# NMEA Reference Guide

Issue 3

# Document History

| Revision | Date | Change Reason |
|---|---|---|
| 1 | 30 JUN 10 | Original publication of this document |
| 2 | 22 DEC 10 | Updated content for MID 120<br>Added name in Table 3.29<br>Editorial updates |
| 3 | 29 FEB 12 | Updated technical content for MIDs: 103, 114, 120, 121, 122, 123, 124, 125, 141, 150, 165, 190, 191, 192<br>Editorial updates<br>If you have any comments about this document, send an email to mailto:comments@csr.com, giving the document number, title and section with your feedback. |

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# 1 Overview

This document provides details of NMEA messages developed and defined for CSR products. It does not provide information about the complete NMEA-0183 interface standard.

Some CSR products support a subset of the NMEA-0183 standard for interfacing marine electronic devices as defined by the National Marine Electronics Association (NMEA).

Table 1.1 lists the applicable NMEA document and software versions. See the *Document History* for a list of updated messages.

| Document Issue Number | Software Release |
|---|---|
| 1 | 4.0.2 |
| 2 | 4.1.0 |
| 3 | 4.1.2 |

**Table 1.1: NMEA ICD Software Versions**

**Note:**

Document issues are backwards compatible. They describe software versions up to and including the software listed for that issue.

## 1.1 Who Should Use This Document

This document was written assuming the user has a basic understanding of interface protocols and their use.

## 1.2 How This Document is Organized

This document contains the following chapters:

- **Output Messages:** Section 2 defines NMEA standard output messages supported by CSR and NMEA proprietary output messages developed by SiRF (a member of the CSR group of companies).
- **Input Messages:** Section 3 defines NMEA standard input messages supported by CSR and NMEA proprietary input messages developed by SiRF (a member of the CSR group of companies).

## 1.3 Related Manuals

Refer to the following documents for more information:

- *NMEA-0183 Standard For Interfacing Marine Electronic Devices*
- *SiRF Binary Protocol Reference Manual*
- *SiRF Evaluation Kit User Guides*
- *SiRF System Development Kit User Guides*

## 1.4 General Format

NMEA 0183 messages use the ASCII character set and have a defined format. Each message begins with a $ (hex 0x24) and end with a carriage return and line feed (hex 0x0D 0x0A, represented as <CR><LF>). Each message consists of one or more fields of ASCII letters and numbers, separated by commas. After the last field, and before the <CR><LF> is a checksum consisting of an asterisk (*, hex 0x2A) followed by two ASCII characters representing the hexadecimal value of the checksum. The checksum is computed as the exclusive OR of all characters between the $ and * characters.

**Note:**

In NMEA 0183 specifications earlier than version 2.3, the checksum is optional.

All references to discontinued unsupported products GSW2 and SiRFXTrac are provided for historical reasons only.

# 2 Output Messages

Table 2.1 lists each of the NMEA output messages specifically developed and defined within CSR products.

| Message | Description |
|---|---|
| GGA | Time, position and fix type data |
| GLL(1) | Latitude, longitude, UTC time of position fix and status |
| GSA | GPS receiver operating mode, satellites used in the position solution, and DOP values |
| GSV | Number of GPS satellites in view satellite ID numbers, elevation, azimuth, and SNR values |
| MSS | Signal-to-noise ratio, signal strength, frequency, and bit rate from a radio-beacon receiver |
| RMC (1) | Time, date, position, course and speed data |
| VTG (1) | Course and speed information relative to the ground |
| ZDA | PPS timing message (synchronized to PPS) |
| 141(1) | Verified 50 BPS |
| 150 | OK to send message |
| 151 | GPS Data and Extended Ephemeris Mask |
| 152 | Extended Ephemeris Integrity |
| 154 | Extended Ephemeris ACK |
| 155 | Extended Ephemeris Proprietary Message |
| 156,0X20 | ECLM ACK/NACK |
| 156,0X21 | ECLM EE Get Age response |
| 156,0X22 | ECLM Get SGEE Age response |
| 156,0X23 | ECLM Download Initiate Request |
| 156,0X24 | ECLM Erase Storage File |
| 156,0X25 | ECLM Update File Content |
| 156,0X26 | ECLM Request File Content |

| Message | Description |
|---|---|
| 160 | Watchdog Timeout and Exception Condition |
| 165[1] | GPIO State |
| 190[1] | Data Log Record |
| 191[1] | Data Log Terminator |
| 192[1] | Data Log Status |
| 195[1] | Response to Poll SW Version String |

**Table 2.1: NMEA Output Messages**

[1] This feature is supported starting at version 4.1.2 and later.

This section gives a full description of the listed NMEA messages. Table 2.2 summarizes the NMEA output messages supported by specific platforms.

| Message | GSW2 [1] | SiRFDRive[1] | SiRFXTrac[1] | SiRFLoc[1] | GSW3 & GSWLT3[1] | SiRFDiRect | GSD3tw | GSD3fLP | Code Linked Host | | GPIO Strapped Chip | | OSP NMEA Switch Msg | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | GSD4t | GSD4e | GSD4t | GSD4e | GSD4t | GSD4e |
| GGA | All | All | All | All | All | All | All | All | All | All | No | All | No | All |
| GLL[2] | No | No | No | No | No | No | No | No | No | Yes | No | Yes | No | Yes |
| GSA | All | All | All | All | All | All | All | All | All | All | No | All | No | All |
| GSV | All | All | All | All | All | All | All | All | All | All | No | All | No | All |
| MSS | All | No | No | No | No | No | No | No | No | No | No | No | No | No |
| RMC[2] | No | No | No | No | No | No | No | No | No | Yes | No | Yes | No | Yes |
| VTG[2] | No | No | No | No | No | No | No | No | No | Yes | No | Yes | No | Yes |
| ZDA | 2.3.2 and later | No | No | No | All | No | All | No | No | No | No | All | No | All |
| 141[2] | No | No | No | No | No | No | No | No | No | Yes | No | Yes | No | Yes |
| 150 | 2.3.2 and later | No | No | No | No | No | No | No | No | No | No | No | No | No |
| 151 | 2.5 and later | No | 2.3 and later | No | 3.2.0 and later | Yes | Yes | Yes | No | No | No | No | No | No |

| Message | GSW2 (1) | SiRFDRive(1) | SiRFXTrac(1) | SiRFLoc(1) | GSW3 & GSWLT3(1) | SiRFDiRect | GSD3tw | GSD3fLP | Code Linked Host | | GPIO Strapped Chip | | OSP NMEA Switch Msg | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | GSD4t | GSD4e | GSD4t | GSD4e | GSD4t | GSD4e |
| 152 | 2.5 and later | No | 2.3 and later | No | 3.2.0 and later | Yes | Yes | Yes | No | No | No | No | No | No |
| 154 | 2.5 and later | No | 2.3 and later | No | 3.2.0 and later | Yes | Yes | Yes | No | No | No | Yes | No | Yes |
| 155 | No | No | No | No | No | No | No | Yes | No | No | No | No | No | No |
| 156,0x20 | No | No | No | No | No | No | No | Yes | Yes | Yes | No | Yes | No | Yes |
| 156,0x21 | No | No | No | No | No | No | No | Yes | Yes | Yes | No | Yes | No | Yes |
| 156,0x22 | No | No | No | No | No | No | No | Yes | Yes | Yes | No | Yes | No | Yes |
| 156,0x23 | No | No | No | No | No | No | No | Yes | Yes | Yes | No | Yes | No | Yes |
| 156,0x24 | No | No | No | No | No | No | No | Yes | Yes | Yes | No | Yes | No | Yes |
| 156,0x25 | No | No | No | No | No | No | No | Yes | Yes | Yes | No | Yes | No | Yes |
| 156,0x26 | No | No | No | No | No | No | No | Yes | Yes | Yes | No | Yes | No | Yes |

| Message | GSW2 [1] | SiRFDRive[1] | SiRFXTrac[1] | SiRFLoc[1] | GSW3 & GSWLT3[1] | SiRFDiRect | GSD3tw | GSD3fLP | Code Linked Host | | GPIO Strapped Chip | | OSP NMEA Switch Msg | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | GSD4t | GSD4e | GSD4t | GSD4e | GSD4t | GSD4e |
| 160 | No | No | No | No | No | No | No | No | No | Yes | No | Yes | No | Yes |
| 165[2] | No | No | No | No | No | No | No | No | No | Yes | No | Yes | No | Yes |
| 190[2] | No | No | No | No | No | No | No | No | No | Yes | No | Yes | No | Yes |
| 191[2] | No | No | No | No | No | No | No | No | No | Yes | No | Yes | No | Yes |
| 192[2] | No | No | No | No | No | No | No | No | No | Yes | No | Yes | No | Yes |
| 195[2] | No | No | No | No | No | No | No | No | No | Yes | No | Yes | No | Yes |

**Table 2.2: Supported NMEA Output Messages**

[1] GSW2 and SiRFDRive software only output NMEA version 2.20 (and earlier). Standard binaries for SiRFXTrac, GSW3, and GSWLT3 firmware use NMEA 3.0. Users of the software developer's kit can choose through software conditional defines (UI_NMEA_VERSION_XXX) to allow a choice between NMEA 2.20 and 3.00. The file `NMEA_SIF.H` contains the NMEA version defines.

[2] This feature is supported starting at version 4.1.2 and later.

**Note:**

In some numeric fields representing a single data element, leading zeros before a decimal are suppressed. A single "0" character preceding the decimal point is maintained. In compound numeric structures, such as LAT or LONG, leading zeros are suppressed only on the leftmost element. Trailing zeros are not suppressed.

## 2.1 Global Positioning System Fixed Data: MID GGA

**Note:**

Fields written in *italic* apply only to NMEA version 2.3 (and later) in this NMEA message description.

Table 2.3 contains the values for the following example:

```
$GPGGA,002153.000,3342.6618,N,11751.3858,W,1,10,1.2,27.0,M,-34.2,M,,0000*5E<CR><LF>
```

| Name | Example | Unit | Description |
|---|---|---|---|
| MID | $GPGGA | - | GGA Protocol header |
| UTC Time | 002153.000 | - | hhmmss.sss |
| Latitude | 3342.6618 | - | ddmm.mmmm |
| N/S Indicator | N | - | N = north or S = south |
| Longitude | 11751.3858 | - | dddmm.mmmm |
| E/W Indicator | W | - | E = east or W = west |
| Position Fix Indicator | 1 | - | See Table 2.4 |
| Satellites Used | 10 | - | Range 0 - 12 |
| HDOP | 1.2 | - | Horizontal Dilution of Precision |
| MSL Altitude | 27.0 | meters | - |
| Units | M | meters | - |
| Geoid Separation | -34.2 | meters | Geoid-to-ellipsoid separation.<br>Ellipsoid altitude = MSL Altitude + Geoid Separation |
| Units | M | meters | - |
| Age of Diff. Corr. | - | sec | Null fields when DGPS is not used |
| Diff. Ref. Station ID | 0000 | - | - |
| Checksum | *5E | - | - |
| <CR><LF> | - | - | End of message termination |

**Table 2.3: GGA Data Format**

| Value | Description |
|---|---|
| 0 | Fix not available or invalid |
| 1 | GPS SPS Mode, fix valid |
| 2 | Differential GPS, SPS Mode, fix valid |
| 3 - 5 | Not supported |
| 6 | Dead Reckoning Mode, fix valid |

**Table 2.4: Position Fix Indicator**

**Note:**

A valid status is derived from all the parameters set in the software. This includes the minimum number of satellites required, any DOP mask setting, presence of DGPS corrections, etc. If the default or current software setting requires that a factor must be met, then if that factor is not met the solution will be marked as invalid.

