User Manual

MAMBA Neo IP platform

P/N – TV20 0011: Red Mamba Neo video encoder for LVDS zoom cameras
P/N – TV50 0011: Cable kit for TV20 0011 - Red Mamba Neo IP streaming platform
Includes: 30-way micro-coax camera cable, 2-way cable (power supply), 12-way cable (RS232/TTL/GPIOs), Wi-Fi antenna

P/N – TV20 0012: Blue Mamba Neo video encoder for LVDS zoom cameras
P/N – TV50 0012: Cable kit for TV20 0012 - Blue Mamba Neo IP streaming platform
Includes: 30-way micro-coax camera cable, 2-way cable (power supply), 12-way cable (RS232/TTL/GPIOs)

P/N – TV50 0013: Evaluation kit for TV20 0011 / TV20 0012 - Red / Blue Mamba Neo
Includes: 30-way micro-coax camera cable, 2-way jack cable (power supply), 12-way cable (RS232/TTL/GPIOs), Wi-Fi antenna, Ethernet cable, HDMI A to Micro HDMI D cable, 12V 2A jack universal power supply

	Writing	Approval
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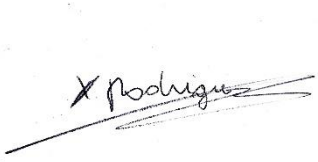
Signature		

Document Revision History

Date	Revision	Description	Modified by	Note
16/05/22	A	Creation of the Document	CBO	
07/04/23	B	Update board and kit references	CBO	
19/04/23	C	Add time zone and initialization script	YRO	

ChangeLog

Mamba revision changelog:

Date	Revision	Description
19/04/23	3.1.2	• Add Time zone option on web server • Add Initialization script • Add Chinese font • Add preview quality • Add full support for Sony EV9520L
01/02/23	3.1.1	• Change RS485 and TCP incoming packets management
02/09/22	3.1.0	• First Mamba Neo TV10 0089 release • Add EV9500L and MP3010 full compatibility • Fix Onvif snapshot size limitation
15/09/21	3.0.8	• Last Mamba TV10 0063 release

Table of content

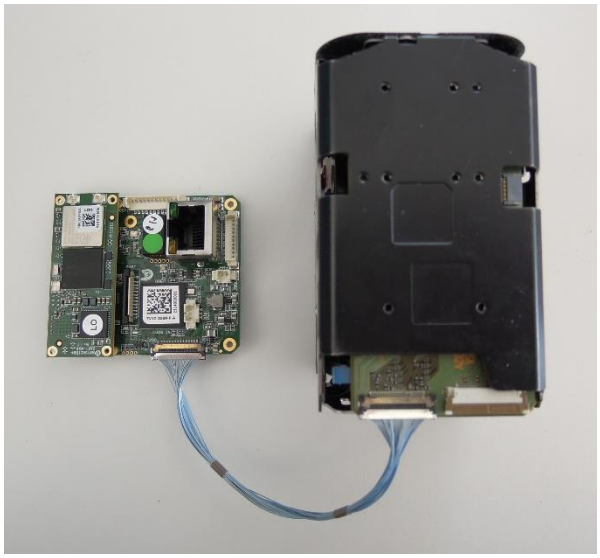
1. Start-up

i) Requirements

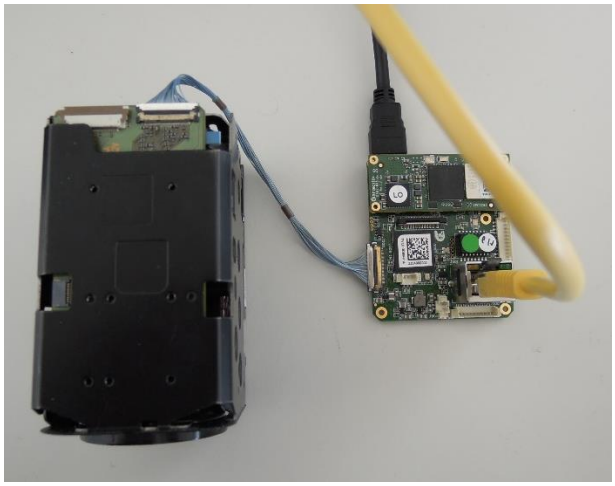
- Twiga Mamba Neo mother board + SoM iMX6 plugged on the top
- 30-way KEL cable
- LVDS Camera block
- Ethernet cable (for video stream over IP)
- Wi-Fi antenna (option for video stream over Wi-Fi)
- HDMI cable (for live video display)
- Power supply, 8-12V
- SD Card (optional)

ii) Connections

- Connect the video source: LVDS camera to the board with a 30 points KEL cable



- Connect the other connectors according to your needs (Ethernet, HDMI, GPIO, debug cable, Wi-Fi Antenna on the top connector) and the SD Card if you want to record.
  For example, the HDMI and the Ethernet cable:



- Connect the power supply to the 2-pins connector. **The maximum voltage is 12V**.

Now you can power up the board.

iii) Behaviour

Once the board started, the camera will be powered up some seconds after. During boot the HDMI screen will output a loading screen with the Twiga logo. Within seconds, a live video from the camera will appear.

A stream is available on the network and on the Wi-Fi. You can also record a video.

The board waits for DHCP (if not set in static mode), if the network does not respond, the IP will automatically be set at the default static IP saved.

iv) Streaming specification

The factory setting is set for the minimal latency over Ethernet with HDMI. You can disable HDMI to reduce latency.

The global latency of the system depends on the decoder and the network. With a powerful PC you can achieve a very low latency. With a smartphone/tablet, it depends on the strength of the internal decoder.

v) MQTT introduction

MQTT is a communication protocol used on the Mamba board between the different applications. It works based on the Publisher/Subscriber system. You can publish a message on a specified topic and receive a message on a topic you subscribed to.

The messages are written in JSON.

