National Central University
2.0m Alt-Azimuth Telescope
Telescope server communication command specification

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1. Telescope server Specification

Protocol	TCP/IP
Maximum number of client connections	4
Maximum communication cycle	100 ms
(Please do not communicate at short intervals of 100 ms.)	
IP address	[ ]
Port	[ ]

2. Command list

Transmission command

Command	Request	Answer
Z	Telescope zero search	Z
Y	Move for finish	Y
X	Move for flat	X
S	Stop	S
G	Mirror cover open	G
H	Mirror cover close	H
K*****	Secondary position move	OK
L	Secondary zero search	L
a	Nasmyth ON	a
b	Nasmyth OFF	b
c	Nasmyth Right	c
d	Nasmyth left	d
E	Error release	E
T*****	Move & tracking	OK
P*****	Offset	OK
A*****	Information acquisition	A*****
O	Turn off	O

The answer is immediately returned.

Please confirm status whether to process the instruction.

3. Command Details

1. Telescope zero search Z

   Azimuth and Position angle are moved in the direction of the plus and Elevation moves in the direction of the minus to look for the reference point.

   Each axis moves by 20 degrees.

   When the reference point is not found, it becomes an error.

   Answer is Z

2. Move for finish Y

   The telescope and the dome are moved to the finish position.

   Please confirm whether to have completed the movement.

   Answer is Y

3. Move for flat X

   The telescope and the dome are moved to the flat position.

   Please confirm whether to have completed the movement.

   Answer is X

4. Stop S

   All the movements are stopped.

   Answer is S

5. Mirror cover open G

   The mirror cover is opened.

   Please confirm whether to have opened by status.

   Answer is G

6. Mirror cover open H

   The mirror cover is opened.

   Please confirm whether to have opened by status.

   Answer is H

7. Secondary position move K

   Format : K±＊＊. ＊＊＊ (With sign、unit of mm)

   The secondary mirror is moved to a target position.

   Answer is OK

8. Secondary zero search L

   Secondary mirror moves in the direction of the plus to look for the reference point.

   When the reference point is not found, it becomes an error.

   Coordinates are kept in battery.

   Performed only when the battery runs out.

   Answer is L

9. Nasmyth ON a

   Nasmyth mirror is put out.

   Answer is a

10. Nasmyth OFF b

    Nasmyth mirror is stored.

    Answer is b

11. Nasmyth right c

    Nasmyth mirror is turned to the right.

    Answer is c

12. Nasmyth left d

    Nasmyth mirror is turned to the left.

    Answer is d

13. Error release E

    The error is released.

    Answer is E

14. Move & tracking T

Format : T_ 00 : 00 : 00.0_±00 : 00 : 00.0_0.0_0.0_0000.0_NONAM

_ is a space

The numeral is

"RA" " DEC" "RA Proper motion" "DEC Proper motion" "Equinox" "NAME" coordinates in order.

It moves to the target.
The tracking is begun when arriving at the target.
Please confirm whether to have completed the movement.
Please confirm the state of the movement and the tracking by status.
When zero search is not completed will be ignored.
It rewrites in the limit value when value is small or large.

Answer is OK

15. Offset P

Format : P_0.0_0.0_0.0_0.0_0.0_0.0_0.0

_ is a space

The numeral is

"RA" " DEC" "CSPA" "NSPA" "AZ" "EL" "TIME"

value in order.

"RA" " DEC" "AZ" "EL"	Unit is arcsecond. Maximum value is ±3600.0.
"CSPA" "NSPA"	Unit is degree. Maximum value is ±180.0.
"TIME"	Unit is second.
"RA" "DEC"	maximum value of A is 100.

Used to a little move during tracking.

Answer is OK

16. Information acquisition A

Format : A_001_004_009・・・・・

Value is
- 001 date (year month day)
- 004 Local time (unit is second)
- 009 Sidereal time (unit is second)
- 010 Azimuth angle (unit is arcsecond)
- 012 Elevation angle (unit is arcsecond)

014 CsPA angle (unit is arcsecond)
016 Error code
017 Status
019 RA coordinate (hour minute second)
021 DEC coordinate (hour minute second)
027 Focus position (mm)
050 Offset RA (arcsecond)
051 Offset DEC (arcsecond)
054 Offset CsPA (degree)
084 Azimuth speed (arcsecond/sec)
086 Elevation speed (arcsecond/sec)
088 CsPA speed (arcsecond/sec)
090 Move Status
300 NsPA angle (unit is arcsecond)
306 Offset NsPA (degree)
312 CsPA speed (arcsecond/sec)
370 Status2
371 I/O status IN1
372 I/O status IN2
373 I/O status OUT1
374 I/O status OUT2
385 Azimuth sensor status
386 Elevation sensor status
387 CsPA sensor status
388 NaPA sensor status
389 Focus sensor status

note : CsPA is a Cassegrain rotator.
NaPA is Nasmyth rotator.