## 2.2 Geographic Position - Latitude/Longitude: MID GLL

**Note:**

Fields written in *italic* apply only to NMEA version 2.3 (and later) in this NMEA message description.

Table 2.5 contains the values for the following example:

```
$GPGLL,3723.2475,N,12158.3416,W,161229.487,A,A*41<CR><LF>
```

| Name | Example | Description |
|---|---|---|
| MID | $GPGLL | GLL Protocol header |
| Latitude | 3723.2475 | ddmm.mmmm |
| N/S Indicator | N | N = north or S = south |
| Longitude | 12158.3416 | dddmm.mmmm |

| Name | Example | Description |
|---|---|---|
| E/W Indicator | W | E = east or W = west |
| UTC Time | 161229.487 | hhmmss.sss |
| Status | A | A = data valid or V = data not valid |
| *Mode* | *A* | *A = Autonomous*<br>*D = DGPS*<br>*E = DR*<br>*N = Output Data Not Valid*<br>*R = Coarse Position* (1) (2) (3)<br>*S = Simulator* |
| Checksum | *41 | - |
| <CR><LF> | - | End of message termination |

**Table 2.5: GLL Data Format**

(1) Position was calculated based on one or more of the SVs having their states derived from almanac parameters, as opposed to ephemerides.

(2) This feature is suported in the GSD4e product only.

(3) This feature is supported in the GSD4e product, version 1.1.0 and later.

## 2.3 GNSS DOP and Active Satellites: MID GSA

Table 2.6 contains the values for the following example:

```
$GPGSA,A,3,07,02,26,27,09,04,15, , , , ,
,1.8,1.0,1.5*33<CR><LF>
```

| Name | Example | Description |
|---|---|---|
| MID | $GPGSA | GSA Protocol header |
| Mode 1 | A | See Table 2.7 |
| Mode 2 | 3 | See Table 2.8 |
| Satellite Used(1) | 07 | SV on Channel 1 |
| Satellite Used(1) | 02 | SV on Channel 2 |
| .... | - | .... |

| Name | Example | Description |
|---|---|---|
| Satellite Used | | SV on Channel 12 |
| PDOP(2) | 1.8 | Position Dilution of Precision |
| HDOP(2) | 1.0 | Horizontal Dilution of Precision |
| VDOP(2) | 1.5 | Vertical Dilution of Precision |
| Checksum | *33 | - |
| <CR><LF> | - | End of message termination |

**Table 2.6: GSA Data Format**

(1) Satellite used in solution.

(2) Maximum DOP value reported is 50. When 50 is reported, the actual DOP may be much larger.

| Value | Description |
|---|---|
| M | Manual = Forced to operate in 2D or 3D mode |
| A | 2D Automatic = Allowed to automatically switch 2D/3D |

**Table 2.7: Mode 1**

| Value | Description |
|---|---|
| 1 | Fix not available |
| 2 | 2D (<4 SVs used) |
| 3 | 3D (>3 SVs used) |

**Table 2.8: Mode 2**

## 2.4 GNSS Satellites in View: MID GSV

Table 2.9 contains the values for the following example:

```
$GPGSV,2,1,07,07,79,048,42,02,51,062,43,26,36,256,42,27,27,138,42*71
$GPGSV,2,2,07,09,23,313,42,04,19,159,41,15,12,041,42*41<CR><LF>
```

| Name | Example | Unit | Description |
|---|---|---|---|
| MID | $GPGSV | - | GSV Protocol header |
| Number of Messages(1) | 2 | - | Total number of GSV messages to be sent in this group |
| Message Number(1) | 1 | - | Message number in this group of GSV messages |
| Satellites in View(1) | 07 | - | - |
| Satellite ID | 07 | - | Channel 1 (Range 1 - 32) |
| Elevation | 79 | degrees | Channel 1 (Maximum 90) |
| Azimuth | 048 | degrees | Channel 1 (True, Range 0 - 359) |
| SNR (C/N0) | 42 | dBHz | Range 0 - 99, null when not tracking |
| .... | - | - | .... |
| Satellite ID | 27 | - | Channel 4 (Range 1 - 32) |
| Elevation | 27 | degrees | Channel 4 (Maximum 90) |
| Azimuth | 138 | degrees | Channel 4 (True, Range 0 - 359) |
| SNR (C/N0) | 42 | dBHz | Range 0 - 99, null when not tracking |
| Checksum | *71 | - | - |
| <CR><LF> | - | - | End of message termination |

**Table 2.9: GSV Data Format**

(1) Depending on the number of satellites tracked, multiple messages of GSV data may be required. In some software versions, the maximum number of satellites reported as visible is limited to 12, even though more may be visible.

## 2.5 MSK Receiver Signal: MID MSS

**Note:**

Fields written in *italic* apply only to NMEA version 2.3 (and later) in this NMEA message description.

Table 2.10 contains the values for the following example:

```
$GPMSS,55,27,318.0,100,1,*57<CR><LF>
```

| Name | Example | Unit | Description |
|---|---|---|---|
| MID | $GPMSS | - | MSS Protocol header |
| Signal Strength | 55 | dB | SS of tracked frequency |
| Signal-to-Noise Ratio | 27 | dB | SNR of tracked frequency |
| Beacon Frequency | 318.0 | kHz | Currently tracked frequency |
| Beacon Bit Rate | 100 | - | bits per second |
| *Channel Number* | *1* | - | *The channel of the beacon being used if a multi-channel beacon receiver is used* |
| Checksum | *57 | - | - |
| <CR><LF> | - | - | End of message termination |

**Table 2.10: MSS Data Format**

**Note:**

The MSS NMEA message can only be polled or scheduled using the MSK NMEA input message. See section 3.25.

## 2.6 Recommended Minimum Specific GNSS Data: MID RMC

**Note:**

Fields written in *italic* apply only to NMEA version 2.3 (and later) in this NMEA message description.

Table 2.11 contains the values for the following example:

```
$GPRMC,161229.487,A,3723.2475,N,12158.3416,W,0.13,309.62,120598,
,*10<CR><LF>
```

| Name | Example | Unit | Description |
|---|---|---|---|
| MID | $GPRMC | - | RMC Protocol header |
| UTC Time | 161229.487 | - | hhmmss.sss |
| Status(1) | A | - | A = data valid or V = data not valid |

| Name | Example | Unit | Description |
|---|---|---|---|
| Latitude | 3723.2475 | - | ddmm.mmmm |
| N/S Indicator | N | - | N = north or S = south |
| Longitude | 12158.3416 | - | ddmm.mmmm |
| E/W Indicator | W | - | E = east or W = west |
| Speed Over Ground | 0.13 | knots | - |
| Course Over Ground | 309.62 | degrees | True |
| Date | 120598 | - | ddmmyy |
| Magnetic Variation(2) | - | degrees | E = east or W = west |
| East/West Indicator(2) | E | - | E = east |
| *Mode* | *A* | - | *A = Autonomous*<br>*D = DGPS*<br>*E = DR*<br>*N = Output Data Not Valid*<br>*R = Coarse Position* (3) (4) (5)<br>*S = Simulator* |
| Checksum | *10 | - | - |
| <CR><LF> | - | - | End of message termination |

**Table 2.11: RMC Data Format**

(1) A valid status is derived from all the parameters set in the software. This includes the minimum number of satellites required, any DOP mask setting, presence of DGPS corrections, etc. If the default or current software setting requires that a factor is met, then if that factor is not met the solution will be marked as invalid.

(2) CSR Technology Inc. does not support magnetic declination. All course over ground data are geodetic WGS84 directions relative to true North.

(3) Position was calculated based on one or more of the SVs having their states derived from almanac parameters, as opposed to ephemerides.

(4) This feature is suported in the GSD4e product only.

(5) This feature is supported in the GSD4e product, version 1.1.0 and later.

## 2.7 Course Over Ground and Ground Speed: MID VTG

**Note:**

Fields written in *italic* apply to NMEA version 2.3 (and later) in this NMEA message description.

Table 2.12 contains the values for the following example:

```
$GPVTG,309.62,T,
,M,0.13,N,0.2,K,A*23<CR><LF>
```

| Name | Example | Unit | Description |
|---|---|---|---|
| MID | $GPVTG | - | VTG protocol header |
| Course | 309.62 | degrees | Measured heading |
| Reference | T | - | True |
| Course | - | degrees | Measured heading |
| Reference | M | - | Magnetic(1) |
| Speed | 0.13 | knots | Measured horizontal speed |
| Units | N | - | Knots |
| Speed | 0.2 | km/hr | Measured horizontal speed |
| Units | K | - | Kilometers per hour |
| *Mode* | *A* | - | *A = Autonomous*<br>*D = DGPS*<br>*E = DR*<br>*N = Output Data Not Valid*<br>*R = Coarse Position* (2) (3) (4)<br>*S = Simulator* |
| Checksum | *23 | - | - |
| <CR><LF> | - | - | End of message termination |

**Table 2.12: VTG Data Format**

(1) CSR does not support magnetic declination. All “course over ground” data are geodetic WGS84 directions.

(2) Position was calculated based on one or more of the SVs having their states derived from almanac parameters, as opposed to ephemerides.

(3) This feature is suported in the GSD4e product only.

(4) This feature is supported in the GSD4e product, version 1.1.0 and later.

## 2.8 Time and Date: MID ZDA

This message is included only with systems, which support a time-mark output pulse identified as "1PPS". This outputs the time associated with the current 1PPS pulse. Each message is outputted within a few hundred m/s after the 1PPS pulse is outputted and provides the time of the pulse that just occurred.

Table 2.13 contains the values for the following example:

```
$GPZDA,181813,14,10,2003,,*4F<CR><LF>
```

| Name | Example | Unit | Description |
|---|---|---|---|
| MID | $GPZDA | - | ZDA Protocol header |
| UTC Time | 181813 | hhmmss | The UTC time units are:<br>hh = UTC hours from 00 to 23<br>mm = UTC minutes from 00 to 59<br>ss = UTC seconds from 00 to 59<br>Either using valid IONO/UTC or estimated from default leap seconds |
| Day | 14 | - | Day of the month, range 1 - 31 |
| Month | 10 | - | Month of the year, range 1 - 12 |
| Year | 2003 | - | Year |
| Local zone hour(1) | - | hour | Offset from UTC (set to 00) |
| Local zone minutes(1) | - | minute | Offset from UTC (set to 00) |
| Checksum | *4F | - | - |
| <CR><LF> | - | - | End of message termination |

**Table 2.13: ZDA Data Format**

(1) Not supported by CSR, reported as 00.

