

K40T Quad-Sensor Gimbal User Control Protocol

K40T Quad-Sensor Gimbal User Control Protocol-1.4.52

Modify records

modification time	Modify content	Version	Modifier
20231012	initial version	V1.0.0	Jorge
20231020	Added camera IP address acquisition command	V1.1.0	Jorge
20231112	Added camera precise reshooting instructions	V1.2.0	Jorge
20231212	Added specified mixed zoom command	V1.3.0	Jorge
20240125	Added restore factory settings command	V1.4.0	Jorge
20240410	Added camera osd watermark custom copywriting command	V1.4.1	Jorge
20240429	Added gimbal impeller speed setting command	V1.4.2	Jorge
20240430	Add network port description	V1.4.3	Jorge
20240510	Modify the instructions for reporting gimbal attitude information, reporting gimbal status, etc.	V1.4.4	Jorge
20240708	Improve the protocol, visible light single-channel setting	V1.4.5	darius

20240802	Delete visible light photo and video resolution setting instructions (0x000201, 0x000202, 0x00020C)	V1.4.6	darius
20240809	Added flight control request target GPS information command (0x000320)	V1.4.7	darius
20241115	Added gimbal debugging function (0x000013, 0x00002D, 0x00002E, 0x00002F, 0x000030, 0x000031)	V1.4.8	Jorge
20241210	Corrected infrared area temperature measurement instructions and infrared point temperature measurement instructions	V1.4.9	Jorge
20241214	Restore visible light photo and video resolution setting command (0x000201, 0x000202)	V1.4.10	darius
20250117	Added gimbal stabilization command (0x000033) and modified gimbal status message (0x000001)	V1.4.11	Jorge
20250324	Added AI recognition/tracking instructions (0x000319, 0x000324)	V1.4.12	darius
20250404	Added OSD configuration protocol and multimedia download protocol	V1.4.13	Jorge
20250408	Delete the feedback that the photo does not exist	V1.4.14	darius
20250513	Added gimbal lock/follow mode switching command	V1.4.15	Jorge
20250610	Added movement temperature acquisition command	V1.4.16	Jorge
20250610	Modify the specified angle setting command and add sbus switch command	V1.4.17	Jorge
20250703	Added device movement query command, osd watermark configuration		Jorge

	and switch acquisition command, identification category query command	V1.4.18	
20250710	Added sbus variable magnification channel expansion setting instructions and sbus variable magnification channel expansion acquisition instructions	V1.4.19	Jorge
20250711	Added 1080p capture mode setting instructions	V1.4.20	Jorge
20250714	Added commands to obtain the video file name and modify the camera OSD watermark custom copy command	V1.4.21	Jorge
20250731	Added new command to obtain video playback and file delivery and send client IP/port number by default.	V1.4.22	Jorge
20250916	Added 1080p photo taking mode	V1.4.23	Jorge
20250930	Added night vision mode, night vision frame rate settings and acquisition instructions	V1.4.44	Jorge
20250931	Added a new kernel version number acquisition command and a modified camera command to request aircraft GPS information.	V1.4.45	Jorge
20251108	Added target gps reporting switch command, and added video stream information reporting for camera system status	V1.4.46	Jorge
20251209	Added AI recognition speed measurement command and gimbal stabilization command	V1.4.47	Jorge
20251218	Added one-click downward view and pseudo-color sbus settings	V1.4.48	Jorge
20260129	Added infrared fusion setting command		Jorge

	and infrared parameter reading command. Added fusion parameter reading command.	V1.4.49	
20260209	Added visible light fusion setting instructions and visible light parameter reading. Added fusion parameter reading.	V1.4.50	Jorge
20260311	New media library folder acquisition for multimedia downloads, and new infrared fusion and visible light fusion debugging instructions	V1.4.51	Jorge
20260411	New grayscale image settings for visible light fusion and infrared fusion	V1.4.52	Jorge

1. Electrical interface

1. Quad-sensor Gimbal pod external electrical interface protocol

pin	Function	Name	Remarks
To be determined	Power interface	To be determined	
To be determined	network interface	LAN_TX_P	
		LAN_TX_N	
		LAN_RX_N	
		LAN_RX_P	
To be determined	Communication interface	USART_RX	
		USART_TX	
To be determined	clock sync pin	RTC_IO	

2. Protocol Definition

2.1 Protocol frame format

BLST V1 Frame 12-255bytes									
STX	LEN	DT SYS ID	DA COMP ID	SEQ	SA SYS ID	SA COMP ID	MESSAGE ID	PAYLOAD DATA	CHECKSUM
1 bytes	1 bytes	1 bytes	1 bytes	1 bytes	1 bytes	1 bytes	3 bytes	0-243 bytes	2 bytes

Byte number	Type	content	value	explain
0	UInt8_t	packet start flag	0xFD	Protocol-specific text start (stx) marker used to indicate the start of a new packet. Any system that does not recognize the protocol version will skip the packet.
1	UInt8_t	load length	0-255	Displays the length of the payload section. This may be affected by message data.
2	UInt8_t	System ID (recipient)	0-255	Refers to the recipient system ID, which is used to distinguish the systems of different products.
3	UInt8_t	Component ID (receiver)	0-255	Refers to the recipient system ID, used to distinguish components of different products.
4	UInt8_t	Packet sequence number	0-255	Used to detect packet loss, the component increments the value for each message sent.
5	UInt8_t	System ID (sender)	1-255	Refers to the sender system ID, used to distinguish systems on the network.
6	UInt8_t	Component ID (sender)	1-255	Refers to the sender component ID, used to distinguish components in the system.

7-9	Uint32_t	Message ID (low, medium, high byte)	0-16777215	The id of the message type in the payload, used to decode the data back into the message object.
10-n+10	Uint8_t[243]	payload		message data. Depends on message type (i.e. message ID) and content.
N+11 - N+12	Uint16_t	Checksum		X.16 CRC (check data starting from 0XFD and all data)

App address: System ID: 0x01; Component ID: 0x01

Flight control address: System ID: 0x02; Component ID: 0x01

Quad-Sensor Gimbal Payload address: System ID: 0x04; Component ID: 0x01

Set the high byte of the message ID to 0x00

Set the high byte of the message ID of the ACK of the message reply to 0x01

Set the high byte of the message ID of the status frame message of the message reply to 0x02

For example: after specifying the hybrid zoom (0x000304) setting, the message ID of the ACK is 0x010304 and the message ID of the status frame is 0x020304.

The multi-byte parameters of the message payload (except ACK) are all low byte first, high byte last.

Note:

Setting message: message sent by App or host computer to gimbal

ACK: Feedback of whether the gimbal receives and executes the setting information normally

Status frame: status feedback during gimbal execution

crc code:

```
C
static void crc_accumulate(uint8_t data, uint16_t *crcAccum)
{
    uint8_t tmp;
    tmp = data ^ (uint8_t)(*crcAccum &0xff);
    tmp ^= (tmp<<4);
    *crcAccum = (*crcAccum>>8)^(tmp<<8)^(tmp<<3)^(tmp>>4);
}

#define X25_INIT_CRC 0xffff
```

```

static void crc_init(uint16_t* crcAccum)
{
    *crcAccum = X25_INIT_CRC;
}

uint16_t crc_calculate(const uint8_t* pBuffer, uint16_t length)
{
    uint16_t crcTmp;
    crc_init(&crcTmp);
    while (length--)
    {
        crc_accumulate(*pBuffer++, &crcTmp);
    }
    return (crcTmp);
}

```

2.2 Serial port description

2.2.1 Serial port interface definition

The serial port is a 3.3V TTL serial port.

2.2.2 Serial port description and configuration

The basic configuration of the serial port is:

Serial port baud rate	115200
Serial port level standard	TTL3.3V level
Serial data bits	8Bit
Serial port stop bit	1Bit
parity bit	None
Serial port flow control	None

2.3 Network port description

1.Default IP address of camera network port

The camera's default IP address is: 192.168.144.64

2.RTSP streaming address

Default push address: rtsp://IP:558/live/single

For example: rtsp://192.168.144.64:558/live/single

3. File download and video playback communication method (UDP)

Gimbal pod file download and sending server IP: 192.168.144.64, port number: 6665 (IP based on Gimbal pod)

Gimbal pod video playback sending server IP: 192.168.144.64, port number: 6660 (IP based on Gimbal pod)

The maximum number of bytes for UDP data transmission is 64000. When it exceeds 64000 bytes, it will be sent in packets.

The video playback data is the data encoded by the original mp4 (h264/h265), which will be sent frame by frame, and can be played directly after being obtained.

The process is as follows: 1. Enter playback download mode. 2. Refresh the file list (this operation can also be performed without entering playback/download mode). 3. Download the file list. 4. Download or play back multimedia files as needed.

4.udp network port control

Gimbal pod server IP: 192.168.144.64 (default);

Gimbal pod server port: 1030;

3. Gimbal pod system

3.1 gimbal payload protocol (Sysid: 0x03) (not supported by Methane customized version)

3.1.1 Periodic reporting of messages (0x000001-0x00000F)

3.1.1.1 gimbal status message (500ms) (msgid: 0x000001)

Note: This message is for uploading status information of the gimbal. Reporting cycle: 2HZ

payload:

Byte1	Byte2	Byte3	Byte4	Byte5	Byte6-7
gimbal status	reserved	Self-test results	Steady image state	reserved	reserved

The specific instructions are as follows:

Gimbal Status Notification	Byte1	gimbal status, uint8_t type data Low 4 bits: 0: gimbal connection is normal; 1: gimbal connection is abnormal High 4 bits: 0: The camera connection is normal; 1: The camera connection is abnormal
	Byte2	reserved
	Byte3	Self-test results Bit0: Infrared movement: 1-normal; 0-abnormal Bit1: telephoto visible light movement: 1-normal; 0-abnormal Bit2: Wide-angle visible light movement: 1-normal; 0-abnormal Bit3: Laser: 1-normal; 0-abnormal Bit4: Telephoto motor: 1-normal; 0-abnormal Bit5-7: reserved
	Byte4	0x01: Stabilizing; 0x00: Not stabilizing (K40T)
	Byte5	reserved
	Byte6-7	reserved

3.1.1.2 gimbal attitude information (100ms) (msgid: 0x000002)

This message is the upload of gimbal attitude angle information. Reporting cycle: 10HZ

payload:

Byte1-2	Byte3-4	Byte5-6	Byte7-8	Byte9-10	Byte11-12
---------	---------	---------	---------	----------	-----------

Yaw angle of gimbal (joint angle)	Gimbal roll angle (joint angle)	Gimbal pitch angle (joint angle)	Gimbal yaw angle (attitude angle)	Gimbal roll angle (attitude angle)	Gimbal pitch angle (attitude angle)
Byte13-14	Byte15-16	Byte17-18	Byte19-20		
Gimbal yaw angular velocity	Gimbal pitch angle speed	Gimbal roll angular velocity	reserved		

The specific instructions are as follows:

gimbal information	Byte1-2	Yaw angle of gimbal (joint angle), signed integer; unit: degree*100
	Byte3-4	Gimbal roll angle (joint angle), signed integer; unit: degree*100
	Byte5-6	Pan/tilt pitch angle (joint angle), signed integer; unit: degree*100
	Byte7-8	Yaw angle of the gimbal (attitude angle), signed integer; unit: degree*100
	Byte9-10	Gimbal roll angle (attitude angle), signed integer; unit: degree*100
	Byte11-12	Pitch angle of the gimbal (attitude angle), signed integer; unit: degree*100
	Byte13-14	Gimbal azimuth angular velocity int16, accuracy 0.01°/s
	Byte15-16	Gimbal pitch angle speed int16, accuracy 0.01°/s
	Byte17-18	Gimbal roll angular velocity int16, accuracy 0.01°/s
	Byte19-20	reserved

3.1.2 Request messages (0x000010-0x0000FF)

3.1.2.1 gimbal control command (0x000010)

Explanation: This message is to control the action of the gimbal
payload:

Byte1	Byte2	Byte3	Byte4
Working modes and quick functions	Orientation control	pitch control	reserved

The specific instructions are as follows:

Remote control pan/tilt information	Byte1	High 4 digits: gimbal working mode 00(0000): No operation, default 01(0001): Indicates that the gimbal returns to center 02(0010): Indicates that the gimbal is looking down at 90° Lower 4 bits: reserved
	Byte2	Set the direction of azimuth movement (0: move to the left, 1: move to the right, 2: stop moving)
	Byte3	Set the direction of pitch movement (0: upward movement, 1: downward movement, 2: stop movement)
	Byte4	reserved

Ack

Byte1-2
response code

3.1.2.2 Specify pan/tilt angle control command (0x000012)

Description: This message specifies that the gimbal moves to the corresponding
angular position.

payload:

Byte1-3	Byte4-6	Byte7
Specify gimbal pitch angle	Specify the azimuth angle of the gimbal	reserved

The specific instructions are as follows:

Specify gimbal angle command	Byte1-3	Byte1 specifies the tilt movement direction of the gimbal. 0: Specify the angle upwards 1: Specify the angle downwards 2: No movement Byte2-3 specifies the pitch movement angle of the gimbal (up 30 degrees, down 90 degrees, angle value * 100)
	Byte4-6	Byte4 specifies the yaw movement direction of the gimbal. 0: Specify the angle to the left 1: Specify the angle to the right 2: No movement Byte5-6 specifies the yaw movement angle of the gimbal (left 180 degrees, right 180 degrees, angle value * 100)
	Byte7	reserved

Ack

Byte1-2
response code

3.1.2.3 One-click gimbal calibration command (0x000013)

Description: The App sends a one-click gyro calibration command to control the gimbal to perform gyro calibration.

