WORKSWELL
WORKSWELL MAVLINK INTEFACE

USER MANUAL

FW Version: 1.5.8 and higher

Release date: 8th November, 2023

Revision   231108EN

WORKSWELL

Contents

1   User Information

1.1   Camera User Manual

This MAVLink guide applies to several Workswell products. For information about your device capabilities please refer to the user manual of your device which you can find at my.workswell.eu

1.2   Typographic Conventions

Following typographic conventions are used in this User Manual:

- UPPER CASE is used for the names of the commands
- COURIER is used for filenames and paths
- Italic is used for important information and document names
- underlined is used for the links to other sections, for function names or Internet sites

1.3   Help and Support

For technical questions that were not answered in this User Manual feel free to contact your dealer or use our support center at support.workswell.eu.

1.4   Updates

The primary aim of Workswell s.r.o. company is to supply their products in a way that meets the current needs of its users and at the same time to remove all the weaknesses that were found in their use as quickly possible. For this reason, Workswell s.r.o. regularly releases updates for all their products.

Visit my.workswell.eu to get the latest firmware release. The update process itself is described in the user manual of your device.

1.5   Firmware

Firmware is the „internal" control program of the device. From the user's point of view, only the official firmware released by Workswell s.r.o. company can be used for update of the device.

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2   Revision history

210219

- initial draf (message definitions, connection guide)

210226

- added GPS information
- changed formatting
- added referencing inside document

210312

- added licensing information

210518

- added Camera Protocol

210616

- added new possibility to the MAV_CMD_SET_CAMERA_MODE (#530)

220608

- added WWE connections
- 5V logic on WWE

231108

- updated info about Ardupilot

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3   Overview

This document provides the necessary information about WORKSWELL MAVLink interface. The goal is to provide users with full guide to connect their devices with WORKSWELL cameras (chapter 5) and communicate with them (chapter 6) using MAVLink communication protocol.

3.1   Basic Information

MAVLink is a very lightweight messaging protocol for drone communication (and communication between onboard drone components, for example Drone Thermal Camera). WORKSWELL cameras support recieving range of common commands (`MAVLINK_MSG_ID_COMMAND_LONG`) as defined in MAVLink Common Message Set as well as MAVLink GPS messages `MAVLINK_MSG_ID_GLOBAL_POSITION_INT` and `MAVLINK_MSG_ID_GPS_STATUS`.

This document provides description of implementad MAVLink messages and their parameters.

3.2   Workswell MAVLink ID

The device will ignore any and all MAVLink commands adressed to component with mavlink component ID different from 0 (`MAV_COMP_ID_ALL`) or the camera ID ($100 - 105$, can be set via Menu Interface) For more information on MAVLink please see MAVLink developer guide.

Recieving broadcasted messages (mainly MAVLINK_MSG_ID_GLOBAL_POSITION_INT and MAVLINK_MSG_ID_GPS_STATUS) is not dependent on MAVLink ID settings.

3.3   Getting Help and Suggestions

If you find any bugs, inconveniences or if you have any suggestions for improvement, please contact us at support.workswell.eu.

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4 Activating WORKSWELL MAVLink interface licence

The WORKSWELL MAVLink interface licence needs to be activated in your device in order to recognize MAVLink commands (see chapter 6.3). It is not free of charge. Please contact the sales support at sales@workswell.eufor more information.

The MAVLink GPS capabilities are not considered part of the command protocol so the messages described in chapter 6.1 are processed regardles on the Licence status.

Once you have the Licence, you can activate it by entering it to the camera. To do so please connect your camera to USB keyboard and navigate to Menu Advanced -> System -> Activate MAVLink licence.

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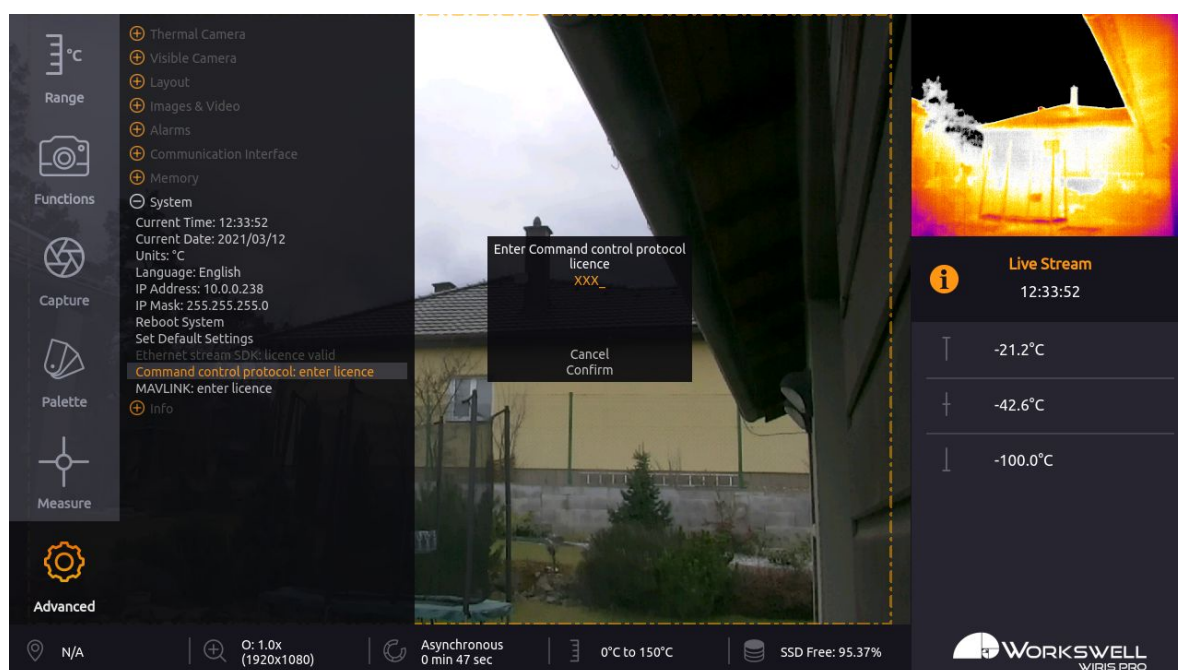
5   MAVLink connection

