PRIME Telescope Communication Commands

List of commands

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Command** | **Data** | **Operation Content** | **Answer** | **Data** |
| A | Yes | Get Current Status | A | Yes |
| C | - | Send Dome Stop Command | OK/NG | - |
| D | Yes | Send Dome Controller Command | OK/NG | - |
| E | - | Reset Error | E | - |
| F | - | Exit the Program | F | - |
| G | - | Open Mirror Cover | G | - |
| H | - | Close Mirror Cover | H | - |
| I | - | Clear Focus Position Scale (A) Value | I | - |
| J | - | Clear Focus Position Scale (B) Value | J | - |
| K | Yes | Move Focus | OK | - |
| L | - | Return to Focus Origin | L | - |
| M | Yes | Send Operation Command in Horizontal Coordinate System | OK | - |
| N | - | Send Null Command | N | - |
| O | - | Turn off Controller Power | O | - |
| P | Yes | Change Offset Value | OK | - |
| P0 | Yes | Clear Offset Value | OK | - |
| Q | Yes | Send Operation Command in Horizontal Coordinate System (only once) | OK | - |
| R | Yes | Change Rotator (θ) Flag | OK | - |
| S | - | Stop Telescope | S | - |
| T | Yes | Move Telescope to a Target in Equatorial Coordinate System and Track it | OK | - |
| U | - | Set New Position Including Offset Value | OK | - |
| X | - | Move Telescope to Flat Screen Position | OK | - |
| Y | - | Move Telescope to Home Position | OK | - |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Command** | **Data** | **Operation Content** | **Answer** | **Data** |
| Z | - | Zero Search | Z | - |
| e | - | Azimuth (X) Zero Search | e | - |
| f | - | Altitude (Y) Zero Search | f | - |
| g | - | Rotation (θ) Zero Search | g | - |
| x | - | Turn on Link to Dome Movement | OK | - |
| y | - | Turn off Link to Dome Movement | OK | - |
| D0 | - | Move Dome to Home Position | OK | - |
| DL | Yes | Turn on/off Dome Lamp | OK | - |
| DE | Yes | Emergency Dome Stop | OK | - |
| DM | Yes | Move Dome | OK | - |
| DD | Yes | Update Dome Position | OK | - |
| DS | Yes | Open/Close Dome Slit | OK | - |
| RE | Yes | Emergency Roof Stop | OK | - |
| RA | Yes | Turn on/off Air Conditioner | OK | - |
| RC | Yes | Open/Close Roof |  |  |
| MA | Yes | Move Telescope Based on Absolute Encoder | OK | - |
| j | Yes | Move Focus to Specified Position | OK | - |
| k | Yes | Change Focus Position (A) Value | OK | - |
| ks | Yes | Change Focus Position (B) Value | OK | - |

Green: Required when we observe targets

Orange: Required when we change focus

**Get Current Status**

Get the information of the telescope system and the status of the controller. To get the information, add the request number to the command and send it. The answer will return the information corresponding to the request number.

[Command String]

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CMD |  | Request# | | |  | Request# | | |  | Request# | | |  | Request# | | |  | Request# | | |  |  |
| A |  | 0 | 0 | 1 |  | 0 | 0 | 4 |  | 0 | 0 | 9 |  | 0 | 1 | 9 |  | 0 | 2 | 1 | … | CR |

001…Current date

004…Current time

009…Current local sidereal time

019…Current RA

021…Current Dec

[Answer String]

In the answer string, the values are returned in the order of the requested number after the time of the response. The answer to the above command is as follows.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ANS |  | Time of the response (based on internal time of PC) | | | | | | | | | | | | | | | | | | |
| A |  | 2 | 0 | 1 | 3 | / | 0 | 1 | / | 3 | 1 |  | 1 | 7 | : | 2 | 6 | : | 3 | 7 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Request# | | | | Current data | | | | | | | | | |  | Request# | | | | Current time (s) | | | | | | |
|  | 0 | 0 | 1 | = | 2 | 0 | 1 | 3 | / | 0 | 1 | / | 3 | 1 |  | 0 | 0 | 4 | = | 6 | 0 | 9 | 5 | 3 | . | 3 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Request# | | | | Current local sidereal time | | | | | | |  | Request# | | | | RA | | | | | | | | | |
|  | 0 | 0 | 9 | = | 6 | 2 | 8 | 0 | 4 | . | 4 |  | 0 | 1 | 9 | = | 1 | 7 | : | 2 | 6 | : | 3 | 7 | . | 2 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Request# | | | | Dec | | | | | | | | | | |  |  |
|  | 0 | 2 | 1 | = | + | 3 | 4 | : | 0 | 4 | : | 3 | 7 | . | 5 | … | CR |

