



Viewpro Gimbal Camera TCP Protocol V3.0

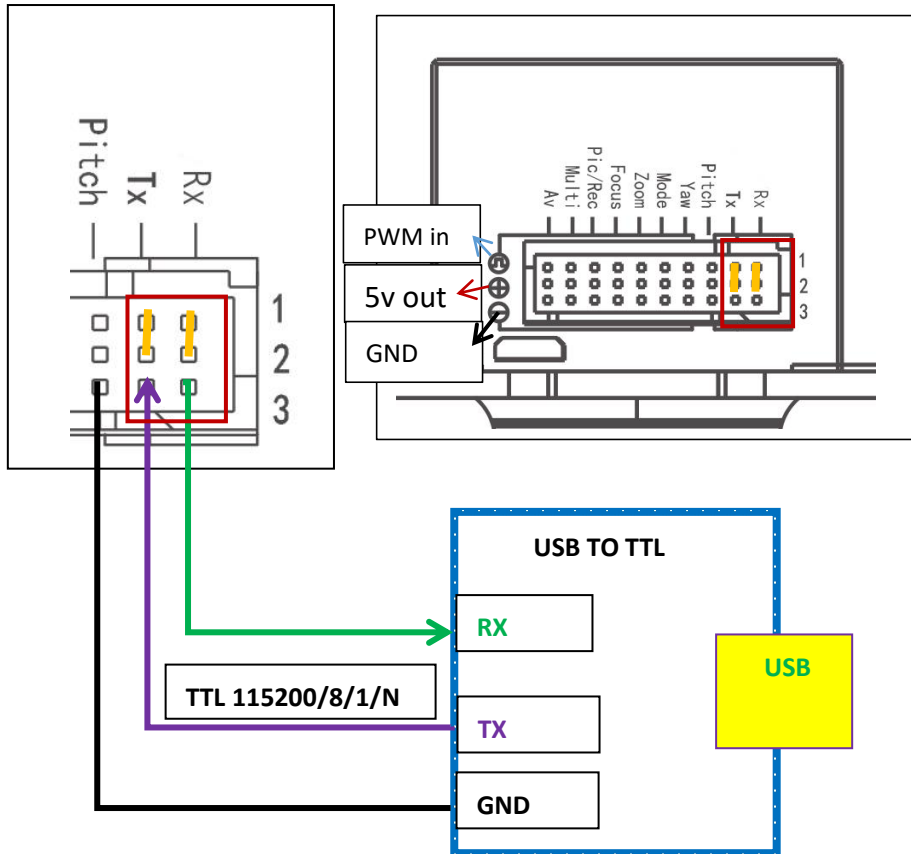
Model	Descriptions	Definition & port	TF card max	Protocol support functions
Z10F/Q10F	10x 1080p gimbal	HDMI 1080P/AV	32G	CMD control YAW/ROLL/PITCH and get angles, control camera zoom, focus, rec/pic
Z18F/Q18F	18x 1080p gimbal	HDMI 1080P/AV	32G	CMD control YAW/ROLL/PITCH and get angles, control camera zoom, focus, rec/pic
Z30F/Q30F	30x 1080p gimbal	HDMI 1080P/ AV	32G	CMD control YAW/ROLL/PITCH and get angles, control camera zoom, focus, rec/pic
Q30T/U30T/U30 T pro /Q30T pro	30x 1080p tracking pod	HDMIÐ 1080P SDI & ETH	128G	CMD control YAW/ROLL/PITCH and get angles, control camera zoom, focus, rec/pic, OSD, tracking, GPS, pod status, geo tag
Z36T	36x 1080p tracking gimbal	HDMI & ETH /SDI & ETH 1080P	128G	CMD control YAW/ROLL/PITCH and get angles, control camera zoom, focus, rec/pic, OSD, tracking, GPS, pod status, geo tag
Z36N	36x 1080p gimbal	Ethernet ONVIF 1080P25/P30	128G	CMD control YAW/ROLL/PITCH and get angles, control camera zoom, have app for PC&phone.
Q20K	20x 4K	HDMI	128G	CMD control YAW/ROLL/PITCH and get angles, control camera zoom, focus.
Z40K Z40KT	40x FHD/25x 4K EO	HDMI/ETH 1080P	128G	CMD control YAW/ROLL/PITCH and get angles, control camera zoom, focus, rec/pic, OSD, tracking, GPS, pod status, geo tag
Z10TL	10X + 300M laser light day/night gimbal	HDMI & ETH/SDI & ETH 1080P	128G	CMD control YAW/ROLL/PITCH and get angles, control camera zoom, laser focus, rec/pic, OSD, tracking, GPS, pod status, geo tag
Z30TL	30X + 800M laser light day/night gimbal	HDMI & ETH/SDI & ETH 1080P	128G	CMD control YAW/ROLL/PITCH and get angles, control camera zoom, laser focus, rec/pic, OSD, tracking, GPS, pod status, geo tag
Z-Fusion Z-fusionS	EO + 19mm thermal camera 4K EO + 19mm thermal	HDMI / ETH	128G	CMD control YAW/ROLL/PITCH and get angles, control camera zoom, rec/pic, OSD, tracking, GPS, pod status, geo tag, PIP, fusion.

