

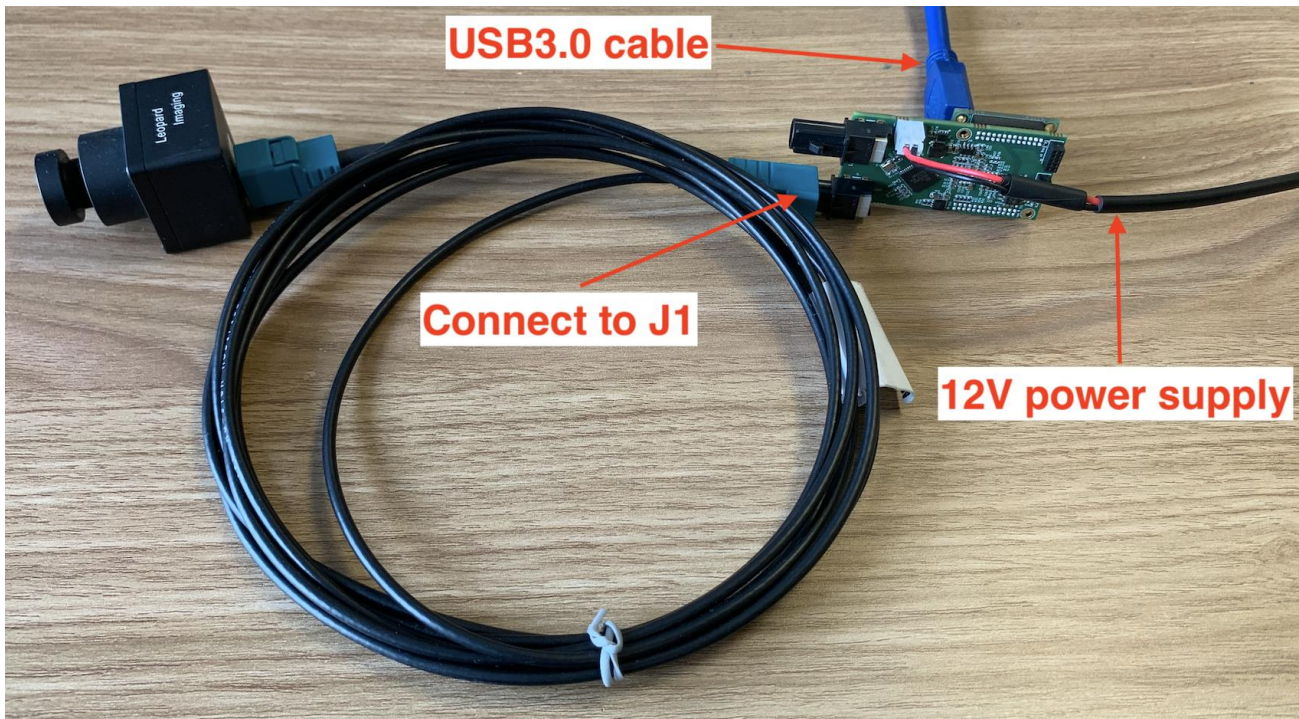


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### Overview

This firmware is for LI-USB30-AR0231-FPDLINKIII camera.  
This firmware supports 1916 x 1208 @ 33.5 fps  
This camera doesn't include ISP and outputs raw data.

Platform	Camera
1 x LI-FPDLINKIII-USB	1 x LI-AR0231-FPDLINKIII
Cable	Adapter/Carrier Board
1 x USB 3.0 Micro-B cable 1 x FAK-SMZSMZ Fakra cable	1 x 12VDC power supply





LI-USB30-AR0231-FPDLINKIII\_Firmware\_Release\_Note\_20240613

Revision	SVN version	Release Date	Author	Tested By
2024_06_13		06/13/2024		Shelby Hache
Updates				
Revision	Description			Release Date
2020_06_13	First Release			06/13/2024
Known bugs				



## Setup Procedure 1/3

### - Hardware:

1. LI-AR0231-FPDLINKIII x 1
2. LI-FPDLINKIII-USB Tester x 1
3. FAK-SMZSMZ Fakra cable x 1
4. USB 3.0 cable x 1
5. LI-PS12-01 x 1

### - Hardware Setup:

Connect the camera and US 3.0 Tester as the picture in the first page.

