

Communication protocol

V2.3

Contents

[Basic Conventions]	11
1. Query Commands.....	3
2. Satellites.....	7
3. Enter the local position by hand	8
4. Antenna reset	9
5. Antenna alignment star.....	9
6. Antenna collection.....	10
7. Manual (speed mode)	10
8. Manual (position mode) ★.....	10
9. Manual (position + speed mode)	11
10. Stop.....	12
11. Limit enable	12
twelve Set the local oscillator and amplification factor.....	13
13. Read the antenna software and hardware version number	14
fourteen factory data reset	Error! Bookmark not defined.

[Basic Conventions]

The protocol uses ASCII code. When serial communication is used, the default parameters for serial communication are: baud rate =38400bps, data bits =8 bits, start bits =1bit, stop bits =1bit, and no parity check.

The frame format is like:

\$cmd,bs,ddd,... ,ddd,*hh<CR><LF>

1. "\$cmd" -- Frame type;
2. bs - Frame code;
3. ddd... ddd - Data;
4. "*" -- checksum prefix;
5. hh -- check sum, the check sum of all ASCII characters between \$and * (excluding \$and *) (perform an XOR operation on each byte to obtain the check sum, then convert the ASCII characters to hexadecimal format.)
6. <CR><LF> -- CR (Carriage Return) + LF (Line Feed) frame ends with carriage return and line feed
7. The **control host** does not actively send messages. When applied, the response mechanism is used and the query interval is no less than 20ms.
8. The communication should have a retransmission mechanism. When a command does not respond for more than 100ms, attempt to **retransmit at least three times**.
9. When checking for anomalies, the **slave machine** returns \$cmd, xor error, *57.
10. When the protocol does not conform, the slave returns \$cmd, order error, *5c.
11. When the parameter is incorrect, the **slave machine** returns \$cmd, para error, *30.
12. For timeout operations, return \$cmd, time out! *10.
13. Parameters with commands, if you don't want to change irrelevant items, you can "fill a space" with that item.

For example:

\$CMD, place, 108.90, 34.10, 180.04, * 18

In the command, if the current course is not changed and only the longitude and latitude are changed, the following is issued:

\$cmd, place, 101.20, 40.10, *2a

1. Query Commands

1.1 Issued

Example 1		
1	\$cmd, get show,*3f	For portable antenna use, the host computer sends to the antenna. For vehicle-mounted remote control use, the host sends to the ACU.

1.2 Response

Example 1		
1	\$show, 180.00, 29.50, 0.00, 180.00, 65.32, 62.69, 1, 0157, 81.80, 0.50, 108.58, 34.10, 1256,0,00, 0 9-10- 15 18:12:23, * 1 e	The antenna transmits back to the upper computer.

Note Table 1: Display Information Format

	Name	Instance	Units	Notes
0	Frame code	\$SHOW		
1	Preset azimuth	180.00	Degr ee of	[0.00, 360.00]
2	Preset pitch Angle	50.10	Degr ee of	[-80.00, 90.00]
3	Preset polarization Angle	-5.00	Degr ee of	[-95.00, 95.00]
4	Current azimuth	198.43	Degr ee of	[0.00, 360.00]
5	Current pitch Angle	48.00	Degr ee of	[-80.00, 90.00]
6	Current polarization Angle	0.00	Degr ee of	[-95.00, 95.00]
7	Antenna status	4		0x11: Reset Begins (17) 0x12: Reset Failed (18) 0x13: Reset Completed (19) 0x14: Reset Interruption (20) 0x21: Collection Start (33) 0x22: Collection failed (34) 0x23: Collection Completed (35) 0x24: Collection Interruption

				(36) 0x31: Star-to-star Start (49) 0x32: Failed star alignment (50) 0x33: Star alignment completed (51) 0x34: Interruption of alignment (52) 0x41: Compass calibration Begins (65) 0x42: Compass calibration in progress (66) 0x43: Compass calibration completed (67) 0x44: Compass calibration failed (68) 0x45: Compass calibration interruption (69) 0x51: Tracking (81) 0x53: Tracking Completed (83) 0x54: Tracking interruption (84) 0x61: Manual speed 0x62: Manual position 0x90: Idle 0xee: Host restart
8	Carrier heading Angle	90.35	Degr ee of	[0.00, 360.00]
9	Carrier pitch Angle	2.11	Degr ee of	[-90.00, 90.00]
10	Carrier roll Angle	-1.04	Degr ee of	[-90.00, 90.00]
11	Longitude	108.90	Degr ee of	[-180.00, 180.00] (positive for east longitude and negative for west longitude)
12	Latitude	34.10	Degr ee of	[-90.00, 90.00] (positive for north latitude, positive for south latitude)
13	GPS status	1		0: GPS invalid 1: GPS Locked 2: Unlocked
14	Limit information	0		See Table 2

