

3D FPV camera The BlackBird 1

User manual

Table of contents

1	Description and operation	2
1.1	Product description.....	2
1.2	Specifications.....	2
1.3	Equipment	3
1.4	Construction	4
1.5	Device and operation	5
1.6	Adjustment instrument, tools and accessories	5
2	Intended use	6
2.1	Operating limitations.....	6
2.2	Preparing for use.....	6
2.3	Product use	8
3	Product maintenance	8
3.1	Setting focus lenses	8
3.2	Adjusting the vertical offset images	8
3.3	Configuring convergence	9
3.4	Possible errors and methods of their elimination	9

1 Description and operation

1.1 Product description

Stereo video camera BlackBird 1 (further in the text "camera" or "product") is designed for generating a video signal in the interlaced 3D format. The camera generates stereo image in real time, and small size, support power supply input voltage in the range from 5V to 12V and variable stereo base, making it versatile and easy to use.

For the wireless transmission of stereo image from the camera to your 3D monitor or 3D video goggles, you can use an analog video transmitter. Recording is done with the help of video capture devices.

The main area of use BlackBird 1 - FPV (first person view), as the steering cameras on radio-controlled model quadcopter, airplane, car, robot platform.


1.2 Specifications

Table 1

Video sensor	
Model	Omni Vision OV7950
Size and type of the matrix	1/4" CMOS
Size of the array of pixels	656 x 492
Sensitivity	3.0V/Lux-sec @ 5600K
Signal / noise rate	48dB
Mechanical and performance	
Camera weight	21 g.
Dimension (LxHxW)	Ver. 1.3.2 – 34 x 32 x 25 mm Ver. 1.3.3 – 34 x 34 x 25 mm
Interface connector	on board MW-3M, on cable MU-3F
Board-to-board connector	PBD1.27-8A, PLLD1.27-8A
Operating temperature	from -20 °C to +50 °C
Optics	
Focal length of the lens	2.5 mm
Angel of view	90°
Thread type	M12 x 1
IR filter on the lens	680 nm (day lens for color cameras)
Focus operation	by hand
Electrical specifications	
Supply voltage	5V – 12V (the recommended voltage 5V)
Consumed current, not more	130 mA
Power consumption at 5V (12V)	0.65W (1.56W)
Video output	
Video format	NTSC 525/60
Video output	75 ohm, scope 1V
Horizontal resolution	470 TVL
Stereo	
3D format	interlaced 3D (field sequential 3D)
Frame rate for each eye	30 Hz
Minimum stereo base	17.5 mm
Adjusting the convergence	by hand

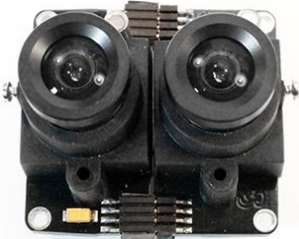
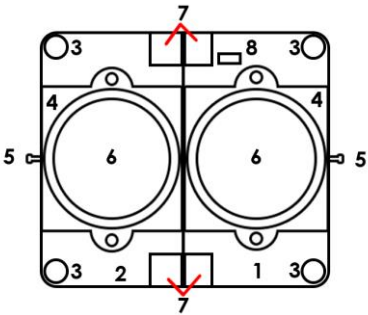
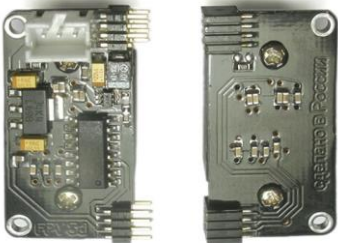
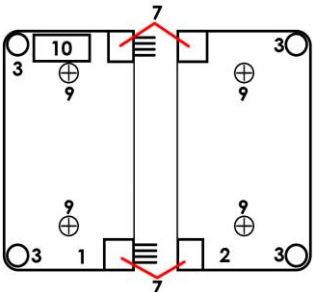
1.3 Equipment

Table 2

picture	name	number
	<p>3D FPV camera The BlackBird 1</p>	<p>1 part</p>
	<p>Lens cap - used to protect the lens from dirt and damage during storage or carrying the BlackBird 1</p>	<p>2 part</p>
	<p>Interface cable - connects the BlackBird 1 output to a playback device or to a video transmitter, connection to a power source</p>	<p>1 part</p>
	<p>Power splitter - is a branching JST connector to the Li-Po battery. It allows you to connect the BlackBird 1 and a video transmitter to the same power source</p>	<p>1 part</p>
	<p>Connection cable 20 cm - its application allows you to post board BlackBird 1 at a distance of 20 cm, thereby increasing the stereo base. Plugs into the lower board-to-board connector of main and additional board of the camera</p>	<p>1 part</p>
	<p>Cable for soldering</p>	<p>1 part</p>

