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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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. If you are using a Orin nano or Orin NX module please see the Orin nano & Orin NX flashing section.

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 should make sure that Python 2.x is installed as it is required for the NVIDIA SDK Manager. You can check your installation in the command line with: `python --version` example return: Python 2.7.17. If you do not get a return or error you do not have Python 2.x installed. Please use: `sudo apt install python` to install Python 2.x to your system.

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

- If you are using a AGX Orin please use the Advanced flashing guide.

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. Please check the description to download the right file for your module (NX, TX2,...)

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

3) Extract the tar.gz file you just downloaded.
4) Change directory to the extracted bootloader folder.

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) Connect your system to power (please see specifications to apply the right voltage for your system when using your own power supply). The system will start automatically and detect the host PC and enter the flashing state (also called force recovery mode). In some cases, you will have manual press or short pins before connecting to your power source to enter force recovery mode. For example, with the JN30D you will need to short Pins 7 & 8 of J32 to enter force recovery. A simple way is to use tweezers. Please see the Technical Reference Manual for a detailed pin description. You can also see the FAQs in this document for further informations.
7) Check that the connection is established with the “lsusb” command. You should find one entry with “Nvidia Corp.” as highlighted below.

Your system is now connected properly and ready to be flashed

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.

9) Please connect a monitor to the system. After the flashing process has completed the system should automatically boot and show the Ubuntu desktop.
You now have a functioning system ready for your needs.

2.5 Maintaining functionality

After successful flashing please be aware that if you use "sudo apt-get upgrade" some of the applied changes performed in this guide (Bootloader, Kernels, DTBs, ...) will be overwritten by standard Nvidia packages. This will most probably brick some board functionality and some interfaces may not work correctly anymore.

When overriding the Auvidea configurations only basic functionality like 1080p HDMI, some USB ports, Ethernet could work
Without the correct configurations and packages 4k HDMI, PCIe ports, some USB ports, CSI, CAN, ... will not work.

If you know what you are doing you can exclude the Nvidia Debian packages from the Nvidia sources.list from being updated. This prevents overriding relevant files and changes.
If you are unsure, we recommend DO NOT UPGRADE YOUR SYSTEM.

In the case you accidental upgraded your system and some board functionality stopped working correctly we recommend to reflash your system according to this guide.

2.6 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
Terminal (example)

```
sudo apt-get update && sudo apt-get install nvidia-jetpack
```

```
test@tech-desktop:~ $ sudo apt-get update && sudo apt-get install nvidia-jetpack
[sudo] password for test:
Hit:1 http://ports.ubuntu.com/ubuntu-ports/bionic InRelease
Hit:2 http://ports.ubuntu.com/ubuntu-ports/bionic-updates InRelease
Hit:3 http://ports.ubuntu.com/ubuntu-ports/bionic-updates-ppa InRelease
Hit:4 http://ports.ubuntu.com/ubuntu-ports/bionic-security InRelease
Fetched 2.547 B in 0s (1.554 B/s)
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
apt-clone archdetect-deb bogi-btmem busybox-static cryptsetup-blk
dpkg-repack-ctrl-ii-dbus nvidia-geb10 nvidia-geforce-331.45 nvidia-geforce-331.45-unity
kde-window-manager kinit kis kpackage-tools kwayland-data kwin-common
kwin-data k:host-1 libdb10 libgnome3-canonical libgnome3-data libgnome3-data
libgnome3-data-uninstall libgnome3-extensionlib libgnome3-extensionlib
libgnome3-extensionlib-uninstall libgnome3-extensionlib-uninstall
libgnome3-extensionlib-uninstall
Reading state information... Done
```

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 should make sure that Python 2.x is installed as it is required for the NVIDIA SDK Manager. You can check your installation in the command line with: `python --version` example return: `Python 2.7.17`. If you do not get a return or error you do not have Python 2.x installed. Please use: `sudo apt install python` to install Python 2.x to your system
- You will also need a high-quality standard USB 2.0 Type A to micro-USB 2.0 cable.
- If you are using a AGX Orin please see the `Flashing the AGX Orin` section, as additional steps are required.

