

MRDVS Technology

M4 Mega User Manual

V1.0



Apr. 2024

Content

1. Introduction	1
1.1 Purpose and Scope of the Document.....	1
1.2 Terminology	1
1.3 Working Principle.....	1
1.4 Product Overview	2
2. Specifications.....	2
2.1 Basic Specifications.....	2
2.2 Electrical Characteristics	3
2.3 Interface Definitions.....	3
2.3.1 Camera Interface Details.....	3
2.3.2 Cable Wiring Details.....	4
2.3.3 Hardware Trigger Functionality.....	5
2.4 Camera Component Introduction	6
3. Camera Integration Guide.....	7
3.1 Structural Design	7
3.1.1 Camera Field of View	7
3.1.2 Camera Dimensions.....	7
3.2 Software SDK.....	8
4. Environment and Reliability.....	8
5. Quick Start Guide	9
5.1 Connection Test.....	9
5.2 IO Wiring Instructions	9
5.3 Soft Trigger Function Description	10
6. Precautions.....	11
6.1 Laser Safety Level	11
7. Common Questions (QA).....	11

1. Introduction

1.1 Purpose and Scope of the Document

This document presents the product specifications of the M4 Mega camera and provides developers with details on certain design aspects necessary for understanding and using the product.

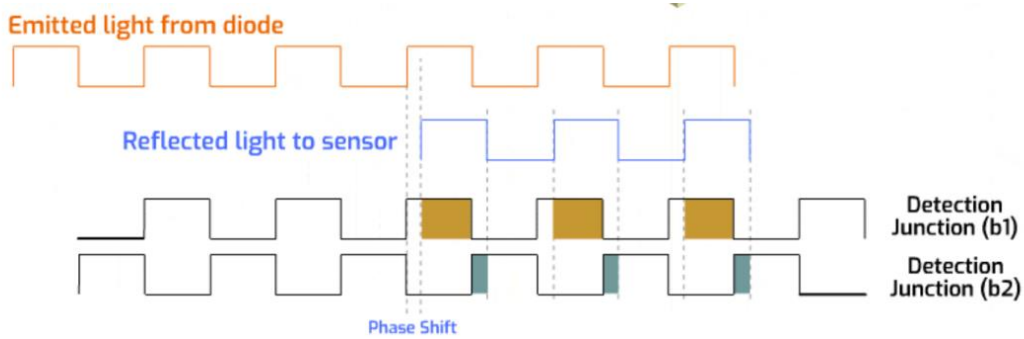
1.2 Terminology

- **RGBD Camera:** Supports the simultaneous output of RGB and depth images, ensuring synchronization in both time and space.
- **Depth:** In depth video streams, similar to color or monochrome, each pixel is assigned a value representing its distance from the camera lens, termed as 'depth.'
- **FOV (Field of View):** Describes the angular range of imaging captured by a camera, including Horizontal Field of View (HFOV), Vertical Field of View (VFOV), and Diagonal Field of View (DFOV).
- **IR Camera:** Specializes in imaging within the near-infrared spectrum.
- **RGB Camera:** Captures images in full color.
- **Depth Camera:** Specializes in depth imaging, typically comprising a dot matrix projector, an infrared camera, and a depth computation processor. It is distinguished from modules used for color imaging.
- **SoC (System on Chip):** A chip system that processes image data, computes depth, and runs application-specific algorithms.

1.3 Working Principle

M4 Mega employs the Indirect Time of Flight (ITOF) method for distance measurement. The camera emits laser pulses, and the receiving sensor chip calculates the phase difference by comparing the received waveform with the emitted waveform, thereby determining the flight time of the laser pulse, Δt . The distance to the target from the camera can be calculated using the following formula:

The distance = speed of light * $\Delta t/2$



1.4 Product Overview

M4 Mega is a compact, high-performance, cost-effective industrial RGBD camera. It features a built-in SONY CW iTOF camera and triple-channel true color RGB image output, providing high-performance depth data ranging from 0.2m to 5m. The camera internally aligns RGB and depth images both spatially and temporally.