1.4 Construction

Table 3

<p>front view (parts connected)</p> <p>Picture 1a</p> 	№	name	number
	1	Printed circuit Board part 1 - main	1 part
	2	Printed circuit Board part 2 - additional	1 part
	3	Mounting hole	4 part
	4	Lens holder	2 parts
	5	Screw fixing lens	2 pcs
<p>back viws (parts disconnected)</p> <p>Picture 1b</p> 	6	Lens	2 part
	7	Board-to-Board connector	4 pcs
	8	Led	1 pcs
	9	Mounting screw mount lens	4 pcs
	10	Interface connector	1 pcs

The product consists of the printed-circuit board with the electronic components and lenses which are installed on it.

The board of the camera consists of two parts, the main (1) and additional (2). On the main part there are the interface (10) and board-to-board connectors (7). On the additional part there are only board-to-board connectors (7).

On the board video sensors are installed. They are closed with the lens holders (4). In the holders there are lenses (1) which are installed and fixed with screws (5). Lens holders are fixed on the board with screws (9).

Indication of giving of supply is made by the led (8) located on the face of the main board (1).

Interface connector (10) provides voltage to power the camera and get video images. Numbering of contacts of the socket is made from left to right ([see picture 1b](#)). First contact **plus 12V**, second pin **GND** (it is common for power and video), the third contact - **video output**.

Connecting to a power source and the receiver signal is performed using the interface cable.

1.5 Device and operation

The basis of video camera is made by two sensors and their optical system. Signal from a sensor switched alternately, thus, signal is generated in the format interlaced 3D. Then the signal is amplified and transmitted to the interface connector.

1.6 Adjustment instrument, tools and accessories

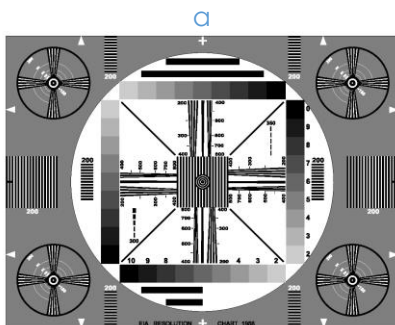
The main tool that is required for camera maintenance - phillips screwdriver. It is used when setting the vertical displacement and focusing the lenses. You can use it to loosen the screws that hold the lenses and their holders.

Optional accessories:

- Pencil for cleaning lenses. It is used to clean the lenses from contamination ([see picture 2b](#)). The flat side of the stick used for cleaning the lens from dirt. A brush is used to clean the dust from the lenses.
- Connecting cable 300 mm need to connect board camera together. You can order cable of any length, but not more than 2m.

As a means of measurement resolution it is used a special table. For example, EIA1956 or another for resolution of at least 600 TVL ([see picture 2a](#)).

Picture 2. Accessories



2 Intended use

2.1 Operating limitations

Operating temperature of the camera is in the range from -20 to +50 degrees Celsius. If you want to use at other temperatures, it is needed to organize additional cooling or heating to ensure an acceptable temperature.

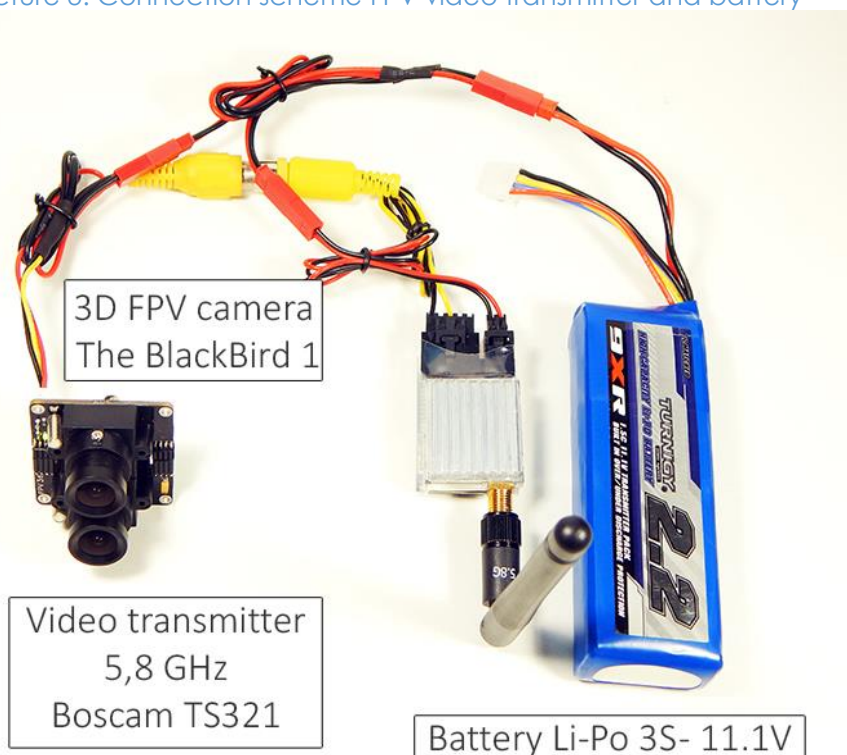
The camera is made in case less form and is not protected from moisture. Protection class sensors IP50, class of protection, other components IP00. For use in humid environment it's needed to protect from moisture.