3.2 Install and configure NVIDIA SDK manager

1) Download and install the Nvidia SDK manager for Ubuntu
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 your 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 your carrier board as described in the following steps.
3.3 Download installation files from Auvidea

The following steps are necessary to enable all features of the Auvidea carrier board. It is possible to skip these steps and flash your system without them. But then you will only be able to use basic functionality like 1080p HDMI, some USB ports, Ethernet. Without these steps 4k HDMI, PCIe ports, some USB ports, CSI, CAN,… will not work, we strongly recommend to follow it if possible.

4) Download our latest firmware for your carrier board

- [Link](https://auvidea.eu/firmware/)

<table>
<thead>
<tr>
<th>Date</th>
<th>Product</th>
<th>Version</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dec 2021</td>
<td>X200/X220/X220-LC/X221/X221-LC/X400 carrier boards</td>
<td>4.0</td>
<td>supports: X200, X220, X220-LC, X221, X221-LC, X400 carrier boards</td>
</tr>
<tr>
<td></td>
<td>firmware for Jetpack 4.6</td>
<td>4.0</td>
<td>– 2x USB 3.0</td>
</tr>
<tr>
<td></td>
<td>(sources, kernel, patches and readme)</td>
<td>4.0</td>
<td>– 2x HDMI</td>
</tr>
<tr>
<td></td>
<td>(LX32 36.2.1)</td>
<td>4.0</td>
<td>– 2x GbE (native and 210)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4.0</td>
<td>– M.2 5 SSD (NVME)</td>
</tr>
</tbody>
</table>

5) Extract the downloaded 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 (Linux for Tegra) folder.  
Usual File path:
"/home/<YOUR_USERNAME>/nvidia/nvidia_sdk/JetPack_<Jetpack_version>_Linux_<Jetson_module>/Linux_for_Tegra"

3.4 Flasing the AGX Orin

If you want to flash a AGX Orin the following steps should be followed additionally to the flashing guide from above. Other modules (like AGX Xavier, Nano, Nano NX, ...) do not need those additional steps and you should continue with the next step.  
Future installation packages from Auvidea should already include the following changes. In that case you can use the following steps as a check or implement them yourself when skipping the Auvidea installation files.

3.4.1 AGX Orin Jetpack compatibility

When flashing a AGX Orin production module the Jetpack version 5.0 GA must be used.  
The Jetpack versions 5.0 DP and 5.0.1 DP do not work!

3.4.2 Necessary changes

Independent of the used AGX Orin version you must make the following changes.  
These changes must be done in the filesystem of the Host PC before flashing it to the AGX Orin module.  
Usual File path:
"/home/<YOUR_USERNAME>/nvidia/nvidia_sdk/JetPack_<Jetpack_version>_Linux_<Jetson_module>/Linux_for_Tegra/ bootloader/tegra234-mb2-bct-common.dtsi"

<table>
<thead>
<tr>
<th>Replace</th>
<th>cvb_eeprom_read_size = &lt;0x100&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replace with</td>
<td>cvb_eeprom_read_size = &lt;0x0&gt;</td>
</tr>
</tbody>
</table>

In tegra234-mb2-bct-common.dtsi

Also, the ODMDATA must be changed.  
Usual File path:
"/home/<YOUR_USERNAME>/nvidia/nvidia_sdk/JetPack_<Jetpack_version>_Linux_<Jetson_module>/Linux_for_Tegra/ p3701.conf.common"

| Set                  | ODMDATA="gbe-uphy-config-0,hsstp-lane-map-3,nvhs-uphy-config-0,hsio-uphy-config-16" |
3.5 Flashing of system

8) Connect a USB 2 micro-USB cable to the Jetson before powering it up.
9) After connecting to the host PC power up your Jetson. This will put the system in to flashing mode (also called force recovery mode) with a connected Host PC. In some cases, you will have to manually press the force recovery mode button or short pins to enter force recovery mode. For example, with the JN30D you will need to short Pins 7 & 8 of J32 to enter force recovery. A simple way is to use tweezers or jumpers. Please see the Technical Reference Manual for a detailed pin description.
10) Check that the connection is established with the lsusb command. You should find one entry with Nvidia Corp. as highlighted below.

