Reebot Mini Quad-Sensor
AI Optical Pod UniPod MT11
External SDK Protocol Specification

Initial creation

Version	Date	Change Description	Remarks
V0.1.0	2025-09-16	Initial creation	
V0.2.0	2025-10-30	Updated 0x55 (Set AI Tracking Mode Status): Added function conflict indication Updated 0x56 (Select AI Tracking Target Status): Added function conflict indication	
V0.2.1	2025-12-05	Added 0x62: Get/Set Electronic Defog Status Added 0x63: Get/Set Night Vision Status	
V0.2.2	2026-01-22	Added 0x30 and 0x40: Set/Get UTC Time Added 0x5F: AI Candidate Target Bounding Box Push Enable Added 0x80: Gimbal Camera Soft Reboot	
V0.2.3	2026-03-13	Updated 0x0D and 0x0E: Automatic Coordinate System Adaptation for Inverted Installation Updated 0x60 and 0x61: Added function conflict indication	
V0.3.0	2026-07-10	Added 0x1C: Set/Get Thermal Imaging AI Super-Resolution Switch; added 0x84: Reset ISP Parameters, 0x85: Get All ISP Parameters, 0x86: Set Single ISP Parameter, 0x87: Set/Get ISP Mode, 0x88: Set All ISP Parameters	
V0.3.1	2026-08-31	Updated 0x50 (AI Module Target Tracking Data Stream): updated Target Type ID (class_id) descriptions	

Chapter 1 Protocol Description

1. Protocol Format

Field	Index	Bytes	Description
STX	0	2	Start flag 0x6655(Little Endian, LSB first)
CTRL	2	1	0：need_ack (Whether the current packet requires acknowledgment) 1：ack_pack (Whether this packet is an acknowledgment) 2-7: Reserved
Data_len	3	2	Length of the data field (Little Endian, LSB first)
SEQ	5	2	Frame sequence number, range (0–65535) (Little Endian, LSB first)
CMD_ID	7	1	Command ID
DATA	8	Data_len	Data field
CRC16		2	CRC16 checksum for the entire packet (Little Endian, LSB first)

Chapter 2 SDK Communication Commands

0x00：TCP Heartbeat

CMD_ID:0x00------TCP Heartbeat			
Send Packet Format			
No.	Data Type	Data Name	Description
ACK Packet Format			
			No ACK

Note:

1. Heartbeat Packet：55 66 01 01 00 00 00 00 00 59 8B
2. Supported only over TCP connections

0x01：Request Firmware Version

CMD_ID:0x01------Request Firmware Version			
Send Packet Format			
No.	Data Type	Data Name	Description
ACK Packet Format			
	uint32_t	camera_firmware_ver	camera_firmware_ver
	uint32_t	gimbal_firmware_ver	gimbal_firmware_ver
	uint32_t	zoom_firmware_ver	zoom_firmware_ver

Eg：0x8A 00 01 0A --> Gimbal firmware version **v0.1.10**

0x89 01 00 01 --> Camera firmware version **v1.0.1**

Notes：

1.The UniPod MT11 has **no zoom firmware version**.

2.Since the camera system requires up to 30 seconds to initialize, a valid firmware version cannot be retrieved during startup.

During this period, the version number will return as v0.0.0 (all zeros).

0x02：Request Gimbal Hardware ID

CMD_ID:0x02------ Request Gimbal Hardware ID			
Send Packet Format			
No.	Data Type	Data Name	Description
ACK Packet Format			
	Uint8_t	hardware_id[12]	Hardware ID string (10 digits)

Note:
The first two bytes represent the product code in hexadecimal format.
Example:
38 41 30 32 32 30 32 32 32 39 00 00 → String "8A0220222229"
8A indicates the MT11 model.

0x04：Auto Focus

CMD_ID:0x04------Auto Focus			
Send Packet Format			
No.	Data Type	Data Name	Description
1	uint8_t	auto_focus	1: Trigger one auto-focus operation.
2	uint16_t	touch_x	x: Horizontal coordinate (range = video stream width)
3	uint16_t	touch_y	y: Vertical coordinate (range = video stream height)
ACK Packet Format			
1	uint8_t	sta	1: Set successfully 0: Setting error

Note: Supported only on models with optical zoom. In dual-view zoom mode, the x-coordinate range is half of the video stream width.

0x05：Manual Zoom with Auto Focus

CMD_ID:0x05------Manual Zoom with Auto Focus			
Send Packet Format			
No.	Data Type	Data Name	Description
1	int8_t	zoom	1: Zoom in 0: Stop zooming (send when button is released) -1: Zoom out
ACK Packet Format			
	uint16_t	zoom_multiple	Current (hybrid) zoom level, zoom_multiple / 10 (precision: one decimal place)

0x06：Manual Focus

CMD_ID:0x06------Manual Focus			
Send Packet Format			
No.	Data Type	Data Name	Description
1	int8_t	focus	1：Focus farther 0：Stop focusing (send when button is released) -1：Focus nearer
ACK Packet Format			
1	uint8_t	sta	1: Set successfully 0: Setting error

Note: Supported only on models with optical zoom.

0x07：Gimbal Yaw / Pitch Control

CMD_ID:0x07------Gimbal Yaw / Pitch Control			
Send Packet Format			
No.	Data Type	Data Name	Description
1	int8_t	turn_yaw	-100 ~ 0 ~ 100 — The sign indicates direction. The farther you slide, the larger the value and the faster the gimbal rotates. When released, send 0 to stop rotation. (Yaw: Right swipe 0~100, Left swipe 0~(-100))
2	int8_t	turn_pitch	-100 ~ 0 ~ 100 — The sign indicates direction. The farther you slide, the larger the value and the faster the gimbal rotates. When released, send 0 to stop rotation. (Pitch: Up swipe 0~100, Down swipe 0~(-100))
ACK Packet Format			
1	uint8_t	sta	1: Set successfully 0: Setting error

0x08：Gimbal Recenter (One-Key Reset)

CMD_ID:0x08------Gimbal Recenter (One-Key Reset)			
Send Packet Format			
No.	Data Type	Data Name	Description
1	uint8_t	center_pos	1：One-Key Reset 2：Center and face downward 3：Center 4：Face downward
ACK Packet Format			
1	uint8_t	sta	1: Set successfully 0: Setting error

0x0A：Request Camera System Information

CMD_ID:0x0A------Request Camera System Information			
Send Packet Format			
No.	Data Type	Data Name	Description
ACK Packet Format			
1	uint8_t	reserved	
2	uint8_t	hdr_sta	0: Off 1: On
3	uint8_t	reserved	
4	uint8_t	record_sta	0：Not recording 1：Recording 2：No TF card inserted 3：TF card data loss during recording — please check the TF card
5	uint8_t	gimbal_motion_mode	0: Lock Mode 1: Follow Mode 2: FPV Mode
6	uint8_t	gimbal_mounting_dir	Gimbal Mounting Orientation 0: reserved 1: Normal 2: Upside Down
7	uint8_t	video_hdmi_or_cvbs	HDMI & CVBS Output Status 0: HDMI on / CVBS off 1: HDMI off / CVBS on 2: HDMI off / CVBS off
8	uint8_t	zoom_linkage	Zoom Linkage 0: Off 1: On

0x0B：Transmission Feedback

[Sent automatically by the camera; no request required]

CMD_ID:0x0B------Transmission Feedback			
Send Packet Format			
No.	Data Type	Data Name	Description
ACK Packet Format			
1	uint8_t	info_type	0：Photo captured successfully 1：Photo capture failed — please check if the TF card is inserted 2：HDR mode enabled(currently not supported) 3：HDR mode disabled(currently not supported) 4：Recording failed — please check if the TF card is inserted 5： Recording started 6： Recording stopped

0x0C：Photo and Recording

[No immediate response. Photo and recording status shall be returned by 0x0B.]