2.2 Preparing for use

Connect video and power

Before you begin, you need to connect the BlackBird 1 output to a video playback device or a video transmitter¹, and also to a power source. To do this, connect the interface cable to the interface connector of the BlackBird 1. The yellow RCA connector of the interface cable is connected to the playback device or a video transmitter. The red JST connector of the interface cable is to be connected to the 2S or 3S Li-Po battery or another power source. If everything is connected correctly, the camera should light up the LEDs and the video monitor / stereo video goggles connected to the camera should display the live video of the BlackBird 1.

Picture 3. Connection scheme FPV video transmitter and battery



¹ Under playback device or a video transmitter are understood: video eyepieces, monitors, video transmitters, video capture devices, etc

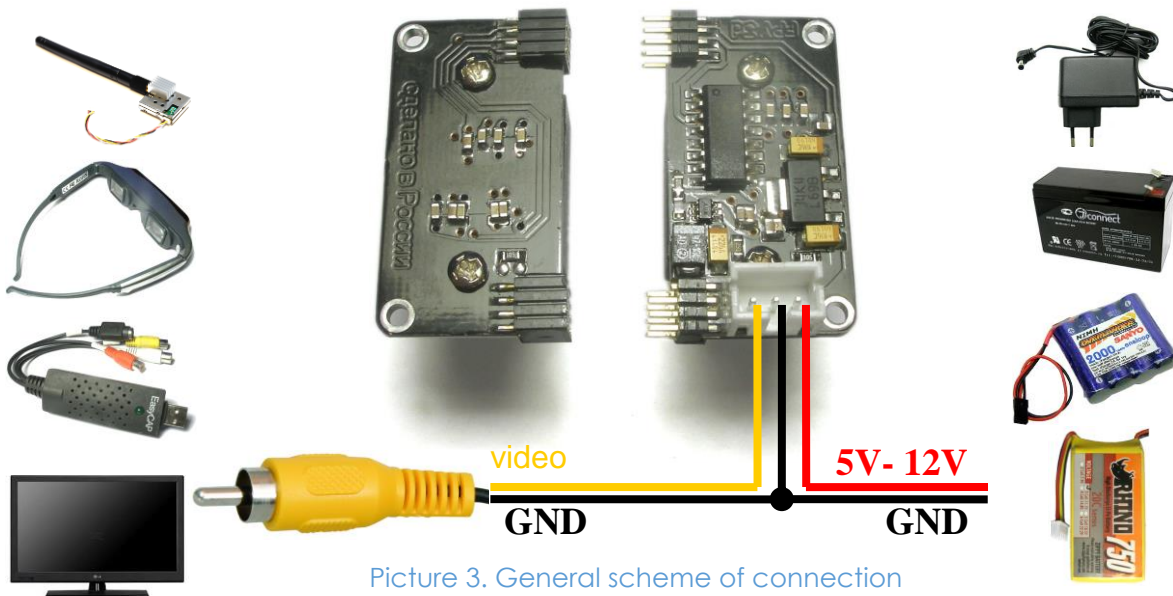
Do not connect the video output jack to the audio input. Usually this RCA red or white jacks. It does not cause damage, but the image on the monitor / stereo video goggles will not show.

As power for the camera it is permissible to use an external DC power source with a voltage of 5 to 12V. The sources to be used can be:

- From 4 to 9 batteries with a voltage (1.5V) connected in series;
- From 5 to 9 batteries NiMH, NiCd (1.2V) connected in series;
- From 2 to 3 batteries Li-Ion, Li-Po (3.6V) connected in series;
- 1 lead battery with a voltage of 6 to 12V;
- A stabilized DC power supply with a voltage of 5V to 12V and a current of 150 mA.

Plus power supply connects to the red wire of the interface cable, minus connected to the black wire of the interface cable.

Attention! Observe that the polarity to the power supply connections are correct. Connection of the power supply to the video output, or failure to comply with the polarity will damage the camera!