15	Alert Information	3		See Table 3
16	AGC levels	0.00	V	[0.00, 9.99]
17	Azimuth potentiometer	0		Voltage *1000
18	Pitch potentiometer	0		Voltage *1000
19	Time	14-09-03 20:43:00		Beijing time, can be padded to 0
20	Verification	*1e		
21	<CR><LF>	\r\n		Carriage return and line wrap

Note Table 2: Limit Information Table

BIT		BIT	Limit message
0	Polarization hard inverse limit 0x1	8	Azimuth hard zero 0x100
1	Polarization hard compliance limit 0x2	9	Soft inverse polarization 0x200
2	The hard lower limit of pitch is 0x4	10	Polarization soft compliance limit 0x400
3	Pitch hard upper limit 0x8	11	Pitch soft lower limit 0x800
4	Azimuth hard right limit 0x10	12	Pitch soft upper limit 0x1000
5	Azimuth hard left limit 0x20	13	The soft right limit of orientation 0x2000
6	Polarization hard zero 0x40	14	Azimuth soft left limit 0x4000
7	Pitch hard zero 0x80		

Note: Limit information is represented in hexadecimal bits, and a corresponding bit of 1 indicates a corresponding limit information. Output in the form of a string of decimal numbers.

Note Table 3: Warning Messages

BIT	Code name	Warning Messages		
0	E0	Azimuth-driven anomaly	0x00000001	
1	E1	Pitch drive	0x00000002	

		anomaly		
2	E2	Polarization driver anomaly	0x00000004	
3	E3	GPS not connected	0x00000008	
4	E4	The compass is not connected	0x00000010	
5	E5	The beacon receiver is not connected	0x00000020	
6	E6	DVB receiver not connected	0x00000040	
7	E7	Polarization zeroing failed	0x00000080	
8	E8	The position finding failed	0x00000100	
9	E9	Pitch finding failed	0x00000200	
10	E10	Position following error	0x00000400	
11	E11	Pitch position follows error	0x00000800	
12	E12	The inclinometer is not connected	0x00001000	
13	E13	Beacon setup failed	0x00002000	
14	E14	Reset the antenna Angle	0x00004000	
15	E15	Limit switch error	0x00008000	
16	E16	Incorrect collection	0x00010000	
17	E17	Data out-of-bounds 1	0x00020000	

18	E18	Data out of bounds 2	0x00040000	
19	E19	Data out of bounds 3	0x00080000	
20	E20	Hardware error 1	0x00100000	
21	E21	CAN communication anomaly	0x00200000	
22	E22	Communication anomaly	0x00400000	
23	E23		0x00800000	
24	E24		0x01000000	
25	E25		0x02000000	
26	E26		0x04000000	
27	W1	GPS not located	0x08000000	
28	W2	Motion limitation protection	0x10000000	
29	W3		0x20000000	
30	W4		0x40000000	
31	W5		0x80000000	

Note: Warning messages are represented in hexadecimal bits, and a corresponding bit of 1 indicates that the corresponding warning message is output in the form of a string of decimal numbers.

For example:

The warning message is "24", corresponding to 0x18 in hexadecimal, meaning bit4 and bit3 are 1, indicating that the GPS is not connected and the compass is not connected.

2. Satellite

2.1 Read the current satellite parameters

Example 1:	
Distri buted:	\$cmd, get sat, *5a
Respon	\$CMD, sat, Sino5, 12260.00, 0, 0, 110.50, 1, 5.00, * 6

se:	
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2.2 Set the current satellite parameters

Example 1: Beacon data transmission	
Distri bution :	\$CMD, sat, Sino5, 12260.00, 0, 0, 110.50, 1, 5.00, * 6
Example 2: DVB data sending	
Sent out	\$CMD, sat, Sino5, 0122, 60.00, 10000110.50, 1, 5.00, * 07
Respon se:	\$cmd, set sat ok,*6a

Note Table 4: Satellite Parameters

Names	Instance	Units	Remarks
Frame type	\$cmd		
Frame code	Sat		
Satellite Name	Sino5		Since ACU does not support all Chinese characters, it is recommended to use Satellite x representation, or in English, pinyin form, with a length of no more than 8 bytes
Center frequency	12260.00	MHz	12200 to 12900 3600 to 4200. 00
Carrier frequency	0	MHz	12200 to 12900 3600 to 4200. 00
Carrier rate	0	Kbaud	2000~45000
Satellite longitude	110.50	Degree of	[-180.00, 180.00] (positive for east longitude and negative for west longitude)
Polarization mode	1		0: Horizontal polarization 1: Vertical polarization
Lock the threshold	5.00	V	[4.00, 8.00]
Verification	* 06		
<CR><LF>	\r\n		Carriage return and line wrap