CMD_ID:0x0C------Photo and Recording			
Send Packet Format			
No.	Data Type	Data Name	Description
	uint8_t	func_type	0: Capture photo 1: HDR toggle (currently not supported) 2: Start / stop recording 3: Motion mode — Lock 4: Motion mode — Follow 5: Motion mode — FPV 6: Set HDMI video output (takes effect after reboot; currently not supported) 7: Set CVBS video output (takes effect after reboot; currently not supported) 8: Disable HDMI/CVBS video output (takes effect after reboot; currently not supported) 9: One-key downward view (currently

			not supported) 10: Zoom linkage toggle (each command switches the state)
ACK Packet Format			
			No ACK. Status is reported via 0x0B.

0x0D：Request Gimbal Attitude Data

CMD_ID:0x0D------Request Gimbal Attitude Data			
Send Packet Format			
No.	Data Type	Data Name	Description
ACK Packet Format			
	int16_t	yaw	Yaw angle
	int16_t	pitch	Pitch angle
	int16_t	roll	Roll angle
	int16_t	yaw_velocity	Gyroscope yaw angular velocity
	int16_t	pitch_velocity	Gyroscope pitch angular velocity
	int16_t	roll_velocity	Gyroscope roll angular velocity

Note 1: Right-Front-Up (RFU) coordinate system. Automatic adaptation is supported for both upright and inverted mounting. Positive values correspond to leftward and upward movement in the image.

Note 2: Divide the reported values by 10 to obtain the actual angle in degrees. Resolution: 0.1°.

Tip: It is recommended to use command 0x25 to configure the attitude data reporting rate. The gimbal will then continuously transmit attitude data at the specified frequency.

0x0E：Set Gimbal Attitude Angle

CMD_ID:0x0E------Set Gimbal Attitude Angle			
Send Packet Format			
No.	Data Type	Data Name	Description
	int16_t	yaw	Target yaw angle
	int16_t	pitch	Target pitch angle
ACK Packet Format			
	int16_t	yaw	Current yaw angle
	int16_t	pitch	Current pitch angle
	int16_t	roll	Current roll angle

MT11 Angle Control Range:

Yaw: Unlimited

Pitch: -90.0° to +30.0° (upright mounting)

Note 1: Right-Front-Up (RFU) coordinate system. Automatic adaptation is supported for both upright and inverted mounting. Positive values correspond to leftward and upward movement in the image.

Note 2: Angle commands use a resolution of 0.1°. For example, to command a yaw angle of 60.5°, set the Yaw field to 605.

Note 3: Divide the returned angle value by 10 to obtain the actual angle in degrees. Resolution: 0.1°.

0x0F：Absolute Zoom with Auto Focus

CMD_ID:0x0F------Absolute Zoom with Auto Focus			
Send Packet Format			
No.	Data Type	Data Name	Description
1	uint8_t	Absolute_movement_int	Integer part of specified zoom level: 0x01 ~ 0x1E
2	uint8_t	Absolute_movement_float	Decimal part of specified zoom level: 0x0 ~ 0x9
ACK Packet Format			
1	uint8_t	Absolute_movement_ask	Return value on success: 1

0x10：Request Video Stitching Mode

CMD_ID:0x10------Request Video Stitching Mode			
Send Packet Format			
No.	Data Type	Data Name	Description
ACK Packet Format			
1	uint8_t	main_stream	0: Zoom 1: Wide-angle 2: Thermal imaging 3: Zoom & Thermal imaging 4: Wide-angle & Thermal imaging 5: Zoom & Wide-angle
2	uint8_t	sub_stream	0: Zoom 1: Wide-angle 2: Thermal imaging 6: No input

0x11：Set Video Stitching Mode

CMD_ID:0x11------Set Video Stitching Mode			
Send Packet Format			
No.	Data Type	Data Name	Description
1	uint8_t	main_stream	0: Zoom 2: Thermal imaging 3: Zoom & Thermal imaging
2	uint8_t	sub_stream	0: Zoom 2: Thermal imaging
ACK Packet Format			
1	uint8_t	main_stream	0: Zoom 1: Wide-angle 2: Thermal imaging 3: Zoom & Thermal imaging 4: Wide-angle & Thermal imaging 5: Zoom & Wide-angle
2	uint8_t	sub_stream	0: Zoom 1: Wide-angle 2: Thermal imaging 6: No input

Note: The MT11 currently supports only the following combinations:
Main Zoom + Secondary Thermal
Main Thermal + Secondary Zoom
Main Zoom (stitched with Thermal) + Secondary Thermal

0x12：Get Temperature at Selected Point

CMD_ID:0x12------Get Temperature at Selected Point			
Send Packet Format			
No.	Data Type	Data Name	Description
1	uint16_t	x	Selected point X coordinate
2	uint16_t	y	Selected point Y coordinate
3	uint8_t	get_temp_flag	
ACK Packet Format			
1	uint16_t	temp	Temperature at the selected point (divide by 100 for two decimal places)
1	uint16_t	x	Selected point X coordinate
2	uint16_t	y	Selected point Y coordinate

Note: The measurement update rate is approximately 1 Hz.

0x13：Regional Temperature Measurement

CMD_ID:0x13------Regional Temperature Measurement			
Send Packet Format			
No.	Data Type	Data Name	Description
1	uint16_t	startx	X coordinate of the box start point
2	uint16_t	starty	Y coordinate of the box start point
3	uint16_t	endx	X coordinate of the box end point
4	uint16_t	endy	Y coordinate of the box end point
5	uint8_t	get_temp_flag	0: Disable measurement 1: Single measurement 2: Continuous measurement (5 Hz)
ACK Packet Format			
1	uint16_t	startx	X coordinate of the box start point
2	uint16_t	starty	Y coordinate of the box start point
3	uint16_t	endx	X coordinate of the box end point
4	uint16_t	endy	Y coordinate of the box end point
5	uint16_t	temp_max	Maximum temperature within the box (divide by 100, two decimal places)
6	uint16_t	temp_min	Minimum temperature within the box (divide by 100 for two decimal places)
7	uint16_t	temp_max_x	X coordinate of the maximum temperature point
8	uint16_t	temp_max_y	Y coordinate of the maximum temperature point
9	uint16_t	temp_min_x	X coordinate of the minimum temperature point
10	uint16_t	temp_min_y	Y coordinate of the minimum temperature point

Note: The measurement update rate is approximately 1 Hz.

0x14：Full-Frame Temperature Measurement

CMD_ID:0x14------Full-Frame Temperature Measurement			
Send Packet Format			
No.	Data Type	Data Name	Description
1	uint8_t	get_temp_flag	Y coordinate of the box start point
ACK Packet Format			
1	uint16_t	temp_max	Maximum temperature within the full frame (divide by 100 for two decimal places)
2	uint16_t	temp_min	Minimum temperature within the full frame (divide by 100 for two decimal places)

3	uint16_t	temp_max_x	X coordinate of the maximum temperature point
4	uint16_t	temp_max_y	Y coordinate of the maximum temperature point
5	uint16_t	temp_min_x	X coordinate of the minimum temperature point
6	uint16_t	temp_min_y	Y coordinate of the minimum temperature point

Note: The measurement update rate is approximately 1 Hz.

