

# NebulaGUITool

## User Guide

Windows

2022.08

Vzense Technology Co. , Ltd.

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# 1. Overview

NebulaGUITool is a graphical interface tool based on Nebula SDK, providing depth image display, 3D point cloud display, filters tuning, device parameter setting, and RGB & depth alignment.

For Ethernet products, IP addresses setting and firmware upgrading could be handled through the settings page of NebulaGUITool.

NebulaGUITool Download Link:

China:<https://gitee.com/Vzense/NebulaGUITool>

Oversea:<https://github.com/Vzense/NebulaGUITool>

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## 2. Products

NebulaGUITool currently supports products like:

- DS77 Lite/Pro
- DS77C Lite/Pro
- DS86 & DS87

### 2.1. DS77 Lite/Pro



Sensor	DS77 Lite	DS77 Pro
Sensor	SONY DepthSense ToF	
Laser	940nm VCSEL * 2	
TOF Resolution	640 * 480, Max. 25fps	
TOF FOV	70°(H) * 50°(V)	
Pixel Format	12bit Depth, 8bit IR	
Digital Interface	1000M Ethernet, RS485	
Power Supply	12V ~ 24V DC	12V ~ 24V DC or POE+
Accuracy	< 1% (4mm@1m)	
Detect Range	0.15m ~ 5m	
Operating Temperature	-20°C ~ 50°C	
OS Support	Windows, Linux, Arm Linux	
Software Support	Nebula SDK, C++, C, Python, ROS, ROS2	
Ingress Protection	IP42	IP67

## 2.2. DS77C Lite/Pro



Sensor	DS77C Lite	DS77C Pro
Sensor	SONY DepthSense ToF + RGB	
Laser	940nm VCSEL * 2	
TOF Resolution	640 * 480, Max. 25fps	
RGB Resolution	1600 * 1200, Max. 25fps	
TOF FOV	70°(H) * 50°(V)	
RGB FOV	77°(H) * 55°(V)	
Pixel Format	12bit Depth, 8bit IR, MJPEG RGB	
Digital Interface	1000M Ethernet, RS485	
Power Supply	12V ~ 24V DC	12V ~ 24V DC or POE+
Accuracy	< 1% (4mm@1m)	
Detect Range	0.15m ~ 5m	
Operating Temperature	-20°C ~ 50°C	
OS Support	Windows, Linux, Arm Linux	
Software Support	Nebula SDK, C++, C, Python, ROS, ROS2	
Ingress Protection	IP42	IP67

## 2.3. DS86 & DS87



Model	DS87	DS86
Sensor	SONY DepthSense ToF CMOS	
Laser	940nm VCSEL * 2	
TOF Resolution/Frame rate	640 * 480, Max. 15fps	
ToF HDR Mode	Supported with Max. 10fps	
ToF FOV	70°(H) * 50°(V)	
RGB Camera	1600 * 1200, , Global Shutter, 77°(H)*55°(V)	
Output Format	RAW12(Depth, IR) + JPG(RGB)	
Interface	1000Mbps Ethernet and RS485	
Physical Connection	Aviation Plug x 2	RJ45 x1 8pin Connector x 1
Power Supply	PoE+ or 12V~24V (DC)	12V~24V (DC)
Accuracy	< 1%	
Working Range	0.15m ~ 5m	
Working Temperature	-20°C to +50°C	
Operation System&Platform	Windows/Linux/Arm Linux/ROS1/ROS2	
SDK	C/C++/Python	
Enclosure Rating	IP67	IP42
Conformity	CE, FCC, FDA	

## 3. Installation

### 3.1. Recommended System Configuration

Item	Recommended Configuration
OS	Win7 32/64 bits Win10 64 bits Win11 64 bits
RAM	At least 4GB

### 3.2. NebulaGUITool Contents

NebulaGUITool contains NebulaGUITool.exe, user manual, upgrade firmware, and related dynamic link libraries.

<input type="checkbox"/> Firmware	Firmware images
<input type="checkbox"/> SaveImage/2022_07_25_14_43_34	update version to 1.1.7
<input type="checkbox"/> platforms	update version to 1.1.7
<input type="checkbox"/> QCC_CORE_UI8.dll	update version to 1.1.7
<input type="checkbox"/> DSImagePreProcess.dll	update version to 1.1.7
<input type="checkbox"/> NebulaGUITool.exe	Executable file
<input type="checkbox"/> Nebula_api.dll	update version to 1.1.7
<input type="checkbox"/> QCC_DB_UI8.dll	update version to 1.1.7
<input type="checkbox"/> QCC_IO_UI8.dll	update version to 1.1.7
<input type="checkbox"/> Qt5Concurrent.dll	update version to 1.1.7
<input type="checkbox"/> Qt5Core.dll	update version to 1.1.7
<input type="checkbox"/> Qt5Gui.dll	update version to 1.1.7
<input type="checkbox"/> Qt5OpenGL.dll	update version to 1.1.7
<input type="checkbox"/> Qt5Widgets.dll	update version to 1.1.7
<input type="checkbox"/> ReleaseNotes.txt	update version to 1.1.7
<input type="checkbox"/> UTool.ini	update version to 1.1.7
<input type="checkbox"/> WhiteList.bat	update version to 1.1.7
<input type="checkbox"/> conort140.dll	update version to 1.1.7
<input type="checkbox"/> libEGL.dll	update version to 1.1.7
<input type="checkbox"/> libGLESv2.dll	update version to 1.1.7
<input type="checkbox"/> libopenblas.dll	update version to 1.1.7
<input type="checkbox"/> msvcp120.dll	update version to 1.1.7
<input type="checkbox"/> msvcp140.dll	update version to 1.1.7
<input type="checkbox"/> msvcr120.dll	update version to 1.1.7
<input type="checkbox"/> opencv_world300.dll	update version to 1.1.7
<input type="checkbox"/> opengl32sw.dll	update version to 1.1.7
<input type="checkbox"/> vcomp140.dll	update version to 1.1.7
<input type="checkbox"/> vcruntime140.dll	update version to 1.1.7
<input type="checkbox"/> version	update version to 1.1.7
<input type="checkbox"/> zlib1.dll	update version to 1.1.7

Figure 3. 1 NebulaGUITool Contents



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## 3.3. Device Connection

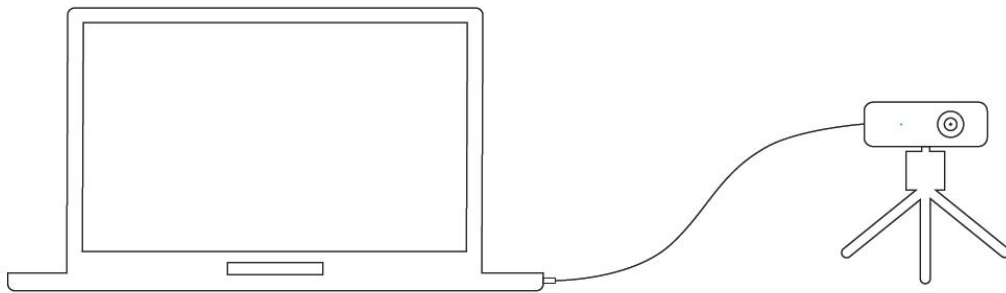


Figure 3. 2 Hardware Installation

Vzense devices have two connection methods: static IP address and DHCP. Static IP address is the default connection mode. The IP address, subnet mask and DHCP can be also changed by NebulaGUITool.