5.1   Camera settings

The camera will react to any broadcasted message (Mavlink target component ID = 0) and to a message with target component as set in settins of the camera. Supported settings are 100 - 105 (MAVLink cameras).
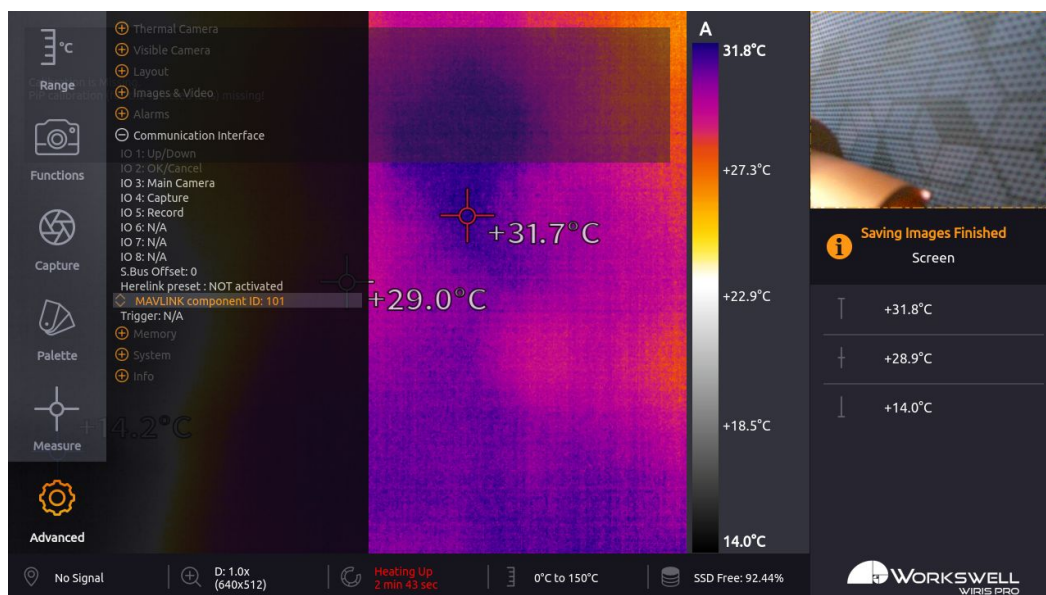
Figure 5.1 – Camera settings

5.2   Controller settings

Autopilots or any device supporting MAVLink messages can be connected to the camera unified interface cable with a 4 pin connector. As for the physical layer, the camera system is designed for UART with operating voltage of 5 V, although it is tolerant to 3.3 V.

> Warning: Do NOT connect the +5V wire on the Workswell unified interface cable to any device which draws power through another connection (e.g. Pixhawk autopilot boards). The +5V wire is intended for powering otherwise unpowered GPS modules, connecting it to powered device may lead to damage on both the device and Workswell camera.

Technical data summary:

- UART at baud rate 57600 bps
- MAVLink protocol version 2.0
- operating voltage of 5 V

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- MAVLink connection is shown in the status bar as GPS:
  - N/A: no connection
  - No signal: connected to MAVLink device, but no GPS data provided
  - GPS coordinates

5.2.1 Connection to Wiris Pro, Wiris Security, Wiris Agro and GIS-320 devices
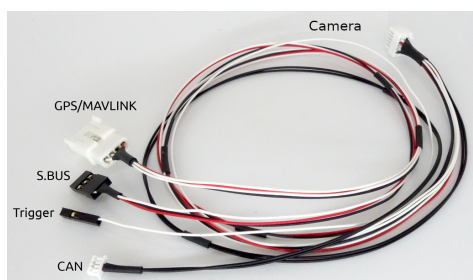
(a) Workswell unified interface cable

(b) Camera connection

Figure 5.2 – Camera connectors

5.2.2 Connection to Wiris Enterprise

Wiris Enterprise is not equipped with the 10-pin connector or the Workswell unified interface cable. Instead two 6-pin connectors (AUX1 and AUX2) are used. Connect the MAVLink UART to the GPS RX/TX pins and GND on the AUX2 connector

5.2.2.1 Pixhawk

Here is typical pin to pin connection between Camera cable and autopilot connector

5.2.3 Example Ardupilot settings

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```
1  - CANH
2  - CANL
3  - GND
4  - S.BUS
5  - +5V
6  - Trigger
7  - +5V
8  - Tx
9  - Rx
10 - GND
```