Example of message for the topic “mamba/video/setEncoder0”:

```
{
        “bitrate” : 5000,
        “gop” : 8,
        “idr” : 0
}
```

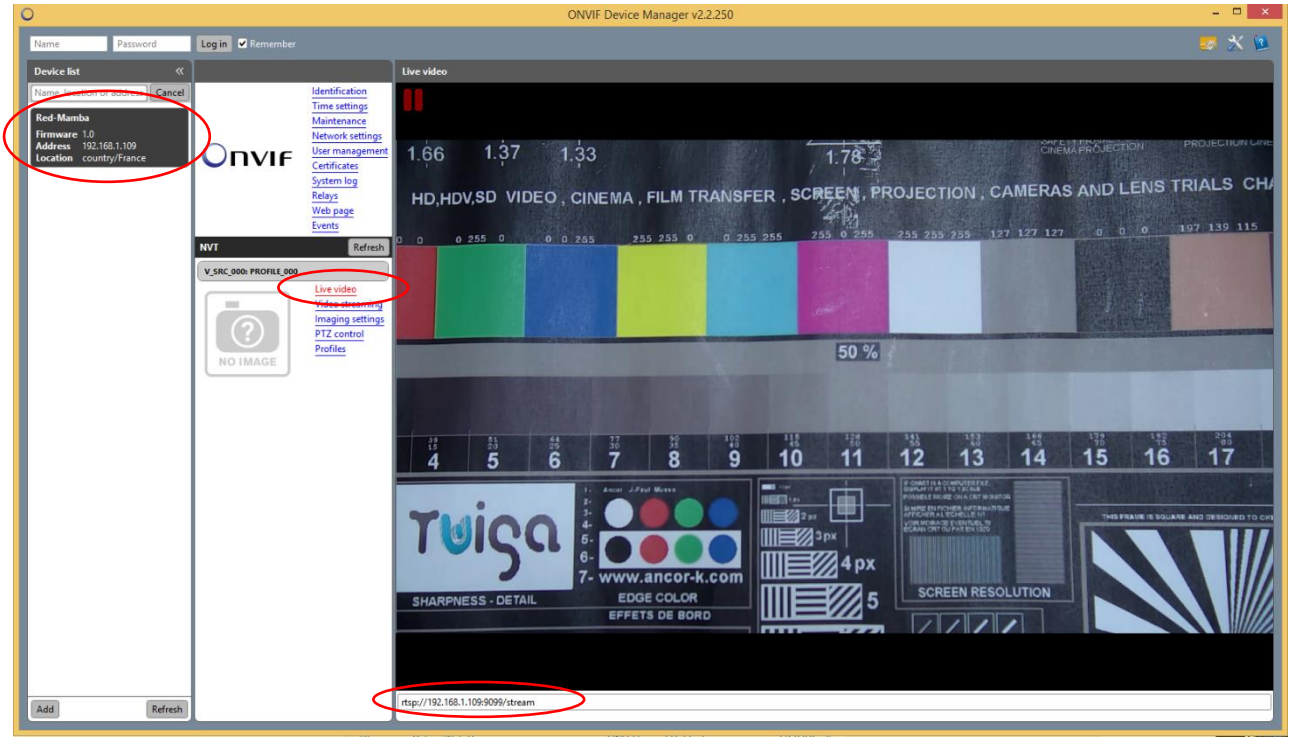
For more information about this protocol, you can consult this link: https://en.wikipedia.org/wiki/MQTT

2. Functions

i) Ethernet Streaming

If you plug an Ethernet cable before the start-up, a live video will be streamed on your network. To find the IP address of the Mamba, we recommend you use ONVIF Device Manager. You just need to launch this application on you PC, it will find the Mamba automatically.

The PC needs to be connected on the same network as the Mamba.



On the left, the "*Red-Mamba*" device is listed. You can see the live video, use PTZ control. At the bottom, the IP of the board is written.

For Linux users, you can use GStreamer, which is the best viewer for streaming video, the latency is the lowest possible.

On Linux you need to launch:

```
gst-launch-1.0 rtspsrc location=rtsp://<IP>:9099/stream latency=0 connection-speed=30000 user-id=client user-pw=twiga2016 ! queue ! decodebin ! queue ! videoconvert ! ximagesink
```

By replacing <IP> with the correct IP of the board. "user-id" and "user-pw" parameters are used to do the authentication to read the stream.

ii) WiFi Streaming

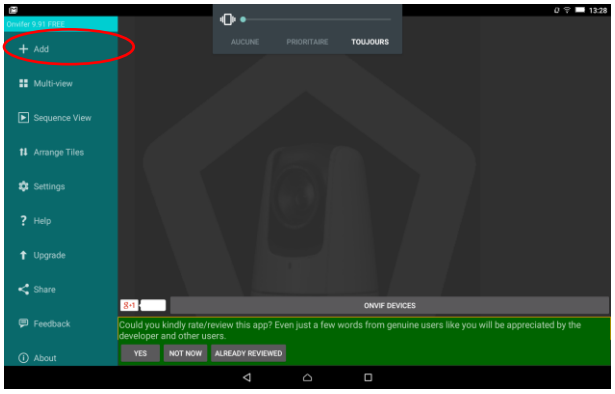
The Wi-Fi streaming is always available. You need to find a Wi-Fi called "RedMamba-XXXXXX", the password is **twiga2016**. The XXXXXX value is the 6 lasts characters of the serial number of the Processor.

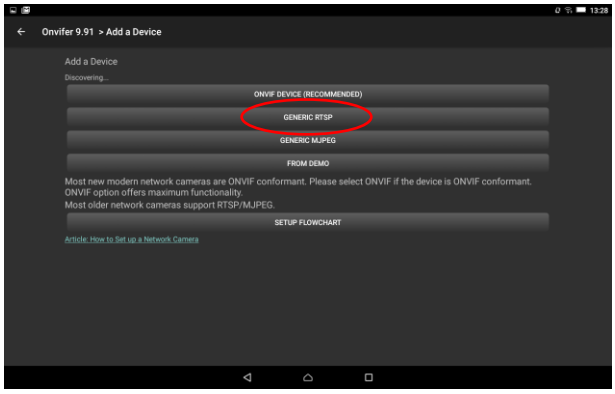
To view the streaming video, we recommend **Onvifer** on Android, **M-Sight Pro** on iOS devices.