	camera			
Z10TIR /mini Z10TIR /mini Z10TIR-35	10x EO +25mm/19mm/35mm 640 IR tracking gimbal	HDMI & ETH /SDI & ETH 1080P	128G	CMD control YAW/ROLL/PITCH and get angles, control camera zoom, PIP, rec/pic, OSD, tracking, GPS, pod status, IR camera control, geo tag
Q10TIR-35	10X +350mm 640 IR tracking	HDMI & ETH /SDI & ETH 1080P	128G	CMD control YAW/ROLL/PITCH and get angles, control camera zoom, PIP, rec/pic, OSD, tracking, GPS, pod status, IR camera control, geo tag
Z30TIR /Z30TIR-50	30x EO+25mm/50mm 640 IR tracking gimbal	HDMI & ETH /SDI & ETH 1080P	128G	CMD control YAW/ROLL/PITCH and get angles, control camera zoom, PIP, rec/pic, OSD, tracking, GPS, pod status, IR camera control, geo tag
Q30TIR /Q30TIR-50	30X EO+25mm/50mm 640 IR tracking pod	HDMI & ETH /SDI & ETH 1080P	128G	CMD control YAW/ROLL/PITCH and get angles, control camera zoom, PIP, rec/pic, OSD, tracking, GPS, pod status, IR camera control, geo tag
Q40TIR-50	40X EO FHD/25x 4k + 50mm 640 thermal camera	HDMI & ETH/SDIÐ 1080P	128G	CMD control YAW/ROLL/PITCH and get angles, control camera zoom, PIP, rec/pic, OSD, tracking, GPS, pod status, IR camera control, geo tag
Z10TIRM	10X EO + 19mm Thermal +1500m LRF	HDMIÐ SDIÐ 1080P	128G	CMD control YAW/ROLL/PITCH and get angles, control camera zoom, PIP, rec/pic, OSD, tracking, GPS, pod status, IR camera control, geo tag, target position resolving
WK10TIRM	10X EO + 19mm Thermal +1500m LRF	HDMIÐ SDIÐ 1080P	128G	CMD control YAW/ROLL/PITCH and get angles, control camera zoom, PIP, rec/pic, OSD, tracking, GPS, pod status, IR camera control, geo tag, target position resolving
Q30TIRM	30X EO + 25mm Thermal +1500m LRF	HDMIÐ SDIÐ 1080P	128G	CMD control YAW/ROLL/PITCH and get angles, control camera zoom, PIP, rec/pic, OSD, tracking, GPS, pod status, IR camera control, geo tag, target position resolving



Z6KA7	SONY a6000/a7RII gimbal	HDMI 1080p /AV	a6000 /a7RII	CMD control YAW/ROLL/PITCH and get angles, control sony a6000 /a7RII camera zoom, picture, record
Z-duo pro	FLIR duo PRO gimbal	HDMI	Two TF card	CMD control YAW/ROLL/PITCH and get angles, control camera
Z-Vue pro	FLIR Vue PRO gimbal	HDMI	Two TF card	CMD control YAW/ROLL/PITCH and get angles, control camera

TTL 3.3v UART baud: 115200/9600, 8/1/N, HEX



RX1/ RX2 and TX1 / TX2 must be connected with jumper caps before connecting UART/FTDI devices.

Please connect your RX to RX3, and TX to TX3 as shown in the figures.

CAUTION!!

- 1) the signals inside red frame are all TTL signals, DO NOT connect these pin headers to any power(VCC) or ground(GND)!
- 2) The other signals is for PWM input signals to control the gimbal,

PWM in: connect to your PWM reciever signals (does not include AV, AV output is for CVBS video signal)

5V out: for your PWM reciever power supply.

GND: connect to your PWM reciever GND.

1.1) **CMD_CONTROL** -control gimbal Movement: **FF 01 0F 10 RM PM YM Rsl Rsh Ral Rah Psl Psh Pal Pah Ysl Ysh Yal Yah CS**

HEAD
CONTRL_MODE
SPEED
ANGLE
SPEED
ANGLE
SPEED
ANGLE
CHECKSUM

RM: Roll control Mode, **00=MODE_NO_CONTRL, 01=MODE_SPEED, 02 = MODE_ANGLE, 03 = MODE_SPEED_ANGLE, 04 = MODE_RC, 05=MODE_ANGLE_REF_FRAME, 06 = MODE_RC_HIGH_RES.**

ROLL SPEED: RS= 0xRshRsl Rsl = low byte; Rsh= high byte (2 byte signed, little-endian order), units: 0,1220740379 degree/sec;

ROLL ANGLE: RA= 0xRahRal Ral = low byte ; Rah= high byte (2 byte signed ,little-endian order), units: 0.02197265625 degree

PM Psl Psh Pal Pah: Pitch control, same as roll control formats **YM Ysl Ysh Yal Yah:** Yaw control, same as roll control formats

sl= Speed Low byte, sh = speed high byte, al= angle low byte, ah= angle high byte.

If use RC mode, PA/YA is RC value should be -500~500, (-500 is PWM 1000ms, 0 is PWM 1500ms, 500 is PWM 2000ms)

CS = body checksum, checksum is calculated as a sum of bytes from 'RM' to 'YAH' modulo 256.

example1: ROLL no control, PITCH speed mode 1.22degree/sec, YAW speed mode 1.22degree/sec.

EB 90 14 FF 01 0F 10 00 01 01 00 00 00 00 0A 00 00 00 0A 00 00 00 16 4B

Example2: ROLL no control, PITCH angle mode to 40 degree down REF home position, YAW angle mode 20 degree left REF home position.

EB 90 14 FF 01 0F 10 00 05 05 00 00 00 00 00 1C 07 00 00 E4 F8 09 31

Example3: RC control pitch down(PWM = 1920, PA value = 1920-1500 = 420), RC control Yaw left (PWM = 1050, YA value =1050-1500 = -450)

EB 90 14 FF 01 0F 10 00 04 04 00 00 00 00 00 A4 01 00 00 3E FE E9 F1

Example4: at all mode, stop command pitch and yaw use the command:



EB 90 14 FF 01 0F 10 **00 00 00** 00 00 00 00 00 00 00 00 00 00 00 00 00 00 1F

Name	Type	Min	Max	Possible values, remarks
<i>Legacy format: mode is common for all axes</i>				
CONTROL_MODE	1u			<p>Bits 0..3 for mode, bits 4..7 for flags.</p> <p>Modes:</p> <p>MODE_NO_CONTROL=0 If this mode is set for all axes, finish serial control and restore normal RC control. If set for single axis, does not change its current control mode.</p> <p>MODE_SPEED=1 Camera travels with the given speed in the Euler coordinates until the next CMD_CONTROL command comes. Given angle is ignored.</p> <p>MODE_ANGLE=2* Camera travels to the given Euler angle with the fixed speed. Speed is decreased near target to keep control smooth. Low-pass filter may be applied for the same reason.</p> <p>MODE_SPEED_ANGLE=3 Camera travels with the given speed. Additionally, controller keeps the given angle and fix accumulated error by the outer PI-loop. This mode allows the most precise type of control (see fig.1 for example), but it requires pretty fast update rate to keep it smooth, or apply low-pass filtering for speed and angle.</p>

MODE_RC=4*

The ANGLE parameter is used as RC signal and overrides any other signal source, assigned to this axis. Normal working range is -500..500. A special value -10000 encodes a "signal lost" condition.