0x15：Request Laser Distance Measurement

CMD_ID:0x15------Request Laser Distance Measurement			
Send Packet Format			
No.	Data Type	Data Name	Description
ACK Packet Format			
1	Uint16_t	laser_distance	Laser ranging value (Little Endian: low byte first, high byte last), minimum value 50, unit: decimeters (dm)

Note:

The laser must be enabled before measurement (use command 0x32 to toggle).

It is recommended to set the ranging data transmission frequency via command 0x25 for continuous active output.

When the measured distance is within 5–1200 m, a valid distance value is returned; values outside this range return 0.

0x16：Request Supported Zoom Range

CMD_ID:0x16------Request Supported Zoom Range			
Send Packet Format			
No.	Data Type	Data Name	Description
ACK Packet Format			
	uint8_t	zoom_max_int	Maximum zoom (integer part)
	Uint8_t	Zoom_max_float	Maximum zoom (decimal part)

0x17：Request Laser Target Coordinates

CMD_ID:0x17------Request Laser Target Coordinates			
Send Packet Format			
No.	Data Type	Data Name	Description

ACK Packet Format			
	int32_t	Lon_degE7	Longitude [degE7] (WGS84, EGM96 ellipsoid)
	int32_t	Lat_degE7	Latitude [degE7] (WGS84, EGM96 ellipsoid

0x18：Request Current Zoom Level

CMD_ID:0x18------Request Current Zoom Level			
Send Packet Format			
No.	Data Type	Data Name	Description
ACK Packet Format			
	uint8_t	zoom_int	Current zoom (integer part)
	Uint8_t	Zoom_float	Current zoom (decimal part)

0x19：Request Current Gimbal Mode

CMD_ID:0x19------Request Current Gimbal Mode			
Send Packet Format			
No.	Data Type	Data Name	Description
ACK Packet Format			
	uint8_t	gimbal_mode	0: Lock Mode 1: Follow Mode 2: FPV Mode

0x1A：Request Current Thermal Palette

CMD_ID:0x1A------Request Current Thermal Palette			
Send Packet Format			
No.	Data Type	Data Name	Description
ACK Packet Format			
	uint8_t	pseudo color	Total of 11 color swatches 0：White_Hot 1：Reserved 2：Sepia 3：Ironbow 4：Rainbow 5：Night 6：Aurora 7：Red_Hot 8：Jungle 9：Medical 10：Black_Hot 11：Glory_Hot

0x1B：Set Thermal Palette

CMD_ID:0x1B------Set Thermal Palette			
Send Packet Format			
No.	Data Type	Data Name	Description
	uint8_t	pseudo color	Total of 11 color swatches 0：White_Hot 1：Reserved 2：Sepia 3：Ironbow 4：Rainbow 5：Night 6：Aurora 7：Red_Hot 8：Jungle 9：Medical 10：Black_Hot 11：Glory_Hot
ACK Packet Format			
	uint8_t	pseudo color	Total of 11 color swatches 0：White_Hot 1：Reserved 2：Sepia 3：Ironbow 4：Rainbow 5：Night 6：Aurora 7：Red_Hot 8：Jungle 9：Medical 10：Black_Hot 11：Glory_Hot

0x1C： Set/Get Thermal Imaging AI Super-Resolution Switch

CMD_ID:0x1C------Set/Get Thermal Imaging AI Super-Resolution Switch			
Send Packet Format			
No.	Data Type	Data Name	Description
1	uint8_t	video_flow	Video AI super-resolution level 0: Disable 1: x2 super-resolution
2	uint8_t	photo	Photo AI super-resolution level 0: Disable 1: x2 super-resolution 2: x4 super-resolution
ACK Packet Format			
No.	Data Type	Data Name	Description
1	uint8_t	video_flow	0: Disable 1: x2 super-resolution
2	uint8_t	photo	0: Disable 1: x2 super-resolution 2: x4 super-resolution
3	uint8_t	sta	0: Success 1: Night vision is enabled; failed to enable super-resolution 2: AI tracking is enabled; failed to enable super-resolution

Note: Sending an empty data packet retrieves the current thermal imaging AI super-resolution switch status.

0x20：Request Camera Encoding Parameters

CMD_ID:0x20------Request Camera Encoding Parameters			
Send Packet Format			
No.	Data Type	Data Name	Description
	uint8_t	req_stream _type	0: Recording Stream 1: Main Stream 2: Sub Stream
ACK			
1	uint8_t	stream _type	0: Recording Stream 1: Main Stream 2: Sub Stream
2	uint8_t	VideoEncType	Encoding Format 1: H264 2: H265
3	uint16_t	Resolution_ L	Resolution Width
4	uint16_t	Resolution_ H	Resolution Height
5	uint16_t	VideoBitrate	Bitrate (Constant Bitrate, unit: Kbps)
6	uint8_t	VideoFrameRate	Frame Rate

0x21：Set Camera Encoding Parameters

CMD_ID:0x21------Set Camera Encoding Parameters			
Send Packet Format			
No.	Data Type	Data Name	Description
1	uint8_t	stream_type	0: Set Recording Stream 1: Set Main Stream 2: Set Sub Stream
2	uint8_t	VideoEncType	Encoding Format 1: H.264 2: H.265 (Modifying the recording stream encoding format is currently not supported)
3	uint16_t	Resolution_L	Resolution Width: 3840, 1920, 1280
4	uint16_t	Resolution_H	Resolution Height: 2160, 1080, 720

5	uint16_t	VideoBitrate	Bitrate (Constant Bitrate, unit: Kbps,Not supported yet, reserved - set to 0)
6	uint8_t	reserve	Reserved
ACK			
1	uint8_t	stream_type	0: Set Recording Stream 1: Set Main Stream 2: Set Sub Stream
2	uint8_t	sta	1: Success 0: Failure

0x22：Send Aircraft Attitude Data to Gimbal

CMD_ID:0x22------Send Aircraft Attitude Data to Gimbal			
Send Packet Format			
No.	Data Type	Data Name	Description
1	uin32_t	time_boot_ms	[ms]Timestamp (time since system boot)
1	float	Roll	[rad] Roll angle (-pi..+pi)
2	float	Pitch	[rad] Pitch angle (-pi/2..+pi/2)
3	float	Yaw	[rad] Yaw angle (-pi..+pi)
4	float	Rollspeed	[rad/s] Roll angular speed
5	float	Pitchspeed	[rad/s] Pitch angular speed
6	float	Yawspeed	[rad/s] Yaw angular speed
ACK			

Note: NED (North-East-Down) coordinate system, rotation order: yaw → pitch → roll.
Recommended frequency: 20–50 Hz

0x23：Send RC Channel Data to Gimbal (Not in use)