2. Specifications

2.1 Basic Specifications

Specification	Details
Model	M4 Mega
Operating Principle	TOF (Time-of-Flight) depth camera
Output Format	Depth & RGB & Amplitude Map
TOF Resolution and Frame Rate	640x480 pixels @ Max 25fps, typical value 15fps
TOF Field of View	Horizontal-74°, Vertical-56°
RGB Resolution and Frame Rate	1280x960 pixels @ Max 25fps, typical value 15fps
RGB Field of View	Horizontal-86°, Vertical-55°
Distance Range	0.2m-5m
Accuracy	<1% (4mm @ 1m)
Power Consumption	7W @ 24VDC
Laser	940nm
Dimensions(L x W x H)	92mm×47mm×51mm
Weight	340g
Power Supply	24 VDC / 2A

Communication Interfaces	Gigabit Ethernet / CAN / IO
Protection Level	IP67
Operating Temperature	-20°C~60°C
Storage Temperature	-25°C~85°C
Software Environment	C / C++ / ROS SDK
Supported Operating Systems	Windows 7/8/10/11, Linux, Arm Linux/ROS
Cooling Method	Passive (no fan)
Eye Safety	Class 1
Sunlight Resistance	100KLUX

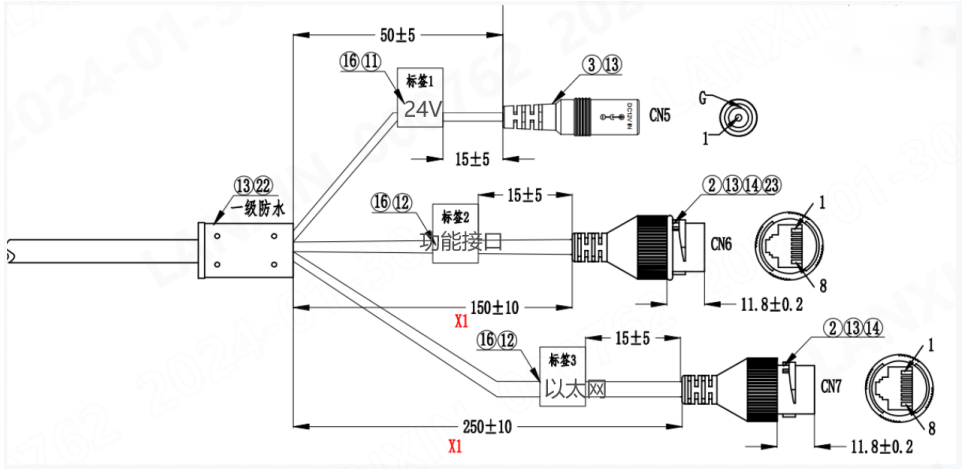
2.2 Electrical Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Supply Voltage	VDD		18	24	30	V
Digital I/O	IN		3.3		24	V
CAN Interface			0		5V	V
Operating Temp.	Ta		-20		60	°C
Operating Humidity			20		80	%
Storage Temp.			-25		80	°C
Storage Humidity			20		80	%

2.3 Interface Definitions

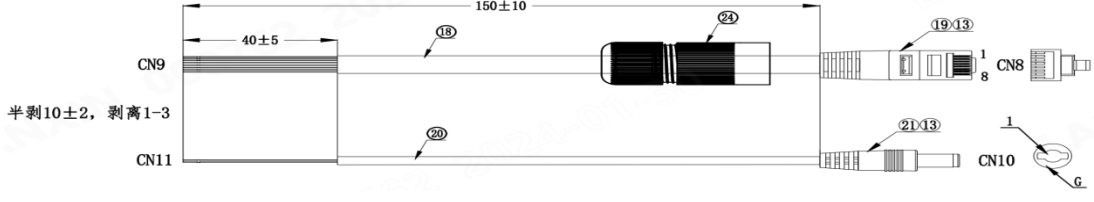
2.3.1 Camera Interface Details

Camera interfaces include three ports: a DC24v power port, a Gigabit Ethernet port, and a functional interface (IO/CAN).