The flag CONTROL_FLAG_AUTO_TASK can affect this mode (see below).

Prior ver., 'SPEED' parameter is ignored.

MODE_RC_HIGH_RES=6*

The same as the MODE_RC, but the range of the ANGLE parameter has better resolution: -16384..16384. A special value -32768 encodes a "signal lost" condition.

MODE_ANGLE_REL_FRAME=5*

First, the neutral point of a camera relative to a frame is found in the Euler coordinates for a given axis. Then, the given angle value is add to this point, and camera travels to it. Note that the given angle does not relate to a particular motor, it relates to global Euler angles!

Flags:

CONTROL_FLAG_AUTO_TASK=(1<<6)

- If mode is one of the <MODE_ANGLE, MODE_ANGLE_REL_FRAME>, the task is processed with the speed and acceleration configured for *automated*

			<p><i>tasks</i>. If the SPEED parameter is provided, it's used instead. When all target angles are reached with the 1-degree tolerance, confirmation is sent: CMD_CONFIRM(CMD_CONTROL, 1) . Use this flag to move gimbal to a certain position as fast as possible, and receive confirmation when the target is reached.</p> <ul style="list-style-type: none">- If mode is MODE_RC, this flag forces a control in the "speed" mode, with the dead-band, trimming and inversion settings are NOT applied to the provided RC signal, but the LPF, Expo curve and ACC limiter are still applied. Use this flag to control gimbal from remote applications, where signal is well-defined and you need to have a direction of rotation that does not depend on gimbal's settings. <p>CONTROL_FLAG_HIGH_RES_SPEED=(1<<7)</p> <p>Speed units changed to 0.001 deg/sec for extremely slow motion (like timelapse shooting)</p> <p><i>* In the control modes "MODE_ANGLE", "MODE_RC", and "MODE_ANGLE_REL_FRAME", if the "SPEED" parameter is not provided (set to zero), the speed is defined by the RC settings. Relationship: SPEED = settings.RC_SPEED*16.</i></p>
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axis = (1..3)	SPEED	2s	-	-	<p>Speed of rotation. Overrides the speed settings in the GUI and from the adjustable variables.</p> <p>Notes:</p> <ul style="list-style-type: none"> If the acceleration limiter is enabled in the RC settings, the actual speed is filtered by it; For the modes "MODE_ANGLE", "MODE_RC", "MODE_ANGLE_REL_FRAME", the value may be omitted (set to 0). if this case, speed is taken from the RC settings; Also, in these modes, the actual speed is decreased near target to prevent jerks when the ANGLE parameter given with the high rate, changes slowly; <p><i>Units: 0,1220740379 deg./sec. (0.001 deg./sec., if the CONTROL_FLAG_HIGH_RES_SPEED is set)</i></p>
	ANGLE	2s	-32768	32767	<p>Depends on the MODE parameter:</p> <ul style="list-style-type: none"> MODE_ANGLE, MODE_SPEED_ANGLE: encodes the target angle MODE_SPEED: ignored MODE_RC: encodes RC signal in range -500..500 MODE_RC_HIGH_RES: encodes RC signal in range -16384..16384 <p><i>Units: 0,02197265625 degree.</i></p>
<p>Notes:</p> <ul style="list-style-type: none"> Serial control overrides RC control. To switch back to RC, send this command with the mode=MODE_NO_CONTROL for all axes, and all data set to zeros. All parameters that was changed by the CMD_CONTROL_CONFIG, will be restored to their default values. 					

1.2) **CMD_GET_ANGLES_EXT**: EB 90 05 3e 3D 00 3D 00 B8

Gimbal feedback data: **3e 3d 36 73** { ...body... } cs

For example

{3E 3D 36 73 **98 FF 98 FF E6 FF FF FF 00 00 00 00 00 00 00 00 00 00 00 00 00 1C F7 1C F7 28 F7 FF FF 00 00 00 00 00 00 00 00 00 00 00 00 88 FF 88 FF F8 F6 FF FF 00 00 00 00 00 00 00 00 00 00 4E** }

3E 3D 36 73 = header,

98 FF 98 FF E6 FF FF FF 00 00 00 00 00 00 00 00 00 00 = **ROLL status data, detail as following**

(**98 FF**=ROLL_IMU_angle int16_t units: 0.02197265625degree

98 FF=ROLL_RC_TARGET_ANGLE int16_t units: 0.02197265625degree

E6 FF FF FF =ROLL_STATOR_REL_ANGLE = camera actual Euler angle int32_t units: 0.02197265625degree

00 00 00 00 00 00 00 00 00 00 = 10 bytes reserved)

1C F7 1C F7 28 F7 FF FF 00 00 00 00 00 00 00 00 00 00 = pitch status data, same as roll format

88 FF 88 FF F8 F6 FF FF 00 00 00 00 00 00 00 00 00 00 = yaw status data, same as roll format

4E = body checksum

CMD_GET_ANGLES_EXT - Information about angles

Name	Type	Min	Max	Possible values, remarks
axis = (1..3)	IMU_ANGLE	2s		IMU angles in 14-bit resolution per full turn <i>Units: 0,02197265625 degree</i>
	TARGET_ANGLE	2s		Target angles, in 14-bit resolution <i>Units: 0,02197265625 degree</i>
	STATOR_ROTOR_ANGLE	4s		Relative angle for joints between two arms of gimbal structure, measured by encoder or 2 nd IMU. Value 0 corresponds to normal position of a gimbal. This angle does not overflow after multiple turns. <i>Units: 0,02197265625 degree</i>
	RESERVED	10b		

1.3) Other commands:

Return head:	EB 90 06 3E 45 01 46 12 12 EE	Look down:	EB 90 06 3E 45 01 46 11 11 EC
Center yaw	EB 90 06 3E 45 01 46 23 23 10	Restore Settings	EB 90 06 3E 45 01 46 35 35 34
Motor on	EB 90 06 3E 45 01 46 0B 0B E0	Motor off	EB 90 06 3E 45 01 46 0C 0C E2
follow_yaw_disable	EB 90 0B 3E 1F 06 25 01 1F 00 00 00 00 20 C8	follow_yaw_enable	EB 90 0B 3E 1F 06 25 01 1F 01 00 00 00 21 CA
query_follow_state	EB 90 07 3E 40 02 42 01 1F 20 02	save gimbal settings	EB 90 06 3E 20 00 20 00 00 7E



2 camera_control_cmd: different model use different commands, so please use command as your model.

