

# CA378-AOIS for Jetson TX2 Software Setup Guide

Version 1.0.3

Dated: 2018/01/10

Home Page <a href="http://www.centuryarks.com/">http://www.centuryarks.com/</a>

# History



Date	Version	Comment
2017/12/15	v1.0.0	Initial Release
2017/12/18	v1.0.1	"How to build sample code" added wget command "no-check-certificate" added
2017/12/26	v1.0.2	Support 2 to 5 connected multiple cameras
2018/01/10	v1.0.3	Fixed installation problem

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# 1. Environment configuration



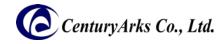
★Before installing the CA 378-AOIS driver, please implement the following environment.

- Prerequisites
- 1. Installing Jetpack 3.0 (Linux for Tegra R27.1)
- 2. Setting sudo permissions

#### Step 1. Install Jetpack 3.0

- (1) Register as user at NVIDIA DEVELOPER site. <a href="https://developer.nvidia.com">https://developer.nvidia.com</a>
- (2) Download Jetpack 3.0 https://developer.nvidia.com/embedded/jetpack-3\_0
- (3) Install according to the procedure on page 10 below. <a href="http://developer2.download.nvidia.com/embedded/L4T/r27">http://developer2.download.nvidia.com/embedded/L4T/r27</a> Release v1.0/Docs/Jetson X2 Develop er Kit User Guide.pdf?WZACmxm6jRHQtvToEuvEm4kspfaRaZJk8iX8mMEtn-YgwECKmEIn-GFEW5UPf9HIdkALsnxIZX4qZxO43CE3crogni16PuviWZO4bLF23I12fMhJ1jxyn4qq5OZHaMImZrchFQAhDNjQln9rSK6fw0lGAfzB12fu5WXOU717PVLQW6slDJIKTg

# 1. Environment configuration



#### Step 2. Setting sudo permissions

(1) Execute the following command.

#### \$ sudo visudo

(2) Add the following red line.

```
# User privilege specification
root ALL=(ALL:ALL) ALL
nvidia ALL=(ALL:ALL) ALL

# Members of the admin group may gain root privileges
% admin ALL=(ALL) ALL

# Allow members of group sudo to execute any command
% sudo ALL=(ALL:ALL) ALL
% nvidia ALL=(ALL:ALL) NOPASSWD: ALL
```

(3) Reboot Jetson TX2.

\$ sudo reboot

#### 2. Driver install



- · Installation procedure
- 1. Download "CA378\_2L\_v1.0.3\_L4T27.1.tar.gz" from the following site.

https://github.com/centuryarks/CA378-AOIS/releases

 $\$\ wget\ --no\text{-}check\text{-}certificate\ https://github.com/centuryarks/CA378\text{-}AOIS/releases/download/v}1.0.3/CA378\_2L\_v1.0.3\_L4T27.1.tar.gz$ 

2. Extract "CA378\_2L\_v1.0.3\_L4T27.1.tar.gz" file.

\$ tar zxvf CA378\_2L\_v1.0.3\_L4T27.1.tar.gz

3. Edit "/boot/extlinux/extlinux.conf" and add the following red line.

#### \$ sudo vim /boot/extlinux/extlinux.conf

TIMEOUT 30
DEFAULT primary

MENUTITLE p2771-0000 eMMC boot options

LABEL primary

MENU LABEL primary kernel

LINUX /boot/Image

FDT /boot/tegra186-quill-p3310-1000-c03-00-imx378.dtb

APPEND fbcon=map:0 net.ifnames=0 console=tty0 OS=I4t console=ttyS0,I I 5200n8 memtype=0 video=tegrafb no\_console\_suspend=I earlycon=uart8250,mmio32,0x03100000 gpt tegraid=18.1.2.0.0 tegra\_keep\_boot\_clocks maxcpus=6 android.kerneltype=normal androidboot.serialno=0335115020673 vpr\_resize root=/dev/mmcblk0p1 rw rootwait

