Gemini-II web interface

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1. Introduction

Gemini's internal web server searches the files requested by the HTTP URLs first on the SD card. Only very few pages, like an initial index.htm, sd.cgi and error pages are stored hard-coded in the firmware as a fallback if the SD card is empty, freshly formatted or faulty. This gives the user the possibility to customize the web interface at will. He can put static files on the SD card (HTML, JPEG, PNG, ...) if the browser can interpret them correctly.

Important to find the files is their location. Currently Gemini's web server supports four languages: English, German, French and Spanish. For these languages, directories EN, DE, FR and ES exist on the SD card, which contain the web pages in the respective

languages.

Whenever a web page is requested, the web server examines the language code in the HTTP header the browser sent according to its setup, changes to the directory (or defaults to EN if the language is not (yet) supported and tries to open the file. If this is successful and the file name extension does not mark it as a dynamic HTML file, the file content is transmitted to the browser.

All commands and parameters described below are case sensitive!

2. Dynamic .cgi files

2.1. Format description

These files are analyzed and interpreted line by line. A line must not exceed 120 characters.
Each line starts with a character describing how to to interpret it:

'#' A hash mark tells the interpreter to ignore this line
't' Text. The line will be sent to the browser without any changes
'i' This line will be replaced by the file with the given name included,
'c' This line will be interpreted, the output will be dynamically build.
'.' End of file.

Lines starting with the character 'c' will have some more characters following determining how to interpret them. The second character will be ignored, the third character will be used for the first and most important selection. Depending on this, the fifth character may be used as a secondary choice.

Dynamic files are examined and the returned content is generated at runtime. If you don't want to build your own .cgi-file, there's a dummy file "command.cgi" included in the Gemini firmware image, that allows to work with the parameters given below.

2.2 cgi file parameter list

'a' Network parameters

	i	current IP address
	m	current netmask
	g	current default gateway
	p	current primary DNS server
	q	current secondary DNS server
	a	current MAC address
	I	static IP address
	M	static netmask
	G	static default gateway
	P	static primary DNS server
	Q	static secondary DNS server
	N	NTP server address
	A	static MAC address
	T	DHCP timeout span
	d	displays "checked" if DHCP is selected
	U	UDP Port number

```
                u       accepted IP address
for UDP communication or 0 for all
                t       TCP Port number for
transparent BSD socket
                c       accepted IP address
for TCP BSD socket or 0 for all

'A'     A/D (battery, 12V, Feature port)
                1
                ..
                6

'b'     Default Boot mode
                0
                ..
                3

'B'     Preferred Browser language

'C'     Coordinates
                p       current PRA position
                q       current DEC position
                r       current apparent RA
position
                d       current apparent DEC
```

```
position
                i       current telescopic RA
position
                j       current telescopic DEC
position
                R       target RA position
                D       target DEC position
                a       current Az position
                e       current El position
                A       target Az position
                E       target El position
                n       target name
                s       apparent target TRA
position
                t       apparent target TDEC
position
                h       telescopic target TRA
position
                m       telescopic target TDEC
position
                u       difference target RA -
telescope RA
                v       difference target DEC
- telescope DEC
                U       difference unmodelled
```

```
target RA - telescope RA
                V       difference unmodelled
target DEC - telescope DEC
                Y       current RA worm PEC
pointer position
                S       Serial Emulator output
string
'c'     TCP status

'D'     Databases
                D       name of current
directory
                d       complete directory
                f       catalog files
directory
                F       catalogue files
                t       catalogue content
                S       object selection
                s       flash chip selection
                i       object info
(state.cgi)

'd'     System password - file 'system.cgi'

'E'     Axis encoder
```

```
                R       resolution X / RA
                D       resolution Y / DEC
                r       current value X / RA
                d       current value Y / DEC
                x       X / RA readout errors
                y       Y / RA readout errors

'e'     Encoder Port Usage

'F'     Firmware
                f       SD card label
                i       current firmware info
                B       firmware .bin file
names
                b       firmware .bin file
directory entries
                s       board serial #

'g'     Graphic HC brightness
'G'     Graphic HC color scheme

'H'     Hardware
                S       Get Serial Number

'h'     Classic HC mode
```

```
                0       Visual Mode
                1       Photo Mode
                2       All Speeds Mode

'I'     Information
          'I' Information Buffer Content
          'H' Hand Controller Display
          'S' Serial emulation return string
'i'     returns currently selected site (1..4)

'K'     returns current Parking mode
preselection (0..2)

'k'     returns current PEC state

'L'     Safety Limits in steps
                r       right
                l       left
                g       Western GoTo Limit
                t       Time to western limit
'l'     Browser Language - file 'language.cgi'

'M'     Gearing:
                W       RA worm ratio
                w       DEC ...
```

```
                S       RA spur ratio
(unsigned int)
                s       DEC ...
                X       RA spur ratio (double)
                Y       DEC ...
                R       RA motor nominal
encoder resolution
                r       DEC
                A       RA step size
(double)
                a       DEC ...
                T       DEC TVC step count
'm'     Mount Type
                0
                ..
                6

'N'     Mount Design
                0       (German) Equtorial
                1       Alt/Az


'n'     tracking rate selection
                0       Sidereal
                1       King
```

```
                2       Lunar
                3       Solar
                4       Terrestrial
                5       Closed Loop
                6       Comet/User Defined
'O'     Object
                'n'     name of selected
object or "---"

'Q'     Filename to store the currently
selected telescope pointing model

'P'     Model parameters
                E       Alignment count in the
East
                W       ... West
                a       Azimuth
                e       Elevation
                c       Non-Polarity at the
Meridian
                n       Non-Polarity at the
Pole
                h       Index error in HA
                d       Index error in DEC
                t       Tube Flexure
```

```
                C       Counterweight flexure
                F       Flip in RA
                f       Flip in DEC
                0..1    currently selected
model
                s       swap :CM# and :Cm#

'p'     serial port setings - file 'serial.cgi

'Q'     Parking mode preselection
                0       Unpark on any Move
command
                1       Unpark on GoTo or
Unpark commands
                2       Unpark only after
Unpark command

'q'     GPS port

'R'     Axis Movement
                r       RA/AZ
                d       DEC/EL

'S'     Safety Limits in degrees/minutes
                r       right
```

```
                l       left
                g       WestGoToLimit
's'     Site Settings
                n       name of site
                t       timezone
                o       longitude
                a       latitude
                e       elevation
                #       site number

'T'     time:
                U       UTC date
                u       UTC time
                C       Civil Date
                c       Civil time
                s       Sidereal time
                m       Julian Date
(floating poit)
't'     moving mode
                x       RA axis state, f.i.
currently active tracking rate
                        (sidereal, solar,
lunar, terrestrial, comet, ...),
                        Slewing, No Motion,
Centering, Guiding, STALL
```