[Request Number]

Please refer to the list for the allocated request numbers and corresponding contents from the next section.

[001] Current date

2013/03/03

year/month/day

[002] UTC date

2013/03/03

year/month/day

[003] JD (Julian Day)

\*\*\*\*\*.\*

minimum unit: 0.1 day. Variable number.

[004] Current time

8639.9

0.0 ~ 8639.9. Total seconds since midnight.

[005] Current time (String)

12:34:56.7

hour:minute:second. Fixed number of strings.

[006] UTC time

8639.9

0.0 ~ 8639.9. Total seconds since midnight.

[007] UTC time (String)

12:34:56.7

hour:minute:second. Fixed number of strings.

[008] Difference between UT1 and UTC

\*.\*

UT1\_UTC (0.1s minimum)

[009] Current local sidereal time

8639.9

Current local sidereal time. Total seconds since midnight. (0.1s minimum)

[010] Current azimuth (arcsec)

-1296000.0

-1296000.0 ~ 1296000.0. (0.1 arcsec minimum)

[011] Current azimuth (°)

-360.0

-360.0 ~ 360.0. (0.1° minimum)

[012] Current altitude (arcsec)

324000.0

1. ~ 324000.0. (0.1 arcsec minimum)

[013] Current altitude (°)

90.0

0.0 ~ 92.0. (0.1°minimum)

[014] Current rotator angle (arcsec)

-1296000.0

-1296000.0 ~ 1296000.0. (0.1 arcsec minimum)

[015] Current rotator angle (°)

-360.0

-360.0 ~ 360.0. (0.1°minimum)

[018] Current RA

86399.999

1. ~ 86399.999. (0.001 arcsec minimum)

[019] Current RA (String)

12:34:56.789

0.001 arcsec minimum. Fixed number of strings.

[020] Current Dec

-32400.00

-32400.00 ~ 32400.00. (0.01 arcsec minimum)

[021] Current Dec (String)

±12:34:56.78

* 1. arcsec minimum. Fixed number of string

[022] secZ

Floating point type

If altitude is under 10°then 10.0

[023] Current RA without considering T-Point correction

86399.999

1. 00~ 86399.999

0.001 arcsec minimum.

[024] Current Dec without considering T-Point correction

-32400.00 ~ 32400.00

0.01 arcsec minimum.

[025] Focus Position (A)

Floating point type

Valuable String. Current focus position.

[026] Focus Position (B)

Floating point type

Valuable String. Current glass tube displacement sensor value.

[027] Focus Position (A-B)

Floating point type

Valuable String. Focus position – glass tube displacement value. (Actual position.)

[016] Current Error

Unsigned two digits integer

Error code:

000: Nothing

001: Hardware failure

002: Backup data error

003: An error occurred during shutdown

004: An error occurred in communication with the host PC

005: An error occurred in communication with the GPS

006: Check sum error

010: Zero search is required before deciding current position

011: Cannot process until the motors stop

012: Emergency stop button pressed

013: Failed to read the absolute encoder

014: The power of the driver unit is not turned on

100(X), 110(Y), 120(θ), 130(F): Some error occurred initializing axis

101(X), 111(Y), 121(θ), 131(F): Driver failure

102(X), 112(Y), 122(θ), 132(F): Detected limit sensor

103(X), 113(Y), 123(θ), 133(F): Failed to read the absolute encoder from the driver

104(X), 114(Y), 124(θ), 134(F): Reference (origin) signal was not be detected according to zero search

105(X), 115(Y), 125(θ), 135(F): Zero search cannot be conducted from the current position