Request frame: payload:

Byte 1	Byte 2
Calibration status	reserved

The specific instructions are as follows:

One-click calibration of the gimbal	Byte1	0x01: Start calibration
	Byte2	reserved

Ack

Byte1-2
response code

3.1.2.4 gimbal mode switching command (0x000014)

Description: The App sends a gimbal mode switching command to control the gimbal to switch modes.

Request frame: payload:

Byte 1	Byte 2
gimbal mode	reserved

The specific instructions are as follows:

gimbal mode settings	Byte1	0x01:Follow mode 0x02: Lock mode 0x03:Joint locking mode
	Byte2	reserved

Ack

Byte1-2
response code

3.1.2.5 gimbal control speed setting command (0x000017)

Description: App sets the gimbal control speed command.

Request frame: payload:

Byte 1	Byte 2	Byte 3
Gimbal pitch control speed	gimbal orientation control speed	reserved

The specific instructions are as follows:

gimbal impeller speed setting command	Byte1	Gimbal pitch control speed: Byte1 gimbal pitching wave wheel speed, uint8_t type, range 5-150, Corresponds to movement speed of 1-30 degrees/second
	Byte2	gimbal orientation control speed: Byte1 gimbal azimuth wave wheel speed, uint8_t type, range 5-150, corresponding to the movement speed of 1-30 degrees/second
	Byte 3	reserved

Ack

Byte1-2
response code

3.1.2.6 Get the gimbal version number (msgid: 0x000018)

Description: Get the gimbal version number

payload:

Byte 1	Byte 2
Get the gimbal version number	reserved

The specific instructions are as follows:

Get the gimbal version number	Byte1	Byte1 0x01: Get the gimbal version number
	Byte2	reserved

Ack:

Byte1-2	Byte3-5	Byte6-8	Byte9
response code	gimbal hardware version number	gimbal software version number	reserved

The specific instructions are as follows:

Get the gimbal version number	Byte1-2	response code
	Byte3	gimbal hardware version number (major version number)
	Byte4	gimbal hardware version number (minor version number)
	Byte5	gimbal hardware version number (minor version number)
	Byte6	gimbal software version (major version number)
	Byte7	gimbal software version (minor version number)
	Byte8	gimbal software version (minor version number)
	Byte9	reserved

3.1.2.7 gimbal pointing and alignment command (0x00002C)

Description: gimbal pointing and alignment control command

payload:

Byte1	Byte 2-3	Byte4-5	Byte6-7
Zoom lens selection	Mixed zoom ratio	Point to align the X coordinate point	Point to align the Y coordinate point

The specific instructions are as follows:

gimbal pointing and alignment instructions	Byte1	Zoom lens selection 0x00: Telephoto lens 0x01: Wide angle lens 0x02: Infrared lens
	Byte2-3	Mixed variable magnification, Uint16_t Telephoto lens unit 0.1x range (3.5-11.0 is optical zoom, 11.0-160 is electronic magnification) Wide-angle lens unit 0.1x (supports integer electronic magnification of 1-8) Infrared lens unit 0.1 times (supports integer electronic magnification of 1-8)
	Byte4-5	Point to align the X coordinate point, uint16 type, range 1-1920, middle value 960
	Byte6-7	Point to align the Y coordinate point, uint16 type, range 1-1080, middle value 540

Ack:

Byte1-2
response code

3.1.2.8 Turn off gimbal servo command (0x00002D)

Description: App requests the gimbal to turn off the servo.

Request frame: payload:

Byte 1	Byte 2
Turn off servo (0x00)	reserved

Ack:

Byte1-2
response code

3.1.2.9 gimbal linear calibration command (0x00002E)

Description: App requests gimbal linear calibration.

Request frame: payload:

Byte 1	Byte 2
Linear calibration (0x01)	reserved

Ack:

Byte1-2
response code

3.1.2.10 gimbal soft restart command (0x00002F)

Description: The App requests a soft restart of the gimbal.

Request frame: payload:

Byte 1	Byte 2
Soft restart (0x01)	reserved

Ack:

Byte1-2
response code

3.1.2.11 The gimbal uses the flight control fake attitude command (0x000030)

Description: The App requests the gimbal to use the flight control fake attitude.

Request frame: payload:

Byte 1	Byte 2
Use flight control fake attitude (0x01)	reserved

Ack:

Byte1-2
response code

3.1.2.12 gimbal calibration motion acceleration offset command (0x000031)

Description: The App requests the gimbal to calibrate the motion acceleration offset.

Request frame: payload:

Byte 1	Byte 2
Calibrate motion acceleration (0x01)	reserved

Ack:

Byte1-2
response code

3.1.2.13 The flight controller sends flight control information to the gimbal command (0x000032)

Message ID: 0x0032

Frequency: 10HZ

Description: The flight controller sends the drone's desired heading angle, pitch angle, roll angle, heading angle, acceleration information, and takeoff flag to the gimbal.

Request frame: payload:

Byte 1-2	Byte3-4	Byte5-6	Byte7-8	Byte9-10	Byte11-12	Byte13-14	Byte15
UAV desired heading angle	UAV pitch angle	UAV roll angle	UAV heading angle	reserved	reserved	reserved	Takeoff sign

The specific instructions are as follows:

Flight	Byte 1-2	UAV desired heading angle, current flight angle;
--------	----------	--

controller sends information		unit: degree*100 Type: int16_t
	Byte3-4	UAV pitch angle, unit: degree*100 Type: int16_t
	Byte5-6	UAV roll angle, unit: degree*100 Type: int16_t
	Byte7-8	UAV heading angle, real-time angle; unit: degree*100 Type: int16_t
	Byte9-10	reserved
	Byte11-12	reserved
	Byte13-14	reserved
	Byte15	Takeoff sign Bit0: 0: means the plane has not taken off, 1: means the plane has taken off Bit1-Bit6: reserved Bit7: 0: indicates that the flight control data is invalid, 1: indicates that the flight control data is valid

Ack:

Byte1-2
response code

Note: xyz represents the north-east coordinate system, and north is the x-axis.

3.1.2.14 gimbal stabilization command (0x000033) (K40T)

Description: The gimbal is automatically stabilized through a special object in the center.

Request frame: payload:

Byte 1	Byte 2
Stability enhancement switch (0x01: on; 0x00: off)	reserved

Ack:

Byte1-2
response code

3.2 Camera payload protocol (Sysid: 0x04)

3.2.1 Periodic reporting messages (status reporting) (0x000001-0x00000F)

3.2.1.1 Camera system status feedback (1s) (msgid: 0x000003)

This message is the upload of camera system status information. Reporting cycle: 1HZ

payload:

Byte 1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
Photo/video mode	Network rendering resolution	Video encoding format	Push mode	Video output bit rate	Set photo mode	Delayed photo time
Byte8	Byte9	Byte10-11	Byte12-13	Byte14-15	Byte16	
Number of continuous shots	sd status	sd card total capacity	sd card remaining capacity	sd card used capacity	Video stream status	

The specific instructions are as follows:

Camera status feedback	Byte 1	Photo and video mode 0: Photo mode 1: Video mode
	Byte 2	Network output resolution 0: 1080P30fps 1: 720P30fps

	Byte3	Video encoding format 0: H264 1: H265
	Byte4	Push mode: 00: Infrared push 0x05/0x06: Visible light push 0x07: Split-screen push
	Byte5	Video output bit rate 1:1M 2:1.5M 3:2M 4: 4M 5: 8M 6: 12M
	Byte6	Photo mode 0: Single shot 1: Continuous shot of 3/5 shots 2: Time-lapse shot
	Byte7	Time-lapse photography time 5/7/30/60
	Byte8	Continuous shooting number setting 3/5
	Byte9	SD card status 0: Normal card 1: Abnormal card 2: Current card reading and writing speed is slow 3: SD card not inserted 4: SD card is full 5: SD card format error
	Byte10-11	Total capacity of SD card Unit: MB*10
	Byte12-13	SD card remaining capacity Unit: MB*10
	Byte14-15	SD card used capacity Unit: MB*10
	Byte16	Video streaming status 1: Playback download mode (no streaming); 2: Normal streaming mode

3.2.1.2 Infrared camera status feedback (200ms) (0x000004) (not supported by methane version)

Note: This message is the infrared status information uploaded to the flight controller and App;

Reporting cycle: 5HZ

payload:

Byte 1-2	Byte3-4	Byte5-6	Byte7-8	Byte9-10	Byte11-14	Byte15-18	Byte19-22
Regional maxim	Regional minimu	Regional center tempera	Point temperature	Regional averag	Regional maxim	Regional minimu	Regional central

um temper ature value	m tempera ture value	ture value	measure ment temperat ure value	e temper ature value	um temper ature coordin ates	m temper ature coordin ates	tempe rature coordi nates
Byte23 -26	Byte27	Byte28	Byte29	Byte30	Byte31	Byte32- 34	
Point temper ature measu rement coordi nates	High tempera ture warning sign	Low tempera ture warning sign	Temperat ure difference warning sign	Thresh old temper ature warnin g flag	Infrared device type	reserve d	

The specific instructions are as follows:

Infrared camera status feedback	Byte1-2	Regional maximum temperature value, int16_t type, unit 0.1°C
	Byte3-4	Regional minimum temperature value, int16_t type, unit 0.1°C
	Byte5-6	Regional center temperature value, int16_t type, unit 0.1°C
	Byte7-8	Point temperature measurement temperature value, int16_t type, unit 0.1°C
	Byte9- 10	Regional average temperature value, int16_t type, unit 0.1°C
	Byte11- 14	Regional maximum temperature coordinates Byte11-12: Regional maximum temperature coordinate X, uint16_t type Byte13-14: Regional maximum temperature coordinate Y, uint16_t type
	Byte15- 18	Regional minimum temperature coordinates Byte15-16: Regional minimum temperature coordinate X, uint16_t type

		Byte17-18: Regional minimum temperature coordinate Y, uint16_t type
	Byte19-22	Regional central temperature coordinates Byte19-20: Regional central temperature coordinate X, uint16_t type Byte21-22: Regional central temperature coordinate Y, uint16_t type
	Byte23-26	Point temperature measurement coordinates Byte23-24: Point temperature measurement coordinate X, uint16_t type Byte25-26: Point temperature measurement coordinate Y, uint16_t type
	Byte27	High temperature warning sign: 0: No warning 1: Start warning
	Byte28	Low temperature warning flag: 0: No warning 1: Start warning
	Byte29	Temperature difference warning flag: 0: No warning 1: Start warning
	Byte30	Threshold temperature warning flag: 0: No warning 1: Start warning
	Byte31	0: ar; 1: win2; 3: hk
	Byte32-34	reserved

Note: The regional temperature measurement reports the maximum temperature, minimum temperature, average temperature, central temperature, and the coordinates of the maximum temperature, minimum temperature, and central

temperature in the region; the point temperature measurement reports the point temperature value and its coordinates, and the coordinate system is the 1080p coordinate system.

3.2.1.3 Visible light camera status feedback (200ms) (0x000005)

Description: This message is the upload of visible light camera parameter status information.

