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These Web pages access a Losmandy New Gemini telescope control system.  
Click on the links above to get status information about the system and operate it.

For additional information about Losmandy products, please visit:

[www.losmandy.com](http://www.losmandy.com)

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# Gemini State

UTC Date (dd.mm.yyyy):		UTC Time:	
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Telescopic Coordinates:

Hour Angle Axis State:		Declination Axis State:	
Hour Angle Axis Physical Position:		Declination Axis Physical Position:	
RA PEC Pointer:		Tracking Time to Western Limit:	
Telescopic Right Ascension:		Telescopic Declination:	
Apparent Right Ascension:		Apparent Declination:	

Target:

Target Right Ascension:		Target Declination:	
Delta RA:		Delta DEC:	
Target Modelled Physical Position RA:		Target Modelled Physical Position DEC:	
Target Physical Position RA:		Target Physical Position DEC:	
Object Azimuth:		Object Elevation:	

Information Buffer Content:

Current Display Content:

Previous Display Content:

Periodic:

STOP

PARK

LST:

00:00:00:00

RA:

00:00:00:00

DEC:

+00:00:00:00

To Limit:

+00:00:00:00

Rev RA

Rev Dec

Guide

Track

PEC

>>

Equinox J2000

Equinox of Date

Object:

Object RA:

Object Dec:

Park CWD

Park Home

Park Current

Sync Coord.

Additional Align

Meridian Flip

# Functions

## GoTo Coordinate Input

### RA/DEC

Right Ascension	12:22:54	Declination	+90:00:00
Target Right Ascension		Target Declination	

### Physical Position

Hour Angle Axis Physical Position	00864000	Declination Axis Physical Position	00864000
Hour Angle Target Physical Position		Declination Axis Target Physical Position	

### Alt/Az

Azimuth	359:59:59	Elevation	+34:05:22
Target Azimuth		Target Elevation	

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## Park/Sleep/Wakeup/Reboot Mount

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## Train PEC

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## Classic Hand Controller Mode

Terrestrial

# Catalogues

- [Sun/Moon/Planets](#)
- [Arp\\_EN.guc](#)
- [BSL.guc](#)
- [Caldwell\\_EN.guc](#)
- [Cederblad\\_EN.guc](#)
- [Combined\\_Constellation\\_Stars.guc](#)
- [G2V\\_EN.guc](#)
- [Herschel400\\_EN.guc](#)
- [IC.guc](#)
- [LBN\\_EN.guc](#)
- [LDN\\_EN.guc](#)
- [Messier.guc](#)
- [NGC.guc](#)
- [PN.guc](#)
- [SAO.guc](#)
- [Sharpless\\_EN.guc](#)
- [Southern\\_Constellation\\_Stars.guc](#)
- [Struve\\_EN.guc](#)
- [WDS.guc](#)

# Object Selection

Insert Object Here:

Equinox J2000  
Equinox of Date

- [M1,5:34:31,+22:00:52,SNREM \(Tau\) m8.4 8'x4' 6300ly.](#)
- [M2,21:33:29,-00:49:23,GC \(Ver\) m6.5 11'7 37900ly.](#)
- [M6,17:40:20,-32:15:15,OC \(Sco\) m4.2 20' 1600ly.](#)
- [M7,17:53:51,-34:47:34,OC \(Sco\) m3.3 80' 800ly.](#)
- [M8,18:03:41,-24:22:49,NEB \(SGC\) m5.0 45'x30' 5200ly.](#)
- [M11,18:51:06,-06:16:00,OC \(Sct\) m5.8 14' 6000ly.](#)
- [M14,17:37:36,-03:14:45,GC \(Oph\) m7.6 6'7 30300ly.](#)
- [M15,21:29:58,+12:10:01,GC \(Peg\) m6.4 12'3 33600ly.](#)
- [M16,18:18:48,-13:47:00,NEB \(Ser\) m6.0 30'x40' 7000ly.](#)
- [M17,18:20:48,-16:11:00,NEB \(SGC\) m6.0 30'x30' 5000ly.](#)
- [M18,18:19:54,-17:08:00,OC \(SGC\) m6.9 9' 4900ly.](#)
- [M20,18:02:42,-22:58:19,NEB \(SGC\) m6.3 28' 5200ly.](#)
- [M21,18:04:13,-22:29:24,OC \(SGC\) m5.9 13' 4300ly.](#)
- [M22,18:36:24,-23:54:12,GC \(SGC\) m5.2 24' 10400ly.](#)
- [M23,17:57:04,-18:59:07,OC \(SGC\) m5.5 27' 2200ly.](#)
- [M24,18:17:18,-18:40:00,OC \(SGC\) m3.1 95'x35' 10000ly.](#)
- [M25,18:31:38,-19:14:20,OC \(SGC\) m4.6 29' 2000ly.](#)
- [M26,18:45:12,-09:24:00,OC \(Sct\) m8.0 15' 5000ly.](#)
- [M27,19:59:36,+22:43:16,PN \(Vul\) m7.3 8'0x5'6 1300ly.](#)
- [M28,18:24:32,-24:52:12,GC \(SGC\) m6.9 15' 18300ly.](#)
- [M29,20:23:54,+38:32:00,OC \(Cyg\) m6.6 7' 4000ly.](#)
- [M30,21:40:22,-23:10:45,GC \(Cap\) m6.9 8'9 26100ly.](#)
- [M31,0:42:44,+41:16:06,GAL \(And\) m3.4 189'x61' 3Mly.](#)
- [M32,0:42:41,+40:51:55,GAL \(And\) m8.1 8'5x6'5 3Mly.](#)
- [M33,1:33:51,+30:39:27,Gal \(Tri\) m5.7 68'x41' 3.0Mly.](#)
- [M34,2:42:04,+42:46:34,OC \(Per\) m5.2 35' 1400ly.](#)
- [M36,5:36:17,+34:08:27,OC \(Aur\) m6.0 12' 4100ly.](#)
- [M38,5:28:42,+35:51:18,OC \(Aur\) m6.4 21' 4200ly.](#)
- [M39,21:32:12,+48:26:00,OC \(Cyg\) m4.6 32' 830ly.](#)
- [M42,5:35:15,-05:23:25,NEB \(Ori\) m4.0 90'x60' 1600ly.](#)
- [M43,5:35:31,-05:16:03,NEB \(Ori\) m7.0 20'x15' 1600ly.](#)
- [M45,3:47:00,+24:07:00,OC \(Tau\) m1.2 100' 440ly.#](#)
- [M52,23:24:12,+61:35:00,OC \(Cas\) m6.9 13' 5000ly.](#)
- [M54,18:55:03,-30:28:42,GC \(SGC\) m7.7 9'1 87400ly.](#)
- [M55,19:39:59,-30:57:44,GC \(SGC\) m6.3 19' 17300ly.](#)
- [M56,19:16:35,+30:11:05,GC \(Lyr\) m8.3 5' 32900ly.](#)
- [M57,18:53:35,+33:01:45,PN \(Lyr\) m9.4 86"x62" 2300ly.](#)
- [M69,18:31:23,-32:20:53,GC \(SGC\) m7.7 7'1 29700ly.](#)
- [M70,18:43:12,-32:17:31,GC \(SGC\) m7.8 7'8 29300ly.](#)
- [M71,19:53:46,+18:46:42,GC \(Sge\) m8.3 6'1 13000ly.](#)
- [M72,20:53:27,-12:32:13,GC \(Sge\) m9.2 5'9 55400ly.](#)
- [M73,20:59:00,-12:38:00,OC \(Ver\) m9.7 2'8 2500ly.](#)
- [M74,1:36:41,+15:46:58,GAL \(Psc\) m9.4 10'x9'4 35Mly.](#)
- [M75,20:06:04,-21:55:17,GC \(SGC\) m8.6 6' 67500ly.](#)
- [M76,1:42:19,+51:34:35,PN \(Per\) m10.1 2'7x1'7 3400ly.](#)
- [M77,2:42:40,-00:00:48,GAL \(Cet\) m8.9 7'3x6'3 60Mly.](#)
- [M79,5:24:10,-24:31:27,GC \(Lep\) m7.7 7'8 42100ly.](#)
- [M103,1:33:21,+60:39:29,OC \(Cas\) m7.4 6' 8500ly.](#)
- [M110,0:40:22,+41:41:05,GAL \(And\) m8.1 19'5x11'5 3Mly.](#)

