ORBBEC

DATASHEET
Document classification: Public

ORBBEC® 3D Camera

Femto Bolt

ORBBEC Inc.

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Revision History

Version	Date	Note
V1.0	2023.10	Initial release

Catalogue

The ORBBEC ® 3D camera Femto Bolt

Product Brief

Femto Bolt 3D The camera uses iToF 3D imaging technology to achieve the realization of object depth data measurement within a distance of 0.25m 5.46m, obtain the object depth image of objects, at the same time use the color camera to collect color images of objects, and support the cross-platform development kit ORBBEC SDK.

ORBBEC®Provide customers with excellent 3D camera products, and a large number of customers worldwide use our products to innovate their solutions to provide a more competitive user experience and give more value.

Product characteristics

- High-precision-depth data
- High-quality color images
- Support for multiple-resolution / frame-rate depth images
- Support for multi-resolution / frame rate / format color images
- Type-C / DC two power supply modes are supported
- Supports multiple-camera synchronization
- Support for obtaining the six-axis IMU data

Application and market

- medical rehabilitation
- somatosensory interaction
- production-manufac-turing
- Smart retail
- Exercise fitness

Recommended system

Windows

- Operating system: Windows 10
- Data interface: Thunderbolt 3 / 4
- CPU: Quad-core, or above
- Memory: It is recommended for 8GB or above

Linux

- Operating system: Unbuntu 20.04
- Data interface: Thunderbolt 3 / 4
- CPU: Quad-core, or above
- Memory: It is recommended for 8GB or above

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Product specifications

Femto Bolt 3D Camera		
Parameter	Specifications	Remarks
Name	Femto Bolt	
Model	F00364-152	
Depth measurement range	NFOV unbinned：0.5m – 3m.86 NFOV binned：0.5m – 5.46m WFOV binned：0.25m – 2.88m WFOV unbinned：0.25m – 2.21m	
Relative measurement accuracy	Laser wavelength 850nm, ambient light 2.2 μ W / cm2 / nm, object surface reflectivity：15% to 95% Relative accuracy：random error standard deviation of 17mm Absolute accuracy：a distance with a typical systematic error of <11 mm + 0.1% (no multipath interference)	
Data transmission interface	Type-C USB 3.0 8 Pin-Connector	* 8 Pin-Connector is a multi-machine synchronization interface
Power supply mode	DC Type-C	
Power supply advice	DC 12V 2A Type-C 5V 3A	
Working mode	Working mode 1：DC power supply + Type-C data transmission Working mode 2：Type-C power supply + Type-C data transmission	
Power consumption	Average power consumption： DC power supply + Type-C data transmission：4.7W Type-C power supply + Type-C data transmission：4.3W	Color image：3840 x 2160@30pfs MJPEG (AE：on, HDR：on), depth & infrared image：640 x 576@30fp Y16, IMU open
	Peak power consumption： DC power supply + Type-C data transmission：8.7W Type-C power supply + Type-C data transmission：7.7W	Color image：3840 x 2160@30pfs MJPEG (AE：on, HDR：on), depth & infrared image：1024 x 1024@15fp Y16, IMU open

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Working temperature	10℃ - 25℃	
Working humidity	8% RH-90% RH (non-condensation)	
Camera size	115.30×64.95×40.26mm ± 0.3mm	
The weight of the machine	348g ± 3g	
Depth image resolution @ frame rate	NFoV unbinned：640 x 576@5/15/25/30fps NFoV binned：320 x 288@5/15/25/30fps WFoV unbinned：1024 x1024@5/15fps W FoV binned：512 x 512@5/15/25/30fps	Image format：Y 16
Degree of depth FOV	NFoV unbinned & binned：H 75 ° V 65 ° WFoV unbinned & binned：H 120 ° V 120 °	
Infrared camera resolution @ frame rate	NFoV unbinned：640 x 576@5/15/25/30fps NFoV binned：320 x 288@5/15/25/30fps WFoV unbinned：1024 x1024@5/15fps W FoV binned：512 x 512@5/15/25/30fps	Image format：Y 16
IR picture FOV	NFoV unbinned & binned：H 75 ° V 65 ° WFoV unbinned & binned：H 120 ° V 120 °	
Color image resolution @ frame rate	3840 x 2160@5/15/25/30fps MJPEG 2560 x 1440@5/15/25/30fps MJPEG 1920 x 1080@5/15/25/30fps MJPEG 1280 x 720@5/15/25/30fps MJPEG、YUY2、N V12 1280 x 960@5/15/25/30fps MJPEG	
Color picture FOV	H 80 ° V 51 ° D 89 ° ±2 °	
Anti-flashing	50Hz&60Hz	
IMU	Data format：float Frequency range：50-2000Hz	Six-axis acceleration & 6-axial angular velocity
Applicable scene	Indoor / semi-outdoor	
Safety	Class1 Laser light	
Camera principle	iToF	
Certification	ROHS 、Reach、WEEE、CP65、EMC、	