### 3.3.1. Static Address

Using static address connection method, device can be directly connected to computer, or with switch on the same network segment.

Direct connection: one end of the cable is connected to the camera, and the other end is plugged into RJ45 port of the PC. The default IP address of Vzense devices is 192.168.1.101, so the address of the PC can be set to 192.168.1.100. In Win10 system, the below picture can be referenced to set the PC network up.

General

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

☐ Obtain an IP address automatically

☒ Use the following IP address:

IP address: 192 . 168 . 1 . 100

Subnet mask: 255 . 255 . 255 . 0

Default gateway: . . .

☐ Obtain DNS server address automatically

☒ Use the following DNS server addresses

Preferred DNS server: . . .

Alternate DNS server: . . .

☐ Validate settings upon exit

Advanced...

OK Cancel

Figure 3. 3 Static Address

### 3.3.2. DHCP

Using DHCP connection mode, the Vzense camera need be connected to a router which DHCP is enabled, then connect a PC on the same LAN. Set the 'local Connection' of the PC to 'Obtain the IP address automatically' . For details on how to set the camera to DHCP connection mode, refer to the [4.3.5.1](#).

General Alternate Configuration

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

☒ Obtain an IP address automatically

☐ Use the following IP address:

IP address: . . .

Subnet mask: . . .

Default gateway: . . .

☒ Obtain DNS server address automatically

☐ Use the following DNS server addresses

Preferred DNS server: . . .

Alternate DNS server: . . .

☐ Validate settings upon exit

Advanced...

OK Cancel

Figure 3. 4 DHCP

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Note:

1. The network card, router and switch used on the PC have to meet the requirements of 1000Mbps.
2. When the NebulaGUITool first run, all options of the firewall should be chosen.

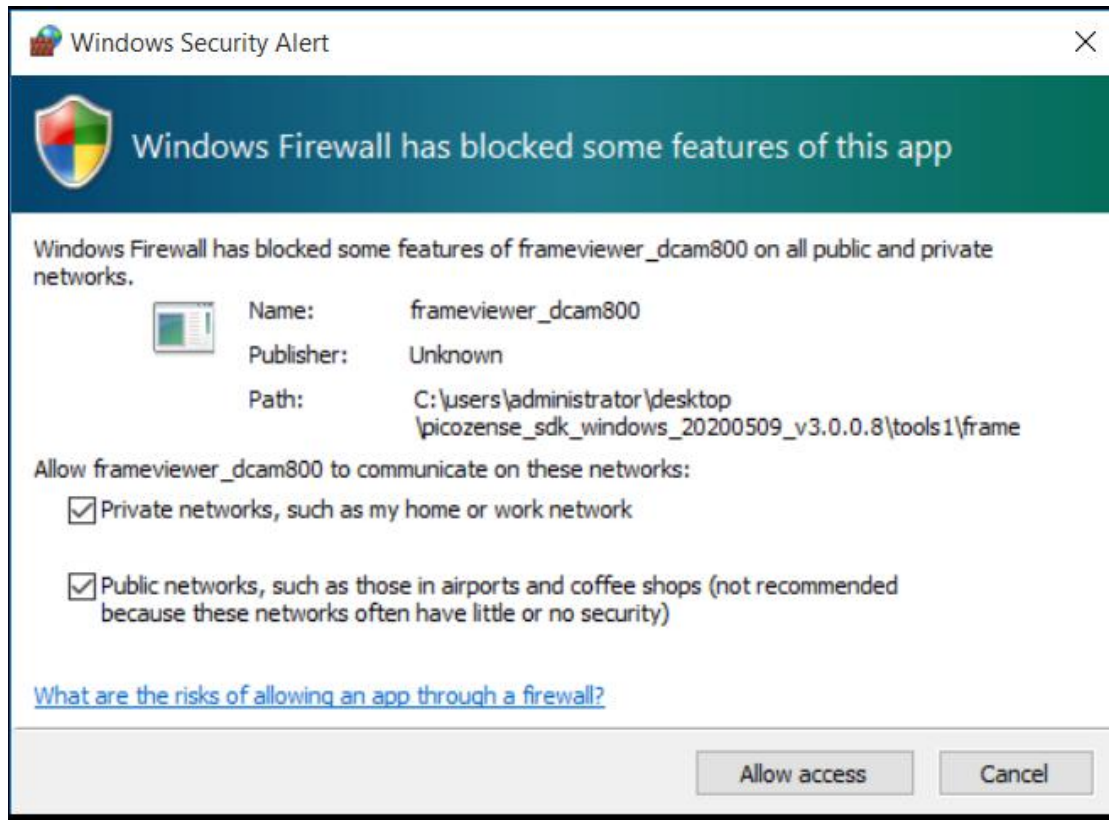


Figure 3. 5 firewall setting

## 4. Function Instruction

### 4.1. Device List

Device list is used to search and connect devices. For the purpose of demonstration, only one camera can be opened at the same time by NebulaGUITool, but SDK allows multiple cameras to work simultaneously.

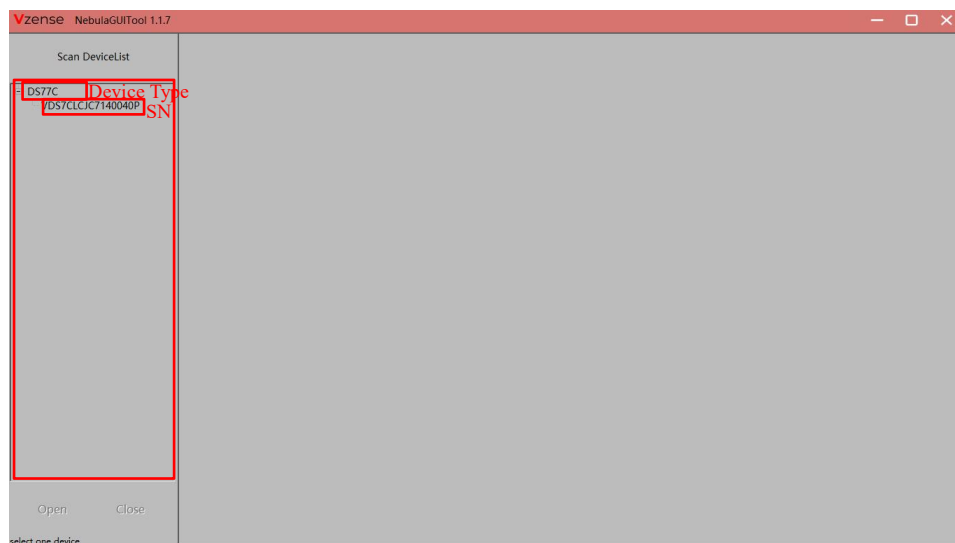


Figure 4. 1 Search Device

Connect device:

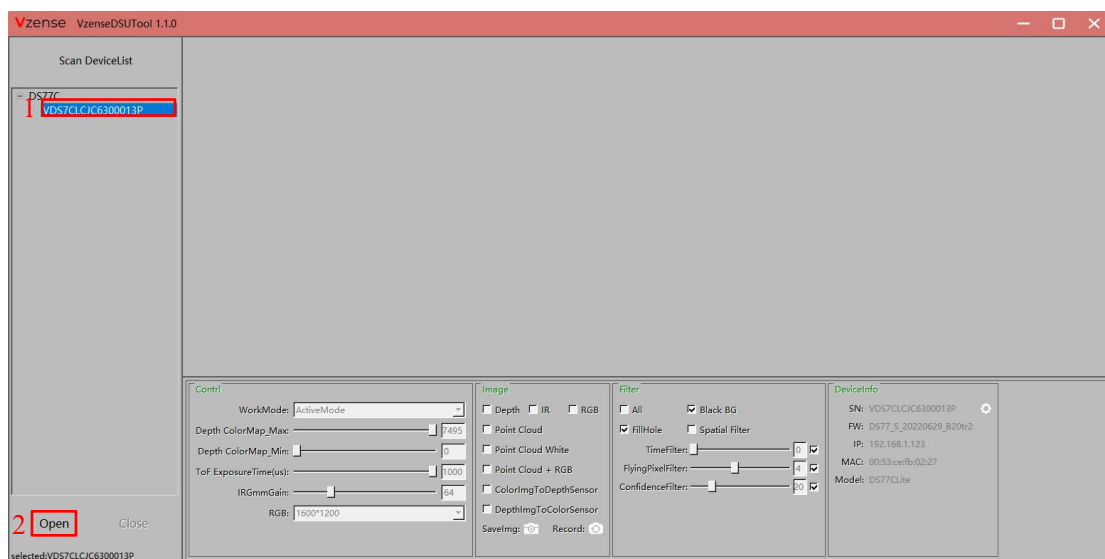


Figure 4. 2 Connect Device

1. Search the device.
2. Select the SN of the device.
3. Click “Open” to open the device, or double-click the device SN to open the device.

Disconnect device:

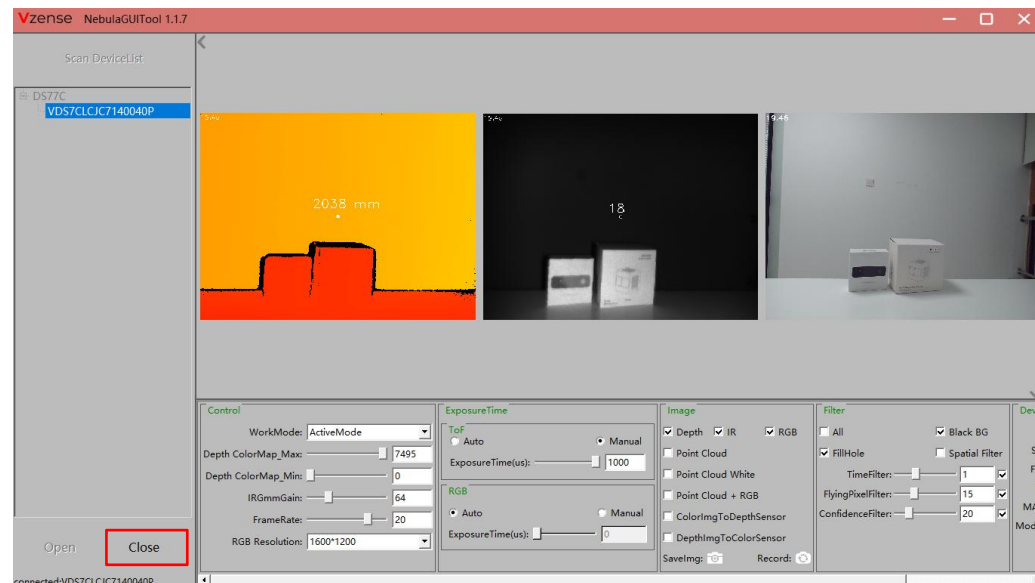


Figure 4. 3 Disconnect Device

1. Click “Close” to close the device.

## 4.2. Display Area

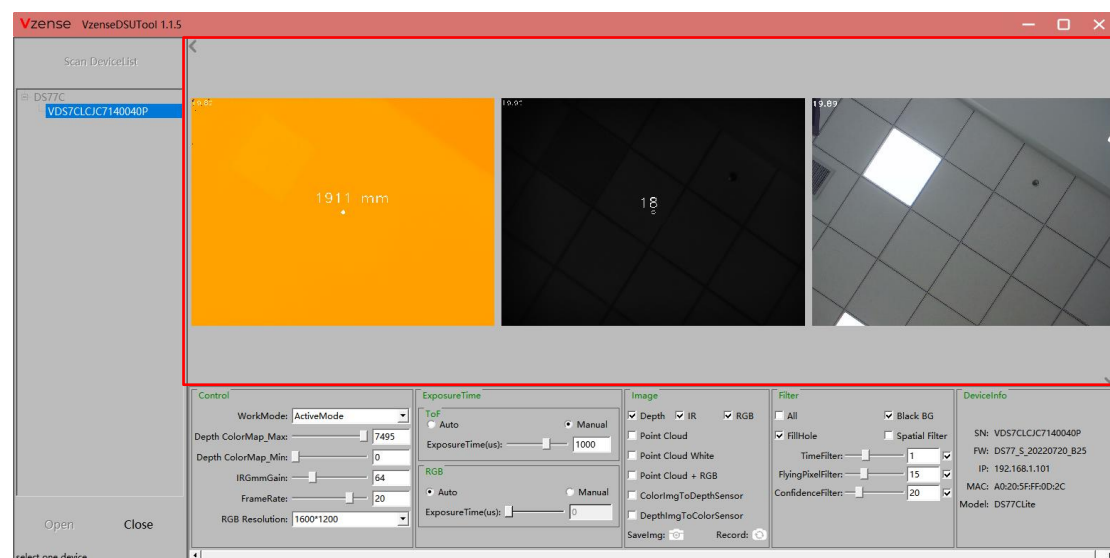


Figure 4. 4 Display Area

The display area is used to display images. From left to right, there are depth image window, IR image window, color image window and point cloud image window (closed by default).

The value displayed in the depth image window is the depth value of **the real-time pixel** at the white point, the unit is mm. As shown in the figure above, the depth value of the point is 1911mm.

Note: Click the right button of mouse to select the position of the white point and display the depth value of the corresponding point.

