GPS Receiver Engine Board
Software Command

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SOFTWARE COMMAND

1. NMEA Output Command

A) The GGA-Global Positioning System Fix Data describes Time, position and fix related data for a GPS receiver.

Format:
$GPGGA,HHMMSS.sss,DDMM.mmm,d,DDDMM.mmm,d,q,ss,h.h,a.a,z,,,,*CC
<CR><LF>

$	Beginning of NMEA sentence
GPGGA	Message Header
HHMMSS.sss	UTC of position fix
	HH: hours (00 .. 24)
	MM: minutes (00.59)
	SS.sss seconds (00.000..59.999)
DDMM.mmmm,d	Latitude –N(+)/S(-)
	DD: Degree (00..90)
	MM.mmmm: Minutes (00.0000..59.9999)
	d: direction, N-north, S-south
DDDMM.mmmm,d	Latitude –E(+)/W(-)
	DDD: Degree (00.180)
	MM.mmmm: Minutes (00.0000..59.9999)
	d: Direction, E-east, W-west
q	GPS quality indicator
	q: 0 – Fix not available, or invalid 1 – GPS SPS Mode, fix valid 2 – Differential, GPS SPS Mode, fix valid 3 – GPS PPS Mode, fix valid
ss	Number of satellities in use (in tracking) ss=0..12
h.h	Horizontal dilution of precision h.h : HDOP
a.a	Antenna altitude re: mean-sea-level (geoid)
M	Units of antenna altitude, meters

NULL	Geoidal separation (Not supported)
NULL	Units of geoidal separation (Not yet supported)
x.x	Age of Differential GPS data(NULL)
Xxxx	Differenttial reference station ID
***CC<CR><LF>**	Check Sum and sentence termination delimiter

Ex.: $GPGGA,084131.430,2505.9144,N,12145.0509,E,1,05,2.0,59.1,M,,,,0000*38

**Checksum Field: The absolute value calculated by exclusive-OR the 8 data bits of each character in the Sentence,between, but excluding "$" and "*". The hexadecimal value of the most significant and least significant 4 bits of the result are convertted to two ASCII characters (0-9, A-F) for transmission. The most significant character is transmitted first.

B) RMC-Recommended minimum specific GPS/Transit data and fix related data for a GPS receiver

Format:
$GPRMC,HHMMSS.sss,a,DDMM.mmm,d,DDMM.mmm,d,z.z,y.y,ddmmyy,d.d,v
*hh<CR><LF>

$	Beginning of NMEA sentence	
GPRMC	Message Header	
HHMMSS.sss	UTC of position fix	
	HH:	hours (00 .. 24)
	MM:	minutes (00.59)
	SS.sss	seconds (00.000..59.999)
a	Status (A=valid, V=invalid) Invalid if over current DOP mask	
DDMM.mmmm,d	Latitude – N(+)/S(-)	
	DD:	Degree (00..90)
	MM.mmmm	Minutes (00.0000.59.9999)
	d:	Direction, N-north, S-south

DDDMM.mmmm,d	Longitude – E(+)/W(-)	
	DDD:	Degrees (00 .. 180)
	MM.mmmm:	Minutes (00.000 .. 59.9999)
	d:	Direction, E-east, W-west
z.z	Speed over ground (knots). 0 if over current DOP mask	
y.y	Course over ground (reference to true north). 0 if over current DOP mask	
Ddmmyy	UTC date of position fix	
	dd:	Day (1…31)
	mm:	Month (01..12)
	yy:	Year (00 .. 99)
d,d	(Null)Magnetic variation (degrees) (0.0..180.0)	
v	(Null)Variation sense (E=east, W=west)	
***hh<CR><LF>**	Check Sum and sentence termination delimiter	

Ex.: $GPRMC,084119.430,A,2505.9101,N,12145.1214,E,19.80,265.26,260799,,*39

C) The GSA - GPS DOP and Active Satellites GPS receiver operating mode, satellites used in the navigation solution reported by the $ --GGA sentences, and DOP values.

Format:
$GPGSA,a,x,s1,s2,s3,s4,s5,s6,s7,s8,s9,sA,sB,sC,p.p,h.h,v.v*hh<CR><LF>

GPGSA	GSA message header
a,	Mode: A – Automatic M – Manual (forced to operate in 2D or 3 D mode)
x,	Mode: 1 = Fix not available 2 = 2D 3 = 3D
sl,…., sC	1 –12 PRN number of satellites used in solution (NULL for unsued fields)

p.p,	PDOP
h.h	HDOP
v.v	VDOP
***hh<CR><LF>**	Check Sum and sentence termination delimiter

Ex: $GPGSA,A,3,09,17,08,26,23,29,,,,,,,2.5,1.7,1.8*33

D) The GSV - GPS Satellites in view

Number of satellites in view, PRN numbers, elevation, azimuth, and SNR value. Four satellites max. per transmission, additional satellite data sent in second or third message. Total number of messages being transmitted and the number of the message being transmitted is indicated in the first two
indicated in the first two fields.