2.1) Z10F, Z18F, Z30F, Q10F, Q18F, Q30F HDMI output version:

EB 90 06 81 01 04 07 37 FF C3 zoom out
EB 90 06 81 01 04 07 27 FF B3 zoom in
EB 90 06 81 01 04 07 00 FF 8C stop zoom
EB 90 06 81 01 04 08 27 FF B4 focus in
EB 90 06 81 01 04 08 37 FF C4 focus out
EB 90 06 81 01 04 08 00 FF 8D stop focus
Zoom_direct_pos EB 90 09 81 01 04 47 0p 0q 0r 0s FF CS
photograph /record action command: 81 01 04 68 xx FF

xx = :

- 01 photograph
- 02 start record
- 03 stop record
- 04 invert record state
- 05 switch to record mode or picture mode

Inquiry record/photograph state:EB 90 05 81 09 04 68 FF F5

Camera Feedback:

81 09 04 68 00 FF stop record

81 09 04 68 01 FF recording

81 09 04 68 10 FF photograph mode

Query_zoom_position:EB 90 05 81 09 04 47 ff D4 Zoom_position_feedback: 90 50 0p 0q 0r 0s FF 0xpqrs: zoom_position_value

EB 90 06 81 01 04 01 03 ff 89 day mode

EB 90 06 81 01 04 01 02 ff 88 night mode

EB 90 06 81 01 04 51 02 ff D8 day/night auto switch mode



2.2) Z36N, Z12NL Ethernet onvif IP camera output version:

Zoom_out EB 90 06 81 01 04 07 37 FF C3 //wide
Zoom_in EB 90 06 81 01 04 07 27 FF B3 //tele
Stop_zoom EB 90 06 81 01 04 07 00 FF 8C
Auto Focus EB 90 06 81 01 04 38 02 FF BF //AF On
Manual Focus EB 90 06 81 01 04 38 03 FF C0 //AF Off
Auto/Manual EB 90 06 81 01 04 38 10 FF CD //invert
Focus_out EB 90 06 81 01 04 08 37 FF C4 //near
Focus_in EB 90 06 81 01 04 08 27 FF B4 //far
Stop_focus EB 90 06 81 01 04 08 00 FF 8D
Start_picture EB 90 04 55 02 07 aa 08
Start_record EB 90 04 55 02 05 aa 06
Stop_record EB 90 04 55 02 06 aa 07
Zoom_direct_pos EB 90 09 81 01 04 47 0p 0q 0r 0s FF CS
Camera feedback: get cmd: 90 41 ff finished cmd: 90 51 ff
Query_zoom_position: 81 09 04 47 ff Zoom_position_feedback: 90 50 0p 0q 0r 0s FF 0xpqrs: zoom_position_value

2.3) laser light cmd

2.3.1) Z12NL/Z30TL

Zoom_in_laser EB 90 07 FF 01 01 04 00 1a 20 3F zoom_out_laser EB 90 07 FF 01 01 04 01 1a 21 41
Laser_on EB 90 07 FF 01 01 01 01 00 04 07 laser_off EB 90 07 FF 01 01 01 00 00 03 05

2.3.2) Z10TL

zoom_in_laser EB 90 07 FF 01 00 20 00 00 21 41 zoom_out_laser EB 90 07 FF 01 00 40 00 00 41 81
zoom_stop_laser EB 90 07 FF 01 00 00 00 00 01 01 laser_on EB 90 07 FF 01 00 09 00 01 0b 15 laser_off EB 90 07 FF 01 00 0b 00 01 0d 19

2.4) Z6KA7 cmd for sony a6000/a7Rii



Power on/off EB 90 07 FF 01 00 50 00 00 51 A1 zoom_wide EB 90 07 FF 01 00 40 00 00 41 81 focus EB 90 07 FF 01 00 80 00 00 81 01
zoom_tele EB 90 07 FF 01 00 20 00 00 21 41 stop_zoom EB 90 07 FF 01 00 00 00 00 01 01 focus hold EB 90 07 FF 01 01 80 00 00 82 03
picture EB 90 07 FF 01 00 07 00 66 6E DB record EB 90 07 FF 01 00 07 00 55 5D B9 focus release EB 90 07 FF 01 02 80 00 00 83 05
shoot_under_focus_hold EB 90 07 FF 01 00 07 00 67 6F DD picture_interval_2s_time EB 90 07 FF 01 00 07 02 6f 79 F1
picture_interval_3s_time EB 90 07 FF 01 00 07 03 6f 7A F3 picture_interval_OFF EB 90 07 FF 01 00 07 00 6f 77 ED

2.5) T serials model: Q30T, Q30T pro, U30T, U30Tpro, Z36T, Z12TL, Z30TL, mini Z10TIR, Rugby, Z10TIR, mini Z10TIR-35, Q10TIR-35, U30TIR, U30TIR-50, Z30TIR-25, Z30TIR-50, Q30TIR, Q30TIR-50, Q40TIR, Z10TIRM, WK10TIRM, Q10TIRM, Q30TIRM, Z30TM

Zoom_out EB 90 06 81 01 04 07 37 FF C3 //wide
Zoom_in EB 90 06 81 01 04 07 27 FF B3 //tele
Stop_zoom EB 90 06 81 01 04 07 00 FF 8C
Auto Focus EB 90 06 81 01 04 38 02 FF BF //AF On
Manual Focus EB 90 06 81 01 04 38 03 FF C0 //AF Off
Auto/Manual EB 90 06 81 01 04 38 10 FF CD // invert AF on/off
Focus_out EB 90 06 81 01 04 08 37 FF C4 //near
Focus_in EB 90 06 81 01 04 08 27 FF B4 //far
Stop_focus EB 90 06 81 01 04 08 00 FF 8D
Query_zoom_position EB 90 05 81 09 04 47 FF D4
Zoom_position_feedback: 90 07 90 50 0p 0q 0r 0s FF CS pqr: zoom_position_value

Record, photograph, PIP, track, color bar, these commands use 48bytes command as following:

Following command is a 48bytes data : cmd_data[48], last byte is checksum, sum of all 47 bytes, low byte.

