvtboot.bin
	./bootloader/LICENSE
	./bootloader/LICENSE.mkgpt
	./bootloader/tos.img
	./bootloader/mksparse
	./bootloader/tos-mon-only.img
	./bootloader/system.img

4) Change directory to the extracted bootloader folder.

Host PC	`cd ./bootloader`

Terminal host PC (example)	auvidea@auvidea-HP-Z620-Workstation: ~/Downloads/bootloader
	File Edit View Search Terminal Help
	./bootloader/t210ref/BCT/P2180_A00_LP4_DSC_204Mhz.cfg
	./bootloader/t210ref/BCT/E2220_LP3_DSC_931.2Mhz.cfg
	./bootloader/t210ref/BCT/P3448_A00_lpddr4_204Mhz_P987.cfg
	./bootloader/t210ref/BCT/P2894_A00_Samsung_3GB_lpddr4_204Mhz_P984_v2.cfg
	./bootloader/t210ref/cboot.bin
	./bootloader/t210ref/p2371-0000/
	./bootloader/t210ref/p2371-0000/u-boot.bin
	./bootloader/t210ref/LICENSE.cboot
	./bootloader/t210ref/p3541-0000/
	./bootloader/t210ref/p3541-0000/u-boot.bin
	./bootloader/bmp.blob
	./bootloader/tegrasign_v3.py
	./bootloader/crc-flash.xml.tmp
	./bootloader/mkbootimg
	./bootloader/P3448_A00_lpddr4_204Mhz_P987.cfg
	./bootloader/LICENSE.tegraopenssl
	./bootloader/LICENSE.tos-mon-only.img.arm-trusted-firmware
	./bootloader/cboot.bin
	./bootloader/kernel_tegra210-p3448-0002-p3449-0000-b00.dtb
	./bootloader/nvidia-l4t-bootloader_32.6.1-20210726122000_arm64.deb
	./bootloader/tegrahost
	./bootloader/LICENSE.mksparse
	auvidea@auvidea-HP-Z620-Workstation:~/Downloads$ cd ./bootloader/
	auvidea@auvidea-HP-Z620-Workstation:~/Downloads/bootloader$

2.3 Connect carrier board to host PC
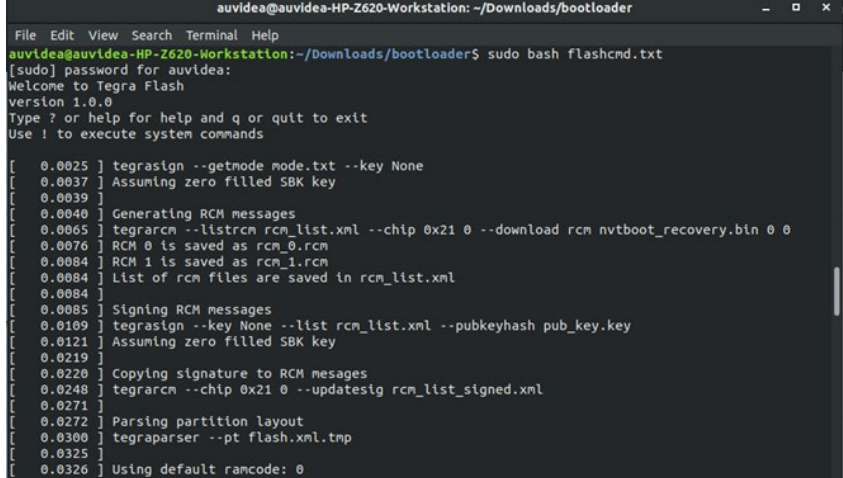
5) Connect the system to the Linux host PC. Please use a USB 2.0 cable (micro-USB on the carrier board).
6) After connecting to the host PC power up the system. The system will detect the host PC and automatically enter the flashing state (also called force recovery mode).
7) Check that the connection is established with the lsusb command. You should find one entry with Nvidia Corp. as highlighted below.

Host PC	`lsusb`

Terminal host PC example	

2.4 Flashing of system

8) Use the flashcmd script in the extracted bootloader folder to transfer the software into the Jetson compute module and flash it.

Host PC	`sudo bash ./flashcmd.txt`
Terminal host PC example	

9) Please connect a monitor to the system. After the flashing process has completed the should automatically boot and show the Ubuntu desktop.