## 4.3. Operation Area

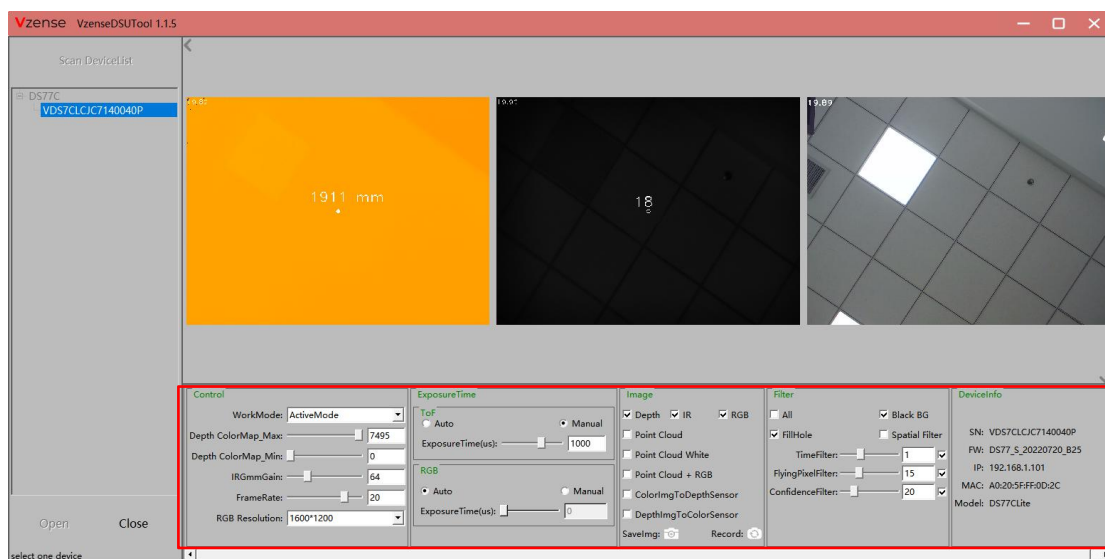


Figure 4. 5 Operation Area

The operation area is used to control the device parameter, set the image processing algorithm, and view the device information.

## 4.3.1.Control

### 4.3.1.1. Work Mode

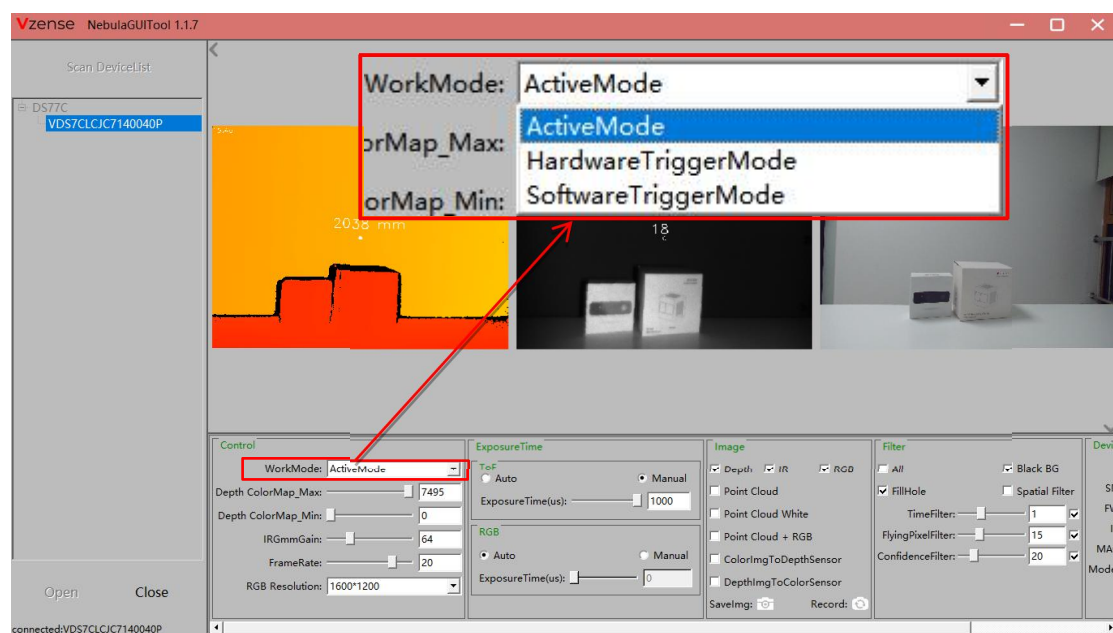


Figure 4. 6 Device Work Mode

ActiveMode: Active image with fixed frame rate.

HardwareTriggerMode: The image is triggered by the hardware signal. For details, please refer to the corresponding product specifications.

SoftwareTriggerMode: The image is triggered by API call, click the 'Trigger' button to send the soft trigger instruction once.

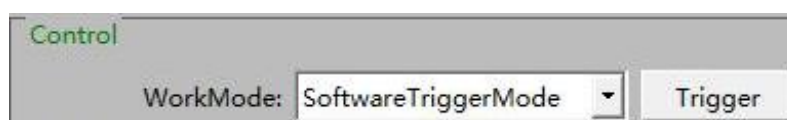


Figure 4. 7 SoftwareTriggerMode

### 4.3.1.2. Color Map



Figure 4. 8 Color Map

For displaying the depth image intuitively, we map 16-bit depth image to color image. When mapping, we intercept the depth value in a given range: from **ColorMap\_Min** to **ColorMap\_Max**, and then map it to 0-255 range. Finally, the image is transformed into a color image by using color mapping.

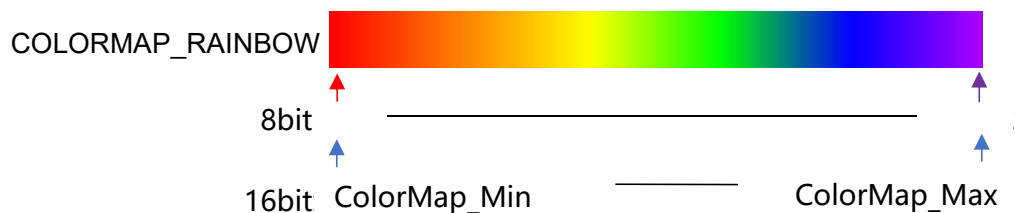


Figure 4. 9 Chromaticity Diagram

The effect of color map mapping is shown in Figure 4.10

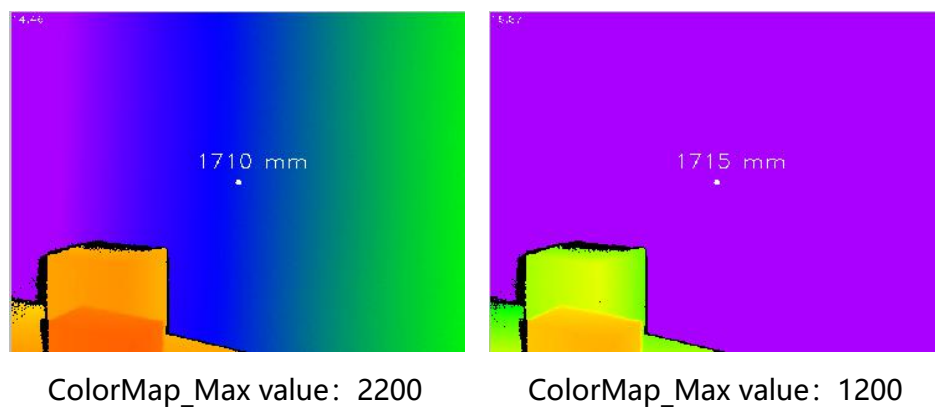


Figure 4. 10 Color Map Effect

### 4.3.1.3. IRGmmGain





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Figure 4. 11 IRGmmGain

Set the gain of the IR image, the higher GmmGain value, the brighter IR image.