## 2. Driver install



4. Configure the number of camera connections.

Execute the following command and enter the number of camera connections.

```
$ cd CA378_2L_v1.0.3_L4T27.1/
$ ./Install.sh

What is the number of camera connections? : 5

CN2 : CH1 Camera module installed

CN3 : CH2 Camera module installed

CN4 : CH3 Camera module installed

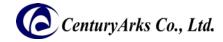
CN5 : CH4 Camera module installed

CN6 : CH5 Camera module installed

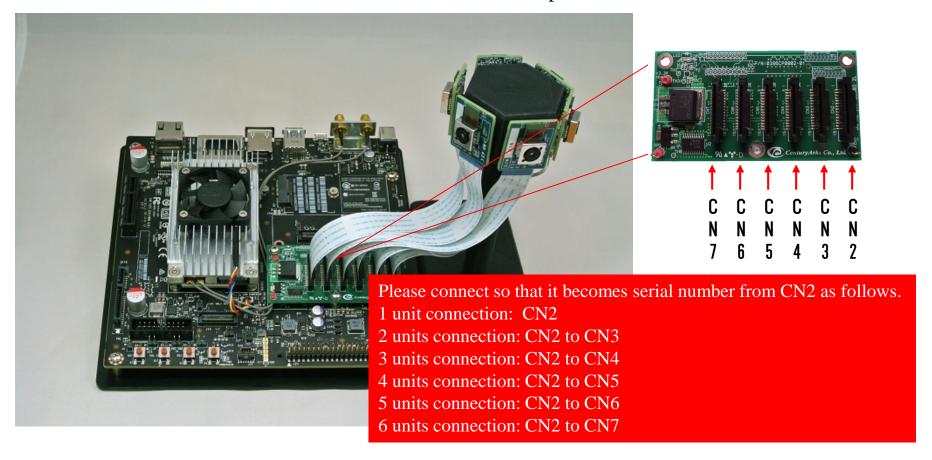
CN6 : CH5 Camera module installed
```

5. Shutdown Jetson TX2 and turn off the power.

## 2. Driver install



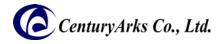
6. Connect the Jetson TX2 conversion board as shown in the picture below.



7. Turn on the power and start up Jetson TX2.

\* If you want to change the number of camera connections, repeat steps 4 to 7.

#### 3. Software install



Please install by the following procedure.

- · Installation procedure
- 1. Download "demo\_v1.0.0\_tx2.tar.gz " from the following site. https://github.com/centuryarks/Sample/releases

\$ wget --no-check-certificate https://github.com/centuryarks/Sample/releases/download/v1.0/demo\_v1.0.0\_tx2.tar.gz

2. Unzip "demo\_v1.0.0\_tx2.tar.gz" file.

\$ tar zxvf demo\_v1.0.0\_tx2.tar.gz

3. Execute "Install.sh" in the extracted folder.

\$ cd demo

\$ ./Install.sh

4. A shortcut is created on the desktop. DEMO

## 4. Demonstration functions



- 4.1. Focus & OIS
- 4.2. 4K3K-resolution(12Mpixel) still image capturing
- 4.3. Multi cameras control



Procedure of starting Focus & OIS:

- 1. Click "DEMO" on the desktop.
- 2. After a while the GUI screen will be displayed.
- 3. Please change the distance of the object, or move the camera, confirm the function.
  - \* For details of functions, refer to page 12-13.

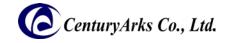




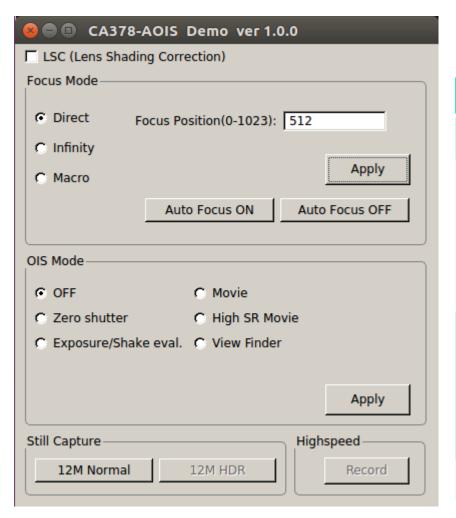
Procedure of finishing Focus & OIS:

1. Click the [x]





The following section describes each function of Focus & OIS.



Function	Description	
LSC	Check to enable shading correction.  X Theoretical values have been set.	
Focus Mode	Direct: Directly specify the focus position. Infinity: Set the focus position to infinity. Macro: Set the focus position to the short distance. Focus Position: Focus position. Apply: Apply the settings. Auto Focus ON: Enable auto focus. Auto Focus OFF: Disable auto focus. * Current debug control is for demo.	
OIS Mode	OFF: Disable OIS. It corresponds to each OIS mode. Zero Shutter Exposure / Shake eval. Movie High SR Movie View Finder Apply: Apply the settings.	
Still Capture	12M Normal: Capture 12Mpixel normal still image.	

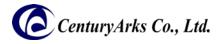


Description of the script file: It describes about the "script/demo.sh".

