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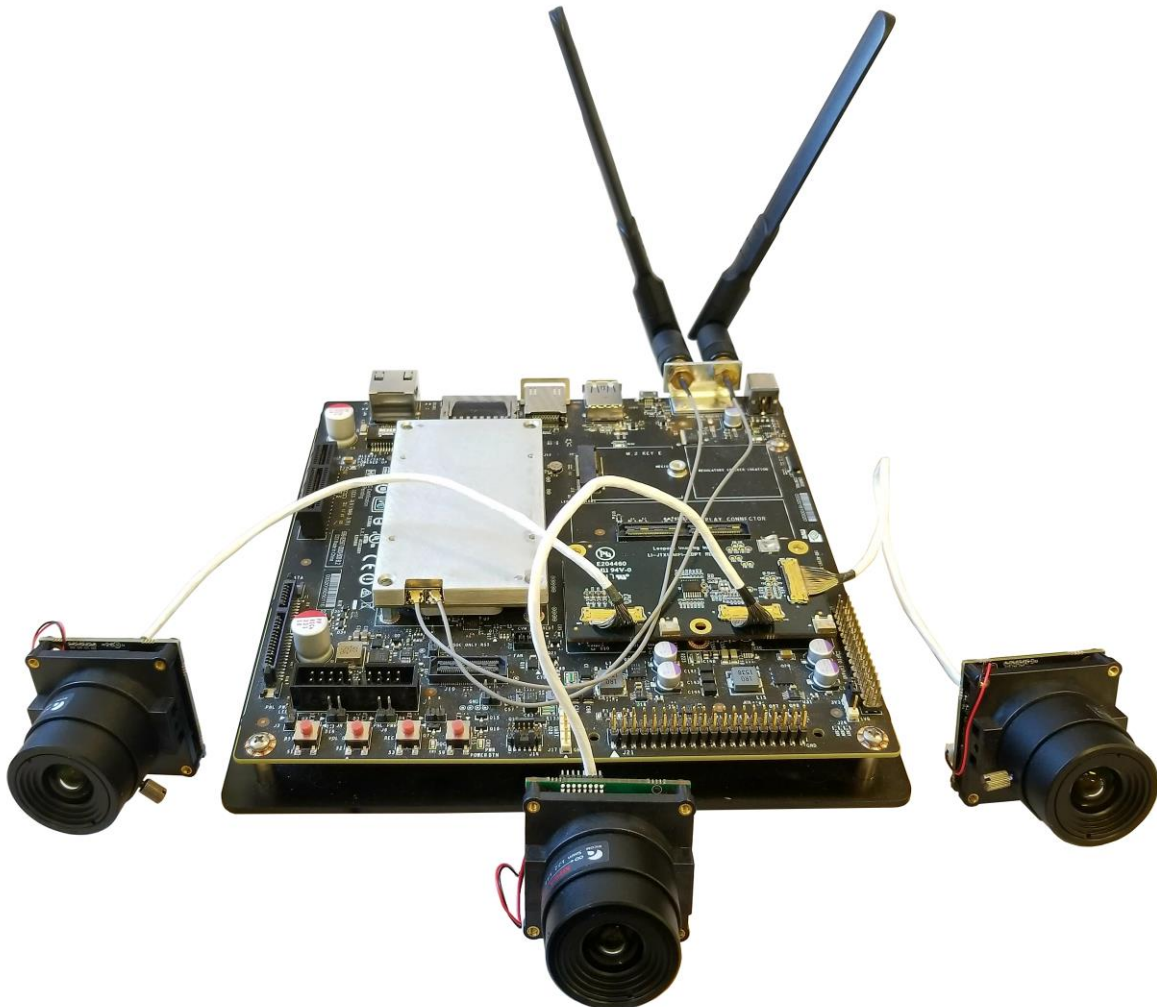
Overview

This driver is for LI-RAA462113-MIPI camera with Nvidia Jetson TX2 Developer Kit.
This driver supports up to 3 RAA462113 cameras. The adapter board is LI-JTX1-MIPI-ADPT V1.2.
This driver supports 3872 x 2144@50fps,
This driver is based on R28.2.1 (Jetpack 3.2.1/3.3).