Answer is A_000_000_000 ・・・・

The answer comes in sending order.

Example : The answer when sending it in order of the above-mentioned list

A 2006/09/28 60953.3 62804.4 5784.7 320787.9 0.0 00 8443 17:26:37.2 +34:04:37.5 0.000 0.0 0.0 0.0 -163.0 4.2 154.8 -1 0.0 0.0 0.0 0000 FFFF0000 A08300FF 00003000 0002000F 0200 0200 0200 0200 1600

Answer Details

016 Error code

00	Nothing
01	Hard defect
02	Defect of back up data
03	Error of termination
04	Connect error of host PC
05	GPS connect error
06	Checksum error
10	Demand on Zero search
11	Wait for motor stop
12	Detection of emergency stop
14	There is no power supply of driver.
20	Azimuth driver error
21	Azimuth over run
22	Azimuth encoder error
23	Azimuth reference error
30	Elevation driver error
31	Elevation over run
32	Elevation encoder error
33	Elevation reference error
40	Cassegrain Position angle driver error
41	Cassegrain Position angle over run
42	Cassegrain Position angle encoder error
43	Cassegrain Position angle reference error
50	Focus driver error
51	Focus over run
60	Unexpected Error
61	Azimuth invalid operation mode
62	Elevation invalid operation mode
63	Cassegrain Position angle invalid operation mode
64	Azimuth invalid operation pattern
65	Elevation invalid operation pattern
66	Cassegrain Position angle invalid operation pattern
67	Azimuth invalid operation phase
68	Elevation invalid operation phase
69	Cassegrain Position angle invalid operation phase
71	ＣＯＭ１connection error

72	ＣＯＭ２connection error
73	Definition file error
74	XMS memory error
75～	System error

017　Status

0x0001	Zero search complete
0x0002	Tracking mode
0x0004	Moving
0x0008	Turn-off inside
0x0010	Emergency stop
0x0020	Mirror cover opened
0x0040	Mirror cover closed
0x0080	
0x0100	Tracking completion
0x0200	Last data disregard
0x0400	Calculation result overflow
0x0800	Nasmyth ON
0x1000	Nasmyth OFF
0x2000	Nasmyth R
0x4000	Nasmyth L
0x8000	GPS receiving

370　Status2

0x0001	Maintenance displayed
0x0002	Parameter displayed
0x0004	I/O monitor displayed
0x0008	Compulsion output displayed
0x0010	
0x0020	
0x0040	
0x0080	
0x0100	
0x0200	
0x0400	
0x0800	
0x1000	

090　Move status

−1	Stop
0	Moving
1	Tracking

371　I/O Status IN1

0x00000001	Azimuth＋
0x00000002	Azimuth−
0x00000004	Elevation＋
0x00000008	Elevation−
0x00000010	CsPA＋
0x00000020	CsPA−
0x00000040	Focus＋
0x00000080	Focus−
0x00000100	Speed 1
0x00000200	Speed 2
0x00000400	Mode select
0x00000800	Stop
0x00001000	Speed 3
0x00002000	Dummy
0x00004000	NaPA＋
0x00008000	NaPA−
0x01000000	Dummy
0x02000000	Dummy
0x04000000	Dummy
0x08000000	Turn off
0x10000000	Emergency stop
0x20000000	Dummy
0x40000000	GPS1PPS signal
0x80000000	KEY SW