[017] Current status

Unsigned four digits integer

Display code:

0x0001: Zero search finished

0x0002: Tracking mode

0x0004: Moving

0x0008: Powering off

0x0010: Emergency stop

0x0020: Primary mirror cover opening

0x0040: Primary mirror cover closing

0x0100: Tracking finished

0x0200: Ignore the former data

0x0400: Calculation result overflow

0x8000: Receiving GPS

[370] Extended status

Unsigned four digits integer

Display code:

0x0001: Displaying maintenance

0x0002: Displaying parameter

0x0004: Displaying monitor

0x0008: Displaying forced output

0x0010: Displaying manual operations

0x0400: Azimuth zero search finished

0x0800: Altitude zero search finished

0x1000: Rotator (axis1) zero search finished

0x2000: Rotator (axis2) zero search finished

0x8000: Focus zero search finished

[090] Observation ready flag

Signed integer

-1: Stop, 0: Moving, 1: Tracking

[050] Offset 1 (RA)

[051] Offset 1 (Dec)

[052] Offset 1 (Azimuth)

[053] Offset 1 (Altitude)

-3600.0

-3600.0 ~ 3600.0. (0.1 arcsec minimum)

[054] Offset 1 (Rotator)（°）

-270.0

-270.0 ~ 270.0. (0.1° minimum)

[078] Offset 1 (time)

-10.0

-10.0 ~ 10.0. (0.1 s minimum)

[120] Current dome angle

3600

0 ~ 3600. (0.1°\*10 minimum)

[121] Dome status

Unsigned eight digits integer

Status of dome controller board

0x00000001: Crane interface state

0x00000008: Slit drive time up

0x00000010: Slit opening

0x00000020: Slit closing

0x00000040: Slit open

0x00000080: Slit close

0x00000100: Dome rotating clockwise

0x00000200: Dome rotating counter clockwise

**Send Dome Stop Command**

Send a stop command to dome controller.

[Command String]

|  |  |
| --- | --- |
| CMD |  |
| C | CR |

[Answer String]

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| O | K | CR |

Command reception complete. Send command to dome controller.

or

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| N | G | CR |

Command reception failed. Command is invalid because dome control is off.

**Send Dome Controller Command**

Send control command to dome controller.

[Command String]

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CMD |  | Command | | | | Angle | | | | Expansion | | | |  |
| D |  | F | F | F | F | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | CR |

[Answer String]

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| O | K | CR |

Command reception complete. Send command to dome controller.

or

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| N | G | CR |

Command reception failed. Command is invalid because dome control is off.

**Reset Error**

Reset error that occurred in the controller. It cannot be removed if the cause of the error has not been removed.

[Command String]

|  |  |
| --- | --- |
| CMD |  |
| E | CR |

[Answer String]

|  |  |
| --- | --- |
| ANS |  |
| E | CR |

**Exit Program**

The server process running on the host PC will be terminated.

[Command String]

|  |  |
| --- | --- |
| CMD |  |
| F | CR |

[Answer String]

|  |  |
| --- | --- |
| ANS |  |
| F | CR |

**Open Mirror Cover**

Open the primary mirror cover. Check the status and input/output status during opening, closing and operation.

[Command String]

|  |  |
| --- | --- |
| CMD |  |
| G | CR |

[Answer String]

|  |  |
| --- | --- |
| ANS |  |
| G | CR |

**Close Mirror Cover**

Close the primary mirror cover. Check the status and input/output status during opening, closing and operation.

[Command String]

|  |  |
| --- | --- |
| CMD |  |
| H | CR |

[Answer String]

|  |  |
| --- | --- |
| ANS |  |
| H | CR |

**Clear Focus Position Scale (A) Value**

Clear the scale value that control the position of the focus.

[Command String]

|  |  |
| --- | --- |
| CMD |  |
| I | CR |

[Answer String]

|  |  |
| --- | --- |
| ANS |  |
| I | CR |

**Clear Focus Position Scale (B) Value**

Clear the glass tube scale value that control the position of the focus.

[Command String]

|  |  |
| --- | --- |
| CMD |  |
| I | CR |

[Answer String]

|  |  |
| --- | --- |
| ANS |  |
| I | CR |

**Move Focus**

Move focus to the desired position.