<table>
<thead>
<tr>
<th>Host PC</th>
<th>lsusb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terminal host PC (example)</td>
<td></td>
</tr>
</tbody>
</table>

11) Open your terminal in the <Jetpack_L4T_folder> folder if you are not already in it.
12) You can now flash your system using the following command:

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

<table>
<thead>
<tr>
<th>Module name</th>
<th>&lt;your_module&gt;:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jetson Nano</td>
<td>jetson-nano-emmc</td>
</tr>
<tr>
<td>Jetson AGX-Xavier</td>
<td>jetson-xavier</td>
</tr>
<tr>
<td>Jetson Xavier NX</td>
<td>jetson-xavier-nx-devkit-emmc</td>
</tr>
<tr>
<td>Jetson TX2 NX</td>
<td>jetson-xavier-nx-devkit-tx2-nx</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

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

13) Please connect a monitor to the system. After the flashing process has completed the system should automatically boot and show the Ubuntu desktop.
You now have a functioning system ready for your needs.

14) Please also see 2.5 Maintaining functionality

### 3.6 Installing additional NVIDIA SDK components

14) Now you can install additional NVIDIA SDK components. Please connect the system to the internet. Use `apt-get` to install the components. If this fails, please check the Internet connection of the system.

```bash
sudo apt-get update && sudo apt-get install nvidia-jetpack
```

![Terminal example with command output]
SECTION 4  Preliminary Orin nano & Orin NX flashing guide

This guide is intended to be used with the Orin modules Orin nano & Orin NX series. As the integration of the flashing capabilities are not yet integrated into the SDK manager from Nvidia. This guide is meant to bridge the time until the SDK manager can be used. Not that not all functionalities of your carrier board like the JNX42 or JNX45 are supported yet (like some USB ports may not work). This will be fixed in a future release following soon.

4.1 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.
- If you are using a AGX Orin please use the Advanced flashing guide.

4.2 Download installation file from NVIDIA

11) Download the installation file for your selected JetPack from the NVIDIA archive into a working directory of your choice. The following table shows step by step where to download the appropriate files.

<table>
<thead>
<tr>
<th>Link</th>
<th><a href="https://developer.nvidia.com/embedded/jetpack-archive">https://developer.nvidia.com/embedded/jetpack-archive</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>NVIDIA webpage (JetPack)</td>
<td></td>
</tr>
</tbody>
</table>
12) Open a terminal window (CTRL + ALT + T) on your Linux host PC and navigate to your download location.

Host PC
```
cd <path_to_downloaded_tar>
```

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

Host PC
```
tar xf Jetson_Linux_R35.2.1_aarch64.tbz2
```

14) Change directory to the extracted rootfs folder.

Host PC
```
cd Linux_for_Tegra/rootfs/
```

15) Extract the rootfs.

Host PC
```
sudo tar xpf ../../../Tegra_Linux_Sample-Root-Filesystem_R35.2.1_aarch64.tbz2
```

16) Change directory to the extracted Linux_for_Tegra folder.

Host PC
```
cd Linux_for_Tegra
```

17) Install the flashing prerequisites.

Host PC
```
sudo ./tools/l4t_flash_prerequisites.sh
```

18) Apply the binaries.

Host PC
```
sudo ./apply_binaries.sh
```

19) On Auvidea carrier boards you have to adjust the eeprom size:
change "cvb_eeprom_read_size = <0x100>;" in "<working
directory>/Linux_for_Tegra/bootloader/t186ref/BCT/tegra234-mb2-bct-misc-p3767-0000.dts" to "cvb_eeprom_read_size = <0x0"

4.3 Connect carrier board to host PC

20) Connect the system to the Linux host PC. Please use a USB 2.0 cable (micro-USB on the carrier board).
21) Connect your system to power (please see specifications to apply the right voltage for your system when using your own power supply). The system will start automatically and detect the host PC and enter the flashing state (also called force recovery mode). In some cases, you will have manual press or short pins before connecting to your power source to enter force recovery mode. For example, with the JN30D you will need to short Pins 7 & 8 of J32 to enter force recovery. A simple way is to use tweezers. Please see the Technical Reference Manual for a detailed pin description. You can also see the FAQs in this document for further informations.
22) Check that the connection is established with the “lsusb” command. You should find one entry with “Nvidia Corp.” as highlighted below.
Your system is now connected properly and ready to be flashed