2.5.1) Record/photograph command:

Cmd_data[5]= 0X7c

Cmd_data[6]= 0x04: stop record / 0x05: start record / 0x06: photograph


```
{EB 90 30 7E 7E 44 00 00 71 00 00 00 00 00 00 00 2C 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 DD BA};
```

Step 2: move the cursor x,y. speed.

Protocol: cmd_data[5]=0X71 // tracking use '+' cursor cmd_data[11] = 0X00

cmd_data[7]= 0xXL, X LOW BYTE cmd_data[8]= 0xXH, X HIGT BYTE
cmd_data[9]= 0xYL, Y LOW BYTE cmd_data[10]= 0xYH, Y HIGH BYTE

Down_cursor_2[]=

```
{EB 90 30 7E 7E 44 00 00 71 00 00 00 02 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 B3 66}.
```

2.5.5) Finger tracking mode: cmd_data[5]=0X86, cmd_data[11] = 0X01, cmd_date[13] = track size

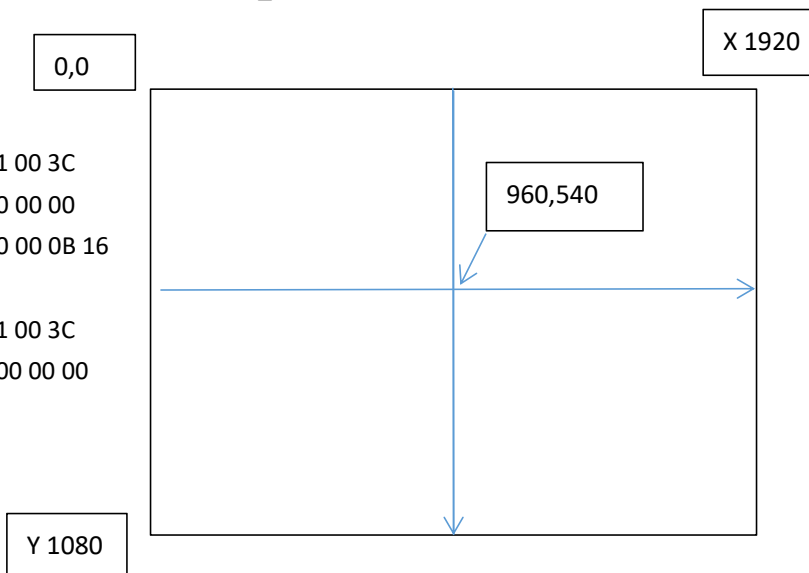
Cmd_data[7]=0xXL, XLOW BYTE Cmd_data[8]=0xXH, XHIGT BYTE
Cmd_data[9]=0xYL, YLOW BYTE Cmd_data[10]=0xYH, YHIGH BYTE

Track the target at position: (769, 769)

```
EB 90 30 7E 7E 44 00 00 86 00 01 03 01 03 01 00 3C  
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 0B 16
```

Track the target at position: (1025, 769)

```
EB 90 30 7E 7E 44 00 00 86 00 01 04 01 03 01 00 3C  
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```



2.5.7) Laser Ranger Finder command (Z10TIRM, WK10TIRM, Q10TIRM, Q30TIRM, Z30TM)

EB 90 04 10 83 00 7D 10 one time get LRF data

EB 90 04 10 83 40 3D 10 continuous get LRF data

EB 90 03 10 84 7C 10 stop get LRF data

LRF feedback data:

EB 90 07 10 01 20 12 d7, fe f8 10 distance: 0x12D7 = 4823 = 482.3m pitch angle: 0XFE = -2 degree.

EB 90 07 10 01 A0 80 00 01 DE 10 invalid distance data(byte4 = 0xA0, bit7 = 1 pitch angle = 1degree

Last byte is Checksum = 0x100- byte2-byte3-...

2.5.8) SD card inquiry command and feedback command protocol

- Inquiry command to get information . 48bytes Header: 7e 7e 44 CS= sum of all other bytes, mod 256.

- ❖ format SD card Data5 = 0x8a Data6 = 00

- ❖ Inquiry SD card information:

Data5 = 0x8b

Data6 =

7E	7E	44	00	00	Data5	Data6	00	00	00	00	00	00	00	00	00
00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	CS

02-inquiry SD card status

03-inquiry SD card total capacity

04-inquiry SD card remain capacity

05-inquiry SD card remain pictures quantity capacity

06-inquiry SD card remain video time capacity

- Feedback command. 8bytes

Data0 BB	Data1 09	Data2	Data3	Data4	Data5	Data6	Data7 CS
-------------	-------------	-------	-------	-------	-------	-------	-------------

Data2 = 1 : SD card status,

Data2 = 2 : SD card total capacity

Data2 = 3 : SD card remain capacity

Data2 = 4 : SD card remain pictures quantity

Data2 = 5 : SD card remain video time

◆ Feedback command details ([0] means bit0)

1) SD card status

BB-----header1 09-----header2 Data2 = 01-----SD card status,

Data 3:

[0] :Is inserted

[1] :Is initializing

[2] :Is read only

[3] :Is formatted

[4] :Is formatting

[5] :Is full

[6] :Is verified

[7] :Is invalid format

Data4:

[0] :Has error

[1] : 1: Is Recording 0: not recording

[2-7] Reserved

Data5 res

Data6 res

Data7 cs

2) SD card total capacity

BB-----header1 09-----header2 Data2 = 02-----SD card total capacity
Data3= ss, Data4=rr, Data5=qq, Data6=pp uint32
0xppqqrss = SD card capacity(unit MB,LSB is at the front and MSB is at the back)
Data7 cs

3) SD card remain capacity

BB-----header1 09-----header2 Data2 = 03-----SD card remain capacity
Data3= ss, Data4=rr, Data5 =qq, Data6 =pp uint32
0xppqqrss = Remaining SD card capacity(unit MB,LSB is at the front and MSB is at the back)
Data7 cs

4) SD card remain pictures quantity

BB-----header1 09-----header2 Data2 = 04-----SD card remain pictures quantity
Data3= ss, Data4=rr, Data5=qq, Data6=pp uint32
0xppqqrss = Remaining shots(LSB is at the front and MSB is at the back)
Data7 cs

5) SD card remain video time

BB-----header1 09-----header2 Data2 = 05-----: SD card remain video time
Data3= ss, Data4=rr, Data5=qq, Data6=pp uint32
0xppqqrss = Remaining video recording time (unit: second, LSB is at the front and MSB is at the back)
Data7 cs

3) Camera settings command: (blue byte for different setting value)

3.1) EB 90 05 AA 55 04 08 FF 0A timezone set, beijing is 8

3.2) EB 90 05 AA 55 05 03 FF 06 OSD on/Off (refer table A)

3.3) EB 90 05 AA 55 06 0F FF 13 Magnetic Variation set <https://skyvector.com/> <http://www.magnetic-declination.com/>

- 3.4) EB 90 05 AA 55 07 **11** FF 16 OSD input enable/disable (refer table B)
- 3.5) EB 90 05 AA 55 08 **02** FF 08 baudrate setting (refer table C)
- 3.6) EB 90 05 AA 55 09 **01** FF 08 EO digital zoom : 1 on 0: off
- 3.7) EB 90 05 AA 55 0A **96** FF 9E temperature alarm low byte
- 3.8) EB 90 05 AA 55 0B **00** FF 09 temperature alarm high byte
- 3.9) EB 90 05 AA 55 0C **01** FF 0B 1: track enable 0: track disable
- 3.10) EB 90 05 AA 55 0D **01** FF 0C 0: stop LRF 1: 1HZ get LRF data 2: continuously get LRF data 3: one time get LRF data
- 3.11) EB 90 05 AA 55 0E **01** FF 0D 1: 4k25fps 2: 1080p25 Z40K/Q40TIR record definition set
- 3.12) EB 90 05 AA 55 0F **01** FF 0E 0: OSD GPS is UAV 1: OSD GPS is target
- 3.13) EB 90 05 AA 55 10 **00** FF s.bus/mavlink channels map set 1: 1~7, 2: 6~12 3: 8~14 4: custom channels, see 3.14 as following
- 3.14) EB 90 0B **AA 55 11 YW PT MO ZM FC RP MU FF** CS custom channels map set. (all byte is hex data, set to 0 if no control)