$GPGSV,<a>,<m>,<nn>,
<ss>,<ee>,<aaa>,<cc>,
<ss>,<ee>,<aaa>,<cc>,
<ss>,<ee>,<aaa>,<cc>,
<ss>,<ee>,<aaa>,<cc>*hh<CR><LF>

<a>	Total number of messages (1 .. 3)
<m>	Message number (1 .. 3)
<nn>	Total number of satellites in view for each visible satellite (four groups per message)
<ss>	Satellite PRN number (1 .. 32)
<ee>	Elevation, degrees (00 .. 90)
<aaa>	Azimuth, degrees True (000 .. 359)
<cc>	SNR (C/No) (00 .. 99) Null when not tracking
*hh<CR><LF>	Check Sum and sentence termination delimiter

Ex.: $GPGSV,2,1,06,09,70,054,45,17,64,249,43,08,59,203,46,26,27,048,39*7E
$GPGSV,2,2,06,23,46,336,43,29,12,270,39*7A

E) The GLL - Geographic Position-Latidude/Longitude

Format:
$GPGLL,DDMM.mmmm,d,DDDMM.mmmm,d,HHMMSS.ss,a*CC<CR><LF>

$	Beginning of NMEA sentence	
GPGLL	Message Header	
DDMM.mmm,d	Latitude - N(+)/S(-)	
	DD:	degree (00.90)
	MM.mmmm:	minutes (00.000..59.9999)
	d:	direction, N – north, S – south
DDDMM, mmmm, d	Latitude – E(+)/W (-)	
	DDD:	degree (00..180)
	MM.mmmm:	minutes (00.000..59.9999)
	d:	direction, E – east, W – west
HHMMSS.ss	UTC of position fix	
	HH:	Hours (00…24)
	MM:	Minutes (00.59)
	SS.ss:	Seconds (00.00..59.99)
a	Status :A – valid B – Invalid	
***CC<CR><LF>**	Check Sum and sentence termination delimiter	

F) The VTG - Course Over Ground and Ground Speed
The actual course and speed relative to the ground.

Format:
$GPVTG,t.t,T,m.m,M,s.s,N,g.g,K*hh<CR><LF>

t.t	Course Over Ground (degrees True) 0 if over current DOP mask
T	Units: T - degrees True
m.m	Course Over Ground (degrees Magnetic) 0 if over current DOP mask
M	Units: M - degrees Magnetic
s.s	Speed (knots). 0 if over current DOP mask
N	Units: N – knots
g.g	Speed (Km/hr). 0 if over current DOP mask
K	Units: K - Km/hr
*hh<CR><LF>	Check Sum and sentence termination delimiter

Due to continuous product improvements, all specifications may be subject to change without notice

2. NMEA Input Command

A) Set Serial Port ID:100 Set PORTA parameters and protocol

This command message is used to set the protocol(SiRF Binary, NMEA, or USER1) and/or the communication parameters(baud, data bits, stop bits, parity). Generally,this command would be used to switch the module back to SiRF Binary protocol mode where a more extensive command message set is available. For example,to change navigation parameters. When a valid message is received,the parameters will be stored in battery backed SRAM and then the receiver will restart using the saved parameters.

Format:
$PSRF100,<protocol>,<baud>,<DataBits>,<StopBits>,<Parity>*CKSUM
<CR><LF>

<protocol>	0=SiRF Binary, 1=NMEA, 4=USER1
<baud>	1200, 2400, 4800, 9600, 19200, 38400
<DataBits>	8,7. Note that SiRF protocol is only valid f8 Data bits
<StopBits>	0.1
<Parity>	0=None, 1=Odd, 2=Even

Ex. 1: Switch to SiRF Binary protocol at 9600,8,N,1
$PSRF100,0,9600,8,1,0*0C<CR><LF>

Ex. 2: Switch to User1 protocol at 38400,8,N,1
$PSRF100,4,38400,8,1,0*38<CR><LF>

**Checksum Field: The absolute value calculated by exclusive-OR the 8 data bits of each character in the Sentence,between, but excluding "$" and "*". The hexadecimal value of the most significant and least significant 4 bits of the result are convertted to two ASCII characters (0-9,A-F) for transmission. The most significant character is transmitted first.

**<CR><LF> : Hex 0D 0A

B) Navigation lnitialization ID：101 Parameters required for start

This command is used to initialize the module for a warm start, by providing current position （in X, Y, Z coordinates）,clock offset, and time. This enables the receiver to search for the correct satellite signals at the correct signal parameters. Correct initialization parameters will enable the receiver to acquire signals more quickly, and thus, produce a faster navigational solution.

When a valid Navigation Initialization command is received, the receiver will restart using the input parameters as a basis for satellite selection and acquisition.