Picture 3. General scheme of connection

Before starting

Before using the BlackBird 2 it is recommended:

- check the lens focus settings (item 3.1)
- ensure there is no vertical image shift (item 3.2)
- configure convergence..... (item 3.3)

2.3 Product use

Camera that is configured and correctly connected starts immediately after power-up. Led ([see Table 3, position 8](#)) indicates that power is supplied.

Before long use of the camera, you have to verify the absence of vertical offsets. For this purpose it is enough to disable the 3D mode on the video receiver and visually to appraise the offset of the left and right image relative to each other. If there is noticeable offsets to configure according to [item 3.3](#)

3 Product maintenance

3.1 Setting focus lenses

To adjust the focus you need to do the following actions:

- Loosen the fastening screw of one lens ([see table 3, position 5](#))
- Rotate the lens until the image is clear for the desired distance
- Fix the lens with screw
- Repeat for the second lens

3.2 Adjusting the vertical offset images

Vertical offset of the image is poorly perceived by human. If there is offset, it's possible rapid eye fatigue and incorrect perception of the volume.

To perform the setting you need to prepare the camera for ([see item 2.2](#)), disable 3D mode on the receiver of the signal and visually appraise the offset of the left and right image relative to each other.

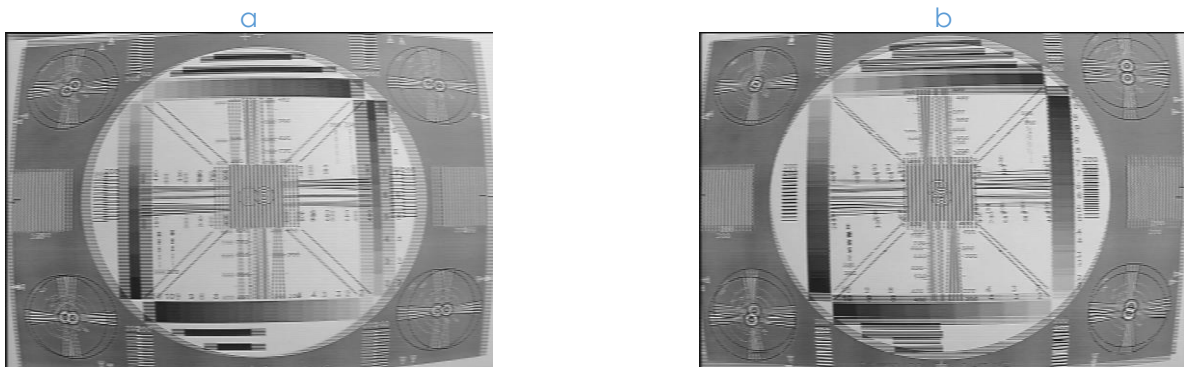
Picture 4a shows the image from the adjusted camera, without vertical offset. There is only horizontal offset caused with the mixing of the optical axis of the lens (convergence).

Picture 4b shows the image which is not properly configured camera. There is only the vertical offset.

For correction of offset loosen the screws of the holders of the lens ([see picture 1b, position 9](#)), move them to reduce offset images and fix it again. After fixing to appraise the offset of the image again. If it is necessary, adjust the focusing of the lens.

When you spread boards of camera using the connection cable also need to remove the vertical offset by turning and safe fixing the boards.

Picture 4. Image offset



3.3 Configuring convergence

Convergence is the angle between the optical axis of the lens and the left and right camera.

If the optical axis of the lens intersect on a monitored object, in this place will be missing the horizontal offset of the image. The object will be visible on the screen plane.

If the optical axis of the lens intersect behind the object, it will be visible in front of the screen, and if before the object - behind the screen.

To configure the convergence it is necessary to tilt the lens to each other or apart. There are no special instruments of fixation of convergence on the product. For fixing it is necessary to firmly secure the cards of camera during installation.

3.4 Possible errors and methods of their elimination

errors	reason	elimination
LED doesn't light	<ul style="list-style-type: none"> It is not powered on the board of camera LED is broken. 	<ul style="list-style-type: none"> Check the power connection, eliminate breakage Contact technical support
LED burns, no picture	<ul style="list-style-type: none"> Video signal isn't fed to the receiver Malfuction in the camera's 	<ul style="list-style-type: none"> Check the power connection, eliminate breakage Contact technical support
The image is visible from only one camera (half or full), image jerks	<ul style="list-style-type: none"> There is no connection between boards The break in connection cable Malfuction in the camera's 	<ul style="list-style-type: none"> Check the plug connection between boards Replace connection cable Contact technical support
The consumption is more 150 mA.	<ul style="list-style-type: none"> Short circuit in board-to-board connector Short circuit in the interface cable Malfuction in the camera's 	<ul style="list-style-type: none"> Check the plug connection between boards Replace the interface cable Contact technical support