372 I/O status IN2

0x00000001	Azimuth SV-RDY	Servo ready
0x00000002	Elevation SV-RDY	Servo ready
0x00000004	CsPA SV-RDY	Servo ready
0x00000008	NaPA SV-RDY	Servo ready
0x00000010	Nasmyth ON-LS	Limit
0x00000020	Nasmyth OFF-LS	Limit
0x00000040	Nasmyth R-LS	Limit
0x00000080	Nasmyth L-LS	Limit
0x00000100	Azimuth＋SD	＋Deceleration sensor
0x00000200	Azimuth－SD	－Deceleration sensor
0x00000400	Elevation＋SD	＋Deceleration sensor
0x00000800	Elevation –SD	－Deceleration sensor
0x00001000	CsPA ＋SD	＋Deceleration sensor
0x00002000	CsPA －SD	－Deceleration sensor
0x00004000	NaPA ＋SD	＋Deceleration sensor
0x00008000	NaPA –SD	－Deceleration sensor
0x00010000	Focus SV-RDY	Servo ready
0x00020000	Focus ＋SD	＋Deceleration sensor
0x00040000	Focus –SD	－Deceleration sensor
0x00080000	Focus ABSB0	For internal setting
0x00100000	Focus ABSB1	For internal setting
0x00200000	Focus ABST	For internal setting
0x00400000	Nasmyth DC Amplifier ALARM	
0x00800000	DRIVER Power ON	
0x01000000	Mirror cover 3 ＋LS	Not used
0x02000000	Mirror cover 3 －LS	Not used
0x04000000	Mirror cover 4 ＋LS	Not used
0x08000000	Mirror cover 4 －LS	Not used
0x10000000	Mirror cover 1 ＋LS	
0x20000000	Mirror cover 1 －LS	
0x40000000	Mirror cover 2 ＋LS	Not used
0x80000000	Mirror cover 2 －LS	Not used

373 I/O Status OUT1

0x00000001	PIO_LED+X	
0x00000002	PIO_LED-X	
0x00000004	PIO_LED+Y	
0x00000008	PIO_LED-Y	
0x00000010	PIO_LED+Z	
0x00000020	PIO_LED-Z	
0x00000040	PIO_LED+F	
0x00000080	PIO_LED-F	
0x00000100	Speed 1	
0x00000200	Speed 2	
0x00000400	Manual mode	
0x00000800	Error	
0x00001000	Speed 3	
0x00002000	Turn off out put	
0x00004000	LED＋W	
0x00008000	LED－W	
0x01000000	Standby LED	
0x02000000	Manual LED	
0x04000000	Error LED	
0x08000000	Emergency LED	
0x10000000	Buzzer	
0x20000000	Emergency	
0x40000000	Manual mode	
0x80000000	Turn off	

374 I/O Status OUT2

0x00000001	Azimuth SV-ON	
0x00000002	Elevation SV-ON	
0x00000004	CsPA SV-ON	
0x00000008	NaPA SV-ON	
0x00000010	Nasmyth On/Off Speed	
0x00000020	Nasmyth R/L Speed	
0x00000040	Focus ABSM	
0x00000080	Focus ABSR	
0x00000100	Azimuth VFREQ SEL (DI_8)	
0x00000200	Azimuth PFREQ SEL (DI_9)	
0x00000400	Azimuth CLR signal	
0x00000800	Azimuth POSINT INH(DI_11)	
0x00001000	Elevation VFREQ SEL (DI_8)	
0x00002000	Elevation PFREQ SEL (DI_9)	
0x00004000	Elevation CLR 信号(ダミー)	
0x00008000	Elevation POSINT INH(DI_11)	
0x00010000	Focus SV-ON	
0x00020000	Watch Dog Timer Clear	
0x00040000	CsPA ZERO latch clear	
0x00080000	NaPA ZERO latch clear	
0x00100000	Nasmyth 1 Move	
0x00200000	Nasmyth 1 ON side	
0x00400000	Nasmyth 2 Move	
0x00800000	Nasmyth R side	
0x01000000	Mirror cover 4 opening	Not used
0x02000000	Mirror cover 4 closing	Not used
0x04000000	Mirror cover 3 opening	Not used
0x08000000	Mirror cover 3 closing	Not used
0x10000000	Mirror cover 2 opening	Not used
0x20000000	Mirror cover 2 closing	Not used
0x40000000	Mirror cover 1 opening	
0x80000000	Mirror cover 1 closing	

385 Each axis sensor status

0x8000	＋ELS	＋End limit
0x4000	—ELS	—End limit
0x2000	DLS	Not used
0x1000	OLS	Z phase
0x0800	SDSP	Not used
0x0400	ZERO	Not used
0x0200	COIN	In position
0x0100	ALM	Alarm
0x0080	＋SD	＋Deceleration sensor
0x0040	—SD	—Deceleration sensor

17. Turn off O

The power supply of telescope controller and driver unit and XY-stage controller is turned off.

Answer is OK

4. Others

① Controller's mode

Controller has modes of three.

The mode is can be confirmed from status.

I. Tracking mode

Tracking mode is operated from computer.

017 status 0x0002 is 1.

II. Maintenance mode

For maintenance.

The instruction of the computer is disregarded.

370 status2 0x000f is 1.

III. Manual mode

Manual mode is operated from Hand Box.

The instruction of the computer is disregarded.

Conditions other than Ⅰ and Ⅱ.