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# Mount Parameter Setup

Titan

## Gearing

RA Worm Ratio		DEC Worm Ratio	
RA Spur Ratio		DEC Spur Ratio	
RA Motor Encoder Resolution		DEC Motor Encoder Resolution	
RA Positioning Resolution	0.750000"	DEC Positioning Resolution	0.750000"
		DEC TVC Step Count	

## Speeds

RA Manual Slewing Rate		DEC Manual Slewing Rate	
RA GoTo Slewing Rate		DEC GoTo Slewing Rate	
RA Move Speed		DEC Move Speed	
RA Slewing Acceleration		DEC Slewing Acceleration	
RA Centering Rate		DEC Centering Rate	
RA Guiding Rate		DEC Guiding Rate	

## Safety Limits

Left Safety Limit		Right Safety Limit	
Left Safety Limit Step Position		Right Safety Limit Step Position	
Western GoTo Limit		Western GoTo Limit Step Position	



Axis Encoders

RA Axis Encoder Resolution		DEC Axis Encoder Resolution	
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Default StartUp Mode

Ask , if possible

This page allows you to set up the mount parameters. Use it with care! A Cold Start is recommended after changing mount parameters.

# Site Parameters

## Predefined Observing Sites

Hollywood(active)

## Geographic Location

Site Name		Time Zone	
Longitude		Latitude	
Elevation [m]		Store as Site #	

## Time Settings

Civil Time		Civil Date(dd.mm.yyyy)	
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UTC Time		UTC Date(dd.mm.yyyy)	
Sidereal Time	23:36:36	Julian Date	2456012.30236

## Query GPS receiver

Serial 1

Site #0 is the one currently used, Site #1 ... #4 can be stored for rapid selection.

# Telescope Pointing Model

Current Model:

0

Manage Current Model:

Change Current Model:

Model Parameters:

Alignment Count	East Side: 00000	West Side: 00000
Polar Axis Misalignment	Azimuth: 00000	Elevation: 00000
Orthogonality Errors	Meridian: 00000	Pole: 00000
Flexure	Tube: 00000	Cantilever: 00000
Index Errors	RA Axis: 00000	DEC Axis: 00000

Manage models on SD card:

Store model on SD card:

Load a model from SD card:

Delete a model from SD card:

# SD Card

## Current SD Card Directory: Root

File Name	File Size	Creation Date
<a href="#">LOGS</a>	Directory	02.03.2012 17:03
<a href="#">FR</a>	Directory	25.03.2012 17:18
<a href="#">DE</a>	Directory	25.03.2012 17:18
<a href="#">EN</a>	Directory	25.03.2012 17:18
<a href="#">ES</a>	Directory	25.03.2012 17:18
<a href="#">MHC</a>	Directory	25.03.2012 17:18
<a href="#">HC</a>	Directory	25.03.2012 17:19
<a href="#">DOC</a>	Directory	25.03.2012 17:28
<a href="#">Catalogs</a>	Directory	25.03.2012 17:16
<a href="#">HCFirmware</a>	Directory	25.03.2012 17:19
<a href="#">Cur_Gem2.bin</a>	237.596	25.03.2012 17:21

1 File(s) 237.596 bytes  
10 Dir(s) 2.012.872.704 bytes free.

## Upload a file to the SD Card's current directory

Select a File to upload to SD Card:  
no file selected

## Format SD Card

SD Card Volume Label:

# Flash Memory

## Gemini Flash Memory Directory

File Name	File Size	Creation Date
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0 File(s) 0 bytes  
524.151 bytes free.

## File Upload

Upload a file to the Flash root folder.

Select a File to upload to Flash:  
no file selected

# Network Settings

Item	Current Settings	Stored Settings
▶ LAN IP Address		
▶ LAN Netmask		
▶ Default Gateway		
▶ Primary DNS Server		
▶ Secondary DNS Server		
▶ MAC Address		
▶ UDP port for serial emulation		
▶ DHCP Server Timeout [seconds]:		
Use DHCP to aquire network settings:		On success, these settings take precedence over the stored static configuration.

This page allows to change the IPv4 network settings. Please note: If you change them you may have to adapt the settings in your host or router to be able to reconnect to Gemini. **Take care** or you may block the network access.

# System Settings

Item	Setting
▶ Authentication	Enabled
▶ Password for user 'admin'	
▶ Retype your password	

# Serial Ports settings

**Serial Port 1 Baudrate:**

9600

**Serial Port 2 Baudrate:**

57600

**Serial Port 3 (Pins 6,7 of the Feature port, 3.3V level) Note: This port is part of the Feature Port and has to be activated using the Hardware menu**

57600

**Serial Port 4 (Pins 4,5 of the Feature port, 3.3V level) Note: This port is part of the Feature Port and has to be activated using the Hardware menu**

57600

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**GPS Receiver Baudrate**

4800



# TCP Socket status

Socket	State	Rem IP	Rem Port	Loc Port	Timer
1	TIMEWAIT	192.168.0.125	51452	80	0
2	CONNECT	192.168.0.125	51453	80	240
3	LISTEN	-	-	80	-
4	LISTEN	-	-	80	-
5	LISTEN	-	-	80	-
6	LISTEN	-	-	80	-
7	LISTEN	-	-	80	-
8	LISTEN	-	-	80	-
9	LISTEN	-	-	80	-
10	LISTEN	-	-	80	-
11	LISTEN	-	-	4030	-
12	LISTEN	-	-	21	-
13	CLOSED	-	-	-	-
14	LISTEN	-	-	21	-
15	CLOSED	-	-	-	-
16	FREE	-	-	-	-
17	FREE	-	-	-	-
18	FREE	-	-	-	-

## Power Supply Voltage

A/D Value	Volts	Bargraph
0x1D7	12.322 V	<div><div></div></div>

## Lithium Battery Voltage

A/D Value	Volts	Bargraph
0x3AD	3.033 V	<div><div></div></div>

## Pin Status

Item	Status					
▶ HC Buttons:	RA-	DEC-	DEC+	RA+		
▶ AG Port:	RA-	DEC-	DEC+	RA+		
▶ Port F:	F5	F4	F3	F2	F1	F0
▶ Port E:		E3	E2	E1	E0	

Periodic:

## Port E Usage

Axis Encoder

# Gemini Firmware

## Gemini Firmware Information

Gemini Board Serial Number: 140810081  
Version: 5.00  
Build date: Mar 25 2012  
Build time: 15:46:07  
ROM size: 237176  
RAM size: 752

## Hand Controller Firmware Information

## SD Card Gemini Firmware

**Pushing the "Flash Firmware" button will permanently erase the currently loaded firmware, flash the selected image from the SD card to the board and restart Gemini. If this fails or if the image is corrupted you can't reconnect to the board. In this case you'll have to use alternative programming methods.**

**Firmware flashing takes 10 to 20 seconds. Please wait until Gemini restarts with the new firmware. Don't resubmit or reload this page!**

Select firmware image: Cur\_Gem2.bin

## Manage configuration data in SRAM

- Store SRAM content to file
- Reset SRAM to Factory Defaults
- Reset SRAM to MI-250 Defaults
- Load SRAM content from file

## Reboot Mount

# Gemini Level 5, Version 1.0 Serial Interface Command Description

## Gemini's LX200-like Commands

The Gemini system supports a subset of the Meade® LX200 Command Set making it compatible to many planetarium programs using this command set. Programs featuring special Gemini drivers can make use of the additional LX200-style extensions. Gemini also supports a Native Command Set as described below. Many of these features and a hub functionality allowing several programs to access the Gemini controller simultaneously can be accessed by using an [ASCOM driver](#).

Syntax: values in <> are (to be) replaced by actual values. Curled brackets {} show alternative characters. Upon completion, ASCII characters or strings are returned, if indicated.

