Getting Started Guide
NVIDIA® Jetson Orin™ Reference Design

2 Channel MIPI CSI-2 Carrier Board With Jetson Orin NX SoM | CBM-NVA-ONX-16-128-V2

THE IMAGINGSOURCE
TECHNOLOGY BASED ON STANDARDS

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1. General Information

This application note describes how to get started with the 2-Channel MIPI CSI-2 Carrier Board with Jetson Orin NX SoM, Part-No. CBM-NVA-ONX-16-128-V2.

Figure 1: NVIDIA Jetson Orin Reference Design, 2-Channel MIPI CSI-2 Carrier Board with Jetson Orin NX 16 GB SoM and two MIPI CSI-2 cameras.

1.1 Cautions

⚠	**DO NOT UPGRADE YOUR SYSTEM** If you upgrade your system, e.g., by executing: *#sudo apt-get dist upgrade* this may brick some board functionality and some interfaces may not work correctly anymore. The cameras and carrier board drivers depend on the installed kernel and bootloader versions. Upgrading them to incompatible versions may render the system unusable. In this case, the carrier board may need to be returned per RMA to The Imaging Source.

DO NOT INSTALL NEW JETPACK

If you install a new JetPack version, The Imaging Source MIPI CSI-2 cameras will not work anymore.

MIPI CSI-2 CAMERAS HANDLING

Connect MIPI-based cameras ONLY when the system is powered off.

Make sure to unplug the power supply and any USB or GigE cables before connecting or re-connecting MIPI-based cameras.
Otherwise, the cameras may be damaged, may not be detected, or may not work properly.

MICRO-USB PORT USE

If you plug a cable into the Micro-USB port, the board will not boot.

The Micro-USB port must only be used for Flash or Recovery. This procedure is not covered by this document.

LOGIN DATA

To login on Linux, use the following data:
- Login: **nvidia**
- Password: **jetson**

1.2   Hardware

The procedures described in this document assume that you are using the following hardware components, which are included in this Reference Design:

- Carrier board with 2-channel MIPI CSI-2, i.e., JNX42:
    - o   Note: 4-channel MIPI CSI-2 board is available upon request.
- NVIDIA Orin NX System on Module with 16 GB RAM:
    - o   Note: Orin Nano SoM and different RAM sizes are available upon request.
- SSD 128 GB
- NVIDIA heatsink and fan
- Power supply 12V/40W (FSP) incl. power cable (EU version)
- 1x DMM 36SX462-ML, 36S MIPI CSI-2 monochrome camera
- 1x DFM 36SX462-ML, 36S MIPI CSI-2 color camera
- 2x TLH 10-M lens holders
- 1x TBL 8 C, M12 lens with IR-cut filter
- 1x TBL 8, M12 lens
- 2x CA-FFC-22P/0.3m cables

1.3   Software

For your convenience, some software packages have been pre-installed:

- JetPack 5.1.2 with Ubuntu 20.04 LTS.
- The Imaging Source drivers, e.g., theimagingsource-drivers_rxxxx.deb:
    - o   Drivers required to operate different MIPI-based cameras and carrier boards.
- tiscamera, e.g., tiscamera_1.1.0.4139_arm64_ubuntu_2004.deb:
    - o   GStreamer-based SDK for straightforward image acquisition and image preprocessing.
- tcamtegrasrc, e.g., tcamtegrasrc-jp5_xxxxx_arm64.deb:
    - o   Package containing the camera source for MIPI-based cameras for use with tiscamera.
- tcamdutils, e.g., tcamdutils_1.0.0.560_arm64.deb:
    - o   GStreamer-1.0 module which offers a wide range of image enhancement and conversion algorithms. The module is highly optimized for speed on the CPU.
- v4l-utils:
    - o   Series of packages for handling industrial and embedded cameras.

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ℹ	**Note** The 'First-Time-Installation Package' is stored under /usr/local/first_time_setup which includes the above-mentioned packages. You may also use them in the event that re-installation is necessary.