CMD_ID:0x23------Send RC Channel Data to Gimbal			
Send Packet Format			
No.	Data Type	Data Name	Description
1	uint16_t	chan1_raw	[us] RC channel 1 value
2	uint16_t	chan2_raw	[us] RC channel 2 value
3	uint16_t	chan3_raw	[us] RC channel 3 value
4	uint16_t	chan4_raw	[us] RC channel 4 value
5	uint16_t	chan5_raw	[us] RC channel 5 value
6	uint16_t	chan6_raw	[us] RC channel 6 value
7	uint16_t	chan7_raw	[us] RC channel 7 value
8	uint16_t	chan8_raw	[us] RC channel 8 value
9	uint16_t	chan9_raw	[us] RC channel 9 value
10	uint16_t	chan10_raw	[us] RC channel 10 value
11	uint16_t	chan11_raw	[us] RC channel 11 value
12	uint16_t	chan12_raw	[us] RC channel 12 value
13	uint16_t	chan13_raw	[us] RC channel 13 value
14	uint16_t	chan14_raw	[us] RC channel 14 value
15	uint16_t	chan15_raw	[us] RC channel 15 value
16	uint16_t	chan16_raw	[us] RC channel 16 value
17	uint16_t	chan17_raw	[us] RC channel 17 value
18	uint16_t	chan18_raw	[us] RC channel 18 value

19	uint8_t	chancount	Total number of RC channels being received. This can be larger than 18, indicating that more channels are available but not given in this message. This value should be 0 when no RC channels are available.
20	uint8_t	rssi	Receive signal strength indicator in device-dependent units/scale. Values: [0-254], 255: invalid/unknown.
ACK			

0x24：Request Flight Controller to Send Data Stream to Gimbal (Not in use)

CMD_ID:0x24------Request Flight Controller to Send Data Stream to Gimbal			
Send Packet Format			
No.	Data Type	Data Name	Description
1	uint8_t	data_type	1: Attitude Data 2: RC Channel Data
2	uint8_t	data_freq	Output Frequency 0: Disable transmission 1: 2 Hz 2: 4 Hz 3: 5 Hz 4: 10 Hz 5: 20 Hz 6: 50 Hz 7: 100 Hz
ACK			
1	uint8_t	data_type	1: Attitude Data 2: RC Channel Data

0x25：Request Gimbal to Send Data Stream

CMD_ID:0x25------Request Gimbal to Send Data Stream			
Send Packet Format			
No.	Data Type	Data Name	Description
1	uint8_t	data_type	1: Attitude Data 2: Laser Ranging Data 3: Magnetic Encoder Angle Data 4: Motor Voltage Data
2	uint8_t	data_freq	Output Frequency 0: Disable transmission 1: 2 Hz 2: 4 Hz 3: 5 Hz 4: 10 Hz 5: 20 Hz 6: 50 Hz 7: 100 Hz Note: The laser data output frequency ignores this setting and follows the actual output frequency.
ACK Packet Format			
1	uint8_t	data_type	1: Attitude Data 2: Laser Ranging Data

Note 1: To subscribe to laser rangefinder data, laser ranging must first be enabled using command 0x32.

Note 2: The reporting rate of laser rangefinder data is currently not configurable. Any non-zero value enables data transmission.

0x26：Request Gimbal Magnetic Encoder Angle Data

CMD_ID:0x26------Request Gimbal Magnetic Encoder Angle Data			
Send Packet Format			
No.	Data Type	Data Name	Description
ACK Packet Format			
	int16_t	yaw_angle	Yaw Angle
	int16_t	pitch_angle	Pitch Angle
	int16_t	roll_angle	Roll Angle

Note: The actual angles are obtained by dividing the returned values by 10, with a precision of one decimal place.

It is recommended to use command 0x25 to set the attitude data transmission frequency for continuous active output.

0x2A：Request Gimbal Motor Voltage Data

CMD_ID:0x2A------Request Gimbal Motor Voltage Data			
Send Packet Format			
No.	Data Type	Data Name	Description
ACK Packet Format			
	int16_t	yaw_voltage	Yaw Motor Voltage
	int16_t	pitch _voltage	Pitch Motor Voltage
	int16_t	roll_voltage	Roll Motor Voltage

Note: Divide the returned values by 1000 to obtain the actual voltage, with a precision of three decimal places.

It is recommended to use command 0x25 to set the motor voltage data transmission frequency for continuous active output.

0x30：Set UTC Time

CMD_ID:0x 30 -----Set UTC Time			
Send Packet Format			
No.	Data Type	Data Name	Description
1	uint64_t	Timestamp	UNIX epoch time(us)
ACK Packet Format			
1	int8_t	ack	1: Success 0: Invalid time format

0x31：Request Gimbal System Information

CMD_ID:0x 31 -----Request Gimbal System Information			
Send Packet Format			
No.	Data Type	Data Name	Description
ACK Packet Format			
1	Uint8_t	laser_state	1: Laser Ranging Enabled 0: Laser Ranging Disabled

0x32：Set Laser Ranging Status

CMD_ID:0x 32 -----Set Laser Ranging Status			
Send Packet Format			
No.	Data Type	Data Name	Description
1	Uint8_t	laser_state	1: Laser Ranging Enabled 0: Laser Ranging Disabled

ACK Packet Format			
1	Uint8_t	Sta	1: Success 0: Failure

0x37：Request Thermal Imaging Gain Mode

CMD_ID:0x 37 -----Request Thermal Imaging Gain Mode			
Send Packet Format			
No.	Data Type	Data Name	Description
ACK Packet Format			
1	uint8_t	Ir_gain	0: Low Gain 1: High Gain

0x38：Set Thermal Imaging Gain Mode

CMD_ID:0x 38 -----Set Thermal Imaging Gain Mode			
Send Packet Format			
No.	Data Type	Data Name	Description
1	uint8_t	Ir_gain	0: Low Gain 1: High Gain
ACK Packet Format			
1	uint8_t	Ir_gain	0: Low Gain 1: High Gain

0x3E：Send Raw GPS Data to Gimbal

CMD_ID:0x 3E-----Send Raw GPS Data to Gimbal			
Send Data Format			
No.	Data Type	Data Name	Date Description
1	uint32_t	time_boot_ms	[ms]time since boot
2	int32_t	lat	[degE7]Latitude
3	int32_t	lon	[degE7]Longitude
4	int32_t	alt	[cm]Altitude (MSL)
5	int32_t	alt_ellipsoid	[cm]Altitude (above WGS84, EGM96 ellipsoid). Positive for up.
6	int32_t	vn	[m E3/s] X Speed
7	int32_t	ve	[m E3/s] Y Speed
8	int32_t	vd	[m E3/s] Z Speed
ACK Data Format			

0x40：Request System Time

CMD_ID:0x 40 -----Request System Time			
Send Packet Format			
No.	Data Type	Data Name	Description
ACK Packet Format			
1	uint64_t	time_unix_usec	Timestamp (UNIX epoch time, unit: μs)
2	uint32_t	time_boot_ms	Timestamp (time since system startup, unit: ms)

0x48：Format SD Card

CMD_ID:0x 48 ----- Format SD Card			
Send Packet Format			
No.	Data Type	Data Name	Description
ACK Packet Format			
1	uint8_t	format_sta	0: Formatting Failed 1: Formatting Succeeded

0x49：Request TF Card Information

CMD_ID:0x 48 ----- Request TF Card Information			
Send Packet Format			
No.	Data Type	Data Name	Description
ACK Packet Format			
1	uint8_t	Status	TF Card Status: 0: Not inserted 1: Inserted but failed to mount 2: Mounted and functioning normally 3: Mounted but insufficient free space 4: Mounted as read-only 5: Mounted but identification/read error
2	uint8_t	File system	File System Type: 0: Unknown 1: FAT32 2: exFAT
3	uint16_t	Total capacity	TF Card Total Capacity: Value divided by 100 gives the actual size in GB (two decimal places).
4	uint16_t	Available capacity	TF Card Available Capacity: Value divided by 100 gives the actual available space in GB (two decimal places).