### - Software:

This camera kit can be tested with any one of below software or other software.

#### 1. Camera tool (Windows OS)

The Camera tool can be downloaded from link below.

[https://www.dropbox.com/s/s4sr5hrerzc3ms0/CameraUSB30\\_3\\_2\\_20190622.7z?dl=0](https://www.dropbox.com/s/s4sr5hrerzc3ms0/CameraUSB30_3_2_20190622.7z?dl=0)

It's better to use the 7-zip to uncompress the package.

<http://www.7-zip.org/download.html>

And install below software to your PC.

[https://www.dropbox.com/s/6uswl40z8rqh2et/vcredist\\_x86.exe?dl=0](https://www.dropbox.com/s/6uswl40z8rqh2et/vcredist_x86.exe?dl=0)

If needed, you can also download below camera tool SDK.

[https://www.dropbox.com/s/bkdavm1tytp8q3y/USB30\\_CameraTool\\_SDK\\_rev1440\\_20190622.7z?dl=0](https://www.dropbox.com/s/bkdavm1tytp8q3y/USB30_CameraTool_SDK_rev1440_20190622.7z?dl=0)

#### 2. Linux Camera tool (Linux OS)

The Linux camera tool can be downloaded below.

[https://github.com/LI01/linux\\_camera\\_tool](https://github.com/LI01/linux_camera_tool)

or from link below.

[https://www.dropbox.com/s/4m2efo696px9739/linux\\_camera\\_tool-master\\_20190624.zip?dl=0](https://www.dropbox.com/s/4m2efo696px9739/linux_camera_tool-master_20190624.zip?dl=0)

Please follow the README.md in GitHub to install the Linux camera tool.

There are instructions online for how to install the OpenCV on Ubuntu OS.

Below is an example.

<https://www.learnopencv.com/install-opencv-3-4-4-on-ubuntu-18-04/>



## Run Camera 1/3

### - Camera Tool (Windows OS)

1. Connect the camera to J1 of USB 3.0 Tester. (refer to picture in page 1)
2. Plug in the 12V power supply to USB 3.0 Tester.
3. Connect the camera to PC (**USB3.0 port**) through USB 3.0 cable.
4. Open camera Tool.

Please make sure to complete these steps in numerical order. Steps 2 and 3 cannot be reversed.

Color matrix:

You can adjust the color matrix in Options→ Configuration. Below is an example.

The screenshot shows the 'ConfigForm' application window. It has a red title bar and two buttons at the top: 'UPDATE' and 'CLOSE'. The main content is organized into several sections:

- Camera:** 'DefaultMode' is set to 0. 'FocusProcDownSample' is checked.
- RAW Interpolation:** 'GammaEna' is unchecked with 'Gamma' set to 1.0. 'RGBGainOffsetEna' is checked, with 'Red Gain' (400), 'Green Gain' (250), and 'Blue Gain' (500) all set. 'Red Offset', 'Green Offset', and 'Blue Offset' are all set to 0.
- RGB2RGBMatrixEna:** This is checked and contains a 3x3 matrix:

	Red	Green	Blue
Red	300	0	0
Green	0	300	0
Blue	0	0	400
- Capture:** 'CaptureNum' is set to 1. 'RAW' and 'BMP' are both checked.

Register access function:

This camera supports register access function. The I2C address is 0x20.

Below is an example. 0x3012 is the exposure register address.

The screenshot shows the 'CameraTool' application window. It has a menu bar with 'File', 'Devices', and 'DevInfo'. The 'Device' is listed as 'LI-AR0231 HW\_R'. The 'I2C Access' section is active, showing:

- 'I2C Addr' set to 0x20.
- 'I2C Addr Width' set to 16 bits (radio button selected).
- 'I2C Data Width' set to 16 bits (radio button selected).
- 'Reg Addr' set to 0x3012.
- 'Reg Value' set to 0x200.
- Buttons for 'Read', 'Write', and 'Hex' are visible at the bottom.