Command	Returns	Remarks
0x06 (ACK char)	B# while the initial startup message is being displayed , b# while waiting for the selection of the Startup Mode, S# during a Cold Start or G# after completed startup.	Usable for testing the serial link and determining the type of mount (German equatorial). During Startup, with a "b#" being returned, the PC can select the startup mode by sending a <ul style="list-style-type: none"><li>• bC# for selecting the Cold Start,</li><li>• bW# for selecting the Warm Start and</li><li>• bR# for selecting the Warm Restart.</li></ul>
Synchronize		
:CE<character>#	<character>#	This commands echoes the given character, followed by a hash mark. It can be used to synchronize the serial data exchange. <b>NEW in L5</b>
:Cm#	No object!# or <object name>#	The string "No object!#" is returned if the mount is not aligned or no object was selected, otherwise the name of the selected object used is returned. This command does an "Additional Alignment", (re)calculating the current pointing model parameters and synchronizing to the position of the selected object.
:CM#	No object!# or <object name>#	The string "No object!#" is returned if the mount is not aligned or no object was selected, otherwise the name of the selected object used is returned. The position (RA and DEC) is synchronized to the position of the object by setting the Index or Flip parameters of the current model.
:C<n>#	<n>#	Select a pointing model. Currently two models (n=0, n=1) are supported. <b>NEW in L5</b>
:C?#	<n>#	Returns the number of the currently active pointing model. Currently two models (n=0, n=1) are supported. <b>NEW in L5</b>
:CI#	No object!# or <object name>#	The string "No object!#" is returned if the mount is not aligned or no object was selected, otherwise the name of the selected object used is returned. An Initial Align is done. The currently selected model is reset and the mount is synchronized to the selected object. <b>NEW in L5</b>
:CR#	<n>#	The currently selected model <n> is reset. <b>NEW in L5</b>

:CU#	<n>#	The last alignment of the currently selected model is reset. <b>NEW in L5</b>
Focus Control		
:F+#		Focus In
:F-#		Focus Out
:FQ#		Stop focusing
:FF#		Focus Fast
:FM#		Focus Medium
:FS#		Focus Slow
Get Information		
:GA#	<p>In Double Precision mode: {+-}&lt;dd&gt;.&lt;dddddd&gt;#</p> <p>In High Precision mode: {+-}&lt;dd&gt;:&lt;mm&gt;:&lt;ss&gt;#</p> <p>In Low Precision mode: {+-}&lt;dd&gt;°&lt;mm&gt;#</p>	Get Altitude (from L1, V2.0 up)
:GB#	<n>#	Get LED Display Brightness Value(from L1, V2.0 up) n=0: 100% n=6: 6.6% n=7: blank display n=8: test mode (all pixels lit).
:GC#	<mm>/<dd>/<yy>#	Local Calendar Date, month mm, days dd and years yy separated by slashes.
:Gc#	(24)#	Clock Format
:GD#	<p>In Double Precision mode: {+-}&lt;dd&gt;.&lt;dddddd&gt;#</p> <p>In High Precision mode: {+-}&lt;dd&gt;:&lt;mm&gt;:&lt;ss&gt;#</p> <p>In Low Precision mode: {+-}&lt;dd&gt;°&lt;mm&gt;#</p>	<p>Apparent (refraction included) Declination the telescope is pointing to, to the equinox of the date. Except during GoTo operations, the coordinates are corrected according to the pointing model.</p> <p>Signed degrees (-90 to +90), minutes, seconds. The degree sign in Low Precision mode is the character 0xDF.</p>
:GE#	<hh>:<mm>:<ss>#	Get Alarm time (from L1, V2.0 up)
:GG#	{+-}<hh># or {+-}<hh>:<mm>:<ss>#	Get the difference between local time and UTC (from L1, V2.0 up). If your local time is earlier than UTC this command will return a positive value, if later than UTC the value is negative. <b>The extended format with minutes and seconds is new in L5. Minutes and seconds will be omitted if both are zero.</b>
	{+-}<ddd>°<mm>#	

:Gg#	In Double Precision mode: {+-} <dd>.<dddddd>#	Get Site Longitude (from L1, V2.0 up)
:GH#	[ - <hh>:<mm>:<ss>#  In Double Precision mode: {+-} <hh>.<hhhhhh>#	Hour Angle the telescope is pointing to. From L4, V1.0 up.
:GI#	<Information Buffer Content>#	Get the content of the information buffer. Up to 256 characters, followed by a hash mark. <b>NEW in L5</b>
:GL#	<hh>:<mm>:<ss># In Double Precision mode: {+-} <hh>.<hhhhhh>#	Civil Time (UTC time from the internal Real Time Clock + UTC offset), hours, minutes, seconds in 24-hour format.
:Gm#	{EW}#	Get Telescope Mount's Side of Meridian. E# for East or W# for West side is replied. From L4, V1.0 up.
:GM#	<name string>#	Name (up to 15 characters) of the first site stored.
:GN#	<name string>#	Name (up to 15 characters) of the second site stored.
:GO#	<name string>#	Name (up to 15 characters) of the third site stored.
:GP#	<name string>#	Name (up to 15 characters) of the fourth site stored.
:GR#	In Double Precision mode: {+-} <hh>.<hhhhhh># High Precision mode: <hh>:<mm>:<ss># Low Precision mode: <hh>:<mm>.<m>#	Apparent (refraction included) Right Ascension the telescope is pointing to, to the equinox of the date. Despite during GoTo operations, the coordinates are corrected according to the pointing model. Hours (0 to 24), minutes, seconds or tenth of minutes.
:GS#	<hh>:<mm>:<ss># In Double Precision mode: {+-} <hh>.<hhhhhh>#	Sidereal Time. From L4, V1.0 up.
:Gt#	{+-}<dd>°<mm># In Double Precision mode: {+-} <hh>.<hhhhhh>#	Get Site Latitude (from L1, V2.0 up).
:GV#	<l><vv>#	Get Software Level l(one digit) and Version vv(two digits)
:GVD#	<mm> <dd> <yyyy>#	Get Software Built Date (from L4, V1.0 up)
:GVN#	<l>.<vv>#	Get Software Level l(one digit) and Version vv(two digits) (from L4, V1.0 up)

:GVP#	Losmandy Gemini#	Product String (from L4, V1.0 up)
:GVT#	<hh>:<mm>:<ss>#	Get Software Built Time (from L4, V1.0 up)
:Gv#	N (for "no movement") T (for Tracking) G (for Guiding) C (for Centering) S (for Slewing) ! for Stall	Get Maximum Velocity of both axes.
:GW#	N (for "no movement") T (for Tracking) G (for Guiding) C (for Centering) S (for Slewing) ! for Stall	Get Velocity RA <b>New in L5.</b>
:Gw#	N (for "no movement") T (for Tracking) G (for Guiding) C (for Centering) S (for Slewing) ! for Stall	Get Velocity DEC <b>New in L5.</b>
:Gu#	N (for "no tracking") T (for Tracking) G (for Guiding) C (for Centering) S (for Slewing) ! for Stall	Get Velocity RA, DEC (2 characters) <b>New in L5.</b>
:GZ#	In Double Precision mode: {+-} <hh>.<hhhhhh># In High Precision mode: <ddd>:<mm>:<ss>#  In Low Precision mode: <ddd>°<mm>#	Get Azimuth. From North over East. (From L4, V1.0 up)
Home Position		
:hP#		Move to Home Position. The Home Position defaults to the celestial pole visible at the given hemisphere (north or south) but can be set by the user at the Gemini.
Startup Position		
:hC#		Move to the Startup Position. This position is the position required for a Cold or Warm Start, pointing to the celestial pole of the given hemisphere (north or south), with the counterweight pointing downwards (CWD position). From L4, V1.0 up.