0x4D：Get AI Mode Status

CMD_ID:0x4D------Get AI Mode Status			
Send Packet Format			
No.	Data Type	Data Name	Description
ACK Packet Format			
1	uint8_t	sta	0: AI Mode Off 1: AI Mode On

0x4E：Get AI Module Target Tracking Data Stream Status

CMD_ID:0x4E------Get AI Module Target Tracking Data Stream Status			
Send Packet Format			
No.	Data Type	Data Name	Description
ACK Packet Format			
1	uint8_t	sta	0: Not Enabled 1: Coordinates Stream Active 2: AI Recognition Not Enabled 3: AI Target Tracking Not Enabled 4:AI target tracking stream is enabled, but the link ID does not match.

0x4F：Manually Update Thermal Imaging Shutter

CMD_ID:0x4F------Manually Update Thermal Imaging Shutter			
Send Packet Format			
No.	Data Type	Data Name	Description
ACK Packet Format			
1	Uint8_t	ack	1: Update Successful

0x50：AI Module Target Tracking Data Stream

[Enabled via 0x51. Automatically transmitted; no request required.]
[Origin: upper-left corner. Coordinates represent the center of the target bounding box. Resolution base: 1280 × 720 pixels.]

CMD_ID:0x50------AI Module Target Tracking Data Stream			
Send Packet Format			
No.	Data Type	Data Name	Description

ACK Packet Format			
1	uint16_t	pos_x	Target X Coordinate
2	uint16_t	pos_y	Target Y Coordinate
3	uint16_t	pos_width	Target Detection Box Width
4	uint16_t	pos_height	Target Detection Box Height
5	uint8_t	Target_ID	Target Type ID 0: Person 1: Car 2: Bus 3: Truck 4: Aircraft 5: Ship 6: Insulator 7: Flame 8: Smoke 255: Any Object Tracking
6	uint8_t	Track_Sta	Tracking Status 0: Normal Tracking (AI) 1: Intermittent Loss, can resume 2: Lost 3: User Cancelled Tracking 4: Normal Tracking (Any Object)

0x51：Set AI Module Target Tracking Data Stream Status

CMD_ID:0x51------Set AI Module Target Tracking Data Stream Status			
Send Packet Format			
No.	Data Type	Data Name	Description
	uint8_t	track_action	1: Enable Output 0: Disable Output
ACK Packet Format			
1	uint8_t	sta	1: Enable Output 0: Disable Output

0x55：Set AI Tracking Mode

CMD_ID:0x55------Set AI Tracking Mode			
Send Packet Format			
No.	Data Type	Data Name	Description
	uint8_t	Ai_mode	0: Disable 1: Enable
ACK Packet Format			
1	uint8_t	Ai_mode	0: Disable 1: Enable
2	uint8_t	Sta	0: Success

			1: Night Vision is enabled; AI Tracking cannot be started. Only box selection tracking is enabled. 2: AI Super-Resolution is enabled; AI Tracking cannot be started. Only box selection tracking is enabled. 3: Video stabilization is enabled. AI tracking is unavailable in recognition mode. 4: Night Vision and video stabilization are enabled. AI tracking cannot be enabled. 5: AI Super-Resolution and video stabilization are enabled. AI tracking cannot be enabled.

0x56：AI Select Tracking Target

CMD_ID:0x56------AI Select Tracking Target			
Send Packet Format			
No.	Data Type	Data Name	Description
	uint8_t	track_action	1: Track Target 0: Cancel Tracking
	uint16_t	touch_lx	Point Selection: X coordinate (range: video stream width) Box Selection: Top-left X coordinate (range: video stream width)
	uint16_t	touch_ly	Point Selection: Y coordinate (range: video stream height) Box Selection: Top-left Y coordinate (range: video stream height)
	uint16_t	touch_rx	Point Selection: 0 框选：Bottom-right X coordinate (range: video stream width)
	uint16_t	touch_ry	Point Selection: 0 Box Selection: ottom-right Y coordinate (range: video stream height)
ACK Packet Format			
1	uint8_t	sta	0: Setting Failed 1: Success 2: Current mode is not AI Tracking 3: Current stream does not support AI Tracking 4: Box selection area has insufficient texture 5: Video stabilization is enabled. AI tracking is unavailable.

0x57： AI Tracking Status

[This data can be requested on demand and will also be automatically pushed when tracking is lost.]

CMD_ID:057------ AI Tracking Status			
Send Packet Format			
No.	Data Type	Data Name	Description
ACK Packet Format			
1	uint8_t	sta	0: Tracking 1: Target Lost

0x5F： AI Candidate Target Bounding Box Push Enable

[When transmitted via UART, each packet contains up to five targets with the highest confidence scores. For TCP and UDP transmission, up to ten targets are supported per packet.]

CMD_ID:0x5F------ AI Candidate Target Bounding Box Push Enable			
Send Packet Format			
No.	Data Type	Data Name	Description
1	uint8_t	mode	0-3: Reserved 4: Disable Bounding Box Push 5: Enable Bounding Box Push
ACK Packet Format			
1	uint8_t	mode	0-3: Reserved 4: Disable Bounding Box Push 5: Enable Bounding Box Push
2	uint8_t	Cur_AI_model	0: General Model (Visible Light) 1: Insulator Model 2: General Model (Thermal Imaging) 3: Custom Model
3	uint64	Pts	Timestamp (μ s)
4	uint8_t	Obj_num	Number of Detected Targets Pushed
5	uint16[Obj_num]	lx	Bounding Box Top-Left X, mapped from [0, 65535] to [0, 1]
6	uint16[Obj_num]	ly	Bounding Box Top-Left Y, mapped from [0, 65535] to [0, 1]
7	uint16[Obj_num]	rx	Bounding Box Bottom-Right X, mapped from [0, 65535] to [0, 1]
8	uint16[Obj_num]	ry	Bounding Box Bottom-Right Y, mapped from [0, 65535] to [0, 1]
9	uint16[Obj_num]	score	Bounding Box Confidence, mapped from [0, 65535] to [0, 1]
10	Uint8[Obj_num]	class_id	Target Class ID(same as the class_id description in 0x50)

0x60：EIS Status

[Enabled via 0x51. Automatically transmitted; no request required.]

CMD_ID:0x60------ EIS Status			
Send Packet Format			
No.	Data Type	Data Name	Description
ACK Packet Format			
1	uint8_t	EIS_mode	0: Disabled 1: Enabled

0x61：Set EIS Status

CMD_ID:0x61------ EIS Status			
Send Packet Format			
No.	Data Type	Data Name	Description
1	uint8_t	EIS_mode	0: Disabled 1: Enabled
ACK Packet Format			
1	uint8_t	EIS_mode	0: Disabled 1: Enabled
2	uint8_t	EIS_err	0: Success 1: Target tracking is active. Failed to enable video stabilization. 2: AI is entering recognition mode. Tracking will be unavailable. 3: AI is exiting recognition mode. Normal tracking is available.