```
a - 1a - NC
    2a - CANH  (1)
    3a - CANL  (2)
    4a - NC
b - 1b - GND    (3)
    2b - +5V    (5)
    3b - S.BUS  (4)
c - 1c - Trigger (6)
d - 1d - +5V    (7)
    2d - Tx     (8)
    3d - Rx     (9)
    4d - GND    (10)
```

(a) MAVLink pinout on the Workswell unified interface cable (4 pin molex 36877-0004).

(b) Workswell camera connector pinout - ZPDR-10V-S (camera side)

Warning Do not connect the +5V wire to any powered device! Read this document carefully BEFORE any physical connection is made.
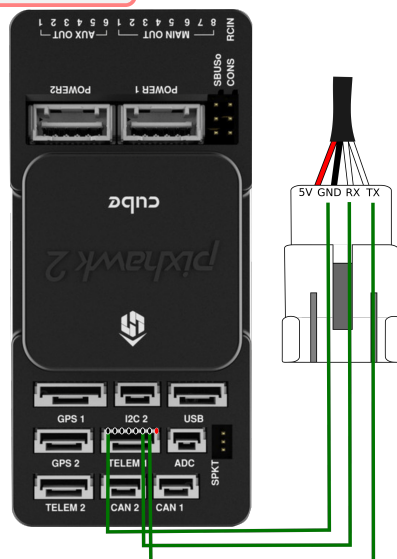
(c) Connection diagram: Workswell cable with Pixhawk Cube2

Figure 5.3 – Camera connectors pinouts
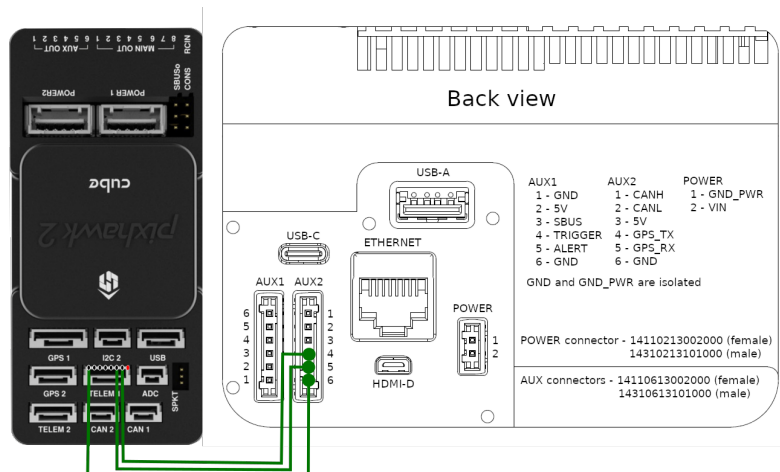
Figure 5.4 – Wiris Enterprise AUX pinout

Pixhawk		WWP, WWS, CWSI and GIS-320			WWE
PX4 TELEM pin number	PX4 TELEM pin name	Cable pin number (4pin connector - fig. 5.3a)	Cable pin name	Camera pin number (10pin connector - fig.5.3b)	Camera pin number (6pin connector - fig.5.4)
2	UART TX	4	RX	9	AUX2.4
3	UART RX	3	TX	8	AUX2.5
6	GND	2	GND	10	AUX2.6

Table 5.1 – Pixhawk/camera connection pinout
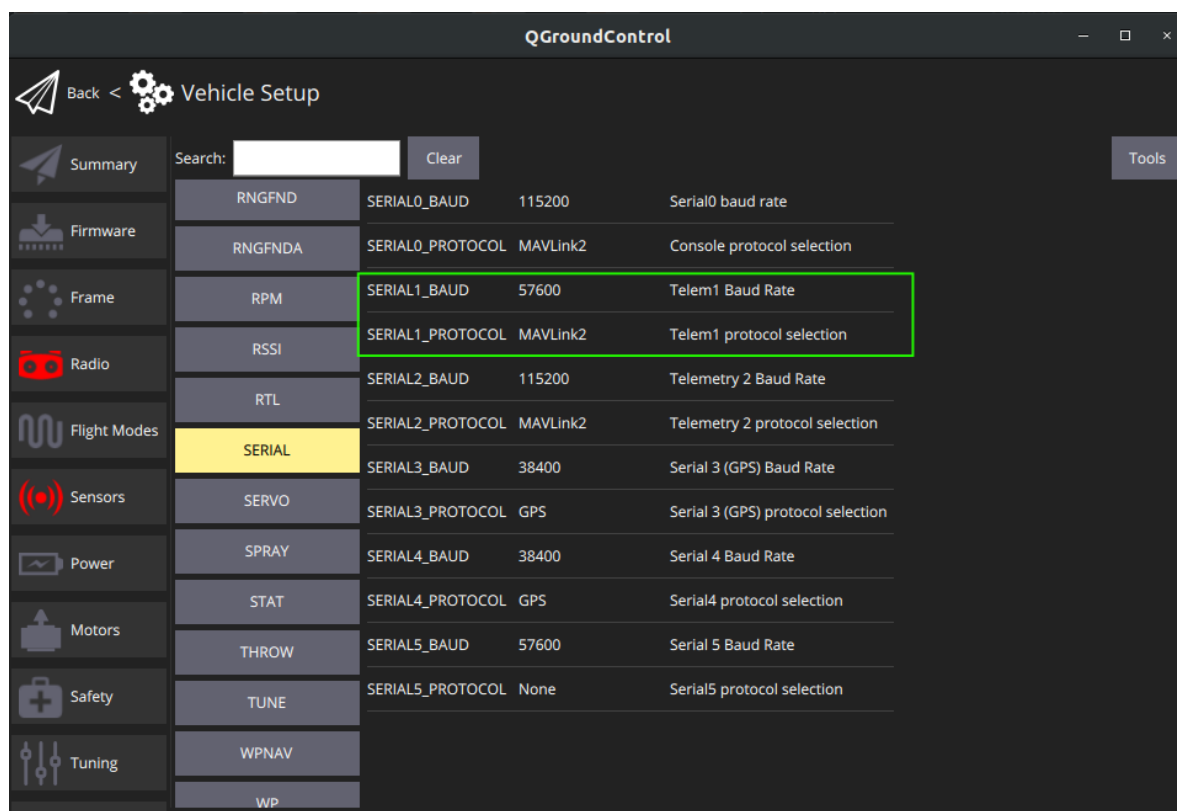
Figure 5.5 – Example of settings for pixhawk Cube 2 with Ardupilot firmware

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6 MAVLink communication interface

This chapter describes the various supported MAVLink messages from the MAVLink Common Message Set. For more information about MAVLINK Common Message Set please see the MAVLink project documentation.

6.1 GPS messages

Following GPS messages are supported by WORKSWELL devices:

6.1.1 GPS_STATUS (#25)

The positioning status, as reported by GPS. This message is intended to display status information about each satellite visible to the receiver. This message can contain information for up to 20 satellites.

Field Name	Type	Units	Description
satelites visible	uint8_t		Number of satellites visible
satelites prn	int8_t[20]		Global satelite ID
satelites used	int8_t[20]		0: not used, 1: used for localization
satelites elevation	int8_t[20]	deg	Elevation (0: right on top of receiver, 90: on the horizon) of satellite
satelites azimuth	int8_t[20]	deg	Direction of satellite, 0: 0 deg, 255: 360 deg.
satelites snr	int8_t[20]	db	Signal to noise ratio of satellite

6.1.2 GLOBAL_POSITION_INT (#33)

The filtered global position (e.g. fused GPS and accelerometers). The position is in GPS-frame (right-handed, Z-up). It is designed as scaled integer message since the resolution of float is not sufficient.

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Field Name	Type	Units	Description
time boot ms	uint32_t	ms	Time since system boot
lat	int32_t	degE10	Latitude
long	int32_t	degE10	Longtitude
alt	int32_t	mm	Altitude (MSL)
relative alt	int32_t mm		Altitude above ground
vx	int16_t	cm/s	Ground X Speed (Latitude, positive north)
vy	int16_t	cm/s	Ground Y Speed (Longitude, positive east)
vz	int16_t	cm/s	Ground Z Speed (Altitude, positive down)
hdg	uint16_t	cdeg	Vehicle heading (yaw angle), 0.0..359.99 degrees

6.2 MAVLink camera protocol

The camera utilizes the MAVLink camera protocol. This protocol provides easy setting of the camera's parameters from the ground station. The camera protocol is supported by WirisPro, WirisPro^{sc}, WirisSecurity and GIS cameras.

The camera protocol allows setting of various parameters, e.g. Range, Main Camera, Layout, Zoom, Alarms etc. via ground station or MAVLink autopilot.

As ground station software, we recommend for example the QGroundControl (QGC). When first communicating with the camera via MAVLink the QGC needs acces to the internet to download the Camera Definition File specifying the possible settings. Once it is cached the QGC can operate without acces to the internet using the cached Definition file until the camera firmware update.

6.2.1 Ardupilot

> Note: This section is relevant only for builds based on upstream version 4.2.0 and older. Never versions does not require any code changes for full functionality

The ArduPilot firmware did not support all the messages from MAVLink Extended parameter protocol utilized by the Camera Protocol in it's upstream versions in some versions (up until 4.2.0). To fully utilize the camera's possibilities it is necessary to build the Ardupilot from source adding following messages from common.xml :