## 2.9 Proprietary: MID 140

This message is reserved for CSR extended ephemeris usage only. The content of this message is proprietary.

Table 2.14 contains the message parameter definitions.

| Name | Example | Description |
|---|---|---|
| MID | $PSRF140 | PSRF140 Protocol header |
| Extended Ephemeris | - | Proprietary message |
| Checksum | - | - |
| <CR><LF> | - | End of message termination |

**Table 2.14: Proprietary: MID 140**

## 2.10 Verified 50 BPS/SUBFRAME: MID 141

This message outputs the verified 50 BPS/Sub frame packets from NAV that are used by SIF as seed data for CGEE predictions in NMEA mode.

**Note:**

This message is available in the latest releases of GSD4t verison 4.1.2, but will not be available in ROM 2.2/ GSD4e_ROM 4.1.2 releases.

| | |
|---|---|
| MID (Hex) | - |
| MID (Dec) | PSRF141 |
| Message Name in Code | NMEA_EE_SUBFRAME_VERIFIED_OUTPUT |
| SID (Hex) | - |
| SID (Dec) | - |
| SID Name in Code | - |

**Table 2.15: Verified 50 BPS/SUBFRAME: MID 141**

| Name | Example | Unit | Description |
|---|---|---|---|
| MID | $PSRF141 | - | PSRF141 Protocol header |
| Extended ephemeris | - | - | CSR's proprietary message |
| Checksum | *3B | *3B | Checksum |
| <CR><LF> | - | - | End of message termination |

**Table 2.16: Message Field Description**

## 2.11 OkToSend: MID 150

This message is sent out during power-saving mode, such as TricklePower™ and Push-to-Fix™, to indicate when the receiver is ready to receive messages or when it is going into low-power mode. When power is restored, it is the first message sent, and when it is going to be reduced, it is the last message sent.

Table 2.17 contains the values for the following examples:

1. OkToSend

   ```
   $PSRF150,1*3E<CR><LF>
   ```

2. not OkToSend

   ```
   $PSRF150,0*3F<CR><LF>
   ```

| Name | Example | Description |
|---|---|---|
| MID | $PSRF150 | PSRF150 Protocol header |
| OkToSend | 1 | 1 = OK to send,<br>0 = not OK to send |
| Checksum | *3F | |
| <CR><LF> | - | End of message termination |

**Table 2.17: OkToSend Massage Data Format**

## 2.12 GPS Data and Extended Ephemeris Mask: MID 151

SiRFInstantFix uses MID 151 to request ephemerides for specific satellites.

```
$PSRF151,3,1485,147236.3,0x43002732*4A<CR><LF>
```

Table 2.18 contains the parameter definitions and example values.

| Name | Example | Unit | Description |
|---|---|---|---|
| MID | $PSRF151 | - | PSRF151 Protocol header |
| GPS_TIME_VALID_FLAG | 3 | N/A | Bit 0 = 1, GPS week is valid |
| GPS Week | 1485 | week number | Extended week number |
| GPS Time of Week | 147236.3 | seconds | GPS Time Of Week |
| EPH_REQ_MASK | 0x43002732 | N/A | Mask to indicate the satellites for which new ephemeris is needed. Eight characters preceded by the following characters, "0x", are used to show this 32-bit mask (in hex). The MSB is for satellite PRN 32, and the LSB is for satellite PRN 1. |
| Checksum | - | - | - |
| <CR><LF> | - | - | End of message termination |

**Table 2.18: GPS Data and Extended Ephemeris Mask: MID 151**

## 2.13 Extended Ephemeris Integrity: MID 152

SiRFInstantFix uses MID 152 to report the validity of various aspects of satellite data in the receiver.

```
$PSRF152,0x43002712,0x43002712,0x00000001*44<CR><LF>
```

Table 2.19 contains the parameter definitions and example values.

| Name | Example | Description |
|---|---|---|
| MID | $PSRF152 | PSRF152 Protocol header |
| SAT_POS_VALIDITY_FLAG | 0x00000002 | Hexadecimal representation of 32-bit field, where MSB represents satellite PRN 32, LSB satellite PRN 1. A bit set to 1 indicates an invalid position has been found for that satellite. |
| SAT-CLK-VALIDITY-FLAG | 0x00000002 | Hexadecimal representation of 32-bit field, where MSB represents satellite PRN 32, LSB satellite PRN 1. A bit set to 1 indicates that satellite has an invalid clock. |
| SAT-HEALTH-FLAG | 0x00000001 | Hexadecimal representation of 32-bit field, where MSB represents satellite PRN 32, LSB satellite PRN 1. A bit set to 1 indicates that satellite is reported to be unhealthy. |
| Checksum | *44 | - |
| <CR><LF> | - | End of message termination |

**Table 2.19: Extended Ephemeris Integrity: MID 152**

## 2.14 Extended Ephemeris ACK: MID 154

The SiRFInstantFix software uses MID 154 to acknowledge input MIDs 107, 108, 110.

```
$PSRF154,110*3B<CR><LF>
```

Table 2.20 contains parameter definitions and example values.

| Name | Example | Description |
|---|---|---|
| MID | $PSRF154 | PSRF154 Protocol header |
| ACK ID | 110 | MID of the message to ACK (107, 108 or 110) |
| Checksum | - | - |
| <CR><LF> | - | End of message termination |

**Table 2.20: Extended Ephemeris ACK**

## 2.15 Proprietary: MID 155

This message is reserved for CSR's extended ephemeris usage only. The content of this message is proprietary.

Table 2.21 contains the message parameter definition.

| Name | Example | Description |
|---|---|---|
| MID | $PSRF155 | PSRF155 Protocol header |
| Extended Ephemeris | - | Proprietary message |
| Checksum | - | - |
| <CR><LF> | - | End of message termination |

**Table 2.21: Proprietary: MID 155**

## 2.16 ECLM ACK/NACK: MID 156, SID 0x20

This is the ACK/NACK response to MID 114, SID 0x16, 0x17, 0x18, 0x19, or 0x1A. The SID for this message is fixed to 0x20.

Table 2.22 contains the values for the following example:

SID = 0x20, ACK SID = 0x16

```
$PSRF156,20,72,16,0,0*09<CR><LF>
```

| Name | Example | Description |
|---|---|---|
| MID | $PSRF156 | ECLM ACK/NACK |
| SID | 0x20<br>(Decimal = 32) | 0x20 = SID for ECLM ACK/NACK |
| ACK MID | 0x72 | 114 = MID for ECLM Download |
| ACK SID | 0x16 | 0x16 = SID for ECLM Start Download<br>This field can take values 0x16, 0x17, 0x18, 0x19, or 0x1A to ACK corresponding SIDs |
| ACK/NACK | 0x0 | 0 = ACK<br>1 = NACK |
| Reason | 0x0 | See Table 2.23 |
| Checksum | *09 | - |
| <CR><LF> | - | End of message termination |

**Table 2.22: ECLM ACK/NACK**

| Value | Example | Code | Description |
|---|---|---|---|
| 0 | 0x00 | ECLM_SUCCESS | Success |
| 1 | 0x01 | ECLM_SPACE_UNAVAILABLE | Insufficient space |
| 2 | 0x02 | ECLM_PKT_LEN_INVALID | Packet length field out of range |
| 3 | 0x03 | ECLM_PKT_OUT_OF_SEQ | Packet received is out of sequence |
| 4 | 0x04 | ECLM_DOWNLOAD_SGEE_NONEWFILE | No new file |
| 5 | 0x05 | ECLM_DOWNLOAD_CORRUPTFILE_ERROR | Corrupt file |
| 6 | 0x06 | ECLM_DOWNLOAD_GENERIC_FAILURE | Generic failure |
| 7 | 0x07 | ECLM_API_GENERIC_FAILURE | Generic failure calling CLM API |

**Table 2.23: Description of ACK/NACK Values**

## 2.17 ECLM EE Age: MID 156, SID 0x21

This is the response to MID 114, SID 0x19. The SID for this message is fixed to 0x21.

Table 2.25 contains the input values for the following example:

SID = 0x21, prnNum = 7

```
$PSRF156,21,1,7,2,0,0,0,0,0,0,2,0,0,0,0,0,0,0*10<CR><LF>
```

If NACKed, the reason for the NACK is present in the next byte (see Table 2.23). If ACKed, the following fields appear after the ACK field.

| Field Name | Description |
|---|---|
| numSAT ID | This field indicates the number of times the following fields are present in the message |
| prnNum; | PRN number of satellite for which age is indicated in other fields |
| ephPosFlag | Ephemeris flag to indicate the type of ephemeris available for the satellite: (Position Age):<br>0 = Invalid ephemeris, not available<br>1 = Broadcast Ephemeris (BE)<br>2 = Server-generated EE (SGEE)<br>3 = Client-generated EE (CGEE) |
| eePosAge | Age of EE in 0.01 days (Position Age) |

| Field Name | Description |
|---|---|
| cgeePosGPSWeek | GPS week of BE used in the CGEE generation.<br>0 if ephPosFlag is not set to 3, or set to 0 (Position Age) |
| cgeePosTOE | TOE of BE used in the CGEE generation.<br>0 if ephPosFlag is not set to 3, or set to 0 (Position Age) |
| ephClkFlag | Ephemeris flag to indicate the type of ephemeris available for the satellite<br>(Clock Age) |
| eeClkAge | Age of EE in 0.01 days (Clock Age) |
| cgeeClkGPSWeek | GPS week of BE used in the CGEE generation.<br>0 if ephClkFlag is not set to 3, or set to 0 (Clock Age) |
| cgeeClkTOE | TOE of BE used in the CGEE generation; 0 if ephClkFlag is not set to 3 or set to 0<br>(Clock Age) |

**Table 2.24: ECLM EE Age Fields**

| Name | Example | Description |
|---|---|---|
| MID | $PSRF156 | ECLM output |
| SID | 0x21<br>(Decimal: 33) | 0x21: SID for ECLM EE Age |
| numSAT | 1 | This field indicates the number of times the fields repeat. |
| prnNum; | 7 | PRN number = 7 |
| ephPosFlag | 2 | EE age |
| eePosAge | 00 | - |
| cgeePosGPSWeek | 00 | - |
| cgeePosTOE | 00 | - |

| Name | Example | Description |
|---|---|---|
| ephClkFlag | 2 | - |
| eeClkAge | 00 | - |
| cgeeClkGPSWeek | 00 | - |
| cgeeClkTOE | 00 | - |
| Checksum | *10 | - |
| <CR><LF> | - | End of message termination |

**Table 2.25: ECLM EE Age**

## 2.18 ECLM SGEE Age: MID 156, SID 0x22

This is the response to the MID 114, Sub ID 0x1A. The SID for this message is fixed to 0x22.

Table 2.26 contains the input values for the following example:

SID = 0x22, SGEE Age = 0x7da8, Prediction Interval = 0x15180

Example:

```
$PSRF156,22,7da8,15180*3E<CR><LF>
```

| Name | Example | Description |
|---|---|---|
| MID | $PSRF156 | ECLM ACK/NACK |
| SID | 0x22<br>(Decimal: 34) | 0x22: SID for ECLM Get EE Age ACK/NACK |
| SGEE Age | 0x7da8 | Age of the satellite |
| Prediction Interval | 0x15180 | Prediction interval |
| Checksum | *3E | - |
| <CR><LF> | - | End of message termination |

**Table 2.26: ECLM Get SGEE Age**

## 2.19 ECLM Download Initiate Request: MID 156, SID 0x23

This message is a Download Initiate Request. It is sent if a fresh download of the SGEE file is required.