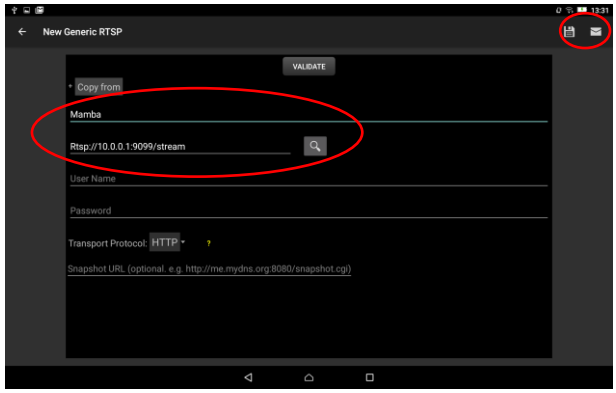
The IP of the Mamba is always 10.0.0.1 on the WiFi.

Onvifer on Android

You need to add a device, as Generic RTSP. Set the URL to **rtsp://client:twiga2016@10.0.0.1:9099/stream** and save it.



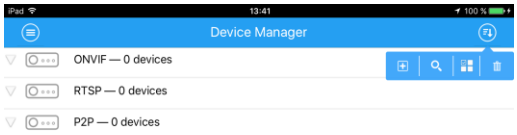


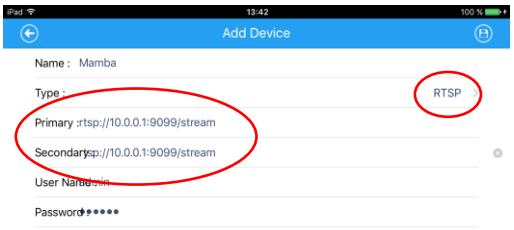


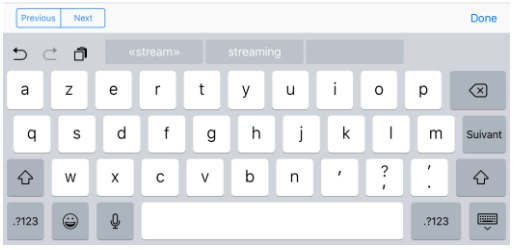
Now you can see the video on your android device (tablet, phone…)

M-Sight on iOS

You need to add a device, as RTSP. Set the primary and secondary to **rtsp://client:twiga2016@10.0.0.1:9099/stream** and save it.







RTSP player on Linux

On Linux we recommend GStreamer, this is the pipeline:

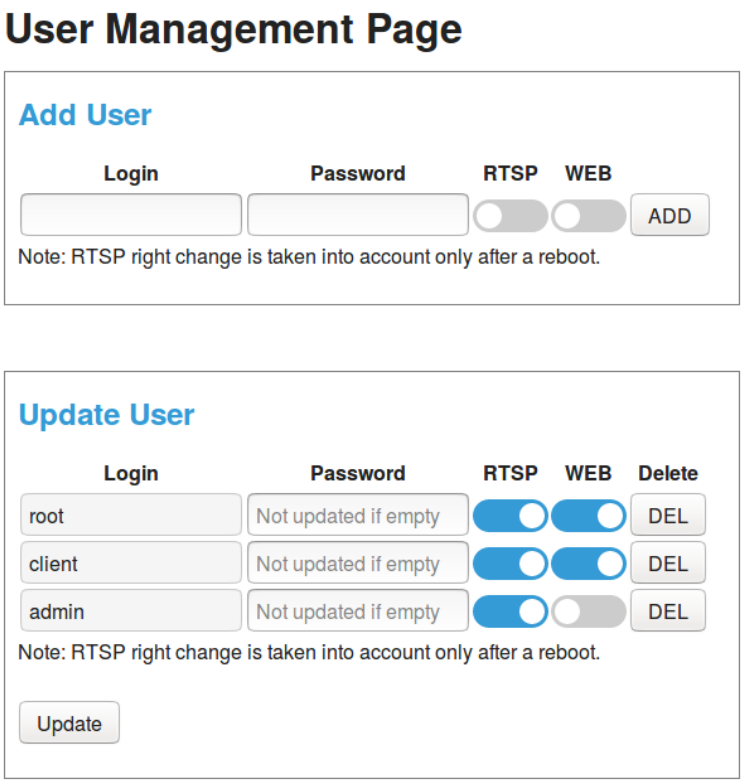
```
gst-launch-1.0 rtspsrc location=rtsp://10.0.0.1:9099/stream latency=0 connection-speed=30000 user-id=client user-pw=twiga2016 ! queue ! decodebin ! queue ! videoconvert ! ximagesink
```

“user-id” and “user-pw” parameters are used to do the authentication to read the stream.

iii) Access Mamba’s website

An authentication page asks you login and password to access to the website and different control pages. The user needs to have WEB right. Basic login and password are “client,twiga2016” and “root,Twig@31!” with root rights.

If you connect as root, you will have access to user management page where you can add, delete, or update other users.



Admin user is only used to get the stream with ONVIF application, do not take it into account.

From the website, you can control the board, change some streaming parameters

Via Wi-Fi

With a Wi-Fi device connected you can access the website of the Mamba by searching 10.0.0.1 in the address bar of a browser (Chrome, Safari, Mozilla Firefox …)

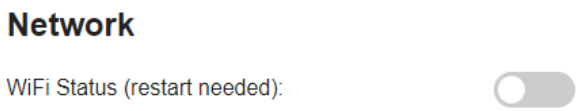
Via Ethernet

You need to know the IP address of the Mamba; you can do this with ONVIF Device manager. Once retrieved, simply type the IP address in the address bar of a browser.