:hN#		Sleep Telescope: stop tracking, blank displays.
:hW#		Wake Up Telescope, restart tracking.
:h?#	2: Home/CWD Search in progress 1: Home/CWD Search done 0: Home/CWD Search failed or no :hP# or :hC# command was received.	Move to Home/CWD Position Status Inquiry
Move Telescope		Note: the directions mentioned depend upon the hemisphere of the observing site and the side of the mount the telescope actually is. Directions do not change when crossing one of the poles.
:MA#	0 1Object below horizon.# 2No object selected.# 3Manual Control.#	Slew to an object. The object selection had to be done by sending the Sz and Sa commands with the horizontal (Azimuth and Altitude) object coordinates. This command will be rejected while the system is in Manual Mode, f.i. identifying or selecting an object from the internal databases. From L4, V1.0 up.
:MF<n>	#	Move Find: for 0<256 move n arcmin in a Meander Search pattern at centering speed. Can be interrupted by :Q#. If not interrupted, Move Find will return to the start position after 6 cycles. For n=0 the position is changed ("wobbled") shaping an X with 5 arcmin legs moving at a quarter of the centering speed to detect faint objects.
:ML#	#	Move Lock: Slew commands :MS# and :MA# will be suppressed, error code 3 (Manual Control) will be returned.
:Ml#	#	Move Unlock: Slew commands :MS# or :MA# will be allowed to be executed again.
:Mf#	0 1Object below horizon.# 3Manual Control.# 4Position unreachable.#	Do a meridian flip and slew to the current coordinates.
:MM#	0 1Object below horizon.# 2No object selected.# 3Manual Control.# 4Position unreachable.# 5Not aligned.# 6Outside Limits.#	Slew to an object, doing a meridian flip if possible. Selection has had to be done locally (from Gemini's databases) or by sending the Sr and Sd commands with the equatorial object coordinates. This command will be rejected while the system is in Manual Mode, f.i. identifying or selecting an object from the internal databases.
	0 1Object below horizon.# 2No object	Slew to an object. Selection has had to be done locally (from Gemini's databases) or by sending the Sr and Sd commands with



:MS#	selected.# 3Manual Control.# 4Position unreachable.# 5Not aligned.# 6Outside Limits.#	the equatorial object coordinates. This command will be rejected while the system is in Manual Mode, f.i. identifying or selecting an object from the internal databases.
:Me#		Move eastwards at the selected speed rate.
:Mw#		Move westwards at the selected speed rate.
:Mn#		Move northwards at the selected speed rate.
:Ms#		Move southwards at the selected speed rate.
:mi<RA steps>;<DEC steps>#		Move axes by a certain amount of motor encoder ticks. The parameter value is multiplied by the factor given by the last :mm command (default 1). The allowed parameter range is 0..65535, signed to select the direction. If this range is not sufficient, a prescaler factor can be set by the :mm command.
:mm<step multiplier>#		Step multiplier for the :mi command. The step count parameter of the :mi command is multiplied by this factor.
<b>Precision Guiding</b>		
:Ma<direction><arcsecs>#		Moves into <direction> "e", "w", "n", "s" for <arcsecs> arc seconds. <arcsecs> are converted into motor encoder ticks, in L4 the result must not exceed 255 or will be cut off modulo 256.
:Mi<direction><steps>#		Moves into <direction> "e", "w", "n", "s" for <steps> (1 <= steps <= 255) motor encoder ticks.
:Mg<direction><time>#		Moves into <direction> "e", "w", "n", "s" for <time> milliseconds. <time> is converted into motor encoder ticks, in L4 the result must not exceed 255 or will be cut off modulo 256.
<b>Object/Observing/Output</b>		
:OC#		Clears the Observing Log.
:OI<catalog-id><object-id>#		Select an object object-id from Gemini's internal databases catalog-id. Catalog-id is a character selecting one of the contiguous catalogues: '1': Messier, '2': NGC, '3': IC, '4': Sh2, '7': SAO, ':': LDN, ';': LBN. Object-id is a numeric designation of the object in the catalogue; it can be followed by an extension character for NGC and IC catalogues.
:OO#	<current display content>#	Ask for the current content of the output display line (up to 32 characters followed by a hash mark). <b>New in L5.</b>
:Oo#	<previous display content>#	Ask for the current content of the output display line (up to 32 characters followed by a hash mark). <b>New in L5.</b>
:ON<name>#		Tells the Gemini system the name or identification of the selected object. If this command is not used, the name defaults to "PC Object". Using this command is recommended between the :Sr and :Sd commands for equatorial coordinates or the :Sz and :Sa commands for horizontal coordinates respectively. From L4, V1.0 up.
:OR#	<log entry>#	Reads the next line from the Observing Log.
:OS#		Points to the beginning of the Observing Log.
:Oc#		Delete all User Catalogue entries.

:Od<object line>#		<p>Download a User Catalogue entry to the Gemini. The object line consist of</p> <ul style="list-style-type: none"><li>• the object name (up to 10 ASCII characters),</li><li>• a comma ',' as delimiter,</li><li>• Right Ascension &lt;hh&gt;:&lt;mm&gt;:&lt;ss&gt;,</li><li>• Declination {+-}&lt;dd&gt;:&lt;mm&gt;:&lt;ss&gt;.</li></ul> <p>The coordinates have to be given for the epoch 2000.0.</p>
:On#	<n>#	0 <= n <= 4096: Read current number of Gemini's User Catalogue entries.
:Or#	<object line>#	Upload a User Catalogue entry from Gemini.
:Os#		Points to the beginning of the User Catalogue (for downloading).
<b>Precession and Refraction</b>		
:p0#		No precession calculation necessary in the Gemini. Coordinates transferred to the Gemini are already precessed to the equinox of the date. Refraction is not calculated.
:p1#		Precession calculation is to be done by Gemini. Coordinates transferred to the Gemini refer to the standard epoch J2000.0. Refraction is not calculated.
:p2#		No precession calculation necessary in the Gemini. Coordinates transferred to the Gemini are already precessed to the equinox of the date. Refraction is calculated. From L4, V1.0 up.
:p3#		Precession calculation is to be done by Gemini. Coordinates transferred to the Gemini refer to the standard epoch J2000.0. Refraction is calculated. From L4, V1.0 up.
<b>Precision</b>		
:P#	DBL PRECISION or HIGH PRECISION  or LOW PRECISION	All strings are 14 characters long (there are 2 blanks between LOW or DBL and PRECISION).
:U#		Toggle between Low Precision (short) and High Precision (long) mode. Gemini is in High Precision mode after starting up.
:u#		<b>NEW in L5</b> Select the Double Precision mode. Values will be displayed in signed floating point format with 6 digits after the decimal point. "Set" parameters can be send the same way.
<b>Quit Moving</b>		
:Q#		Quit all movements mentioned below.
:Qe#		Quit movement eastwards.
:Qw#		Quit movement westwards.
:Qn#		Quit movement northwards.
:Qs#		Quit movement southwards.
<b>Rate</b>		

:RC#		Rate Centre. Subsequent Move commands will move at Centering Speed.
:RG#		Rate Guide. Subsequent Move commands will move at Guiding Speed.
:RM#		Rate Move. Subsequent Move commands will move at Move/Find Speed.
:Rm[<sign>][<value>]#		Set Move Rate, either to an absolute value (if no sign was specified) given or (if a sign was given) as increment/decrement to the current rate. If no value is specified, Move Rate is set to the default value 50.
:RS#		Rate Slew. Subsequent Move commands will move at Slewing Speed.
Set		
:Sa{+-}<dd>{*°}<mm># or :Sa{+-}<dd>{*°}<mm>:<ss>#	0 if invalid or 1 if valid	Sets the object's altitude. A negative sign is ignored. Values greater than 90 degrees are set to 90 degrees. It is important that the :Sz# command has been send prior. If the coordinate selection is valid the object status is set to "Selected". From L4, V1.0 up.
:SB<n>#		Set LED Display Brightness Value(from L1, V2.0 up) n=0: 100% n=6: 6.6% n=7: blank display n=8: test mode (all pixels lit).
:SC<mm>/<dd>/<yy>#	0 if invalid or 1Updating planetary data# <24 blanks>#	Set Calendar Date: months mm, days dd, year yy of the civil time according to the timezone set. The internal calender/clock uses GMT.
:Sd{+-}<dd>{*°}<mm># or :Sd{+-}<dd>{*°}<mm>:<ss>#	0 if invalid or 1 if valid	Sets the object's declination. It is important that the :Sr# command has been send prior. Internal calculations are done that may take up to 0.5 seconds. If the coordinate selection is valid the object status is set to "Selected".
:SE<hh>:<mm>:<ss>#	1	Set Alarm Time from the civil time hours hh, minutes mm and seconds ss. The timezone has to be set before using this command.
:SG{+-}hh#	1	Set the number of hours by which your local time differs from UTC. If your local time is earlier than UTC set a positive value, if later than UTC set a negative value. The time difference has to be set before setting the calendar date (SC) and local time (SL), since the Real Time Clock is running at UTC.
:SM<name string>#	1	Set name of the first site stored. The minimum length of site name strings is 1 byte, the maximum length 15 bytes.
:SN<name string>#	1	Set name of the second site stored.
:SO<name string>#	1	Set name of the third site stored.
:SP<name string>#	1	Set name of the forth site stored.
:SL<hh>:<mm>:<ss>#	1	Set RTC Time from the civil time hours hh, minutes mm and seconds ss. The timezone has to be set before using this command.
:Sg{+-}<ddd>*<mm>#	1 if valid	Sets the longitude of the observing site to ddd degrees and mm minutes. The longitude has to be specified positively for western latitudes (west of Greenwich, the plus sign may be omitted) and negatively for eastern longitudes. Alternatively, 360 degrees may be added to eastern longitudes.