Table 2.27 contains the input values for the following example:

SID = 0x23, Start Download = 0x1, Time to Wait = 0x0

Example:

```
$PSRF156,23,1,0*09<CR><LF>
```

Table 2.27 contains the message parameter definitions.

| Name | Example | Description |
|---|---|---|
| MID | $PSRF156 | ECLM ACK/NACK |
| SID | 0x23<br>(Decimal = 35) | 0x23 = Download Initiate Request |
| start/stop | 0x1 | 1 = Start download<br>0 = Stop download |
| Time to Next Start | 0x0 | 0 = Immediate start, otherwise specified number of seconds |
| Checksum | *09 | Checksum |
| <CR><LF> | - | End of message termination |

**Table 2.27: ECLM Download Initiate Request**

## 2.20 ECLM Erase Storage File: MID 156, SID 0x24

This message erases a storage file specified by NVMID.

Table 2.28 contains the input values for the following example:

SID = 0x24, NVM ID = 0x3

Example:

```
$PSRF156,24,3*10<CR><LF>
```

Table 2.28 contains the input values for the following example.

| Name | Example | Description |
|---|---|---|
| MID | $PSRF156 | ECLM ACK/NACK |
| SID | 0x24<br>(Decimal = 36) | 0x24 = Erase Storage File |
| NVM ID | 0x3 | 1 = Erase SGEE file<br>2 = Erase CGEE file<br>3 = BE file |
| Checksum | *10 | - |
| <CR><LF> | - | End of message termination |

**Table 2.28: Erase Storage File**

## 2.21 ECLM Update File Content: MID 156, SID 0x25

Send update file content to host for specified file.

Table 2.29 contains the input values for the following example:

SID = 0x25, NVMID = 0x2, Blocks = 0x1

Example:

```
$PSRF156,25,2,11,4f06,1,29,38,c2,75,4e,fb,c,b3,cc,b0,bf,b6,93,3e,84,24,90*1C
<CR><LF>
```

Table 2.29 contains the input values for the above example.

| Name | Example | Description |
|---|---|---|
| MID | $PSRF156 | ECLM ACK/NACK |
| SID | 0x25 (Decimal = 37) | 0x25 = SID for ECLM Update File Content |
| NVM ID | 0x2 | SGEE File = 1<br>CGEE File = 2<br>BE File = 3 |

| Name | Example | Description |
|---|---|---|
| Size | 0x11 | Size |
| Offset | 0x4f06 | Offset |
| Seq Number | 0x1 | Seq number |
| Data | 29,38,c2,75,4e,fb,c,b3,cc,b0,bf,b6,93,3e,84,24,90 | - |
| Checksum | *1C | - |
| <CR><LF> | - | End of message termination |

**Table 2.29: Update File Content**

## 2.22 ECLM Request File Content: MID 156, SID 0x26

Request for file content of specified NVM ID.

Table 2.30 contains the input values for the following example.

SID = 0x26, NVMID = 0x3, Blocks = 0x1

Example:

```
$PSRF156,26,3,1,1,4c,0*75<CR><LF>
```

| Name | Example | Description |
|---|---|---|
| MID | $PSRF156 | ECLM ACK/NACK |
| SID | 0x26 (Decimal = 38) | 0x26 = SID for ECLM Request for file content |
| NVM ID | 0x3 | SGEE File = 1<br>CGEE File = 2<br>BE File = 3 |
| Seq Number | 0x1 | - |
| Num Blocks | 0x1 | Number of blocks in packet |
| Block Size | 0x4c | - |
| Block offset | 0x0 | Offset in file |
| Checksum | *75 | - |
| <CR><LF> | - | End of message termination |

**Table 2.30: Request File Content**

## 2.23 Watchdog Timeout and Exception Condition: MID 160

This message notifies a PVT product host of a watchdog timeout or processor exception in the receiver.

The consistent accumulation of these notification messages by the host can produce statistics for:

- reliability measurement and analysis
- troubleshooting purposes

For the GSD4e, it has the purpose of enabling the host to determine the need for reloading the patch RAM. The indications of potential corruption in the patch RAM are the watchdog event and some exception events. This message enables the host to initiate the patch download protocol.

Upon receipt of this message, the host requests to switch the receiver into binary OSP messaging mode. Already in OSP messaging mode, the host polls the software version of the receiver, and the response contains the actual patch status of the receiver.

The host then compares this status with the last applied patch according to the patch maintenance value stored in the host. If the software version response does not indicate the up-to-date patch status, the host initiates the reload of the required patch according to the latest patch maintenance value stored in the host. After completing the patch procedure using the binary OSP messages, the host switches back to NMEA mode for normal operation to continue.

Example:

```
$PSRF160,W,1,0*5A<CR><LF>
```

**Note:**

This message is not supported in the GSD4t or earlier products.

| Name | Example | Description |
|---|---|---|
| MID | $PSRF160 | PSRF160 Protocol header |
| Event Condition | W | W = Watchdog time-out event<br>E = Reserved: Exception condition event |
| Patch RAM corruption | 1 | 0 = Intact, not corrupted<br>1 = Corrupted, need to restore |
| Exception code | - | Hexadecimal value of the processor exception code register (0 if event W) |
| Checksum | *hh | - |
| <CR><LF> | - | End of message termination |

**Table 2.31: Watchdog and Exception Condition Notification**

## 2.24 GPIO State Output: MID 165

Message sent in response/request for this message: Example: `$PSRF165,1ff*38<CR><LF>`

**Note:**

This message supports GSD4e version 4.1.2 and later.

| | |
|---|---|
| MID (Hex) | 0xA5 |
| MID (Dec) | 165 |
| Message Name in Code | $PSRF165 |
| SID (Hex) | - |
| SID (Dec) | - |
| SID Name in Code | - |

**Table 2.32: GPIO State Output: MID 165**

| Name | Bytes | Example (Optional) | | Unit | Description |
|---|---|---|---|---|---|
| | | Hex | Dec | | |
| MID | - | A5 | 165 | n/a | PSRF165 Protocol header |
| gpio_state | 2 | 0x01FF | 511 | Bitmap | State of each GPIO:<br>bit 0 = GPIO 0,<br>bit 1 = GPIO 1, etc. |

**Table 2.33: Message Field Description**

## 2.25 Data Log Record Output: MID 190

This message consists of data read from the data log store using a single record type of 0 through 4, and is a subset of fields from OSP MID 41 and uses the same units, precision, and ranges for all values. Not all fields are populated for all record types. Applicable fields that are empty are indicated by adjacent commas.

These fields are not included in the CRC. Record type one is the smallest, and each subsequent type includes the previous with additional fields. All fields within the message remain in the same position. Record type 0 is for previous compatibility. Longer record types (e.g. types 0 and 4) are split into multi-sentence messages to maintain length limits.

Total sentences and unique sequence number fields in each sentence facilitate multi-part management. Requesting this message while the data logger is active will stop data logging before output begins. No other NMEA messages are outputted while retrieving logged data.

**Note:**

This message supports version 4.1.2 and later.

| | |
|---|---|
| MID (Hex) | - |
| MID (Dec) | PSRF190 |
| Message Name in Code | NMEA_190 |
| SID (Hex) | - |
| SID (Dec) | - |
| SID Name in Code | - |

**Table 2.34: Data Log Record Output: MID 190**

| Name | Example | Unit | Range | Description |
|---|---|---|---|---|
| MID | $PSRF190 | - | - | PSRF190 Protocol header |
| Total Sentences | 2 | - | 1 - 255 | Number of sentences for full data. |
| Sentence Number | 1 | - | 1 - 255 | Sentence sequence number out of total sentences. |
| Record Type | 4 | - | 0 - 4 | Record Type (rec type 0 - 4) |
| UTC Date | 110919 | Year<br>Month<br>Day | - | YYMMDD Date (rec type 0 - 4) |
| UTC Time | 203320 | Hour<br>Minute<br>Second | - | HHMMSS Time (rec type 0 - 4) |
| Latitude | 3322.4948 | Degree<br>Minute | 0.0 - 8959.9999 | DDMM.mmm (rec type 0 - 4) |
| Latitude Direction | N | - | N or S | + = N, - = S (rec type 0 - 4) |
| Longitude | 11158.5691 | Degree<br>Minute | 0.0 - 17959.9999 | DDDMM.mmm (rec type 0 - 4) |
| Longitude Direction | W | - | E or W | + = E, - = W (rec type 0 - 4) |

| Name | Example | Unit | Range | Description |
|---|---|---|---|---|
| Altitude | 379.9 | Meter | - | Altitude from mean sea level (rec type 0, 2 - 4 ) |
| Altitude Units | M | - | - | Meters (rec type 0, 2 - 4) |
| Speed | 0.0 | m/s | - | (rec type 3 - 4) |
| CRC-32 | - | - | - | CRC-32 value of non-zero -padded playload (rec type 1 - 3). Not populated for multi-part rec type 0 or 4. |
| SV Count | 8 | - | 1 - 255 | Count of SVs in fix (rec type 0, 4) |
| HDOP | 1.0 | - | 0.0 - 10.2 | Horizontal Dilution of Precision (rec type 0, 4) |
| EHPE | 6.2 | - | - | Estimated Horizontal Position Error (rec type 4) |
| EHPE Units | M | - | - | Meters |
| TOW | 160415000 | - | - | Time of Week (rec type 4) |
| CRC | 2036663234 | - | - | CRC-32 value of non-zero-padded playload for rec type 4; CRC-16 for rec type 0. |

**Table 2.35: Message Field Description**

## 2.26 Data Log Terminator Output: MID 191

This message indicates data log output is complete and outputs once after all valid data records have been read from the data log store and sent out. When the log output is complete, regular NMEA messaging resumes. This message contains no payload data. To start data logging again, issue a new Start Log command.

**Note:**

This message supports version 4.1.2 and later.

| | |
|---|---|
| MID (Hex) | - |
| MID (Dec) | PSRF191 |
| Message Name in Code | `NMEA_191` |
| SID (Hex) | - |
| SID (Dec) | - |
| SID Name in Code | - |

**Table 2.36: Data Log Terminator Output: MID 191**

| Name | Example | Unit | Scale | Range | Description |
|---|---|---|---|---|---|
| MID | $PSRF191 | - | - | - | PSRF191 Protocol header |

**Table 2.37: Message Field Description**

## 2.27 Data Log Status Output: MID 192

This message provides the current data logger status including; threshold settings, memory usage, record type, and activity. It can be requested at anytime even while the data logger is active. Memory used indicates the amount of memory written to that has not yet been read back. It is valid only for stop-on-memory-full management and zero.

When all data has been read or the data logger is restarted after a memory full condition, memory used returns to zero. Memory available as with memory used, indicates memory available for writing. It is used for stop-on-memory-full management and shows the full store size. When all data has been read or the data logger is restarted, after a memory full condition, memory available returns to the full store size.