2. Assembling the Hardware

The procedures described in this chapter should be followed to ensure the best first-time experience with this reference design.

1. Begin by screwing the TBL 8 C lens (for use with the color camera) and the TBL 8 lens (for use with the monochrome camera) into the TLH 10-M lens mount holders.

2. Mount the TLH 10-M lens mount holders to the two DxM 36SX462-ML cameras. In order to achieve true color fidelity, make sure to use the TBL 8 C lens with the DFM 36SX462-ML color camera.

3. Connect the CA-FFC-22P/0.3m cables to the two black MIPI CSI-2 22-pin connectors. These are located beneath the heat sink/fan assembly, directly under the SoM (please see image below):
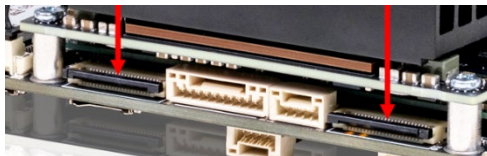
   a. To do so, unlock the black clips of the MIPI CSI-2 22-pin connectors by pulling them up.

   b. Insert one end of the first FFC cable, labeled 'CPU SIDE,' into the connector with 22 pins facing downward. Then, secure the cable by locking the black clips in place.

   c. Repeat the same procedure with the second FFC cable.

|	**MIPI CSI-2 CABLE "CPU SIDE"**
⚠	Pay attention to the lettering on the MIPI CSI-2 cable. Ensure that the cable end with the inscription "CPU SIDE" is plugged into the SoM. Otherwise, the carrier board may be damaged or behave erratically, e.g., you may not get an HDMI signal or may experience booting issues.

4. Connect the other ends of the FFC cables to the DxM 36SX462-ML cameras (please see image below).

	MIPI CSI-2 CABLE "CAM SIDE" Pay attention on the lettering of the MIPI CSI-2 cable. Ensure that the cable end with the inscription "CAM SIDE" is affixed to the camera. Otherwise, the carrier board may be damaged or behave erratically, e.g., you may not get an HDMI signal or may experience booting issues.
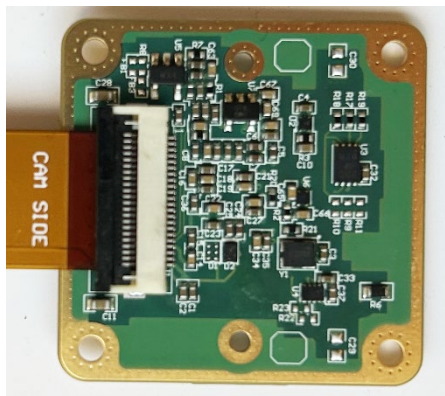
5. Connect a USB mouse and a USB keyboard to the two horizontal USB3 ports:
   a. Note: No mouse and keyboard are included in this reference design kit.
6. Connect the HDMI cable to the HDMI port of the reference design, and the other end to a monitor (HD resolution or higher is recommended):
   a. Note: No HDMI cable and no monitor are included in this reference design kit.
7. Take the power supply 12V/40W (FSP) and the power cable and first connect it to a wall socket.
   Then connect it to the reference design to supply power to the board.

|	**MIPI CSI-2 CAMERAS HANDLING**
⚠	**Connect MIPI-based cameras ONLY when the system is powered off**. Make sure to unplug the power supply and any USB or GigE cables before connecting or re-connecting MIPI-based cameras. Otherwise, the cameras may be damaged, may not be detected, or may not work properly.

# 3. Image Acquisition

3.1 Using 'tcam-capture'

The easiest way to start with image acquisition and image display is by using the GUI application tcam-capture which is part of the pre-installed tiscamera SDK.