Download link

<https://www.dropbox.com/sh/6cgg2nb6d33yrr2/AADEA6guDQ1xqVe54MR5iDH0a?dl=0>

Platform	Camera
Nvidia Jetson TX2 Developer Kit	1 ~ 3 x LI- RAA462113-MIPI V1.0
Cable	Adapter/Carrier Board
1 ~ 3 x FAW-1233	1 x LI-JTX1-MIPI-ADPT V1.2





RAA462113_R28.2.1_TX2_NV_Tri_20190330_Driver_Guide

Revision	SVN version	Release Date	Operator
20190330	Rev89	2019-03-30	Xingxing Gu
Updates			
1. First driver of RAA462113 + LI-JTX1-MIPI-ADPT on Nvidia TX2 Developer kit.			
Known bugs			
1. Zigzag issue on edges of objects.			



Setup Procedure 1/2

1. Download the L4T R28.2.1 for TX2 from link below to your Ubuntu OS on Intel x64 host PC (Ubuntu 16.04 or 14.04, virtual machine is fine) and follow the quick start guide to flash the R28.2.1 image to TX2.

Note: If your TX2 SOM already includes the Ubuntu OS with L4T **R28.2.1**, you can skip this step.

You can use below command to check the L4T version.

```
nvidia@tegra-ubuntu:~$ cat /etc/nv_tegra_release
# R28 (release), REVISION: 2.1, GCID: 11272647, BOARD: t186ref, EABI: aarch64, D
ATE: Thu May 17 07:29:06 UTC 2018
```

R28.2.1 OS Image: <https://www.dropbox.com/sh/4dt0uca3mj3yr3q/AADt1jqT5o2N2dQxDbL69tu9a?dl=0>

```
simon@ubuntu:~/TX2_R28.2.1/R28.2.1_TX2$ ls
l4t_quick_start_guide.txt
Tegra186_Linux_R28.2.1_aarch64.tbz2
Tegra_Linux_Sample-Root-Filesystem_R28.2.1_aarch64.tbz2
simon@ubuntu:~/TX2_R28.2.1/R28.2.1_TX2$ sudo tar xpf Tegra186_Linux_R28.2.1_aarc
h64.tbz2
[sudo] password for simon:
simon@ubuntu:~/TX2_R28.2.1/R28.2.1_TX2$ cd Linux_for_Tegra/rootfs/
simon@ubuntu:~/TX2_R28.2.1/R28.2.1_TX2/Linux_for_Tegra/rootfs$ sudo tar xpf ../
./Tegra_Linux_Sample-Root-Filesystem_R28.2.1_aarch64.tbz2
simon@ubuntu:~/TX2_R28.2.1/R28.2.1_TX2/Linux_for_Tegra/rootfs$ cd ..
simon@ubuntu:~/TX2_R28.2.1/R28.2.1_TX2/Linux_for_Tegra$ sudo ./apply_binaries.sh
```

Then put your system into "reset recovery mode" by holding down the REC (S3) button and press the RST (S1) button once on the Jetson EVA board.

Connect the TX2 to your Ubuntu host PC with USB cable, and do "lsusb", make sure there is a device with "NVidia Corp."

```
simon@ubuntu:~/TX2_R28.2.1/R28.2.1_TX2/Linux_for_Tegra$ lsusb
Bus 001 Device 006: ID 0955:7c18 NVidia Corp.
```

Then do below command to flash the OS image.

```
simon@ubuntu:~/TX2_R28.2.1/R28.2.1_TX2/Linux_for_Tegra$ sudo ./flash.sh jetson-t
x2 mmcblk0p1
```

2. Reboot TX2 and Put your system into "reset recovery mode" again.

3. Copy the tegra186-quill-p3310-1000-c03-00-base.dtb (which was downloaded from the Driver link in page 1) and replace the same file under Linux_for_Tegra/kernel/dtb on your Ubuntu host PC.

```
simon@ubuntu:~/TX2_R28.2.1/R28.2.1_TX2/Linux_for_Tegra$ sudo cp ../tegra186-quil
l-p3310-1000-c03-00-base.dtb kernel/dtb/
```

4. Under Linux_for_Tegra/ do

sudo ./flash.sh -r -k kernel-dtb jetson-tx2 mmcblk0p1

```
simon@ubuntu:~/TX2_R28.2.1/R28.2.1_TX2/Linux_for_Tegra$ sudo ./flash.sh -r -k ke
rnel-dtb jetson-tx2 mmcblk0p1
```