[Command String]

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CMD |  | Moving Amount (mm) | | | | | | |  |
| K |  | ± | 0 | 0 | . | 0 | 0 | 1 | CR |

[Answer String]

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| O | K | CR |

or

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| N | G | CR |

**Return to Focus Origin**

Focus move in the plus direction and returns to the origin. It continues to move until the origin can be detected, and it stops with an error when it reaches the end limit.

[Command String]

|  |  |
| --- | --- |
| CMD |  |
| L | CR |

[Answer String]

|  |  |
| --- | --- |
| ANS |  |
| L | CR |

**Send Operation Command in Horizontal Coordinate System**

Move telescope to specified azimuth, altitude and rotator axis.

[Command String]

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CMD |  | Azimuth (deg) | | | | | | | | | | | |  | Azimuth Velocity (arcsec/s) | | | | | |
| M |  | ± | 3 | 5 | 9 | : | 5 | 9 | : | 5 | 9 | . | 9 |  | 0 | 0 | 0 | 0 | . | 0 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Altitude (deg) | | | | | | | | | | | |  | Altitude Velocity (arcsec/s) | | | | | |
|  | ± | 3 | 5 | 9 | : | 5 | 9 | : | 5 | 9 | . | 9 |  | 0 | 0 | 0 | 0 | . | 0 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Rotator (deg) | | | | | | | | | | | |  | Rotator Velocity (arcsec/s) | | | | | |  |
|  | ± | 3 | 5 | 9 | : | 5 | 9 | : | 5 | 9 | . | 9 |  | 0 | 0 | 0 | 0 | . | 0 | CR |

\* Note: Velocity data is variable length and can be 0.0.

[Answer String]

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| O | K | CR |

or

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| N | G | CR |

**Send Null Command**

It doesn’t nothing in particular.

[Command String]

|  |  |
| --- | --- |
| CMD |  |
| N | CR |

[Answer String]

|  |  |
| --- | --- |
| ANS |  |
| N | CR |

**Turn off Controller Power**

Send power-off command to telescope system (controller unit, driver unit and dome controller). After power-off, the process of host PC will be terminated.

[Command String]

|  |  |
| --- | --- |
| CMD |  |
| O | CR |

[Answer String]

|  |  |
| --- | --- |
| ANS |  |
| O | CR |

**Change offset Value**

Add offset value to the coordinate data being tracked. The actual coordinate will be shifted by the offset value.

[Command String]

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CMD |  | RA offset (arcsec) | | | | | |  | DEC offset (arcsec) | | | | | |  | Rotator offset (arcsec) | | | | | |
| P |  |  |  |  | 0 | . | 0 |  |  |  |  | 0 | . | 0 |  |  |  |  | 0 | . | 0 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Azimuth offset | | | | | |  | Altitude offset | | | | | |  | Time offset | | | | | |  |
|  |  |  |  | 0 | . | 0 |  |  |  |  | 0 | . | 0 |  |  |  |  | 0 | . | 0 | CR |

\* The maximum value of RA and DEC offset is ±3600.0 (arcsec) (variable length)

\* The maximum value of rotator offset is ±180.0 (deg) (variable length)

\* The azimuth, altitude and time offset will not be used, thus just enter 0.0.

[Answer String]

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| O | K | CR |

or

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| N | G | CR |

**Clear Offset Value**

All offset values set above will be cleared to 0.0.

[Command String]

|  |  |  |
| --- | --- | --- |
| CMD | |  |
| P | 0 | CR |

[Answer String]

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| O | K | CR |

or

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| N | G | CR |

**Send Operation Command in Horizontal Coordinate System (only once)**

Move telescope to specified azimuth, altitude and rotator axis position. But it only sends a command. It may not reach the specified position due to calculation error or drive system loss.

[Command String]

Same as “**Send Operation Command in Horizontal Coordinate System”** except for CMD “Q”.

[Answer String]

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| O | K | CR |

or

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| N | G | CR |

**Change Rotator (θ) Flag**

Specify MOVE or STOP when you don’t want to move the rotator while moving or tracking the telescope. After STOP is specified, the rotation move will be ignored, so if you need to move it, specify MOVE.