To launch tcam-capture go to *Show Applications* > type in *tcam-capture* in the search bar and select tcam-capture to launch it:
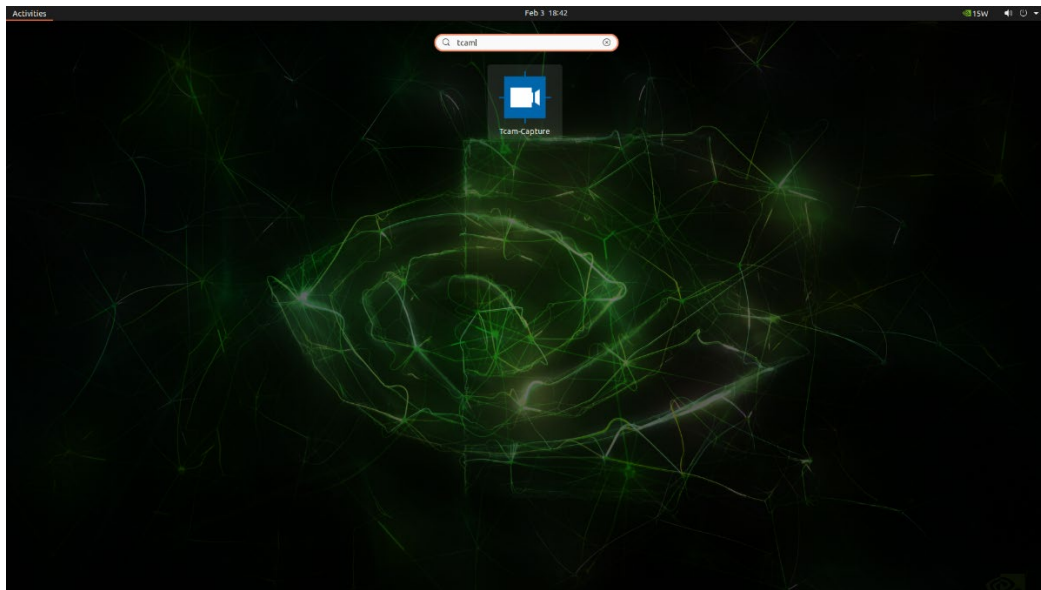
Select one of the cameras to start image acquisition:
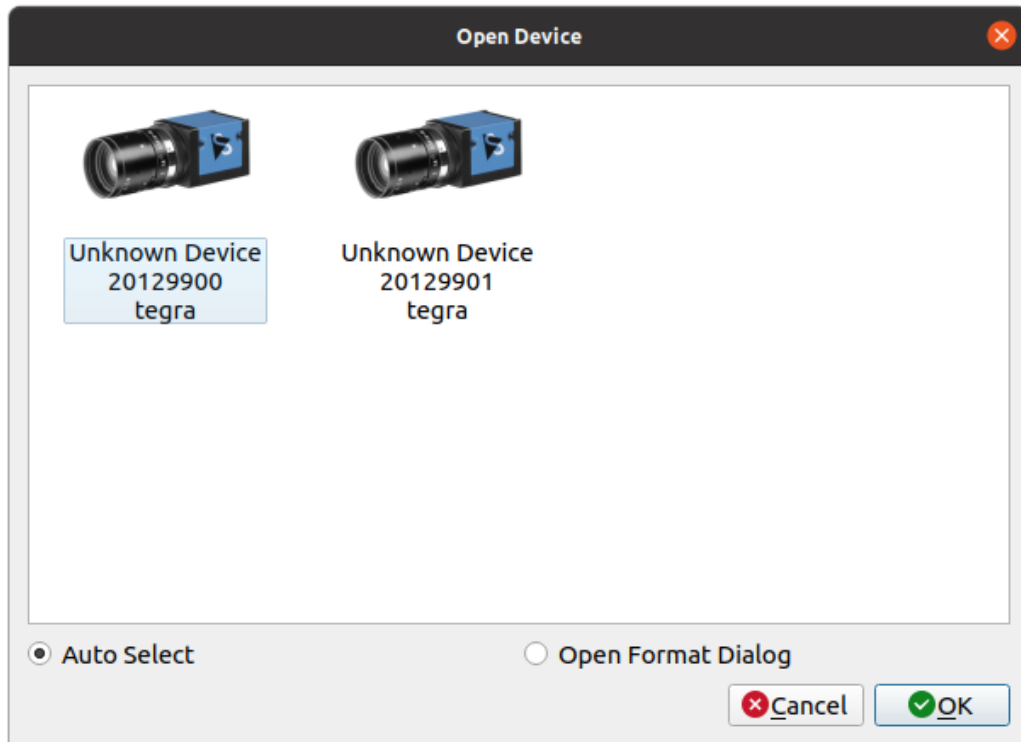
and launch image display:

To launch another instance of tcam-capture > right click on the already running tcam-capture instance and select *New Window* > then open the second camera.

