Topotek-T-series-Protocol

（Version：V1.00）

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Revision

Data	Version	Descript	Writer
2018.12.03	V1.0.0	T series protocol（T10PRO,TP18,TP30）	Liang
2020.04.22		English version	Cai

Catalog

1. Introduction

This tele-com protocols is based on T series optical zoom tracking gimbal system，include T10PRO, TP18,TP30.

2. Command Format

1：Frame Structure

12 to 27 char

Frame Head (3char)	Target Bit (2char)	Data Length (1char)	Control Bit (1char)	Identify Bit (3char)	Data1 (char)	。。。。 (char)	Data L (char)	Correlation Bit (2char)
#TP	U/M/D/I/E/P	L	w/r	X1X2X3	D1	。。。。	DL	CRC

Frame Head:

#TP - data length is 2 byte, fixed length command;

#tp - various length command, data length depends on length bit, the maximum length is 0x0F;

Target Bit：（source address, target address）

U	M	D	E	G
Uart	lens	ISP image	Auxiliary equipment	Gimbal

U：UART device address bit, that is, the external control module address is u when the external control module is controlled through the serial port；

M: Zoom lens address bit, the command to lens, such as : zoom， focus;

D：ISP processor address, such as record, photo, TF status ,and so on ;

E：Auxiliary equipment address, such as thermal camera, laser measure(LRF);

G：Gimbal address, such as pitch, yaw control, angle reading；

[Target] same as above;

[Data Length] depends on how many data we have, the maximum length is F;

[Control bit] r->query; w->setup; c->callback

[Data1] data;

[Identifier] to be used for identifying; (see about Appendix I）

[CRC] all converted to HEX except the head. Use accumulation to add up, then convert result to ASC-II, 2 chars, high bit is in front; see attachment in the last page. （see about Appendix II）

Serial Port setting:

Baud Rate :115200， data length is 8, stop bit is 1, CRC is none.

2：Response

(1) correct command:
Control command: echo the same as before, exchange source address and destination;
Query command: put query content in frame Data Bit to echo, exchange source address and destination;
(2) wrong command：
Command failed：#TP dd 2wERE!! RR
Example: #TPMU2wERE!!30
Exchange source address and destination

3. M command

1：ZOOM

1.1 Control

Control bit：w

Identify Bit：ZMC

Data bit：

00	stop
01	zoom in
02	zoom out

Note: zoom in/out shall be used together with stop commands

Uart command example：

#TPUM2wZMC005C stop
#TPUM2wZMC015D zoom in
#TPUM2wZMC025E zoom out

1.2 Reading

Control bit：w

Identify Bit：ZMC

Data bit：00

Uart command example：

send：#TPUM2rZOM0063

receive：#tpMU4rZOM Z0Z1Z2Z3 RR

Z0Z1Z2Z3：use four chars to represent signed char zoom location, high bit is in front;

eg：#tpMU4rZOMFFB447

Z0Z1Z2Z3 = FFB4(char) -> FFB4(Hex) ->-76

Note that zoom location is -76

2：FOCUS

2.1 Control

Control bit：w

Identify Bit：FCC

Data bit：X_0X_1

X_0X_1	
00	stop
01	focus +
02	focus -
10	Auto mode（To be added）
11	Manual mode（To be added）
12	Keying mode（To be added）
20	Trigger one focus（To be added）

Note: focus in/out shall be used together with stop commands

Uart command example：

#TPUM2wFCC003E stop
#TPUM2wFCC013F focus+
#TPUM2wFCC0240 focus-

2.2 Reading

Control bit：w

Identify Bit：FCC

Data bit：00

Uart command example：

send：#TPUM2rFOC0045

receive：#tpMU2rFOC　F0F1F2F3 RR

F0F1F2F3：use four chars to represent signed char zoom location, high bit is in front;

eg：#tpMU4rFOCFFB429

F0F1F2F3 = FFB4(char) -> FFB4(Hex) ->-76

Note that zoom location is -76

3：configure zoom and focus position

Control bit：w

Identify Bit：ZFP

Data bit：Z0Z1Z2Z3 F0F1F2F3

Z0Z1Z2Z3：use four chars to represent signed char zoom location, high bit is in front;

Z0Z1Z2Z3：use four chars to represent signed char focus location, high bit is in front;

Example：set zoom position as -76，focus position as 50，convert -76 and 50 to complement form FFB4 and 0032. Then convert them to be ’F’’F’’B’’4’ and ’0’’0’’3’’2’; Add frame head、address、frame length、commands and CRC. Finally name it as #tpUM8wZFPFFB400320F.