0x62：Get/Set Electronic Defog Mode

CMD_ID:0x62------ Get/Set Electronic Defog Mode			
Send Packet Format			
No.	Data Type	Data Name	Description
1	uint8_t	DEHAZE_mode	0: Auto 1: Low 2: High 3: Off
ACK Packet Format			
1	uint8_t	DEHAZE_mode	0: Auto 1: Low 2: High 3: Off

Note: Send an empty data packet to query the current defog mode.

0x63：Get/Set Night Vision Status

CMD_ID:0x63------ Get/Set Night Vision Status			
Send Packet Format			
No.	Data Type	Data Name	Description
1	uint8_t	HNR_status	0: Off 1: On
ACK Packet Format			
1	uint8_t	HNR_status	0: Off 1: On
2	uint8_t	HNR_err	0: Success 1: AI tracking is active. Failed to enable Night Vision. 2: AI Super-Resolution is active. Failed to enable Night Vision. (MT11 only)

Note: Send an empty data packet to query the current Night Vision status. This command is also used to enable or disable Night Vision.

0x80：Gimbal Camera Soft Reboot

CMD_ID:0x 80 -----Gimbal Camera Soft Reboot			
Send Packet Format			
No.	Data Type	Data Name	Description
1	uint8_t	Camera_reboot	0: No Action 1: Reboot Camera (currently not supported)
2	uint8_t	Gimbal_reset	0: No Action 1: Reboot Gimbal
ACK Packet Format			
1	uint8_t	Camera_reboot_sta	0: No Action 1: Reboot Camera
2	uint8_t	Gimbal_reset_sta	0: No Action 1: Reboot Gimbal

0x81：Get Gimbal Camera IP Address

CMD_ID:0x 81 -----Get Gimbal Camera IP Address			
Send Packet Format			
No.	Data Type	Data Name	Description
ACK Packet Format			
1	uint32_t	IP	IP Address
2	uint32_t	Mask	Subnet Mask
3	uint32_t	Gateway	Gateway

0x82：Set Gimbal Camera IP Address

CMD_ID:0x 82 -----Set Gimbal Camera IP Address			
Send Packet Format			
No.	Data Type	Data Name	Description
1	uint32_t	IP	IP Address
2	uint32_t	Mask	Subnet Mask
3	uint32_t	Gateway	Gateway
ACK Packet Format			
1	uint8_t	Ack	1: Success

0x84： Reset ISP Parameters

CMD_ID:0x84------Reset ISP Parameters			
Send Packet Format			
ACK Packet Format			
No.	Data Type	Data Name	Description
1	uint8_t	Ack	1: Success 0: Failure

0x85： Get All ISP Parameters

CMD_ID:0x85------Get All ISP Parameters			
Send Packet Format			
No.	Data Type	Data Name	Description
1	uint8_t	sensor_id	Reserved; can be an empty packet of length 0 or any value
ACK Packet Format			
No.	Data Type	Data Name	Description
1	uint8_t	sensor_id	Reserved (0)
2	uint8_t	brightness_val	Brightness: 0-100 (default 50)
3	uint8_t	saturation_val	Saturation: 0-127 (default 50)
4	uint8_t	contrast_val	Contrast: 0-100 (default 50)
5	uint8_t	awb_mode	White Balance: 0-Auto, 1-Daylight, 2-Cloudy, 3-Fluorescent, 4-Incandescent (default 0-Auto)
6	int8_t	exposure_comp	Exposure Compensation: -10~10 (default 0)
7	uint8_t	iso_val	ISO: 0-Auto, 1-100, 2-200, 3-400, 4-800, 5-1600, 6-3200 (default 0-Auto)
8	uint8_t	metering_mode	Metering Mode (exposure weighting table type parameter): 0-Average, 1-Center-weighted, 2-Spot (default 0)
9	uint8_t	shutter_speed	Shutter Speed: 0-Auto, 1-1/30s, 2-1/50s, 3-1/100s, 4-1/250s, 5-1/500s, 6-1/750s, 7-1/1000s, 8-1/2000s (default 0-Auto)

0x86： Set Single ISP Parameter

CMD_ID:0x86------Set Single ISP Parameter			
Send Packet Format			
No.	Data Type	Data Name	Description
1	uint8_t	set_item	Setting Item: 0: Brightness 1: Saturation 2: Contrast 3: White Balance 4: Exposure Compensation 5: ISO 6: Metering Mode 7: Shutter Speed
2	uint8_t	sensor_id	Reserved, any value
3	int8_t	param_val	Parameter value
ACK Packet Format			
No.	Data Type	Data Name	Description
1	uint8_t	set_item	Setting Item
2	uint8_t	sensor_id	Reserved (0)
3	uint8_t	ack	0: Failure 1: Success

0x87： Set/Get ISP Mode

CMD_ID:0x87------Set/Get ISP Mode			
Send Packet Format			
No.	Data Type	Data Name	Description
1	uint8_t	sensor_id	Reserved, any value
2	uint8_t	Mode	0: Auto Mode 1: Professional Mode
ACK Packet Format			
No.	Data Type	Data Name	Description
1	uint8_t	Mode	0: Auto Mode 1: Professional Mode

0x88： Set All ISP Parameters

CMD_ID:0x88------Set All ISP Parameters			
Send Packet Format			
No.	Data Type	Data Name	Description
1	uint8_t	sensor_id	Reserved, any value
2	uint8_t	brightness_val	Brightness: 0-100 (default 50)
3	uint8_t	saturation_val	Saturation: 0-127 (default 50)

4	uint8_t	contrast_val	Contrast: 0-100 (default 50)
5	uint8_t	awb_mode	White Balance: 0-Auto, 1-Daylight, 2-Cloudy, 3-Fluorescent, 4-Incandescent (default 0-Auto)
6	int8_t	exposure_comp	Exposure Compensation: -10~10 (default 0)
7	uint8_t	iso_val	ISO: 0-Auto, 1-100, 2-200, 3-400, 4-800, 5-1600, 6-3200 (default 0-Auto)
8	uint8_t	metering_mode	Metering Mode (exposure weighting table type parameter): 0-Average, 1-Center-weighted, 2-Spot (default 0)
9	uint8_t	shutter_speed	Shutter Speed: 0-Auto, 1-1/30s, 2-1/50s, 3-1/100s, 4-1/250s, 5-1/500s, 6-1/750s, 7-1/1000s, 8-1/2000s (default 0-Auto)
ACK Packet Format			
No.	Data Type	Data Name	Description
1	uint8_t	sensor_id	Reserved (0)
2	uint8_t	ack	0: Failure 1: Success

Chapter 3 Communication Interfaces

1. TTL Serial Port

Baud Rate:115200

Data Bits: 8, Stop Bits: 1, Parity: None

2. UDP

IP Address: 192.168.144.25

Port Number: 37260

3. TCP

IP Address: 192.168.144.25

Port Number: 37260

Heartbeat Packet: 55 66 01 01 00 00 00 00 00 59 8B

Chapter 4 Communication Data Example

Color Legend: Packet Header | CTRL | Data Length SEQ | ID | Data/Data | CRC

TCP Heartbeat
55 66 01 01 00 00 00 00 00 59 8B

Request Firmware Version
55 66 01 00 00 00 00 01 64 C4

Request Gimbal Hardware ID
55 66 01 00 00 00 00 02 07 F4

Auto Focus
55 66 01 05 00 00 00 04 01 C0 03 1C 02 15 8E(For screen coordinates 960,540)

Manual Zoom with Auto Focus
55 66 01 01 00 00 00 05 01 8D 64(Zoom In)
55 66 01 01 00 00 00 05 00 AC 74(Stop)
55 66 01 01 00 00 00 05 FF 5C 6A(Zoom Out)