The default GmmGain is 64.

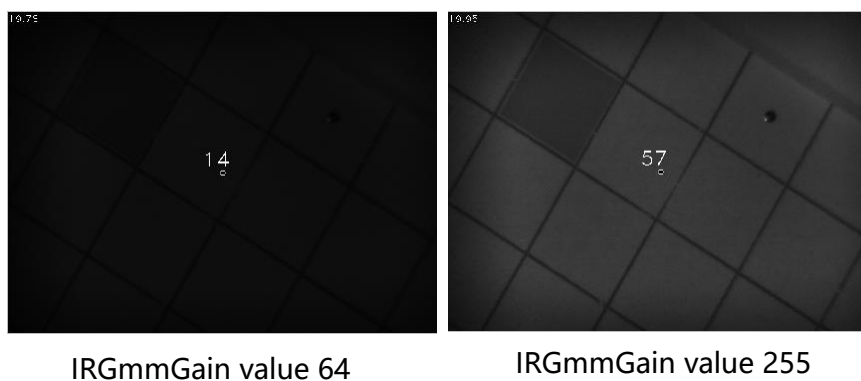


Figure 4. 12 IR image effect

#### 4.3.1.4. RGB Resolution

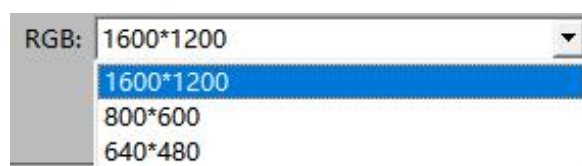


Figure 4. 13 RGB Resolution

The RGB resolution can be switched according to the actual list. For example, the resolution of the above figure is 1600\* 1200,800 \* 600,640 \*480.

### 4.3.2.Exposure Time

#### 4.3.2.1. ToF Sensor Exposure Time



Figure 4. 14 ToF sensor exposure time setting

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The exposure time of the ToF sensor can be set.

Auto: The ToF sensor is set to automatic exposure, and the device will adjust the exposure time according to the image.

Manual: The ToF sensor is set to manual exposure, and the exposure time is manually adjusted through the slider or input box.

The Manual exposure mode is the default mode with 1000us exposure value. For laser safety reason, the maximum of the exposure time is limited. If user want to increase it, please contact FAE for support.

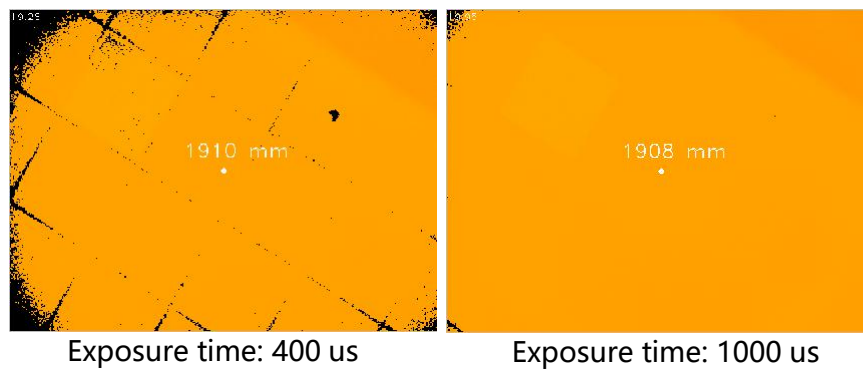


Figure 4. 15 ToF sensor exposure time effect

#### 4.3.2.2. RGB Sensor Exposure Time

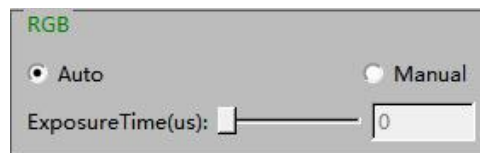


Figure 4. 16 RGB sensor exposure time setting

The RGB sensor exposure time can be set.

Auto: The exposure time of the RGB sensor is set to the automatic exposure.

Manual: The exposure time of the RGB sensor is set to the manual exposure.

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The default exposure mode of the RGB sensor is the automatic exposure.

## 4.3.3. Image

### 4.3.3.1. Image Display

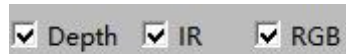


Figure 4. 17 Image display options

The display image content in the display area can be set. After deselect, the display area will no longer display the corresponding image window.

Depth image, IR image and RGB image (if device contain) are enabled by default.

### 4.3.3.2. Point Cloud



Figure 4. 18 Point Cloud display button

Point Cloud: display point cloud, point cloud default using depth color display.

Point Cloud White: Set point cloud using monochrome display (white).

Point Cloud + RGB: Set point cloud to be filled with the RGB map.

Point cloud control operations:

Double-click the point cloud : display the point cloud in full screen

Hold down the left mouse button and drag: Rotate the point cloud

Hold down the right mouse button and drag: Translate the point cloud

Mouse wheel: Zoom in/out of the point cloud

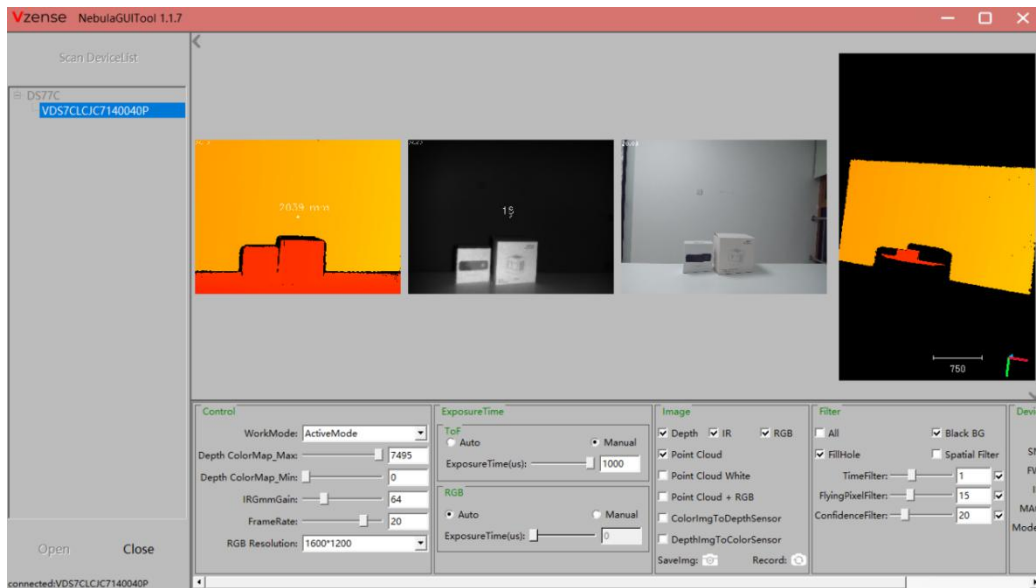


Figure 4. 19 Point Cloud

### 4.3.3.3. RGBD Map

#### 1.ColorImgToDepthSensor

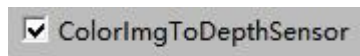


Figure 4. 20 ColorImgToDepthSensor button

RGB image map to Depth domain. When enabled, images with RGB pixels map to Depth pixel space are output and displayed, that is, RGB images corresponding to depth pixels one by one.