HDMI monitor Jetson system	
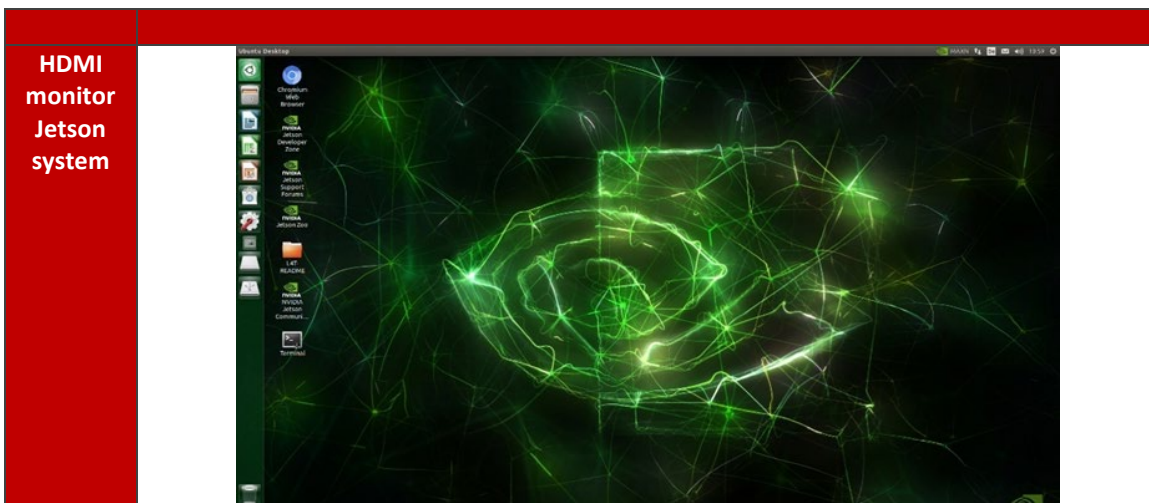
You now have a functioning system ready for your needs.

2.5 Installing additional NVIDIA SDK components

10) Now you can install additional NVIDIA SDK components. Please connect the system to the Internet. Open a terminal window on the system (CTRL ALT T). Use aptget to install the components. If this fails, please check the Internet connection of the system.

Jetson system	`sudo apt-get update && sudo apt-get install nvidia-jetpack`
Terminal Jetson system (example)	
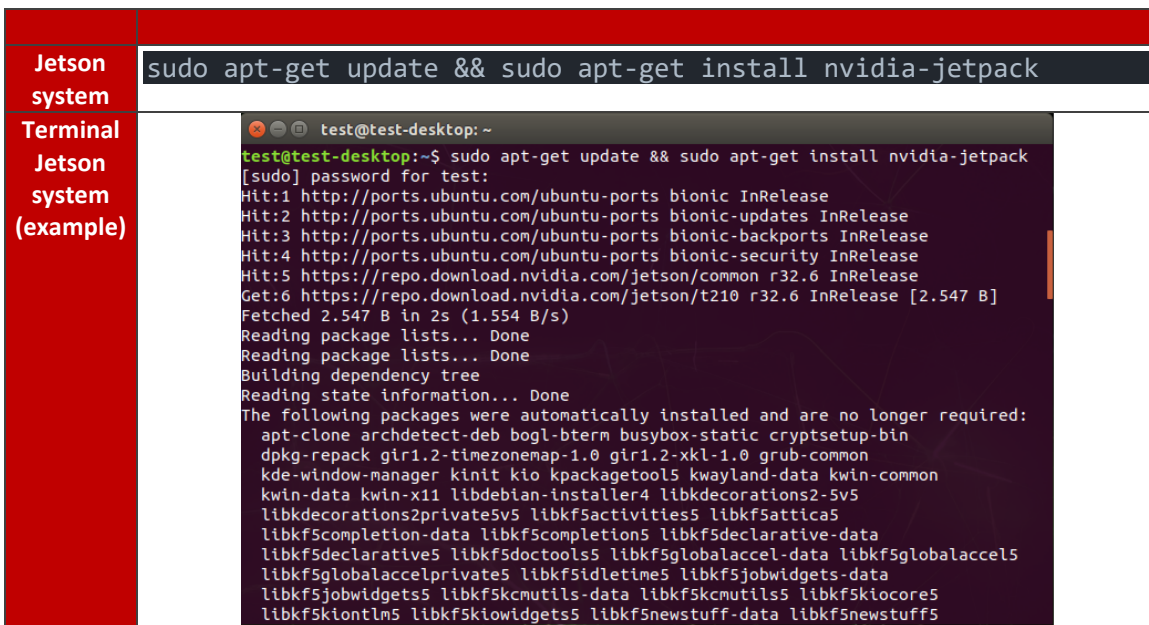
SECTION 3   Advanced flashing guide (experienced users)