[Command String]

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| CMD |  | Rotation Command | | | |  |
| R |  | M | O | V | E | CR |

or

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| CMD |  | Rotation Command | | | |  |
| R |  | S | T | O | P | CR |

[Answer String]

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| O | K | CR |

or

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| N | G | CR |

**Stop Telescope**

Stop all movements of the telescope.

[Command String]

|  |  |
| --- | --- |
| CMD |  |
| S | CR |

[Answer String]

|  |  |
| --- | --- |
| ANS |  |
| S | CR |

**Move Telescope to a Target in Equatorial Coordinate System and Track it**

Move telescope to a target in equatorial coordinate system and start tracking it after it reaches to the target. Please check the status for judgment during moving and tracking.

[Command String]

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CMD |  | RA | | | | | | | | | |  | DEC | | | | | | | | | | |
| T |  | 2 | 3 | : | 5 | 9 | : | 5 | 9 | . | 9 |  | ± | 8 | 9 | : | 5 | 9 | : | 5 | 9 | . | 9 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | RA proper motion | | |  | Dec proper motion | | |  | Equinox | | | | | |  | Target Name | | | | | |  |
|  | 0 | . | 0 |  | 0 | . | 0 |  | 0 | 0 | 0 | 0 | . | 0 |  | N | O | N | A | M | E | CR |

\* Proper motion and equinox are variable length.

\* Target name can be up to 20 single-byte characters.

[Answer String]

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| O | K | CR |

or

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| N | G | CR |

**Set New Position Including Offset Value**

Add offset value while tracking a target. The value set in advance by “Change Offset Value” command will be added to the target value and cleared as offset value.

[Command String]

|  |  |
| --- | --- |
| CMD |  |
| U | CR |

[Answer String]

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| O | K | CR |

or

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| N | G | CR |

**Move Telescope to Flat Screen Position**

Move telescope to flat screen in the dome. Please check the operation status with the status, and when the movement is completed, send a stop command.

[Command String]

|  |  |
| --- | --- |
| CMD |  |
| X | CR |

[Answer String]

|  |  |
| --- | --- |
| ANS |  |
| X | CR |

**Move Telescope to Home Position**

Both telescope and dome move to home position. The home position of telescope is fixed at position where zero search can be done, and cannot be changed. Please check the operation status with the status, and when the movement is completed, send a stop command.

[Command String]

|  |  |
| --- | --- |
| CMD |  |
| Y | CR |

[Answer String]

|  |  |
| --- | --- |
| ANS |  |
| Y | CR |

**Zero search**

Conduct zero search while azimuth and rotator axis move to plus direction and altitude axis move to minus direction. If each axis moves 10 degrees and the origin cannot be found, an error will occur and the axis will stop.

[Command String]

|  |  |
| --- | --- |
| CMD |  |
| Z | CR |

[Answer String]

|  |  |
| --- | --- |
| ANS |  |
| Z | CR |

**Azimuth (X) Zero Search**

Execute the above zero search command independently for azimuth axis (X).

[Command String]

|  |  |
| --- | --- |
| CMD |  |
| e | CR |

[Answer String]

|  |  |
| --- | --- |
| ANS |  |
| e | CR |

**Altitude (Y) Zero Search**

Execute the above zero search command independently for altitude axis (Y).

[Command String]

|  |  |
| --- | --- |
| CMD |  |
| f | CR |

[Answer String]

|  |  |
| --- | --- |
| ANS |  |
| f | CR |

**Rotator (θ) Zero Search**

Execute the above zero search command independently for rotator axis (θ).

[Command String]

|  |  |
| --- | --- |
| CMD |  |
| g | CR |

[Answer String]

|  |  |
| --- | --- |
| ANS |  |
| g | CR |

**Turn on Link to Dome Movement**

**Turn off Link to Dome Movement**

Switch the dome link/unlink in synchronization with “**Move Telescope to a Target in Equatorial Coordinate System and Track it**”.