#!/bin/sh
cd /home/nvidia/demo
sudo ./bin/DemoGUI -id 0 -w 4056 -h 3040 -fps 30

Function	Description
-id	Specify 0 to 5 when 6 camera modules are connected.
-W	Specify the width.
-h	Specify the height.
-fps	Specify the frame rate.
	The combination of resolution and frame rate is as follows. 4056 x 3040 @ 30 fps 3840 x 2160 @ 30 fps 1920 x 1080 @ 30 fps 1920 x 1080 @ 60 fps 1920 x 1080 @ 120 fps
	To add a mode, edit "script / preview.sh".

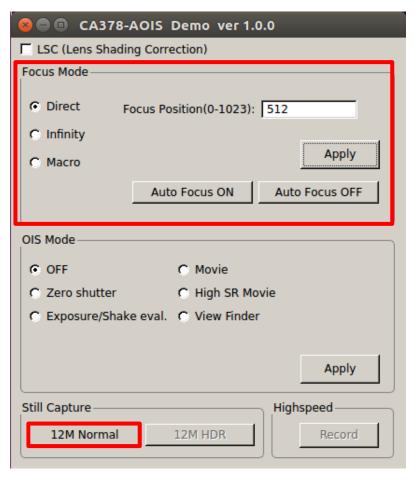
# 4.2. 12Mpixel still image capturing



Procedure of capturing 12Mpixel still image:

- 1. Adjust the focus.

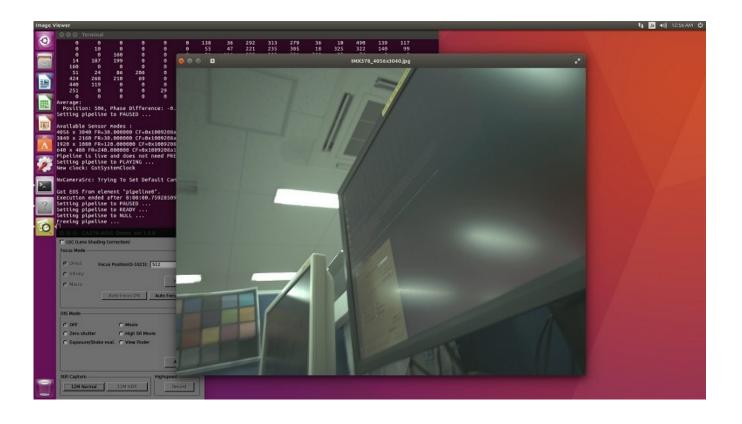
  (It is useful to turn on Auto Focus and turn Auto Focus OFF when focus is on)
- 2. Click the [12M Normal] button



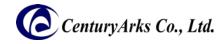
# 4.2. 12Mpixel still image capturing



3. Images can be captured in JPEG and YUV format. (RAW format will be available soon.)

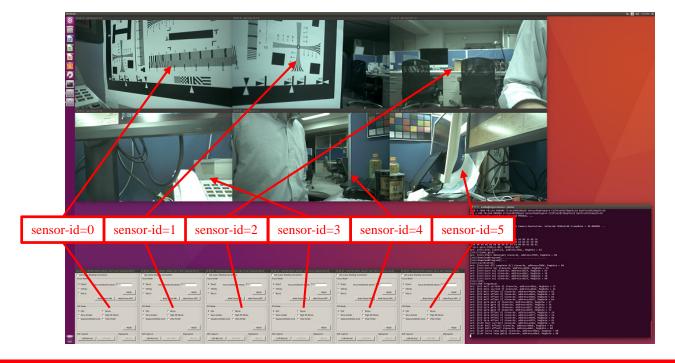


## 4.3. Multi cameras control



Please start one at a time the following command although it will take some time.

\$ cd demo
\$ ./script/demo.sh 0 &
\$ ./script/demo.sh 1 &
\$ ./script/demo.sh 2 &
\$ ./script/demo.sh 3 &
\$ ./script/demo.sh 4 &
\$ ./script/demo.sh 5 &



For it exceeds the processing of Jetson TX2 (1.4G pixel/sec), Depending on Jetson's environment and conditions, it may not be possible to display 6 cameras.

# 5. Sample Script



1. Camera display

The camera can be displayed on the screen with the following command.