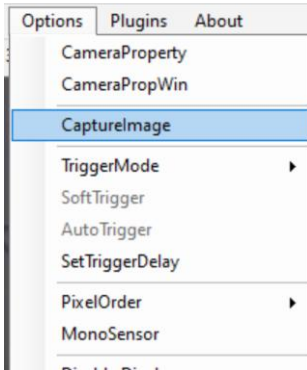
You can also use BatchCmd.txt file to write/read register.



## Run Camera 2/3

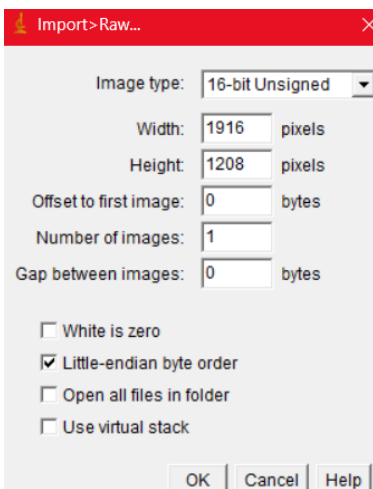
### Capture Image:

The images can be captured by clicking Options → CaptureImage. Two images (RAW and BMP) will be saved to PC.



The raw image can be viewed by ImageJ.

<https://www.dropbox.com/s/fsvfmdy6s9ft03i/ImageJ.7z?dl=0>



Note: This camera tool supports Raw-to-RGB function which will reduce the display frame rate. You can click Options → DisableDisplay to get actual frame rate from the sensor. You can also use other regular software (like AMcap) to get higher frame rate, but the video will be green (like below) due to lack of Raw-to-RGB conversion function.