Format：
$PSRF101,<X>,<Y>,<Z>,<ClkOffset>,<TimeOfWeek>,<WeekNo>,<chnlCount>,<ResetCfg>

*CKSUM<CR><LF>

<X>	X coordinate position. INT32
<Y>	Y coordinate position. INT32
<Z>	Z coordinate position. INT 32
<ClkOffset>	Clock offset of the receiver in Hz, Use 0 for last saved value if available. If this is unavailable, a default value of 75000 for GSP1, 95000 for GSP 1/LX will be used. INT32
<TimeOf Week>	GPS Time Of Week. UINT32
<WeekNo>	GPS Week Number. UINT16 (Week No and Time of Week calculation from UTC time)
<chnlCount>	Number of channels to use.1-12. If your CPU throughput is not high enough, you could decrease needed throughput by reducing the number of active channels UBYTE
<ResetCfg>	Bit mask 0×01=Data Valid warm/hotstarts=1 0×02=clear ephemeris warm starts=1 0×04=clear memory. Cold start=1 UBYTE

Ex.: Start using known position and time.
$ PSRF101,-2686700,-4304200,3851624,96000,497260,921,12,3*7F

C) Set DGPS Port ID:102 Set PORT B parameters for DGPS input

This command is used to control Serial Port B that is an input only serial port used to receive RTCM differential corrections. Differnttial receivers may output corrections using different communication parameters. The default communication parameters for PORT B are 9600 Baud, 8 data bits, 0 stop bits, and no parity. If a DGPS receiver is used which has different communication parameters, use this command to allow the receiver to correctly decode the data. When a valid message is received, the parameters will be stored in battery backed SRAM and then the receiver will restart using the saved parameters.

Format:
$ PSRF102,<Baud>,<DataBits>,<StopBits>,<Parity>*CKSUM<CR><LF>

<baud>	1200,2400,4800,9600,19200,38400
<DataBits>	8
<StopBits>	0,1
<Parity>	0=None,Odd=1,Even=2

Ex. : Set DGPS Port to be 9600,8,N,1
$ PSRF102,9600,8,1.0*12

D) Query/Rate Control ID:103 Query standard NMEA message and/or set output rate

This command is used to control the output of standard NMEA message GGA, GLL, GSA, GSV RMC, VTG. Using this command message, standard NMEA message may be polled once, or setup for periodic output. Checksums may also be enabled or disabled depending on the needs of the receiving program. NMEA message settings are saved in battery backed memory for each entry when the message is accepted.

Format:
$ PSRF103,<msg>,<mode>,<rate>,<cksumEnable>*CKSUM<CR><LF>

<msg>	0=GGA,1=GLL,2=GSA,3=GSV,4=RMC,5=VTG
<mode>	80=SetRate,1=Query
<rate>	Output every <rate>seconds, off=0,max=255
<cksumEnable>	0=disable Checksum,1=Enable checksum for specified message.

Example 1: Query the GGA message with checksum enabled
$ PSRF103,00,01,00,01*25

Example 2: Enable VTG message for a 1Hz constant output with checksum enabled
$ PSRF103,05,00,01,01*20

Example 3: Disable VTG message
$ PSRF103,05,00,00,01*21

E) LLA Navigation lnitialization ID:104 Parameters required to start using Lat/Lon/Alt

This command is used to initialize the module for a warm start, by providing current position (in Latitude, Longitude, Altitude coordinates), clock offset, and time. This enables the receiver to search for the correct satellite signals at the correct signal parameters. Correct initialization parameters will enable the receiver to acquire signals more quickly, and thus, will produce a faster navigational soution.
When a valid LLANavigationInitialization command is received, the receiver will restart using the input parameters as a basis for satellite selection and acquisition.

Format:
$ PSRF104,<Lat>,<Lon>,<Alt>,<ClkOffset>,<TimeOfWeek>,<WeekNo>,<ChannelCount>, <ResetCfg>*CKSUM<CR><LF>

<Lat>	Latitude position, assumed positive north of equator and negative south of equator float, possibly signed
<Lon>	Longitude position, it is assumed positive east of Greenwich and negative west of Greenwich Float, possibly signed
<Alt>	Altitude position float, possibly signed
<ClkOffset>	Clock Offset of the receiver in Hz, use 0 for last saved value if available. If this is unavailable, a default value of 75000 for GSP1, 95000 for GSP1/LX will be used. INT32
<TimeOfWeek>	GPS Time Of Week UINT32
<WeekNo>	GPS Week Number UINT16
<ChannelCount>	Number of channels to use. 1-12 UBYTE

<ResetCfg>	bit mask	0×01=Data Valid warm/hot starts=1 0×02=clear ephemeris warm start=1 0×04=clear memory. Cold start=1

UBYTE

Ex.: Start using known position and time.
$ PSRF104,37.3875111,-121.97232,0,96000,237759,922,12,3*37

F) Development Data On/Off ID:105 Switch Development Data

G) Messages On/Off

Use this command to enable development debug information if you are having trouble getting commands accepted. Invalid commands will generate debug information that should enable the user to determine the source of the command rejection. Common reasons for input command rejection are invalid checksum or parameter out of specified range. This setting is not preserved across a module reset.

Format: $ PSRF105,<debug>*CKSUM<CR><LF>

<debug> 0=Off,1=On

Ex.: Debug On $ PSRF105,1*3E
Ex.: Debug Off $ PSRF105,0*3F