3. Configure the Mamba

i) Disable Wi-Fi

If you do not want to use the Wi-Fi, you can disable it on the Website.



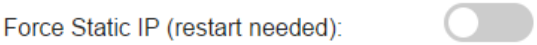
It is like an airplane mode on a Phone. You can choose the Wi-Fi status activated or not.

Clicks on “Update” button and restart the board to change the status. By default, the Wi-Fi is activated.

ii) Set the IP as static

You can force the IP as a static value if you want to use the Mamba directly on your computer (without a router).

You need to activate the corresponding button on the website.



You can set an IP/netmask specific value:

Restart of the board is needed to enable this function.

By default, the IP is not set as static.

Once set as static, connect the RJ45 cable directly to your PC, and restart the board.
You will need to modify your local IP address to **a value corresponding to the network.** The Mamba’s default address is **192.168.1.99**

If you want to come back to a dynamic IP, go to the Mamba’s website and toggle the button to disable it.

Note: The static IP is set if the DHCP server is not found by the system.

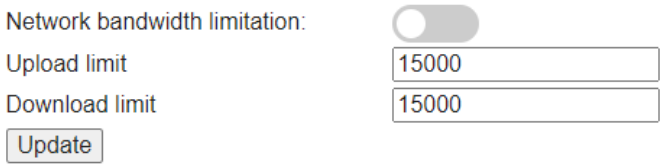
iii) Set default gateway

You can force the gateway as a static value if you want to use a specific one. You need to activate the corresponding button on the website. This option is retained after a reboot of the system.

The chosen gateway must be in the same network as the IP address of the Mamba.

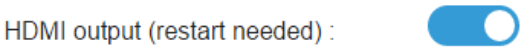
iv) Network bandwidth limiter

You can force a bandwidth limitation to your system. If the stream consumption is higher, you will lose pictures, but it will not exceed the limit.



v) Disable HDMI

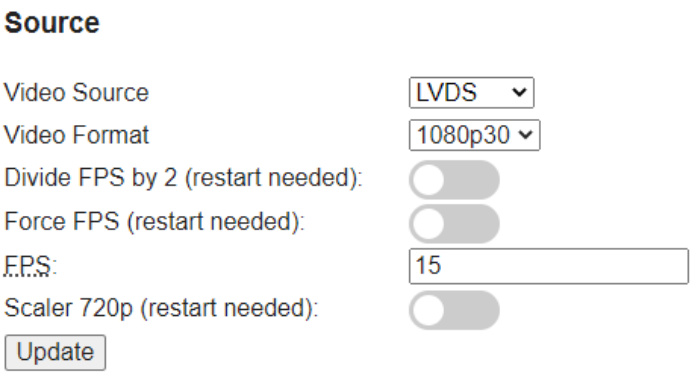
You can disable HDMI output. The latency over Ethernet will decrease by one or two frames.



By default, the HDMI output is enabled.

vi) Main stream parameters

Eight sources are available for the main stream: LVDS, HDMI, MA130, Analog input, HDSDI, USB, 6GSDI and OV5640. For LVDS you only need the camera and a 30 points KEL cable. For others video sources you need dedicated addon boards.

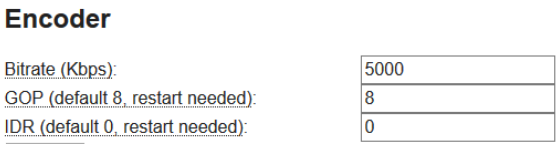


If the LVDS camera is not in the format you choose on the website, the camera will reboot in the good one before the video becomes available.
If the video device is not found a video pattern will be streamed.

Fps can be divided by 2 or forced to a chosen value and a 720p scaler can be activated to allow camera limited to 1080p give a 720p output. The record will keep the fps forced.

Some parameters of the encoder are available. These parameters change the way to compress the video for the streaming and the recording.

The bitrate defines the quality of the video. Below 3000 the video quality is bad, but the recorded size will be small. 5000 is a good compromise, and above 10000 the quality is very good, but the recorded size will be high.



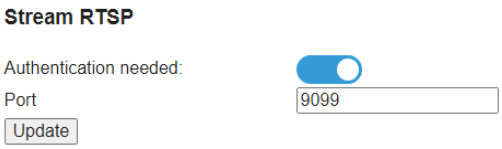
The GOP (group of frames) is a collection of successive pictures within a coded video stream. A video consists of successive GOPs. Encountering a new GOP in a compressed video stream means that the decoder does not need any previous frames to decode the next one and allows fast seeking through the video. Value from 0 to 1000, default value at 8. A small value is better.

A value of 1 allows low latency encoding but requires a higher bitrate value.

The Keyframe value change the P-Frame frequency: the P-frame predict a future frame based on old frames. A P-frame consume less data than other frames. The default value is 0.

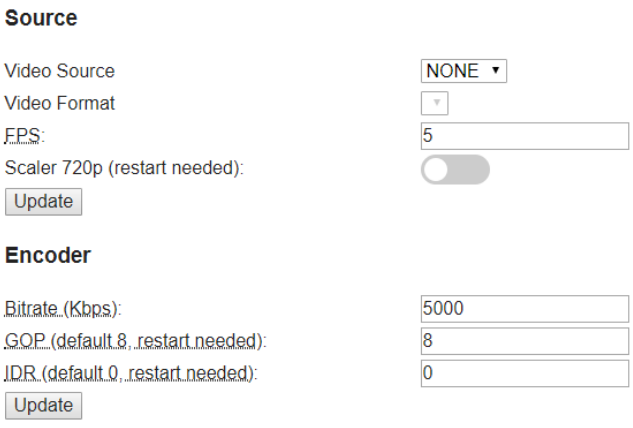
A high value Keyframe increase the latency.