Depth Image

ColorImgToDepthSensor Image

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Figure 4. 21 ColorImgToDepthSensor effect

## 2.DepthImgToColorSensor



Figure 4. 22 DepthImgToColorSensor button

Depth image map to RGB domain. When enabled, the images with Depth pixels aligned to the RGB pixel space are output and displayed, that is, the depth image corresponding to RGB pixel one by one.

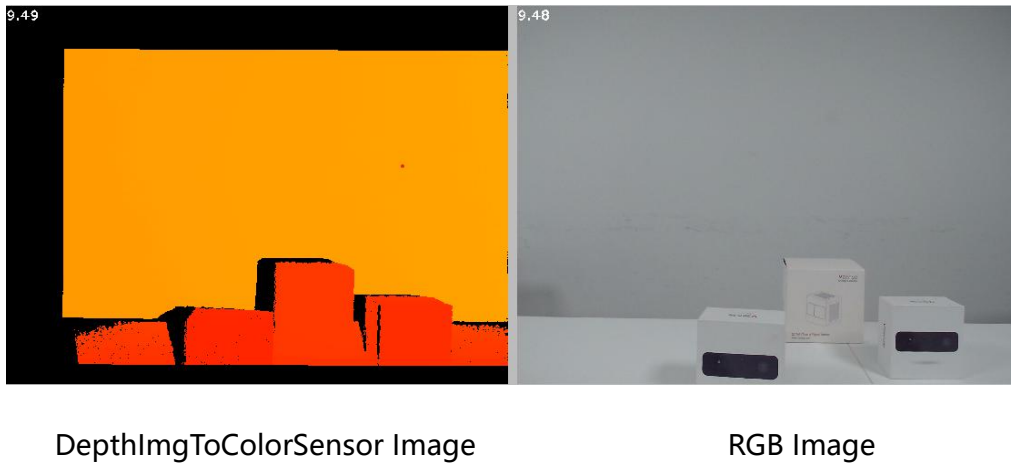


Figure 4. 23 DepthImgToColorSensor effect

### 4.3.3.4. Save Image



Figure 4. 24 Save button

**SaveImg:** Save a frame of all images in the current display area. Click to save one image at a time. If the display area is not enabled, it will not be saved.

Note: All the saved images/point clouds are stored in the same folder, named after the current time, in the SaveImage folder of NebulaGUITool directory. The saved

file is named in the following format:

Nebula > NebulaGUITool-master > NebulaGUITool > SaveImage > 2022\_08\_10\_10\_11\_32 >

名称	修改日期	类型	大小
Depth	2022/8/10 10:11	文件夹	
IR	2022/8/10 10:11	文件夹	
PointCloud	2022/8/10 10:11	文件夹	

Figure 4. 25 Path to save the original data

**Record:** Continuously save the images of all display areas (do not support point cloud continuous save).












	00000001.png	2022/8/10 10:12	PNG 图片文件	602 KB
	00000002.png	2022/8/10 10:12	PNG 图片文件	602 KB
	00000003.png	2022/8/10 10:12	PNG 图片文件	602 KB
	00000004.png	2022/8/10 10:12	PNG 图片文件	602 KB
	00000005.png	2022/8/10 10:12	PNG 图片文件	602 KB
	00000006.png	2022/8/10 10:12	PNG 图片文件	602 KB
	00000007.png	2022/8/10 10:12	PNG 图片文件	602 KB
	00000008.png	2022/8/10 10:12	PNG 图片文件	602 KB
	00000009.png	2022/8/10 10:12	PNG 图片文件	602 KB
	00000010.png	2022/8/10 10:12	PNG 图片文件	602 KB
	00000011.png	2022/8/10 10:12	PNG 图片文件	602 KB

Figure 4. 26 Save depth effect continuously

File format:

The Depth image is stored in 16-bit PNG format, the unit is mm.

IR images are stored in 8-bit single-channel PNG format;

The RGB diagram is an 8-bit three-channel color map, saved in JPG format;

The PointCloud data is saved in txt format, and each row of data represents the coordinates of a point (X, Y, Z). The saved file can be viewed using CloudCompare.

**Note:**

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NebulaGUITool's saved depth map is a 16bit single-channel PNG image, with each pixel represented by two bytes. Windows' default image display tool can only display 8bit single-channel images, so they look black. User can use Image J to display and view pixel distance values.

## 4.3.4. Filter

### 4.3.4.1. Image filter

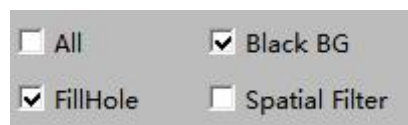


Figure 4. 27 Filter button

#### 1. All

Enable/disable all filters.

#### 2. Black BG

Black BG: enable or disable the Black background. The effect is as follows.

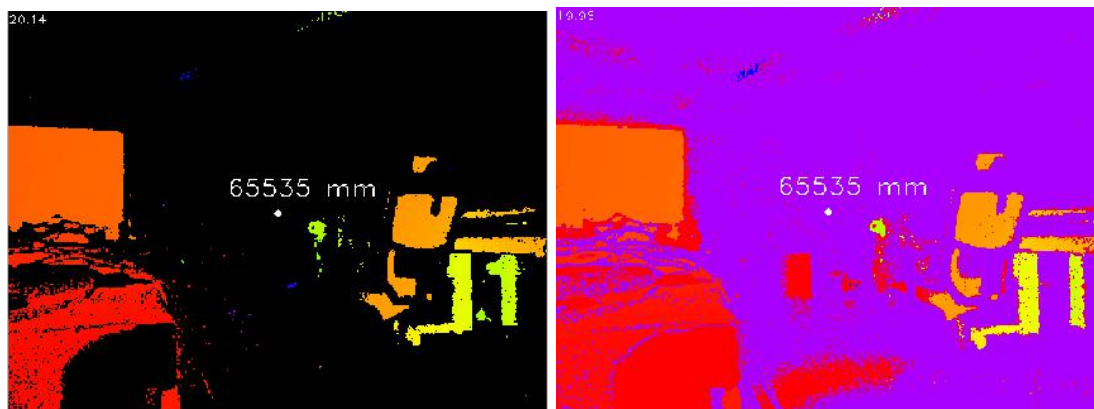


Figure 4. 28 Turn on/off the black background effect

#### 3. FillHole

FillHole: fill up some empty data. This function is enabled by default.

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## 4. Spatial Filter

Spatial Filter: similar to Gaussian filter, reduce noise. This function is disabled by default.