[Command String]

|  |  |
| --- | --- |
| CMD |  |
| x | CR |

Link On

or

|  |  |
| --- | --- |
| CMD |  |
| y | CR |

Link off

[Answer String]

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| O | K | CR |

Command reception complete. While the link on, dome will rotate with azimuth axis.

or

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| N | G | CR |

Command reception failed. Command is invalid because dome control is off.

**Move Dome to Home Position**

Move dome to its home position (0°) regardless of the telescope position. The dome link will forcibly be turned off.

[Command String]

|  |  |  |
| --- | --- | --- |
| CMD | |  |
| D | 0 | CR |

[Answer String]

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| O | K | CR |

Command reception complete.

or

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| N | G | CR |

Command reception failed.

**Turn on/off Dome Lamp**

Switch turn on/off of lumps in dome. When turning on, the brightness can be specified within the range of 0 to 100 %.

[Command String]

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CMD | |  | Command | |  | Dimming value | | |  |
| D | L |  | O | N |  | 1 | 0 | 0 | CR |

Turn on dome lamp. The brightness can be set within the range of 0 to 100 %.

or

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CMD | |  | Command | | |  | Dimming value | | |  |
| D | L |  | O | F | F |  | 0 | 0 | 0 | CR |

Turn off dome lamp.

[Answer String]

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| O | K | CR |

Command reception complete.

or

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| N | G | CR |

Command reception failed. Command is invalid because dome control is off.

**Emergency Dome Stop**

Send dome controller an emergency stop command. Every dome process is shut down.

[Command]

|  |  |  |
| --- | --- | --- |
| CMD | |  |
| D | E | CR |

[Answer String]

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| O | K | CR |

Command reception complete.

or

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| N | G | CR |

Command reception failed. Command is invalid because dome control is off.

**Move Dome**

Send dome controller to move. The moving speed can be specified in 4 steps of MAX/HIGH/MID/LOW.

[Command String]

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CMD | |  | Direction | |  | Speed | | |  |
| D | M |  | C | W |  | M | A | X | CR |

The dome rotates clockwise.

or

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CMD | |  | Direction | | |  | Speed | | |  |
| D | M |  | C | C | W |  | M | A | X | CR |

The dome rotates counter clockwise.

or

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CMD | |  | Direction | | |  | Speed | | |  |
| D | M |  | R | E | T |  | M | A | X | CR |

The dome starts zero search. It will be completed one rotation after detecting the origin sensor.

or

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CMD | |  | Angle | | | |  | Speed | | |  |
| D | M |  | 3 | 6 | 0 | 0 |  | M | A | X | CR |

The dome rotates to specified angle.

[Answer String]

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| O | K | CR |

Command reception complete.

or

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| N | G | CR |

Command reception failed. Command is invalid because dome control is off.

**Update Dome Position**

This command is used to update the dome angle after specifying the angle with the DM command. Normally, specify the azimuth angle that the telescope is facing.

[Command String]

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | |  | Angle | | | |  |
| D | D |  | 3 | 6 | 0 | 0 | CR |

Update the dome (angle) position. The angle can be set within 0 to 360 degree.

[Answer String]

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| O | K | CR |

Command reception complete.

or

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| N | G | CR |

Command reception failed. Command is invalid because dome control is off.

**Open/Close Dome Slit**

Open and close the dome slit. The slit stops where there is the close limit or the open limit, thus stop the slit if you want to stop it in the middle.

[Command String]

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| CMD | |  | Command | | | |  |
| D | S |  | O | P | E | N | CR |

Open the dome slit.

or

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CMD | |  | Command | | | | |  |
| D | S |  | C | L | O | S | E | CR |

Close the dome slit.

or

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| CMD | |  | Command | | | |  |
| D | S |  | S | T | O | P | CR |

Stop the dome slit. Stop the above open/close operation.

[Answer String]

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| O | K | CR |

Command reception complete.

or

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| N | G | CR |

Command reception failed. Command is invalid because dome control is off.

**Emergency Roof Stop**

Send roof controller an emergency stop command. Every roof process is shut down.

[Command String]

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| CMD | |  | CMD | |  |
| R | E |  | O | N | CR |

Send an emergency stop command.

or

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| CMD | |  | CMD | | |  |
| R | E |  | O | F | F | CR |

Cancel the emergency stop.