An authentication is available on the RTSP main and second stream. The user needs to have RTSP rights to read it. Basic login and password are “client,twiga2016” and “root,Twig@31!” with root rights. Root user can via the website modify profiles to add or remove RTSP right.
You can enable or disable authentication on the website for each stream.



vii) Dual Stream management

The dual Stream allows a second stream of the same or another video source. You can enable or disable the second stream thanks to the web site, in the control page selecting the video source, the video format and clicking on update button.



Some sources cannot be used at the same time because they use the same MIPI connector or two different addon boards.

	LVDS	MA130	HDMI	Analog	HDSDI	USB	6GSDI
LVDS	OK	OK	OK	OK	NOK	OK	NOK
MA130	OK	OK	NOK	NOK	OK	NOK	OK
HDMI	OK	NOK	OK	NOK	OK	NOK	OK
Analog	OK	NOK	NOK	OK	NOK	OK	NOK
HDSDI	NOK	OK	OK	NOK	OK	NOK	NOK
USB	OK	NOK	NOK	OK	NOK	OK	NOK
6GSDI	NOK	OK	OK	NOK	NOK	NOK	OK
None	OK	OK	OK	OK	OK	OK	OK

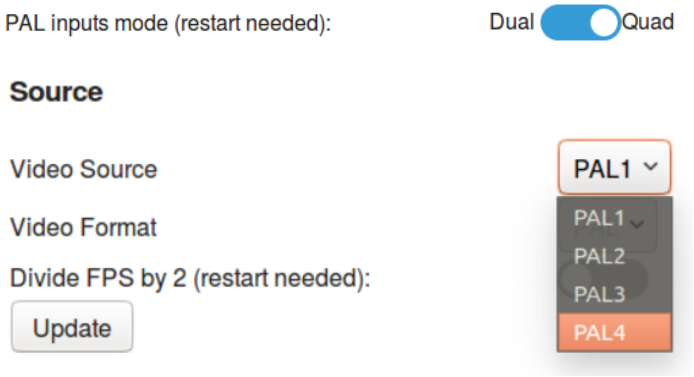
You can also control the bitrate, the GOP and the FPS of the second stream. The goal is to find the right compromise between video quality and latency. The main utility of the second stream is to have a first stream with full FPS and normal quality (bitrate around 5000), and a second stream with a better quality (bitrate of 20000) but a low fps (around 4).
The 720p scaler feature is available on the secondary video source too.

By default, the second stream is disabled, and only bitrate changes do not necessitate a restart of the board. To visualise this stream, the only thing that change from the main stream is the RTSP port used, 9098 instead of 9099.

RTP multicast and RTP mpeg2ts are available on the secondary video source.

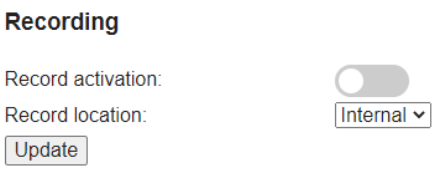
viii) Quad analog inputs mode

With the analog quad input addon board you can use the quad input mode. In dual mode you have 2 analog inputs and another input available for LVDS. In quad mode sources available change, you have only the four analog inputs. You need to reboot the board after changing Pal inputs mode.



ix) Recording a video

You can record video on the internal storage (Local eMMC) or on the micro SDcard.



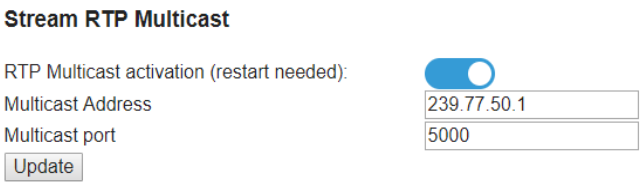
- The SD card needs to be plugged in before record start-up
- If the SD card is not plugged, the record location is set to internal: the video will be recorded on the eMMC.

NOTE: We do not recommend unplugging while recording, or some seconds after.

To record, check the “Record Activation” button and click Update button.
To stop it, uncheck and click Update.
The location can be changed without restart. The location will be taken in account when a record is started.
The space available at the chosen location and the file size are checked. A record is stopped and restarted automatically if the file size exceeds 2Go. 50Mo available space is the limit to authorize a record to start.
Record feature is available on both video sources.

x) RTP Multicast Streaming

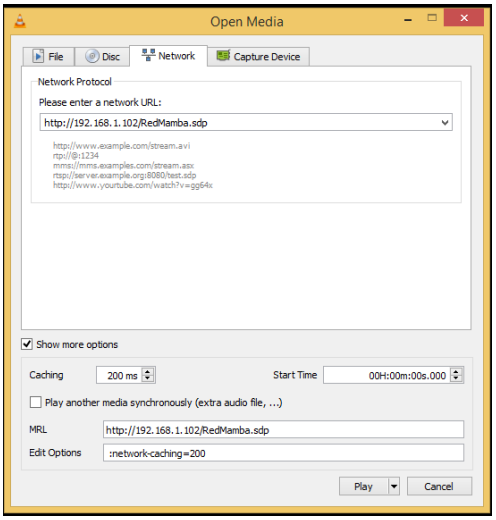
You can enable the RTP Multicast via the website.



You can modify the address and port for RTP multicast.

Once activated/deactivated, you need to click update and restart the board.

To play the stream on VLC, Open a network with: http://<IP>/RedMamba.sdp

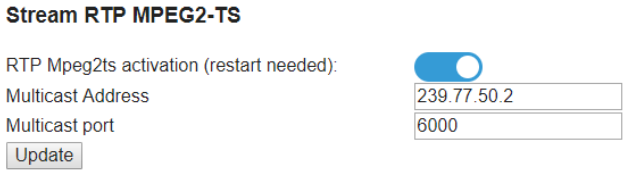


You can reduce the caching value to reduce the latency.

xi) RTP MPEG2TS

Since 2.5.0, a MPEG2TS encapsulated RTP stream is available.