	FCC、IC、UKCA、Class 1、FDA	
Camera installation	Bottom mounting：1 x 1 / 4-20un screw holes Installation on both sides：4 xM 2.5 screw holes	
Guarantee	1 year	

1 Introduction

1.1 Purpose and scope of this document

This document describes the ORBBEC®Femto Bolt (Product name) Specification and some design details of the 3D camera products, as well as for the developers to understand and use the related products.

1.2 Term

-Table 12-1 Terminology description table

Term	Description
Depth	The deep video stream is basically consistent with the color video stream, except that each pixel value represents the spatial depth of the observed object from the camera, rather than the color information in the color image
FOV	Field of view, used to describe the angle range of the camera observing a given scene, is mainly horizontal field of view (HFOV), vertical field of view (VFOV) and diagonal field of view (DFOV)
IR Camera	Infrared camera, or an infrared camera
Depth Camera	It only includes the depth imaging module and the external interface, and the depth imaging module is generally composed of infrared projector, infrared camera and depth calculation processor
I2C	I2C bus is a simple, two-way second-line synchronous serial bus developed by Philips Company. It requires only two wires to transmit information between devices connected to the bus
ISP	Image signal processor, used for the post-processing of the image
IR Flood	IR flood light, using infrared light to illuminate the environment, is used to fill the light for infrared imaging
MIPI	The MIPI Alliance, namely the Mobile Industry Processor Interface (Mobile Industry Processor Interface for MIPI) Alliance. MIPI (Mobile Industry Processor Interface) is an open standard and a specification for mobile application processors initiated by the MIPI Alliance

SoC	System on Chip abbreviation, called chip level system, also known as chip system, means that it is a product, is an integrated circuit with dedicated goals, which contains the complete system and has the entire content of the embedded software
PCBA	Circuit board, carrying depth computing processor, memory and other electronic devices
TBD	To be determined, information will be provided in later revisions

2 Product composition

2.1 Component composition

This section will introduce the basic structure of the Femto Bolt 3D camera. Structural size data and pictures may cause subtle differences due to differences in product configuration, please refer to the physical object.