:Sp#	No object!# or 1 if object coordinates were set.	Precess coordinate transmitted by means of :Sr and :Sd to the equinox of the date.
:Sr<hh>:<mm>.<m># or :Sr<hh>:<mm>:<ss>#	0 if invalid or 1 if valid	Sets the object's Right Ascension and the object status to "Not Selected". The :Sd# command has to follow to complete the selection. The subsequent use of the :ON...# command is recommended.
:St{+-}<dd>*<mm>#	1 if valid	Sets the latitude of the observing site to dd degrees, mm minutes. The minus sign indicates southern latitudes, the positive sign may be omitted.
:Sw<n>#	1 if valid	Sets the Slewing rate for the Move commands
:Sz<ddd>{*°}<mm># or :Sz<ddd>{* °}<mm>:<ss>#	0 if invalid or 1 if valid	Sets the object's azimuth. From L4, V1.0 up.
Site Select		
:W<n>#		Select stored Site n with 0<=n<=3.

Gemini Native Commands

Many of Gemini's system settings that cannot be accessed using the LX200-like command set can be read or modified using the native command set implemented in Gemini. The native commands follow a simple syntax:

<<id>:<checksum>#	<parameter value><checksum>#	Get Value(from L2 up)
><id>:<parameter value><checksum>#		Set Value(from L2 up)

Id's and possible values in Level 5, Version 1.0:

A zero value disables comet tracking DEC movements.

Id	Get Parameters	Set Parameters	Get Return Values	Description and Remarks
0..6			0: Custom Mount 1: GM8 2: G-11 3: HGM-200 4: MI-250 5: Titan 6: Titan50	Mount Type. Custom mount support (Id 0 and also commands 21..28) was introduced in L4. Attention: The CI-700 entry was replaced by the MI-250. CI-700 can be supported as a custom mount.
10, 11..15			10: Neither use encoder nor end switches 11: Use Encoder 12: Test Encoder 13: Ignore Encoder 14: Use end switches 15: Don't use end switches	Axis Encoder port status. 10 can be used for requesting.
				RA worm gear ratio. The sign indicates the direction. <b>Note:</b> The 1,296,00 arcsec of a circle divided by the product of worm gear ratio, spur gear

21		{+-}80..720	{+-}80..720	ratio and motor encoder resolution define the step size per encoder tick. Gemini L4 supports step sizes from 0.2 arcsec/tick to 2.5 arcsec/tick. Combinations exceeding this range are not allowed.
22		{+-}80..720	{+-}80..720	DEC worm gear ratio. The sign indicates the direction. See note for command 21.
23		20..150	20..150	RA spur gear ratio. See notes for commands 21 and 27.
24		20..150	20..150	DEC spur gear ratio. See note for command 21.
25		100..2048	100..2048	RA motor encoder resolution. See notes for commands 21 and 27.
26		100..2048	100..2048	DEC motor encoder resolution. See note for command 21.
27			2000..25600	Number of RA steps for one worm revolution (since is a product of spur ratio and motor encoder ratio,this command can only be used for reading out the maximum step count, not for setting it). <b>Note:</b> This product must not exceed 25600. If higher values are reported the combination of RA spur gear ratio and motor encoder is invalid.
28			2000..25600	Amount of DEC steps for one worm revolution (since is a product of spur ratio and motor encoder ratio,this command can only be used for reading out the maximum step count, not for setting it).
97			Six revision characters 1: Site, 2: Date/Time, 3: Mount Parameter, 4: Display content, 5: Modelling parameters, 6: Speeds.	State Check. This string of characters can be requested periodically to be compared with a former state. Whenever one of these characters was changed, the corresponding serial commands can be used to get the latest information. The characters are initialized to a '0' (0x30), will be incremented up to '~' (0x7E) and will then start at '0' again. There can be multiple changes between requests. <b>NEW in L5</b>
99			Decimal sum of 1: Telescope is Aligned, 2: Modelling in use, 4: Object is selected, 8: GoTo operation is performed, 16: RA limit reached, 32: Gemini assumes object coordinates to refer to J2000.0 and precesses them to the equinox of the date.	Status Inquiry.

100		{+-}2048..32768	{+-}2048..32768	Encoder Resolution in RA.
101			0..Encoder Resolution RA-1	Get Encoder Value RA.
110		{+-}2048..32768	{+-}2048..32768	Encoder Resolution in DEC.
111			0..Encoder Resolution DEC-1	Get Encoder Value DEC.
120		20..2000	20..2000	Manual Slewing Speed.
121		20..2000	20..2000	Manual Slewing Speed in RA. <b>New in L5.</b>
122		20..2000	20..2000	Manual Slewing Speed in DEC. <b>New in L5.</b>
130, 131..137			131: Sidereal 132: King Rate 133: Lunar 134: Solar 135: Terrestrial Mode 136: Closed Loop 137: Comet/User Defined	Tracking Rate. 130 can be used for requesting.
140		20..2000	20..2000	GoTo Slewing Speed (for both axes).
141		20..2000	20..2000	GoTo Slewing Speed in RA. <b>New in L5.</b>
142		20..2000	20..2000	GoTo Slewing Speed in DEC. <b>New in L5.</b>
145		20..2000	20..2000	Move Speed (for both axes). <b>New in L5.</b>
146		20..2000	20..2000	Move Speed in RA. <b>New in L5.</b>
147		20..2000	20..2000	Move Speed in DEC. <b>New in L5.</b>
150		0.2..0.8	0.2..0.8	Guiding Speed (for both axes).
151		0.2..0.8	0.2..0.8	Guiding Speed in RA. <b>New in L5..</b>
152		0.2..0.8	0.2..0.8	Guiding Speed in DEC. <b>New in L5..</b>
160, 161..163			161: Visual Mode 162: Photo Mode 163: All Speeds	Classical Hand Controller Mode. 160 can be used for requesting.
170		1..255	1..255	Centering Speed (for both axes).
171		1..255	1..255	Centering Speed in RA. <b>New in L5..</b>
172		1..255	1..255	Centering Speed in DEC. <b>New in L5..</b>
180, 181..182			181: Alarm Off 182: Alarm On	Alarm Mode. 180 can be used for requesting.
190, 191..192			191: RA Motor stopped. 192: RA Motor moving.	RA Motor Movement. Command 190 can be used to obtain the current status, 191 for stopping and 192 for restarting the tracking.
200		0..255	0..255	TVC Step Count.
201		{+-}0..65535	{+-}0..65535	Modelling Parameter A (Polar Axis Misalignment in Azimuth), in seconds of arc.
202		{+-}0..65535	{+-}0..65535	Modelling Parameter E (Polar Axis Misalignment in Elevation), in seconds of arc.
203		{+-}0..65535	{+-}0..65535	Modelling Parameter NP (Axes Non-Perpendicularity at the Pole), in seconds of arc.