Reporting cycle: 5HZ

payload:

Byte1	Byte2-3	Byte4-5	Byte6	Byte7-8
Zoom state	focal length	Mixed zoom magnification	EV value reporting	ISO value reporting
Byte9-10	Byte11	Byte12	Byte13-14	Byte15
Electronic shutter reporting	AE_LOCK status	focus status	Accurate repeat shooting focus	reserved

The specific instructions are as follows:

Visible light camera parameter status information	Byte1	Zoom status 0x00: Zoom completed 0x01: Zoom in progress
	Byte2-3	Focal length, unit: 0.01mm
	Byte4-5	Hybrid zoom ratio: The telephoto hybrid ratio includes optical zoom and electronic zoom. Above 11 times, it is electronic magnification, and the unit is 0.1 times.
	Byte6	EV value reporting 0x00:Auto 0x0A:+2 0x10:+1 0x16:0 0x1C:-1 0x23:-2
	Byte 7-8	0x00: AUTO 0x01: ISO100 0x02: ISO200 0x03: ISO400 0x04: ISO800 0x05: ISO1600 0x06: ISO3200 0x07: ISO6400
	Byte9-10	electronic shutter 0x00: Auto 0x01: 1/4 0x02: 1/8

		0x03: 1/15 0x04: 1/30 0x05:1/60 0x06:1/125 0x07:1/250 0x08: 1/500 0x09: 1/1000 0x0A:1/2000 0x0B: 1/4000 0x0C:1/5000 0x0C:1/6000 0x0E:1/8000
	Byte11	AE_LOCK status 0x01 on, 0x02 off
	Byte12	Focus status 0x00: Focusing completed 0x01: Focusing in progress
	Byte13-14	Accurate repeat shooting focus
	Byte15	reserved

3.2.1.4 Camera upgrade and repair status feedback (1s) (0x000008)

Description: Report camera upgrade or repair progress

Byte 1	Byte2	Byte3
Status	Progress	reserved

The specific instructions are as follows:

Camera upgrade and repair status feedback	Byte 1	0: Upgrade or repair successful 1: Upgrade or repair failed 2: Upgrading 3: Repairing
	Byte 2	Current upgrade or repair progress (0~100) 0: start 100: Complete
	Byte 3	reserved

3.2.2 Infrared camera setting message (0x000100-0x0001FF) (not supported by methane customized version)

3.2.2.1 Infrared camera all setting parameter reading command (0x000100)

Description: Read all parameters of infrared camera.

payload:

Byte1	Byte2
Read all camera settings instructions	reserved

The specific instructions are as follows:

App reads all camera parameter instructions	Byte1	0x01: Read all setting instructions of the infrared camera
	Byte2	reserved

Ack

Byte1-2	Byte3-23
response code	Feedback on all camera settings parameters

The specific instructions are as follows:

ACK	Byte1-2	Feedback, ACK: 0 indicates successful feedback
All parameters of infrared camera	Byte3	Infrared camera image settings Pseudo color settings: 1-20
	Byte4	Temperature measurement and electronic amplification configuration Byte4 (bit7-bit0) : bit0 temperature measurement switch (0 is on, 1 is off) Bit1 temperature measurement type (0 point temperature measurement, 1 area temperature measurement) Bit2 infrared movement type (0 viewing version, 1 temperature measurement version)

	Bit3-7 electronic amplification
Byte5	Infrared sharpening parameter range, see support instructions
Byte6	Infrared gain mode (0: high gain mode 1: low gain mode 2: automatic)
Byte7	Infrared brightness setting range, see support instructions
Byte8	Infrared contrast setting range, see support instructions
Byte9	Denoising settings Byte3 (bit7) denoising switch 0: off; 1: on Byte3 (bit6-bit0) denoising level
Byte10	Enhance settings Byte10 (bit0) enhancement switch: 0: off; 1: on Byte10 (bit6-0) enhanced parameters
Byte11-12	High temperature warning temperature setting: Open and set the temperature range: -1000-5000 Turn off high temperature warning: -2732 Unit: 0.1°C Data type: int
Byte13-14	Low temperature warning temperature setting: Open and set the temperature range: -1000-5000 Turn off low temperature warning: -2732 Unit: 0.1°C Data type: int
Byte15-16	Temperature difference warning setting: Open and set the temperature difference range: 1-6000 Turn off temperature difference warning: -2732

		Unit: 0.1°C Data type: int
	Byte17	Threshold temperature warning switch: Set the threshold temperature difference alarm function switch: 0: off; 1: on
	Byte18-19	Temperature difference reference value setting (-30°C to 50°C): Set the temperature difference reference value: -300-500 Unit: 0.1°C Data type: int
	Byte20-21	Temperature floating value setting: Set temperature floating value: 0-800 Unit: 0.1°C Data type: int
	Byte22	Infrared fusion switch 0: off; 1: on
	Byte23	bit0-3: visible light fusion weight bit4-7: infrared fusion weight

3.2.2.2 Infrared electronic amplification setting command (0x000105)

Description: Set the infrared electronic amplification command

Request frame: payload:

Byte 1	Byte 2
Infrared electronic amplification settings	reserved

The specific instructions are as follows:

Infrared electronic amplification settings	Byte1	Byte1: 0x01: No amplification 0x02-0x08: 2-8 times electronic amplification
	Byte2	reserved

Ack:

Byte1-2
response code

3.2.2.3 Infrared pseudo color setting command (0x000106)

Description: Set the infrared pseudo color setting request command.

Request frame: payload:

Byte 1	Byte 2
Infrared pseudo color settings	reserved

The specific instructions are as follows:

Infrared pseudo color settings	Byte1	1-20 respectively represent white hot, black body, rainbow, high contrast rainbow, iron red, magma, sky, medium gray, gray red, purple orange, special 1, warning red, ice fire, cyan red, special 2, gradient red, gradient green, gradient blue, warning green, warning blue (air) 1-11 are white hot, golden, iron red, rainbow, shimmer, aurora, red hot, jungle, medical, black hot, golden red (win2) 1-15: white hot, black hot, fusion 1, rainbow, iron red 2, fusion 2, iron red 1, dark brown, color 1, color 2, ice fire, rain, red heat, green heat, dark blue (hk)
	Byte2	reserved

Ack:

Byte1-2
response code

3.2.2.4 Infrared temperature measurement switch command (0x000108)

Description: Set the infrared temperature measurement switch request command

Request frame: payload:

Byte 1	Byte 2
Infrared temperature measurement switch	reserved

The specific instructions are as follows:

Infrared temperature measurement switch	Byte1	Byte1 0x00: Temperature measurement switch is on 0x01: The temperature measurement switch is turned off; it is turned on by default (when turned on, the camera periodically sends temperature information)
	Byte2	reserved

Ack:

Byte1-2
response code

3.2.2.5 Infrared sharpening setting command (0x00010A)

Description: Set the infrared sharpening setting request command

Request frame: payload:

Byte 1	Byte 2
Sharpen settings	reserved

The specific instructions are as follows:

Sharpen settings	Byte1	Byte1 sharpening setting: 0-100
	Byte2	reserved

Ack:

Byte1-2
response code

3.2.2.6 Infrared brightness setting command (0x00010B)

Description: Set the infrared brightness request command

Request frame: payload:

Byte 1	Byte 2
IR brightness setting	reserved

The specific instructions are as follows:

IR brightness setting	Byte1	Byte1 brightness parameter 0-100
	Byte2	reserved

Ack:

Byte1-2
response code

3.2.2.7 Infrared contrast setting command (0x00010C)

Description: Set infrared contrast request command

Request frame: payload:

Byte 1	Byte 2
IR contrast setting	reserved

The specific instructions are as follows:

IR contrast setting	Byte1	Byte1 contrast parameter 0-100
	Byte2	reserved

Ack:

Byte1-2
response code

3.2.2.8 Infrared denoising setting command (0x00010D)

Description: Set the infrared denoising request command

Request frame: payload:

Byte 1-2	Byte 3
IR denoising settings	reserved

The specific instructions are as follows:

IR denoising settings	Byte1-2	Byte1: Denoising switch 0: Off 1: On Byte2: Denoising level: 0-100
	Byte3	reserved

Ack:

Byte1-2
response code

3.2.2.9 Infrared image enhancement setting command (0x00010E)

Description: Infrared enhancement setting instructions

Request frame: payload:

Byte1	Byte2
IR enhancement settings	reserved

The specific instructions are as follows:

IR enhancement settings	Byte1	Infrared image enhancement setting: 0, off; 1-10: set level.
	Byte2	reserved

Ack:

Byte1-2
response code

3.2.2.10 Infrared point temperature measurement setting command (0x00010F)

Description: Set the infrared point temperature measurement command

Request frame: payload:

Byte1-2	Byte3-4	Byte5
X-axis cursor point	Y axis cursor point	reserved

The specific instructions are as follows:

	Byte1-2	Byte1-Byte2 X-axis cursor point
	Byte3-4	Byte3-Byte4 Y-axis cursor point
	Byte5	reserved

Ack:

Byte1-2
response code

Note: The x coordinate range is between 320-1599; the y coordinate range is between 28-1051.

3.2.2.11 Infrared area temperature measurement setting command (0x000110)

Description: App sets the infrared rectangular frame temperature measurement command

Request frame: payload:

Byte 1-2	Byte 3-4	Byte 5-6	Byte 7-8	Byte 9
Infrared	Infrared	Infrared	Infrared	reserved

rectangular frame width	rectangular frame height	rectangular frame center coordinate X	rectangular frame center coordinate Y	
----------------------------	--------------------------------	---	---	--

The specific instructions are as follows:

Infrared rectangular frame settings	Byte1-2	Byte1-Byte2 area box width
	Byte3-4	Byte3-Byte4 area box height
	Byte5-6	Byte5-Byte6 X coordinate of area box center
	Byte7-8	Byte7-Byte8 Y coordinate of area box center
	Byte9	reserved

Ack:

Byte1-2
response code

Note: Half the width of the rectangular box plus the x-coordinate range is between 320-1599; half the height of the rectangular box plus the y-coordinate range is between 28-1051.

3.2.2.12 Infrared camera gain mode setting command (0x000123)

Description: App sets infrared camera gain mode instructions

Request frame: payload:

Byte1	Byte2
Infrared camera gain mode setting	reserved

The specific instructions are as follows:

Infrared camera gain mode setting	Byte1	0x00: high gain mode 0x01: low gain mode 0x02: Automatic mode
	Byte2	reserved

Ack:

Byte1-2
response code

3.2.2.13 Infrared camera temperature warning setting command (0x000124)

Description: App sets infrared high temperature warning, low temperature warning, and temperature difference warning setting functions.

Request frame: payload:

Byte1-2	Byte3-4	Byte5-6	Byte7
High temperature warning temperature setting	Low temperature warning temperature setting	Temperature difference warning setting	reserved

The specific instructions are as follows:

Infrared camera temperature warning settings	Byte1-2	High temperature warning temperature setting: Open and set the temperature range: -1000-5000 Turn off high temperature warning: -2732 Unit: 0.1°C Data type: int
	Byte3-4	Low temperature warning temperature setting: Open and set the temperature range: -1000-5000 Turn off low temperature warning: -2732 Unit: 0.1°C Data type: int
	Byte5-6	Temperature difference warning setting: Open and set the temperature difference range: 1-6000 Turn off temperature difference warning: -2732 Unit: 0.1°C Data type: int

	Byte7-8	reserved

Ack:

Byte1-2
response code

3.2.2.14 Infrared camera temperature information overlay switch setting command (0x000125)

Description: The App sets the infrared push screen to display the high and low temperature function

Request frame: payload:

Byte1	Byte2
Temperature superposition switch	reserved

The specific instructions are as follows:

Infrared camera gain mode setting	Byte1	0x00: Turn off temperature information overlay 0x01: Turn on temperature information overlay
	Byte2	reserved

Ack:

Byte1-2
response code

Note: The maximum and minimum temperatures (area temperature measurement) and point temperature (point temperature measurement) will be displayed on the infrared streaming screen.

3.2.2.15 Infrared camera threshold temperature difference setting command (0x0126)

Description: App sets the infrared threshold temperature difference warning setting function.

Request frame: payload:

Byte1	Byte2-3	Byte4-5	Byte6
Switch settings	Temperature difference reference value	Temperature floating value	reserved

The specific instructions are as follows:

Infrared threshold temperature difference warning setting	Byte1	Switch settings: Set the threshold temperature difference alarm function switch: 0: off; 1: on
	Byte2-3	Temperature difference reference value setting (-30°C to 50°C): Set the temperature difference reference value: -300-500 Unit: 0.1°C Data type: int
	Byte4-5	Temperature floating value setting: Set temperature floating value: 0-800 Unit: 0.1°C Data type: int
	Byte6	reserved

Ack:

Byte1-2
response code

3.2.2.16 Infrared fusion visible light setting command (0x000127)

Description: App sets the infrared fusion visible light function

Request frame: payload:

Byte1	Byte2	Byte3	Byte4
Set switch	Visible light fusion weight	Infrared fusion weight	reserved

The specific instructions are as follows:

Infrared camera gain mode setting	Byte1	0x00: Turn off infrared fusion 0x01: Turn on infrared fusion
	Byte2	Visible light fusion weight range (0-10)
	Byte3	Infrared fusion weight range (0-10)
	Byte4	reserved

1. The higher the visible light fusion weight, the clearer the visible light, and vice versa.
2. The higher the infrared fusion weight, the clearer the infrared, and vice versa.
3. The sum of the visible light fusion weight and the infrared fusion weight does not exceed 10. The default visible light fusion weight is 8 and the infrared fusion weight is 2.

Ack:

Byte1-2
response code

3.2.2.17 Infrared fusion visible light debugging setting command (0x000128)

Description: App debugs infrared fusion visible light function

Request frame: payload:

Byte1	Byte2-3	Byte4-5	Byte6-7
Set switch	Visible light horizontal offset value	Visible light vertical offset value	Visible light rotation angle

The specific instructions are as follows:

Visible light fusion infrared debugging	Byte1	0x01: debug mode; 0x02: save to configuration file
	Byte2-3	Visible light horizontal offset value unit*10 unsigned integer
	Byte4-5	Visible light vertical offset value unit*10 unsigned integer
	Byte6-7	Visible light rotation angle unit*10 unsigned integer

Ack:

Byte1-2
response code

Note: The visible-light horizontal offset range is -753 to -553, the infrared vertical offset range is -491 to -391, and the infrared rotation angle is 0-360.