It can be enabled on the website:



Once activated/deactivated, you need to click update and restart the board.

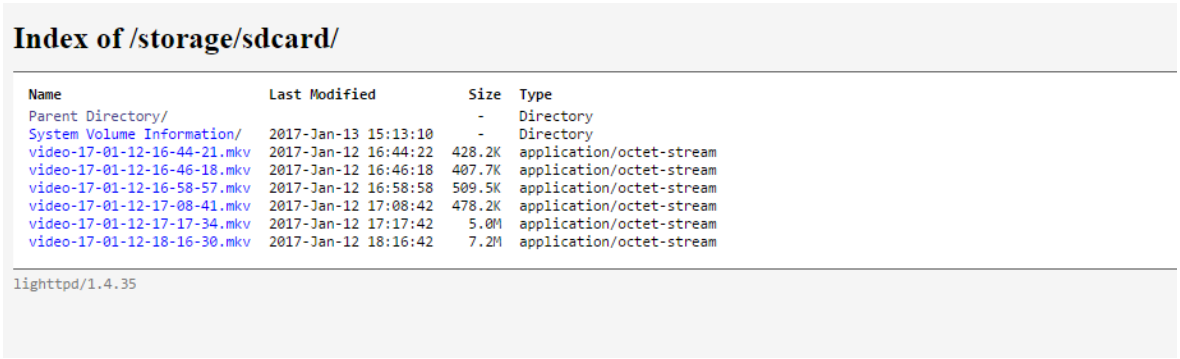
To play the stream on VLC, Open a network with: rtp://<MULTICAST IP>:<MULTICAST PORT>

For example: rtp://239.77.50.2:6000

Sometime the stream will not work, you need to open the ports in Windows Configuration Panel.

xii) Get the recorded videos

You can get your video files on the storage tab of the website.



Index of /storage/sdcard/

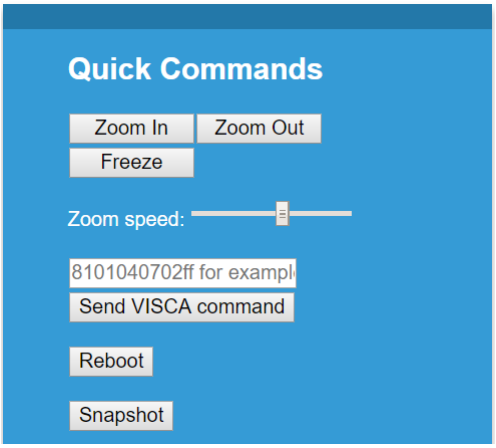
Name	Last Modified	Size	Type
Parent Directory/		-	Directory
System Volume Information/	2017-Jan-13 15:13:10	-	Directory
video-17-01-12-16-44-21.mkv	2017-Jan-12 16:44:22	428.2K	application/octet-stream
video-17-01-12-16-46-18.mkv	2017-Jan-12 16:46:18	407.7K	application/octet-stream
video-17-01-12-16-58-57.mkv	2017-Jan-12 16:58:58	509.5K	application/octet-stream
video-17-01-12-17-08-41.mkv	2017-Jan-12 17:08:42	478.2K	application/octet-stream
video-17-01-12-17-17-34.mkv	2017-Jan-12 17:17:42	5.0M	application/octet-stream
video-17-01-12-18-16-30.mkv	2017-Jan-12 18:16:42	7.2M	application/octet-stream

lighttpd/1.4.35

If you click on a video, it will be downloaded on your computer. You can play it with VLC.

xiii) Take Snapshot

You can take snapshots of the current scene by clicking on the button “Snapshot” on the website



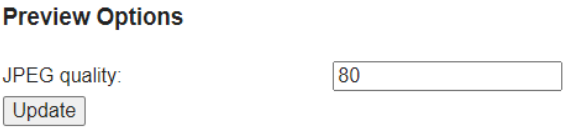
It will be saved on the same location as the recorded videos.

You can modify the jpeg quality:

xiv) Preview

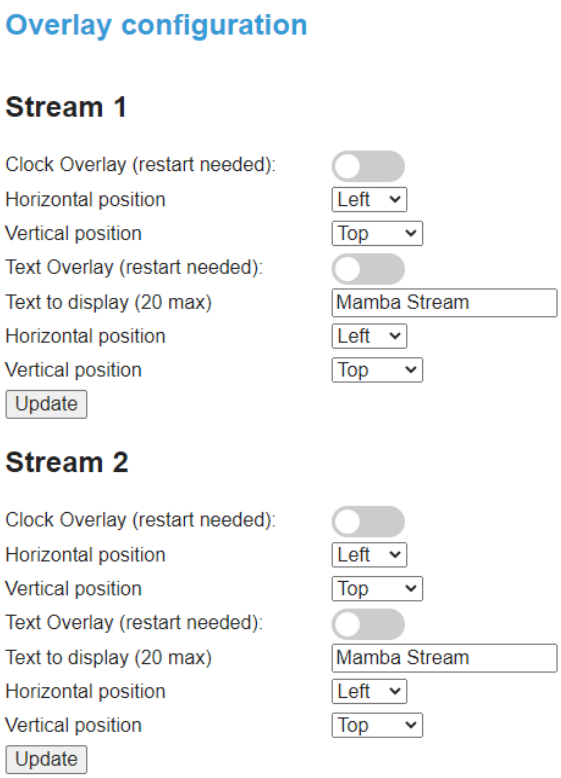
A preview page is available on the website to have pictures from the camera. To refresh the preview, you can click on Preview button or select “Auto” option to have a refresh every second.

You can modify the jpeg quality:



xv) Overlay

Clock overlay and text overlay are available on both streams.

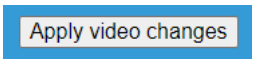


You can enable or disable them, change the text and the position for each stream.