4.4 Flashing of system

23) Use this flash command for your system.

```
sudo ./tools/kernel_flash/l4t_initrd_flash.sh --external-device
nvme0n1p1 -c tools/kernel_flash/flash_l4t_external.xml -p "-c
bootloader/t186ref/cfg/flash_t234_qspi.xml" --showlogs --network
usb0 p3509-a02+p3767-0000 internal
```

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

You now have a functioning system ready for your needs.
4.5 Maintaining functionality

After successful flashing please be aware that if you use “sudo apt-get upgrade” some of the applied changes performed in this guide (Bootloader, Kernels, DTBs, ...) will be overwritten by standard Nvidia packages. This will most probably brick some board functionality and some interfaces may not work correctly anymore.

When overriding the Auvidea configurations only basic functionality like 1080p HDMI, some USB ports, Ethernet could work
Without the correct configurations and packages 4k HDMI, PCIe ports, some USB ports, CSI, CAN, ... will not work.

If you know what you are doing you can exclude the Nvidia Debian packages from the Nvidia sources.list from being updated. This prevents overriding relevant files and changes.
If you are unsure, we recommend NOT UPGRADE YOUR SYSTEM.

In the case you accidental upgraded your system and some board functionality stopped working correctly we recommend to reflash your system according to this guide.
SECTION 5  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.

5.1  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.

5.1.1  Before you start

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

5.1.2  Locate and identify storage device

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

<table>
<thead>
<tr>
<th>Ubuntu</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jetson system</td>
<td></td>
</tr>
</tbody>
</table>

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/nvme0n1p1
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/sdb1
The ending / stands for partition one. In the following steps you must remove the partition information from the device path. See the following example:

\(<YOUR\_STORAGE\_DEVICE> = /dev/sdb\)

### 5.1.3 Set up RootFS on SSD

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

1. **Format the storage device**

   ```
   sudo parted <YOUR\_STORAGE\_DEVICE> mklabel gpt
   ```

2. **Create the RootFS partition**

   ```
   sudo parted <YOUR\_STORAGE\_DEVICE> mkpart APP 0GB <YOUR\_ROOTFS\_SIZE>
   ```

3. **Create filesystem**

   ```
   sudo mkfs.ext4 <YOUR\_STORAGE\_DEVICE>1
   ```

4. **Copy the existing RootFS to the storage device**

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

### 5.1.4 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.

1. **Open exlinux.conf**

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

2. **Modify the exlinux.conf by changing the root path**

   ```
   LABEL primary
   MENU LABEL primary kernel
   LINUX /boot/Image
   INITRD /boot/initrd
   ```
5.1.5 Validate

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

```
$ df /
Filesystem     1K-blocks     Used Available Use% Mounted on
/dev/nvme0n1p1 122507912 14618752 102744904 13% /
```

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

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

This guide is only applicable for the Jetson AGX Xavier, Xavier NX and AGX Orin series. These series support direct boot from NVME SSD.

Note: If you run into problems, there is also another resource from JetsonHacks: “Jetson Xavier NX – Run from SSD” which you can find on google.

5.2.1 Before you start

- Please 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 from the Advanced flashing guide (experienced users) to apply the native SSD boot.

5.2.2 Flash system

1. Please change the command as displayed below.
The crossed-out command is just for reference and must not be executed!
SECTION 6  Frequently Asked Questions

- Why is my X221 not going into force recovery?
  - If your system is not going into force recovery, please contact our support as you may got a system with a mismatched firmware.

- Why is my system not entering the force recovery state?
  - Most of our carrier boards are design to enter force recovery mode when they detect a Host PC. This detection only works one time automatically after the system was connected to its power supply. We recommend unplugging your system before connecting to a Host PC and plugging it back in to power after connecting.
  - If your system still does not enter force recovery you may have to press the force recovery button or short the respective pins before connecting to power (please see the Technical Reference Manual for a detailed pinout description).
  - If you cannot disconnect your system from power, it is also possible to enter force recovery via a button sequence.
    - Press/jumper “force recovery” button/pins
    - Press/jumper “reset” button/pins
    - Release/disconnect “reset” button/pins
    - Release/disconnect “force recovery” button/pins a few seconds later then the “reset” button/pins
SECTION 7  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

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