**Note:**

This message supports version 4.1.2 and later.

| | |
|---|---|
| MID (Hex) | - |
| MID (Dec) | PSRF192 |
| Message Name in Code | NMEA_192 |
| SID (Hex) | - |
| SID (Dec) | - |
| SID Name in Code | - |

**Table 2.38: Data Log Status Output: MID 192**

| Name | Example | Unit | Range | Description |
|---|---|---|---|---|
| MID | $PSRF192 | - | - | PSRF192 Protocol header |
| SID | - | - | - | - |
| Active | 1 | - | 0 - 1 | 0 = Not Active<br>1 = Logging Active |
| Record Type | 4 | - | 0 - 4 | Record Type |
| Logging Interval | 1 | sec | 1 - 65535 | Minimum seconds between logging each record. |
| Distance Threshold | 0 | m | 0 - 65535 | Current distance threshold setting. |

| Name | Example | Unit | Range | Description |
|---|---|---|---|---|
| Speed Threshold | 0 | m/s | 0 - 65535 | Current speed threshold setting. |
| Memory Available | 86016 | bytes | - | Size of the data store, or if stopping on full, unused memory. |
| Memory Used | 0 | bytes | - | If stopping on full, indicates memory used, zero otherwise. |
| Stop On Memory Full | 0 | - | 0 - 1 | 0 = Circular buffering<br>1 = Stop logging at end of first pass through store. |
| Memory Full | 0 | - | 0 - 1 | 0 = Not full. If stopping on full<br>1 = memory is full (logging stopped). |
| Reserved | 0 | - | 0 | Always zero |

**Table 2.39: Message Field Description**

## 2.28 Response to Poll SW Version String: MID 195

This message is the response to the Poll SW version message (PSRF125). Example: `$PSRF195 GSD4e_4.1.2-E51 F+ 06/06/2011 157-Jul 5 2011-15:27:59*3A`

**Note:**

This message supports GSD4e version 4.1.2 and later.

| | |
|---|---|
| MID (Hex) | - |
| MID (Dec) | PSRF195 |
| Message Name in Code | `NMEA_195` |
| SID (Hex) | - |
| SID (Dec) | - |
| SID Name in Code | - |

**Table 2.40: Response to Poll SW Version String: MID 195**

| Name | Example | Description |
|---|---|---|
| MID | $PSRF195 | PSRF195 Protocol header |
| Version String | GSD4e_4.1.2-E51 F+ 06/06/2011 157-Jul 5 2011-15:27:59 | - |
| Checksum | *3A | - |
| <CR><LF> | - | End of message termination |

**Table 2.41: Message Field Description**

## 2.29 Reserved: MID 225

Except for SID 6, the contents of this message are proprietary, reserved for use by CSR engineers, and are not described here.

# 3 Input Messages

This section describes the NMEA input messages listed in Table 3.1.

| Message | Description |
|---|---|
| 100 | SetSerialPort: Set Port A parameters and protocols |
| 101 | NavInit: Parameters required to start using X/Y/Z(1) |
| 102 | SetDGPSPort: Set port B parameters for DGPS input |
| 103 | Query NMEA Message and/or set output rate |
| 104 | LLANavInit: Parameters to start using Lat/Long/Alt(2) |
| 105 | DevDataOn/Off: Development data messages On/Off |
| 106 | Selection of datum for coordinate transformation |
| 107 | Extended ephemeris proprietary message |
| 108 | Extended ephemeris proprietary message |
| 110 | Extended ephemeris debug |
| 112 | Set message rate |
| 113, 0x01 | Set GRF3i+ IF Bandwidth Mode |
| 113, 0x02 | Set GRF3i+ Normal/Low Power RF Mode |
| 117, 0x01 | Set GRF3i+ IF Bandwidth Mode |
| 114, 0x16 | ECLM start download |
| 114, 0x17 | ECLM file size |
| 114, 0x18 | ECLM packet data |
| 114, 0x19 | ECLM get EE age |
| 114, 0x1A | ECLM get SGEE age |
| 114, 0x1B | ECLM host file content |
| 114, 0x1C | ECLM host ACK/NACK |
| 117, 0X10 | System turn off |
| 117, 0X20 | Switch to boot mode |
| 120(4) | Storage configuration setting |

| Message | Description |
|---|---|
| 121[3] | Data logging command |
| 122[3] | Data logging interval command |
| 123[3] | Data logging threshold command |
| 124[3] | Data logging memory management command |
| 125[3] | Poll SW version string |
| 200 | Marketing software configuration |
| MSK | Command message to an MSK radio-beacon receiver |

**Table 3.1: NMEA Input Messages**

[1] Input coordinates in WGS-84 ECEF format.

[2] Input coordinates in WGS-84 Latitude, Longitude and MSL Altitude format.

[3] This feature is supported starting at version 4.1.2 and later.

[4] This feature is supported starting from GSD4e and later.

**Note:**

NMEA input messages 100 to 200 are CSR proprietary NMEA messages. The MSK NMEA string is as defined by the NMEA 0183 standard.

Table 3.2 shows which CSR platforms support the NMEA input messages.

| Message | GSW2 | SiRFDRive | SiRFXTrac | SiRFLoc | GSW3 & GSWLT3 | SiRFDiRect | GSD3tw | GSD3fLP | Code Linked Host | | GPIO Strapped Chip | | OSP NMEA Switch Msg | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | GSD4t | GSD4e | GSD4t | GSD4e | GSD4t | GSD4e |
| 100 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No | No | No | Yes | No | Yes |
| 101 | Yes | Yes | Yes(1) | Yes | Yes(1) | Yes(1) | Yes | Yes | No | No | No | Yes | No | Yes |
| 102 | Yes | Yes | No | No | Yes | Yes | Yes | Yes | No | No | No | Yes | No | Yes |
| 103 | No | No | No | No | No | No | No | No | No | Yes | No | Yes | No | Yes |
| 104 | Yes | Yes | Yes(1) | Yes | Yes(1) | Yes(1) | Yes | Yes | No | No | No | Yes | No | Yes |
| 105 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No | No | No | Yes | No | Yes |
| 106 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No | No | No | Yes | No | Yes |
| 107 | 2.5 and later | No | 2.3 and later | No | Yes | Yes | Yes | Yes | No | No | No | Yes | No | Yes |
| 108 | 2.5 and later | No | 2.3 and later | No | Yes | Yes | Yes | Yes | No | No | No | Yes | No | Yes |
| 110 | 2.5 and later | No | 2.3 and later | No | 3.2.0 and later | Yes | Yes | Yes | No | No | No | Yes | No | Yes |
| 114,0x16 | No | No | No | No | No | No | No | Yes | Yes | Yes | No | Yes | No | Yes |
| 114,0x17 | No | No | No | No | No | No | No | Yes | Yes | Yes | No | Yes | No | Yes |

| Message | GSW2 | SiRFDRive | SiRFXTrac | SiRFLoc | GSW3 & GSWLT3 | SiRFDiRect | GSD3tw | GSD3fLP | Code Linked Host | | GPIO Strapped Chip | | OSP NMEA Switch Msg | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | GSD4t | GSD4e | GSD4t | GSD4e | GSD4t | GSD4e |
| 114,0x18 | No | No | No | No | No | No | No | Yes | Yes | Yes | No | Yes | No | Yes |
| 114,0x19 | No | No | No | No | No | No | No | Yes | Yes | Yes | No | Yes | No | Yes |
| 114,0x1A | No | No | No | No | No | No | No | Yes | Yes | Yes | No | Yes | No | Yes |
| 114,0x1B | No | No | No | No | No | No | No | Yes | Yes | Yes | No | Yes | No | Yes |
| 114,0x1C | No | No | No | No | No | No | No | Yes | Yes | Yes | No | Yes | No | Yes |
| 117, Ox10 | No | No | No | No | No | No | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| 117, Ox20[2] | No | No | No | No | No | No | No | No | No | Yes | No | Yes | No | Yes |
| 120[5] | No | No | No | No | No | No | No | No | No | Yes | No | Yes | No | Yes |
| 121[4] | No | No | No | No | No | No | No | No | No | Yes | No | Yes | No | Yes |

| Message | GSW2 | SiRFDRive | SiRFXTrac | SiRFLoc | GSW3 & GSWLT3 | SiRFDiRect | GSD3tw | GSD3fLP | Code Linked Host | | GPIO Strapped Chip | | OSP NMEA Switch Msg | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | GSD4t | GSD4e | GSD4t | GSD4e | GSD4t | GSD4e |
| 122[4] | No | No | No | No | No | No | No | No | No | Yes | No | Yes | No | Yes |
| 123[4] | No | No | No | No | No | No | No | No | No | Yes | No | Yes | No | Yes |
| 124[4] | No | No | No | No | No | No | No | No | No | Yes | No | Yes | No | Yes |
| 125[4] | No | No | No | No | No | No | No | No | No | Yes | No | Yes | No | Yes |
| 200 | Yes[3] | No | No | No | No | No | No | No | No | No | No | No | No | No |
| MSK | Yes | Yes | No | No | No | No | No | No | No | No | No | No | No | No |

**Table 3.2: Supported NMEA Input Messages**

[1] In GSW firmware versions prior to GSW3.5.0, input of position and [XXXtme] time are not allowed.

[2] Only revisions 4.1.0 and later support this message.

[3] Only with a GSC2xr chip

[4] This feature is supported starting at version 4.1.2 and later.

[5] This feature is supported starting from GSD4e and later.

## 3.1 Set Serial Port: MID 100

This command message is used to set the protocol (SiRF binary or NMEA) and/or the communication parameters (Baud rate, data bits, stop bits, and parity). The command is used to switch the module back to SiRF binary protocol mode where a more extensive command message set is available. When a valid message is received, the parameters are stored in battery-backed SRAM and, after a reset, the receiver resumes using the saved parameters.

Table 3.3 contains the input values for the following example:

Switch to SiRF binary protocol at 9600, 8, N, 1

```
$PSRF100,0,9600,8,1,0*0C<CR><LF>
```

| Name | Example | Description |
|---|---|---|
| MID | $PSRF100 | PSRF100 Protocol header |
| Protocol | 0 | 0 = SiRF binary<br>1 = NMEA |
| Baud | 9600 | 1200, 2400, 4800, 9600, 19200, 38400, 57600, or 115200 |
| DataBits | 8 | 8 only |
| StopBits | 1 | 1 only |
| Parity | 0 | 0 = None only |
| Checksum | *0C | - |
| <CR><LF> | - | End of message termination |

**Table 3.3: Set Serial Port Data Format**

**Note:**

For the GSD4e, operation at speeds below 38400 carries the risk of dropped messages when using SGEE (Server Generated Extended Ephemeris).

## 3.2 Navigation Initialization: MID 101

This command message restarts the receiver, as well as, specifies the type of restart. Optionally, it may also initialize position (in X, Y, Z ECEF coordinates), clock drift, GPS Time Of Week and GPS Week Number. This enables the receiver to search for the correct satellite signals at the correct signal parameters. Correct initialization parameters enable the receiver to quickly acquire signals.