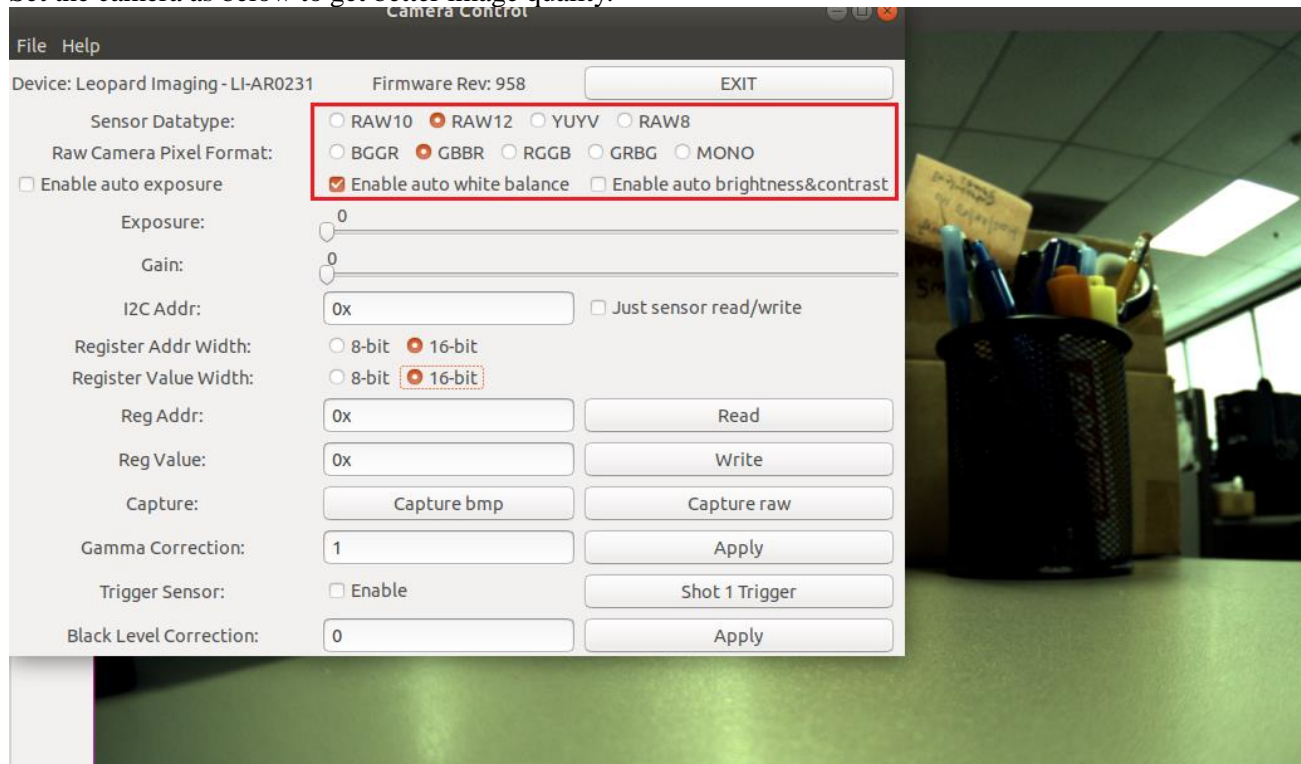
## Run Camera 3/3

### - Camera Tool (Linux OS)

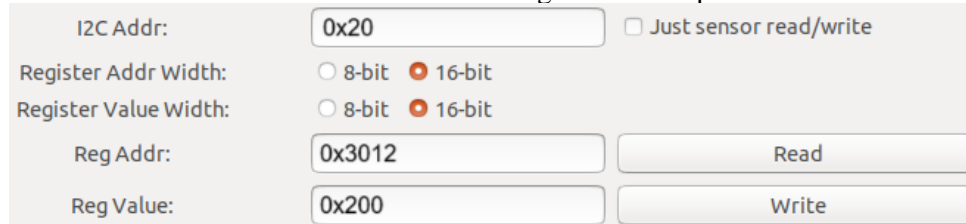
1. Connect the camera to J1 of USB 3.0 Tester. (refer to picture in page 1)
2. Plug in the 12V power supply to USB 3.0 Tester.
3. Connect the camera to PC (**USB3.0 port**) through USB 3.0 cable.
4. Open a terminal and use command “leopard\_cam” to open the camera.

Please make sure to complete these steps in numerical order. Steps 2 and 3 cannot be reversed.

Set the camera as below to get better image quality.



This camera tool can be used to write/read registers and capture Raw and BMP images.



Note: Since this camera doesn't include ISP and output raw data, the image quality should not be good as regular YUV video.



Note 1/3

This camera kit is pre-loaded Firmware (in USB 3.0 Tester) and FPGA (in USB 3.0 Tester).  
If there are any new firmware and/or FPGA binary from Leopard Imaging, you can refer to below instructions to update them.

**1. Firmware Update:**

Please use the **LP\_USB3\_FirmwareUpdateTool** in the camera tool folder to update the firmware.

- 1) Click “Erase” to erase the old firmware.
- 2) Click “FW Update” button to select the lif file. (If the “FW\_Update is unavailable, please install the WestBridge driver, check below)
- 3) The update process may take about 15 seconds.
- 4) If the process takes too long, please disconnect the USB and reconnect it to PC.  
Then try the update tool again.

——Install WestBridge:

If the camera cannot be recognized after you update the firmware, and there is a device name “WestBridge” on the Device Manager, please download the driver from the link below and install it.

[https://www.dropbox.com/s/4yx2p31b7qo2gix/WestBridge\\_driver.zip?dl=0](https://www.dropbox.com/s/4yx2p31b7qo2gix/WestBridge_driver.zip?dl=0)

- 1) Right click on “WestBridge” and select Update Driver Software.
- 2) Choose browse my computer for driver software.
- 3) Click Browse, locate the driver at the downloaded and unzipped folder. (C:\temp\driver\bin\ for example)  
If your PC has Win7 or later version, please select the folder “win7”.
- 4) Click next and complete the installation process.

After install the driver, please update the firmware again.