The alternative flashing guide is intended to be used if you encounter problems with the recommended guide. This guide is more general and should also work with boards from other vendors and requires a few more steps. In this guide you will download the core operating system from NVIDIA with the SDK manager and only download the files that need to be changed for your carrier board from Auvidea.

3.1   Before you start

▪ Please make sure to use a Linux host PC with Ubuntu 18.04 LTS or Ubuntu 20.04 LTS (other versions may work but some caused problems in the past!) operating system. Please use a native setup (no virtual machine). This host PC should have a high bandwidth internet connection for the download of 2GB+ installation file in the following steps.

▪ You will also need a high-quality standard USB 2.0 Type A to micro-USB 2.0 cable.

3.2   Install and configure NVIDIA SDK manager

1) Download and install the Nvidia SDK manager for Ubuntu
https://developer.nvidia.com/nvidia-sdk-manager

2) Install Jetpack 4.6 and up for your Jetson module (AGX Xavier)
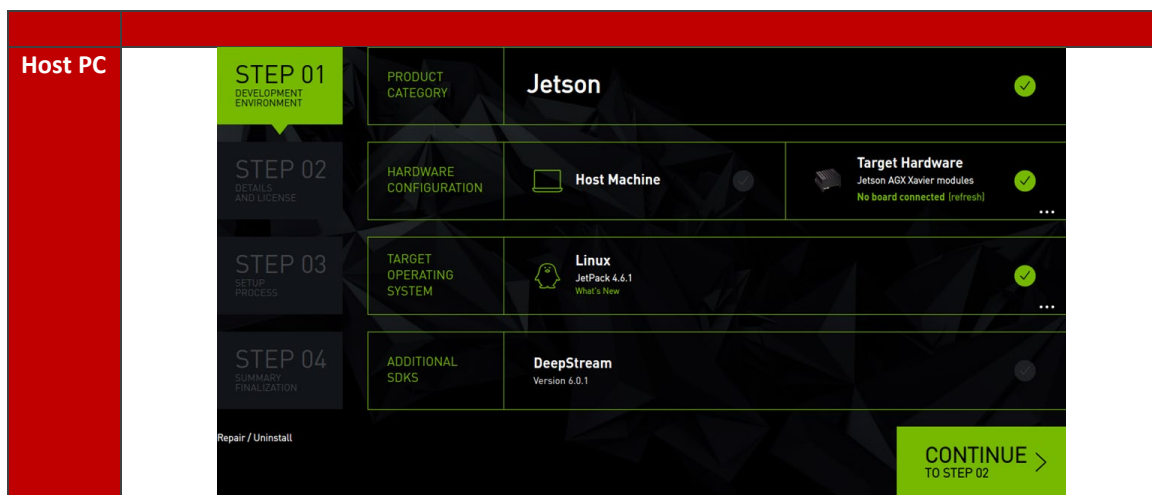
3) Skip the flashing process after installation. This step is necessary to set up the file system and contents of you Host PC. Do not flash with this configuration! Specific steps need to be performed to enable all functionality of you carrier board as described in the following steps.