Note: if the two streams have the same video source the overlay will be the same for the two streams.

xvi) Apply video changes

Most of the video parameters changes need a reboot. To avoid a reboot an “apply video changes” button can be used to restart the video stream with the new saved parameters. It will not consider TCP or serial parameter changes.

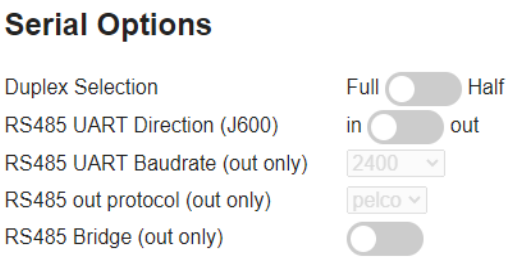


xvii) Serial communication

The external RS485 connector can be used in two cases:

- As a transparent bridge to communicate directly to the camera, and to send commands to the board
- As a controller for PELCO/VISCA devices. The Mamba can control an external turret via ONVIF client.

To enable the transparent bridge, leave the switch at “in” position:



To control external PELCO devices, put the switch in “out” position. You can change the output baud rate from 2400 to 115200. The protocol used to control the turret can be selected between “pelco” and “visca”.

A MQTT topic (mamba/rs/external) send data received on the RS beginning with a special header (99;). Each data sent is separated using ";" such as: 99;123;456 where value 1 is 123 and value 2 is 456.

You can communicate in Half or in Full duplex according to the configuration you set.

xviii) User API to control the board via j600 connector

If you enable the Transparent Bridge, the board will respond to some commands.

The protocol is based on VISCA, but with custom registers.

Settings

- Communication speed: 9.6kbps
- Data bits: 8
- Start bits: 1
- Stop bits: 1
- No parity
- No flow control

Commands

Command type	Packet (hexadecimal)	Note
Command	A**x qq rr** … FF	**qq**: type, **0x01** (Command)
		rr: interface, **0x04** (recorder)
		x: device address, **0x01**

Return messages

Return type	Packet (hexadecimal)	Note
Acknowledge	**x**0 41 FF	**x**: device address+8, **0x9**
Completion	**x**0 51 FF	**x**: device address+8, **0x9**
Syntax error	**x**0 61 02 FF	**x**: device address+8, **0x9**
Not executable	**x**0 61 41 FF	**x**: device address+8, **0x9**

When a command is received, an "Acknowledge" is sent, when a successful command is executed, "Completion" is sent.

The "Not Executable" message is sent when a command cannot be executed (start a record already started).

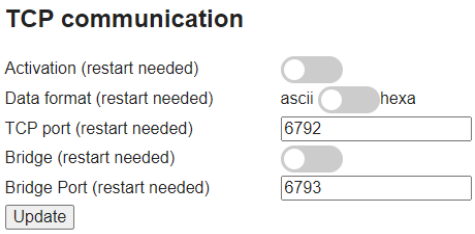
Registers

The "x" stands for the device address. Currently, only 0x1 is valid.

Command Set	Command	Command Packet (hex)	Comments
TWIGA_REC	Start record	Ax 01 04 01 01 FF	Start/stop record
	Stop record	Ax 01 04 01 00 FF	
TWIGA_SNAP	–	Ax 01 04 02 01 FF	Take a snapshot

xix) TCP server communication

You can configure the port to use, the data format (Hexadecimal or Ascii) and if you want to activate or not this function on the website. Do not forget to click on “update” and to reboot the board to save the changes.

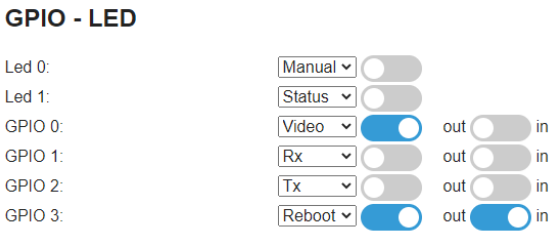


The protocol is based on VISCA. You can also configure a TCP bridge that will redirect the data sent via the bridge TCP port to the serial. Serial data will also be redirected to the TCP port. In this mode you cannot communicate to the camera via the serial.

xx) GPIOs

Several functions can be used with GPIOs:

- Manual: you can use them manually as input or output
- Status: the GPIO level changes according to the board state (1 blink per second during initialization, high level when running and 2 blinks per second when error)
- Video: high level when the video is detected
- Rx and Tx: high level when data is sent or received on the serial
- Reboot: set the GPIO to 0V to reboot the board

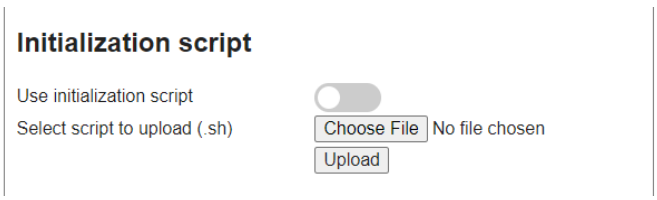


xxi) Custom boot logo

To change the start picture of the Mamba board you must select the png file you want, upload it, and enable the feature on the control web page.

xxii) Initialization script

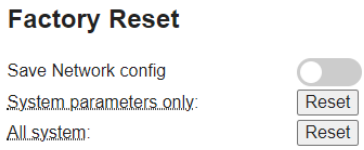
To upload and initialization script to be executed at startup, upload it, and enable the feature on the control web page.