204		{+-}0..65535	{+-}0..65535	Modelling Parameter NE (Axes Non-Perpendicularity at the Equator), in seconds of arc.
205		{+-}0..65535	{+-}0..65535	Modelling Parameter IH (Index Error in Hour Angle), in seconds of arc.
206		{+-}0..65535	{+-}0..65535	Modelling Parameter ID (Index Error in Declination), in seconds of arc.
207		{+-}0..65535	{+-}0..65535	Modelling Parameter FR (Mirror Flop/Gear Play in RA), in seconds of arc.
208		{+-}0..65535	{+-}0..65535	Modelling Parameter FD (Mirror Flop/Gear Play in Declination), in seconds of arc.
209		{+-}0..65535	{+-}0..65535	Modelling Parameter CF (Counterweight & RA axis Flexure), in seconds of arc.
211		{+-}0..65535	{+-}0..65535	Modelling Parameter TF (Tube Flexure), in seconds of arc.
220			<ddd>d<mm>; <ddd>d<mm>	Set the respective Safety Limit to the current position. The Get function returns the eastern and western safety limits currently set. <b>Note:</b> Gemini will automatically compensate if you change hemispheres by swapping the eastern and western limits. This is because the mount is oriented northwards in the northern hemisphere and southwards in the southern hemisphere and so the side of the mount that faces east in the northern hemisphere will face west in the southern hemisphere and vice versa.
221		<ddd>d<mm>	<ddd>d<mm>	Get/Set eastern Safety Limit with respect to the meridian in degrees ddd and minutes mm. See note at command 220.
222		<ddd>d<mm>	<ddd>d<mm>	Get/Set western Safety Limit with respect to the meridian in degrees ddd and minutes mm. See note at command 220.
223		<ddd>d<mm>	<ddd>d<mm>	Get/Set Western GoTo limit (with respect to the meridian) in degrees ddd and minutes mm. GoTo operations will include a meridian flip if necessary to stay outside this limit. Note: If the RA angles usable for GoTo operations (East Safety Limit to Western GoTo limit) are not sufficient to point to any location, GoTo operations to unreachable locations will be refused and the hand controller will display "Interrupted". A zero value (000d00) indicates that the GoTo Limit wasn't set yet and the default (002d30, allowing for at least 10 minutes tracking the object) is to be used.
225			<seconds>	Get Amount of steps (motor encoder ticks) to Western GoTo Limit. <b>NEW in L5</b>

226			<seconds>	Get Tracking Time to Western GoTo Limit in seconds. <b>NEW in L5</b>
230			<east>;<west>	Get physical Safety Limits in clusters of 256 motor encoder ticks. See note at command 221.
231			<east>;<west>	Get Amount of steps (motor encoder ticks) to the Safety Limits. <b>NEW in L5</b>
235			<ra_clusters>;<dec_clusters>	Get current physical RA and DEC axes position in clusters of 256 motor encoder ticks.
236			0..255;0..255	Get the remainders of the current physical RA and DEC axes position clusters.
237			<ra_clusters>;<dec_clusters>	Get the size of a half physical circle in clusters of 256 motor encoder ticks.
238			<ra ticks>;<dec ticks>	Get the size of a half physical circle in motor encoder ticks. <b>NEW in L5</b>
239			<ra ticks>;<dec ticks>	Get current physical RA and DEC axes position in motor encoder ticks. <b>NEW in L5</b>
311		0..15	0..63	Feature Port Status. 4 bits (0..15) can be used for setting input/output bits, 6 bits (including two additional input only bits 16 and 32, extending the range to 0..63) are available for input.
312			0..15	Encoder Port Status. 4 bits (0..15) can be used for reading or setting input/output bits if it is not intended to connect mount axis encoders but to use these channels alternatively.
411		Up to L4: 256..65535 L5: 0..4294967295	Up to L4: 256..65535 L5: 0..4294967295	RA (comet) tracking rate divisor. Up to L4, the RA timer runs at 1.5 MHz, using this divisor the tracking rate can be adapted to the (mount dependent) speed of an object to be tracked. Attention: up to L4, several internal prescalers may be used for further dividing down the frequency. <b>NEW in L5</b> The divisor corresponds to a 12.0 MHz timer.
412		Up to L4: {+-} }0..65535 L5: {+-} }0..2147483647	Up to L4: {+-} }0..65535 L5: {+-} }0..2147483647	DEC comet tracking rate divisor. <b>Attention: Changed Meaning!</b> In L3, there was no timer for DEC comet tracking available, the DEC divisor referred to the number of RA steps to be done for one step in DEC. In L4, the divisor value counts the number of internal timer ticks (at 22.888 18359 Hz) per one step in DEC, independently from RA. This corresponds to 0.657154312 arcsec/tick <b>NEW in L5</b> The divisor corresponds to a 12.0 MHz timer. The absolute value is limited to 31bit(2G), the sign indicates the direction. The least significant bit is



				discarded.
413		Up to L4: 256..65535 L5: 0..4294967295	Up to L4: 256..65535 L5: 0..4294967295	RA- (slow, eastwards) guiding rate divisor. L4: While guiding eastwards, an additional 4x prescaler is active. L4: A value of zero returned means a timer set to the maximum of 65536. <b>NEW in L5</b> The divisor corresponds to a 12.0 MHz timer.
414		Up to L4: 256..65535 L5: 0..4294967295	Up to L4: 256..65535 L5: 0..4294967295	RA+ (fast, westwards) guiding rate divisor. See description to command 413. <b>NEW in L5</b> The divisor corresponds to a 12.0 MHz timer.
415		Up to L4: 0..65535 L5: 0..4294967295	Up to L4: 0..65535 L5: 0..4294967295	DEC guiding rate divisor. <b>NEW in L5</b> The divisor corresponds to a 12.0 MHz timer.
501		0..PECmax	0..PECmax	Current RA PEC counter in steps, from 0 to the maximum step count per worm revolution PECmax. This maximum is the product of RA motor encoder resolution and spur gear ratio. It can be calculated multiplying the return values of the <23 and <25 commands or can be obtained directly by <27.
502			0.2 .. 0.8	Guiding Speed used for training PEC. Only valid if PEC was trained or PEC data were downloaded, see command 509. The set command can be used without parameters and sets the guiding speed back to the value used for training.
503		0..25600	0..25600	Maximum RA PEC counter in steps, from 0 to the maximum step count per worm revolution PECmax. This maximum is calculated as the product of RA motor encoder resolution and spur gear ratio at startup and whenever mount type or mount parameter are changed. Using this command, PECmax can be set to user defined values, f.i. to allow multiple worm cycles to be recorded.
504		0..255	0..255	Maximum consecutive RA PEC steps. 0 disables step supervision. Higher values define the maximum count of PEC steps in a row to enforce tiny corrections. After this maximum count is reached, normal tracking speed is reestablished.
509		0..63	0..63	PEC status. Decimal sum of: 1: PEC active, 2: freshly trained (not yet altered) PEC data are available as current PEC data, 4: PEC training in progress,

				8: PEC training was just completed, 16: PEC training will start soon, 32: PEC data are available.
511	offset	value;offset;repeat count	value;repeat count	Currently used PEC data. [value] can be 0 (=normal tracking), 1 (RA-, guiding eastwards) or 8 (RA+, guiding westwards). [offset] ranges from 0 to PECmax-1. [repeat count] indicates the number of equal values starting at the given offset.
512	offset	value;offset;repeat count	value;repeat count	Saved PEC data. [value] can be 0 (=normal tracking), 1 (RA-, guiding eastwards) or 8 (RA+, guiding westwards). [offset] ranges from 0 to PECmax-1; [repeat count] indicates the number of equal values starting at the given offset.
521			RA-/slow step count; normal step count; RA+/fast step count	PEC statistics. Three decimal values, summing up the steps at the three speeds.
601				Select English as language for the following display outputs. <b>NEW in L5</b>
602				Select German as language for the following display outputs. <b>NEW in L5</b>
603				Select French as language for the following display outputs. <b>NEW in L5</b>
604				Select Spanish as language for the following display outputs. <b>NEW in L5</b>
801	IPv4 address	IPv4 address		IP version 4 address in decimal dotted notation. Activates new network settings immediately. <b>NEW in L5</b>
802	IPv4 netmask	IPv4 netmask		IP version 4 netmask in decimal dotted notation. Activates new network settings immediately. <b>NEW in L5</b>
803	IPv4 default gateway	IPv4 default gateway		IP version 4 gateway address in decimal dotted notation. Activates new network settings immediately. <b>NEW in L5</b>
804	IPv4 primary name server address	IPv4 primary name server address		IP version 4 name server address in decimal dotted notation. Activates new network settings immediately. <b>NEW in L5</b>
805	IPv4 secondary name server address	IPv4 secondary name server address		IP version 4 name server address in decimal dotted notation. Activates new network settings immediately. <b>NEW in L5</b>
810	0: don't use DHCP 1: use DHCP	0: don't use DHCP 1: use DHCP		Decides whether DHCP is activated at startup or not. <b>NEW in L5</b>