- \$ gst-launch-1.0 nvcamerasrc! 'video/x-raw(memory:NVMM),width=4056,height=3040,framerate=(fraction)30/1'! nvvidconv! nvoverlaysink -e \$ gst-launch-1.0 nvcamerasrc! 'video/x-raw(memory:NVMM),width=3840,height=160,framerate=(fraction)30/1'! nvvidconv! nvoverlaysink -e \$ gst-launch-1.0 nvcamerasrc! 'video/x-raw(memory:NVMM),width=1920,height=1080,framerate=(fraction)120/1'! nvvidconv! nvoverlaysink -e
- 2. JPEG still image capturing

JPEG still image can be captured with the following command.

\$ gst-launch-1.0 nvcamerasrc num-buffers=1! 'video/x-raw(memory:NVMM),width=3840,height=2160,format=1420,framerate=30/1' \( \) ! nvvidconv! nvjpegenc! filesink location=test.jpg -e

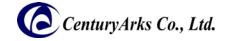
- 3. H.264 video recording
- H.264 video can be recorded with the following command. (Maximum 60 fps)

4. YUV video recording

YUV video can be recorded with the following command.

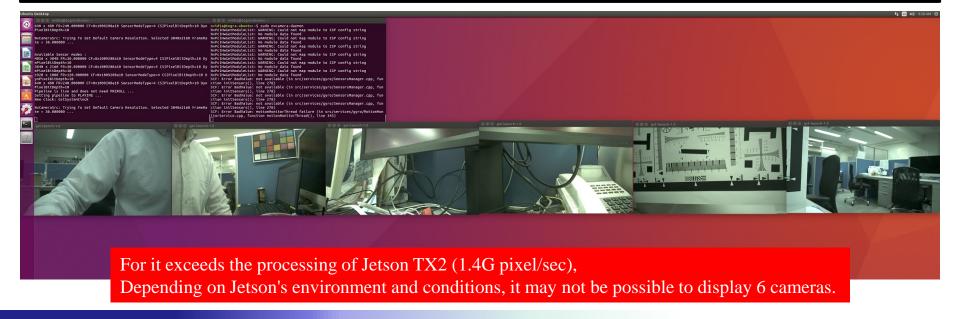
\$ gst-launch-1.0 nvcamerasrc num-buffers=200! 'video/x-raw(memory:NVMM),width=1920,height=1080,format=1420,framerate=120/1' \times nvvidconv! 'video/x-raw,width=1920,height=1080,format=1420,framerate=120/1'! filesink location=test.yuv -e

# 5. Sample Script

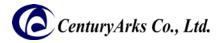


5. Multiple cameras display Multiple cameras can be displayed on the screen with the following command.

```
$ gst-launch-1.0 nvcamerasrc sensor-id=0! 'video/x-raw(memory:NVMM), width=(int)3840, height=(int)2160, framerate=(fraction)30/1'!¥ nvvidconv flip-method=2! 'video/x-raw, width=(int)640, height=(int)360, framerate=(fraction)30/1'! queue! xvimagesink ¥ nvcamerasrc sensor-id=1! 'video/x-raw(memory:NVMM), width=(int)3840, height=(int)2160, framerate=(fraction)30/1'! ¥ nvvidconv flip-method=2! 'video/x-raw, width=(int)640, height=(int)360, framerate=(fraction)30/1'! queue! xvimagesink ¥ nvcamerasrc sensor-id=2! 'video/x-raw, width=(int)640, height=(int)360, framerate=(fraction)30/1'! queue! xvimagesink ¥ nvcamerasrc sensor-id=3! 'video/x-raw(memory:NVMM), width=(int)3840, height=(int)2160, framerate=(fraction)30/1'! ¥ nvvidconv flip-method=2! 'video/x-raw, width=(int)640, height=(int)360, framerate=(fraction)30/1'! queue! xvimagesink ¥ nvcamerasrc sensor-id=4! 'video/x-raw(memory:NVMM), width=(int)3840, height=(int)2160, framerate=(fraction)30/1'! ¥ nvvidconv flip-method=2! 'video/x-raw, width=(int)640, height=(int)360, framerate=(fraction)30/1'! queue! xvimagesink ¥ nvcamerasrc sensor-id=5! 'video/x-raw, width=(int)640, height=(int)360, framerate=(fraction)30/1'! queue! xvimagesink ¥ nvcamerasrc sensor-id=5! 'video/x-raw, width=(int)640, height=(int)3840, height=(int)2160, framerate=(fraction)30/1'! * nvcamerasrc sensor-id=5! 'video/x-raw, width=(int)640, height=(int)360, framerate=(fraction)30/1'! queue! xvimagesink * nvcamerasrc sensor-id=5! 'video/x-raw, width=(int)640, height=(int)360, framerate=(fraction)30/1'! queue! xvimagesink * nvcamerasrc sensor-id=5! 'video/x-raw, width=(int)640, height=(int)360, framerate=(fraction)30/1'! queue! xvimagesink * nvcamerasrc sensor-id=5! 'video/x-raw, width=(int)640, height=(int)360, framerate=(fraction)30/1'! queue! xvimagesink * nvcamerasrc sensor-id=5! 'video/x-raw, width=(int)640, height=(int)360, framerate=(fraction)30/1'! queue! xvimagesink * nvcamerasrc sensor-id=5! 'video/x-raw, width=(int)640, height=(int)360, framerate=(fraction)30/1'! queue! xvimagesink * nvcame
```