```

| | | | | | | __Multi :combine mode(<0x11),separate mode(>0x10)
| | | | | | | _PIC/REC: combine mode(<0x11), separate mode(>0x10)
| | | | | | | __Focus: combine mode(<0x11),separate mode(>0x10)
| | | | | | | ___Zoom: combine mode(<0x11),separate mode(>0x10)
| | | | | | | ___Mode: combine mode(<0x11),separate mode(>0x10)
| | | | | | | ___Pitch: combine mode(<0x11),separate mode(>0x10)

```

|__Yaw: combine mode(<0x11),separate mode(>0x10)

1100 is PWM value 1100us, 1500 is PWM value 1500us, 1900 is PWM value 1900us

3.14.1) Combine mode:

Each function use one 3-position channel to control, the value should be <= 16 (0x10), set 1 for channel 1, 2 for channel 2, ...0x10 for channel 16, if no control ,just set to 0.For example: use chan#1,2,3,4,9,10,16 to control gimbal, command should be EB 90 0B AA 55 11 01 02 03 04 09 0A 10 FF 3C

EB 90 0B AA 55 11 01 02 03 04 09 0A 10 FF 3C (all byte is hex data)

										_Multi:channel 16, 1100,stop track,1500 cross cursor, 1900 start track
										_PIC/REC:channel 10: from 1500 to 1100 pic, from 1500 to 1900 record start or record stop
										_Focus:channel 9: 1100 focus out, 1500 focus stop,1900 focus in
										_Zoom: channel 4: 1100 zoom out, 1500 zoom stop, 1900 zoom in
										_Mode:channel 3: 1100 low speed, 1500 mid speed, from 1500 to 1900 recenter
										_Pitch: channel 2: 1100 pitch up, 1500 pitch stop, 1900 pitch down
										_Yaw: channel 1: 1100 yaw left, 1500 yaw stop, 1900 yaw right

3.14.2) Separate mode:

Each function use two separate 2-postion channels to control.value should be > 16 (0x10). in separate mode ,byte definition is bit 0-3: 1100ns chan#, bit4-7: 1900ns chan#, initial value of these two channels should be 1500ns. The switch use momentary switch mode. Do not use toggle switch mode.

EB 90 0B AA 55 11 YW PT MO ZM FC RP MU FF CS (all byte is hex)

										__Multi :0x0 <u>M</u> = track chan#(1900), 0x0 <u>U</u> = stop track chan#(1100)
										_PIC/REC: 0x0 <u>R</u> = record chan#(1900), 0x0 <u>P</u> = picture chan#(1100)
										__Focus:0x0 <u>F</u> = focus in chan#(1900), 0x0 <u>C</u> = focus out chan#(1100)
										__Zoom: 0x0 <u>Z</u> = zoom in chan#(1900), 0x0 <u>M</u> = zoom out chan#(1100)