	Note
(info icon)	tcam-capture offers advanced image enhancement functionalities, e.g., auto-exposure, auto-gain, saturation, hue, sharpness, tone-mapping, etc., which are performed on the CPU and may cause higher CPU load.

Select a feature category to find different camera functions or image processing functions:
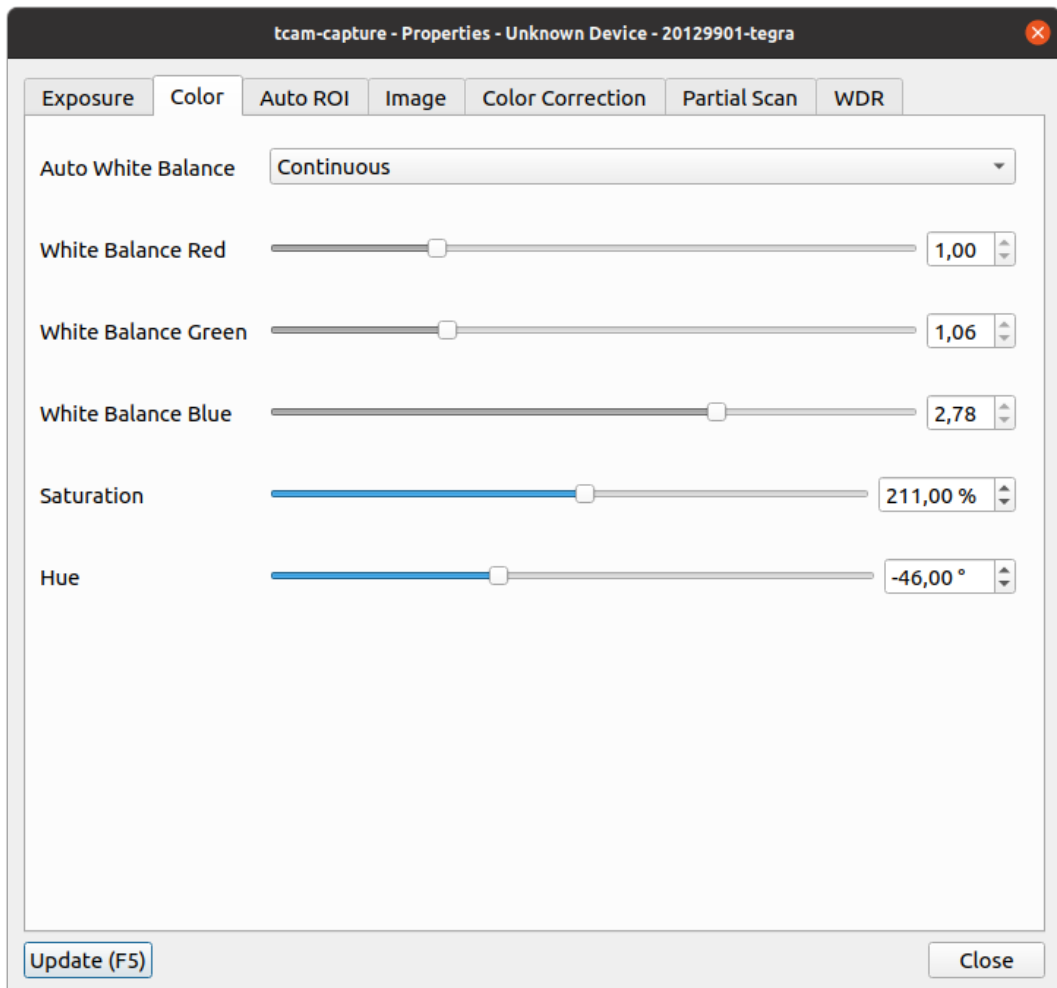
3.2   Using tiscamera SDK Examples

The tiscamera SDK provides different SDK examples for the programming languages C and Python.