(language-dependend string)

	y	DEC axis state...
	L	RA axis lag [steps], range -400..400
	l	DEC axis lag [steps], range -400..400
	P	RA motor PWM duty cycle, -100..100
	p	DEC motor PWM duty cycle, -100..100
	T	warning treshold for offset in RA/Az while holding position/guiding/tracking
	t	warning treshold for offset in DEC/El while holding position/guiding/tracking
	H	warning treshold for heavy load (high PWM duty cycle) in RA/Az while holding position/guiding/tracking
	h	warning treshold for heavy load (high PWM duty cycle) in DEC/El while holding position/guiding/tracking
	S	warning treshold for heavy load (high PWM duty cycle) in RA/Az while slewing

	s	warning treshold for heavy load (high PWM duty cycle) in DEC/El while slewing

'V' Velocities:

	S	Manual Slewing RA
	s	Manual Slewing DEC
	M	Move Speed RA
	m	Move Speed DEC
	T	GoTo Slewing RA
	t	GoTo Slewing DEC
	A	Slewing Acceleration RA
	a	Slewing Acceleration DEC
	C	Centering RA
	c	Centering DEC
	G	Guiding RA
	g	Guiding DEC

'X' Servo motor curve parameters (Attention: Wrong values could burn the motors!)

	P	Proportional value for the X axis (RA, AZ)

```
                p       Proportional value for
the Y axis (DEC, EL)
                D       Differential value for
the X axis (RA, AZ)
                d       Differential value for
the Y axis (DEC, EL)

'z'     State   (may be expanded later, please
test single bits)
                0       currently waiting for
startup mode selection
                1       Gemini started up
```

2.3 Serial Port Emulator

This emulator bridges the gap between the HTTP-based web interface and the serial commands. Commands sent as string value of the SE= parameter are executed by the serial command interpreter. It is possible to send several serial commands at once, but it must be assured that the responses not exceed 64 bytes, the length of a special output buffer used for the interpreter. This output can be

obtained with the cgi command line "c C S %s".

2.4 Forms input

2.4.1 POST parameter

So far, the HTTP POST method is only used for file uploading and SD card formating.