										__Mode:0x0 <u>M</u> = recenter chan#(1900), 0x0 <u>O</u> = slow speed chan#(1100)
										__Pitch: 0x0 <u>P</u> = pitch down chan#(1900), 0x0 <u>I</u> =pitch up chan#(1100)
										__Yaw: 0x0 <u>Y</u> = yaw right chan#(1900), 0x0 <u>W</u> = yaw left chan#(1100)



For example: PIC/REC and Multi use separate mode to control, other channels use combine mode. 1(yaw), 2(pitch), 3(mode), 4(zoom), 5(focus), 6(photograph), 7(record), 8(stop track), 9(track)

EB 90 0B AA 55 11 01 02 03 04 05 76 98 FF CS

| | | | | | | |__Multi :**channel 8**: from 1500 to 1100 stop track, **channel 9**:from 1500 to 1900 start track
| | | | | | |__PIC/REC: **channel 6**: from 1500 to 1100 take a picture, **channel 7**: from 1500 to 1900 start record/stop record
| | | | | | |__Focus: channel 5: 1100 focus out, 1500 focus stop, 1900 focus in
| | | | | | |__Zoom:channel 4: 1100 zoom out, 1500 zoom stop, 1900 zoom in
| | | | | | |__Mode:channel 3: 1100 low speed, 1500 mid speed, 1900 recenter
| | | | | | |__Pitch:channel 2: 1100 pitch up, 1500 pitch stop, 1900 pitch down
| | | | | | |__Yaw: channel 1: 1100 yaw left, 1500 yaw stop, 1900 yaw right

- 3.15) EB 90 05 AA 55 20 01 FF 1F restore IP address to 192.168.2.119 (T serial model)
- 3.16) EB 90 05 AA 55 21 10 FF 2F Z40k/Q40TIR definition OSD on/off 10: on 20: off
- 3.17) EB 90 05 AA 55 22 80 FF A0 Z40k/Q40TIR date OSD on/off 80: on 90: off
- 3.18) EB 90 05 AA 55 23 40 FF 61 Z40k/Q40TIR OSD on/off 30: off 40: on
- 3.19) EB 90 05 AA 55 24 A0 FF C2 Z40k/Q40TIR SD card capacity OSD on/off A0: off B0: on
- 3.20) EB 90 05 AA 55 25 C0 FF E3 Z40k/Q40TIR record time OSD on/off C0: off D0 : on

TABLE A : OSD ON/OFF settings

BIT0 0: all OSD on
 1: all OSD off

BIT1 0: cross OSD on
 1: cross OSD off

BIT2 0: pitch& yaw ON
 1: pitch & yaw OFF

BIT3 0: XY shift osd on
 1: XY shift osd off

BIT4 0: GPS OSD ON
 1: GPS OSD OFF

BIT5 0: time OSD ON
 1: time OSD off

BIT6 0: VL-MAG OSD ON
 1: VL-MAG OSD OFF

BIT7 0: SMALL OSD WORD
 1: BIG OSD WORD

TABLE B: OSD input
 enable/disable

BIT0 0: not save setting
 1: save

BIT1 0: time input disable
 1: time input enable

BIT2 0: GPS time input disable
 1: GPS time input enable

