

LI-USB30-AR0231-GMSL2\_Firmware\_Release\_Note\_20240612

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# Overview

This firmware is for LI-USB30-AR0231-GMSL2 camera. This firmware supports 1928 x 1208 @ 12 fps. This camera doesn't include ISP and output raw data.

Platform	Camera
1 x LI-GMSL2-USB	1 x LI-AR0231-GMSL2
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-GMSL2\_Firmware\_Release\_Note\_20240612

Revision	SVN version	Release Date	Author	Tested By
2024_06_12		06/12/2024		Shelby Hache
Updates				
Revision		Description		Release Date
2020_06_12	First Release			06/12/2024
Known bugs				



## Setup Procedure 1/3

#### - Hardware:

- 1. LI-AR0231-GMSL2 x 1
- 2. LI-GMSL2-USB Tester x 1
- 3. FAK-SMZSMZ Fakra cable x 1
- 4. USB 3.0 Micro-B cable x 1
- 5. LI-PS12-01 x 1

## - Hardware Setup:

Connect the camera and USB 3.0 Tester board as the picture on the first page.

## - Software:

This camera kit can be tested with any one of the below software:

# 1. Camera tool (Windows OS)

The Camera tool can be downloaded from the link below: https://www.dropbox.com/s/8daqfypyhnubjr5/CameraUSB30\_3\_2\_20190622.7z?dl=0

It's better to use the 7-zip to uncompress the package: <u>http://www.7-zip.org/download.html</u>

And install the software below on your PC: https://www.dropbox.com/s/6uswl40z8rqh2et/vcredist\_x86.exe?dl=0

If needed, you can also download the camera tool SDK: https://www.dropbox.com/s/j6ccl8cvt75gu2g/USB30 CameraTool SDK rev1440 20190622.7z?dl=0

# 2. Linux Camera tool (Linux OS)

The Linux camera tool can be downloaded from link below. https://www.dropbox.com/s/4m2efo696px9739/linux\_camera\_tool-master\_20190624.zip?dl=0

For how to install it, please refer to the README.md in below link. (the latest version of Linux camera tool may have an issue, so please use above Linux camera tool) https://github.com/LI01/linux\_camera\_tool

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.learnopency.com/install-opency-3-4-4-on-ubuntu-18-04/



# Run Camera 1/3

#### - Camera Tool (Windows OS)

- 1. Connect the camera to port 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 your PC (USB3.0 port) using the 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.

ConfigForm	Color Matrix: You can adjust the color matrix in Options $\rightarrow$
UPDATE	Configuration
Camera	
DefaultMode: 0 FocusProcDownSample	
RAW Interpolation	
GammaEna Gamma: 1.0	
RGBGainOffsetEna	
Red Gain:         400         Red Offset:         0	
Green Gain: 300 Green Offset: 0	
Blue Gain: 400 Blue Offset: 0	
RGB2RGBMatrixEna	
Red 300 0 0	
Green 0 400 0	
Blue 0 0 300	
Capture	
Capture Num: 1	
CameraTool	
File Devices DevInfo Register access	s function:
This camera su	pports register access function.
The I2C address	SS IS UX20
12C Addr 0x20	exposure register address.
8 bits 16 bits	
I2C Data Width	
0 8 • 16 0 32	
Reg Addr 0x3012	
Reg Value 0x200	
Deed Was Used	
Head Winte Hex	
You can also use BatchCmd.txt file to w	rite/read register.



#### Run Camera 2/3

#### Capture Image:

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

Options	Plugins	About	
Cam	eraPropert	y	
Cam	eraPropWi	n	
Capt	turelmage		
Trigg	gerMode		•
Soft	Trigger		
Auto	Trigger		
SetTi	riggerDelay		
Pixe	Order		•
Mon	oSensor		

The raw image can be viewed by ImageJ. https://www.dropbox.com/s/fsvfmdy6s9ft03i/ImageJ.7z?dl=0

🛓 Import>Raw		×
Image type:	16-bit U	nsigned 💌
Width:	1928	pixels
Height:	1208	pixels
Offset to first image:	0	bytes
Number of images:	1	
Gap between images:	0	bytes
<ul> <li>White is zero</li> <li>✓ Little-endian byte order</li> <li>✓ Open all files in folder</li> <li>✓ Use virtual stack</li> </ul>		
OK Cancel Help		





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.

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# 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 the 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.

ggle_button)'			
	Camera Control	06	
File Help			ndow
Device: Leopard Imaging - LI-AR0231	Firmware Rev: 1454	EXIT	
Sensor Datatype:	○ RAW10 0 RAW12 ○ YU	JYV O RAW8	
Raw Camera Pixel Format:	O BGGR O GBBR O RGGB		
🗆 Enable auto exposure	🖾 Enable auto white balance	🗌 🗆 Enable auto brightness&contra	ast
Exposure:	0		
Gain:	<u>^</u>		
I2C Addr:	Ox	□ Just sensor read/write	
Register Addr Width:	o 8-bit 🔿 16-bit		
Register Value Width:	<b>0</b> 8-bit 🔿 16-bit		
Reg Addr:	Ox	Read	
Reg Value:	0x	Write	
Capture:	Capture bmp	Capture raw	
Gamma Correction:	1	Apply	
Trigger Sensor:	🗆 Enable	Shot 1 Trigger	
Black Level Correction:	0	Apply	
This camera tool car	n be used to write	e/read registers and	capture Raw and BMP image
IZC AUUI.	0.20		- Just sensor ready write
Register Addr Width:	🔾 8-bit	O 16-bit	
Register Value Width:	: 08-bit	O 16-bit	
Reg Addr:	0x3012		Read
Reg Value:	0x200		Write

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 with 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/4yx2p31b7qo2gjx/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.



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## 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-MAX9296-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 your 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". nd Programmer - Untitled 🚷 Di File Edit View Design Help Enable Status Device Family Device Operation File Name Cable Settings 1 🗹 LIFMD LIF-MD6000 Fast Program Detect Cable 😂 LIFMD - LIF-MD6000 - 🗖.. × Cable: HW-US · Port: EzUSB- \* General Device Information Custom p Device Operation Programming Speed S Access mode: SPI Flash Programming Use default Cloc Operation: SPI Flash Erase, Program, Veril O Use custom Clor Programming Options TCK Div 1 🗘 Programming file: <a>[vds2mipi\_top.rbt</a>. pue I/O Settings Cable Device Options Use default I/O Reinitialize part on program error O Use custom I/O SPI Flash Options INITN pin co DONE pin co Family: SPI Serial Flash TRST pin co Vendor: Micron Set TRS' Device: SPI-M25P16 · O Set TRS Package: 8-pin SOIC SPI Programming Data file siz 163466 Load from Fi Start address (Hex) 0x00000000 -End address (Hex) 0x00020000 -| Erase SPI part on programming Output Lattice VM Drivers detected (HW-DLN-3C (Parallel), HW-U Programmer device database loaded INFO - Scanning USB Port E2USB-0... INFO - Scan completed successfully. Message INFO - Scanning USB Port EzUSB-0... Secure SPI flash golden pattern INFO - Scan completed successfully WARNING - Cannot identify detected device on row 1. Ple < Tcl Console Output OK Cancel ng\* Info\* Ready 6) Click program icon. Diamond Programmer - Untitled \* File Edit View Design Help Enable Status **Device Family** 7) It may take 9s to program the FPGA. Output Disabling... Verifying... Finalizing... INFO - Execution time: 00 min : 09 sec INFO - Elapsed time: 00 min : 09 sec INFO - Operation: successful. Output Tcl Console 8) Refer to the "Firmware Update" section to install the firmware.