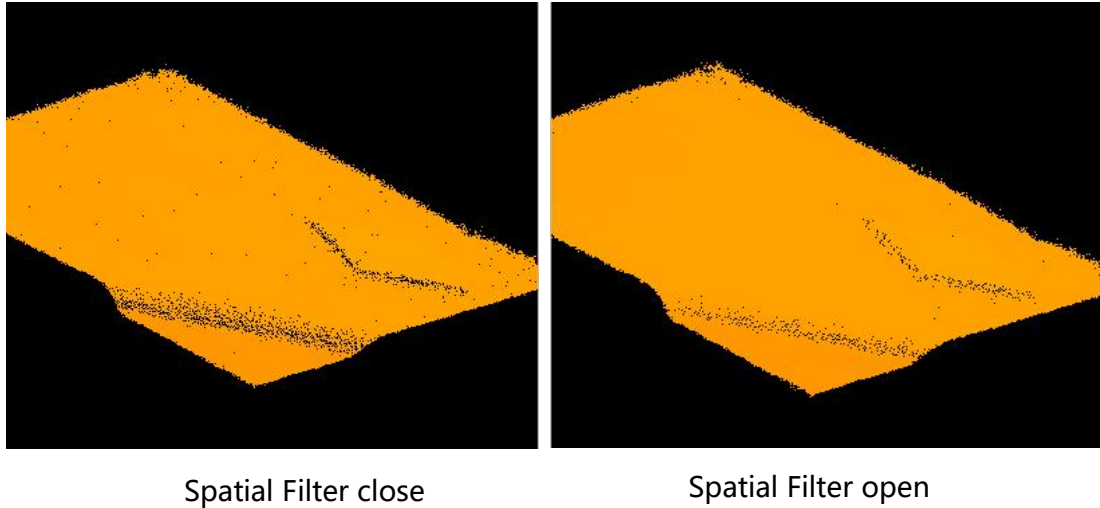


Figure 4. 29 Spatial Filter Close/Open effect

### 4.3.4.2. Time Filter



Figure 4. 30 Time Filter Switch and threshold

Time Filter: Time Filter reduce image noise. By default, this function is enabled and the default value is 1. (the larger value, the stronger filtering effect).

### 4.3.4.3. Flying Pixel Filter



Figure 4. 31 Flying Pixel Filter Switch and threshold

Flying Pixel Filter: Flying Pixel Filter eliminate the depth value of the boundary flying points. The default value is 4 (the larger value, the stronger filtering effect).



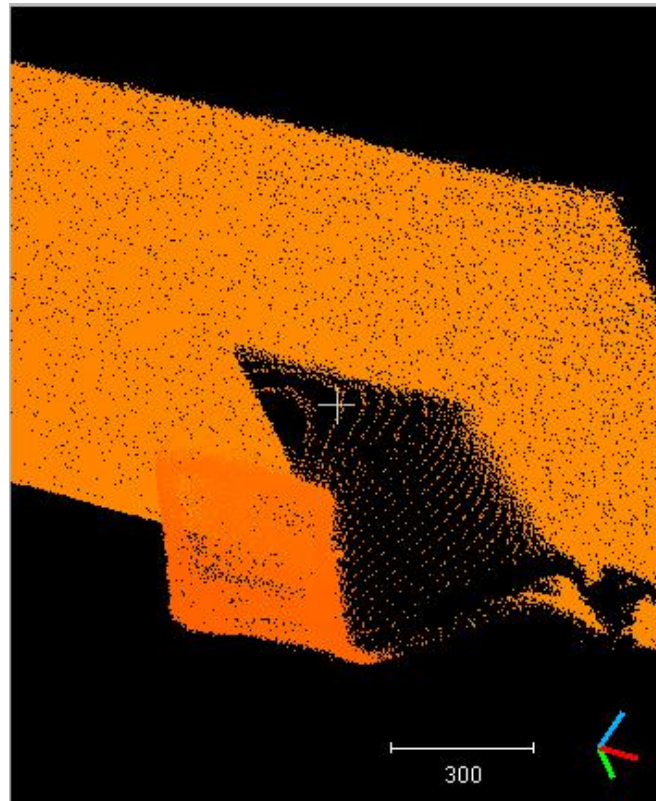


Figure 4.32 Flying Pixel Filter close

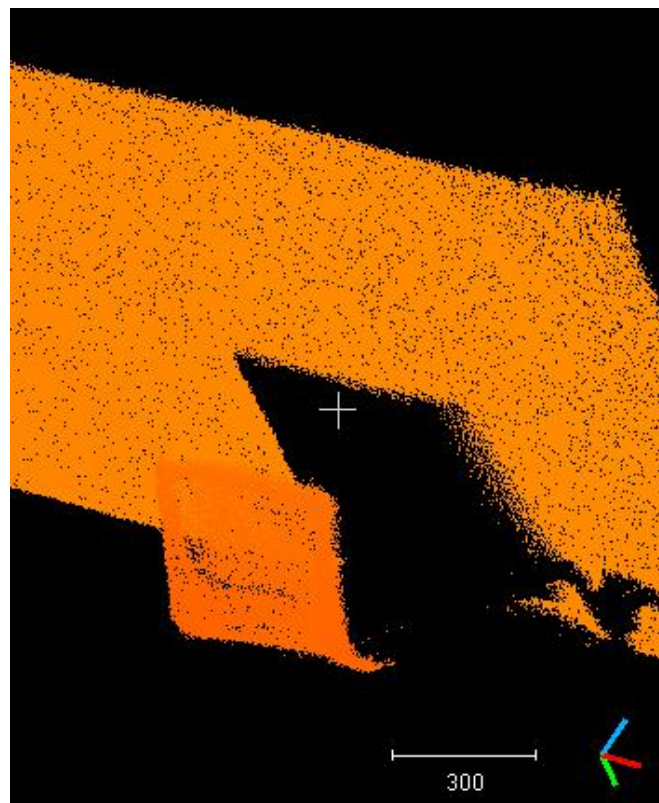


Figure 4.33 Flying Pixel Filter value: 15

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#### 4.3.4.4. ConfidenceFilter



Figure 4. 34 Confidence Filter Switch and threshold

Confidence filter: Confidence filter eliminate points with poor signal quality. The default threshold of Confidence Filter is 20.