BIT3 0: GPS
 1: MGRS

BIT4 0: pitch/yaw input disable
 1: pitch/yaw input enable

BIT5 0: VL-MAG input disable
 1: VL-MAG input enable

BIT6 0: zoom times display
 1: fov display

BIT7 0: word have no black frame
 1: word have black frame

Table C:

Baudrate setting

0: 2400

1: 4800

2: 9600

3: 19200

4: 38400

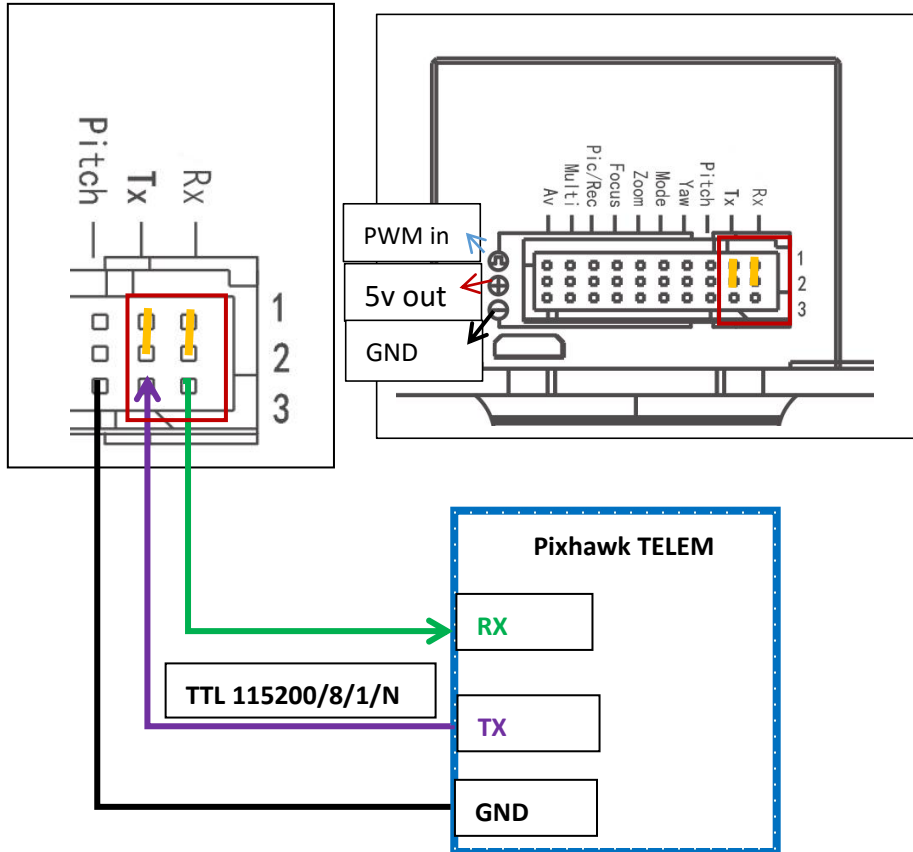
5: 57600

6: 115200 (default)

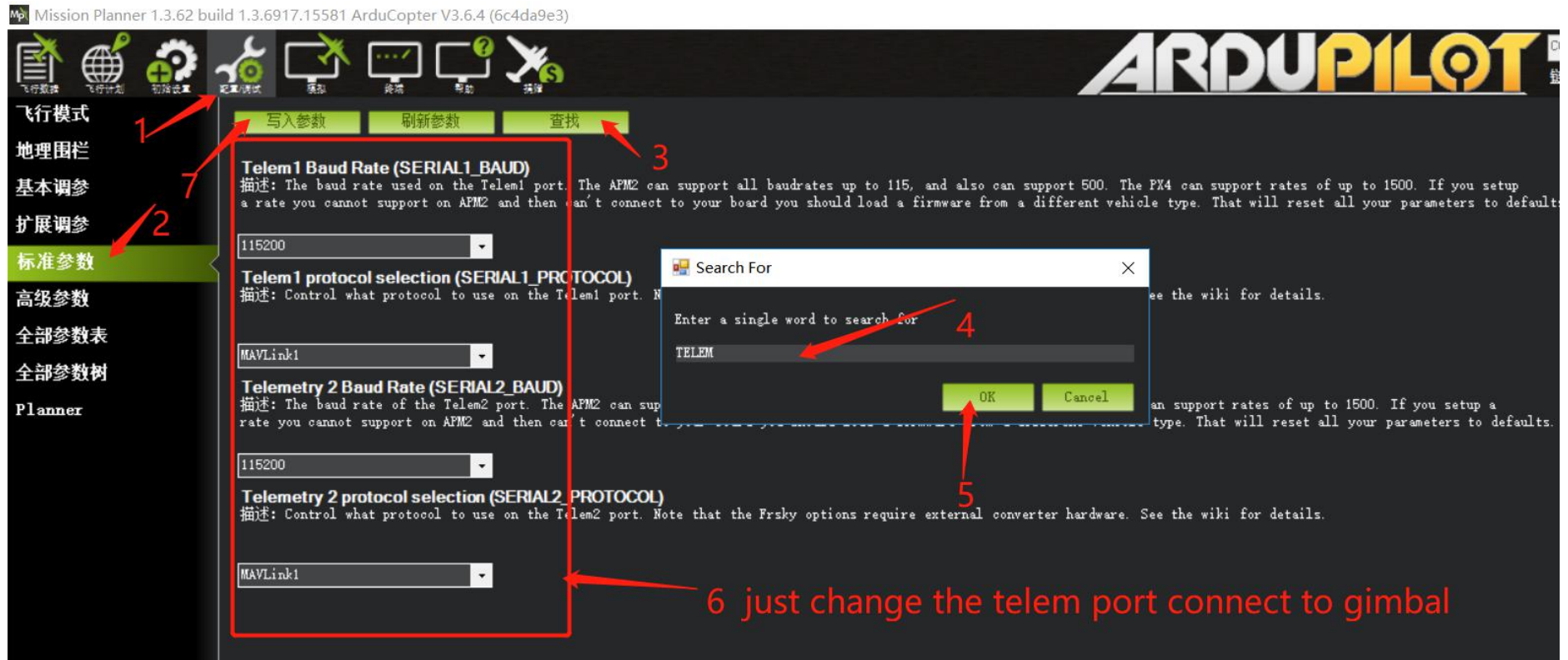
7: S.BUS mode

How to connect gimbal to Pixhawk with serial port ?

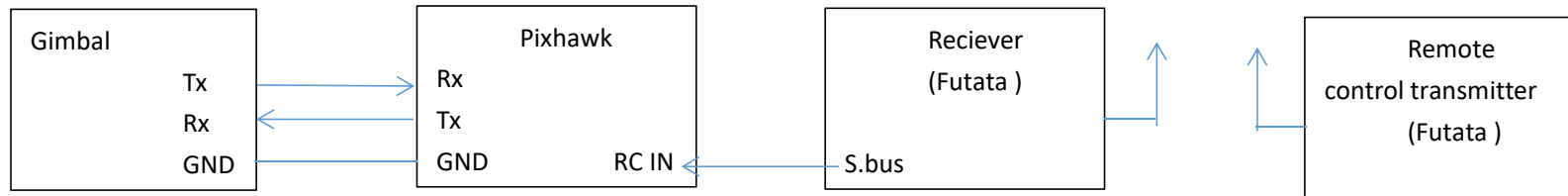
Step 1: serial port of gimbal connect to Pixhawk serial port (telem1 or telem2)



Step2: Set Pixhawk baudrate to 115200 and protocol select mavlink1. (eg, use mission planner)



Use "RCIN" connect to S.bus port of futaba reciever, user can control gimbal by futaba remote controller.



SET channels for control gimbal camera:

EB 90 05 AA 55 10 01 FF 0F 1~7ch

EB 90 05 AA 55 10 02 FF 10 6~12ch

EB 90 05 AA 55 10 03 FF 11 8~14ch

EB 90 05 AA 55 10 04 FF 12 custom channel mapping as following

For example: use 7~14chan to control

EB 90 0B AA 55 11 07 08 09 0A 0B 0C 0D FF 55



Viewpro Gimbal Supported Mavlink msg ID List:

- A) MAVLINK_MSG_ID_SYSTEM_TIME get time for OSD
- B) MAVLINK_MSG_ID_COMMAND_LONG
 - 1) MAV_CMD_DO_MOUNT_CONFIGURE
 - I) MAV_MOUNT_MODE_RETRACT ----off motor function
 - ii) MAV_MOUNT_MODE_NEUTRAL-----home position
 - 2) MAV_CMD_DO_MOUNT_CONTROL
 - I) gimbal_CONTROL_MODE_ANGLE
 - II) gimbal_CONTROL_MODE_SPEED
 - III) gimbal_CONTROL_MODE_ANGLE_REF_FRAME
 - 3) MAV_CMD_REQUEST_CAMERA_INFORMATION
 - 4) MAV_CMD_REQUEST_CAMERA_SETTINGS
 - 5) MAV_CMD_SET_CAMERA_MODE
 - 6) MAV_CMD_REQUEST_STORAGE_INFORMATION
 - 7) MAV_CMD_STORAGE_FORMAT
 - 8) MAV_CMD_REQUEST_CAMERA_CAPTURE_STATUS
 - 9) MAV_CMD_IMAGE_START_CAPTURE
 - 10) MAV_CMD_VIDEO_START_CAPTURE
 - 11) MAV_CMD_VIDEO_STOP_CAPTURE
- C) MAVLINK_MSG_ID_ATTITUDE
- D) MAVLINK_MSG_ID_GLOBAL_POSITION_INT
- E) MAVLINK_MSG_ID_RC_CHANNELS

Viewpro TCP command protocol

	STX	CMD ID	DATA LEN	DATA BODY	DATA CHECKSUM LSB of sum of data body
	0xEB	0x90	XX	Serial command protocol	Data body
Eg.	EB	90	06	81 01 04 07 27 FF	B3
				Zoom in	

For example: TCP zoom in command: EB 90 06 81 01 04 07 27 FF B3