3.2.2.18 Infrared fusion visible light grayscale setting command (0x000129)

Description: App sets the grayscale of infrared fusion visible light

Request frame: payload:

Byte1	Byte2
Grayscale mode	reserved

The specific instructions are as follows:

Infrared fusion visible light grayscale	Byte1	0x00: Normal output of visible light 0x01: Visible light grayscale image
	Byte2	reserved

Ack:

Byte1-2

response code

Note: This can be set only when fusion is enabled.

3.2.3 Visible light camera (0x000200-0x0002FF)

3.2.3.1 Read command for all setting parameters of visible light camera (0x000200)

Description: Instructions to read all parameters of visible light camera

Request frame: payload:

Byte1	Byte2
Read all setting instructions of visible light camera	reserved

The specific instructions are as follows:

App reads all camera parameter instructions	Byte1	0x01: Read all setting instructions of visible light camera
	Byte2	reserved

Ack

Byte1-2	Byte3-21
response code	Feedback on all camera settings parameters

ACK	Byte1-2	Feedback, ACK: 0 indicates successful feedback
Feedback on all camera settings parameters	Byte3	Visible light photography resolution 0x14: 8000*6000 0x15: 4000*3000 0x17: 1920*1080 (unique to methane version)
	Byte4	Visible light video resolution 0x08: 1080p:1920*1080

		0x26: 4K:3840*2160 0x36: 1200W:4000*3000 (K40T-MINI/K40T-SE does not have this resolution)
	Byte5	Visible light video bit rate In H264 encoding format 0x00:6M; 0x01:8M; 0x02:10M; 0x03:12M (1080P video resolution) 0x00:30M; 0x01:40M; 0x02:50M; 0x03:60M (4K video resolution) 0x00:40M; 0x01:55M; 0x02:70M; 0x03:80M (4000*3000 resolution) In H265 encoding format (default H265) 0x00:3M; 0x01:4M; 0x02:5M; 0x03:6M (1080P video resolution) 0x00:15M; 0x01:20M; 0x02:25M; 0x03:30M (4K video resolution) 0x00:20M; 0x01:25M; 0x02:35M; 0x03:40M (4000*3000 video resolution)
	Byte6	bit3-0 white balance setting: 0001: Auto 0010: Incandescent lamp 0011: Fluorescent lamp 0100: Warm fluorescent lamp 0101: Daytime 0110: Cloudy day 0111: Dusk 1000: Dark bit7-4: reserved
	Byte7	Visible light night vision status: 0: off; 1: on
	Byte8	Visible light night vision frame rate: 0: Night vision is not turned on; 1: 30fps; 2: 15fps; 3: 7fps
	Byte9	EV value 0x00:Auto 0x0A:+2 0x10:+1 0x16:0 0x1C:-1 0x23:-2
	Byte10	ISO settings 0x00: AUTO 0x01: ISO100

		0x02: ISO200 0x03: ISO400 0x04: ISO800 0x05: ISO1600 0x06: ISO3200 0x07: ISO6400
	Byte11	electronic shutter Photo mode: Auto: 0x00: Auto Manual: 0x01: 1/4 0x02: 1/8 0x03: 1/15 0x04: 1/30 0x05: 1/60 0x06: 1/125 0x07: 1/250 0x08: 1/500 0x09: 1/1000 0x0A: 1/2000 0x0B: 1/4000 0x0C: 1/5000 0x0C: 1/6000 0x0E: 1/8000 Recording mode: Auto: 0x00: Auto Manual: 0x01: 1/4 0x02: 1/8 0x03: 1/15 0x04: 1/30 0x05: 1/60 0x06: 1/125 0x07: 1/250 0x08: 1/500 0x09: 1/1000 0x0A: 1/2000 0x0B: 1/4000 0x0C: 1/5000 0x0C: 1/6000 0x0E: 1/8000
	Byte12	Zoom fine adjustment value 0-100
	Byte13	Backlight compensation Bit7: Backlight compensation switch 0x01: On 0x00: Off Bit6-Bit0: Backlight compensation value: 0-100
	Byte14	Strong light suppression Bit7: Strong light suppression switch 0x01: On 0x00: Off Bit6-Bit0: Strong light suppression value: 0-100
	Byte15	AE LOCK Feedback: 0x1: on 0x2: off
	Byte16-	Visible OSD watermark switch (low byte first, high

	17	byte last) bit0 custom string 1 1: on 0: off bit1 custom string 2 1: on 0: off bit2 custom string 3 1: on 0: off bit3 timestamp 1: on 0: off bit4 field of view and multiple 1: on 0: off bit5 ranging distance 1: on 0: off bit6 photo and video prompts 1: On 0: Off bit7 aircraft heading angle 1: on 0: off bit8 gimbal yaw angle, elevation angle 1: On 0: Off bit9 TF card remaining capacity 1: On 0: Off bit10 maximum temperature 1: on 0: off bit11 minimum temperature 1: on 0: off bit12 average temperature 1: on 0: off bit13 aircraft longitude and latitude 1: on 0: off bit14 target longitude and latitude 1: on 0: off bit15 reserved
	Byte18	Anti-flicker status 0x01: Turn off anti-flicker 0x02: 50HZ anti-flicker 0x03: 60HZ anti-flicker 0x04: Automatic
	Byte19	Visible light metering mode setting feedback 0x01: Center-weighted metering 0x02: Area metering 0x03: Average metering
	Byte20	Visible light fusion infrared switch 0: off; 1: on
	Byte21	bit0-3: Fusion infrared weight bit4-7: Fusion of visible light weights

3.2.3.2 Visible light video resolution setting command (0x000201)

Description: Set the visible light video resolution request command.

Request frame: payload:

Byte 1	Byte 2
Start setting up	Visible light video resolution setting

The specific instructions are as follows:

Visible light video resolution setting	Byte1	0x00: Start setting
	Byte2	0x08:1920*1080 0x26:3840*2160 0x36:4000*3000 (K40T-MINI/K40T-SE does not have this resolution)

Ack:

Byte1-2
response code

3.2.3.3 Visible light photography resolution setting command (0x000202)

Description: Set visible light photography resolution request command.

Request frame: payload:

Byte 1	Byte 2
Start setting up	Visible light photography resolution settings

The specific instructions are as follows:

Visible light photography resolution settings	Byte1	0x00: Start setting
	Byte2	0x14: 8000*6000 0x15: 4000*3000 (K40T-MINI/K40T-SE does not have this resolution) 0x16: 3840*2160

		0x17: 1920*1080 (methane version/K40T-MINI/K40T-SE)
--	--	---

Ack:

Byte1-2
response code

3.2.3.4 Visible light ISO setting command (0x000203)

Description: Instructions for setting visible light camera ISO parameters.

Request frame: payload:

Byte1	Byte 2
Start setting up	Visible light ISO settings

The specific instructions are as follows:

Visible light ISO settings	Byte1	0x00: Start setting
	Byte2	0x00: AUTO; 0x01: ISO100 0x02: ISO200 0x03: ISO400; 0x04: ISO800 0x05: ISO1600; 0x06: ISO3200; 0x07: ISO6400 One-click restore to factory default value: 0x00: AUTO

Ack:

Byte1-2
response code

3.2.3.5 Visible light electronic shutter setting command (0x000204)

Description: Set the visible light electronic shutter command.

Request frame: payload:

Byte1	Byte 2
Start setting up	Visible light electronic shutter settings

The specific instructions are as follows:

Visible light electronic shutter settings	Byte1	0x00: Start setting
	Byte2	Auto: 0x00: Auto Manual: 0x01: 1/4 0x02: 1/8 0x03: 1/15 0x04: 1/30 0x05: 1/60 0x06: 1/125 0x07: 1/250 0x08: 1/500 0x09: 1/1000 0x0A: 1/2000 0x0B: 1/4000 0x0C: 1/5000 0x0D: 1/6000 0x0E: 1/8000

Ack:

Byte1-2
response code

3.2.3.6 Visible light EV setting command (0x000205)

Description: Set visible light camera EV parameter command.

Request frame: payload:

Byte1	Byte 2
Start setting up	Visible light EV settings

The specific instructions are as follows:

Visible light EV settings	Byte1	0x00: Start setting
	Byte2	0x00: Auto: 0x0A: +2 0x10: +1.0 0x16: +0 0x1C: -1 0x23: -2

Ack:

Byte1-2
response code

3.2.3.7 Visible white balance setting command (0x000206)

Description: Instructions for setting visible light white balance parameters.

Request frame: payload:

Byte1	Byte 2-4
Start setting up	Visible white balance settings

The specific instructions are as follows:

Visible white balance settings	Byte1	0x00: Start setting	
	Byte2	bit3-0 white balance setting: //3588: 0001: Auto: 0010: Incandescent lamp 0011: Fluorescent lamp 0100: Warm fluorescent lamp 0101: Daytime 0110: Cloudy 0111: Dusk 1000: Dark // 3576: 0001: Auto: 0010: Incandescent lamp 0011: Fluorescent lamp 0100: Warm white fluorescent lamp 0101: Daylight mode 0110: Cloudy Daylight Mode 0111: Dusk/Dawn Mode 1000: Shadow Mode bit7-4: reserved	
	Byte3-4	reserved	

Ack:

Byte1-2
response code

3.2.3.8 Visible light anti-flicker setting command (0x000207)

Description: Set the visible light anti-flicker command.

Request frame: payload:

Byte1	Byte 2
-------	--------

Start setting up	Visible light anti-flicker settings
------------------	-------------------------------------

The specific instructions are as follows:

Visible light anti-flicker settings	Byte1	0x00: Start setting
	Byte2	0x01: Turn off anti-flicker 0x02: 50HZ anti-flicker 0x03: 60HZ anti-flicker 0x04: Automatic

Ack:

Byte1-2
response code

3.2.3.9 Visible light strong light suppression setting command (0x000208)

Description: Set the visible light anti-flicker command.

Request frame: payload:

Byte1	Byte 2
Start setting up	Bright light suppression setting

The specific instructions are as follows:

Visible light anti-flicker settings	Byte1	0x00: Start setting
	Byte2-3	Byte2 0x01: On 0x02: Close Byte3 Setting value: 0-100

Ack:

Byte1-2
response code

Note: Highlight suppression and backlight compensation cannot be enabled at the same time.

3.2.3.10 Visible backlight compensation setting command (0x000209)

Description: Set the visible light backlight compensation command.

Request frame: payload:

Byte1	Byte 2
Start setting up	Backlight compensation settings

The specific instructions are as follows:

Visible light anti-flicker settings	Byte1	0x00: Start setting
	Byte2-3	Byte2 0x01: On 0x02: Close Byte3 Setting value: 0-100

Ack:

Byte1-2
response code

Note: Highlight suppression and backlight compensation cannot be enabled at the same time.

3.2.3.11 Visible light AE LOCK setting command (0x00020A)

Description: Set the AE LOCK command

Request frame: payload:

Byte1	Byte2
Start setting up	AE LOCK settings

The specific instructions are as follows:

AE LOCK	Byte1	0x00: Start setting
	Byte2	0x01:on 0x02:off

Ack:

Byte1-2
response code

3.2.3.12 Visible light camera metering mode command (0x00020B)

Description: Set metering mode command

Request frame: payload:

Byte1	Byte2
Start setting up	Metering mode settings

The specific instructions are as follows:

	Byte1	0x00: Start setting
	Byte2	1: Center-weighted metering 2: Area metering (default area) 3: Average metering

Ack:

Byte1-2
response code

3.2.3.13 Visible light night vision mode setting command (0x00020E)

Description: Set visible light night vision mode

Request frame: payload:

Byte1	Byte2
Start setting up	Night vision mode

The specific instructions are as follows:

	Byte1	0x00: Start setting
	Byte2	1: Turn on night vision mode 3: Turn off night vision mode (off by default)

Ack:

Byte1-2
response code

Status frame (5HZ)

Byte1	Byte2-3
Current status feedback	reserved

	Byte1	0x00: Setting completed 0x01: Setting up 0x02: Setting failed
	Byte2-3	reserved

Note: In night-vision mode, both photo resolution and video resolution are 1080p and cannot be switched.

3.2.3.14 Visible night vision frame rate setting command (0x00020F)

Description: Set visible light night vision frame rate

Request frame: payload:

Byte1	Byte2
Start setting up	Night vision frame rate

The specific instructions are as follows:

	Byte1	0x00: Start setting
	Byte2	1: 30fps 2: 15fps 3: 7fps

Ack:

Byte1-2
response code

Note: This can be set only in night-vision mode.

3.2.3.15 Visible light fusion infrared setting command (0x000212)

App sets visible light fusion infrared function

Request frame: payload:

Byte1	Byte2	Byte3	Byte4
Set switch	Fusion IR weights	Fusion of visible light weights	reserved

The specific instructions are as follows:

Visible light fusion infrared	Byte1	0x00: Turn off visible light fusion 0x01: Turn on visible light fusion
	Byte2	Fusion IR weight range (0-10)

function settings	Byte3	Fusion visible light weight range (0-10)
	Byte4	reserved

1. The higher the fused infrared weight, the more infrared components, and vice versa.
2. The higher the fused visible light weight, the more visible light components, and vice versa.
3. The sum of the infrared fusion weight and the visible light fusion weight does not exceed 10.
4. It can be set below 3.5 times.