Note: If only set zoom position, focus value should be filled with ’N’’N’’N’’N’；and the camera will autofocus after setting.

4：IRCUT switch(day/night switch)

Control bit：w

Identify Bit：IRC

Data bit：x_1x_2

00	Day mode
01	Night mode
0A	Reverse status

Uart command example：#TPUM2wIRC0A61

4. G command

1： Gimbal /PTZ control

Control bit：w
Identify Bit：PTZ
Data bit：x1x2

x1x2	00	01	02	03	04	05
Func	stop	up	down	left	right	Goto Center position
x1x2	06	07	08	09		
Func	Follow	Lock	Lock/follow switch	Gimbal calibration		

Uart command example：#TPUG2wPTZ006A

2：Gimbal speed mode control

Control bit：w
Identify Bit：GSY、GSP、GSR、GSM
Data bit：x1x2

Gimbal_speed_Control	
YAW Cmd	#TPUG 2 w GSY X0X1 RR
	X0X1
	Rotation Speed（-99,99）(0.1deg/s)
PITCH Cmd	#TPUG 2 w GSP X0X1 RR
	X0X1
	Rotation Speed（-99,+99）(0.1deg/s)
ROLL Cmd	#TPUG 2 w GSR X0X1 RR
	X0X1
	Rotation Speed（-99,+99）(0.1deg/s)
Yaw&Pitch	#tpUG 4 w GSM Y0Y1 P0P1 RR
	Y0Y1 P0P1
	Rotation Speed（-99,99）(0.1deg/s)

#TPUG2wGSYE276

Gimbal rotation speed is X0X where X0X1 is 8 signed char（unit is 0.1degree/s），The right direction of Yaw is positive. The up of Pitch is positive. E.g. gimbal rotates at speed 3 degree/sec to left, we have to convert -30 to 0xE2, then further converted to ’E’、’2’. Noe that RR is calibration.

3：Gimbal Angle Control Mode

3.1 Gimbal_Angle_Control

Control bit：w
Identify Bit：GAY、GAP、GAR、GAM
Data bit：see below

Gimbal_Angle_Control		
Yaw	#tpUG 6 w GAY X0X1X2X3 X4X5 RR	
	X0X1X2X3	X4X5
	Angle （-150.00,150.00）	Rotation Speed is (0,99) with precision (0.1deg/s)
Pitch	#tpUG 6 w GAP X0X1X2X3 X4X5 RR	

	X0X1X2X3	X4X5
	Angle （-90.00,+90.00）	Rotation Speed is (0,99) with precision (0.1deg/s)
Roll	#tpUG 6 w GAR X0X1X2X3 X4X5 RR	
	X0X1X2X3	X4X5
	Angle （-90.00,+90.00）	Rotation Speed is (0,99) with precision (0.1deg/s)
Yaw&Pitch	#tpUG C w GAM Y0Y1Y2Y3 Y4Y5 P0P1P2P3 P4P5 RR	
	Y0Y1Y2Y3 / P0P1P2P3	Y4Y5 / P4P5
	Angle （-150.00,150.00）/（-90.00,+90.00）	Rotation Speed is (0,99) with precision (0.1deg/s)

Example:#tpUG6wGAYEF073288

Gimbal rotates at speed of X4X5. X0X1X2X3 indicates angle. They are using 16 bits data to represent string. The right-side of Yaw is positive, the up-side of Pitch is positive. E.g. Angle is -50 degree. We have to use -5000, then convert it to be 16 bit binary number 0xEC78, then further convert it to be 'E'、'C'、'7'、'8'. X4X5 ； Note that RR is calibration.

3.2 Get Gimbal Current Angle

Control bit：r

Identify Bit：GAC

Data bit：00

Uart command example：

send：#TPUG2rGAC0032

receive：#tpUG C r GAC Y0Y1Y2Y3P0P1P2P3R0R1R2R3 CC

Y0Y1Y2Y3	P0P1P2P3	R0R1R2R3
Yaw Angle	Pitch Angle	Roll Angle

Angle is 16 bit binary data. High bit is in front.