- PARAM_EXT_REQUEST_LIST

- PARAM_EXT_VALUE

- PARAM_EXT_REQUEST_READ

- PARAM_EXT_SET

- PARAM_EXT_ACK

It is only necessary to include these messages so the Ardupilot would retransmit them instead of throwing them away. No other implementation is required.
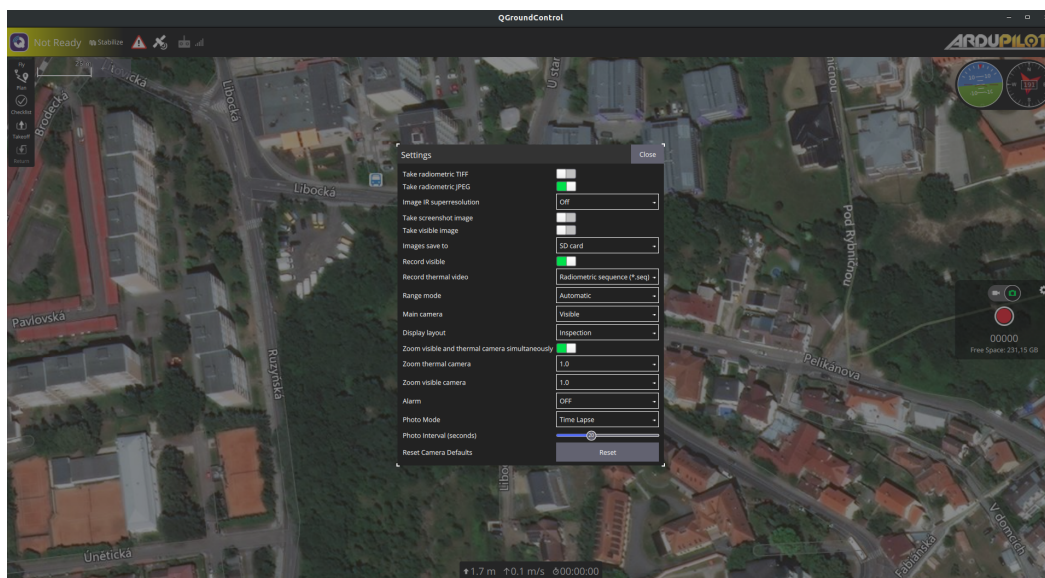
Figure 6.1 – Camera settings via QGC using Camera protocol

For one time only settings it is also possible to use passtrhough from the port with QGC to the camera. Using passthrough does not require building the Ardupilot firmware from source, but does not allow to control other parts of the drone at the same time. To use the passthrough, enable the Ardupilot parameters SERIAL_PASS1 a SERIAL_PASS2 to the serial ports of the camera and groundstation respectively (to create a tunnel between those two ports). The camera and the ground station will now communicate directly, as if there is no autopilot between those two. No message (including heartbeat messages) must appear on the bus for at least SERIAL_PASSTIMO seconds in order to revert the ports back to their normal use (may require reboot of both camera and ground station).

On the my.workswell.eu site we have provided the builds of Ardupilot with the inclusion of the Extended parameter messages for cubeBlack and Pixhawk4. You can also use the provided "Ardupilot MAVLink compatibility patch" to build the Ardupilot firmware from source (the provided patch contains the git patch file and basic steps to get the Ardupilot code, apply the patch and build the app).

6.3   MAVLink commands

All of the messages in chapter 6.3 are MAV_CMD_XX commands. This messages are always sent with 7 float parameters. MAVLink specification states that for any unused (not defined) parameters the value NaN (not-a-number) as specified by IEEE 754 has to be used. This value can also be used to ignore any part of the message (e.g. command MAV_CMD_DO_DIGICAM_CONFIGURE (#202) with parameters NaN, NaN, NaN, 6, NaN, NaN, NaN will only set the Gain to 6, but leaves all other settings on it's prevous value).

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6.3.1   Info and status requests

Following commands are read-only messages requesting various information about the camera.

6.3.1.1   MAV_CMD_REQUEST_MESSAGE (#512)

Request defined info message from the camera. The camera response depends on the first parameter, all supported messages are described in section 6.4 - MAVLink messages. Possible answers are:

- CAMERA_INFORMATION (#259)
- CAMERA_SETTINGS (#260)
- STORAGE_INFORMATION (#261)
- CAMERA_CAPTURE_STATUS (#262)
- VIDEO_STREAM_INFORMATION (#269)

Param (:Label)	Description	Values
Requested message	MAVLink ID of requested message	259, 260, 261, 262, 269
Optional parameter	optional parameter (if the requested message requires some)	

6.3.1.2   MAV_CMD_REQUEST_CAMERA_INFORMATION (#521)

Request basic camera information. The camera response is CAMERA_INFORMATION (#259).

This command does not take any parameters.

6.3.1.3   MAV_CMD_REQUEST_CAMERA_SETTINGS (#522)

Request basic basic camera settings (zoom, main camera). The camera response is CAMERA_SETTINGS (#260).

Param (:Label)	Description	Values
Settings	0: No Action 1: Request camera settings	min:0 max:1 step:1

6.3.1.4   MAV_CMD_REQUEST_STORAGE_INFORMATION (#525)

Request storage information (storage status, free space). The camera response is STORAGE_INFORMATION (#261)

Param (:Label)	Description	Values
StorageID	Id of storage	Storage ID

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6.3.1.5   MAV_CMD_REQUEST_CAMERA_CAPTURE_STATUS (#527)

Request camera capture status (recording/capturing/saving/idle). The camera response is CAMERA_CAPTURE_STATUS (#262).

This command does not take any parameters.

6.3.1.6   MAV_CMD_REQUEST_VIDEO_STREAM_INFORMATION (#2504)

Request RTSP video stream information. The camera response is VIDEO_STREAM_INFORMATION (#269). Please note that RTSP streaming is part of Ethernet Stream SDK, which is aditional feature. Please see your camera user manual or contact our sales department for more information.