# 6. How to build sample code



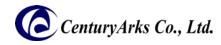
1. Install build environment Install the build environment with the following command.

#### \$ sudo apt-get install qt4-dev-tools

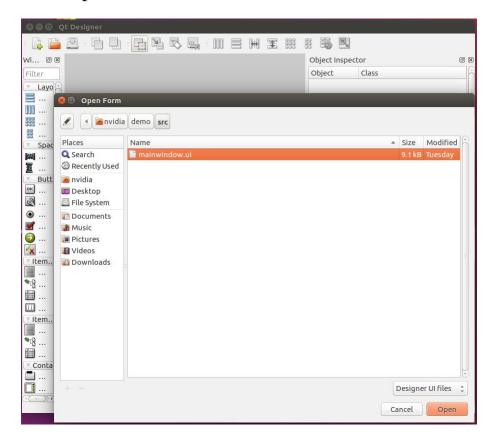
- 2. GUI design
- (1) Search "qt" and select "Qt 4 Designer"



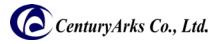
# 6. How to build sample code



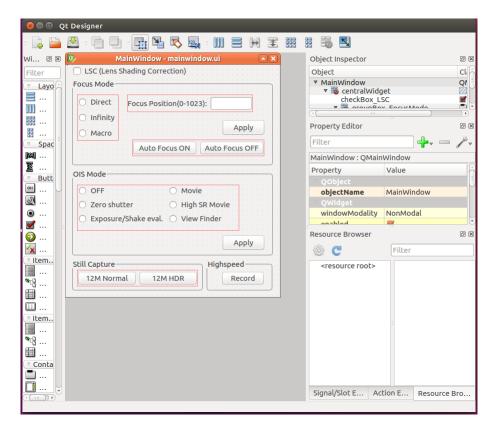
(2) Click "Open...", select and open "demo/src/mainwindow.ui"



# 6. How to build sample code



(3) Change design and save



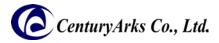
3. Build Build with the following command.

\$ qmake \$ make



# Appendix

# A.1. About the directory structure



The following section describes the directory structure of the software.

```
demo
   -Install.sh
    -bin
     demo.ini
     DemoGUI
    -script
      demo.sh
     preview.sh
     stillCapture I 2M Normal.sh
    -src
    af control.c
    af control.h
    communication.h
    communication jetson.c
    debug_util.h
    DemoGUI.pro
    DemoGUI.pro.user
    demo_control.c
    demo control.h
    lsc control.c
    lsc_control.h
    main.cpp
    mainwindow.cpp
    mainwindow.h
    mainwindow.ui
    Makefile
    ois_control.c
    ois control.h
    slave address.h
     types_util.h
```

Function	Descripution
bin	DemoGUI: Demonstration software Demo.ini: Demonstration software setting file
script	Script files are described.  It can be customized according to specifications.  demo.sh  preview.sh  stillCapture12M_Normal.sh
src	It is a set of demo software source code.

# A.2. About the setting file



The following section describes the "demo.ini" of the setting file.

```
# DEMO Setting
preview = /home/pi/demo/script/preview.sh
stillCapture12M_Normal = /home/pi/demo/script/stillCapture12M_Normal.sh
gyroGainRateX=1.00
gyroGainRateY=1.00
autoFocusGain=2.0
autoFocusConfidenceThreshold=10
autoFocusMoveLimit=100
AutoFocusAverageNum=1
```

Function	Description
preview	Script path for preview
stillCapture12M_Normal	Script path for capturing 12M normal still images
gyroGainRateX gyroGainRateY	It is valid only when OIS calibration result is written in EEPROM.
autoFocusGain	Adjust the autofocus gain.
autoFocusConfidenceThreshold	Specify the threshold value of the confidence level of Phase Difference.
autoFocusMoveLimit	Limit the amount of focus movement at one time.
AutoFocusAverageNum	Adjust the average amount of autofocus.