2.4.2 GET parameter

Syntax:

Several command strings don't need any parameter values given (nothing noted after the equal sign) or simply ignore them, but most commands need them formed exactly as described below in C-printf syntax:

```
%d      integer
%u      unsigned integer
%f      floating point number
%s      string
```

All other characters have to appear exactly as they are shown.

Parameter list:

MR=e	Move Eastward
MR=w	Move Westward
MR=q	Stop moving RA
MD=n	Move Northward
MD=s	Move Southward
MD=q	Stop moving DEC
PH=	Park at Home Position
Ph=	Set Home Position
PC=	Park at CWD Position
PZ=	Park at Zenith
PS=	Sleep Telescope
PW=	Wakeup Telescope
hc=0..2	Set Hand Controler into Visual (0), Photo(1) or All Speed Mode
hB=0..7	Hand Controler brightness
hC=0..2	Hand Controler color scheme (day, dawn, night)
ts=0..6	Set Tracking Mode (Sidereal,

King, ...)

du="%u.%u.%u"	UTC Date
dc="%u.%u.%u"	Civil Date
tu="%u:%u:%u"	UTC Time
tc="%u:%u:%u"	Civil Time
tr="%u:%u:%u"	Target Right Ascension
td="%d:%u:%u"	Target Declination
tR="%u"	Target Physical Right Ascension
tD="%u"	Target Physical Declination
ta="%d:%u:%u"	Target Azimuth
te="%u:%u:%u"	Target Elevation
tn="%s"	Target Name
mn="%u"	Current model number 0..1
sm="%u"	Store current model under number 0..1
cm="%u"	clear model number #
aa=	Additional Alignment
Sm=	Synchronize
ia=	Initial Alignment
ML=%s	Load model under the given

```
name from the Models subdirectory
MS=%s            Store model with the given
name in the Models subdirectory

mD="%u"          mount design
mt="%u"          mount type
wr="%d"          Worm ratio in right ascension
wd="%d"          Worm ratio in declination
sr="%u"          Spur ratio in right ascension
sd="%u"          Spur ratio in declination
mr="%u"          Motor encoder resolution in
right ascension
md="%u"          Motor encoder resolution in
declination
dt="%u"          DEC TVC step count

SP="%u"          Proportional parameter for X
servo (RA/AZ) for High Speed
Sp="%u"          Proportional parameter for X
servo (RA/AZ) for Low Speed
SQ="%u"          Proportional parameter for Y
servo (DEC/EL) for High Speed
Sq="%u"          Proportional parameter for Y
servo (DEC/EL) for Low Speed
SD="%u"          Differential parameter for X
```

servo (RA/AZ) for High Speed
Sd="%u" Differential parameter for X servo (RA/AZ) for Low Speed
SF="%u" Differential parameter for Y servo (DEC/EL) for High Speed
Sf="%u" Differential parameter for Y servo (DEC/EL) for Low Speed
ST="%u" warning treshold for offset in RA/Az while holding position/guiding/tracking
St="%u" warning treshold for offset in DEC/El while holding position/guiding/tracking
SH="%u" warning treshold for heavy load (high PWM duty cycle) in RA/Az while holding position/guiding/tracking
Sh="%u" warning treshold for heavy load (high PWM duty cycle) in DEC/El while holding position/guiding/tracking
SS="%u" warning treshold for heavy load (high PWM duty cycle) in RA/Az while slewing
Ss="%u" warning treshold for heavy load (high PWM duty cycle) in DEC/El while slewing

R1="%c" Move Speed: G=Guide, C=Center,

M=Move, S=Slew

VM="%d" Manual Slewing Speed RA
Vm="%d" Manual Slewing Speed DEC
VT="%d" GoTo Slewing Speed RA
Vt="%d" GoTo Slewing Speed DEC
VV="%d" Move Speed RA
Vv="%d" Move Speed DEC
Vi="%d" Increment Move Speeds by the given value. If omitted, default is 50.
Vd="%d" Decrement Move Speeds by the given value. If omitted, default is 50.