xxiii) Factory reset

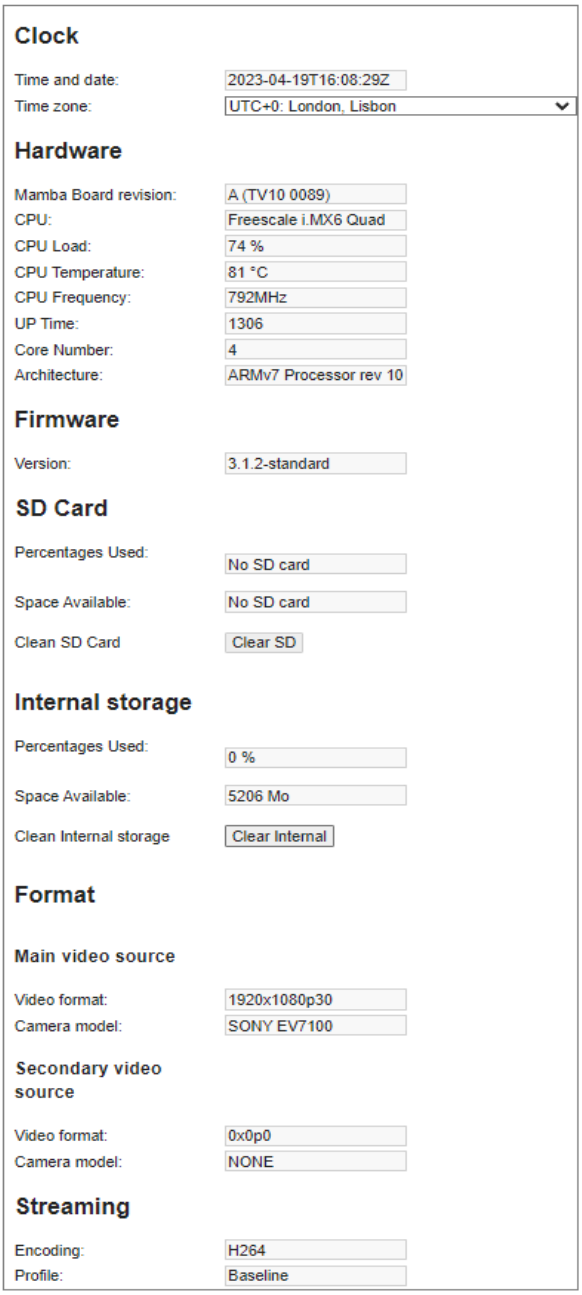
Different factory resets are available. You can do a system parameter reset only to reset all video, network, serial, and TCP parameters. Note that the network parameters can be secured during the factory reset to avoid losing its IP configuration.

You can also reset all the system, it includes system parameters, local storage, boot logo and SD card clean if plugged.



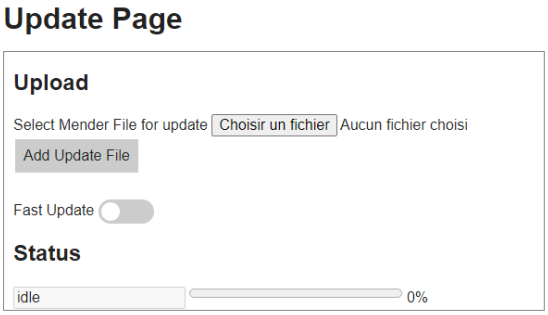
xxiv) Status page

All general parameters of the board are present in the status page of the Mamba's website. Please note that you can select the Timezone on this page.



xxv) Update

An "Update" tab has appeared on the Mamba's website.



You can add a file for update (a *.mender file) and click on "Add Update File".

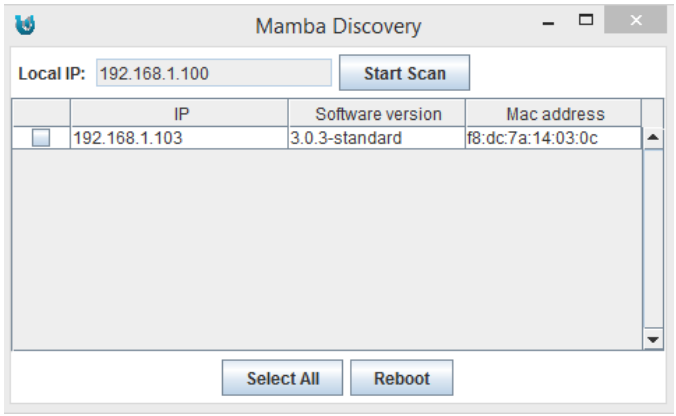
The Mamba will be updated automatically. Do not touch the board during this process. Do not turn off and do not reboot the board, it will do it automatically. Keep the update page open. Some pop up will appear during the process.
To avoid pop up you can enable the fast update.

xxvi) Comment area

You can set a comment on the index web page to be able to recognize the camera you are connected on.

xxvii) Multicast discovery

The Mamba is not easy to find on the network. To help the customer we developed a Java application available on our twiga-support website to scan the network and show all Mamba found.



It works sending a JSON message to a specific multicast address, Mamba will respond with its own IP address, software version and MAC address.

Message to send: { “ask_mamba_info” : true }

Message received: { “ip” : “192.168.1.103”, “version” : “3.0.3-standard”, “mac_address” : “f8:dc:7a:14:03:0c” }

xxviii) Use SSH

You can use SSH to interact with the board directly. Current logins/passwords:

Administrator login: **root**
Administrator password: **Twig@31!**

User login: **client**
User password: **twiga2016**

xxix) ONVIF User

By default, the only ONVIF user is:

- Login: admin
- Password: admin
- Level: administrator

Other users can be created, with different access levels, they are saved after reboot.

If all users are deleted, restart the board, the default user admin will appear.

4. Go further with Mamba Platform

The Mamba is an open platform. Indeed, an Embedded Linux is integrated on the module. You will be able to implement your own software applications.

This is a non-exhaustive list of possible applications:

- Medical Imaging
- Transport
- Surveillance
- Automatic Number Plate Recognition (ANPR)
- Unmanned Aerial Vehicles (UAVs)
- Remotely Operated Underwater Vehicles (ROVs)
- Low Vision Applications
- Video Conferencing
- Industrial Automation
- Robotics

Twiga Team can help you by providing a complete SDK, dedicated documentation, and custom support.

For further technical information, you can refer to the Technical Manual (NT-2203-01.pdf) and our support team via our support website: https://www.twiga-support.com/