Port	Pin	Signal	Description
Ethernet	1	MDI0_N	Gigabit Ethernet
	2	MDI0_p	
	3	MDI1_N	
	6	MDI1_p	
	4	MDI2_N	
	5	MDI2_p	
	7	MDI3_N	
	8	MDI3_p	
Function	Orange	CANH	CAN High
	Orange-White	CANL	CAN Low
	Green-White	GND	CAN Ground
	Green	OUT1	IO Output 1
	Blue	OUT2	IO Output 2
	Blue-White	COM	IO Common
	Brown-White	IN1	IO Input 1
	Brown	IN2	IO Input 2
Power	1	24V+	DC power plug 5.5-2.1mm
	G	24V-	

2.3.2 Cable Wiring Details



Cable	Color	Pin	Description
Functional	Orange	CANH	CAN High
	Orange-White	CANL	CAN Low
	Green-White	GND	CAN Ground
	Green	OUT1	IO Output 1
	Blue	OUT2	IO Output 2
	Blue-White	COM	IO Common
	Brown-White	IN1	IO Input 1
	Brown	IN2	IO Input 2
Power	1	Red	24V+
	G	Black	24V-

2.3.3 Hardware Trigger Functionality

1. Hardware trigger functionality is only effective when the product is set to hardware trigger mode. In this mode, the camera operates in a 'wait for trigger' state, starting an exposure frame only upon receiving a valid hardware trigger pulse on IO input 1, and then returns to waiting state after completion.
2. The hardware trigger signal requires a voltage range of 3.3V to 24V, with a driving current capability of at least 10mA. It is recommended to add a decoupling circuit to the hardware trigger pin to prevent misfiring due to pulse interference.
3. Steps to set up hardware trigger functionality in LxCameraViewer software:
 - Open camera → Check if obstacle avoidance algorithm is disabled → Stop stream → Basic tools → Capture settings → Switch to hardware trigger mode → Set relevant parameters → Start stream and wait for external signal trigger
4. Hardware Trigger Parameters:
 - **Filter Time:** Time to wait for rechecking the trigger signal after receiving a trigger signal. This is used to filter out noise, typically less than 5ms. Setting it too high might filter out valid triggers.
 - **Minimum Interval:** The interval between two consecutive automatic trigger signals, ranging from 70000 to 100000000 microseconds. This value must be greater than the integration time.
 - **Trigger Time:** Delay time after rechecking the trigger signal, set to 0 for immediate triggering, ranging from 0 to 100000000 microseconds.

- **Trigger Frame Count:** Number of frames triggered in a single hardware trigger, ranging from 1 to 200 frames.

Examples of Hardware Triggering:

- **Example 1:** Filter time: 1000ms, Minimum interval: 70000 (minimum value), Trigger time: 2000ms, Trigger frame count: 10.
After receiving a trigger signal, delay 1ms to recheck the signal, trigger the first frame after 2ms, then wait 70ms to trigger the second frame, and continue until the 10th frame is triggered. Any trigger signals received during the triggering period will be ignored.
- **Example 2:** Filter time: 1000ms, Minimum interval: ineffective, Trigger time: 0ms, Trigger frame count: 1.
After receiving a trigger signal, delay 1ms to recheck the signal, then immediately trigger once. If the trigger frame count is 1, the minimum interval is ineffective.
- **Example 3:** Filter time: 1000ms, Minimum interval: 200000, Trigger time: 0ms, Trigger frame count: 200.