Ack:

Byte1-2
response code

3.2.3.16 Visible light fusion infrared debugging command (0x000213)

App debugging visible light fusion infrared debugging function

Request frame: payload:

Byte1	Byte2-3	Byte4-5	Byte6-7
Set switch	Infrared horizontal offset value	Infrared vertical offset value	Infrared rotation angle

The specific instructions are as follows:

Visible light fusion infrared debugging	Byte1	0x01: debug mode; 0x02: save to configuration file
	Byte2-3	Infrared horizontal offset value unit*10 unsigned integer
	Byte4-5	Infrared vertical offset value unit*10 unsigned integer
	Byte6-7	Infrared rotation angle unit*10 unsigned integer

Ack:

Byte1-2
response code

Note: The infrared horizontal offset range is 440-640, the infrared vertical offset range is 111-311, and the infrared rotation angle is 0-360.

3.2.3.17 Visible light fusion infrared grayscale setting command (0x000214)

Description: App sets the grayscale of visible light fusion infrared

Request frame: payload:

Byte1	Byte2
Grayscale mode	reserved

The specific instructions are as follows:

Visible light fusion infrared grayscale	Byte1	0x00: Normal output of visible light 0x01: Visible light grayscale image
	Byte2	reserved

Ack:

Byte1-2
response code

Note: This can be set only when fusion is enabled.

3.2.4 Common part (0x000300-0x0003FF)

3.2.4.1 Photo and video mode setting instructions (0x000300)

Description: Request command to set visible light photo and video mode

Request frame: payload:

Byte 1	Byte 2
--------	--------

Photo/video mode settings	reserved
---------------------------	----------

The specific instructions are as follows:

Visible light photo and video mode settings	Byte1	Byte1 mode switching: 0: photo mode; 1: video mode
	Byte2	reserved

Note: It does not respond to video recording commands in photo taking mode; it does not respond to photo taking commands in video recording mode.

3.2.4.2 Photography parameter setting command (0x000301)

Description: Set the photo parameter setting request command

Request frame: payload:

Byte 1	Byte2	Byte3	Byte 4
Photo function settings	Time-lapse interval	Number of continuous shots	reserved

The specific instructions are as follows:

Visible light photography parameter settings	Byte1	0x00: Normal single shot 0x01: Continuous shooting: 3/5 pictures 0x02: Time-lapse photography
	Byte2	Byte2 delay interval: 5/7/30/60
	Byte3	Byte3 Number of continuous shots: 3/5
	Byte4	reserved

Ack:

Byte1-2
response code

3.2.4.3 Photography command (0x000302)

Description: Camera photography instructions

Request frame: payload:

Byte 1	Byte 2	Byte3-22	Byte23-54
Photo mode	Camera photo instructions	folder name	Picture name

The specific instructions are as follows:

Camera photo instructions	Byte1	Photo mode 0x00: Default photo taking (infrared + visible light taken together) 0x01: Infrared photo (resolution: 640*512) 0x02: Visible light photography (resolution: 4000*3000) 0x03: Infrared + visible light photography
	Byte2	Camera photo instructions 0x00: Single shot/start taking pictures 0x01: Stop taking pictures (only valid in continuous shooting mode)
	Byte3-22	Folder name, does not contain '\0', total 20 bytes, This byte array forms a string (string A). When the string is NULL or "", this field is not used and is placed in the root directory of the image file. If the string is not empty, this field is used. If the root directory of the image has the folder, there is no need to create it. If there is no such folder, the folder needs to be created.
	Byte23-byte54	Image name, excluding '\0', 32 bytes in total, This byte array forms a string. When the string is NULL or "", the default name rule is used. If the string is not empty, the string is used as the image name.

Ack

Byte1-2

response
code

status frame

Byte 1	Byte2	Byte3-4	Byte5-7
Photo mode status	Current photo feedback	Number of continuous shots	reserved

Photo status feedback	Byte1	0-default photo 1-Infrared photography 2-Visible light photography 3-Infrared + visible light photography
	Byte2	Current photo feedback 0-Photography completed 1-Single shooting 2-Continuous shooting 3- Taking time-lapse shooting 4-Stop taking photos 6-Failed to take pictures 7-SD card not inserted 8-SD card is full 9-Exception card 10-Low speed card 11-SD card format error
	Byte3-4	Number of continuous shots
	Byte5-7	reserved

Note: Before taking pictures, a GPS request command will be sent to the flight controller to obtain GPS information.

3.2.4.4 Recording command (0x000303)

Description: Camera recording command

Request frame: payload:

Byte 1	Byte 2	Byte3-22	Byte23-54
Recording mode	Camera recording command	folder name	Picture name

The specific instructions are as follows:

Camera recording command	Byte1	Recording mode 0x00: Default recording (infrared + visible light recording together) 0x01: Infrared video (resolution: 640*512) 0x02: Visible light video (resolution: 4000*3000) 0x03: Infrared + visible light video 0x04: Video streaming screen recording (resolution: 1920*1080)
	Byte2	0x01: Start recording (sending again will not stop recording. To stop, you need to send a stop recording command) 0x02: Stop recording
	Byte3-22	Folder name, does not contain '\0', total 20 bytes, This byte array forms a string (string A). When the string is NULL or "", this field is not used and is placed in the root directory of the image file. If the string is not empty, this field is used. If the root directory of the image has the folder, there is no need to create it. If there is no such folder, the folder needs to be created.
	Byte23-byte54	Video name, excluding '\0', total 32 bytes, This byte array forms a string. When the string is NULL or "", the default name rule is used. If the string is not empty, the string is used as the video name.

Ack

Byte1-2
response code

Status frame (1HZ)

Byte 1	Byte 2	Byte3-4	Byte5-7
Current recording mode feedback	Current video feedback	Recording time	reserved

Recording status feedback	Byte1	Current recording mode feedback 0-Default recording 1-Infrared video 2-Visible light video 3-Infrared + visible light video 4-Video streaming screen recording
	Byte2	Current video feedback 0-stop recording; 1-Recording; 2-Waiting for time-lapse recording; 3-Time-lapse video recording 4-SD card not inserted 5-SD card is full 6-Exception card 7-Low speed card 8-SD card format error
	Byte3-4	Recording time
	Byte5-7	reserved

3.2.4.5 Specify mixed zoom instruction (0x000304)

Description: Specify the hybrid variable magnification command

Request frame: payload:

Byte 1	Byte2-3
Start setting up	Mixed zoom ratio

The specific instructions are as follows:

Visible light specifies precise zoom ratio	Byte1	0: Start setting
	Byte2-3	Visible light: Specified hybrid zoom magnification*10 (magnification is the actual supported magnification of the camera, accurate to one decimal place) (1-160x hybrid zoom) (Methane customized version 1-16x) Infrared: Specify hybrid zoom magnification *10 (magnification is the actual supported magnification of the camera, accurate to one decimal place) (1-8 times electronic magnification) (Wuba intelligent customized version)

Ack:

Byte1-2
response code

status frame

Byte 1	Byte 2
Zoom state	reserved

Visible light specified variable magnification status frame	Byte1	Byte1 zoom status 0x01: Zooming in 0x00: Zoom completed
	Byte2	reserved

3.2.4.6 Continuous mixed zoom instruction (0x000306)

Description: Perform continuous zoom command

Request frame: payload:

Byte1	Byte2
Camera zoom control	reserved

The specific instructions are as follows:

Camera zoom control	Byte1	0x00: Continuous amplification 0x01: Continuous reduction 0x02: Stop zooming 0x03: Zoom in 0x04: Zoom out
	Byte2	reserved

Ack:

Byte1-2
response code

3.2.4.7 Specify camera precise re-shooting instruction (0x000307)

Description: Specify the camera's precise reshooting instructions

Request frame: payload:

Byte 1	Byte 2	Byte 3-4	Byte 5-6
Photo mode	Visible light photography resolution	Visible light multiple	Visible light precise repeat shooting focus
Byte7-26	Byte27-58		
folder name	Photo name		

The specific instructions are as follows:

Visible light accurate re-shooting	Byte1	0x00: Default photo (all stored) 0x01: Infrared photo 0x02: Visible light photography 0x03: Infrared + visible light photography
	Byte2	0x14:8000*6000 0x15:4000*3000
	Byte3-4	Visible light multiple, unit 0.1 times
	Byte5-6	Visible light precise repeat shooting focus
	Byte7-26	Folder name, does not contain '\0', total 20 bytes, This byte array forms a string (string A). When the string is NULL or "", this field is not used and is placed in the root directory of the image file. If the string is not empty, this field is used. If the root directory of the image has the folder, there is no need to create it. If there is no such folder, the folder needs to be created.
	Byte27-58	Image name, excluding '\0', 32 bytes in total, This byte array forms a string. When the string is NULL or "", the default name rule is used. If the string is not empty, the string is used as the image name.

Ack:

Byte1-2
response code

status frame

Byte 1	Byte2	Byte3-7
Photo mode	Current photo feedback	reserved

Photo	Byte1	0-default photo
-------	-------	-----------------

status feedback		1-Infrared photography 2-Visible light photography 3-Infrared + visible light photography
	Byte2	Current photo feedback 0-Photography completed 1-Continuous shooting 3- Taking time-lapse shooting 4-Stop taking photos 5-Single shooting 6-Failed to take pictures 7-SD card not inserted 8-SD card is full 9-Exception card 10-Low speed card 11-SD card format error 12-Precisely resume shooting
	Byte3-7	reserved

3.2.4.8 Video output stream setting command (0x000308)

Description: Set the camera video output stream command.

Request frame: payload:

Byte1	Byte2
Camera output stream settings	reserved

The specific instructions are as follows:

Camera output stream settings	Byte1	1:1M 2:1.5M 3:2M 4: 4M 5: 8M 6: 12M
	Byte2	reserved

Ack:

Byte1-2
response code

3.2.4.9 Video output resolution setting command (0x00030A)

Description: Set camera video output format instructions.

Request frame: payload:

Byte1	Byte2
Video output resolution	reserved

The specific instructions are as follows:

Camera output stream settings	Byte1	1: 1080P30fps 2: 720P30fps
	Byte2	reserved

Ack:

Byte1-2
response code

3.2.4.10 Video encoding format setting command (0x00030B)

Description: Set the video output encoding format setting instructions.

Request frame: payload:

Byte1	Byte2
Video output encoding format	reserved

The specific instructions are as follows:

	Byte1	0: H264
--	-------	---------

		1: H265
	Byte2	Byte2: reserved

Ack:

Byte1-2
response code

3.2.4.11 TF card format command (0x00030D)

Description: TF card formatting instructions

Request frame: payload:

Byte 1	Byte2
TF card format instructions	reserved

The specific instructions are as follows:

TF card format instructions	Byte1	Byte1 0x01: Format sd card
	Byte2	reserved

Ack

Byte1-2
response code

Status frame (5HZ)

Byte1	Byte2-3
Current status feedback	reserved

	Byte1	0x00: Formatting completed 0x01: Formatting in progress 0x02: Format failed 0x03: SD card is not available
	Byte2-3	reserved

Note: A failure is returned during video recording or photo capture.

3.2.4.12 gimbal camera timing command (0x00030E)

Description: gimbal camera timing command.

Request frame: payload:

Byte 1-8	Byte9-12	Byte13-16
Timestamp (number of milliseconds since 1970-01-0100:00:00)	Time zone, unit is minute, time zone is converted into minutes. For example, the East Eighth District is $8*60=480$	Daylight saving time, currently not used, set to 0

Ack

Byte1-2
response code

3.2.4.13 Restore factory settings command (0x00030F)

Description: Restore factory settings instructions

Request frame: payload:

Byte 1	Byte2
Factory reset instructions	reserved

The specific instructions are as follows:

Factory	Byte1	Byte1 0x01: Restore factory settings
---------	-------	--------------------------------------

reset instructions	Byte2	reserved
--------------------	-------	----------

Ack

Byte1-2
response code

Note: Restart after three seconds. Restoring to factory settings will set the IP to 192.168.144.64. Please use it with caution.

3.2.4.14 The camera requests GPS information command from the flight controller (0x000310)

Description: The camera sends a command to the flight controller to request GPS information at a specified time.