This command does not take any parameters.

6.3.2   Action commands

Following commands are to be used for controlling the camera actions and settings.

6.3.2.1   MAV_CMD_DO_DIGICAM_CONFIGURE (#202)

Set parameters for the visible camera.

Param (:Label)	Description	Values
1: Mode	Mode of the visible camera	Visible camera modes
2: Shutter Speed	Shutter speed: Divisor number for one second. Use NaN for ignoring this parameter.	min: 0; max: 21; step: 1
3: Aperture	Aperture: F stop number. Only some exact values are supported and supported values depends on the camera model. The closest possible supported value is set when different value is recieved. Use NaN for ignoring this parameter.	
4: Gain	Sets the gain correction value [dB]. Use NaN for ignoring this parameter.	min: 0; max: 36; step: 2
5: Exposure	Exposure compensation Use NaN for ignoring this parameter.	min: -6; max: 6; step: 1
6: Command Identity	Unused parameter	
7: Engine Cut-off	Unused parameter	

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6.3.2.2   MAV_CMD_DO_DIGICAM_CONTROL (#203)

Control the settings of the device.

Param (:Label)	Description	Values
1: Session control	Unused parameter	
2: Zoom absolute	Zoom's absolute position - set the zoom of the camera to the closest possible value to the given one. (minimal zoom is 1x, maximum is dependent on the model of camera, typically 10). Use NaN for ignoring this parameter.	min: 1; step 0.1
3: Zooms relative	Zooming step value to offset zoom from the current position, meaning the number of zoom steps to go. The range of possible zoom steps depends on the camera model and currently set zoom. Considered only if Zoom absolute is NaN.	step: 1
4: Focus	Unused parameter	
5: Shoot command	Shooting command - saves pictures (the types which are currently set to be saved)	min: 0; max: 1; step: 1
6: Command Identity	Unused parameter	
7: Shot ID	Unused parameter	

6.3.2.3   MAV_CMD_STORAGE_FORMAT (#526)

Format the given storage (if connected), and/or resets the image counter (the image counter is set to 0 at the beginning of each session automatically, and then increased every time an image is saved and CAMERA_IMAGE_CAPTURED (#263) is sent.

Param (:Label)	Description	Values
1: Storage ID	Id of storage to format	Storage ID
2: Format	Format the storage (0 no action, 1 format)	min: 0; max: 1, step: 1
3: Reset	Reset the image counter (0 no action, 1 reset)	min: 0; max: 1, step: 1

6.3.2.4   MAV_CMD_RESET_CAMERA_SETTINGS (#529)

Reset all settings (except MAVLINK ID) back to it's factory default.

Param (:Label)	Description	Values
1: Reset	0: No action, 1: reset	min: 0; max: 1; step: 1

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6.3.2.5 MAV_CMD_SET_CAMERA_MODE (#530)

Set camera mode. Affects HDMI output.

Param (:Label)	Description	Values
1: Reserved		
2: Camera mode		
3: Reserved		
4: Reserved		
5: Layout	Set camera layout. Use NaN for ignoring this parameter.	Layout increased by 1 (0 and NaN keeps the settings)
6: Main camera	Set main camera (VISIBLE/THERMAL). Use NaN for ignoring this parameter.	Main Camera increased by 1 (0 and NaN keeps the settings)
7: Blended opacity	Set opacity for blended image	10 - 100

6.3.2.6 MAV_CMD_IMAGE_START_CAPTURE (#2000)

Starts periodic capturing or takes picture.

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Param (:Label)	Description	Values
1: Reserved		
2: Interval	Desired elapsed time between two consecutive pictures (in seconds). Minimum values depends on settings and camera model, lowest possible value is 1.	min:1; step: 1
3: Total images	Number of images taken. If 0, then continue capturing until MAV_CMD_IMAGE_STOP_CAPTURE (#2001) is recieved	min: 0, step: 1
4: Sequence number	Unused parameter	
5: Images to capture	Images to capture	Capture flags or zero/NaN to keep previous value
6: Memory	Memory to save images	Storage ID + 1, or zero/NaN to keep previous value

6.3.2.7 MAV_CMD_IMAGE_STOP_CAPTURE (#2001)

Stops periodic capturing (if running)

This command does not take any parameters.

6.3.2.8 MAV_CMD_DO_TRIGGER_CONTROL (#2003)

Enacts the trigger

Param (:Label)	Description	Values