Setup Procedure 2/2

If flash the dtb file successfully, the log should be like below.

```
[ 10.0856 ] [ ..... ] 100%
[ 10.1571 ]
[ 10.1575 ] Coldbooting the device
[ 10.1603 ] tegradevflash_v2 --reboot coldboot
[ 10.1627 ] Bootloader version 01.00.0000
[ 10.2290 ]
*** The [kernel-dtb] has been updated successfully. ***
simon@ubuntu:~/TX2_R28.2.1/R28.2.1_TX2/Linux_for_Tegra$
```

Note:

1) If you see below log, that means you haven't used the folder Linux_for_Tegra/ to re-flash the whole TX2. If you don't want to lose the contents in the current TX2 SOM, you can re-flash a second TX2 SOM (if you have it). Then you can use the same folder (Linux_for_Tegra/) to flash the dtb file (tegra186-quill-p3310-1000-c03-00-base.dtb) to the current TX2 SOM. The "file does not exist" issue won't happen again.

```
copying wb0boot(/home/simon/TX2_R28.2.1/R28.2.1_TX2/Linux_for_Tegra/bootloader/t
186ref/warmboot.bin)... done.
Existing tofile(/home/simon/TX2_R28.2.1/R28.2.1_TX2/Linux_for_Tegra/bootloader/
tos.img) reused.
Existing eksfile(/home/simon/TX2_R28.2.1/R28.2.1_TX2/Linux_for_Tegra/bootloader/
eks.img) reused.
copying dtbfile(/home/simon/TX2_R28.2.1/R28.2.1_TX2/Linux_for_Tegra/kernel/dtb/t
egra186-quill-p3310-1000-c03-00-base.dtb)... done.
Reusing existing system.img...
file does not exist.
simon@ubuntu:~/TX2_R28.2.1/R28.2.1_TX2/Linux_for_Tegra$
```

For the Jetpack installation, the Linux_for_Tegra/ folder is under / 64_TX2.

5. After boot up TX2, copy "Image" and "zImage" to /boot on TX2.

```
nvidia@tegra-ubuntu:~/Downloads/driver/Binaries$ sudo cp Image /boot/
nvidia@tegra-ubuntu:~/Downloads/driver/Binaries$ sudo cp zImage /boot/
```

6. copy 4.4.38-tegra-leopard.tgz to /lib/modules and uncompress it.

```
nvidia@tegra-ubuntu:~/Downloads/driver/Binaries$ sudo cp 4.4.38-tegra-leopard.tg
z /lib/modules/
nvidia@tegra-ubuntu:~/Downloads/driver/Binaries$ cd /lib/modules/
nvidia@tegra-ubuntu:/lib/modules$ sudo tar zxvf 4.4.38-tegra-leopard.tgz
```

7. Copy camera_overrides.isp to TX2 /var/nvidia/nvcam/settings and do below two command (if there is an isp file)

```
sudo chmod 664 /var/nvidia/nvcam/settings/camera_overrides.isp
sudo chown root:root /var/nvidia/nvcam/settings/camera_overrides.isp
```

```
nvidia@tegra-ubuntu:~/Downloads/driver/Binaries$ sudo cp camera_overrides.isp /v
ar/nvidia/nvcam/settings/
nvidia@tegra-ubuntu:~/Downloads/driver/Binaries$ sudo chmod 664 /var/nvidia/nvca
m/settings/camera_overrides.isp
nvidia@tegra-ubuntu:~/Downloads/driver/Binaries$ sudo chown root:root /var/nvidi
a/nvcam/settings/camera_overrides.isp
```

8. Reboot TX2.

9. Open a terminal and do "nvgstcapture-1.0". You will get live video output.

Note: Please make sure there is a camera on port J1 of LI-JTX1-MIPI-ADPT board.



Run Camera

1. Argus software

Download the file from link below.

https://www.dropbox.com/s/p87bl29sx7jyrsp/argus_R28.2.tgz?dl=0

Do below commands to install argus software.

```
sudo apt-get update
sudo apt-get install cmake libgtk-3-dev libjpeg-dev libgles2-mesa-dev libgstreamer1.0-dev
tar zxvf argus_R28.2.tgz
cd argus
mkdir build && cd build
cmake ..
make
sudo make install
```

Do "argus_camera --device=**0**" to get the videos.