**Note:**

For software that does not support initializing data (versions of GSW3 and GSWLT3, and SiRFXTrac), attempting to include it can cause unpredictable results. Do not set the initialize-data bit in the `ResetCfg` word.

Table 3.4 contains the input values for the following example:

Start using known position and time.

```
$PSRF101,-2686700,-4304200,3851624,96000,497260,921,12,3*1C<CR><LF>
```

| Name | Example | Unit | Description |
|---|---|---|---|
| MID | $PSRF101 | - | PSRF101 Protocol header |
| ECEF X | -2686700 | meters | X coordinate position |
| ECEF Y | -4304200 | meters | Y coordinate position |
| ECEF Z | 3851624 | meters | Z coordinate position |
| ClkDrift | 96000 | Hz | Clock Drift of the Receiver(1) |
| TimeOfWeek | 497260 | sec | GPS Time Of Week |
| WeekNo | 921 | - | GPS Week Number |
| ChannelCount | 12 | - | Range 1 - 12 |
| ResetCfg | 3 | - | See Table 3.5 and Table 3.6 |
| Checksum | *1C | - | - |
| <CR><LF> | - | - | End of message termination |

**Table 3.4: Navigation Initialization Data Format**

(1) Use 0 for last saved value if available. If this is unavailable, use a default value of 96250.

| Value | Description |
|---|---|
| 1 | Hot start |
| 2 | Warm start (no init) |
| 3 | Warm start (with init) |
| 4 | Cold start |
| 8 | Factory start |

**Table 3.5: Reset Mode Value (SiRFstarIII and Later)**

| Decimal | Description |
|---|---|
| 00 | Perform a hot start using internal RAM data. No initialization data is used. |
| 01 | Use initialization data and begin in start mode. The uncertainties are 5 seconds time accuracy and 300 km position accuracy. Ephemeris data in SRAM is used. |
| 02 | No initialization data is used, ephemeris data is cleared, and warm start performed using remaining data in RAM. |
| 03 | Initialization data is used, ephemeris data is cleared, and warm start performed using remaining data in RAM. |
| 04 | No initialization data is used. Position, time, and ephemeris are cleared, and a cold start is performed. |
| 08 | No initialization data is used. Internal RAM is cleared and a factory reset is performed. |

**Table 3.6: Reset Configuration: SiRFLoc Specific**

## 3.3 SetDGPSPort: MID 102

This command message is used to control the serial port used to receive RTCM differential corrections. Differential receivers can output corrections using different communication parameters. If a DGPS receiver is used that have different communication parameters, use this command to allow the receiver to correctly decode the data. When a valid message is received, the parameters are stored in the battery-backed SRAM and the receiver restarts using the saved parameters.

**Note:**

In receivers that do not support RTCM 104 DGPS (e.g. SiRFStarIII), this command is not supported.

Table 3.7 contains the input values for the following example:

Set DGPS Port to 9600 baud, 8 data bits, 1 stop bit, no parity bit.

```
$PSRF102,9600,8,1,0*12<CR><LF>
```

| Name | Example | Description |
|---|---|---|
| MID | $PSRF102 | PSRF102 Protocol header |
| Baud | 9600 | 1200, 2400, 4800, 9600, 19200, 38400, 57600, or 115200 |
| DataBits | 8 | 8,7 |
| StopBits | 1 | 0,1 |
| Parity | 0 | 0 = None<br>1 = Odd<br>2 = Even |
| Checksum | *12 | - |
| <CR><LF> | - | End of message termination |

**Table 3.7: Set DGPS Port Data Format**

## 3.4 Query/Rate Control: MID 103

This command is used to control the output of only standard NMEA messages GGA, GLL, GSA, GSV, RMC, and VTG. It also controls the ZDA message in software that supports it. Using this command message, standard NMEA messages 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.

Table 3.8 contains the input values for the following example:

Query the GGA message with checksum enabled

```
$PSRF103,00,01,00,01*25<CR><LF>
```

| Name | Example | Unit | Description |
|---|---|---|---|
| MID | $PSRF103 | - | PSRF103 Protocol header |
| Msg | 00 | - | Message to control. See Table 3.8 (1) |
| Mode | 01 | - | 0 = Set Rate<br>1 = Query one time<br>2 = ABP On(5)<br>3 = ABP Off(5)<br>4 = Reverse EE On(4)<br>5 = Reverse EE Off(4)<br>6 = 5Hz Navigation On(4)<br>7 = 5Hz Navigation Off(4)<br>8 = SBAS Ranging On(4)<br>9 = SBAS Ranging Off(4)<br>10 = FTS (Fast Time Sync) Mode On(6)<br>11 = FTS Mode Off(6) |
| Rate | 00 | sec | Output Rate, 0 = Off<br>1 – 255 = seconds between messages(2) |
| CksumEnable | 01 | - | 0 = Disable Checksum<br>1 = Enable Checksum |
| Checksum | *25 | - | Message checksum |
| <CR><LF> | - | - | End of message termination |

**Table 3.8: Query/Rate Control Data Format**

(1) The Msg field is ignored if the Mode field has values other than 1 (query).

(2) The Rate field is ignored unless the Mode field is set to 0 (Set Rate).

(4) This feature is supported on GSD4e version 4.1.0 and later.

(5) This feature is supported on GSD4e version 1.1.0 and later.

(6) This feature is supported on GSD4e version 4.1.2 and later.

| Value | Description |
|---|---|
| 0 | GGA |
| 1 | GLL |
| 2 | GSA |
| 3 | GSV |

| Value | Description |
|---|---|
| 4 | RMC |
| 5 | VTG |
| 6 | MSS (If internal beacon is supported) |
| 7 | Not defined |
| 8 | ZDA (if 1PPS output is supported) |
| 9 | Not defined |

**Table 3.9: Messages**

**Note:**

In TricklePower mode, the update rate specifies TricklePower cycles rather than seconds. If the TricklePower cycle is set at 5 seconds, then an update rate of 2 indicates to output the message every 2 cycles, or 10 seconds.

## 3.5 LLA Navigation Initialization: MID 104

This command is used to cause a restart of the receiver, and to specify the type of restart. Optionally, it may also initialize position (in latitude, longitude, and altitude), clock drift, GPS Time Of Week and GPS Week Number. This enables the receiver to search for the correct satellite signals at the correct signal parameters. Correct initialization parameters enable the receiver to quickly acquire signals.

**Note:**

For software that does not support initializing data (GSW3, GSWLT3, SiRFXTrac), attempting to include initializing data may cause unpredictable results. Do not set the initialize-data bit in the `ResetCfg` word.

Table 3.10 contains the input values for the following example:

Start using known position and time.

```
$PSRF104,37.3875111,-121.97232,0,96000,237759,1946,12,1*07<CR><LF>
```

| Name | Example | Unit | Description |
|---|---|---|---|
| MID | $PSRF104 | - | PSRF104 protocol header |
| Lat | 37.3875111 | degrees | Latitude + = North (Range 90 to -90) |
| Lon | -121.97232 | degrees | Longitude + = East (Range 180 to -180) |
| Alt | 0 | meters | Altitude position |
| ClkDrift | 96000 | Hz | Clock Drift of the Receiver(1) |

| Name | Example | Unit | Description |
|---|---|---|---|
| TimeOfWeek | 237759 | sec | GPS Time Of Week |
| WeekNo | 1946 | - | Extended GPS Week Number |
| ChannelCount | 12 | - | Range 1 to 12 |
| ResetCfg | 1 | - | SeeTable 3.11 |
| Checksum | *07 | - | - |
| <CR><LF> | - | - | End of message termination |

**Table 3.10: LLA Navigation Initialization Data Format**

(1) Use 0 for last saved value if available. If this is unavailable, a default value of 96,250 Hz is used.

| Value | Description |
|---|---|
| 1 | Hot start |
| 2 | Warm start (no init) |
| 3 | Warm start (with init) |
| 4 | Cold start |
| 8 | Factory start |

**Table 3.11: Reset Mode Value (SiRFstarIII and Later)**

## 3.6 Development Data On/Off: MID 105

This command turns development data (debug messages) on and off. Development data can be used to help diagnose system problems since many parts of the software contain messages that are output when problems are detected.

Table 3.12 contains the input values for the following example:

Debug = 1

```
$PSRF105,1*3E<CR><LF>
```

| Name | Example | Description |
|---|---|---|
| MID | $PSRF105 | PSRF105 Protocol header |
| Debug | 1 | 0 = Off<br>1 = On |
| Checksum | *3E | - |
| <CR><LF> | - | End of message termination |

**Table 3.12: Development Data On/Off Data Format**

## 3.7 Select Datum: MID 106

This message allows the selection of an alternate map datum. The receiver software may contain one or more alternate datums in addition to WGS84, the default GPS datum. The table below lists some datums that may be in a particular software build. In addition, other datums may have been added by either CSR or by developers with SDK software access. Available datums, if different from the list below, should be documented in the system or software documentation.

Table 3.13 contains the input values for the following example:

Datum = TOKYO_MEAN

```
$PSRF106,178*32<CR><LF>
```

| Name | Example | Description |
|---|---|---|
| MID | $PSRF106 | PSRF106 Protocol header |
| Datum | 178 | 21 = WGS84<br>178 = TOKYO_MEAN<br>179 = TOKYO_JAPAN<br>180 = TOKYO_KOREA<br>181 = TOKYO_OKINAWA |
| Checksum | *32 | - |
| <CR><LF> | - | End of message termination |

**Table 3.13: Select Datum Data Format**

## 3.8 Proprietary: MID 107

This message is reserved for SiRFInstantFix usage only. The content of this message is proprietary.

Table 3.14 contains the message parameter definitions.

| Name | Example | Description |
|---|---|---|
| MID | $PSRF107 | PSRF107 Protocol header |
| Extended Ephemeris | - | Proprietary message |
| Checksum | - | - |
| <CR><LF> | - | End of message termination |

**Table 3.14: Proprietary: MID 107**

## 3.9 Proprietary: MID 108

This message is reserved for SiRFInstantFix usage only. The content of this message is proprietary.

Table 3.15 contains the message parameter definitions.

| Name | Example | Description |
|---|---|---|
| MID | $PSRF108 | PSRF108 Protocol header |
| Extended Ephemeris | - | Proprietary message |
| Checksum | - | - |
| <CR><LF> | - | End of message termination |

**Table 3.15: Proprietary: MID 108**

## 3.10 Extended Ephemeris Debug: MID 110

This message allows control of a SiRFInstantFix debug flag. Turning on the flag forces the receiver to ignore broadcast ephemeris from the satellites and only use SiRFInstantFix ephemeris for navigation.

Table 3.16 contains the message parameter definitions.

| Name | Example | Description |
|---|---|---|
| MID | $PSRF110 | PSRF110 Protocol header |
| DEBUG_FLAG | 0x01000000 | 0x01000000 = Debug flag on, ignore broadcast ephemeris<br>0x00000000 = Debug flag off, normal operation |
| Checksum | - | - |
| <CR><LF> | - | End of message termination |

**Table 3.16: Extended Ephemeris Debug: MID 110**

## 3.11 Set Message Rate: MID 112

This message is intended only for SiRFInstantFix and must not be used otherwise.