Note 2/3

2. FPGA Update:

FPGA Binary: Radar\_USB3\_top\_top\_Radar\_USB3\_top\_top.rbt

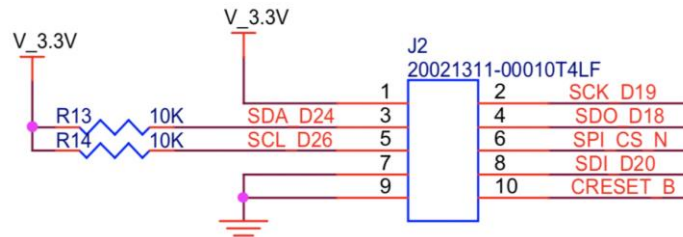
1) Download the Lattice programmer tool software **Programmer Standalone 3.10 64-bit for Windows** from link below and install it to your PC.

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

2) Connect the HW-USBN-2A or HW-USBN-2B to J2 of LI-TI954-DESER 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. Below pins in red need to be connected.

Only below pins in red need to be connected:

TI954 Board ← → HW-USBN-2B	TI954 Board ← → HW-USBN-2B
Pin1: V_3.3V ← → VCC	Pin2: SCK_D19 ← → TCK/SCLK
Pin3: N/A	Pin4: SDO_D18 ← → TDO/SO
Pin5: N/A	Pin6: SPI_CS_N ← → ISPEN/PROG
Pin7: GND ← → GND	Pin8: SDI_D20 ← → TDI/SI
Pin9: N/A	Pin10: CRESET_B ← → TRST

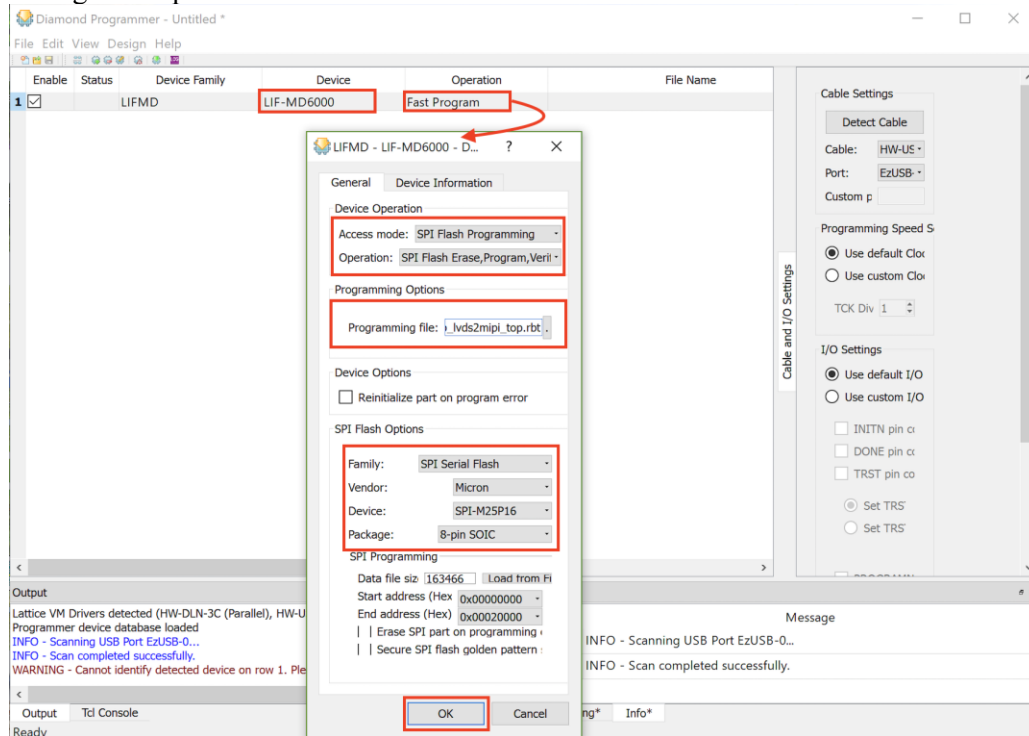






Note 3/3

- 3) Connect the USB3.0 Tester to PC via USB 3.0 cable.
- 4) Open **LP\_USB3\_FirmwareUpdateTool** in the camera tool folder and click “Erase” to erase the firmware.
- 5) 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”.



- 6) Click program icon.



- 7) It may take 9s to program the FPGA.



- 8) Refer to the “Firmware Update” section to install the firmware.