1: Enable	If one, the camera recieves trigger	min: 0; max: 1; step: 1

6.3.2.9 MAV_CMD_VIDEO_START_CAPTURE (#2500)

Starts recording video. Use first parameter to indicate what type of video should be recorded.

Param (:Label)	Description	Values
1: Stream ID	Video ID flags	Video ID
2: Status Frequency	Frequency CAMERA_CAPTURE_STATUS messages should be sent while recording (0 for no messages, otherwise frequency [Hz]).	min:0; step: 1

6.3.2.10 MAV_CMD_VIDEO_STOP_CAPTURE (#2501)

Stops video capturing (if running)

This command does not take any parameters.

6.3.2.11 MAV_CMD_VIDEO_START_STREAMING (#2502)

Enables the RTSP stream. Please note that RTSP streaming is part of Ethernet Stream SDK, which is aditional feature. Please see your camera user manual or contact our sales department for more information.

This command does not take any parameters.

6.3.2.12 MAV_CMD_VIDEO_STOP_STREAMING (#2503)

Disables the RTSP stream. Please note that RTSP streaming is part of Ethernet Stream SDK, which is aditional feature. Please see your camera user manual or contact our sales department for more information.

This command does not take any parameters.

6.3.2.13 MAV_CMD_USER_1 (#31010)

Control the thermal camera. This command is dependant on the camera model. NaN can be used to ignore any parameters (keep previously set value).

Wiris Pro

Param (:Label)	Description	Values
1: Mode	Range mode	Range mode
2: Enviroment	Enviroment range index. Possible values depends on camera calibration, typically 2	
3: Max or window	Maximum (for Manual range) or window width/2 (for Window range)	
4: Min or center	Maximum (for Manual range) or window center (for Window range)	
5: Emissivity	Emissivity of the observed measured surface in the scene	min:0.5; max: 1
6: Reflected temperature	Temperature of radiation reflected by reflected surfaces in the scene [°C]	min: -40; max: 100
7: Atmosferic temperature	Temperature of the ambient air between the device and the observed scenery [°C]	min: -40; max: 100

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Param (:Label)	Description	Values
1: Stabilization	The delay (in seconds) for the lag filter of automated range settings.	min:0; max: 5;
2: Hot rejection	Percentage of the highest value which are to be satured by the automated range settings.	min: 0; max: 30
3: Cold rejection	Percentage of the lowest value which are to be satured by the automated range settings.	min: 0; max: 30

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6.3.2.14   MAV_CMD_USER_2 (#31011)

Control the settings of isotherm alarms. Some settings may not be available for all camera models. Any parameter can be ignored (no change to current settings applied) by sending NaN value.

Param (:Label)	Description	Values
1: Alarm Mode	Alarm mode	Isotherm mode
2: Alarm below	The lower alarm limit. Value is either deg C for radiometric camera, % for non-radiometric.	
3: Alarm above	The upper alarm limit. Value is either deg C for radiometric camera, % for non-radiometric.	
4: Sights	bitmap of displayed crossed and values.	Sights
5: Pallete	sets coulour palette by index. Index is counted as param%(pallete count).	min: 0 ; step: 1
6: Above color	Sets coulour for alarm above.	Isotherm color
6: Below color	Sets coulour for alarm below.	Isotherm color

6.3.2.15   MAV_CMD_USER_3 (#31012)

This command can be used to navigate the menu on HDMI output

Param (:Label)	Description	Values
1: Action	Action in menu	Menu action

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6.4 MAVLink messages

Following messages can either be requested with MAV_CMD_REQUEST_MESSAGE (#512) (other command described in part 6.3.1 of this document), or are send automatically by the camera as response to a command or to indicate camera action.

These messages are sent by the camera to inform the autopilot or ground station about the camera status. They are not to be recieved by the camera.

6.4.1 CAMERA_INFORMATION (#259)

Basic information about a camera. Can be requested by MAV_CMD_REQUEST_MESSAGE (#512) or MAV_CMD_REQUEST_CAMERA_INFORMATION (#521).

Field Name	Type	Units	Values	Description
time boot ms	uint32_t	ms		Time since camera boot