Table 3.17 contains the message parameter definitions for the following example:

```
$PSRF112,140,1,1*3B<CR><LF>
```

| Name | Example | Unit | Description |
|---|---|---|---|
| MID | $PSRF112 | - | PSRF112 Protocol header |
| MID to set | 140 | - | This is the only NMEA MID supported |
| Message rate | 1 | sec | 140 = valid rate is 1 (i.e. occurring once at every periodic EE event, in every 6 seconds) or 0 (to disable) |
| Send Now | 1 | - | Poll NMEA MID once. |

**Table 3.17: Set Message Rate: MID 112**

## 3.12 Set GRF3i+ IF Bandwidth Mode: MID 113, SID 0x01

This message enables the user to set the IF bandwidth mode for the GRF3i+.

Table 3.18 contains the values for the following example:

SID = 0x1, GRF3i+ Bandwidth Mode Selection = 0x1

Example:

```
$PSRF113,01,01*24<CR><LF>
```

| Name | Example | Description |
|---|---|---|
| MID | $PSRF113 | GRF3i+ protocol header |
| SID | 0x01 (Decimal = 01) | 0x01 = Set GRF3i + IF bandwidth mode |
| GRF3i+ If Bandwidth Mode Selection | 0x01 | 0 = Wideband Mode<br>1 = Narrowband Mode [default] |
| Checksum | *24 | - |
| <CR><LF> | - | End of message termination. |

**Table 3.18: Set GRF3i+ IF Bandwidth Mode: MID 113, SID 0x01**

## 3.13 Set GRF3i+ Normal/Low Power RF Mode: MID 113, SID 0x02

This message enables the user to set the RF power mode to normal or low.

Table 3.19 contains the values for the following example:

SID = 0x2, GRF3i+ power mode = 0x1

Example:

```
$PSRF113,02,01*27<CR><LF>
```

| Name | Example | Description |
|---|---|---|
| MID | $PSRF113 | GRF3i+ Protocol header |
| SID | 0x02 (Decimal = 02) | 0x02 = Set GRF3i+ power mode |
| GRF3i+ power mode Selection | 0x01 | 0 = Normal power [default]<br>1 = Low power |
| Checksum | *27 | - |
| <CR><LF> | - | End of message termination. |

**Table 3.19: Set GRF3i+ Normal/Low Power RF Mode: MID 113, SID 0x02**

**Note:**

GRF3i+ Power Mode would be internally saved to NVM. By default, it would be initialized to 0 (Normal power).

## 3.14 ECLM Start Download: MID 114, SID 0x16

This message contains a packet of the SGEE file data being downloaded from the Host to the GPS receiver. The SID for this message is fixed to 0x16.

Table 3.20 contains the input values for the following example:

SID = 0x16

Example:

```
$PSRF114,16*08<CR><LF>
```

| Name | Example | Description |
|---|---|---|
| MID | $PSRF114 | ECLM download packet header |
| SID | 0x16 (Decimal = 22) | 0x16 = SID for ECLM start download |
| Checksum | *08 | - |
| <CR><LF> | - | End of message termination |

**Table 3.20: ECLM Start Download: MID 114, SID 0x16**

**Note:**

The receiver reports the success or failure of this message with MID 156, SID 0x20.

## 3.15 ECLM File Size: MID 114, SID 0x17

This message is sent from Host EE Downloader to the GPS receiver to indicate the size of the SGEE file to be downloaded. The SID for this message is fixed to 0x17.

Table 3.21 contains the values for the following example:

SID = 0x17, SGEE File Size = 0x2859

Example:

```
$PSRF114,17,2859*23<CR><LF>
```

| Name | Example | Description |
|---|---|---|
| MID | $PSRF114 | PSRF114 Protocol header |
| SID | 0x17 (Decimal = 23) | 0x17 = SGEE file length |
| File Length | 0x2859 | File length |
| Checksum | *23 | - |
| <CR><LF> | - | End of message termination |

**Table 3.21: ECLM File Size: MID 114, SID 0x17**

**Note:**

The receiver reports the success or failure of this message with MID 156, SID 0x20.

## 3.16 ECLM Packet Data: MID 114, SID 0x18

This message is sent from Host EE Downloader to the GPS receiver to indicate the size of the SGEE file to be downloaded. The SID for this message is fixed to 0x18.

Table 3.22 contains the values for the following example:

SID = 0x18, Packet Sequence No = 1, Packet Length = 32

Example:

```
$PSRF114,18,1,32,62,12,31,6,3,2,7,d9,7,7,0,0,39,6d,8f,12,0,0,0,0
,0,0,1,2d,9a,e7,5,2,ff,fe,28,5*3D<CR><LF>
```

| Name | Example | Unit | Description |
|---|---|---|---|
| MID | $PSRF114 | - | PSRF114 Protocol header |
| SID | 0x18<br>(Decimal = 24) | - | 0x18 = SGEE Packet Data |
| Packet Sequence Number of this packet | 1 | In decimal | Sequence |
| Packet Length | 32 | In decimal | Length of this packet |
| Packet Data | 62,12,31,6,3,2,7,d9,7,<br>7,0,0,39,6d,8f,<br>12,0,0,0,0,0,0,1,2d,<br>9a,e7,5,2,ff,fe,28,5 | - | SGEE data in this packet of length Packet Length |
| Checksum | *3D | - | - |
| <CR><LF> | - | - | End of message termination |

**Table 3.22: ECLM Packet Data: MID 114, SID 0x18**

**Note:**

The receiver reports the success or failure of this message with MID 156, SID 0x20.

## 3.17 ECLM Get EE Age: MID 114, SID 0x19

This message is sent from Host EE Downloader to the GPS receiver to get the EE age from the GPS receiver. The SID for this message is fixed to 0x19.

Table 3.23 contains the values for the following example:

SID = 0x19, Num Sat = 1, Prn Num = 1

Example:

```
$PSRF114,19,1,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0*1B<CR><LF>
```

| Name | Example | Description |
|---|---|---|
| MID | $PSRF114 | PSRF114 Protocol header |
| SID | 0x19 (Decimal = 25) | 0x19 = Get EE Age |
| Num Sat | 0x1 | Number of times below fields will be repeated |
| prnNum | 0x1 | PRN number = 1 |
| ephPosFlag | 0x0 | - |
| eePosAge | 0x0 | - |

| Name | Example | Description |
|---|---|---|
| cgeePosGPSWeek | 0x0 | - |
| cgeePosTOE | 0x0 | - |
| ephClkFlag | 0x0 | - |
| eeClkAge | 0x0 | - |
| cgeeClkGPSWeek | 0x0 | - |
| cgeeClkTOE | 0x0 | - |
| Pad | 0x0 | - |
| Checksum | *1B | - |
| <CR><LF> | - | End of message termination |

**Table 3.23: EECLM Get EE Age: MID 114, SID 0x19**

**Note:**

The receiver reports the success or failure of this message with MID 156, SID 0x21 or 0x20.

## 3.18 ECLM Get SGEE Age: MID 114, SID 0x1A

This message is sent from Host EE Downloader to the GPS receiver to get the SGEE age from the GPS receiver. The SID for this message is fixed to 0x1A.

Table 3.24 contains the values for the following example:

SID = 0x1A, Sat ID = 1

Example:

```
$PSRF114,1a,1*42<CR><LF>
```

| Name | Example | Description |
|---|---|---|
| MID | $PSRF114 | PSRF114 Protocol header |
| SID | 0x1A (Decimal = 26) | 0x1A = Get SGEE Age |
| Sat ID | 0x1 | Satellite ID for which SGEE Age is asked |
| Checksum | *42 | - |
| <CR><LF> | - | End of message termination |

**Table 3.24: ECLM Get SGEE Age: MID 114, SID 0x1A**

**Note:**

The receiver reports the success or failure of this message with MID 156, SID 0x22 (success) or 0x20 (failure).

## 3.19 ECLM Host File Content: MID 114, SID 0x1B

This message is sent to the GPS receiver in response to a Request File Content message. The SID for this message is fixed to 0x1B.

Table 3.25 contains the values for the following example:

SID = 0x1B, NVM ID = 3, Num Blocks = 1

Example:

```
$PSRF114,1b,1,3,1,a,0,0,0,f,6,0,f0,0,0,4a,0*41<CR><LF>
```

| Name | Example | Description |
|---|---|---|
| MID | $PSRF114 | PSRF114 Protocol header |
| SID | 0x1B (Decimal = 27) | 0x1B = Host file content |
| SeqNum | 0x01 | - |
| NVM ID | 0x03 | 1 = SGEE file<br>2 = CGEE file<br>3 = BE file |

| Name | Example | Description |
|---|---|---|
| Num Blocks | 0x1 | Number of blocks per packet |
| Block Length | 0xA | Block size |
| Offset | 0x0 | Offset of block in file |
| Data | 0,0,f,6,0,f0,0,0,4a,0 | Block data |
| Checksum | *41 | - |
| <CR><LF> | - | End of message termination |

**Table 3.25: HECLM Host File Content: MID 114, SID 0x1B**

## 3.20 ECLM Host ACK/NACK: MID 114, SID 0x1C

This message is the response to Output MID 156 with SID 0x23, 0x24 or 0x25.

Table 3.26 contains the values for the following example:

ACK for Downloader initiate request

```
$PSRF114,1c,9c,23,0,0*06<CR><LF>
```

| Name | Example | Description |
|---|---|---|
| MID | $PSRF114 | PSRF114 Protocol header |
| SID | 0x1C (Decimal = 28) | 0x1C = Host ACK/NACK |
| ACK MID | 0x9C | $PSRF156 |
| ACK SID | 0x23 | This can contain values:<br>0x23, 0x24, 0x25 |
| ACK/NACK | 0x0 | 0x0 = ACK<br>0x1 = NACK |
| Reason | 0x0 | 0x0 = SUCCESS<br>0x1 = Invalid NVMID<br>0x13 = File access error |
| Checksum | *06 | - |
| <CR><LF> | - | End of message termination |

**Table 3.26: ECLM Host ACK/NACK: MID 114, SID 0x1C**

## 3.21 System Turn Off: MID 117, SID 0x10

This message requests that the GPS receiver perform an orderly shutdown and switch to hibernate mode.

Table 3.27 contains the values for the following example:

```
$PSRF117,16*0B<CR><LF>
```

| Name | Example | Description |
|---|---|---|
| MID | $PSRF117 | PSRF117 Protocol header |
| SID | 0x10 (Decimal = 16) | 0x10 = System turn off |
| Checksum | *0B | - |
| <CR><LF> | - | End of message termination |

**Table 3.27: System Turn Off: MID 117, SID 0x10**

## 3.22 Switch to Boot Mode: MID 117, SID 0x20

This message is a request that the GPS receiver perform an orderly shutdown and switch to boot mode.