3. Enter the local location by hand

3.1 Read the local location

Example 1:	
Issue d:	\$cmd, get place,*47
Response:	\$CMD, place, 108.90, 34.10, 180.04, * 18

3.2 Set the local location

Example 2:	
Distributed:	\$CMD, place, 108.90, 34.10, 180.04, * 18
Response 1:	\$cmd, set place ok,*77

Note Table 5: Local Parameter Settings Table

Name	Instance	Units	Notes
Frame type	\$cmd		
Frame code	place		
Longitude	108.90	Degr ee of	[-180.00, 180.00] (positive for east longitude and negative for west longitude)
Latitude	34.10	Degr ee of	[-90.00, 90.00] (positive for north latitude, positive for south latitude)
Heading	180.04		[0, 360.00]
Verification	* 18		
<CR><LF>	\r\n		Carriage return and line wrap

4. Antenna reset

Example 1:	
Distributed:	\$cmd, reset,*1f
Response:	\$cmd, reset ack,*56

5. Antenna alignment star

Example 1:	
Distributed:	\$cmd, search,*64
Response:	\$cmd, search ack,*2d

6. Antenna Collection

Example 1:	
Distrib uted:	\$cmd, stow, *75
Respons e 1	\$cmd, stow ack, *3c

7. Manual (speed mode)

Example 1:	
Distrib uted:	\$cmd,manual,1,3.00,*7c
Respons e:	\$cmd,manual ack,*39

Note Table 6: Speed Mode Parameter Table

Name	Instance	Units	Notes
Frame type	\$cmd		
Frame code	manual		
Adjust the way	1		1 - Increase in azimuth; 2 - Decrease in azimuth; 3 - Increase in pitch Angle; 4 - Reduced pitch Angle; 5 - Increased polarization Angle; 6 - The polarization Angle decreases
Velocity	3.00	Degree s per second	0.00 to 6.00 When the antenna design speed is less than this parameter, move at the antenna's maximum speed
Check	*7c		
<CR><LF>	\r\n		Carriage return and line wrap

8. Manual (Position mode) ★

Example 1:	
Distrib uted:	\$cmd, dir,180.00, 21.50, -90.00, *0c
Respons e 2:	\$cmd,dir ack, *5c

Note Table 7: Location Mode Parameter Table

Name	Instance	Units	Notes
Frame type	\$cmd		
Frame code	dir		
Preset azimuth	180. 00	Degree of	[0.00, 360.00]
Preset pitch Angle	21. 50	Degree of	[0, 90.00]
Preset polarization Angle	-90. 00	Degree of	[-95.00, 95.00]
Verification	*hh		
<CR><LF>	\r\n		Carriage return and line wrap

9. Manual (position + speed mode)

Example 1:	
Distri buted:	\$CMD, dirx, a, 180, 2. 00, , 2. 00, 60-90, 3. 00 * 26
Respon se:	\$cmd, dirx ack, *24

Note Table 8: Position Speed Mode Parameter Table:

Name	Insta nce	Units	Notes
Frame type	\$cmd		
Frame code	dirx		
Sport types	a		a: Directional uniaxial movement e: Pitch uniaxial motion p: Polarized uniaxial motion l: Three axes moving together (lowercase 'L')
Azimuth target Angle	180	Degre e of	Range 0 to 359.99
Azimuth motion speed	2. 00	Degre es per secon d	0 to 6.00
Pitch target Angle	60	Degre e of	Range 0 to 90
Pitch speed	2.00	Degre	0 to 6.00

		es per second	
Polarization target Angle	-90	Degrees of	The value range is -95 to 95
Polarization velocity	3.00	Degrees per second	0 to 6.00
Verification	* 26		
<CR><LF>	\r\n		Carriage return and line wrap

Note: If the speed sent down is greater than the maximum speed designed for the antenna, the antenna moves at its maximum speed.

Cases, issued \$CMD, dirx, a, 180, 5.00, 60, 2.00–90, 3.00, * 21 (location at a rate of 5.00 ° / s movement to 180 degrees c), and maximum speed of 3.00 antenna design, the antenna according to the speed of 3.00.

10. Stop

Example 1:	
Distributed:	\$cmd, stop, *72
Response:	\$cmd, stop ack, *3b

11. Limit enable

12.1 Read the limit enable status

Example 1:	
Distributed:	\$cmd, get xwen, *38
Response 1:	\$cmd, xwen on, *4f
Response 2:	\$cmd, xwen off, *21

12.2 Set the limit enable

Example 2:

Issue 1:	\$cmd, xwen, on, *43
Distribution 2:	\$cmd, xwen, off, *2d
Response:	\$cmd, set xwen ok, *08

12. Set the local oscillator and amplification factor

13.1 Read the local oscillator and amplification factor

Example 1:	
Issue 1:	\$cmd, get beacon, *38
Response 1:	\$CMD, beacon, 11300, 1.0, * 72
Distribution 2:	\$cmd, get dvb, *4c
Response 2:	\$CMD, DVB, 11300, 1.0, * 6

13.2 Set the local oscillator and amplification factor

Example 1:	
Issue 1:	\$cmd, set beacon, 11300, 1.0, *30
Response 1:	\$cmd, set beacon ok, *08
Distribution 2:	\$cmd, set dvb, 11300, 1.0, *44
Response 2:	\$cmd, set dvb ok, *7c

Note: The beacon local oscillator and the DVB local oscillator are the same parameter!