vendor name	uint8_t[32]			Name of the camera vendor ("WORKSWELL")
model name	uint8_t[32]			Name of the camera model ("WIRIS Pro"/"WIRIS Security"/"WIRIS Agro"/"GIS-320")
focal length	float	mm		Focal length
sensor size_h	float	mm	0	Image sensor size horizontal (not implemented, sends 0)
sensor size_v	float	mm	0	Image sensor size vertical (not implemented, sends 0)
resolution_h	uint16_t	pix		Horizontal image resolution (sends resolution of THERMAL image)
resolution_v	uint16_t	pix		Vertical image resolution (sends resolution of THERMAL image)
lens id	uint8_t			Index of current lens on the THERMAL camera
flags	uint32_t		CAMERA CAP FLAGS	Bitmap of camera capability flags.
cam definition version	uint16_t		0	Camera definition version
cam definition uri	char[140]		"\0"	Camera definition URI

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6.4.2 CAMERA_SETTINGS (#260)

Settings of a camera. Can be requested by MAV_CMD_REQUEST_MESSAGE (#512) or MAV_CMD_REQUEST_CAMERA_SETTINGS (#522).

Field Name	Type	Units	Values	Description
time boot ms	uint32_t	ms		Time since camera boot
mode id	uint8_t		Main Camera	Mode Id
zoomLevel	float		1-10 (12)	Current zoom level
focusLevel	float		NaN	Current focus level (not implemented)

6.4.3 STORAGE_INFORMATION (#261)

Information about a storage medium. This message is sent in response to a request with MAV_CMD_REQUEST_MESSAGE (#512). UseMAV_CMD_REQUEST_MESSAGE (#512).param2 to indicate the index/id of requested storage (see Storage ID)

Field Name	Type	Units	Values	Description
time boot ms	uint32_t	ms		Time since camera boot
storage id	uint8_t			Storage Id
storage count	uint8_t		3	Count of possible storages (SSD, Flash stick, microSD)
status	uint8_t	s		Iamge capture interval (Periodic image capture)
total capacity	float	MiB		Total storage capacity
used capacity	float	MiB		Used storage capacity
available capacity	float	MiB		Available storage capacity
read speed	float	MiB/s	0	Not implemented
write speed	float	MiB/s	0	Not implemented
type	uint8_t		Storage ID	Storage type (SSD, Flash stick, microSD)
name	char[32]			Storage name

6.4.4 CAMERA_CAPTURE_STATUS (#262)

Information about the status of a capture. Can be requested with a MAV_CMD_REQUEST_MESSAGE (#512) command.

Field Name	Type	Units	Values	Description
time boot ms	uint32_t	ms		Time since camera boot
image status	uint8_t			Current status of image capturing (0: idle, 1: capture in progress, 2: interval set but idle, 3: interval set and capture in progress)
video status	uint8_t			Current status of video capturing (0: idle, 1: capture in progress)
image interval	float	s		Iamge capture interval (Periodic image capture)
recording time ms	uint32_t	ms		Image sensor size horizontal (not implemented, sends 0)
available capacity	float	MiB		Available storage capacity (internal SSD)
image count	int32_t			Total number of images captured in this session

6.4.5 CAMERA_IMAGE_CAPTURED (#263)

Information about a captured image. This is broadcasted every time an image is captured, or can be requested by MAV_CMD_REQUEST_MESSAGE (#512) command.

Field Name	Type	Units	Values	Description
time boot ms	uint32_t	ms		Time since camera boot
time utc	uint64_t	ms		Timestamp (time since UNIX epoch) in UTC.
cameraId	uint8_t			MAVLink Id of the camera
lat	int32_t	degE10		Latitude where the image was taken, 0 for unknown
long	int32_t	degE10		Longtitude where the image was taken, 0 for unknown
alt	int32_t	mm		Altitude (MSL) where image was taken, 0 for unknown
relative alt	int32_t	mm		Altitude above ground, 0 for unknown
q	float[4]			quaternion of camera orientation - unsupported by WORKSWELL devices
image index	int32_t			Zero based index of this image (i.e. a new image will have index CAMERA_CAPTURE_STATUS.image count -1)
capture result	int8_t			Boolean indicating success (1) or failure (0) while capturing this image.
file name	char[205]			Name of the image taken

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6.4.6 VIDEO_STREAM_INFORMATION (#269)

Information about video stream. It may be requested using MAV_CMD_REQUEST_MESSAGE (#512), where param2 indicates the video stream id: 0 for all streams, 1 for first, 2 for second, etc. Please note that RTSP streaming is part of Ethernet Stream SDK, which is aditional feature. Please see your camera user manual or contact our sales department for more information.