[Answer String]

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| O | K | CR |

Command reception complete.

or

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| N | G | CR |

Command reception failed. Command is invalid because dome control is off.

**Turn on/off Air Conditioner**

Turn on/off the air conditioner in the dome.

[Command String]

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CMD | |  | Command | | |  | Temperature | |  |
| R | A |  | O | N | 1 |  | 1 | 6 | CR |

Turn on the air conditioner in the dome. The temperature can be set within the range of 16 to 30℃.

or

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| CMD | |  | Command | | | |  |
| R | A |  | O | F | F | 1 | CR |

Turn off the air conditioner in the dome.

or

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CMD | |  | Command | | |  | Temperature | |  |
| R | A |  | O | N | 2 |  | 3 | 0 | CR |

Turn on the air conditioner in the controller room.

or

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| CMD | |  | Command | | | |  |
| R | A |  | O | F | F | 2 | CR |

Turn off the air conditioner in the controller room.

[Answer String]

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| O | K | CR |

Command reception complete.

or

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| N | G | CR |

Command reception failed. Command is invalid because dome control is off.

**Move Roof**

Open/close the roof. The roof stops where there is the close limit or the open limit, thus stop the roof if you want to stop it in the middle. You cannot open/close the roof if the roof controller is closing it due to power failure detection.

[Command String]

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| CMD | |  | Command | | | |  |
| R | C |  | O | P | E | N | CR |

Open the roof.

or

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CMD | |  | Command | | | | |  |
| R | C |  | C | L | O | S | E | CR |

Close the roof.

or

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| CMD | |  | Command | | | |  |
| R | C |  | S | T | O | P | CR |

Stop the roof. Stop the above open/close operation.

[Answer String]

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| O | K | CR |

Command reception complete.

or

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| N | G | CR |

Command reception failed. Command is invalid because dome control is off.

**Move Telescope Based on Absolute Encoder**

Move telescope based on absolute encoder equipped with azimuth and altitude axis. This command can be used to move telescope where it can conduct zero search after powering on the telescope and the position is not decided before zero search.

[Command String]

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | |  | axis |  | Target Position (deg) | | | | | |  |
| M | A |  | X |  |  |  |  | 0 | . | 0 | CR |

The axis can be X(=azimuth) or Y(=altitude). If you assign “A” as below, you can move both azimuth and altitude axis at the same time.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | |  | axis |  | Azimuth Position (deg) | | | | | |  | Altitude Position (deg) | | | | | |  |
| M | A |  | A |  |  |  |  | 0 | . | 0 |  |  |  |  | 0 | . | 0 | CR |

If “HOME” is specified instead of the target position, the specified axis can be moved to position where zero search can be conducted.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | |  | axis |  | Command | | | |  |
| M | A |  | X |  | H | O | M | E | CR |

[Answer String]

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| O | K | CR |

or

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| N | G | CR |

**Move Focus to Specified Position**

Move the focus position (A-B) to the specified position.

[Command String]

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CMD |  | Moving Amount(mm) | | | | | | |  |
| j |  | ± | 0 | 0 | . | 1 | 0 | 0 | CR |

In this example, move the focus position to 0.100mm.

[Answer String]

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| O | K | CR |

or

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| N | G | CR |

**Change Focus Position (A) Value**

Change the focus position (A=the position in focus unit) to the specified position.

[Command String]

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CMD |  | Moving Amount(mm) | | | | | | |  |
| k |  | ± | 0 | 0 | . | 1 | 0 | 0 | CR |

In this example, move the focus position to 0.100mm.

[Answer String]

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| O | K | CR |

or

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| N | G | CR |

**Change Focus Position (B) Value**

Change the focus position value (B=glass tube displacement sensor value) to the specified position.

[Command String]

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CMD | |  | Moving Amount(mm) | | | | | | |  |
| k | s |  | ± | 0 | 0 | . | 1 | 0 | 0 | CR |

In this example, move the focus position to 0.100mm.

[Answer String]

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| O | K | CR |

or

|  |  |  |
| --- | --- | --- |
| ANS | |  |
| N | G | CR |