Request frame: payload:

Byte 1-6
GPS time information

The specific instructions are as follows:

time information	Byte1	Lens enable, 0: Disabled 1: Enabled
	Byte2	Hours: 0-23
	Byte3	Points: 0-59
	Byte4	Seconds: 0-59
	Byte5-6	Milliseconds: 0-999

Ack: (sent from flight control to gimbal)

Byte1-2	Byte3-19	Byte20-31
response code	GPS information	Aircraft attitude information

The specific instructions are as follows:

GPS information	Byte1-2	response code
	Byte3	Hours: 0-23 (consistent with the request content)
	Byte4	Points: 0-59 (consistent with the request content)
	Byte5	Seconds: 0-59 (consistent with the request content)
	Byte6-7	Milliseconds: 0-999 (consistent with the request content)
	Byte8-11	Longitude angle (unit °)*10 ⁷ , signed integer
	Byte12-15	Latitude angle (unit °)*10 ⁷ , signed integer
	Byte16-17	Relative height (unit m)*10, signed integer
	Byte18-19	Altitude (unit m)*10, signed integer
	Byte20-21	2-byte signed integer, aircraft azimuth angle*100
	Byte22-23	2-byte signed integer, aircraft roll angle*100
	Byte24-25	2-byte signed integer, aircraft pitch angle*100
	Byte26-27	2-byte signed integer, gimbal azimuth angle * 100 (methane customized version)
	Byte28-29	2-byte signed integer, gimbal roll angle*100 (Methane customized version)
	Byte30-31	2-byte signed integer, gimbal pitch angle * 100 (methane customized version)

Note: The gps information in the photo attributes needs this command to obtain

3.2.4.15 Camera IP address setting command (0x000311)

Description: Set camera IP address command

Request frame: payload:

Byte1	Byte2-5	Byte6-9	Byte10-13
-------	---------	---------	-----------

IP type	IP address	subnet mask	Default gateway
---------	------------	-------------	-----------------

The specific instructions are as follows:

Example	Byte1	0: Static setting 1: Dynamic acquisition	
	Byte2	145 (example)	
	Byte3	192	
	Byte4	1	
	Byte5	20	
	Byte6	255	0x00: NULL
	Byte7	255	
	Byte8	255	
	Byte9	0	
	Byte10	145	0x00: NULL
	Byte11	192	
	Byte12	1	
	Byte13	1	

Ack:

Byte1-2
response code

3.2.4.16 Camera IP address acquisition command (0x000312)

Description: Query camera IP address command.

Request frame: payload:

Byte1	Byte2
Query IP address	reserved

The specific instructions are as follows:

Example	Byte1	1: Query IP address
	Byte2	reserved

Ack:

Byte1-2	Byte3-6	Byte7-10	Byte11-14
response code	IP address	subnet mask	Default gateway

The specific instructions are as follows:

Byte1-2	response code
Byte3	145 (example)
Byte4	192
Byte5	1
Byte6	20
Byte7	255
Byte8	255
Byte9	255
Byte10	0
Byte11	145
Byte12	192
Byte13	1

Byte14	1
--------	---

3.2.4.17 Focus command (0x000313)

Description: Set the camera focus request command

Request frame: payload:

Byte 1-9	Byte 10
Focus settings	Focus type

The specific instructions are as follows:

	Byte1	0x00: auto focus 0x01: Manual fine-tuning of focus+ 0x02: Manual fine-tuning of focus- 0x03: Stop manual fine-tuning of focus 0x04: Area autofocus 0x05: One-click focus 0x06: Turn on autofocus after zooming 0x07: Turn off autofocus after zooming
	Byte2-3	Byte2 X coordinate of the upper left corner of the area autofocus frame
	Byte4-5	Byte3 area autofocus frame upper left Y coordinate
	Byte6-7	Byte4 X coordinate of the lower right corner of the area autofocus frame
	Byte8-9	Byte5 Y coordinate of the lower right corner of the area autofocus frame
	Byte10	Focusing type: (Shenzhen Traffic Control built-in customized version) 0: Normal focus mode. 1: Near focus support mode.

Ack:

Byte1-2
response code

Note: After zooming and one-touch focus, the focus mode returns to center focus. The gimbal automatically performs one-touch focus every 5 seconds.

3.2.4.18 Camera OSD watermark switch (0x000314)

Description: Set the camera OSD watermark master switch.

Request frame: payload:

Byte1	Byte2	Byte3
Watermark switch	reserved	reserved

The specific instructions are as follows:

	Byte1	Watermark switch: 0: off 1: open
	Byte2	reserved
	Byte3	reserved

Ack:

Byte1-2
response code

Note: Turning off not displaying watermarks and turning on displaying watermarks will not affect the watermark configuration switch.

3.2.4.19 Camera OSD watermark custom copy (0x000315) (methane customized version)

Description: Set the camera OSD watermark custom text.

Request frame: payload:

Byte1-60	Byte61-62	Byte63-64	Byte65	Byte66	Byte67	Byte68
Watermark custom copywriting	X coordinate point	Y coordinate point	font size	Watermark switch	Watermark serial number	watermark color

The specific instructions are as follows:

	Byte1-60	Watermark custom copywriting.
	Byte61-62	X coordinate point (unsigned integer): 0-1920
	Byte63-64	Y coordinate point (unsigned integer): 0-1080
	Byte65	Font size (unsigned integer): 1-50
	Byte66	Watermark switch (unsigned integer): 0: off 1: on
	Byte67	Watermark serial number (unsigned integer): 1-10
	Byte68	Watermark color: 1: white; 2: red

Ack:

Byte1-2
response code

3.2.4.20 Camera shutdown and restart command (0x000316)

Note: Shut down or restart the camera

Request frame: payload:

Byte1	Byte2
Turn off the camera and restart it	reserved

The specific instructions are as follows:

Camera shutdown command	Byte1	0x01: Shut down 0x02: Soft restart
	Byte2	reserved

Ack:

Byte1-2
response code

3.2.4.21 Get camera version number (0x000317)

Description: Get the camera version number

Request frame: payload:

Byte 1	Byte 2
Get camera version number	reserved

The specific instructions are as follows:

Get camera version number	Byte1	0x01: Get camera version number
	Byte2	reserved

Ack:

Byte1-2	Byte3	Byte4	Byte5
response code	Major version number	minor version number	minor version number

3.2.4.22 Image mode setting command (0x000318)

Description: Set camera image mode command

Request frame: payload:

Byte 1	Byte 2
--------	--------

Image mode	reserved
------------	----------

The specific instructions are as follows:

Image mode settings	Byte1	0x00: Infrared image 0x05/0x06: visible light 0x07: Split screen
	Byte2	reserved

Ack:

Byte1-2
response code

3.2.4.23 Intelligent identification command (0x000319)

Description: AI intelligent recognition instructions

Request frame: payload:

Byte 1	Byte 2	Byte 3-18
Identification switch	Specify the model type to load	Identify target categories

The specific instructions are as follows:

AI smart switch settings	Byte1	Identification switch 0x01: on 0x02: off
	Byte2	Specify the type of model to be loaded. The currently supported model is the yolov series model. By default this byte is 0x00
	Byte3	bit0: represents category 1, if it is 1, it means turning on this category recognition; 0: does not recognize this category bit1: represents category 2, if it is 1, it means turning on this category recognition; 0: not recognizing this category bit2: represents category 3, if it is 1, it means turning on

		this category recognition; 0: not recognizing this category bit3: represents category 4, if it is 1, it means turning on this category recognition; 0: not recognizing this category bit4: represents category 5, if it is 1, it means turning on this category recognition; 0: not recognizing this category bit5: represents category 6, if it is 1, it means turning on this category recognition; 0: not recognizing this category bit6: represents category 7, if it is 1, it means turning on the recognition of this category; 0: not recognizing this category bit7: represents category 8, if it is 1, it means turning on the recognition of this category; 0: not recognizing this category
	Byte4-18	Similar to byte3 bytes, the categories are accumulated sequentially.

Ack:

Byte1-2
response code

Status frame (reported every 33 ms):

Byte1-Byte(10*N) (used if there is target recognition, not used if there is no target)	Byte(10*N+1)	Byte(10*N+2)
Multiple/single target data: Struct single target occupies 10 bytes { Byte1-2:X in the upper left corner Byte3-4:Y in the upper left corner Byte5-6: width Byte7-8: high	Number of detections (1 byte) Range: 0-24	Detection status (1 byte): 0x00 Detection successful 0x02 Target not detected

Byte9 target confidence (conf*100)		
Byte10 category id;		
N targets occupy 10*N bytes. Note: 0 targets occupy 0 bytes.		

Note:

1. The coordinates are reported at a resolution of 1920*1080. The upper left point of the screen is (0, 0) and the lower right point is (1920, 1080). A single package can transmit multiple target detection frames, and supports up to 24 targets in the screen.
2. When the frame-selected target tracking command is enabled, the coordinate information of a single tracking target is reported.
3. The target category ID range is determined based on the label file recognized by the model. After AI intelligent recognition is turned on, the camera will automatically select and identify objects. The default recognition category IDs are as follows: 1: Pedestrian 2: Crowd 3: Bicycle 4: Car 5: Truck 6: Truck 7: Tricycle 8: Awning - Tricycle 9: Bus 10: Motorcycle 11: Aircraft 12: Boat 13: Fire 14: License plate 15: Roof (Zhongkewei)
4. A single target of Zero One Smart Version occupies 11 bytes, Byte11: is the tracking ID.

Byte1-2
response code

3.2.4.24 Flight control request target GPS information command (0x000320)

Description: The flight controller requests the GPS information of the current laser alignment target from the camera.

Request frame: payload:

Byte1-42
request information

The specific instructions are as follows:

Flight	Byte1	Request to mount
--------	-------	------------------

controller requests target gps command		Bit0: 1: Mount 1 requested, 0: Mount 1 not requested Bit1: 1: Mount 2 requested, 0: Mount 2 not requested Bit2: 1: Mount 3 requested, 0: Mount 3 not requested Bit3: 1: Mount 4 requested, 0: Mount 4 not requested Bit4: 1: Mount 5 requested, 0: Mount 5 not requested Bit5: 1: Mount 6 requested, 0: Mount 6 not requested Bit6: 1: Mount 7 requested, 0: Mount 7 not requested Bit7: 1: Mount 8 requested, 0: Mount 8 not requested Default request mount 1
	Byte2	GPS status 0: GPS is not connected 1: GPS is connected, no positioning information 2: 2D positioning 3: 3D positioning 4: 3D positioning supported by DGPS/SBAS 5: Floating RTK, 3D positioning 6: Fixed RTK, 3D positioning 7: Static fixed state, used for base station 8: PPP, 3D positioning Note: 3 and above are considered positioning accuracy available.
	Byte3-10	UTC timestamp in milliseconds, low byte first
	Byte11-14	Longitude angle (unit °)*10 ⁷ , signed integer, low byte first
	Byte15-18	Latitude angle (unit °)*10 ⁷ , signed integer, low byte first
	Byte19-22	Relative height (unit m) * 1000, signed integer, low byte first
	Byte23-26	Altitude (unit m) * 1000, signed integer, low byte first
	Byte27-28	Aircraft azimuth angle*100 signed integer, low byte

		first
	Byte29-30	Aircraft roll angle*100 signed integer, low byte first
	Byte31-32	Aircraft pitch angle*100 signed integer, low byte first
	Byte33-34	Airspeed*100 (current airspeed) unit: m/s low byte first
	Byte35-36	Ground speed*100 (current airspeed) unit: m/s low byte first
	Byte37-38	Heading*100 (current heading expressed in compass units (0-360, 0: north)) Unit: deg low byte first
	Byte39-40	Throttle*100 (current throttle setting: 0-100) Unit: % low byte first
	Byte41-42	Climb rate*100 (current climb rate) unit: m/s low byte first

Ack:

Byte1-2	Byte3	Byte4-11	Byte12-27
response code	Mount enable	time information	GPS information

response code	Byte1-2	ACK response code
Mount enable	Byte3	The mount required to obtain the target GPS is fixed to: 0x1f
time information	Byte4-11	UTC timestamp, unit: millisecond, low byte first
GPS information	Byte12-15	Longitude angle (unit °)*10 ⁷ , signed integer, low byte first
	Byte16-19	Latitude angle (unit °)*10 ⁷ , signed integer, low byte first
	Byte20-23	Relative height (unit m) * 1000, signed integer, low

		byte first
	Byte24-27	Altitude (unit m) * 1000, signed integer, low byte first

Status frame, can be turned on and off reporting through 0x00033B message (requires access to mavlink message, reported once every 200 milliseconds)

Byte1-2	Byte3	Byte4-11	Byte12-27
response code	Mount enable	time information	GPS information

response code	Byte1-2	ACK response code
Mount enable	Byte3	The mount required to obtain the target GPS is fixed to: 0x1f
time information	Byte4-11	UTC timestamp, unit: millisecond, low byte first
GPS information	Byte12-15	Longitude angle (unit °)*10 ⁷ , signed integer, low byte first
	Byte16-19	Latitude angle (unit °)*10 ⁷ , signed integer, low byte first
	Byte20-23	Relative height (unit m) * 1000, signed integer, low byte first
	Byte24-27	Altitude (unit m) * 1000, signed integer, low byte first

3.2.4.25 Frame selection target tracking command (0x000324)

Description: Set camera frame selection target tracking instructions

Request frame: payload:

Byte1	Byte2-3	Byte4-5	Byte6-7	Byte8-9	Byte10
Frame selection	The x coordinate	The y coordinate	Target box width	Target box height	reserved

settings	of the upper left point of the target box	of the upper left point of the target box			
----------	--	--	--	--	--

The specific instructions are as follows:

Frame selection target tracking settings	Byte1	0x01: Enable frame selection 0x02: Close frame selection
	Byte2-3	The x coordinate of the upper left point of the target box ranges from 0-1920
	Byte4-5	The y coordinate of the upper left point of the target box ranges from 0-1088
	Byte6-7	Target box width: The x coordinate value of the tracking box plus the width does not exceed 1920
	Byte8-9	The height of the target frame. The y coordinate value of the tracking frame plus the height does not exceed 1088.
	Byte10	reserved

Ack:

Byte1-2
response code

Status frame (reported once every 33 milliseconds):

Byte1-Byte10 (used if there is target recognition, not used if there is no target)	Byte11	Byte12
Single target data: Struct single target occupies 10 bytes { Byte1-2:X in the upper left	Number of detections (1 byte) Range: Default 1	detection status 0x00 detection successful; 0x02 No target detected;

corner Byte3-4:Y in the upper left corner Byte5-6: width Byte7-8: high Byte9 target confidence (conf*100) Byte10 category id }		
--	--	--

Note: It is necessary to perform frame-selected target tracking when AI detection is turned on. There are two types of tracking:

1. If the area selected by the frame overlaps the area recognized, use the recognition frame to track it.
2. The frame-selected area does not overlap with the identified area, and the frame-selected area is used for tracking.
3. When tracking is enabled, the reporting of recognition status frames will be stopped and the reporting of tracking status frames will be enabled; if tracking is lost or tracking is turned off, the reporting of status frames will be stopped and the reporting of recognition status frames will be enabled.