2. Gstreamer

```
gst-launch-1.0 nvcamerasrc fpsRange="30.0 30.0" sensor-id=0 ! 'video/x-raw(memory:NVMM),
width=(int)3872, height=(int)2144, format=(string)I420, framerate=(fraction)30/1' ! nvtee ! nvvidconv flip-
method=2 ! 'video/x-raw, format=(string)I420' ! xvimagesink -e
```

3. v4l2-ctl capture raw

```
v4l2-ctl -V --set-fmt-video=width=3872,height=2144,pixelformat=RG12 --set-ctrl bypass_mode=0 --stream-
mmap --stream-count=1 --stream-to=raa462113.raw -d /dev/video0
```

Note:

1. The **0** can be changed to 1 or 2 if there are cameras on J2 and J3.

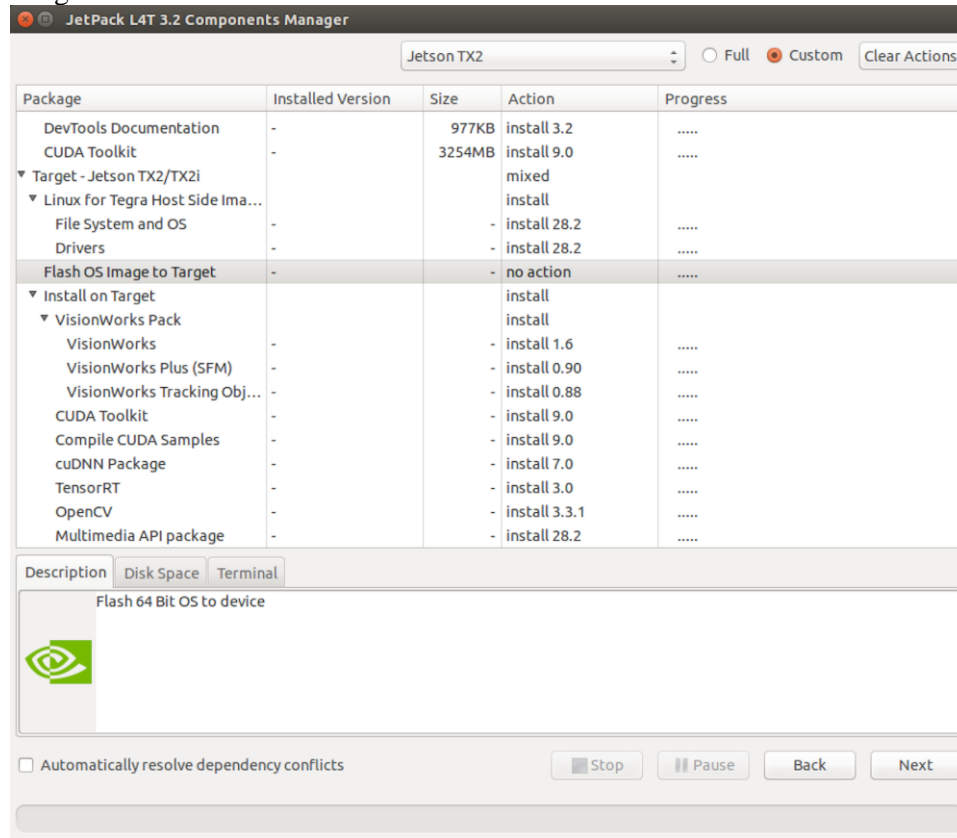
2. Please use below commands to install v4l2.

```
sudo add-apt-repository main
sudo add-apt-repository universe
sudo add-apt-repository restricted
sudo add-apt-repository multiverse
sudo apt-get update
sudo apt-get install v4l-utils
```

3. If there is no video output, please make sure the camera board has been programmed the latest FPGA file (slvs2csi2_top_drop32.rbt). For how to program the FPGA file, please refer to Note#5 below.