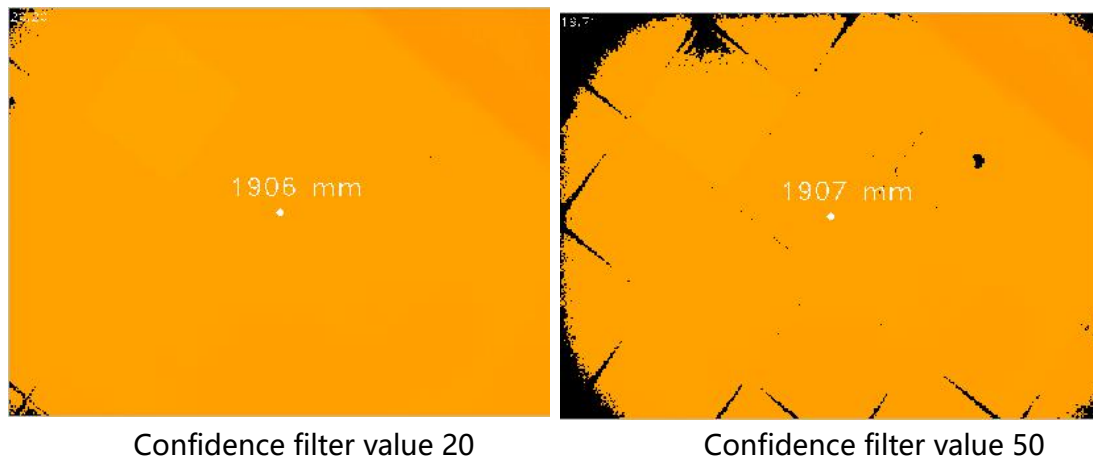


Figure 4. 35 Confidence filter different threshold effect

#### 4.3.5. Device Information

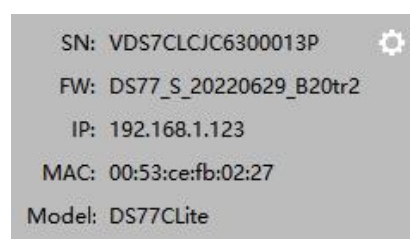


Figure 4. 36 Device information

SN: serial number.

FW: the firmware version.

IP: the current IP address of the device.

MAC: the MAC address of the device.

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Model: device type.



:Device IP address setting and firmware upgrade page.

### 4.3.5.1. Change the IP



Click ,NebulaGUITool shows below

Device Settings

Setting IP Address

☐ Obtain an IP address automatically(DHCP)

☒ Use the following IP address:

IP address: 192 . 168 . 1 . 123

Subnet mask: 255 . 255 . 255 . 0

OK Cancel

Upgrade Firmware

FirmwareImg path:

Upgrade

0%

Figure 4. 37 Device Setting Interface

Obtain an IP address Automatically (DHCP) : Set the network mode of the device to the DHCP mode, which allows the router to assign IP addresses. When this mode is used, DHCP mode need to be set on the PC.

Use the following IP address: Set the connection method of the device to static IP address. In this mode, ensure that the host IP address and subnet mask are on the same network segment as the device IP address.

1. To set dynamic IP address:



Figure 4. 38 Set DHCP

Step1: Choose "Obtain an IP address automatically (DHCP)" .

Step2: Click OK to save.

Step3: The device takes effect after automatic restart.

2. To set static IP address:

Step1: Select "Use the following IP address".

Step2: Change the IP address and subnet mask

Step3: Click OK to save

Step4: The device takes effect after automatic restart.

### 4.3.5.2. Firmware upgrade



Figure 4. 39 Device Settings - Upgrade

Perform the following operations to upgrade firmware:


1. Click , and select NebulaGUITool's firmware image inside the NebulaGUITool folder, as shown here:



Figure 4. 40 Path for storing the firmware image

Note: The path cannot contain Chinese

2. Tap the Upgrade button and wait for the Upgrade to start (do not power off the device during the Upgrade).
3. After the upgrade starts, the progress bar increases to 100%.
4. The system prompts you to restart the device. Click OK then the software will shut down automatically.

### 4.3.5.3. Signal Parameters Settings

The signal parameters are configured on the Device Setting page, as shown in the following figure:

The screenshot shows the 'Device Settings' window with three main sections. The first section, 'Setting IP Address', has two radio buttons: 'Obtain an IP address automatically(DHCP)' and 'Use the following IP address:'. The second section, 'Upgrade Firmware', has a text field for 'FirmwareImg path:' and an 'Upgrade' button. The third section, 'Input Signal Params For HW Trigger', is highlighted with a red border and contains two sub-sections: 'InputSignal' and 'OutputSignal'. Each sub-section has a waveform diagram, polarity settings, and numerical input fields for width, interval, and delay. The 'InputSignal' section shows a high-level pulse for polarity=1 and a low-level pulse for polarity=0. The 'OutputSignal' section shows a high-level pulse for polarity=1 and a low-level pulse for polarity=0, with a 'delay' parameter indicated between the exposure start and the pulse.

Device Settings

Setting IP Address

☐ Obtain an IP address automatically(DHCP)

☒ Use the following IP address:

IP address: 192 . 168 . 1 . 101

Subnet mask: 255 . 255 . 255 . 0

OK Cancel

Upgrade Firmware

FirmwareImg path:

Upgrade

0%

Input Signal Params For HW Trigger

InputSignal

polarity = 1

width

polarity = 0

interval

polarity: 0 width(μs): 100 interval(μs): 34000

Get Set

Output Signal Params

OutputSignal

exposure start

width

polarity = 1

delay

polarity = 0

polarity: 1 width(μs): 100 delay(μs): 0

Get Set

Figure 4. 40 Signal Parameters Settings

Input Signal Parameters for hardware trigger:

1) polarity: Signal validity detection polarity. 0 represents low level effective, and 1 represents high level effective.

Value range: [0,1]

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2) width: Signal width validity detection. Signals smaller than the width setting will not respond. 16-bit, unit:  $\mu\text{s}$ .

Value range: [1,65535]

3) interval: Continuous signal interval validity detection. Signals smaller than the interval setting will not respond.

Value range: [34000,65535]

#### Output Signal Parameters:

1) polarity: Output signal polarity. 0 represents low level effective, and 1 represents high level effective.

Value range: [0,1]

2) width: Output signal width. 16 bits, unit:  $\mu\text{s}$ .

Value range: [1,65535]

3) delay: Output signal delay, that is, after receiving the input signal, how long is the delay before starting to output the signal.

Value range: [0,65535]

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## 5. FAQ

**Q1:** Why can't I find the device when I open the NebulaGUITool?

**A1:** There may be the following reasons:

1. The cable connection between the device and the host is good, and the network adapter of the host is available.
2. The device and host are on different network segments. If the device is in static IP address mode, ensure that the static IP address of the device is on the same network segment as the host, for example, 192.168.1.X. If the DHCP mode is set on the device, ensure that the device and the host are on the same LAN, and the router or switch has the DHCP server function.
3. Check whether the network permission to run the software is restricted. For example, the application is blocked by the firewall, and the firewall popover is not allowed to run.

**Q2:** about "The Other Instance is Running!"

**A2:** "The Other Instance is Running!" There's already a NebulaGUITool running, so you can close the program and restart NebulaGUITool. If this hint still appears after closing, check the background process to close NebulaGUITool.exe directly.

**Q3:** Can the exposure time of the ToF sensor be adjusted above 1ms?

**A3:** Yes, please contact FAE for details.

Contact Information:

Email address: [info@vzense.com](mailto:info@vzense.com)

Technical support platform: <https://support.qq.com/products/377143>



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<https://www.vzense.com/faq>

Gitee: <https://gitee.com/Vzense/NebulaGUITool/issues>

GitHub: <https://github.com/Vzense/NebulaGUITool/issues>