3.2.4.26 Get the movement temperature (0x000325)

Description: Get the movement temperature

Request frame: payload:

Byte 1	Byte 2
Get the movement temperature	reserved

The specific instructions are as follows:

Get the movement temperature	Byte1	0x01: Get the movement temperature
	Byte2	reserved

Ack:

Byte1-2	Byte3-4
---------	---------

response code	Movement temperature (unit: 0.1°C)
---------------	---------------------------------------

3.2.4.27 Set UDP push IP and port number command (0x000327) (Methane customized version)

Description: Set the udp streaming IP and port number

Request frame: payload:

Byte1-4	Byte5-6	Byte7
IP address	port number	reserved

The specific instructions are as follows:

Set udp streaming IP and port number	Byte1	The first field of IP (example: 192)
	Byte2	IP second field (example: 168)
	Byte3	IP third field (example: 144)
	Byte4	The fourth field of IP (example: 64)
	Byte5-6	port number
	Byte7	reserved

Ack:

Byte1-2
response code

3.2.4.28 Get UDP push IP and port number command (0x000328) (Methane customized version)

Description: Get the udp streaming IP and port number

Request frame: payload:

Byte1	Byte2
-------	-------

Get: 0x01	reserved
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The specific instructions are as follows:

IP and port number	Byte1-2	response code
	Byte3	The first field of IP (example: 192)
	Byte4	IP second field (example: 168)
	Byte5	IP third field (example: 144)
	Byte6	The fourth field of IP (example: 64)
	Byte7-8	port number

Ack:

Byte1-2
response code

3.2.4.29 OSD watermark configuration command (0x000329)

Description: Set the OSD watermark content switch, position, font size and color.

Request frame: payload:

Byte1	Byte2	Byte3	Byte4	Byte5
Watermark configuration switch	watermark position	reserved	watermark color	reserved

The specific instructions are as follows:

OSD watermark configuration information	Byte1	OSD watermark switch: bit0-bit6: 1: Custom string 1 2: Custom string 2 3: Custom string 3 4: timestamp
---	-------	---

		5: Field of view and multiples 6: Ranging distance 7: Tips for taking photos and videos 8: Aircraft heading angle 9: Gimbal heading and pitch angle 10: Remaining capacity of TF card 11: Maximum temperature 12: lowest temperature 13: average temperature 14: Aircraft latitude and longitude, altitude 15: Target latitude and longitude 16: Center plus sign (+) bit7: 0x01: enable 0x00: disable
	Byte2	Watermark location: 1, upper left 2, lower left 3, upper right 4, lower right
	Byte3	reserved
	Byte4	Watermark color: 1, white 2, red
	Byte5	reserved

Ack:

Byte1-2
response code

Note: A maximum of 10 OSD watermark configurations can be set, and the configuration file will be written and saved. The configuration file will be read next time it is turned on.

3.2.4.30 OSD custom watermark copy configuration command (0x00032A)

Description: Set OSD custom watermark copy configuration

Request frame: payload:

Byte1	Byte2-65	Byte66
Custom watermark serial number	Custom watermark information (64byte)	reserved

The specific instructions are as follows:

Set OSD custom watermark configuration	Byte1	Custom string index: 1. Custom watermark 1 2. Custom watermark 2 3. Custom watermark 3
	Byte2-65	Supports 64 bytes of data including alphanumeric underscores
	Byte66	reserved

Ack:

Byte1-2
response code

3.2.4.31 Switch playback download mode (0x00032B)

Description: Turn on or off playback download mode

offset address	Number format	Name	Description
byte 1	Uint8_t	Download mode switch	1: Enable playback download mode 2: Turn off playback download mode
byte 2	Uint8_t	reserved	Reserved fields

Ack:

Byte1-2

response code

(1) When the playback/download mode is turned on, the camera video stream is turned off, and playback/download occupies the main image transmission bandwidth.

(2) When the playback/download mode is turned off, it takes 5 seconds to 10 seconds to turn on the camera video stream.

3.2.4.32 Refresh media library list (0x00032C)

Description: Refresh the media library list

offset address	Number format	Name	Description
byte 1	Uint8_t	Refresh media library	0x01: Refresh the multimedia list
byte 2	Uint8_t	reserved	Reserved fields

Ack:

Byte1-2

response code

3.2.4.33 Delete media library file (0x00032D)

Description: Delete media library files

offset address	Number format	Name	Description
byte1	uint8_t	len	The absolute path length of the file
byte2-byte(2+len)	string type	filePath	absolute path to file

Ack:

Byte1-2

response code

3.2.4.34 Download media library file (0x00032E)

Description: Download multimedia files

offset address	data type	Name	Description
byte1	Uint8_t	len	File absolute path length
byte2	Uint8_t	File type	1: Media library list 2: Preview image (800*600) 3: Thumbnail (160*120) 4: Original picture 5: Original video 7: Stop downloading 8: Media library folder (a folder customized by the user when taking photos and videos)
byte3-4	int16_t	One pack size	The size of a package of files reported by UDP (the maximum size cannot exceed 64,000 bytes when downloading; this byte is invalid when downloading is stopped, fill in 0)
byte5-8	Uint32_t	Starting packet sequence number	The starting packet sequence number reported by UDP (this byte is invalid when downloading is stopped, fill in 0)
Byte9	Uint8_t	Total number of packages sent	The total number of packets continuously reported by UDP (this byte is invalid when downloading is stopped, fill in 0)
byte10-byte(10+len)	string type	file name	The absolute path of the downloaded file (download file list, fill in 0 when stopping downloading, one byte)

Ack:

Byte1-2

response code

After receiving the download file command, use the extended protocol to transmit data in udp mode, extending the payload length to short. The extended protocol frame format is as follows:

Byte number	Type	content	value	explain
0	Uint8_t	packet start flag	0xFD	Protocol-specific text start (stx) marker used to indicate the start of a new packet. Any system that does not recognize the protocol version will skip the packet.
1-2	Uint16_t	load length	0-65535	Displays the length of the payload section. This may be affected by message data.
3	Uint8_t	System ID (recipient)	0-255	Refers to the recipient system ID, which is used to distinguish the systems of different products.
4	Uint8_t	Component ID (receiver)	0-255	Refers to the recipient system ID, used to distinguish components of different products.
5	Uint8_t	Packet sequence number	0-255	Used to detect packet loss, the component increments the value for each message sent.
6	Uint8_t	System ID (sender)	1-255	Refers to the sender system ID, used to distinguish systems on the network.
7	Uint8_t	Component ID (sender)	1-255	Refers to the sender component ID, used to distinguish components in the system.

8-10	UInt32_t	Message ID (low, medium, high byte)	0- 167772 15	The id of the message type in the payload, used to decode the data back into the message object.
11- n+11	UInt8_t[243]	payload		message data. Depends on message type (i.e. message ID) and content.
N+12 - N+13	UInt16_t	Checksum		X.16 CRC (check data starting from 0XFD and all data)

The payload content is as follows:

offset address	data type	Description
Byte1	uint8_t	Packet type 1: Parameter package 2: Content pack
Byte2-...	uint8_t	Packet content

When the type in the data packet is 1, this packet is a parameter packet and will contain basic information about the file. The content of the data packet is as follows

Byte1-4	Byte5-6	Byte7-13
Total file length	File CRC check value (the check method is consistent with the check method in the protocol frame)	Spare

When the type in the data packet is 2, the packet is a content packet, and the content of the data packet is as follows

offset address	data type	Name	Description
Byte1-4	uint32_t	num	Send packet number (starting from 0)

Byte5-Byte (5+ file size of one package)	uint8_t	file	File content data (if the file data content is smaller than one packet file size, it will be sent with the actual data content length)
--	---------	------	--

The content of the file list is serialized into byte data in json format and sent. Its structure is:

```
JSON{ "path":"/home/gdu/1.jpg", "filesize":1234, //File size
"mtime":16345467789 //Last modification
time},{ "path":"/home/gdu/2.jpg", "filesize":12344, //File size
"mtime":16345467789 //Last modification
time},{ "path":"/home/gdu/3.mp4", "filesize":1234, //File size
"duration":55, //Video duration "mtime":16345467789 //Last
modification time},
```

The folder content is serialized into byte data in json format and sent. Its structure is:

```
JSON{ "path":"/mnt/sdcard/Vis/Photo/1", "mtime":16345467789 //Last
modification time},{ "path":"/mnt/sdcard/IR/VIDEO/2",
"mtime":16345467789 //Last modification time}
```

1. When sending a message, the sequence number of the UDP reply frame will be consistent with the sequence number of the request frame for downloading the media file to ensure the consistency of the media file.

2. When sending a message, the parameter package will be sent first, and then the content package will be sent.

3. When downloading previews, thumbnails, original pictures, original videos, and file lists, you need to fill in the starting packet serial number, total number of packets sent, size of one packet, file name, etc. The total number of packets sent is the total number of packets sent by the camera when requesting to download, the starting packet serial number is the package from which the download starts, and the size of one packet is the length of the content sent each time; when the number of reported packets is equal to the total number of packets sent, sending will stop.

3.2.4.35 Start playing back video files (0x00032F)

Description: Start playing back multimedia files

offset address	Number format	Description
byte1	UInt8_t	Playback media file path length (len)
byte2-byte(2+len)	UInt8_t	Media file path to be played back

Ack:

Byte1-2
response code

3.2.4.36 Stop playback of video files (0x000330)

Description: Stop playback of multimedia files

offset address	Number format	Description
byte1	UInt8_t	Playback media file path length (len)

byte2-byte(2+len)	Uint8_t	Playback media file path
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Ack:

Byte1-2
response code

3.2.4.37 Pause video file playback (0x000331)

Description: Pause playback of multimedia files

offset address	Number format	Description
byte1	Uint8_t	Playback media file path length (len)
byte2-byte(2+len)	Uint8_t	Playback media file path

Ack:

Byte1-2
response code

3.2.4.38 Jump to playback video file (0x000332)

Description: Pause playback of multimedia files

offset address	Number format	Description
byte1	Uint8_t	Playback media file path length (len)
byte2-5	Uint32_t	Jump seconds
byte6-byte(6+len)	Uint8_t	Media file path to be played back

Ack:

Byte1-2

response code

3.2.4.39 Multimedia file playback download status feedback (0x000333)

Note: Periodically report the playback download status, the playback frequency is 1Hz, and the download frequency is 10Hz.

offset address	Name	unit	Zoom ratio	Description
byte1	File download status			1: Downloading 2: Download ends
byte2	Media file playback status			2: Playing 3: Pause 7: Stop
byte3-6	Total length of playback files	millise conds		Video length
byte7-10	The position where the file is played to	secon ds		The number of seconds the video plays until

Note: Playback and downloading will not occur at the same time. When downloading a file, the file playback status is stopped, the file playback length and playback position are both zero. When a media file is played back, the file download status is download end.

3.2.4.40 Set the default client IP and port for video playback and file download (0x000334)

Description: Set the default client IP and port number for video playback and file download.

Byte1	Byte2-5	Byte6-7	Byte8
IP type	IP address	port number	reserved

The specific instructions are as follows:

IP	Byte1	0: Set the client for video playback: ip and port number
----	-------	--

address and port settings		1: Set the client for file download: ip and port number
	Byte2	192 (example)
	Byte3	168 (example)
	Byte4	144 (example)
	Byte5	20 (example)
	Byte6-7	port number
	Byte8	reserved

Ack:

Byte1-2
response code

Note: The address must be on the same network segment as the device IP. The device will restart automatically after the setting is completed.