**Note 1/4**

1. You can also download the Jetpack 3.2.1 (which includes the L4T R28.2.1) from Nvidia website and install it to TX2 if needed. To keep the drivers and software you have installed on TX2, you may not want to flash the OS image again. Please select “Flash OS Image to Target” as “no action” at below step to skip the OS image installation.



2. If you have cooling system (fan), you can use below commands to turn on/off the fan.

1) switch to the root user.

```
sudo su
```

2) echo 255 > /sys/kernel/debug/tegra_fan/target_pwm //turn on

```
echo 0 > /sys/kernel/debug/tegra_fan/target_pwm //turn off
```

3. If there are any new drivers, we will add them into link below.

<https://www.dropbox.com/sh/16l5z6bubvdhzis/AAD-q-YiYUzyMpG5B0xbyAE5a?dl=0>



Note 2/4

4. Compile the driver

If you would like to re-compile the driver, please follow below steps.

Download the driver code and Tool chain from links below.

Kernel code: https://www.dropbox.com/s/tn65zarx6dl6le2/kernel_src_R28.2.1.tbz2?dl=0

GCC ToolChain: <https://www.dropbox.com/sh/6asavuhthg1an5s/AAD5dUivhkqSyvo3xwq6kbova?dl=0>

Compile the kernel under 64 bit Ubuntu OS on Intel x64 PC. (Virtual machine is fine. We are using Ubuntu 16.04 64 bit OS)

1) Copy compile tool gcc-4.8.5-aarch64.tgz to /opt, and unzip it
`sudo tar zxvf gcc-4.8.5-aarch64.tgz`

2) Copy kernel_src.tbz2 and two patch files to /usr/src
`sudo tar xpf kernel_src-TX2.tbz2`
`sudo chown -R <user_name> kernel`
`sudo chown -R <user_name> hardware`
`patch -p0 < tri_streaming_raa462113_base28.2.1_TX2_NV_dts_20190330 .patch`
`patch -p0 < tri_streaming_raa462113_base28.2.1_TX2_NV_kernel_20190330 .patch`

Note: <user_name> is the user name of your Ubuntu OS. For example: `sudo chown -R leopard kernel`

3) Copy tx2.sh to /usr/src/kernel.
under /usr/src/kernel, do
`source tx2.sh`

4) Create a work folder under /home:
`sudo mkdir /home/work`
`sudo chown -R <user_name> /home/work`

5) In "kernel/kernel-4.4" folder, run:

```
make O=$TEGRA_KERNEL_OUT tegra18_defconfig
make O=$TEGRA_KERNEL_OUT zImage
make O=$TEGRA_KERNEL_OUT dtbs
```

You will get Image and zImage under /home/work/TX2/kernel/kernel_out/arch/arm64/boot and tegra186-quill-p3310-1000-c03-00-base.dtb under /home/work/TX2/kernel/kernel_out/arch/arm64/boot/dts.



Note 3/4

5. Programming FPGA file to RAA462113 board

FPGA file name: [slvs2csi2_top_drop32.rbt](#)

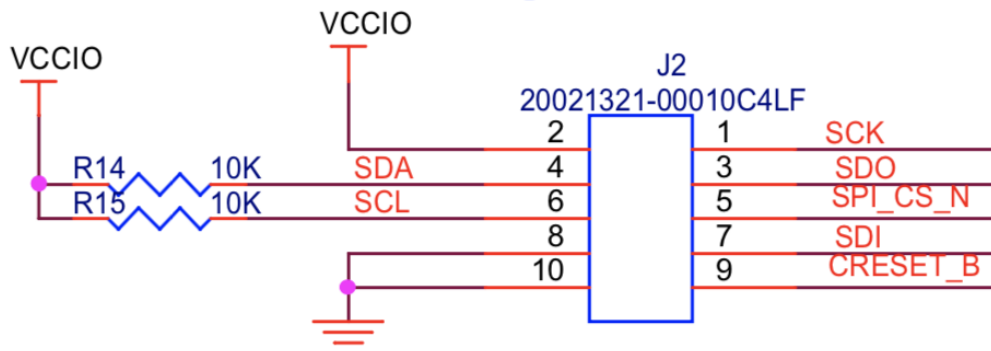
1) Download the Lattice programmer tool software **Programmer Standalone 3.10 64-bit for Windows** from link below and install it to your PC.