Example: Y0Y1Y2Y3 = 'E' 'C' '7' '8' = 0xEC78 = -5000（0.01degree）

3.3 Gimbal angle info send out regularly

Gimbal angle info send out regularly Setting ：

Control bit：w

Identify Bit：GAA

Data bit：X0X1

X0X1	
01	Enable sending
00	Close sending

Uart command example：#TPUG2wGAA0136

Inquiry the regularly sending status：

Control bit：r

Identify Bit：GAA

Data bit：00

receive:	#TPGU2rGAA x1x2 RR
00	Close
01	enable

Uart command example：#TPUG2rGAA0030

4：Tracking Cursor movement（For gimbal tracking Version）

4.1 x axis moving

Control bit：w
Identify Bit：SYC
Data bit：$X_0X_1X_2X_3$

4.1 Y axis moving

Control bit：w
Identify Bit：SPC
Data bit：X0X1X2X3

Control the crosshairs to move to x0x1x2x3; x0x1x2x3 indicates the number of pixels deviating from the center point, the 16 bit signed number represented by the character (unit: pixel), the right of X axis is positive, and the lower of Y axis is positive (eg: move to the position of 50 pixels on the left, i.e., convert - 50 hex representation 0xffce to 'f', 'f', 'C', 'e'); RR check bit

Note：Initially, any movement of the transmit cursor will result in a Crosshairs；

5：Tracking control（For dual light gimbal tracking）

Control bit：w
Identify Bit：SUM
Data bit：X_0X_1

X_0X_1	
00	Tracking stop
01	Tracking confirm
02	Secondary tracking (reselect target during existing tracking)

#TPUG2wSUM0061　Tracking stop
#TPUG2wSUM0162　Tracking confirm
#TPUG2wSUM0263　Secondary tracking

Note: if the crosshairs do not appear, the tracking confirmation will be sent directly, and the center point will be the target;

5. D command

1：Record

1.1 control

Control bit：w
Identify Bit：REC
Data bit：x_1x_2

x_1x_2	Function description
00	Stop record
01	Start record
0A	Overturn status

Uart command example：#TPUD2wREC0A54

1.2 inquiry status

Control bit：r
Identify Bit：REC
Data bit：x_1x_2

x_1	0	1
	Record mode	Photo mode
X_2	0	1
description	No record	Being record

Uart command example：#TPUD2rREC003E

2：Photograph

Control bit：w
Identify Bit：CAP
Data bit：0 X

X	1	A
description	Photograph	Record /photo mode switch

Uart command example：#TPUD2wCAP013E

3：Menu control

Customers can set video resolution, photo resolution, language, image, AWB, EV, ISO and other parameters in the menu.

Control bit：w
Identify Bit：MNU
Data bit：0 X

x	1	2	3	4	5	6
description	up	down	left	right	ok	Menu

Uart command example：#TPUD2wMNU065F

4： Time coordinate

Control bit：w

Identify Bit：see below table

Data bit：see below table

Description	Control bit	Data bit
Latitude	LAT	X_0 X_1...X_A
Longitude	LON	X_0 X_1...X_B
Altitude	ALT	X_0 X_1...X_5
Time	TIM	X_0 X_1...X_E（hh-mm-ss.ss-DD-MM-YY）

Uart command example：#tpUDFwTIM142832.0003121838　2018-12-03 14:28:32

Appendix I：Identify Bit

Identify Bit	Description		Identify Bit	Description
ZMC	ZOOM control		REC	Record
FCC	Focus control		CAP	Photograph
ZFP	Setting zoom& focus position		IRC	IR cut switch
PTZ	Gimbal control (PTZ)		MNU	Menu
GAC	Gimbal angle status		GAA	Gimbal angle send out regularly
GSY	Speed control of YAW axis of PTZ		GAY	Angle control of YAW axis of PTZ
GSP	Speed control of Pitch axis of PTZ		GAP	Angle control of Pitch axis of PTZ
GSR	Speed control of Roll axis of PTZ		GAR	Angle control of Roll axis of PTZ
GSM	Speed control of YAW& Pitch axis of PTZ		GAM	Angle control of YAW& Pitch axis of PTZ
SDC	TF card capacity		AWB	Auto white balance
ISO	Photo sensibility		EVS	Exposure compensation
LAT	latitude		ALT	height
LON	longitude		TIM	Time

Appendix II：CRC calculation

```
char CalculateCrc(volatile char *cmd, char len){
	char crc;
	int i;

	crc=0;
	for(i=0; i<len; i++){
		crc += cmd[i];
	}
	return(crc);
}
```

To convert the generated hex to two characters:
eg：#TPUD2wAWB01
The value of the generated CRC is 0x44
Then the final command is a string：#TPUD2wAWB0144

If the product version needs to be upgraded or the functions are required to be changed, please feel free to contact us for further technical support.

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