Table 3.28 contains the values for the following example:

SID = 0x20

```
$PSRF117,0x20,32*0D<CR><LF>
```

| Name | Example | Description |
|---|---|---|
| MID | $PSRF117 | System Turn Off |
| SID | Decimal = 32 | 0x20 = SID_SwitchToBootMode |
| Checksum | *0D | - |
| <CR><LF> | - | End of message termination |

**Table 3.28: Switch to Boot Mode: MID 117, SID 0x20**

## 3.23 Storage Configuration Setting: MID 120

This command sets storage configuration options to determine on which storage media the different types of system data will be physically stored.

Table 3.29 contains the input values for the following example:

Store patches on $I^2C$ serial flash and extended ephemeris data on $I^2C$ EEROM.

```
$PSRF120,F,R,*<checksum><CR><LF>
```

**Note:**

This message is supported by GSD4e and later.

| Name | Example | Description |
|---|---|---|
| MID | $PSRF120 | PSRF120 Protocol header |
| Patch Storage Setting | F | N = Do not store to external memory(1)<br>F = Store to external memory (default)(1)<br>0 = No change applied to patch |
| EE Storage Setting | R | H = Storage available on host<br>R = I2C EEROM provided for GSD4e access (default)<br>F = Store to parallel FLASH(2)<br>N = No storage<br>0 = No change applied to patch storage settings |
| Checksum | *... | - |
| <CR><LF> | - | End of message termination |

**Table 3.29: Storage Configuration Option Settings Format**

(1) External memory can be either I2C serial flash (EEPROM) or SPI Flash as determined by the Auto-detect feature in GSD4E ROM. For GSD4e, ROM versions prior to 4.1.2, 0 means do not store to I2C Serial flash and 1 means store to I2C serial flash.

(2) Storage will be set to either parallel or SPI flash. SPI flash only applies to GSD4E ROM. If a SPI flash part is detected on GSD4E ROM, then 0x02 means store to SPI flash. Otherwise, 0x02 will be interpreted to mean parallel flash. For GSD4e, versions prior to 4.1.2 and all 4t versions, 0x02 means store to parallel flash.

## 3.24 Data Logging Command: MID 121

This message controls the state of the data logger allowing it to be started, stopped, cleared, retrieve logged data, and retrieve general status. The minimum logging interval is specified as a parameter of the start command. Current position data will be logged if the interval and other threshold criteria are met.

**Note:**

This message supports version 4.1.2 and later.

| | |
|---|---|
| MID (Hex) | - |
| MID (Dec) | PSRF121 |
| Message Name in Code | `NMEA_121` |
| SID (Hex) | - |
| SID (Dec) | - |
| SID Name in Code | - |

**Table 3.30: Data Logging Command: MID 121**

| Name | Example | Unit | Range | Desciption |
|---|---|---|---|---|
| MID | $PSRF121 | - | - | PSRF121 Protocol header |
| Command | 0 | - | 0 - 4 | 0 = Start<br>1 = Stop<br>2 = Clear<br>3 = Retrieve Data<br>4 = Retrieve Status |
| Logging Interval | 2 | sec | 1 - 65535 | Minimum seconds between logging each record. Only applicable to the Start command. |

**Table 3.31: Message Field Description**

| Message | MsgID | Cmd | Response(s) | MsgID |
|---|---|---|---|---|
| DATA_LOGGING_COMMAND | PSRF121 | 3 | DATA_LOG_RECORD_OUTPUT | PSRF190,<br>PSRF191 |
| DATA_LOGGING_COMMAND | PSRF121 | 4 | DATA_LOG_STATUS_OUTPUT | PSRF192 |

**Table 3.32: Message Command Description**

## 3.25 Data Logging Interval Command: MID 122

This message sets the minimum data logging interval and will override the 'minimum logging interval' value set in the Data Logger Command Message. When this time is exceeded, data records will be logged if other threshold criteria are also met. This interval can be changed at any time even while data logging is active.

**Note:**

This message supports version 4.1.2 and later.

| | |
|---|---|
| MID (Hex) | - |
| MID (Dec) | PSRF122 |
| Message Name in Code | `NMEA_122` |
| SID (Hex) | - |
| SID (Dec) | - |
| SID Name in Code | - |

**Table 3.33: Data Logging Interval Command: MID 122**

| Name | Example | Unit | Range | Description |
|---|---|---|---|---|
| MID | $PSRF122 | - | - | PSRF122 Protocol header |
| Distance Threshold | 15 | m | 0 - 65535 | Distance between current record and the previously logged record that must be exceeded to log the current record. |
| Speed Threshold | 2 | m/s | 0 - 65535 | The speed the current record must exceed to be logged. |

**Table 3.34: Message Field Description**

## 3.26 Data Logging Threshold Command: MID 123

This message sets the minimum distance and speed thresholds that must be met before logging a record.

The data record will be logged when:

- the distance change from the last logged record exceeds the distance threshold or
- the current record's speed over ground exceeds the speed threshold and the minimum time interval has been exceeded

These thresholds can be changed at any time even while data logging is active. Zero threshold values are always exceeded. Threshold results are OR'ed with each other. When any threshold is exceeded, logging occurs at the interval controlled rate. Default Distance Threshold is 0 meters. Default Speed threshold is 0 m/s.

**Note:**

This message supports version 4.1.2 and later.

| | |
|---|---|
| MID (Hex) | - |
| MID (Dec) | $PSRF123 |
| Message Name in Code | NMEA_123 |
| SID (Hex) | - |
| SID (Dec) | - |
| SID Name in Code | - |

**Table 3.35: Data Logging Threshold Command: MID 123**

| Name | Example | Unit | Range | Description |
|---|---|---|---|---|
| MID | $PSRF123 | - | - | PSRF123 Protocol header |
| Distance Threshold | 15 | m | 0 - 65535 | Distance between current record and the previously logged record that must be exceeded to log the current record. |
| Speed Threshold | 2 | m/s | 0 - 65535 | The speed the current record must exceed to be logged. |

**Table 3.36: Message Field Description**

## 3.27 Data Logging Memory Management Command: MID 124

This message sets the type of memory management and format of the data record to be stored. The command must be issued when the data logger is NOT active in order to have any effect.

The memory management types include:

- stop-on-memory-full
- circular data buffering: the oldest data is over written by the new data for continuous logging

Logged data is stored and read back using the specified record type. Changing the record type invalidates all stored data and logging starts from the beginning of the allocated area. Default management type is circular buffering. Default record type is type 0.

**Note:**

This message supports version 4.1.2 and later.

| | |
|---|---|
| MID (Hex) | - |
| MID (Dec) | PSRF124 |
| Message Name in Code | NMEA_124 |
| SID (Hex) | - |
| SID (Dec) | - |
| SID Name in Code | - |

**Table 3.37: Data Logging Mem Management Command: MID 124**

| Name | Example | Range | Description |
|---|---|---|---|
| MID | $PSRF124 | - | PSRF124 Protocol header |
| Stop On Memory Full | 1 | 0 - 1 | 0 = Circular Buffering<br>1 = Stop on full (one pass) |
| Data Record Type | 4 | 0 - 4 | 0 = Compatibility format<br>1 = Position<br>2 = Position + Altitude<br>3 = Position + Altitude + Speed<br>4 = Position + Altitude + Speed + Accuracy |

**Table 3.38: Message Field Description**

## 3.28 Poll SW Version String: MID 125

This message polls the version string when in NMEA mode. The response is PSRF195. If a customer version string is defined, this request will generate two PSRF195, one with the SW Version String, and the second one with the customer-specific version string. Example: `$PSRF125*21`

**Note:**

This message supports GSD4e version 4.1.2 and later.

| | |
|---|---|
| MID (Hex) | - |
| MID (Dec) | PSRF125 |
| Message Name in Code | `NMEA_125` |
| SID (Hex) | - |
| SID (Dec) | - |
| SID Name in Code | - |

**Table 3.39: Poll SW Version String: MID 125**

| Name | Example | Description |
|---|---|---|
| MID | $PSRF125 | PSRF125 Protocol header |
| Checksum | *21 | - |
| <CR><LF> | - | End of message termination |

**Table 3.40: Message Field Description**

## 3.29 Marketing Software Configuration: MID 200

**Note:**

Use this message to select one of the pre-programmed configurations within ROM-based devices. Refer to the appropriate product data sheet to determine message format and specific configurations supported.

## 3.30 MSK Receiver Interface: MID MSK

Table 3.41 contains the values for the following example:

```
$GPMSK,318.0,A,100,M,2,*45<CR><LF>
```

| Name | Example | Unit | Description |
|---|---|---|---|
| MID | $GPMSK | - | MSK protocol header |
| Beacon Frequency | 318.0 | kHz | Frequency to use |
| Auto/Manual Frequency(1) | A | - | A = Auto<br>M = Manual |
| Beacon Bit Rate | 100 | - | Bits per second |
| Auto/Manual Bit Rate(2) | M | - | A = Auto<br>M = Manual |
| Interval for Sending $--MSS(3) | 2 | sec | Sending of MSS message for status |

**Table 3.41: MSK Data Format**

(1) If Auto is specified, the previous field is ignored and the receiver will search for beacon frequency automatically.

(2) If Auto is specified, the previous field is ignored and the receiver will search for the correct bit rate.

(3) When status data is not to be transmitted this field is null.

**Note:**

The NMEA messages supported by the receiver does not provide the ability to change the DGPS source. If you need to change the DGPS source to internal beacon, use the SiRF binary protocol and then switch to NMEA.

# Terms and Definitions

| Term | Definition |
|---|---|
| ACK | ACKnowledge |
| ASCII | American Standard Code for Information Interchange |
| BE | Broadcast Ephemeris |
| $C/N_o$ | Carrier to Noise Density |
| CGEE | Client Generated Extended Ephemeris |
| CR | Carriage Return |
| CSR | Cambridge Silicon Radio |
| DGPS | Differential Global Positioning System |
| DoP | Dilution of Precision |
| EE | Extended Ephemeris |
| GGA | NMEA Term: Global Positioning System Fix Data |
| GLL | Generic Location Layer |
| GNSS | Global Navigation Satellite System |
| GPIO | General Purpose Input/Output |
| GPS | Global Positioning System |
| GSA | NMEA string: GNSS DOP and Active Satellites |
| GSV | NMEA string: GNSS Satellites in View |
| LF | Line Feed |
| LSB | Least-Significant Bit (or Byte) |
| MSB | Most Significant Bit (or Byte) |
| MSK | NMEA string: MSK Receiver Interface |
| MSS | NMEA string: MSK Receiver Signal |
| NMEA | National Marine Electronics Association |
| NVM | Non-Volatile Memory |
| OSP | One Socket Protocol |
| PRN | Pseudo-Random Noise |
| PVT | Position, Velocity and Time |
| RAM | Random Access Memory |

| Term | Definition |
|---|---|
| RMC | Recommended Minimum Specific GNSS Data |
| RTCM | Radio Technical Commission for Maritime Services |
| SDK | Software Development Kit |
| SGEE | Server Generated Extended Ephemeris |
| SID | Sub ID |
| SNR | Signal-to-Noise Ratio |
| SRAM | Static Random Access Memory |
| SV | Space Vehicle |
| UTC | Co-ordinated Universal Time |
| VTG | NMEA string: Course Over Ground and Ground Speed |
| ZDA | NMEA string: Time & Date |