2.1.1 Product physical picture

Figure 2-1-1 Physical picture

Figure 2-1-2 Physical facing picture

Figure 2-1-3 Backview physical picture

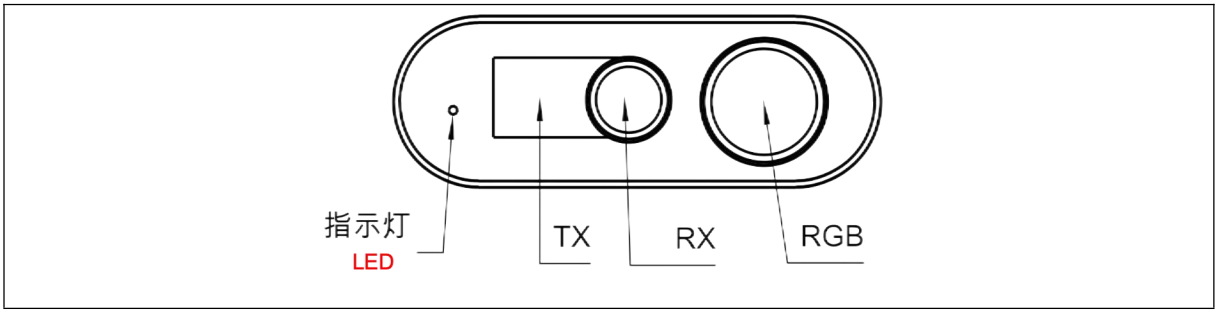
2.1.1 Camera size

Table 2-1-1 Femto Bolt 3D Camera dimensions

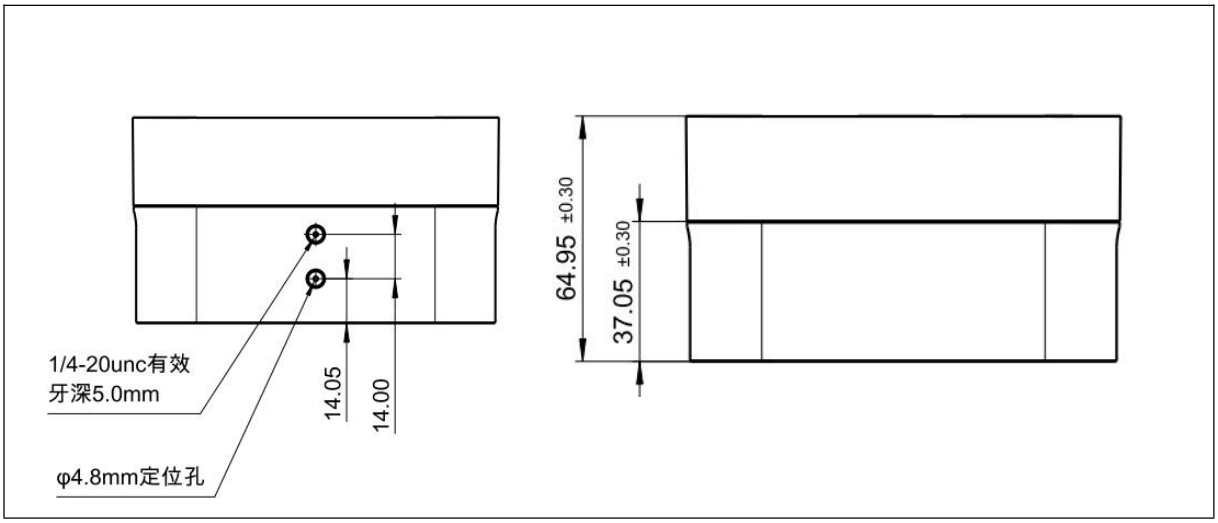
Size	Representative value	Unit
Long	115.3 ± 0.3mm	mm
Wide	64.95 ± 0.3mm	mm
Thickness	40.26 ± 0.3mm	mm

Femto Mega 3D Schematic diagram of the camera size and structure, as shown in the following figure:

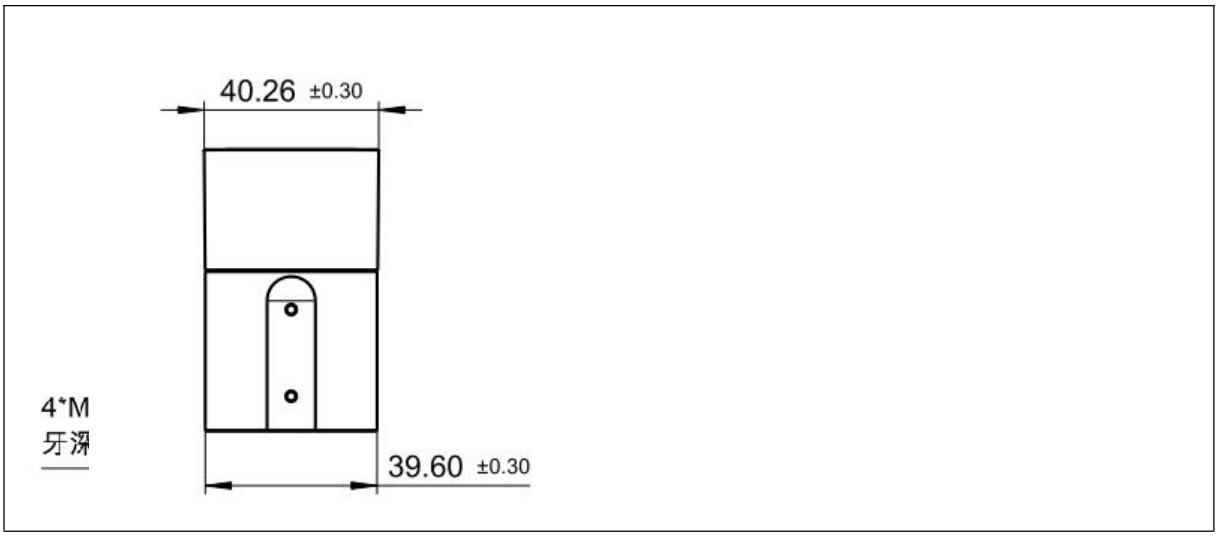
2.1.2 Appearance size diagram



2-1-4 Face map annotation map



2-1-5 Top view annotation map



2-1-6 Side view annotation map

2.2 Component instructions

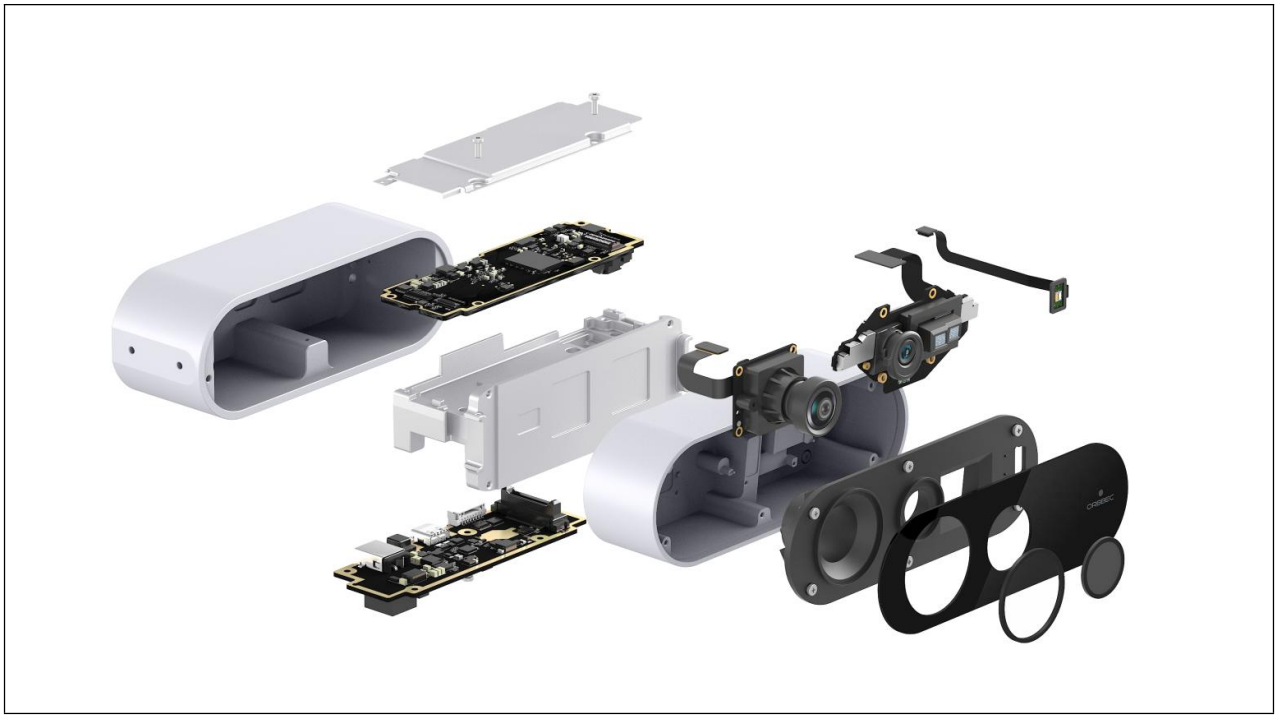


Figure 2-2-1 Explosion diagram of the Femto Bolt structural components

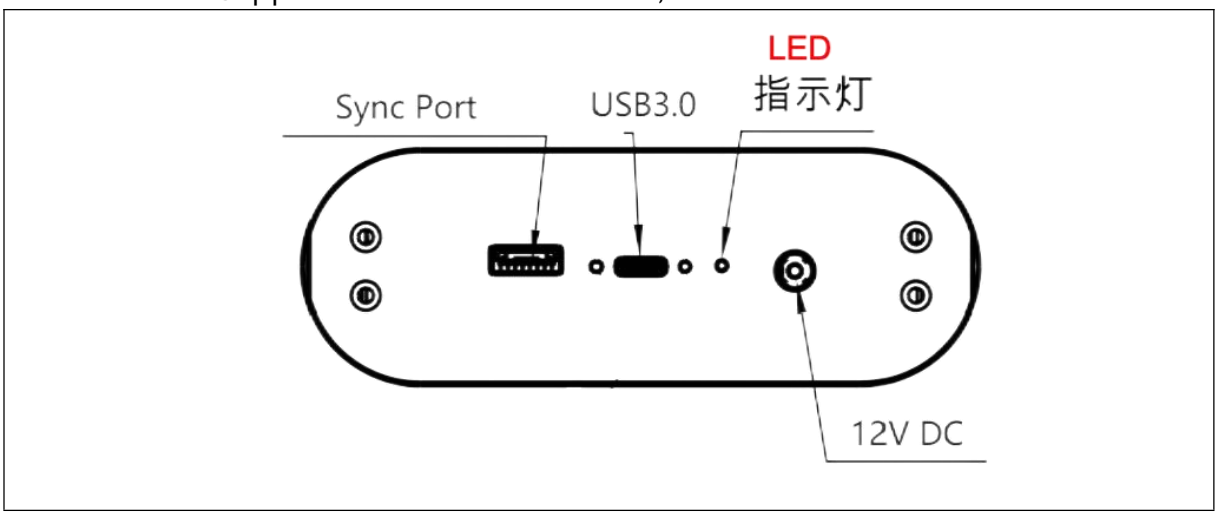
Femto Bolt The camera assembly is shown in the following table:

-Table 22-1 Femto Bolt camera component table

System constituent	Femto Bolt
RGB module	√
IR module	√
TX module	√
PCBA	√
TYPE-C transfer plate	×
ISP	√
Photoelectric bracket	√

2.2.1 3D camera interface

Femto Bolt Supported hardware interfaces, as shown below:



2-2-3 Femto Bolt hardware interface diagram

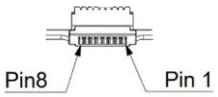
-Table 22-2 Description of the Femto Bolt camera interface

System constituent	Femto Mega
12V DC	12V 2A DC power supply interface
Type-C USB3.0	Power supply interface & data transmission interface
Sync Port*	8-Pin synchronization interface, realize the multi-machine synchronization function

-* Table 22-3 Femto Bolt

Pin	Definition
Pin _1	VCC
Pin _2	GPIO _ OUT synchronization interface, reserved for output GPIO
Pin _3	V SYNC _ OUT synchronization interface, synchronization signal output
Pin _4	TIME_SYNC_OUT
Pin _5	REST _ IN external reset signal input, re-power the device, the high level is effective
Pin _6	V SYNC _ IN synchronization interface, synchronizing the signal input
Pin _7	TIME_SYNC_IN
Pin _8	GND

* Horizontal forward placement camera interface Pin order as in the right



3 Functional specification

3.1 Supplier Identifier (VID) and Equipment Identifier (PID)

Table 3-1-1 for Femto Bolt VID and PID

3D camera name	Unit type	VID	Device identification code PID

Femto Bolt	F00364-152	0x2BC5	0x066B

3.2 Multi-machine synchronization function (Basic principle)

Each Femto Bolt device is equipped with a synchronous interface for up to eight Femto Bolt connections. Using multiple Femto Bolt devices can meet more needs, including:

- Fill the occlusion area: Since the depth on the Femto Bolt and the RGB, the two cameras actually maintain a small distance. This offset makes the occlusion possible. This occlusion refers to the foreground object, blocking part of the view of the background object from one of the two cameras on the device.
- Better scanning for 3 D objects;
- Increase the spatial coverage range of the camera;
- Increase the effective frame rate to values above 30 frames per second (FPS);
- Capture multiple color images of the same scene;
- The multi-machine synchronization function can be better used in scenes such as shooting volume video and the need for large field Angle.