<http://www.latticesemi.com/programmer>

2) Connect the HW-USBN-2A or HW-USBN-2B to J2 of LI- RAA462113-MIPI board. Below is the pinout. You may need to build an adapter cable for the programmer tool and J2. J2 is a 1.27mm pitch interface.



Program Header

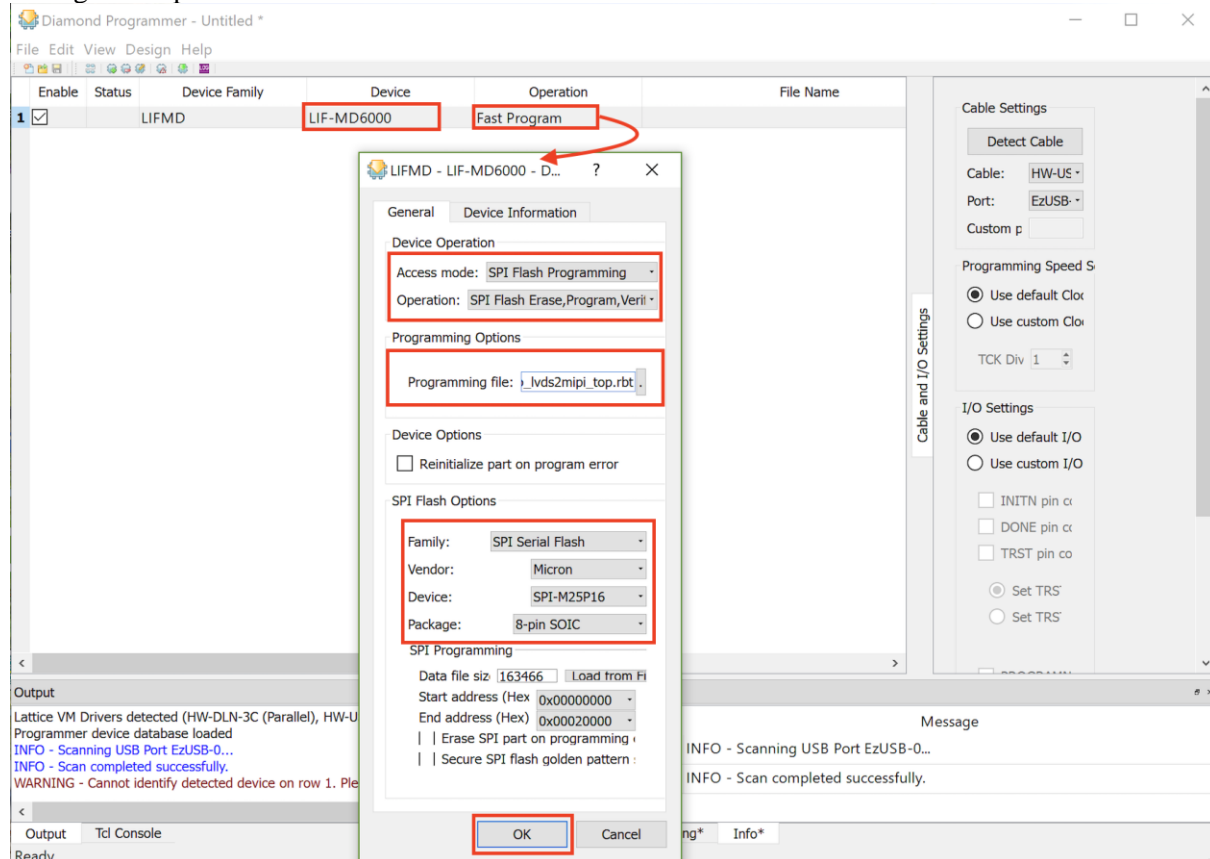




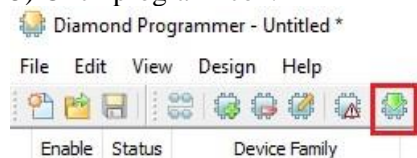
Note 4/4

3) Connect the RAA462113 camera to TX2 EVA kit and power on the EVA kit.

4) Open Lattice software (which you installed in 1). The Device name should be “LIF-MD6000” . Set the settings of “Operation” as below and click “OK”.



5) Click program icon.



6) It may take 9s to program the FPGA.