Note Table 9: Local oscillator and magnification

Names	Instance	Units	Notes
Frame type	\$cmd		
Frame code	beacon		
Local oscillator	11300	MHz	11300, 11256, 5150
Magnification	1.0		[0.4, 2.0]
Verification	* 30		
<CR><LF>	\r\n		Carriage return and line wrap

13. Read the antenna software and hardware version number

Example 1:	
Distributed:	\$cmd, get sn, *21
Response:	Da f1211.1.2.1 \$CMD, sn, R/ub000.1.2.1 R APT10V1.0 / MCB10V1.0, * 1 b

Note Table 10: Software and Hardware version Numbers

Name	Instance	Units	Notes
Frame type	\$cmd		
Frame code	sn		
Code version number	Da f1211.1.2.1 R/ub000.1.2.1 R		Separate the code version number from the hardware version number with a space. The software and hardware version numbers should not exceed 70 characters in total. / is the software version number before the PCU, and/is the software version number after the ACU.
Hardware version number	APT10V1.0 / MCB10V1.0		/ is the hardware version number of the PCU before, and/is the hardware version number of the ACU after.
Verification	*1b		
<CR><LF>	\r\n		Carriage return and line wrap

17.1 General Parameters

Example 1: Reading general parameters	
Distributed:	\$cmd, get general, *4a
Response:	\$CMD, general, 40, 0, 2, 0, * 2 a

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Example 2: Setting general parameters	
Distrib ute:	\$cmd, set general, 40, 0, 2, 0, *68
Respons e 1:	\$cmd, set general ok, *7a

Note Table 13: General Parameters

Name	Instance	Unit s	Notes
Frame type	\$cmd		
Frame code	general		
Location search range	40		[10, 180], 40 indicates searching around 20.
Azimuth compensation for stars	0		[-50.0, 50.0]
Pitch compensation for stars	2		[-30.0, 30.0]
Polarization compensation for stars	0		[-30.0, 30.0]
Verification	* 17		
<CR><LF>	\r\n		Carriage return and line wrap

17.2 Advanced Parameters

Example 1: Reading advanced parameters	
Distrib ute:	\$cmd, get advance, *46
Respons e:	\$CMD, advance, 0, 0, 0, 180, 36, 90, 63.5, 3, 0.5, 385, 25, 90, 10, 95, - 95, 0, 0, 0, 2, 1 * 3 c

Example 2: Setting advanced parameters	
Distri bute:	, 0, 0, 180, 36, 90 \$CMD, set advance, 0, 63.5, 3, 0.5, 385, 25, 90, 10, 95, - 95, 0, 0, 0, 2, 1 * 7 e
Respon se 1:	\$cmd, set advance ok, *76

Note Table 14: Important Parameters

Names	Instance	Unit	Notes
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		s	
Frame type	\$cmd		
Frame code	advance		
Azimuth zero compensation	0		[-20.00, 20.00]
Pitch zero compensation	0		[-20.00, 20.00]
Polarization zero compensation	0		[-20.00, 20.00]
Position reset position	180		[0.0, 360.0]
Pitch reset position	36		[-100.0, 100.0]
Polarization reset position	90		[-100.0, 100.0]
Pitch down Angle	-63.5		[-100.0, 100.0] used in bias feed, this is the collection pitch Angle
Pitch search range	3		[1, 20], 3 indicates up and down search 1.5
Pitch search step	0.5		The pitch search range is an integer multiple of the pitch step Angle
The right limit of azimuth movement	385		[225, 400]
The left limit of azimuth movement	-25		[-40, 135]
Pitch motion upper limit	90		[60, 90]
Lower limit of pitch motion	10		[0, 40]
Polarization motion compliance limit	95		[50, 95]
Inverse limit of polarization motion	-95		[-95, -50]
Compass pitch compensation	0		[-50.0, 50.0]
Compass roll compensation	0		[-30.0, 30.0]
Compass heading compensation	0		[-60.0, 60.0]
Lower limit offset Angle	2		[0, 10.0]
Azimuth-finding correction value	1		[-2.0, 2.0]
Verification	*7e		
<CR><LF>	\r\n		Carriage return and line wrap