2.4 Camera Component Introduction

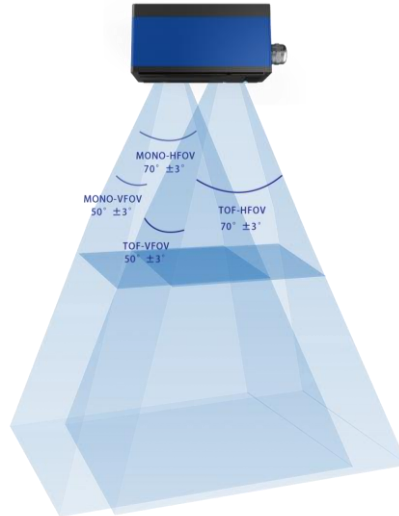


1. Power indicator light, slow flash after power on
2. 940 light source
3. Multi-machine interference detection module
4. TOF lens
5. RGB lens

3. Camera Integration Guide

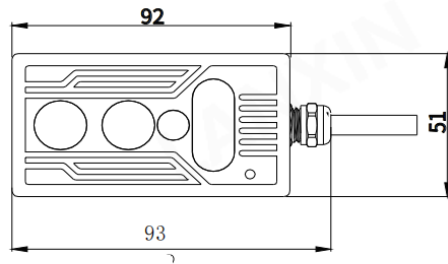
3.1 Structural Design

3.1.1 Camera Field of View

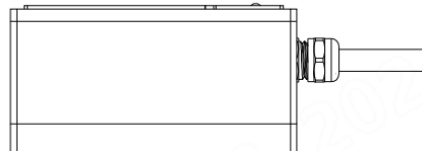


3.1.2 Camera Dimensions

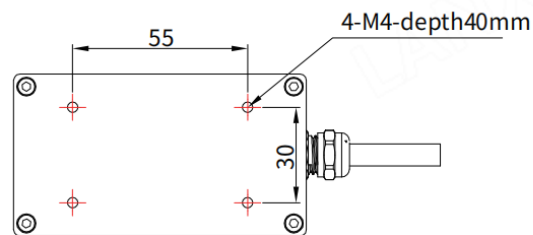
Front view



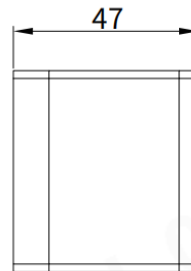
Top view



Rear view



Side view



3.2 Software SDK

MRDVS LxCameraViewer GUI manual and MRDVS SDK development guide download link:

<https://github.com/Lanxin-MRDVS/CameraSDK/tree/master/Document>

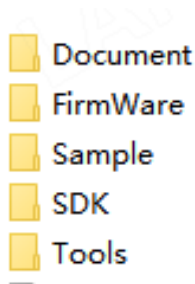
SDK download link:

<https://github.com/Lanxin-MRDVS/CameraSDK>

LxCameraViewer GUI(windows) download link:

<https://github.com/Lanxin-MRDVS/CameraSDK/tree/master/windows/Tools>

The contents of the Camera SDK directory are shown below:



Document: contains various documentation for the Camera SDK

Firmware: contains firmware upgrade packages

Sample: contains sample code for various programming languages using the Camera SDK

SDK: contains header files and library files for the Camera SDK

4. Environment and Reliability

- **Operating Environment**
 - Temperature: -20°C to 60°C
 - Humidity: 0% to 95% RH, non-condensing
 - Illuminance: 0 KLUX to 100 KLUX
- **Storage Environment**
 - Temperature: -25°C to 85°C

- Humidity: 10% to 95% RH, non-condensing
- **Normal Operating Temperature Rise:** Casing temperature rise <25°C
- **ESD Level:** Contact discharge ±4KV, air discharge ±8KV
- **RE Level:** Complies with GB 9254 CLASS A standard
- **Operational Lifespan:** Over 3 years
- **Environmental Certification:** RoHS
- **Laser Safety:** Class 1