Host PC	
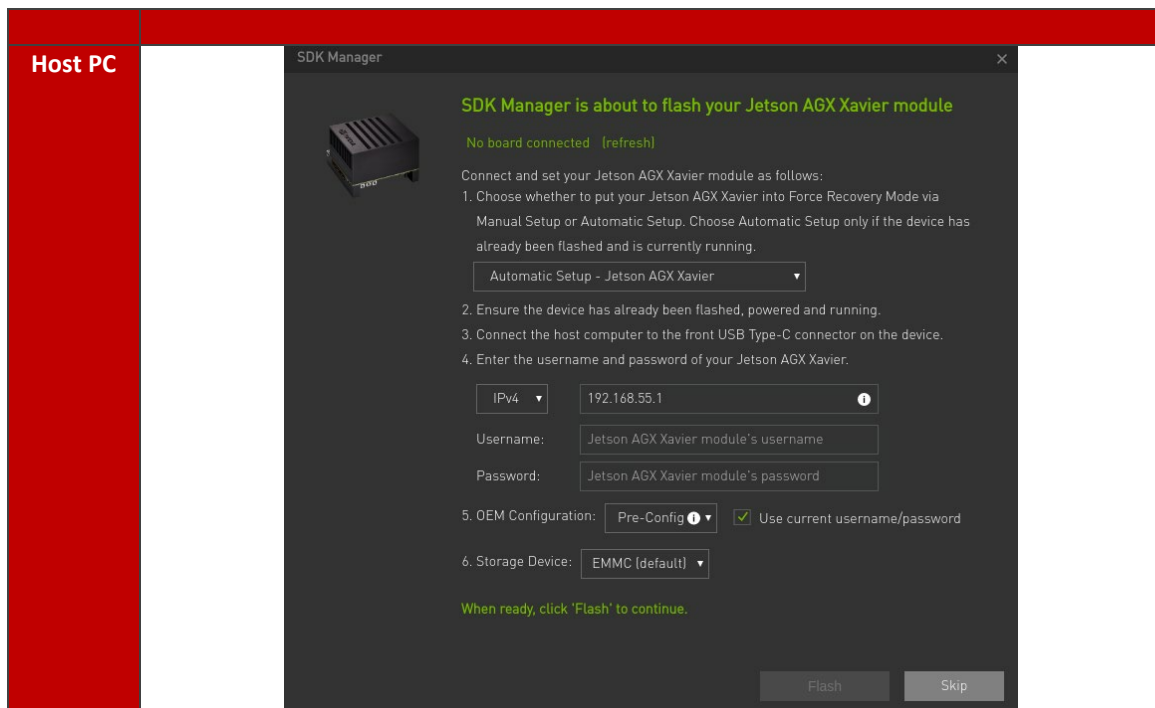
3.3 Download installation files from Auvidea

4) Download our latest firmware for your carrier board
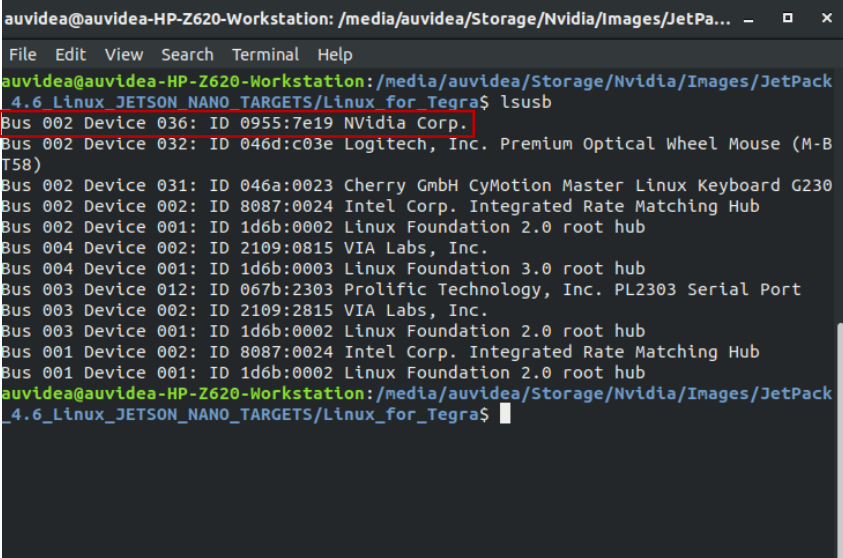
Link	https://auvidea.eu/firmware/
Auvidea webpage (example)	<table of firmware below>

Date	Product	Version	Description
Dec 2021	X200/X220/X220-LC/X221/X221-LC/X400 (223 MB) firmware for Jetpack 4.6 (L4T 32.6.1) (sources, kernel, patches and readme)	4.0	supports: X200, X220, X220-LC, X221, X221-LC, X400 carrier boards – 2x USB 3.0 – 2x HDMI – 2x GbE (native and i210) – M.2 SSD (NVME)