You can find them under:

/home/nvidia/tiscamera/examples

To get started, change to the C folder and call 'make':

#cd /home/nvidia/tiscamera/examples/c
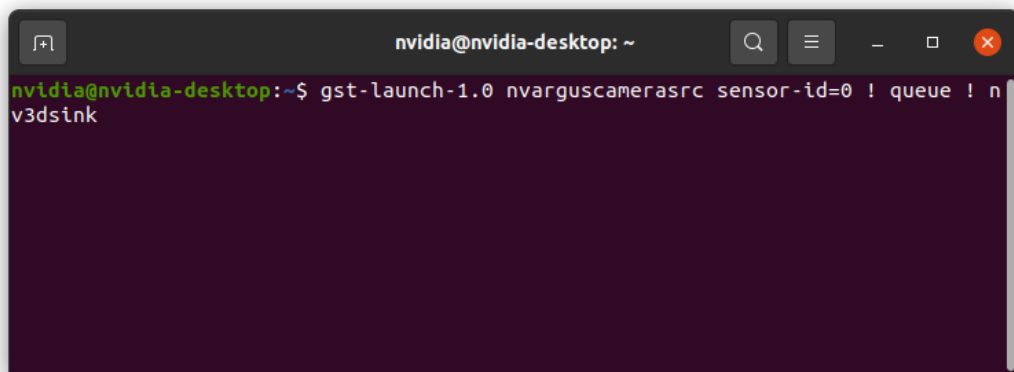
#make

For more information on tiscamera refer to:

https://github.com/TheImagingSource/tiscamera

3.3   Using GStreamer

To launch native image acquisition via GStreamer, type in the following commands in a terminal:

For camera '0':

#gst-launch-1.0 nvarguscamerasrc sensor-id=0 ! queue ! nv3dsink

This will start image acquisition on camera '0' and launch a display window:

For camera '1':

#gst-launch-1.0 nvarguscamerasrc sensor-id=0 ! queue ! nv3dsink

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ℹ️	**Note**
	The proper configuration and use of GStreamer is not covered by this document.