5. Quick Start Guide

5.1 Connection Test

1. Connect the camera to a 24V/2A DC power supply. The power indicator will slowly flash blue, indicating that the power is on correctly.
2. Connect the camera to a computer using a Category 6 network cable.
3. The default IP address of the camera is 192.168.100.82.
4. Set the computer's IP to be in the same subnet as the camera and disable the computer's firewall.
5. Run the corresponding host computer software to obtain camera images.
6. Contact Lanxin MRDVS sales or technical support for host computer software.
7. SDK can be downloaded from: <https://github.com/Lanxin-MRDVS/CameraSDK>

5.2 IO Wiring Instructions

Interface	Property	Note
IN1	Input	Discrete signal input, high active, supports 24V/open entry
IN2	Input	Discrete signal input, high active, supports 24V/open entry
OUT1	Output	Discrete signal output, ground/open signal, supports 24V pull-up
OUT2	Output	Discrete signal output, ground/open signal, supports 24V pull-up
COM	GND	Common ground point for discrete output signals (shared between IN and OUT)

5.3 Soft Trigger Function Description

1. The soft trigger function is only effective when the product is set to soft trigger mode (soft trigger mode and obstacle avoidance mode are mutually exclusive, only one can be activated at a time). In this mode, the camera will operate in a 'wait for trigger' state, starting an exposure frame only upon receiving a valid soft trigger signal.
2. Steps to set up soft trigger functionality in LxCameraViewer software:
 - Open camera → Check if the obstacle avoidance algorithm is disabled → Stop stream → Basic tools → Capture settings → Switch to soft trigger mode → Set relevant parameters → Start stream → Click the soft trigger send button
3. Soft Trigger Parameters:
 - **Filter Time:** Time to wait to recheck the trigger signal after receiving a trigger signal. This is used to filter out noise and is typically less than 5ms. A value too high may filter out valid triggers.
 - **Minimum Interval:** The interval between two consecutive automatic trigger signals, ranging from 70000 to 100000000 microseconds. This value must be greater than the integration time.
 - **Trigger Time:** Delay after rechecking the trigger signal. Set to 0 for immediate triggering, ranging from 0 to 100000000 microseconds.
 - **Trigger Frame Count:** Number of frames triggered in a single soft trigger, ranging from 1 to 200 frames.

Examples of Soft Triggering:

- **Example 1:** Filter time: 1000ms, Minimum interval: 70000 (minimum value), Trigger time: 2000ms, Trigger frame count: 10. After receiving a trigger signal, delay 1ms to recheck the signal, trigger the first frame after 2ms, then wait 70ms to trigger the second frame, and continue until the 10th frame is triggered. Any trigger signals received during the triggering period will be ignored.
- **Example 2:** Filter time: 1000ms, Minimum interval: ineffective, Trigger time: 0ms, Trigger frame count: 1. After receiving a trigger signal, delay 1ms to recheck the signal, then immediately trigger once. If the trigger frame count is 1, the minimum interval is ineffective.
- **Example 3:** Filter time: 1000ms, Minimum interval: 200000, Trigger time: 0ms, Trigger frame count: 200.

For soft trigger SDK interface usage, please refer to the SDK manual.

6. Precautions

6.1 Laser Safety Level

This product emits invisible lasers during operation, which should be avoided to prevent damage to human eyes. The laser emitted by this product complies with Class 1 safety standards according to EN60825 requirements and does not pose a hazard to human health under normal use conditions.

7. Common Questions (QA)

No.	Question	Description
1	Camera does not respond when opened	Check if the firewall is disabled, as it needs to be closed
2	Multiple IPs detected by host computer	If the same IP is obtained by the camera in the LAN, select the required IP to open
3	Unstable data when opening the camera	It is recommended to use a gigabit network cable, as using a megabit cable may result in unstable initial data
4	Software installation location	If installed in the default C drive, there may be permission settings required