Manual Focus
55 66 01 01 00 00 00 06 01 DE 31(Far Focus)
55 66 01 01 00 00 00 06 00 FF 21(Stop)
55 66 01 01 00 00 00 06 FF 0F 3F(Near Focus)

Gimbal Rotation
55 66 01 02 00 00 00 07 14 00 46 EB(yaw at 20% speed, pitch stopped)
55 66 01 02 00 00 00 07 00 00 F1 24(yaw and pitch stopped)

One-Key Functions
55 66 01 01 00 00 00 08 01 D1 12(One-Key Reset)
55 66 01 01 00 00 00 08 02 B2 22(Center and face downward)
55 66 01 01 00 00 00 08 03 93 32(Center)
55 66 01 01 00 00 00 08 04 74 42(Face downward)

Request Camera System Information
55 66 01 00 00 00 00 0A 0F 75

Photo and Recording
55 66 01 01 00 00 00 0C 00 34 CE(Capture photo)
55 66 01 01 00 00 00 0C 02 76 EE(Recording)
55 66 01 01 00 00 00 0C 03 57 FE(Lock Mode)
55 66 01 01 00 00 00 0C 04 B0 8E(Follow Mode)
55 66 01 01 00 00 00 0C 05 91 9E(FPV Mode)
55 66 01 01 00 00 00 0C 0A 7E 6F(Toggle Zoom Linkage)

Request Gimbal Attitude Data
55 66 01 00 00 00 00 0D E8 05

Set Gimbal Attitude Angle
55 66 01 04 00 00 00 0E 00 00 7C FC 4F A4(yaw 0°,pitch -90°)
55 66 01 04 00 00 00 0E 2C 01 C8 00 59 17(yaw 30°,pitch 20°)

Absolute Zoom
55 66 01 02 00 00 00 0F 01 00 61 BE(1.0 x)
55 66 01 02 00 00 00 0F 07 05 62 44(7.5 x)

Request Video Stitching Mode
55 66 01 00 00 00 00 10 74 C6

Set Video Stitching Mode
55 66 01 02 00 00 00 11 00 02 70 F5(Main Stream: Wide-Angle, Sub Stream: Thermal)
55 66 01 02 00 00 00 11 02 00 50 B3(Main Stream: Thermal, Sub Stream: Wide-Angle)
55 66 01 02 00 00 00 11 03 02 23 A0(Main Stream: Wide-Angle + Thermal, Sub Stream: Thermal)

Get Temperature at Selected Point
55 66 01 05 00 00 00 12 C0 03 1C 02 01 AC D7(Measure Once at Point [960,540])

Regional Temperature Measurement
55 66 01 09 00 00 00 13 C8 00 C8 00 90 01 90 01 01 7C 03(Measure Once Within Rectangle: Top-Left [200,200], Bottom-Right [400,400])

Get Laser Switch Status
55 66 01 00 00 00 00 31 37 F2

Toggle Laser Ranging
55 66 01 01 00 00 00 32 01 8F F8(On)
55 66 01 01 00 00 00 32 00 AE E8(Off)

Get Single Laser Ranging Value
55 66 01 00 00 00 00 15 D1 96

Request Main Stream Zoom Range
55 66 01 00 00 00 00 16 B2 A6

Request Laser Target Coordinates (Latitude & Longitude)
55 66 01 00 00 00 00 17 93 B6

Request Current Zoom Level (Main Stream)
55 66 01 00 00 00 00 18 7C 47

Request Current Gimbal Mode
55 66 01 00 00 00 00 19 5D 57

Request Current Thermal Palette
55 66 01 00 00 00 00 1A 3E 67

Set Thermal Palette
55 66 01 01 00 00 00 1B 00 D0 54(White_Hot)
55 66 01 01 00 00 00 1B 02 92 74(Sepia)

Set/Get Thermal Imaging AI Super-Resolution Switch
55 66 01 00 00 00 00 1C F8 07 (Get thermal imaging AI super-resolution status)
55 66 01 02 00 00 00 1C 00 00 63 97 (Disable AI super-resolution for photo and video)
55 66 01 02 00 00 00 1C 01 01 73 B4 (AI super-resolution: photo x2, video x2)
55 66 01 02 00 00 00 1C 01 02 10 84 (AI super-resolution: photo x2, video x4)

Request Camera Encoding Parameters
55 66 01 01 00 00 00 20 01 9E 9D

Set Camera Encoding Parameters
55 66 01 09 00 00 00 21 01 02 00 0F 70 08 00 00 00 95 6E(Main Stream H265 3840x2160)
55 66 01 09 00 00 00 21 01 02 80 07 38 04 00 00 00 59 94(Main Stream H265 1920x1080)
55 66 01 09 00 00 00 21 01 02 00 05 D0 02 00 00 00 58 AA(Main Stream H265 1280x720)
55 66 01 09 00 00 00 21 02 02 00 0F 70 08 00 00 00 D1 43(Sub Stream H265 3840x2160)
55 66 01 09 00 00 00 21 02 02 80 07 38 04 00 00 00 1D B9(Main Stream H265 1920x1080)
55 66 01 09 00 00 00 21 02 02 00 05 D0 02 00 00 00 2D 62Main Stream H265 1280x720)

Request Gimbal Data Stream

55 66 01 02 00 00 00 25 01 04 E2 BF(Request Attitude Data 10Hz)

55 66 01 02 00 00 00 25 01 00 66 FF(Request Attitude Data STOP)
55 66 01 02 00 00 00 25 02 01 14 BA(Request Laser Data - frequency not adjustable, non-zero = enable)

Request Gimbal Data Stream
55 66 01 00 00 00 00 26 E1 90

Request Gimbal Motor Voltage
55 66 01 00 00 00 00 2A 6D 51

Request Thermal Imaging Gain Mode
55 66 01 00 00 00 00 37 F1 92

Set UTC Time
55 66 01 08 00 00 00 30 38 3F FB EF E9 4D 06 00 D5 67
(1774517009203000 corresponds to 2026-3-26 9:23:29)

Set Thermal Imaging Gain Mode
55 66 01 01 00 00 00 38 00 65 07(Low Gain)
55 66 01 01 00 00 00 38 01 44 17(High Gain)

Request System Time
55 66 01 00 00 00 00 40 81 9C

Format SD Card
55 66 01 00 00 00 00 48 89 1D

Get AI Mode
55 66 01 00 00 00 00 4D 2C 4D

Get AI Tracking Target Stream Status
55 66 01 00 00 00 00 4E 4F 7D

Manual Thermal Shutter Refresh
55 66 01 00 00 00 00 4F 6E 6D

Toggle AI Target Stream Output
55 66 01 01 00 00 00 51 01 F6 A6(On)

55 66 01 01 00 00 00 51 00 D7 B6(Off)

Set AI Mode
55 66 01 01 00 00 00 55 01 32 6A(On)
55 66 01 01 00 00 00 55 00 13 7A(Off)

Select AI Tracking Target
55 66 01 09 00 00 00 56 01 C8 00 C8 00 90 01 90 01 92 20(Box Selection: Top-Left [200,200], Bottom-Right [400,400])
55 66 01 09 00 00 00 56 00 00 00 00 00 00 00 00 00 2D 94(Cancel Tracking)
55 66 01 09 00 00 00 56 01 C0 03 1C 02 00 00 00 00 39 F9(Point Selection: [960,540])