Field Name	Type	Units	Values	Description
stream id	uint8_t		Stream ID	Video Stream ID
count	uint8_t		2, 0	Number of available RTSP streams
type	uint8_t		VIDEO STREAM TYPE	Type of stream
flags	uint16_t		VIDEO STREAM FLAGS	Bitmap of stream status flags.
framerate	float	Hz		stream frame rate
resolution_h	uint16_t	pix		Stream horizontal resolution
resolution_v	uint16_t	pix		Stream vertical resolution
bitrate	uint32_t	bits/s		Stream bitrate
rotation	uint16_t	deg	0	Video image rotation clockwise
hfov	uint16_t	deg		Horizontal Field of view (not implemented)
name	char[32]			Stream name
uri	char[3160]			Video stream adress (RTSP adress ground station should connect to, e.g. "rtsp://10.0.0.230:8554/visible")

7 Enumerators

Here are enumerator values used in parameters of varoious MAVLink messages.

7.1 Defined MAVLink enumerators

Following enumerators are used as defined in MAVLink specification. Please see MAVLink Common Message Set for more information. Only values possible for WORKSWELL cameras are listed here.

As convention, enumerators defining FLAGS (multiple enumerator values can be together as bitwise OR of the key values) have values in hexadecimal notation, while other enumerators are in decimal notation.

7.1.1 CAMERA_CAP_FLAGS

Camera capabilities flags

Value	Meaning
0x00	Camera is able to record video
0x02	Camera is able to capture images

7.1.2 VIDEO_STREAM_STATUS_FLAGS

Value	Meaning
0x00	Stream is acive (running)
0x02	Stream is thermal imaging
0x30	Camera has basic zoom control
0x50	Camera has video streaming capabilities

7.1.3 VIDEO_STREAM_TYPE

Value	Meaning
0x00	Stream is RTSP

7.2 Workswell enumerators

Please note that not all settings is available for all Workswell cameras. Please refer to the user manual of your device for information about your camera's capabilities.

7.2.1 Storage ID

Defines prefered storage.

Value	Meaning
0	Internal SSD
1	USB flash drive
2	microSD card

7.2.2 Main Camera

Defines used main camera.

Value	Meaning
0	Thermal camera
1	Visible camera

7.2.3 Layout

Defines layout for HDMI output.

Value	Meaning
0	INSPECTION
1	SECURITY
2	FULLSCREEN
3	BLENDED

7.2.4 Visible camera modes

Modes for visible camera capturing.

Value	Meaning
0	Auto
1	Shutter priority
2	Iris priority
3	Manual

7.2.5 Stream ID

Id for RTSP stream. Please note that RTSP streaming is part of Ethernet Stream SDK, which is aditional feature. Please see your camera user manual or contact our sales department for more information.

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Value	Meaning
0	All
1	Thermal
2	Visible

7.2.6   Video ID

Flags for recording video (what to record = bitwise OR of wanted values. Please note that recording both thermal sequence and thermal encoded streams is NOT possible on any of WORKSWELL cameras). If NaN is recieved, previous settings is kept.

Value	Meaning
0x01	Thermal sequence
0x02	Thermal encoded
0x04	Visible encoded

7.2.7   Capture flags

Flags for saving images (what to save = bitwise OR of wanted values). If 0 or NaN is recieved, previous settings is kept.

Value	Meaning
0x01	Image radiometric JPEG
0x02	Image radiometric TIFF
0x04	Image superresolution JPEG
0x08	Image visible JPEG

7.2.8   Isotherm mode

Defines isotherm (alarm) settings.

Value	Meaning
0	Off
1	Above
2	Bellow
3	Between
4	Above & Bellow

7.2.9   Range mode

Defines Range mode for WWP and GIS cameras.

Value	Meaning
0	Auto
1	Manual
2	Span

7.2.10 Sights

Flags for displaying data on HDMI output (what to record = bitwise OR of wanted values). If 0 or NaN is recieved, previous settings is kept.

Value	Meaning
0x02	Temperatures
0x04	Cross max
0x08	Cross min
0x10	Cross center
0x20	CWSI values

7.2.11 Menu action

Enum for navigating through the camera menu on HDMI output.

Value	Meaning
1	Up
2	Down
3	OK
4	Cancel

7.2.12 Isotherm color

Value	Meaning
0	Red
1	Green
2	Blue

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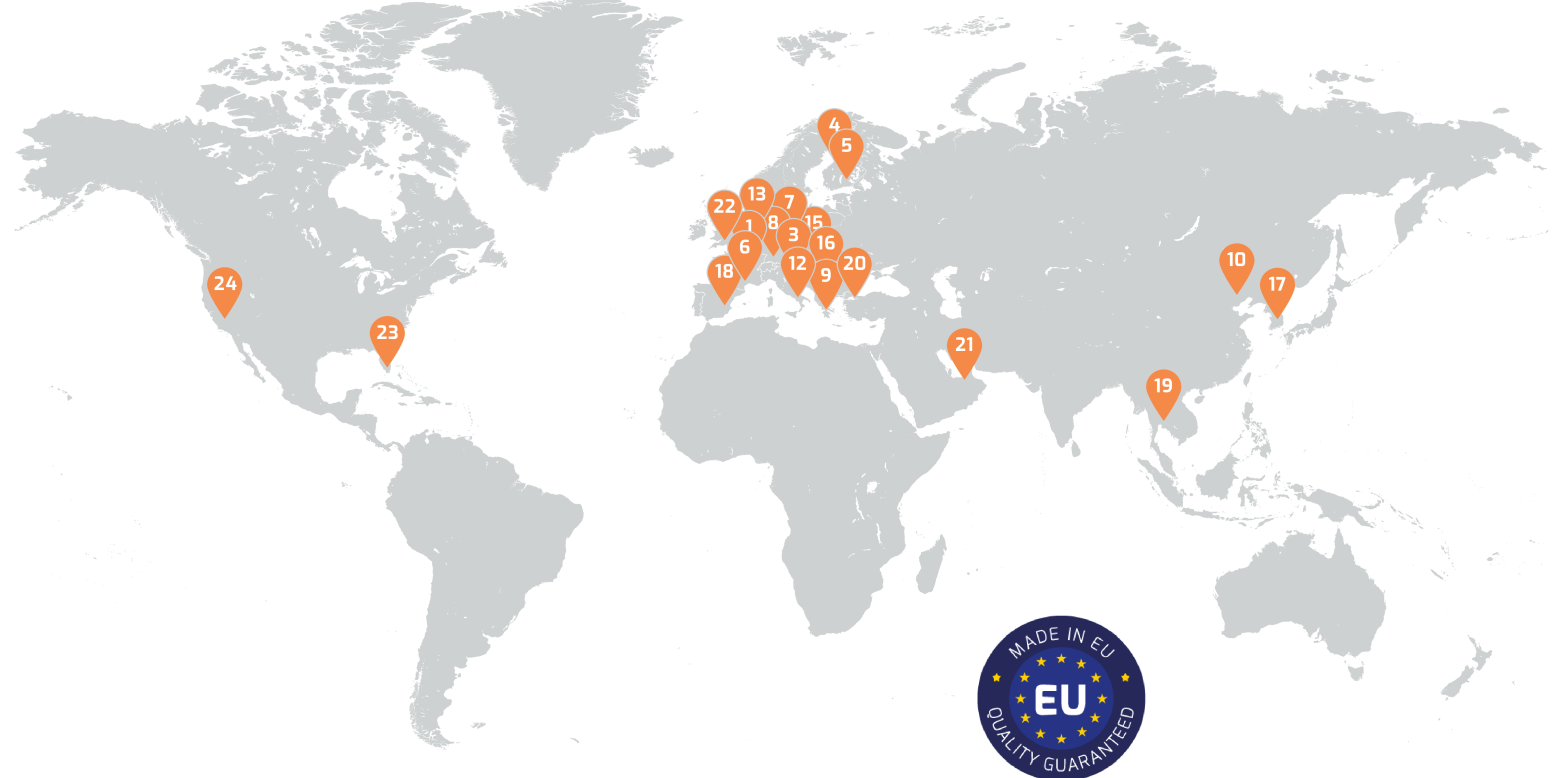
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