5) Extract the download tar ball from our website

Host PC	`tar xvf <your_downloaded_tar>.tar.bz2`

6) Change directory into the extracted files and extract the "kernel_out.tar.bz2"

Host PC	`cd <your_extracted_downloaded_tar>` `tar xvf kernel_out.tar.bz2`

7) Copy the extracted kernel_out folder into your jetpack 4.6 or up L4t folder.
<Jetpakc_L4T_folder> is usually located at:
"/home/<YOUR_USERNAME>/nvidia/nvidia_sdk/JetPack_<Jetpack_version>_Linux_<Jetson_module>/Linux_for_Tegra"

Host PC	`rsync -axHAWX --numeric-ids –` `info=progress2./kernel_out/<Jetpack_L4T_folder>`

(Modify for your version/module needs)

3.4   Flashing of system

8) Connect a USB 2 micro-USB cable to the Jetson bevor powering it up
9) After connecting to host PC power up the Xavier AGX. This will put the system in to flashing mode (also force recovery mode) with a connected Host PC.
10) Check that the connection is established with the lsusb command. You should find one entry with Nvidia Corp. as highlighted below.

Host PC	`lsusb`
Terminal host PC (example)	

11) Open your terminal in the <Jetpakc_L4T_folder> folder if you are not already in it.
12) You can now flash your system using the following command

Module name:	<your_module>:
Jetson Nano	jetson-nano-emmc
Jetson AGX-Xavier	jetson-xavier
Jetson Xavier NX	jetson-xavier-nx-devkit-emmc
Jetson TX2 NX	jetson-xavier-nx-devkit-tx2-nx
…	…

(If you are following the native SSD boot flashing guide. The following command needs to be changed as described in the guide.)

Host PC	`sudo ./flash <your_module> mmcblk0p1`

13) Please connect a monitor to the system. After the flashing process has completed the system should automatically boot and show the Ubuntu desktop.

HDMI monitor Jetson system	

You now have a functioning system ready for your needs.

3.5   Installing additional NVIDIA SDK components

14) Now you can install additional NVIDIA SDK components. Please connect the system to the internet. Open a terminal window on the system (CTRL ALT T). Use aptget to install the components. If this fails, please check the Internet connection of the system.

Jetson system	`sudo apt-get update && sudo apt-get install nvidia-jetpack`
Terminal Jetson system example	

SECTION 4 SSD-Boot flashing guide (experienced users)

This guide describes how to set up your system to boot partially or fully from a M.2 SSD depending on your module choice.
This guide is intended for experienced users only.

4.1 Partial SSD boot for Jetson Nano, NX, TX2 NX

The Jetson Nano, NX and TX2 NX modules do not support native boot purely from the SSD.
To still benefit from the SSD speed and size, this guide describes how to move your RootFS to your SSD.
You can also use the Partial SSD boot flashing guide for the Jetson Xavier/Orin series, but we recommend the Native SSD boot guide for Jetson Xavier/Orin systems.
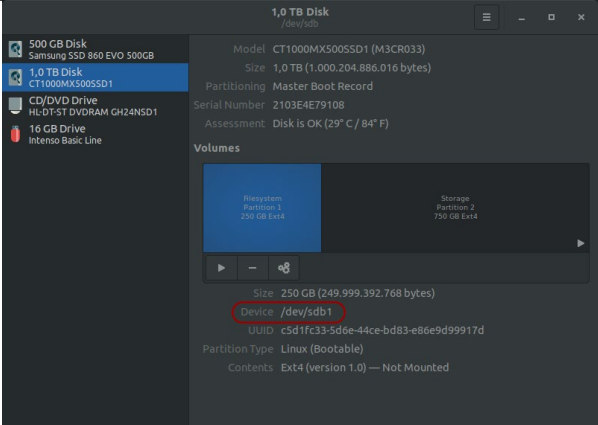Note: If you run in to problems, there is also another resource from JetsonHacks: "Jetson Xavier NX – Run from SSD" which you can find on google.

4.1.1 Before you start

- Before you start pleas make sure your system is set up and running according to our simple or advanced flashing guide from SECTION 2 or SECTION 3.