Get AI Tracking Status
55 66 01 00 00 00 00 57 57 FE

AI Candidate Target Bounding Box Push Control
55 66 01 01 00 00 00 5F 05 7D C5(Enable)
55 66 01 01 00 00 00 5F 04 5C D5(Disable)

Get EIS Status
55 66 01 00 00 00 00 60 E3 B8

Set EIS Status
55 66 01 01 00 00 00 61 01 63 A3(Enable)
55 66 01 01 00 00 00 61 00 42 B3(Disable)

Get/Set Electronic Defog Mode
55 66 01 00 00 00 00 62 A1 98(Get Status)
55 66 01 01 00 00 00 62 00 11 E6(Auto)
55 66 01 01 00 00 00 62 01 30 F6(Low)
55 66 01 01 00 00 00 62 02 53 C6(High)
55 66 01 01 00 00 00 62 03 72 D6(Off)

Get/Set Night Vision Status
55 66 01 00 00 00 00 63 80 88(Get Status)
55 66 01 01 00 00 00 63 00 20 D5(Disable)
55 66 01 01 00 00 00 63 01 01 C5(Enable)

Gimbal Camera Soft Reboot
55 66 01 02 00 00 00 80 00 01 1A 8A(Reboot the gimbal without rebooting the camera)

Get Gimbal Camera IP Address
55 66 01 00 00 00 00 81 EC 55

Set Gimbal Camera IP Address
(IP: 192.168.144.25, Subnet Mask: 255.255.255.0, Gateway: 192.168.144.1)
55 66 02 0C 00 00 00 82 C0 A8 90 19 FF FF FF 00 C0 A8 90 01 DF A6

Reset ISP Parameters
55 66 01 00 00 00 00 84 49 05

Get All ISP Parameters
55 66 01 01 00 00 00 85 00 34 6F

Set Single ISP Parameter
55 66 01 03 00 00 00 86 04 00 F6 A0 2A (Set exposure compensation to -10)

Set/Get ISP Mode
55 66 01 01 00 00 00 87 00 56 09 (Get ISP mode)
55 66 01 02 00 00 00 87 00 00 AB 1F (Auto mode)
55 66 01 02 00 00 00 87 00 01 8A 0F (Professional mode)

Set All ISP Parameters
55 66 01 09 00 00 00 88 00 32 32 32 00 F6 00 00 00 6D 43 (Brightness 50, Saturation 50, Contrast 50, White Balance Auto, Exposure Compensation -10, ISO Auto, Metering Mode Average, Shutter Speed Auto)

Chapter 5 CRC16 Checksum Code

```
const uint16_t crc16_tab[256];
/*************************************************************
CRC16 Coding & Decoding G(X) = X^16+X^12+X^5+1
*************************************************************/
uint16_t CRC16_cal(uint8_t *ptr, uint32_t len, uint16_t crc_init)
{
	uint16_t crc,	oldcrc16;
	uint8_t	temp;
	crc = crc_init;
	while (len--!=0)
	{
		temp=(crc>>8)&0xff;
		oldcrc16=crc16_tab[*ptr^temp];
		crc=(crc<<8)^oldcrc16;
		ptr++;

	}
	return(crc);
}

uint8_t crc_check_16bites(uint8_t* pbuf, uint32_t len,uint32_t* p_result)
{
		uint16_t crc_result = 0;
		crc_result= CRC16_cal(pbuf,len, 0);
		*p_result = crc_result;

		return 2;
}


const uint16_t crc16_tab[256]= {0x0,0x1021,0x2042,0x3063,0x4084,0x50a5,0x60c6,0x70e7,

0x8108,0x9129,0xa14a,0xb16b,0xc18c,0xd1ad,0xe1ce,0xf1ef,

0x1231,0x210,0x3273,0x2252,0x52b5,0x4294,0x72f7,0x62d6,

0x9339,0x8318,0xb37b,0xa35a,0xd3bd,0xc39c,0xf3ff,0xe3de,

0x2462,0x3443,0x420,0x1401,0x64e6,0x74c7,0x44a4,0x5485,

0xa56a,0xb54b,0x8528,0x9509,0xe5ee,0xf5cf,0xc5ac,0xd58d,

0x3653,0x2672,0x1611,0x630,0x76d7,0x66f6,0x5695,0x46b4,

0xb75b,0xa77a,0x9719,0x8738,0xf7df,0xe7fe,0xd79d,0xc7bc,
```

0x48c4,0x58e5,0x6886,0x78a7,0x840,0x1861,0x2802,0x3823,

0xc9cc,0xd9ed,0xe98e,0xf9af,0x8948,0x9969,0xa90a,0xb92b,

0x5af5,0x4ad4,0x7ab7,0x6a96,0x1a71,0xa50,0x3a33,0x2a12,

0xdbfd,0xcbdc,0xfbbf,0xeb9e,0x9b79,0x8b58,0xbb3b,0xab1a,

0x6ca6,0x7c87,0x4ce4,0x5cc5,0x2c22,0x3c03,0xc60,0x1c41,

0xedae,0xfd8f,0xcdec,0xddcd,0xad2a,0xbd0b,0x8d68,0x9d49,

0x7e97,0x6eb6,0x5ed5,0x4ef4,0x3e13,0x2e32,0x1e51,0xe70,

0xff9f,0xefbe,0xdfdd,0xcffc,0xbf1b,0xaf3a,0x9f59,0x8f78,

0x9188,0x81a9,0xb1ca,0xa1eb,0xd10c,0xc12d,0xf14e,0xe16f,

0x1080,0xa1,0x30c2,0x20e3,0x5004,0x4025,0x7046,0x6067,

0x83b9,0x9398,0xa3fb,0xb3da,0xc33d,0xd31c,0xe37f,0xf35e,

0x2b1,0x1290,0x22f3,0x32d2,0x4235,0x5214,0x6277,0x7256,

0xb5ea,0xa5cb,0x95a8,0x8589,0xf56e,0xe54f,0xd52c,0xc50d,

0x34e2,0x24c3,0x14a0,0x481,0x7466,0x6447,0x5424,0x4405,

0xa7db,0xb7fa,0x8799,0x97b8,0xe75f,0xf77e,0xc71d,0xd73c,

0x26d3,0x36f2,0x691,0x16b0,0x6657,0x7676,0x4615,0x5634,

0xd94c,0xc96d,0xf90e,0xe92f,0x99c8,0x89e9,0xb98a,0xa9ab,

0x5844,0x4865,0x7806,0x6827,0x18c0,0x8e1,0x3882,0x28a3,

0xcb7d,0xdb5c,0xeb3f,0xfb1e,0x8bf9,0x9bd8,0xabbb,0xbb9a,

0x4a75,0x5a54,0x6a37,0x7a16,0xaf1,0x1ad0,0x2ab3,0x3a92,

0xfd2e,0xed0f,0xdd6c,0xcd4d,0xbdaa,0xad8b,0x9de8,0x8dc9,

0x7c26,0x6c07,0x5c64,0x4c45,0x3ca2,0x2c83,0x1ce0,0xcc1,

0xef1f,0xff3e,0xcf5d,0xdf7c,0xaf9b,0xbfba,0x8fd9,0x9ff8,

0x6e17,0x7e36,0x4e55,0x5e74,0x2e93,0x3eb2,0xed1,0x1ef0
};