The synchronization function can be realized through two connection modes:

Chain topology:

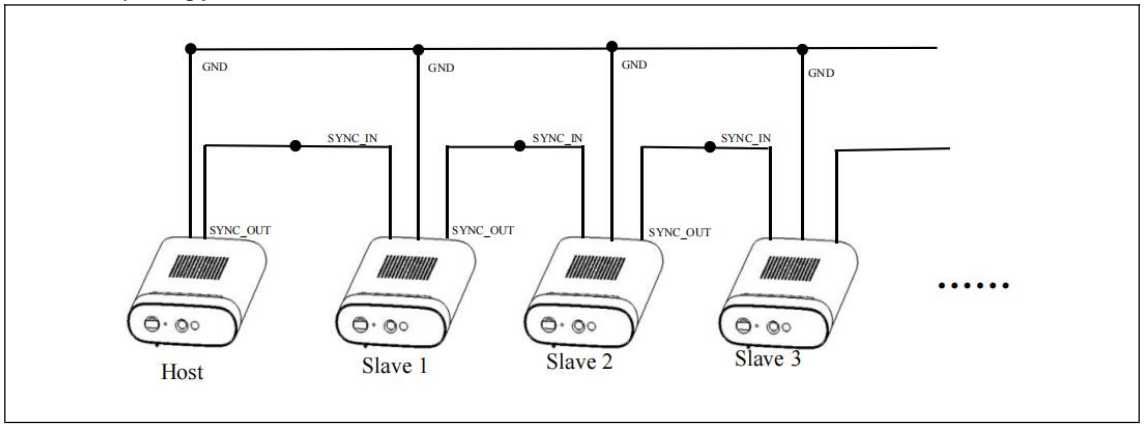


Figure 3-3-2 Chain-type topology

Star topology:

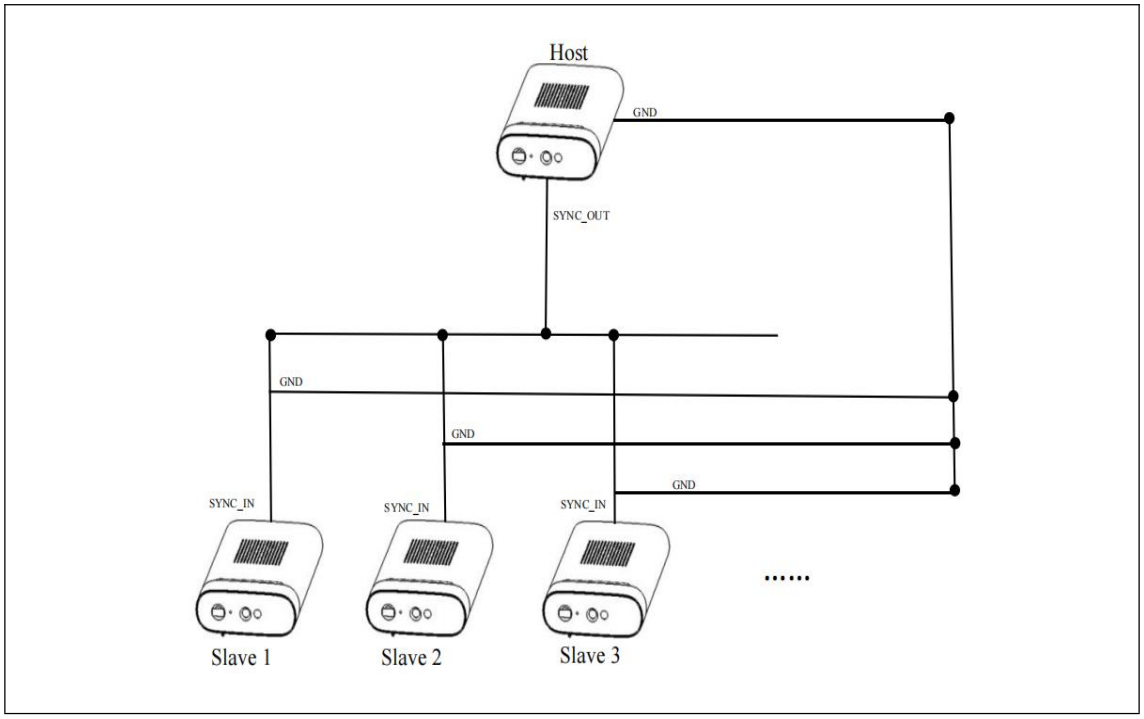


Figure 3-3-1 Schematic representation of the star topology

The multi-machine frame synchronization, deep image synchronization and RGB image synchronization can be realized in two topological modes (time difference of 12ms)

3.3 Deep-color D2C alignment

Femto Bolt Can support D2C depth and color map alignment synchronization output. D2C (Depth To Color) refers to the mapping of each pixel on the depth map to the corresponding position of the color map according to the internal and external parameters of the depth camera and the color camera, so as to obtain the RGBD map. The D2C function supports the alignment of all resolution depth images to any format & resolution color images, but it should be noted that the frame rate of depth image and color image should be consistent.

Table 3-8-1 Femto Bolt depth color map D2C alignment

Depth map	Color picture
1024 x1024@5/15fps 640 x 576@5/15/25/30fps 512 x 512@5/15/25/30fps 320 x 288@5/15/25/30fps	3840 x 2160@5/15/25/30fps MJPEG 2560 x 1440@5/15/25/30fps MJPEG 1920 x 1080@5/15/25/30fps MJPEG 1280 x 720@5/15/25/30fps MJPEG、Y UY2、N V12 1280 x 960@5/15/25/30fps MJPEG

4 Performance

4.1 Electricity performance

4.1.1 Power

Femto Bolt The DC power adapter specification is as follows, ensuring reasonable use under this requirement.

It is necessary to meet the AC grid input requirements of the current region (according to the AC power of the actual place of use decision, it is best to use the wide voltage input power adapter). In order to ensure the safe use of the adapter, it is recommended to choose the brand and model of the corresponding safety certification and EMC certification.

DC output voltage: 12V ± 5%

DC output with load voltage ripple: 600 mV

DC output current: 2,000 mA

4.1.2 Indictator lamp

The front of the equipment is equipped with an indicator light, which is only in the working state of the equipment. It is turned on by default, and the switch can be set manually.

Indicator lamp status	Representation
Stable white	The device is connected normally, and can be normally configured and discharged
Flashing orange	Camera failure, abnormal operating condition

The rear of the equipment is equipped with power supply indicator to indicate the power supply and data connection status. The default is on and cannot be closed manually.

Indicator lamp status	Representation
Stable white	The device has been powered up to establish a valid USB 3.0 or port data connection
Shinked white	The device is powered up but a valid USB 3.0 or port data connection is not established
Flashing orange	Insufficient power supply for equipment

5 Firmware

5.1 Firmware upgrade update

1. Firmware upgrades need to enter a specific mode;
2. When upgrading the firmware, make sure that the data stream is closed;
3. The upgrade tool does not currently check for the possible upgraded or upgraded firmware version of the current device need to "upgrade".

5.2 Update restrictions

After a successful upgrade, the power restart is required and the new firmware version will take effect. During the recovery and upgrade process, ensure that the USB cable is stable, otherwise the upgrade may fail. After the failure, please disconnect the power supply, reconnect the power supply, and burn again.

6 SDK

6.1 SDK explain

Orbbec SDK Is a cross-platform (Windows, Linux) for 3D camera, provide device parameter configuration, data flow reading and flow processing software development package, providing functions including:

1. Access to and control of the hardware devices;
2. Access, control, and data acquisition of the sensors contained in the device;
3. Control of frame synchronization and alignment;
4. Acquisition of point cloud data (later update SDK version);
5. Different systems and Azure Kinect SDK Wrapper support;
6. Effect display tool Orbbec Viewer.