4.1.2 Locate and identify storage device

1. The first thing you need to do is to identify the storage device you are intending to use.

	Ubuntu	Note
Jetson system		With the *disc* program you can find your device as shown in the Picture.

Make sure your intended SSD storage device does not hold valuable data as the following steps will format this device.

SSD-Storage device:
When working with NVME SSD your device name should look like this: /dev/nvme0n1*p1*
The ending *p1* stands for partition one. In the following steps you must remove the partition information from the device path. See the following example:
<YOUR_STORAGE_DEVICE> = /dev/nvme0n1

USB-Storage device:
When working with external USB devices your device name should look like this: /dev/sdb*1*

The ending *1* stands for partition one. In the following steps you must remove the partition information from the device path. See the following example:
<YOUR_STORAGE_DEVICE> = /dev/sdb

4.1.3 Set up RootFS on SSD

Pleas execute the following steps to copy your RootFS to your SSD-Boot storage.

2. Format the storage device

Jetson system	`sudo parted <YOUR_STORAGE_DEVICE> mklabel gpt`

3. Create the RootFS partition

Jetson system	`sudo parted <YOUR_STORAGE_DEVICE> mkpart APP 0GB <YOUR_ROOTFS_SIZE>`

4. Create filesystem

Jetson system	`sudo mkfs.ext4 <YOUR_STORAGE_DEVICE>1`

5. Copy the existing RootFS to the storage device

Jetson system	`sudo mount <YOUR_STORAGE_DEVICE> /mnt` `sudo rsync -axHAWX --numeric-ids --info=progress2 --exclude={"/dev/","/proc/","/sys/","/tmp/","/run/","/mnt/","/media/*","/lost+found"} / /mnt/`

4.1.4 Switch boot device to SSD

You need to change your root target in exlinux.conf to the SSD. This is necessary so that the Operating system knows where to find the system files.

6. Open exlinux.conf

Jetson system	`sudo nano /boot/exlinux/exlinux.conf`

7. Modify the exlinux.conf by changing the root path

Jetson system	`LABEL primary`
	`        MENU LABEL primary kernel`
	`        LINUX /boot/Image`
	`        INITRD /boot/initrd`

```
        APPEND ${cbootargs} quiet root=<YOUR_STORAGE_DEVICE>1 rw
rootwait rootfstype=ext4 console=ttyTCU0,115200n8 console=tty0
fbcon=map:0 net.ifnames=0
```

8. After a reboot your system will start from the SSD

4.1.5 Validate

9. You can validate the SSD boot by using the following test

| Jetson system | ```test@test-desktop:~$ df /
Filesystem   1K-blocks   Used Available Use% Mounted on
/dev/nvme0n1p1 122507912 14618752 102744904 13% /``` |

Wen <Your_Storage_device> shows up to what you have set it, you successfully moved your RootFS and booted from SSD.

4.2   Native SSD boot for Jetson AGX Xavier, AGX Orin, Xavier NX series

This guide is only applicable for the Jetson Xavier and Orin series. These series support direct boot from NVME SSD.
Note: If you run in to problems, there is also another resource from JetsonHacks: "Jetson Xavier NX – Run from SSD" which you can find on google.

4.2.1 Before you start

- Pleas follow the steps described in SECTION 3 Advanced flashing guide (experienced users). The same steps apply if you want your system to boot from the SSD. You only must change one command in this guide to apply the SSD boot.

4.2.2 Flash system

1. Pleas change the command as displayed below.
   The crossed-out command is just for reference and must not be executed!

| Host PC | ~~sudo ./flash <your_module> mmcblk0p1~~
sudo ./nvsdkmanager_flash.sh -s nvme0n1p1 |

SECTION 5   Frequently asked questions

- My X221 is not going in to force recovery
  - If your system is not going in to force recovery please contact our support as you may got a system with a mismatched firmware.

SECTION 6   Disclaimer

Thank you for reading this manual. If you have found any typos or errors in this document, please let us know.
This is the preliminary version of this data sheet. Please treat all specifications with caution as there may be any typos or errors.

The Auvidea Team

Copyright notice

SECTION 7   Trademarks

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SECTION 8 END OF DOCUMENT

End of document