4. Driver Configuration

If you would like to use a camera model other than the ones included with this reference design, you must reconfigure the camera drivers and reboot the system.
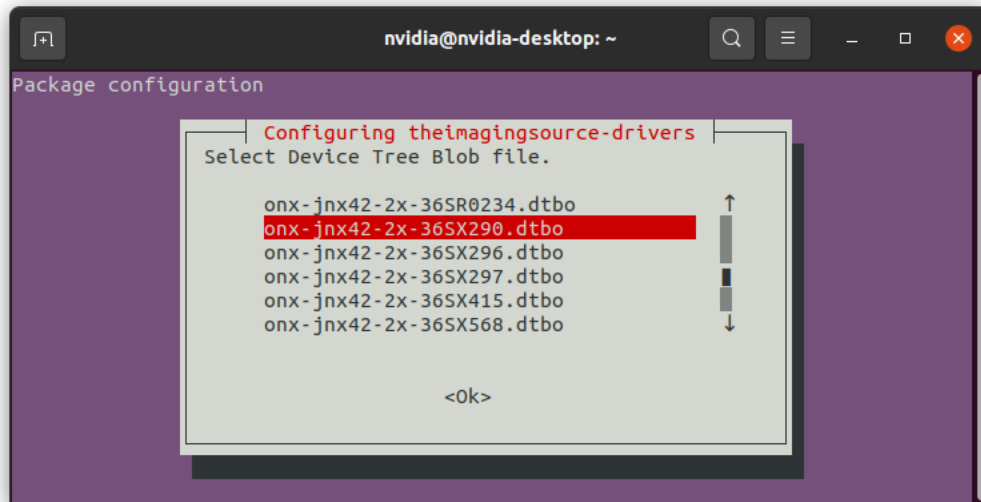
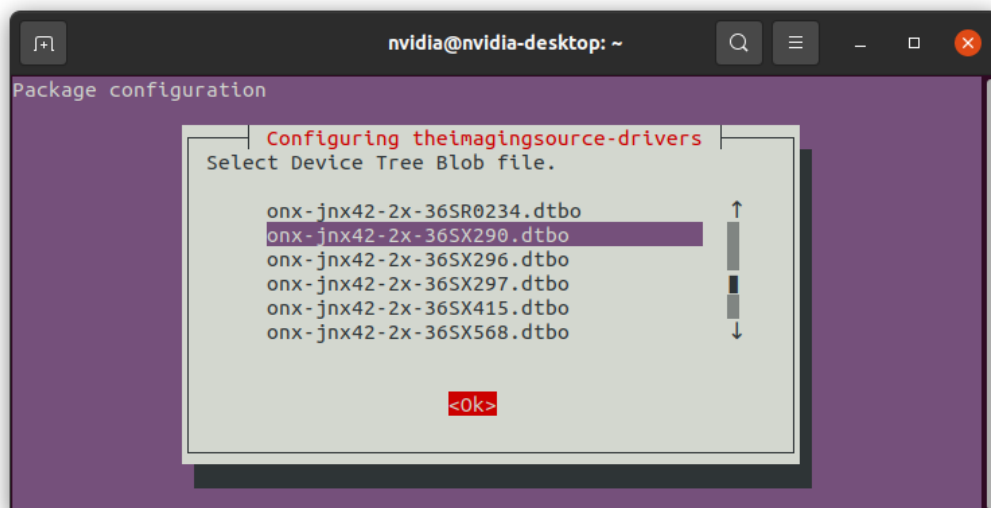To do so, execute the following command in a terminal:

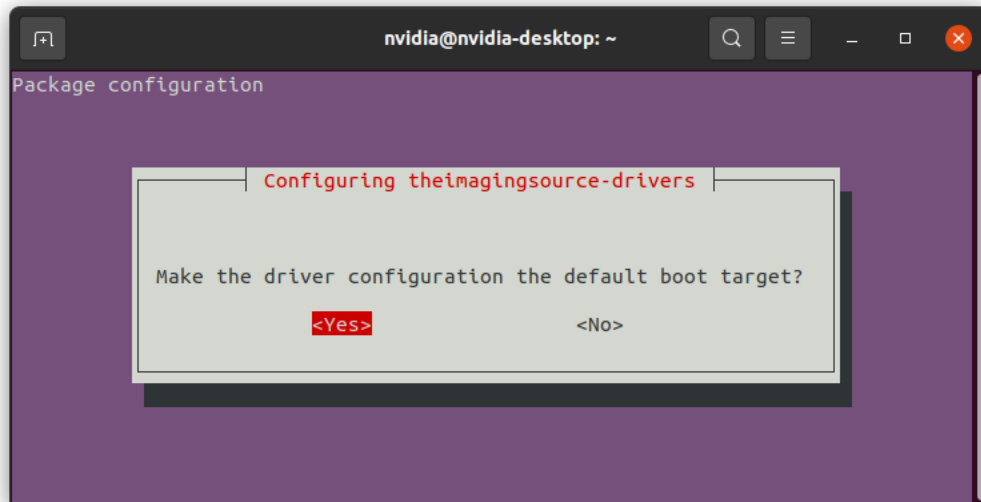*#sudo dpkg-reconfigure theimagingsource-drivers*
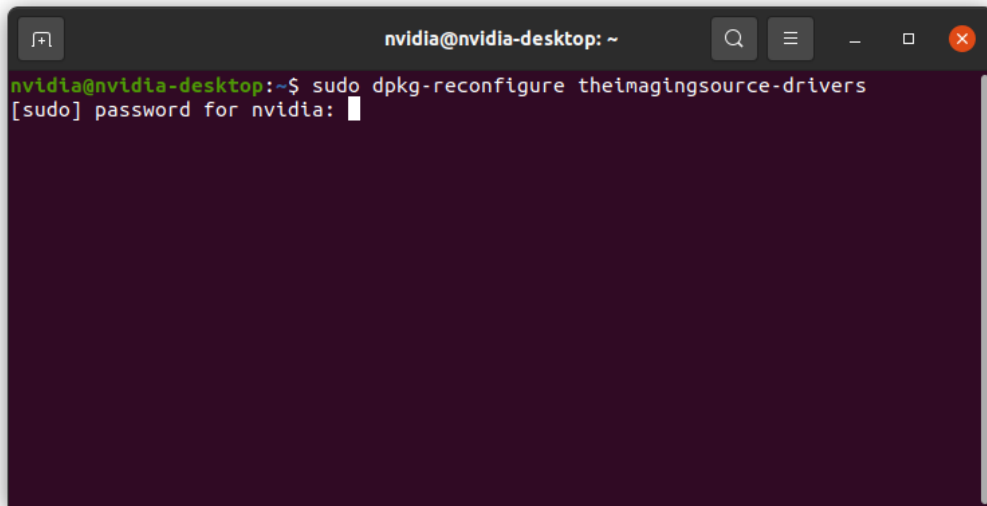
Confirm to continue:
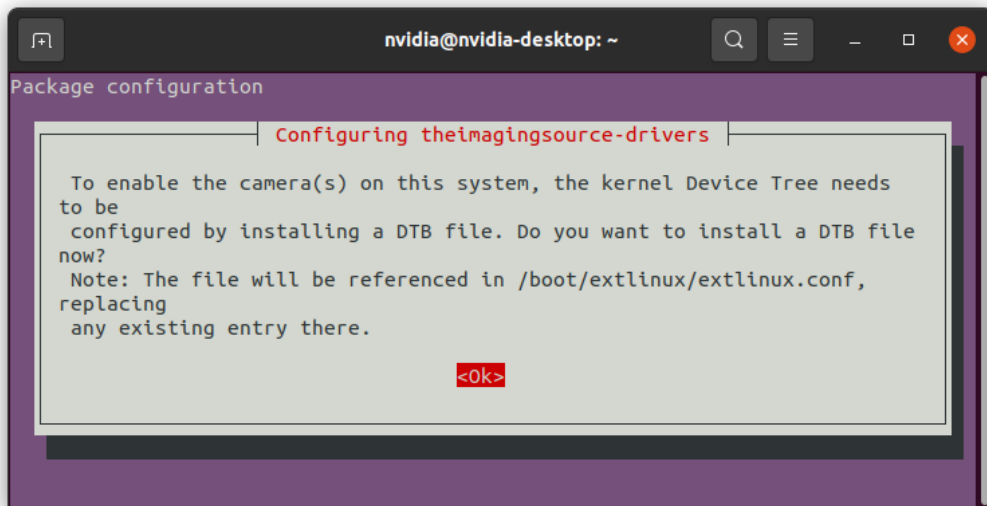
Select the correct camera model (e.g., 36SX290) and carrier board model (e.g., onx-jnx42):

Use the *Tab* key to select *Ok* and confirm your choice:

Confirm to make the current selection the default one:

Reboot the system to apply the changes, e.g.:

#sudo reboot

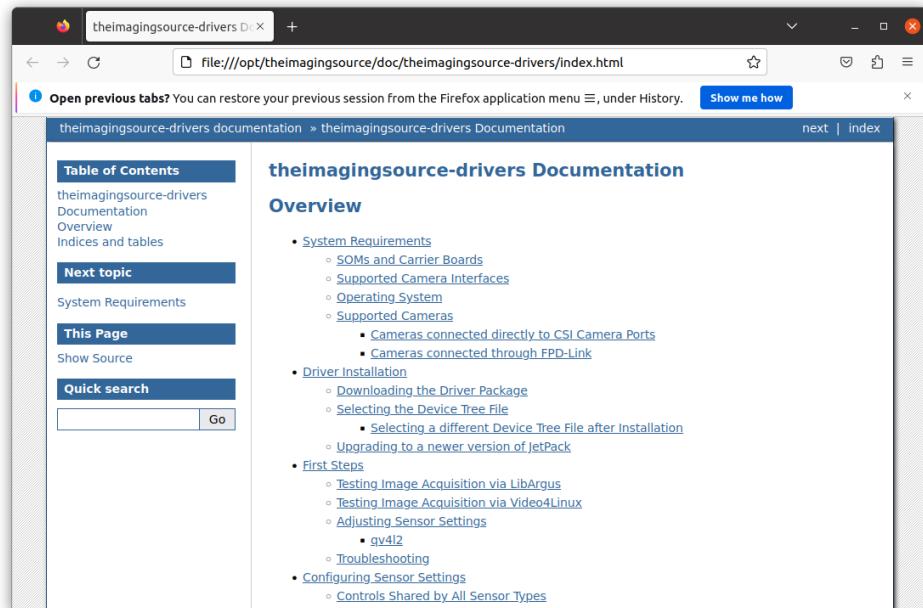|	**Note**
ℹ️	If you do not reconfigure the drivers to match your camera model, the camera may not be detected or may not work properly.
	If you do not reboot the board after reconfiguring the driver, the changes will not take effect.
	Always unplug the power supply from the board before changing the cameras.

5.   Documentation

Refer to the following offline documentation:

- To find the Technical Reference Manuals for 36S MIPI CSI-2 cameras, refer to:
  https://www.theimagingsource.com/en-de/embedded/mipi-csi-2/36s/

- To open the tiscamera documentation, go to e.g.:
  /usr/share/theimagingsource/tcamdutils/html
  # firefox index.html
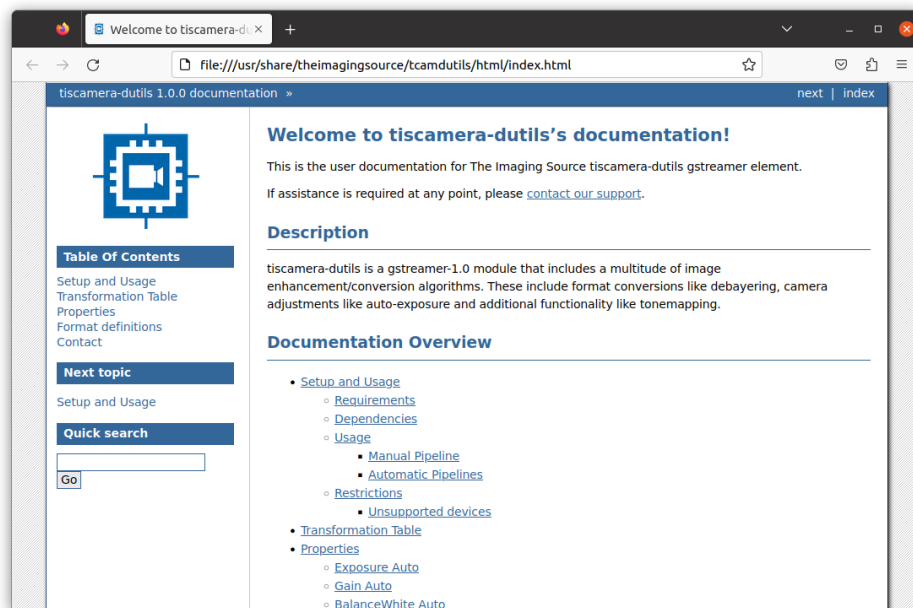
- To open the driver documentation, go to e.g.:
  /opt/theimagingsource/doc/theimagingsource-drivers
  # firefox index.html

Note: The information in the local driver documentation may not always be up to date. Contact the customer support for more information or help.

- To find online documentation, e.g., Technical Reference Manual for the carrier board, refer to:
  https://www.theimagingsource.com/embedded/

- For FAQs or Support refer to:
  https://www.theimagingsource.com/support/

Revision History

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