If you want to download and update SDK, please enter the 3D visual developer community: developer.orbbec.com.cn

7 Instructions for use

7.1 Installation / Fixing scheme

1. 3D camera and shell with foam or Rubber seal, for dust prevention;
2. Do not apply external force to the 3D camera holder during installation;
3. Do not remove the screws between the 3D camera holder and the bridge steel sheet during installation.

7.2 Heat dissipation advice

1. Requirements: the metal support should be far away from other heat sources, to provide good heat dissipation conditions for each 3D Camera, it is strictly prohibited to heat it;
2. Requirements: the back of the motherboard designated chip needs to increase the heat dissipation structure in the whole machine;
3. The 3D camera shell increases the internal space, which is conducive to reducing the ambient temperature of the hardware work;
4. 3D camera shell makes the cooling window structure, considering the local opening of the hole or local or large opening similar to the shutter, considering the whole machine waterproof and dustproof, can increase the auxiliary materials of horn-shaped net.

Note: Installation and heat dissipation are mainly suitable for 3D cameras. For a detailed heat dissipation plan, please contact the sales staff of Orbbec Technology Group Co., Ltd.

7.3 The light transmittance requirements

Femto Bolt 3D The light transmittance parameters of the protective lens are as follows:

1. RX transmittance requirements: 835-865nm Tmin> 85%, 800-960nm Tave> 88%,

400-700nm Tave <2%

2. RGB light transmittance requirement: 420-680nm Tmin> 97%

3. Material plane requirement of front cover lens: <0.005mm;

4. It is recommended to use the glass material material.

If you want to change the structural design of the camera, the protective lens in front of the camera lens should meet the above requirements.

8 Laws and regulations and product implementation standards

Femto Bolt The product has passed the following certification:

1. ROSH
2. Class 1
3. Reach
4. WEEE
5. CP65
6. EMCS
7. FCC
8. IC
9. UKCA
10. FDA

9 System Integration Guide

Before selecting XXX product camera for development, users should contact the sales staff of Orbbec Technology Group Co., Ltd., obtain the user manual and apply for SDK development package; and confirm whether the scheme meets the requirements of mass production through evaluation, debugging and verification.

We provide the SDK for Femto Bolt 3D cameras adapted to various software platforms, and you need the SDK of the corresponding platform to develop and use the hardware devices. The SDK supports Windows, Android multi-platform. SDK is a secondary development package launched for the series of products. After purchasing the product, users can obtain the SDK package through the 3D vision developer community. Users can obtain the depth map through the 3D camera, and convert the original depth into point cloud data using the corresponding API interface. More application layer products can be developed by using the driver and SDK suite.

Suggested process:

1. Read the Femto Bolt product specifications;
2. Official mall to buy and obtain Femto Bolt 3D cameras;
3. Before development, we should contact the sales staff of Orbbec Technology Group Co., Ltd. to obtain the user manual and apply for the SDK development package;
4. Choose the appropriate development platform;
5. Develop products according to the function. If you encounter any technical problems, please contact the staff of Obi Zhongguang in time;
6. Confirm the mass production scheme of the terminal products;
7. Mass production of terminal products according to the mass production scheme.

10 Matters need attention

1. Please follow the instructions to operate the machine correctly, if the illegal operation may cause damage to the internal components;
2. Do not fall or hit this product to prevent damage to internal components and accuracy decline;
3. Do not try to modify or dismantle this product in any way during the assembly and use process, so as to avoid the damage and precision degradation of the 3D camera;
4. The temperature of the product rises after a period of use, which is a normal phenomenon;
5. Do not touch the lens, so as not to leave foreign bodies and thus affect the drawing effect;
6. Do not place the product in places where children or animals are touch to avoid accidents;
7. If the camera cannot be identified, please check whether the wire meets the power supply requirements, and re-plug the USB for inspection;
8. Although this product uses a Class1 laser (harmless without control laser), we also do not recommend directly viewing the laser transmitter for more than 20 seconds to avoid discomfort.