iOptron® Mount RS-232 Command Language 2014

Version 2.0

August 8th, 2014

Abbreviations used:

YYMMDD	YY: last two digits of the year, year are assumed to be 21st Century
	MM: month, DD: day of the month
HHMMSS	HH: hour, MM: minute, SS: second
s	+ or – sign, "+" cannot be replaced by any other characters
MMM	minutes
SSSSSS	arc-seconds
TTTTTTTT(T)	0.01 arc-seconds
XXXXX(XXX)	milliseconds
nnn or longer	digits

All digits above including leading zeroes to match the format of the each command.

Currently the document applies to the following products:

CEM60 (Firmware 140807 and later)

CEM60-EC (Firmware 140807 and later)

iEQ45 Pro (Firmware 140807 and later)

iEQ45 Pro AA (Firmware 140807 and later)

General Information

Command: ":GAS#"

Response: "nnnnnn#"

The 1st digit stands for GPS status: 0 means GPS off, 1 means GPS on, 2 means GPS data extracted correctly.

The 2nd digit stands for system status: 0 means stopped (not at zero position), 1 means tracking with PEC disabled, 2 means slewing, 3 means guiding, 4 means meridian flipping, 5 means tracking with PEC enabled (only for non-encoder edition), 6 means parked, 7 means stopped at zero position (home position).

The 3rd digit stands for tracking rates: 0 means sidereal rate, 1 means lunar rate, 2 means solar rate, 3 means King rate, 4 means custom rate.

The 4th digit stands for moving speed by arrow button or moving command: 1 means 1x sidereal tracking rate, 2 means 2x, 3 means 8x, 4 means 16x, 5 means 64x, 6 means 128x, 7 means 256x, 8 means 512x, 9 means maximum speed. Currently, the maximum speed of CEM60 (-EC) is 900x, the maximum speed of iEQ45 Pro (/AA) is 1400x.

The 5th digit stands for time source: 1 means RS-232 port, 2 means hand controller, 3 means GPS.

The 6th digit stands for hemisphere: 0 means Southern Hemisphere, 1 means Northern Hemisphere.

Command: ":GLT#"

Response: "sMMMYYMMDDHHMMSS#"

This command include a sign and 16 digits, and gets time related data.

The sign and first 3 digits stands for the minutes of UTC offset (time zone). Note: The Daylight Saving Time does not affect this offset.

The 4th digit stands for the Daylight Saving Time, 0 for Daylight Saving Time not observed, 1 for Daylight Saving Time observed.

The 5th to 10th digits stands for local Date.

The 11th to 16th digits stands for local Time in 24 hours format.

Command: ":GEC#"

Response: "sTTTTTTTTXXXXXXXX#"

This command include a sign and 16 digits, and gets right ascension and declination.

The sign and first 8 digits stands for current declination.

The last 8 digits stands for current right ascension.

Command: ":GAC#"

Response: "sTTTTTTTTTTTTTTTTT#"

This command include a sign and 17 digits, and gets altitude and azimuth.

The sign and first 8 digits stands for current altitude.

The last 9 digits stands for current azimuth.

Command: ":Gg#"

Response: "sSSSSSS#"

This command gets the current longitude. Note: East is positive.

Command: ":Gt#"
Response: "sSSSSSS#"
This command gets the current latitude. Note: North is positive.

Command: ":AG#"
Response: "nnn#"
This command returns the guiding rate n.nn * sidereal rate. The range of n.nn is [0.10, 0.90].

Data entered with the following 8 commands will be "remembered" through a power cycle and automatically re-applied on the next power up.

Command: ":SGsMMM#"
Response: "1"
Sets the time zone offset from UTC (Daylight Saving Time will not affect this value). The offset can only be entered in the range of [-720, +780] minutes.

Command: ":SDS0#" ":SDS1#"
Response: "1"
Sets the status of Daylight Saving Time. ":SDS1#" means Daylight Saving Time observed, ":SDS0#" means Daylight Saving Time not observed.

Command: ":SCYYMMDD#"
Response: "1"
Sets the current Local Date.

Command: ":SLHHMMSS#"
Response: "1"
Sets the current Local Time. The time can only be entered in the range of 00:00:00 to 23:59:59.

Command: ":SgsSSSSSS#"
Response: "1"
Sets the current longitude. The longitude can only be entered in the range of [-180, 180] degree. Note: East is positive.

Command: ":StsSSSSSS#"
Response: "1"
Sets the current latitude. The latitude can only be entered in the range of [-90, 90] degree. Note: North is positive.

Command: ":RGnnn#"
Response: "1"
Sets the guiding rate n.nn * sidereal rate. nnn can only be entered in the range of [10, 90].

Command: ":SHE0#" ":SHE1#"

Response: "1"

Sets the hemisphere. 0 means Southern Hemisphere, 1 means Northern Hemisphere.

Mount Motion

Command: ":MS#"

Response: "1"   if command accepted,

         "0"   The desired object is below 0 degrees altitude.

Slew to the most recently defined right ascension and declination coordinates or most recently defined altitude and azimuth coordinates (only works with Alt-Azi Mount). If the object is below the horizon, this will be stated, and no slewing will occur.

Command: ":Q#"

Response: "1"

This command will stop slewing only. Tracking and moving by arrow keys will not be affected.

Command: ":MnXXXXX#" ":MeXXXXX#" ":MsXXXXX#" ":MwXXXXX#"

Response: (none)

Command motion for XXXXX milliseconds in the direction specified at the currently selected guide rate. The range of XXXXX is [0, 99999].

Command: ":ST0#" ":ST1#"

Response: "1"

These command sets tracking state. ":ST0#" indicates stop tracking, ":ST1#" indicates start tracking.

Command: ":RT0#" ":RT1#" ":RT2#" ":RT3#" ":RT4#"

Response: "1"

This command selects the tracking rate. It selects sidereal (:RT0#), lunar (:RT1#), solar (:RT2#), King (:RT3#), or custom (:RT4#). The sidereal rate is assumed as a default by the next power up. This command has no effect on the use of the N-S-E-W buttons.

Command: ":MP1#"

Response: "1"   if command accepted,

         "0"   The desired object is below 0 degrees altitude.

Park to the most recently defined right ascension and declination coordinates or most recently defined altitude and azimuth coordinates (only works with Alt-Azi Mount). If the target is below the horizon, this command will have no effect. In parked mode, the mount cannot slew, track, guide or perform any movement unless a un-park command is issued. If you parked the mount and powered it off, at the beginning of the next power up, the mount will un-park automatically.

Command: ":MP0#"
Response: "1"
This command un-parks the mount. If the mount is already un-parked, the command will have no effect.

Command: ":MH#"
Response: "1"
This command will slew to the zero position (home position) immediately.

Command: ":MSH#"
Response: "1"
This command will auto search the real zero position (home position) immediately. This command ignores any current zero position, and designed to be a safe operation in any cases. Currently, only CEM60 and CEM60-EC support this feature.

Command: ":SRn#"
Response: "1"
Sets the moving rate used for the N-S-E-W buttons. For n, specify an integer from 1 to 9. 1 stands for 1x sidereal tracking rate, 2 stands for 2x, 3 stands for 8x, 4 stands for 16x, 5 stands for 64x, 6 stands for 128x, 7 stands for 256x, 8 stands for 512x, 9 stands for maximum speed. Currently, the maximum speed of CEM60 (-EC) is 900x, the maximum speed of iEQ45 Pro (/AA) is 1400x. 64x is assumed as a default by the next power up.

Command: ":RRsnn.nnnn#"
Response: "1"
"Custom Tracking Rate" (":RT4#") must be selected before this command to take effect.
The command selects the tracking rate in the RA axis to nn.nnnn. The rate added to the standard sidereal rate and can be positive or negative. Currently the value is limited to the range of [-0.0100, +0.0100]. Data entered with this command will be remembered through a power cycle and automatically re-applied on the next power up.

Command: ":RDsnn.nnnn#"
Response: "1"
"Custom Tracking Rate" (":RT4#") must be selected before this command to take effect.
The command selects the tracking rate in the Dec axis to nn.nnnn. Currently this command has not been implemented.

Command: ":mn#" ":me#" ":ms#" ":mw#"
Response: (none)
These commands have identical function as arrow key pressed. They will move mounts to N-E-S-W direction at specified speed (may change by ":SRn#"). The mount will keep moving until a ":qR#", ":qD#", and/or ":q#" sent.