VA="%f" RA Slewing Acceleration
Va="%f" DEC Slewing Acceleration
VC="%u" RA Centering Speed
Vc="%u" DEC Centering Speed

VG="%u.%u" RA Guiding Speed
Vg="%u.%u" DEC Guiding Speed

Sr="%u°%u" Right Safety Limit
Sl="%u°%u" Left Safety Limit
Sg="%u°%u" Western GoTo Limit

```
ER="%d"          Axis Encoder RA resolution
ED="%d"          Axis Encoder DEC resolution
ep="%u"          encoder port usage, 0..15

si="%u"          select location
sn="%s"          site name
st="%d:%u:%u"    Timezone (minutes and seconds
can be omitted)
so="%d°%u'%u"    Longitude
sa="%d°%u'%u"    Latitude
se="%d"          Elevation
s#="%u"          site number
gp="%u"          Query GPS receiver at serial
ports 0..3

bm="%u"          default boot mode, 0..3 for
Cold Start, Warm Start, Warm Restart, Ask, if
possible
bo="%u"          select boot mode, 0..2 for
Cold Start, Warm Start, Warm Restart

bO=              Reboot (if possible, ask for
startup mode)
bC=              Reboot, enforcing a Cold Start
```

```
s0="%u"          Baud rate selection, serial
port 0
s1="%u"          Baud rate selection, serial
port 1
s2="%u"          Baud rate selection, serial
port 2
s3="%u"          Baud rate selection, serial
port 3
sg="%u"          Baud rate selection for GPS
receiver

ct="%u"          Catalog selection (active
catalog file id)
ff="%u"          Firmware flashing (selected
firmware file id)
CN="%s"          Catalog Name selection
DN="%s"          Directory to change to
Df="%s"          Delete File in current path
DF="%s"          Delete File with absolute path
given
DM=              Delete modeling log file
/LOGS/POINTING.DAT

co="%s"          Catalog object string
SO="%u"          Solar System object number
```

```
(Sun=0, ...)
gtf=              enforce meridian flip
pac=              reset MA and ME for Polar Axis
Correction
GT=               start GoTo
GP=               start Physical GoTo
GA=               start Alt/Az GoTo

AbH="%c"          '1': List only catalog object
currently above horizon, '0': list all objects
prec="%u"         always precess ('1') given
coordinates or not ('0')
swCM="%u"         swap serial commands :CM# and
:Cm# functionality: Synchronize<->Additional
Align
sdo=              precess given object
coordinates

ip="%u.%u.%u.%u"          current IP Address
msk="%u.%u.%u.%u"         current IP Netmask
gw="%u.%u.%u.%u"          current IP default
gateway
pdns="%u.%u.%u.%u"        current Primary DNS
server
sdns="%u.%u.%u.%u"        current Secondary DNS
```

```
server
Ip="%u.%u.%u.%u"          static IP Address
Msk="%u.%u.%u.%u"         static IP Netmask
Gw="%u.%u.%u.%u"          static IP default
gateway
Pdns="%u.%u.%u.%u"        static Primary DNS
server
Sdns="%u.%u.%u.%u"        static Secondary DNS
server
NTPS="%u.%u.%u.%u"        static Secondary DNS
server
mac="%x:%x:%x:%x:%x:%x" MAC address
UP="%u"                   UDP socket port number
TP="%u"                   TCP socket port number
Tp="%u.%u.%u.%u"          Accepted TCP Peer for
transparent TCP sockets
Up="%u.%u.%u.%u"          Accepted UDP Peer for
UDP socket communication

CL=              SRAM reset to default Losmandy
HGM settings
CM=              SRAM reset to default MI-250
settings
CS=              Store SRAM configuration
parameters to \config\Gemini.cfg
```

CR= Load SRAM configuration parameters from \config\Gemini.cfg

PM="%u" Parking Mode preseclection (0..2)

pt= Start PEC training
pa= Abort PEC training
ps= Start PEC replay
pe= Stop PEC replay
pb="%u" Activate PEC playback at boot time, if PEC data are available.

3. Character encoding

Gemini-II supports internationalized messages. Special characters have to be displayed by the HC, browsers as well as they have to be exchanged between browser.

XML-like character encoding is the only form of encoding that is fully supported by most browsers not only for displaying HTML pages, but also for Ajax technologies, which requires

valid XML. For this reason, special characters should be coded in UCS Universal Character Set as defined by ISO/IEC 10646. Characters are encoded as numeric entities using the format

&#nnnn;

where nnnn is the numeric representation of the character (leading zeros my be omitted).

The graphical HC supports XML encoded Greek lowercase characters with nnnn reaching from 945 to 969:

945: alpha (coded: α)
946: beta β
947: gamma γ
948: delta δ
949: epsilon ε
... until ...
969: omega ω

The HC also supports the most common German, French and Spanish special characters. So far that are:

196: Ä

205: Í
214: Ö
218: Ú
220: Ü
224: à
225: á
228: ä
231: c cedilla
232: è
233: é
234: ê
237: í
241: ~n (n with tilde above)
243: ó
246: ö
250: ú
252: ü

Other characters used may show up correctly in browsers but the HC will display a question mark '?'at its place.