811	IPv4 address	IPv4 address		IP version 4 address in decimal dotted notation. <b>NEW in L5</b>
812	IPv4 netmask	IPv4 netmask		IP version 4 netmask in decimal dotted notation. <b>NEW in L5</b>
813	IPv4 default gateway	IPv4 default gateway		IP version 4 gateway address in decimal dotted notation. <b>NEW in L5</b>
814	IPv4 primary name server address	IPv4 primary name server address		IP version 4 name server address in decimal dotted notation. <b>NEW in L5</b>
815	IPv4 secondary name server address	IPv4 secondary name server address		IP version 4 name server address in decimal dotted notation. <b>NEW in L5</b>
910	filename		'0' if file not found '1' if file was opened	Open a file for downloading it
911			'0' if error '2' followed by data	Read file data
912	filename		'0' file not deleted '1'file deleted	Delete a file.
43690				Reset to Losmandy HGM default values.
43691				Reset to Mountain Instruments default values.
65533				Reboot the Gemini controller software, enforcing a Cold Start.
65534				Reboot the Gemini controller software.
65535				Reboot the Gemini controller software.

Using the native commands:

- The Identification tag is interpreted as an integer value, leading zeros are ignored.
- Parameters are separated from the Id and from each other by hyphens.
- The checksum for the native commands is calculated by a bitwise XOR operation of the transmitted characters, including the Get/Set command sign ('<', '>') and colon ':'. The highest significant bit of the result is cleared (modulo 128 operation) and 64 is added.
- Undefined Ids are ignored in Set operations. For Get operations, only a hash mark will be returned.
- In Debug Mode, the expected and the received checksum are displayed on the hand controller display in hexadecimal format whenever a discrepancy is detected. A command sent with a wrong checksum will not be executed.

Examples

- Get the Mount Type: "<0:v" and "<00:F#" are equivalent.
- "<1:w#" and "<2:t#" and "<3:u#" will deliver the same result, f.i. the string "1q#" if the mount type is set to GM-8 or "2r#" if G-11 is selected.

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# Solar System objects

Sun

# SD Card

## Current SD Card Directory: LOGS

File Name	File Size	Creation Date
.	Directory	02.03.2012 17:03
..	Directory	02.03.2012 17:03
<a href="#">Gemini.log</a>	921	02.03.2012 17:03
<a href="#">POINTING.DAT</a>	3.421	02.03.2012 17:09
<a href="#">MODEL.LOG</a>	3.851	12.03.2012 16:28
3 File(s) 8.193 bytes		
2 Dir(s) 2.012.872.704 bytes free.		

## Upload a file to the SD Card's current directory

Select a File to upload to SD Card:  
no file selected

## Format SD Card

SD Card Volume Label:

# SD Card

## Current SD Card Directory: EN

File Name	File Size	Creation Date
.	Directory	25.03.2012 17:18
..	Directory	25.03.2012 17:18
<a href="#">AD.CGI</a>	5.315	25.03.2012 17:18
<a href="#">AD.CGX</a>	265	25.03.2012 17:18
<a href="#">BUTTONS.CGI</a>	1.623	25.03.2012 17:18
<a href="#">BUTTONS.CGX</a>	72	25.03.2012 17:18
<a href="#">catalogues.cgi</a>	1.077	25.03.2012 17:18
<a href="#">CATNAMES.CGI</a>	1.692	25.03.2012 17:18
<a href="#">CATS.HTM</a>	572	25.03.2012 17:18
<a href="#">CGIcodes.txt</a>	13.417	25.03.2012 17:18
<a href="#">CONTENT.CGI</a>	1.132	25.03.2012 17:18
<a href="#">coordinates.cgi</a>	5.416	25.03.2012 17:18
<a href="#">DOWNLOAD.CGI</a>	1.378	25.03.2012 17:18
<a href="#">DYNCAT.CGI</a>	568	25.03.2012 17:18
<a href="#">FIRMWARE.CGI</a>	3.898	25.03.2012 17:18
<a href="#">Flash.cgi</a>	1.107	25.03.2012 17:18
<a href="#">functions.cgi</a>	6.040	25.03.2012 17:18
<a href="#">functions_old.cgi</a>	5.580	25.03.2012 17:18
<a href="#">Gemini_Logo.jpg</a>	9.625	25.03.2012 17:18
<a href="#">INDEX.HTM</a>	5.029	25.03.2012 17:27
<a href="#">L5V1serial.html</a>	51.711	25.03.2012 17:18
<a href="#">LLBLUE.JPG</a>	3.008	25.03.2012 17:18
<a href="#">Losmandy_Logo.gif</a>	33.296	25.03.2012 17:18
<a href="#">MODELING.CGI</a>	4.430	25.03.2012 17:18
<a href="#">MOUNTPAR.CGI</a>	8.919	25.03.2012 17:18
<a href="#">NETWORK.CGI</a>	3.385	25.03.2012 17:18
<a href="#">PABB.GIF</a>	121	25.03.2012 17:18
<a href="#">pg_header.inc</a>	197	25.03.2012 17:18
<a href="#">SD.CGI</a>	1.859	25.03.2012 17:18
<a href="#">SER.CGX</a>	11	25.03.2012 17:18
<a href="#">SERIAL.CGI</a>	3.542	25.03.2012 17:18
<a href="#">SITETIME.CGI</a>	5.277	25.03.2012 17:18
<a href="#">SMP.CGI</a>	1.227	25.03.2012 17:18
<a href="#">STATE.CGI</a>	8.000	25.03.2012 17:18
<a href="#">STATE.CGX</a>	1.853	25.03.2012 17:18
<a href="#">SYSTEM.CGI</a>	1.482	25.03.2012 17:18
<a href="#">TCP.CGI</a>	1.150	25.03.2012 17:18
<a href="#">USB.cgi</a>	1.136	25.03.2012 17:18

<a href="#">XML HTTP.JS</a>	4.001	25.03.2012 17:18
37 File(s) 198.411 bytes		
2 Dir(s) 2.012.872.704 bytes free.		

**Upload a file to the SD Card's current directory**

Select a File to upload to SD Card:  
no file selected

---

**Format SD Card**

SD Card Volume Label:

# SD Card

## Current SD Card Directory: MHC

File Name	File Size	Creation Date
.	Directory	25.03.2012 17:18
..	Directory	25.03.2012 17:18
<a href="#">GEMINI.CSS</a>	3.905	25.03.2012 17:19
<a href="#">Images</a>	Directory	25.03.2012 17:18
<a href="#">GEMINI.JS</a>	58.162	25.03.2012 17:19
<a href="#">HCCATS.CGI</a>	8	25.03.2012 17:19
<a href="#">HCGOTO.CGI</a>	5	25.03.2012 17:19
<a href="#">HCMODEL.CGX</a>	543	25.03.2012 17:19
<a href="#">hcmodellist.cgi</a>	6	25.03.2012 17:19
<a href="#">HCMOUNT.CGX</a>	1.315	25.03.2012 17:19
<a href="#">HCSITE.CGX</a>	350	25.03.2012 17:19
<a href="#">HCSTATE.CGX</a>	1.064	25.03.2012 17:19
<a href="#">hctracking.cgx</a>	362	25.03.2012 17:19
<a href="#">jquery-1.6.2.min.js</a>	91.556	25.03.2012 17:19
<a href="#">jquery.mobile-1.0b3.min.js</a>	77.056	25.03.2012 17:19
<a href="#">jquerymobile-10b3min.css</a>	45.936	25.03.2012 17:19
<a href="#">mhc.html</a>	32.698	25.03.2012 17:19

14 File(s) 312.966 bytes  
3 Dir(s) 2.012.872.704 bytes free.

## Upload a file to the SD Card's current directory

Select a File to upload to SD Card:  
no file selected

## Format SD Card

SD Card Volume Label:





# SD Card

## Current SD Card Directory: HC

File Name	File Size	Creation Date
.	Directory	25.03.2012 17:19
..	Directory	25.03.2012 17:19
<a href="#">BUTTONUP.GIF</a>	3.836	25.03.2012 17:19
<a href="#">buttondown.gif</a>	3.749	25.03.2012 17:19
<a href="#">HandControl.html</a>	28.968	25.03.2012 17:19
<a href="#">HCCATS.CGI</a>	8	25.03.2012 17:19
<a href="#">HCDYNCAT.CGI</a>	9	25.03.2012 17:19
<a href="#">HCGOTO.CGI</a>	5	25.03.2012 17:19
6 File(s) 36.575 bytes		
2 Dir(s) 2.012.872.704 bytes free.		