Command: ":q#"
Response: "1"
This command will stop moving by arrow keys or ":mn#", ":me#", ":ms#", ":mw#" command.
Slewing and tracking will not be affected.

Command: ":qR#"
Response: "1"
This command will stop moving by left and right arrow keys or ":me#", ":mw#" command.
Slewing and tracking will not be affected.

Command: ":qD#"
Response: "1"
This commands will stop moving by up and down arrow keys or ":mn#", ":ms#" command.
Slewing and tracking will not be affected.

Position

Command: ":CM#"
Response: "1"
Calibrate mount (Sync). In equatorial mounts, the most recently defined right ascension and declination become the commanded right ascension and declination respectively. In Alt-Azi mounts, the most recently defined altitude and azimuth become the commanded altitude and azimuth. This command assumes that the mount has been manually positioned on the proper pier side for the calibration object. This command is ignored if slewing is in progress. This command should be used for initial calibration. It should not be used after the mount has been tracking unless it is known that it has not tracked across the meridian.

Command: ":SrXXXXXXXX#"
Response: "1"
Defines the commanded right ascension, RA. Slew, calibrate and park commands operate on the most recently defined right ascension.

Command: ":SdsTTTTTTTT#"
Response: "1"
Defines the commanded declination, Dec. Slew, calibrate and park commands operate on the most recently defined declination.

Command: ":SasTTTTTTTT#"
Response: "1"
This command only works with Alt-Azi Mounts. Defines the commanded altitude, Alt. Move, calibrate and park commands operate on the most recently defined altitude.

Command: ":SzTTTTTTTTT#"
Response: "1"
This command only works with Alt-Azi Mounts. Defines the commanded azimuth, Azi. Move, calibrate and park commands operate on the most recently defined azimuth.

Command: ":SZP#"
Response: "1"
This command will set current position as zero position.

Miscellaneous

Command: ":FW1#"
Response: "YYMMDDYYMMDD#"
Gets the date of the mainboard's and the hand controller's firmware. The first "YYMMDD" indicates the date of the mainboard's firmware, the second "YYMMDD" indicates the date of the hand controller's firmware.

Command: ":FW2#"
Response: "YYMMDDYYMMDD#"
Gets the date of the RA motor board's and the Dec motor board's firmware. The first "YYMMDD" indicates the date of the RA motor board's firmware, the second "YYMMDD" indicates the date of the Dec motor board's firmware.

Command: ":V#"
Response: "V1.00#"
This command is the first initialization command of iOptron® series products.

Command: ":MountInfo#"
Response: "0060" "0061" "0045" "0046"
This command gets the mount type. "0060" means CEM60 without high precision encoder, "0061" means CEM60-EC, "0045" means iEQ45 Pro EQ Mode, "0046" means iEQ45 Pro AA Mode.

Miscellaneous information

The command set is written in ASCII character format and can be used to write your own programs. All commands are case sensitive.

Initialization sequence

In order to properly initialize the mount with your software, you must issue the following commands when you establish your link:
:V#
:MountInfo#

RS-232 Port Settings

Baud Rate: 9600
Parity: none
Data bits: 8
Flow Control: none (does not support Xon/Xoff or hardware flow control)
Start Bits: 1
Stop Bits: 1

Version History

1.0   July 4th, 2014
Initial release.

2.0   August 8th, 2014
Commands Corrected:
Corrected the wrong response of ":q#", ":qR#" and ":qD#".

Commands Removed:
":AH#" has been removed.

Commands Changed:
":GAS#" added the ability to judge if the mount is at zero position.
Guiding rate has been expanded from [0.10, 0.80] to [0.10, 0.90].
Changed response of ":GEC#", ":GAC#", ":Gg#", ":Gt#" and ":AG#".
Changed sending commands of time zone set, Local Date set, Local Time set, longitude set, latitude set, custom tracking rate set and target RA, Dec, Alt, Azi set.

Commands Added:
Added set Hemisphere commands ":SHE0#", ":SHE1#".
Added auto search zero position command ":MSH#".
Added set zero position command ":SZP#".