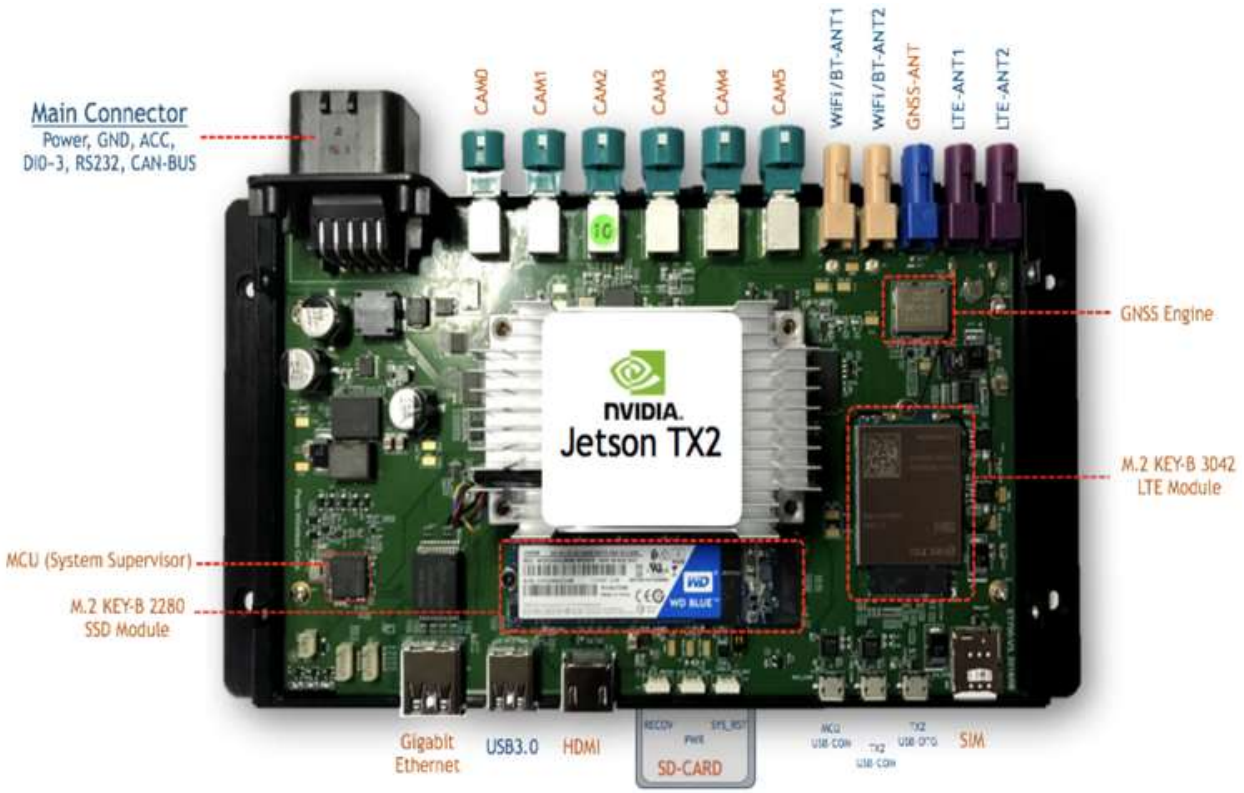
Hardware Overview

ORION T-7 Board

In the following picture you can see the main components of the ORION T-7 board:



Main Connector

The main connector is composed by two pieces:

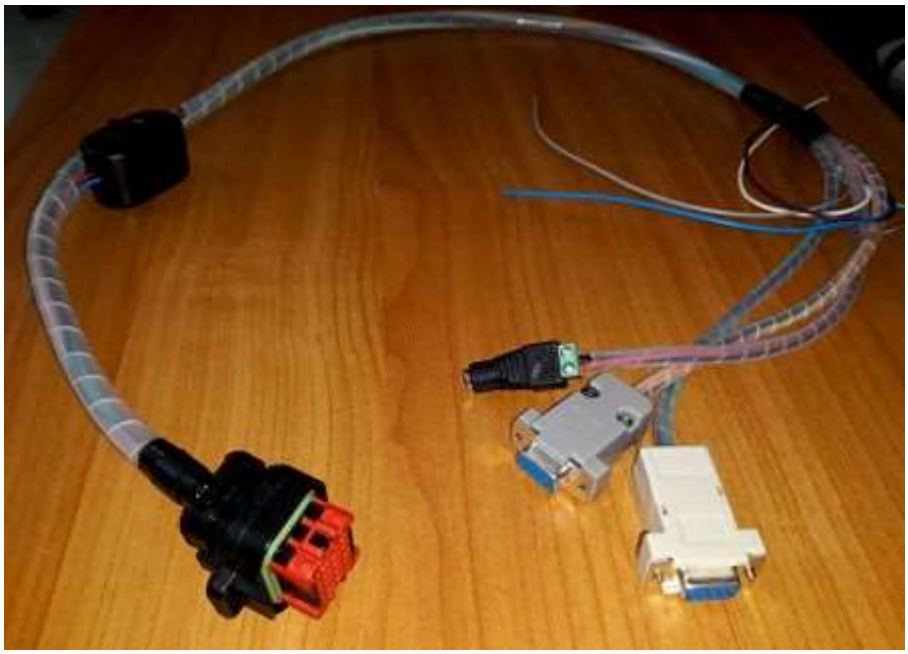
- Red/Black 776273-1 piece (male connector): cable side.
- Black 776266-1 piece (female connector): board side.

Main Cable

The main cable has the following components:

- 1 x 776273-1 Male connector.
- 1 x 2.1mm jack - Female DC power adapter.
- 1 x power switch.
- 2 x RS232 DB9 9 Pin Female connector.

The DC power adapter must be connected to the board charger.



Cameras Set

The ORION T-7 has support for 6 cameras connected via High Speed Data (HSD) connectors.

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Getting Started Guide

Physical Setup

Camera Connection

- Connect the cameras to the ORION T-7 board as is shown in the following image:

Power Connection

- Connect the main cable to the board as follows:

- Connect the charger to the female DC power adapter of the main cable. Make sure the switch is turned off as is shown in the following picture:

After all the connections have been established, you can turn on the power switch.

Testing the Cameras

At this point you should be able to access the operating system of the board via ssh or by using a HDMI cable to a monitor, a mouse and a keyboard connected to the USB ports present in the ORION T-7. Once the session has been established, you can verify if all the 6 video devices were loaded properly. Open a terminal (Ctrl+Alt+T) and run:

```
ls /dev/ | grep video
```

Then, test the cameras by selecting one of the following options:

1 Channel

Select one of the six camera-IDs and run the pipeline:

```
gst-launch-1.0 v4l2src device=/dev/[videoID] ! 'video/x-raw,format=(string)UYVY,width=(int)1280,height=(int)720,framerate=(fraction)30/1' ! xvimagesink sync=false
```

Replacing the **[videoID]** by the video device you chose. You can find this pipeline in a script named **v.sh** at the 'home' directory of the board system. Here is an example of 1-channel capture.

4 Channel

Run the following pipeline in order to capture from four cameras simultaneously:

```
gst-launch-1.0 -ev videomixer name=mix \
sink_0::xpos=0 \
sink_1::xpos=1280 \
sink_2::ypos=720 \
sink_3::xpos=1280 \
sink_3::ypos=720 \
! xvimagesink sync=false \
 v4l2src device=/dev/video0 \
! 'video/x-raw,format=(string)UYVY,width=(int)1280,height=(int)720,framerate=(fraction)30/1' \
! mix.sink_0 \
 v4l2src device=/dev/video1 \
! 'video/x-raw,format=(string)UYVY,width=(int)1280,height=(int)720,framerate=(fraction)30/1' \
! mix.sink_1 \
 v4l2src device=/dev/video2 \
! 'video/x-raw,format=(string)UYVY,width=(int)1280,height=(int)720,framerate=(fraction)30/1' \
! mix.sink_2 \
 v4l2src device=/dev/video3 \
! 'video/x-raw,format=(string)UYVY,width=(int)1280,height=(int)720,framerate=(fraction)30/1' \
! mix.sink_3
```

You can find this pipeline in a script named **4cams.sh** at the 'home' directory of the board system. Here is an example of 4-channel capture:

6 Channel

Run the following pipeline in order to capture from the six cameras simultaneously:

```
gst-launch-1.0 -ev videomixer name=mix \
sink_0::xpos=0 \
sink_1::xpos=1280 \
sink_2::ypos=720 \
sink_3::xpos=1280 \
sink_3::ypos=720 \
sink_4::xpos=0 \
sink_4::ypos=1440 \
sink_5::xpos=1280 \
sink_5::ypos=1440 \
! xvimagesink sync=false \
 v4l2src device=/dev/video0 \
! 'video/x-raw,format=(string)UYVY,width=(int)1280,height=(int)720,framerate=(fraction)30/1' \
! mix.sink_0 \
 v4l2src device=/dev/video1 \
! 'video/x-raw,format=(string)UYVY,width=(int)1280,height=(int)720,framerate=(fraction)30/1' \
! mix.sink_1 \
 v4l2src device=/dev/video2 \
! 'video/x-raw,format=(string)UYVY,width=(int)1280,height=(int)720,framerate=(fraction)30/1' \
! mix.sink_2 \
 v4l2src device=/dev/video3 \
! 'video/x-raw,format=(string)UYVY,width=(int)1280,height=(int)720,framerate=(fraction)30/1' \
! mix.sink_3 \
 v4l2src device=/dev/video4 \
! 'video/x-raw,format=(string)UYVY,width=(int)1280,height=(int)720,framerate=(fraction)30/1' \
! mix.sink_4 \
 v4l2src device=/dev/video5 \
! 'video/x-raw,format=(string)UYVY,width=(int)1280,height=(int)720,framerate=(fraction)30/1' \
! mix.sink_5
```

You can find this pipeline in a script named **6cams.sh** at the 'home' directory of the board system. Here is an example of 6-channel capture:

Switching Demo

Description

This demo is about a switch that display a number of cameras given by the user on simultaneous streaming mode.

Requirements

This demo uses the following RidgeRun's products:

- GStreamer Daemon.
- GstInterpipes.
- GstShark.

Usage

- Run the script called **gstd_interpipe.sh** present at the 'home' directory of the board system.
- The number of cameras to display can be given by pressing a key from 1 to 6.
- Hit the **Esc** key to finish the program execution.

Performance Stats

Framerate and CPU Usage

For these performance tests the results were obtained by using GstShark. The CPU usage indicates the usage mean of the 4 cores used on the platform to run the pipelines when capturing from 1 to 6 cameras. The video output was sent to the following three sinks, where you can see a pipeline example used to get the stats for one camera in each case:

- *fakesink*: The video is not displayed.

```
GST_DEBUG=*TRACER*:9 GST_TRACERS="cpuusage;framerate" gst-launch-1.0 v4l2src device=/dev/video0 \
! "video/x-raw,format=(string)UYVY,width=(int)1280,height=(int)720,framerate=(fraction)30/1" ! fakesink
```

- *videosink*: The video is displayed.

```
GST_DEBUG=*TRACER*:9 GST_TRACERS="cpuusage;framerate" gst-launch-1.0 v4l2src device=/dev/video0 \
! "video/x-raw,format=(string)UYVY,width=(int)1280,height=(int)720,framerate=(fraction)30/1" ! xvimagesink
```

- *filesink*: The video is written on a **.mkv** file.

```
GST_DEBUG=*TRACER*:9 GST_TRACERS="cpuusage;framerate" gst-launch-1.0 v4l2src device=/dev/video0 !
"video/x-raw,format=(string)UYVY,width=(int)1280,height=(int)720,framerate=(fraction)30/1" ! nvvidconv !
omxh265enc ! matroskamux ! filesink location=test_cam0.mkv
```

You can find the test results in the following table:

	Fakesink (No Display)		Videosink (Display)		Filesink (Video File)	
Number of Cameras	**Framerate (fps)**	**CPU Usage (%)**	**Framerate (fps)**	**CPU Usage (%)**	**Framerate (fps)**	**CPU Usage (%)**
1	30	5.5	30	23.5	30	13.5
2	30	20	30	13.5	30	20.5
3	30	20	30	18	30	25
4	30	21.5	30	18.5	30	22.5
5	30	22	30	14	30	23.5
6	30	22	30	14	30	27.5

Glass to Glass Video Latency

The glass to glass test let us identify the latency the capture is having. As you can see in the photo, in this case was possible to identify a latency of **142 ms**.

This time can be considered as acceptable, depending on the application where these sensors are being used.