3.2.4.41 OSD watermark configuration and switch acquisition command (0x000335)

Description: Get osd watermark configuration and switch instructions

Request frame: payload:

Byte1	Byte2
osd watermark configuration acquisition	reserved

The specific instructions are as follows:

osd watermark configuration acquisition	Byte 1	0x01: Request to obtain osd watermark configuration
	Byte 2	reserved

Return value:

Byte1-Byte30 (15 watermark configurations (1-15, in order))	Byte31
Struct single watermark configuration occupies 2 bytes <pre>{ Byte1: Switch (0x00: off 0x01: on) Byte2: (The watermark is valid only when the byte is turned on, otherwise it is 0) bit0-bit3: position (1: upper left; 2: lower left; 3: upper right; 4: lower right) bit4-bit7: color (1: white; 2: red) }</pre>	osd watermark master switch 0x00: off 0x01: on

3.2.4.42 Get the current intelligent recognition category command (0x000336)

Description: Get the current intelligent recognition category

Request frame: payload:

Byte1	Byte2
Get recognition category	reserved

The specific instructions are as follows:

Get recognition category	Byte-1	0x01: Request to obtain identification category
	Byte2-17	Identify categories

Byte1	Byte2	Byte3-Byte17
Identification switch 0x00:	bit0: represents category 1, if it is 1, it means this category is recognized; 0: this category is not recognized bit1: represents category 2, if it is 1, it means this	Same as Byte2

Close 0x01: On	category is recognized; 0: this category is not recognized bit2: represents category 3, if it is 1, it means this category is recognized; 0: this category is not recognized bit3: represents category 4, if it is 1, it means this category is recognized; 0: this category is not recognized bit4: represents category 5, if it is 1, it means this category is recognized; 0: this category is not recognized bit5: represents category 6, if it is 1, it means this category is recognized; 0: this category is not recognized bit6: represents category 7, if it is 1, it means this category is recognized; 0: this category is not recognized bit7: represents category 8, if it is 1, it means this category is recognized; 0: this category is not recognized	
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3.2.4.43 Get the device movement sn code command (0x000337)

Description: Get the device movement SN code

Request frame: payload:

Byte1	Byte2
Get sn code	reserved

The specific instructions are as follows:

Get recognition category	Byte 1	0x01: Request to obtain movement SN code
	Byte 2	reserved

Return value:

Byte1-Byte20
Movement sn code (string)

3.2.4.44 Get the current video file name (0x000338) (methane version customized)

Description: Get the video file name

Request frame: payload:

Byte1	Byte2
Get the file name (0x01)	reserved

Return value:

Byte1	Byte2-Byte(2+len)
File name length len (absolute path)	file name

Note: When the file name is empty, one byte, Byte1, is returned and its value is 0. It can be obtained only after recording ends or after the recording is segmented every 5 minutes.

3.2.4.45 Get the client IP and port sent by default for video playback and file download (0x000339)

Description: Get the client IP and port sent by default for video playback and file download.

Request frame: payload:

Byte1	Byte2
Get category	reserved

The specific instructions are as follows:

Get recognition category	Byte 1	0x01: Get the IP and port number for video playback data push 0x02: Get the IP and port number for downloading data push
	Byte 2	reserved

Return value:

Ack:

Byte1-4	Byte5-6	Byte7
IP address	port number	Corresponding acquisition type: 0x01: Get video playback; 0x02: Get download data

Default video playback data push IP and port number: 192.168.144.23:6660;
download data push IP and port number: 192.168.144.23:6665

3.2.4.46 Get the kernel version number (0x00033A)

Description: Get the kernel version number

Request frame: payload:

Byte 1	Byte 2
Get the kernel version number	reserved

The specific instructions are as follows:

Get camera version number	Byte1	0x01: Get the kernel version number
	Byte2	reserved

Ack:

Byte1-2	Byte3	Byte4	Byte5
response code	Major version number	minor version number	minor version number

3.2.4.47 Target gps reporting switch command (0x00033B)

Note: After accessing the mavlink message, the GPS information of the laser hit location will be resolved but the current target GPS information will not be reported through the 0x000320 command. This command can be used to turn on and off the reporting. The reporting frequency is 5hz.

Request frame: payload:

Byte1	Byte2
Target gps reporting switch	reserved

The specific instructions are as follows:

Camera shutdown command	Byte1	Byte1 0x01: Enable reporting 0x02: Close reporting (closed by default)
	Byte2	reserved

Ack:

Byte1-2
response code

3.2.4.48 AI recognition speed measurement command (0x00033C) (K40T is not open)

Description: Measure and display the speed of the identified vehicle.

Request frame: payload:

Byte1	Byte2-3	Byte4
Speed switch	Speed limit value	reserved

The specific instructions are as follows:

AI recognition vehicle speed measurement	Byte1	0x01: Turn on speed measurement 0x02: Turn off speed measurement
	Byte2-3	Speed limit value, above which the identification box will turn red
	Byte4	reserved

Ack:

Byte1-2
response code

3.3 Other agreements

3.3.1 Laser payload protocol

3.3.1.1 Laser ranging setting command (0x000400)

Description: Request laser ranging setting instructions

Request frame: payload:

Byte 1	Byte2
Laser ranging settings	reserved

The specific instructions are as follows:

Laser ranging settings	Byte1	Byte1 0: Disable; 1: Enable single ranging
------------------------	-------	--

Ack:

Byte1-2	Byte3-4
response code	Laser ranging feedback uint16_t type, unit 0.1 meter (no value feedback 0)

3.3.1.2 Laser periodic ranging setting command (0x000406)

Description: Request laser periodic ranging setting instructions

Request frame: payload:

Byte 1	Byte2
Periodic ranging settings	reserved

The specific instructions are as follows:

Periodic ranging settings	Byte1	Byte1 0: Disable; 1: Enable periodic 1s ranging. (The reporting frequency is 5hz)
---------------------------	-------	---

Ack:

Byte1-2
response code

Status frame:

Byte1-2	0x00 response code
Byte3-4	Laser ranging distance, uint16_t type, unit 0.1 meter (no value feedback 0)

3.3.2 SBUS channel protocol

3.3.2.1 SBUS channel value range setting command (0x000500)

Description: Set the channel value range of the sbus remote control

Request frame: payload:

Byte 1-2	Byte3-4	Byte5
maximum value	minimum value	reserved

The specific instructions are as follows:

Set the channel value range of the sbus remote control	Byte1-2	Set the maximum value of the channel value Data type: uint Data range: 0 - 2047
	Byte3-4	Set the minimum value of the channel value Data type: uint Data range: 0 - 2047, and less than the maximum value
	Byte5	reserved

Ack:

Byte1-2

response
code

Note: After the configuration is modified, it needs to be powered off and restarted before it can take effect.

Note: The channel value must be issued rather than set by the remote control. For example, the remote control setting is 1950-1050, while the remote control setting of the Yundhuo H16 version has a maximum value of 1722 and a minimum value of 282; the Siyi remote control setting has a maximum value of 1712 and a minimum value of 272.

3.3.2.2 SBUS channel configuration command (0x000501)

Description: Configure the SBUS channel corresponding to the function

Request frame: payload:

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Push settings	Zoom setting	Photo settings	Recording settings	Pan/Tilt Pitch	gimbal heading	gimbal back to center	Infrared pseudo color

The specific instructions are as follows:

Configure the SBUS channel corresponding to the function	Byte1	Configure the channel for push streaming settings. The setting range is: 0-16. 0-15 corresponds to channels 1-16. 16 means not occupying any channel.
	Byte2	Configure the channel for zoom setting, setting range: 0-16, 0-15 corresponds to channels 1-16, 16 means not occupying any channel
	Byte3	Configure the channel for taking pictures. The setting range is: 0-16. 0-15 corresponds to channels 1-16. 16 means not occupying any channel.
	Byte4	Configure the channel for recording settings. Setting range: 0-16. 0-15 corresponds to channels 1-16. 16 means not occupying any channel.
	Byte5	Configure the gimbal pitch channel, setting range: 0-16, 0-15 corresponds to channels 1-16, 16 means not occupying any channel

	Byte6	Configure the channel for gimbal heading. Setting range: 0-16. 0-15 corresponds to channels 1-16. 16 means not occupying any channel.
	Byte7	Configure the channel for gimbal centering. The setting range is: 0-16. 0-15 corresponds to channels 1-16. 16 means not occupying any channel.
	Byte8	Configure the channel for infrared pseudo-color, setting range: 0-16, 0-15 corresponds to channels 1-16, 16 means not occupying any channel

Ack:

Byte1-2
response code

Note:

1. Streaming settings, photo settings, video settings, pan/tilt centering, and infrared pseudo-color functions are fixed-point switches from maximum to minimum, and each switch requires one operation.
 - a. The push flow is infrared, visible light, and split-screen rotation;
 - b. Photo switching takes one photo at a time;
 - c. Video recording is switched on once and off once;
 - d. The gimbal back-to-center switch sends a gimbal back-to-center command once.
 - e. Infrared pseudo-color switching in turns
2. The middle value of the zoom setting is stop, the maximum value is zoom out, and the minimum value is zoom in.
3. The center value of gimbal heading and pitch is stop. The greater the difference between the gimbal and the center value, the faster the movement.
4. After the configuration is modified, it needs to be powered off and restarted before it can take effect.
5. The gimbal of G48T/G48 equipment is centered and merged into the gimbal downward view channel, and Byte7 bytes are changed to reserved bytes.

3.3.2.3 SBUS configuration acquisition command (0x000502)

Description: Get the current configuration of SBUS, including the range of setting

values and the channels corresponding to the functions.

Request frame: payload:

Byte 1	Byte2
Get sbus configuration	reserved

The specific instructions are as follows:

Get the current configuration of SBUS	Byte 1	0x01: Request to obtain sbus configuration instructions
	Byte 2	reserved

Return value:

Byte1-2	Byte3-4	Byte5-6	Byte7	Byte8	Byte9
response code	sbus set maximum value	sbus sets minimum value	Push streaming settings channel settings	Zoom setting channel setting	Photo settings channel settings
Byte10	Byte11	Byte12	Byte13	Byte14	
Recording settings channel settings	Gimbal pitch channel settings	gimbal heading channel settings	gimbal back-to-center channel settings	bit0: sbus switch (0x01: on; 0x00: off) bit1-5: Infrared pseudo color channel setting bit6-bit7: reserved	

3.3.2.4 sbus open and close command (0x000503)

Description: switch sbus command

Request frame: payload:

Byte1	Byte2
sbus switch	reserved

The specific instructions are as follows:

Camera shutdown command	Byte1	0x01: on; 0x02: off
	Byte2	reserved

Ack:

Byte1-2
response code

3.3.2.5 sbus variable magnification channel expansion setting command (0x000504) (K40T customization)

Description: sbus variable magnification channel setting command

Request frame: payload:

Byte1	Byte2
Zoom channel setting (0-16: corresponds to channels 1-15, 16 does not occupy any channel)	reserved

Ack:

Byte1-2
response code

3.3.2.6 sbus variable magnification channel expansion acquisition command (0x000505) (K40T customization)

Description: Sbus variable magnification channel acquisition command

Request frame: payload:

Byte 1	Byte2
Get the zoom channel value (0x01: get)	reserved

Return value:

Byte1-2	Byte3
---------	-------

response code	Zoom channel value (0-16: corresponds to channels 1-15, 16 does not occupy any channel)
---------------	---

3.3.2.7 sbus extended channel setting command (0x000506) (G48/G48T customization)

Description: sbus frame tracking channel setting command

Request frame: payload:

Byte1	Byte2	Byte3	Byte4	Byte5-8
Frame tracking channel settings (0-15: corresponds to channels 1-16, 16 does not occupy any channel)	One-click downward view channel setting (0-15: corresponds to channels 1-16, 16 does not occupy any channel)	Laser ranging channel setting (0-15: corresponds to channels 1-16, 16 does not occupy any channel)	Follow/lock switching channel settings (0-15: corresponds to channels 1-16, 16 does not occupy any channel)	reserved

Ack:

Byte1-2
response code

1. G48T/G48 device gimbal back-to-center is merged into gimbal down-view channel, Byte2 byte is changed to gimbal down-view back-to-center channel setting.

3.3.2.8 sbus expansion channel acquisition command (0x000507) (G48/G48T customization)

Description: sbus frame tracking channel acquisition command

Request frame: payload:

Byte 1	Byte2
Get the extended sbus channel value	reserved

(0x01: Get)	
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Return value:

Byte1-2	Byte3	Byte4	Byte5	Byte6	Byte7-10
response code	Frame tracking channel (0-15: corresponds to channels 1-16, 16 does not occupy any channel)	One click to look down the channel (0-15: corresponds to channels 1-16, 16 does not occupy any channel)	Ranging channel (0-15: corresponds to channels 1-16, 16 does not occupy any channel)	Follow/lock switching channels (0-15: corresponds to channels 1-16, 16 does not occupy any channel)	reserved

3.4 ACK feedback form

0x0001-0x01ff Generic error response code	ACK value	Description
	0x0000	OK, successful
	0x0001	failed
	0x0002	unknown error
	0x0003	Verification failed
	0x0004	timeout
	0x0005	MD5 check failed
	0x0006	Not enough system space
	0x0007	The data length does not match the actual
	0x0008	In progress, repeat request

	0x0009	File does not exist
	0x000A	File merge error
0x0201 - 0x02ff Gimbal pod system error response code	0x0201	Recording
	0x0202	Camera failed to open
	0x0203	Photos are being taken
	0x0204	SD card not inserted