## Upload a file to the SD Card's current directory

Select a File to upload to SD Card:  
no file selected

---

## Format SD Card

SD Card Volume Label:

# SD Card

## Current SD Card Directory: DOC

File Name	File Size	Creation Date
.	Directory	25.03.2012 17:28
..	Directory	25.03.2012 17:28
<a href="#">HC-Tutorial.pdf</a>	4.580.952	25.03.2012 17:28
<a href="#">PAA Tutorial.pdf</a>	1.203.367	25.03.2012 17:28
2 File(s) 5.784.319 bytes		
2 Dir(s) 2.012.872.704 bytes free.		

## Upload a file to the SD Card's current directory

Select a File to upload to SD Card:  
no file selected

---

## Format SD Card

SD Card Volume Label:

# SD Card

## Current SD Card Directory: Catalogs

File Name	File Size	Creation Date
.	Directory	25.03.2012 17:16
..	Directory	25.03.2012 17:16
<a href="#">Arp_EN.guc</a>	29.528	25.03.2012 17:16
<a href="#">BSL.guc</a>	5.786	25.03.2012 17:16
<a href="#">Caldwell_EN.guc</a>	6.335	25.03.2012 17:16
<a href="#">Cederblad_EN.guc</a>	11.652	25.03.2012 17:16
<a href="#">Combined_Constellation_Stars.guc</a>	11.904	25.03.2012 17:16
<a href="#">G2V_EN.guc</a>	38.497	25.03.2012 17:16
<a href="#">Herschel400_EN.guc</a>	27.031	25.03.2012 17:16
<a href="#">IC.guc</a>	145.739	25.03.2012 17:16
<a href="#">LBN_EN.guc</a>	65.559	25.03.2012 17:16
<a href="#">LDN_EN.guc</a>	64.963	25.03.2012 17:16
<a href="#">Messier.guc</a>	5.730	25.03.2012 17:16
<a href="#">NGC.guc</a>	231.453	25.03.2012 17:16
<a href="#">PN.guc</a>	34.290	25.03.2012 17:16
<a href="#">SAO.guc</a>	529.080	25.03.2012 17:16
<a href="#">Sharpless_EN.guc</a>	15.846	25.03.2012 17:16
<a href="#">Southern_Constellation_Stars.guc</a>	8.585	25.03.2012 17:16
<a href="#">Struve_EN.guc</a>	266.993	25.03.2012 17:16
<a href="#">WDS.guc</a>	123.628	25.03.2012 17:16

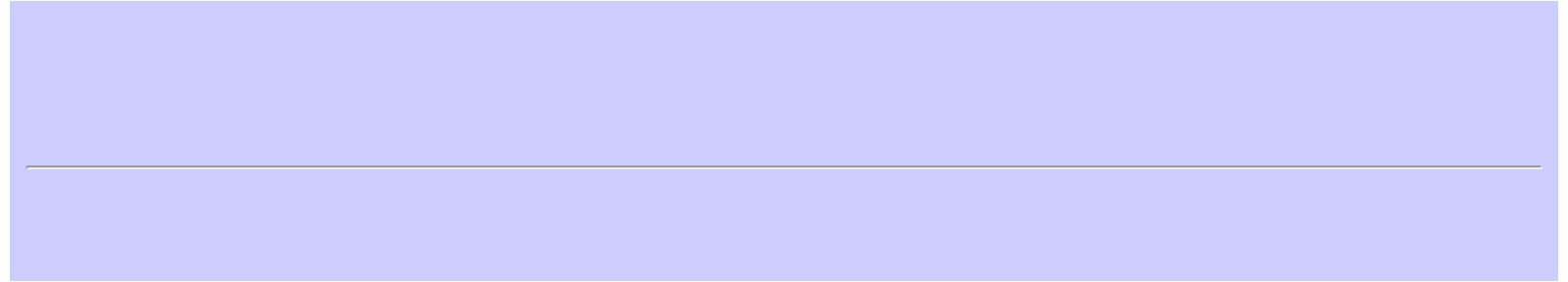
18 File(s) 1.622.599 bytes  
2 Dir(s) 2.012.872.704 bytes free.

## Upload a file to the SD Card's current directory

Select a File to upload to SD Card:  
no file selected

## Format SD Card

SD Card Volume Label:



# SD Card

## Current SD Card Directory: HCFirmware

File Name	File Size	Creation Date
.	Directory	25.03.2012 17:19
..	Directory	25.03.2012 17:19

0 File(s) 0 bytes  
2 Dir(s) 2.012.872.704 bytes free.

## Upload a file to the SD Card's current directory

Select a File to upload to SD Card:  
no file selected

## Format SD Card

SD Card Volume Label:

# Mount Coordinates

Hour Angle Axis Physical Position	00864000	Declination Axis Physical Position	00864000
Right Ascension	12:24:49	Declination	+90:00:00
Target Right Ascension		Target Declination	
Hour Angle Target Physical Position	00000000	Declination Axis Target Physical Position	00000000

Azimuth	359:59:59	Elevation	+34:05:22
Target Azimuth		Target Elevation	

---

# Time Settings

Civil Date(dd.mm.yyyy)		Civil Time	
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UTC Date(dd.mm.yyyy)		UTC Time	
Julian Date	2456012.30367	Sidereal Time	23:38:29

# SD Card

## SD Card File Directory

File Name	File Size	Creation Date
<a href="#">LOGS</a>	Directory	02.03.2012 17:03
<a href="#">FR</a>	Directory	25.03.2012 17:18
<a href="#">DE</a>	Directory	25.03.2012 17:18
<a href="#">EN</a>	Directory	25.03.2012 17:18
<a href="#">ES</a>	Directory	25.03.2012 17:18
<a href="#">MHC</a>	Directory	25.03.2012 17:18
<a href="#">HC</a>	Directory	25.03.2012 17:19
<a href="#">DOC</a>	Directory	25.03.2012 17:28
<a href="#">Catalogs</a>	Directory	25.03.2012 17:16
<a href="#">HCFirmware</a>	Directory	25.03.2012 17:19
<a href="#">Cur_Gem2.bin</a>	237.596	25.03.2012 17:21

1 File(s) 237.596 bytes  
10 Dir(s) 2.012.872.704 bytes free.

## File Upload

Upload a file to the SD Card root folder.

Select a File to upload to SD Card:  
no file selected



# Functions

## GoTo Coordinate Input

### RA/DEC

Right Ascension	12:24:54	Declination	+90:00:00
Target Right Ascension		Target Declination	

### Physical Position

Hour Angle Axis Physical Position	00864000	Declination Axis Physical Position	00864000
Hour Angle Target Physical Position		Declination Axis Target Physical Position	

### Alt/Az

Azimuth	359:59:59	Elevation	+34:05:22
Target Azimuth		Target Elevation	

---

## Park/Wakeup Mount

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## Classic Hand Controller Mode

Terrestrial

# SD Card

## Current SD Card Directory: Images

File Name	File Size	Creation Date
2.012.872.704 bytes free.		

## Upload a file to the SD Card's current directory

Select a File to upload to SD Card:  
no file selected

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## Format SD Card

SD Card Volume Label: