SiRFstar™ GPS Single Chip
A High Performance GPS in a Small Form Factor

ARCHITECTURE HIGHLIGHTS

Next Generation GPS Performance
- High sensitivity for indoor fixes
- Extremely fast TTFF’s at low signal levels
- Real time navigation for location based services
- Low 100ms interrupt load on microprocessor for easy IP implementation

SiRFLOc™ Client AGPS Support
- SiRF’s Patented End to End Solution
- Multi-mode: from Autonomous to Network Centric
- Supports A13 and F Interfaces
- Multi-Standard Support: GSM, 3G, CDMA, PDC, iDen, GPRS, Edge, TIA-916

GSW3 - Modular Software Support
- API compatible with GSW2
- RTOS Friendly

FAMILY HIGHLIGHTS

GSC3 - Digital and RF
- 200,000+ effective correlators for fast TTFF and high sensitivity acquisition
- 20-Channel GPS
- Digital and RF in a single package
- Small 7mm x 10mm BGA package
- 4Mb integrated FLASH memory (GSC3f Only)
- ARM7TDMI CPU to enable user tasks
- Accepts 7 reference frequencies between 13MHz and 33MHz
- Requires minimum external RF components
- Extensive GPS receiver peripherals
  - 2 UARTS, high speed serial bus, battery backed SRAM, 14 GPIO’s

Built on Proven Experience
- IP Integration Experience
- Production support tools
- Supports FCC E911 Mandate

SiRFstarIII ARCHITECTURE

Wireless and handheld applications make rigorous demands on GPS; receivers are pushed to get fixes in places never before expected and in times measure in only seconds. SiRF Technology has risen to the challenge with the SiRFstarIII. This is GPS based on three generations of experience. This experience includes getting customers from design to production in the shortest time, developing IP solutions based on production worthy silicon, and creating a GPS single chip that goes far beyond the FCC’s E911 mandate.

The SiRFstarIII has the performance required to meet the industry’s toughest challenges. The 200,000+ effective correlators allow the SiRFstarIII to acquire in only seconds even in low signal levels. As part of SiRF’s patented multi-mode GPS the SiRFstarIII can acquire signal levels as low as -159dBm. The SiRFstarIII supports real-time navigation in urban canyons as well as high sensitivity acquisition needed for indoor environments. With power management and low power consumption, the SiRFstarIII can get a fix in a fraction of a joule.

SiRFstarIII BLOCK DIAGRAM
## TECHNICAL SPECIFICATIONS

**Acquisition at low signal levels**

<table>
<thead>
<tr>
<th>Aiding Type</th>
<th>Sensitivity</th>
<th>TTFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>GSM or 3G</td>
<td>Open Sky¹</td>
<td>&lt; 1s</td>
</tr>
<tr>
<td>GSM or 3G</td>
<td>Indoor²</td>
<td>&lt; 24s</td>
</tr>
<tr>
<td>CDMA</td>
<td>Open Sky</td>
<td>&lt; 1s</td>
</tr>
<tr>
<td>CDMA</td>
<td>Indoor</td>
<td>&lt; 18s</td>
</tr>
<tr>
<td>Hot Start</td>
<td>Open Sky</td>
<td>&lt; 1s</td>
</tr>
<tr>
<td>Hot Start</td>
<td>Indoor</td>
<td>&lt; 15s</td>
</tr>
<tr>
<td>Cold Start³</td>
<td>Open Sky</td>
<td>&lt; 35s</td>
</tr>
<tr>
<td>Tracking Sensitivity</td>
<td>-159dBm</td>
<td></td>
</tr>
</tbody>
</table>

**Position Accuracy**

- Autonomous: <10m
- SBAS: <5m

**Receiver**

- Tracking: L1, CA code
- Channels: 12
- Max. Update Rate: 10Hz
- Max. Altitude/Velocity: <60,000ft / <1,000 knots

**Protocol Support**

- NMEA, SiRF Binary, A13/F

**Reference Frequencies**

- 13, 16.369, 16.8, 19.2
- 24.5535, 26, 33.6MHz

**Processing Core**

- Processor Type: ARM7TDMI
- Data Bus: 16 Bit
- Ports: 14 GPIO
- Integrated SRAM: 1Mb
- Integrated Flash: 4 Mb (GSC3f only)

**Power**

- Core Voltage: 1.5V
- IO Voltage: 2.7-3.0V
- Tracking² (1s update): 105mW
- Open Sky Fix (Aided): <100mJ

1: Open Sky: All SV at -144dBm or higher.
2: Indoor: 7 SV at -155dBm with one at -147dBm to approximate real environment.
3: SiRFstarIII is capable of cold starts down to -144dBm.
4: Chip power consumption using 300, 1 duty cycle.

## APPLICATIONS

Wireless market requirements are pushing GPS to new levels of performance benefiting all GPS markets. Consumer applications will be able to exploit the SiRFstarIII’s high sensitivity by using very small (high-loss) antennas while still maintaining high-performance. PDA applications can take advantage of the single package by adding GPS to the PDA motherboard in a fraction of the board space required previously. Wireless markets will use SiRFstarIII with aiding for fast fixes even indoors. The SiRFstarIII will usher in a new generation of smaller higher performing GPS products.

## CHIP CONFIGURATIONS

### AVAILABLE PACKAGES

<table>
<thead>
<tr>
<th>Chip Name</th>
<th>Chip PN</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>SiRFstarIII GSC3</td>
<td>GSC3-7871</td>
<td>BGA, 7mm x 10mm</td>
</tr>
<tr>
<td>SiRFstarIII GSC3f</td>
<td>GSC3-7877</td>
<td>BGA, 7mm x 10mm lead-free</td>
</tr>
<tr>
<td>SiRFstarIII GSC3f</td>
<td>GSC3-7879</td>
<td>BGA, 7mm x 10mm lead-free</td>
</tr>
<tr>
<td>SiRFstarII GSC3f GSC3</td>
<td>GSC3-7871</td>
<td>BGA, 7mm x 10mm</td>
</tr>
</tbody>
</table>

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NMEA Reference Manual

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</tr>
<tr>
<td>Development Data On/Off</td>
<td>2-6</td>
</tr>
<tr>
<td>Select Datum</td>
<td>2-7</td>
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<tr>
<td>MSK—MSK Receiver Interface</td>
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</tr>
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<td>1-4</td>
</tr>
<tr>
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<td>1-4</td>
</tr>
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<td>1-5</td>
</tr>
<tr>
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<td>MSS Data Format</td>
<td>1-5</td>
</tr>
<tr>
<td>Table 1-11</td>
<td>RMC Data Format</td>
<td>1-6</td>
</tr>
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<td>Table 1-12</td>
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Preface

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

The NMEA Reference Manual provides details of NMEA messages developed and defined by SiRF. It does not provide information about the complete NMEA-0183 interface standard.

Who Should Use This Guide

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

How This Guide Is Organized

This manual contains the following chapters:

Chapter 1, “Output Messages” defines SiRF developed NMEA output messages.

Chapter 2, “Input Messages” defines SiRF developed NMEA input messages.

Related Manuals

You can refer to the following document for more information:

- NMEA-0183 Standard For Interfacing Marine Electronic Devices
- SiRF Binary Protocol Reference Manual
- SiRF Evaluation Kit User Guide
- SiRF System Development Kit User Guide
Contacting SiRF Technical Support

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Table 1-1 lists each of the NMEA output messages specifically developed and defined by SiRF for use within SiRF products.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GGA</td>
<td>Time, position and fix type data.</td>
</tr>
<tr>
<td>GLL</td>
<td>Latitude, longitude, UTC time of position fix and status.</td>
</tr>
<tr>
<td>GSA</td>
<td>GPS receiver operating mode, satellites used in the position solution, and DOP values.</td>
</tr>
<tr>
<td>GSV</td>
<td>The number of GPS satellites in view satellite ID numbers, elevation, azimuth, and SNR values.</td>
</tr>
<tr>
<td>MSS</td>
<td>Signal-to-noise ratio, signal strength, frequency, and bit rate from a radio-beacon receiver.</td>
</tr>
<tr>
<td>RMC</td>
<td>Time, date, position, course and speed data.</td>
</tr>
<tr>
<td>VTG</td>
<td>Course and speed information relative to the ground.</td>
</tr>
<tr>
<td>ZDA</td>
<td>PPS timing message (synchronized to PPS).</td>
</tr>
<tr>
<td>150</td>
<td>OK to send message.</td>
</tr>
</tbody>
</table>

A full description of the listed NMEA messages are provided in the following sections.
Table 1-2 provides a summary of SiRF NMEA output messages supported by the specific SiRF platforms.

**Table 1-2  Supported NMEA Output Messages**

<table>
<thead>
<tr>
<th>Message</th>
<th>GSW2</th>
<th>SiRFXTrac</th>
<th>SiRFLoc</th>
<th>GSW3</th>
</tr>
</thead>
<tbody>
<tr>
<td>GGA</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>GLL</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>GSA</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>GSV</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>MSS</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>RMC</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>VTG</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>ZDA</td>
<td>2.3.2 and above</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>150</td>
<td>2.3.2 and above</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

**Note** – GSW2 software only outputs NMEA version 2.20 (and earlier). XTrac and GSW3 software have 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.

**GGA —Global Positioning System Fixed Data**

**Note** – Fields marked in italic red apply only to NMEA version 2.3 (and later) in this NMEA message description.

Table 1-3 contains the values for the following example:

$GPGGA, 161229.487,3723.2475,N,12158.3416, W,1,07,1.0,9.0,M, , , ,0000*18

**Table 1-3  GGA Data Format**

<table>
<thead>
<tr>
<th>Name</th>
<th>Example</th>
<th>Units</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message ID</td>
<td>$GPGGA</td>
<td></td>
<td>GGA protocol header</td>
</tr>
<tr>
<td>UTC Time</td>
<td>161229.487</td>
<td>hhmms.sss</td>
<td></td>
</tr>
<tr>
<td>Latitude</td>
<td>3723.2475</td>
<td>ddmms.mmmm</td>
<td></td>
</tr>
<tr>
<td>N/S Indicator</td>
<td>N</td>
<td></td>
<td>N=north or S=south</td>
</tr>
<tr>
<td>Longitude</td>
<td>12158.3416</td>
<td>ddmms.mmmm</td>
<td></td>
</tr>
<tr>
<td>E/W Indicator</td>
<td>W</td>
<td></td>
<td>E=east or W=west</td>
</tr>
<tr>
<td>Position Fix Indicator</td>
<td>1</td>
<td></td>
<td>See Table 1-4</td>
</tr>
<tr>
<td>Satellites Used</td>
<td>07</td>
<td></td>
<td>Range 0 to 12</td>
</tr>
<tr>
<td>HDOP</td>
<td>1.0</td>
<td></td>
<td>Horizontal Dilution of Precision</td>
</tr>
<tr>
<td>MSL Altitude</td>
<td>9.0</td>
<td>meters</td>
<td></td>
</tr>
<tr>
<td>Units</td>
<td>M</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geoid Separation</td>
<td>meters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Units</td>
<td>M</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age of Diff. Corr.</td>
<td>second</td>
<td>Null fields when DGPS is not used</td>
<td></td>
</tr>
<tr>
<td>Diff. Ref. Station ID</td>
<td>0000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Checksum</td>
<td>*18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;CR&gt; &lt;LF&gt;</td>
<td></td>
<td></td>
<td>End of message termination</td>
</tr>
</tbody>
</table>
Table 1-4  Position Fix Indicator

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Fix not available or invalid</td>
</tr>
<tr>
<td>1</td>
<td>GPS SPS Mode, fix valid</td>
</tr>
<tr>
<td>2</td>
<td>Differential GPS, SPS Mode, fix valid</td>
</tr>
<tr>
<td>3-5</td>
<td>Not supported</td>
</tr>
<tr>
<td>6</td>
<td>Dead Reckoning Mode, fix valid</td>
</tr>
</tbody>
</table>

Note – A valid position fix indicator is derived from the SiRF Binary M.I.D. 2 position mode 1. See the SiRF Binary Protocol Reference Manual.

### GLL—Geographic Position - Latitude/Longitude

Note – Fields marked in italic red apply only to NMEA version 2.3 (and later) in this NMEA message description.

Table 1-5 contains the values for the following example:

$GPGLL, 3723.2475,N,12158.3416,W,161229.487,A,A*41

Table 1-5  GLL Data Format

<table>
<thead>
<tr>
<th>Name</th>
<th>Example</th>
<th>Units</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message ID</td>
<td>$GPGLL</td>
<td></td>
<td>GLL protocol header</td>
</tr>
<tr>
<td>Latitude</td>
<td>3723.2475</td>
<td>ddmm.mmmm</td>
<td></td>
</tr>
<tr>
<td>N/S Indicator</td>
<td>N</td>
<td>N=north or S=south</td>
<td></td>
</tr>
<tr>
<td>Longitude</td>
<td>12158.3416</td>
<td>dddmm.mmmm</td>
<td></td>
</tr>
<tr>
<td>E/W Indicator</td>
<td>W</td>
<td>E=east or W=west</td>
<td></td>
</tr>
<tr>
<td>UTC Time</td>
<td>161229.487</td>
<td>hhmmss.sss</td>
<td></td>
</tr>
<tr>
<td>Status</td>
<td>A</td>
<td>A=data valid or V=data not valid</td>
<td></td>
</tr>
<tr>
<td>Mode</td>
<td>A</td>
<td>A=Autonomous, D=DGPS, E=DR (Only present in NMEA version 3.00)</td>
<td></td>
</tr>
<tr>
<td>Checksum</td>
<td>*41</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;CR&gt; &lt;LF&gt;</td>
<td></td>
<td></td>
<td>End of message termination</td>
</tr>
</tbody>
</table>
**GSA—GNSS DOP and Active Satellites**

**Note** – Fields marked in italic red apply only to NMEA version 2.3 (and later) in this NMEA message description.

Table 1-6 contains the values for the following example:

$GPGSA,A,3,07,02,26,27,09,04,15, , , , , ,1.8,1.0,1.5*33

**Table 1-6 GSA Data Format**

<table>
<thead>
<tr>
<th>Name</th>
<th>Example</th>
<th>Units</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message ID</td>
<td>$GPGSA</td>
<td></td>
<td>GSA protocol header</td>
</tr>
<tr>
<td>Mode 1</td>
<td>A</td>
<td></td>
<td>See Table 1-7</td>
</tr>
<tr>
<td>Mode 2</td>
<td>3</td>
<td></td>
<td>See Table 1-8</td>
</tr>
<tr>
<td>Satellite Used¹</td>
<td>07</td>
<td></td>
<td>Sv on Channel 1</td>
</tr>
<tr>
<td>Satellite Used¹</td>
<td>02</td>
<td></td>
<td>Sv on Channel 2</td>
</tr>
<tr>
<td>PDOP</td>
<td>1.8</td>
<td></td>
<td>Position Dilution of Precision</td>
</tr>
<tr>
<td>HDOP</td>
<td>1.0</td>
<td></td>
<td>Horizontal Dilution of Precision</td>
</tr>
<tr>
<td>VDOP</td>
<td>1.5</td>
<td></td>
<td>Vertical Dilution of Precision</td>
</tr>
<tr>
<td>Checksum</td>
<td>*33</td>
<td></td>
<td>End of message termination</td>
</tr>
</tbody>
</table>

1. Satellite used in solution.

**Table 1-7 Mode 1**

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Manual—forced to operate in 2D or 3D mode</td>
</tr>
<tr>
<td>A</td>
<td>2D Automatic—allowed to automatically switch 2D/3D</td>
</tr>
</tbody>
</table>

**Table 1-8 Mode 2**

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fix not available</td>
</tr>
<tr>
<td>2</td>
<td>2D (&lt;4 SVs used)</td>
</tr>
<tr>
<td>3</td>
<td>3D (&gt;3 SVs used)</td>
</tr>
</tbody>
</table>
**GSV—GNSS Satellites in View**

Table 1-9 contains the values for the following example:

\[
\begin{align*}
\$GPGSV,2,1,79,048,02,51,27,27,138,42*71 \\
\$GPGSV,2,2,23,041,27,27,138,42*41
\end{align*}
\]

Table 1-9  GSV Data Format

<table>
<thead>
<tr>
<th>Name</th>
<th>Example</th>
<th>Units</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message ID</td>
<td>$GPGSV</td>
<td></td>
<td>GSV protocol header</td>
</tr>
<tr>
<td>Number of Messages</td>
<td>2</td>
<td></td>
<td>Range 1 to 3</td>
</tr>
<tr>
<td>Message Number</td>
<td>1</td>
<td></td>
<td>Range 1 to 3</td>
</tr>
<tr>
<td>Satellites in View</td>
<td>07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satellite ID</td>
<td>07</td>
<td></td>
<td>Channel 1 (Range 1 to 32)</td>
</tr>
<tr>
<td>Elevation</td>
<td>79</td>
<td>degrees</td>
<td>Channel 1 (Maximum 90)</td>
</tr>
<tr>
<td>Azimuth</td>
<td>048</td>
<td>degrees</td>
<td>Channel 1 (True, Range 0 to 359)</td>
</tr>
<tr>
<td>SNR (C/No)</td>
<td>42</td>
<td>dBHz</td>
<td>Range 0 to 99, null when not tracking</td>
</tr>
<tr>
<td>...</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satellite ID</td>
<td>27</td>
<td></td>
<td>Channel 4 (Range 1 to 32)</td>
</tr>
<tr>
<td>Elevation</td>
<td>27</td>
<td>degrees</td>
<td>Channel 4 (Maximum 90)</td>
</tr>
<tr>
<td>Azimuth</td>
<td>138</td>
<td>degrees</td>
<td>Channel 4 (True, Range 0 to 359)</td>
</tr>
<tr>
<td>SNR (C/No)</td>
<td>42</td>
<td>dBHz</td>
<td>Range 0 to 99, null when not tracking</td>
</tr>
<tr>
<td>Checksum</td>
<td>*71</td>
<td></td>
<td>End of message termination</td>
</tr>
</tbody>
</table>

1. Depending on the number of satellites tracked, multiple messages of GSV data may be required.

**MSS—MSK Receiver Signal**

**Note**  – Fields marked in italic red apply only to NMEA version 2.3 (and later) in this NMEA message description.

Table 1-10 contains the values for the following example:

\[
\$GPMSS,55,27,318.0,100,1,*57
\]

Table 1-10  MSS Data Format

<table>
<thead>
<tr>
<th>Name</th>
<th>Example</th>
<th>Units</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message ID</td>
<td>$GPMSS</td>
<td></td>
<td>MSS protocol header</td>
</tr>
<tr>
<td>Signal Strength</td>
<td>55</td>
<td>dB</td>
<td>SS of tracked frequency</td>
</tr>
<tr>
<td>Signal-to-Noise Ratio</td>
<td>27</td>
<td>dB</td>
<td>SNR of tracked frequency</td>
</tr>
<tr>
<td>Beacon Frequency</td>
<td>318.0</td>
<td>kHz</td>
<td>Currently tracked frequency</td>
</tr>
<tr>
<td>Beacon Bit Rate</td>
<td>100</td>
<td>bits per second</td>
<td></td>
</tr>
<tr>
<td>Channel Number</td>
<td>1</td>
<td></td>
<td><em>The channel of the beacon being used if a multi-channel beacon receiver is used</em></td>
</tr>
<tr>
<td>Checksum</td>
<td>*57</td>
<td></td>
<td>End of message termination</td>
</tr>
<tr>
<td>&lt;CR&gt; &lt;LF&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Note – The MSS NMEA message can only be polled or scheduled using the MSK NMEA input message. See “MSK—MSK Receiver Interface” on page 2-8.

**RMC—Recommended Minimum Specific GNSS Data**

Note – Fields marked in italic red apply only to NMEA version 2.3 (and later) in this NMEA message description.

Table 1-11 contains the values for the following example:

```
$GPRMC, 161229.487,A,3723.2475,N,12158.3416,W,0.13,309.62,120598, ,*10
```

Table 1-11  RMC Data Format

<table>
<thead>
<tr>
<th>Name</th>
<th>Example</th>
<th>Units</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message ID</td>
<td>$GPRMC</td>
<td>RMC protocol header</td>
<td></td>
</tr>
<tr>
<td>UTC Time</td>
<td>161229.487</td>
<td>hhmmss.sss</td>
<td></td>
</tr>
<tr>
<td>Status</td>
<td>A</td>
<td>A=data valid or V=data not valid</td>
<td></td>
</tr>
<tr>
<td>Latitude</td>
<td>3723.2475</td>
<td>ddmm.mmmm</td>
<td></td>
</tr>
<tr>
<td>N/S Indicator</td>
<td>N</td>
<td>N=north or S=south</td>
<td></td>
</tr>
<tr>
<td>Longitude</td>
<td>12158.3416</td>
<td>ddmm.mmmm</td>
<td></td>
</tr>
<tr>
<td>E/W Indicator</td>
<td>W</td>
<td>E=east or W=west</td>
<td></td>
</tr>
<tr>
<td>Speed Over Ground</td>
<td>0.13</td>
<td>knots</td>
<td></td>
</tr>
<tr>
<td>Course Over Ground</td>
<td>309.62</td>
<td>degrees True</td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>120598</td>
<td>ddmmyy</td>
<td></td>
</tr>
<tr>
<td>Magnetic Variation^2</td>
<td></td>
<td>degrees E=east or W=west</td>
<td></td>
</tr>
<tr>
<td>Mode</td>
<td>A</td>
<td>A=Autonomous, D=DGPS, E=DR</td>
<td></td>
</tr>
<tr>
<td>Checksum</td>
<td>*10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;CR&gt; &lt;LF&gt;</td>
<td></td>
<td>End of message termination</td>
<td></td>
</tr>
</tbody>
</table>

2. SiRF Technology Inc. does not support magnetic declination. All “course over ground” data are geodetic WGS84 directions.
VTG—Course Over Ground and Ground Speed

Note – Fields marked in italic red apply only to NMEA version 2.3 (and later) in this NMEA message description.

Table 1-12 contains the values for the following example:

```
$GPVTG,309.62,T,M,0.13,N,0.2,K,A*23
```

**Table 1-12 VTG Data Format**

<table>
<thead>
<tr>
<th>Name</th>
<th>Example</th>
<th>Units</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message ID</td>
<td>$GPVTG</td>
<td></td>
<td>VTG protocol header</td>
</tr>
<tr>
<td>Course</td>
<td>309.62</td>
<td>degrees</td>
<td>Measured heading</td>
</tr>
<tr>
<td>Reference</td>
<td>T</td>
<td></td>
<td>True</td>
</tr>
<tr>
<td>Course</td>
<td></td>
<td>degrees</td>
<td>Measured heading</td>
</tr>
<tr>
<td>Reference</td>
<td>M</td>
<td></td>
<td>Magnetic</td>
</tr>
<tr>
<td>Speed</td>
<td>0.13</td>
<td>knots</td>
<td>Measured horizontal speed</td>
</tr>
<tr>
<td>Units</td>
<td>N</td>
<td></td>
<td>Knots</td>
</tr>
<tr>
<td>Speed</td>
<td>0.2</td>
<td>km/hr</td>
<td>Measured horizontal speed</td>
</tr>
<tr>
<td>Units</td>
<td>K</td>
<td></td>
<td>Kilometers per hour</td>
</tr>
<tr>
<td>Mode</td>
<td>A</td>
<td></td>
<td>$A$=Autonomous, $D$=DGPS, $E$=DR</td>
</tr>
<tr>
<td>Checksum</td>
<td>*23</td>
<td></td>
<td>End of message termination</td>
</tr>
</tbody>
</table>

1. SiRF Technology Inc. does not support magnetic declination. All “course over ground” data are geodetic WGS84 directions.

ZDA—SiRF Timing Message

Outputs the time associated with the current 1 PPS pulse. Each message is output within a few hundred ms after the 1 PPS pulse is output and tells the time of the pulse that just occurred.

Table 1-13 contains the values for the following example:

```
$GPZDA,181813,14,10,2003,00,00*4F
```

**Table 1-13 ZDA Data Format**

<table>
<thead>
<tr>
<th>Name</th>
<th>Example</th>
<th>Units</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message ID</td>
<td>$GPZDA</td>
<td></td>
<td>ZDA protocol header</td>
</tr>
<tr>
<td>UTC time</td>
<td>181813</td>
<td></td>
<td>Either using valid IONO/UTC or estimated from default leap seconds</td>
</tr>
<tr>
<td>Day</td>
<td>14</td>
<td></td>
<td>01 TO 31</td>
</tr>
<tr>
<td>Month</td>
<td>10</td>
<td></td>
<td>01 TO 12</td>
</tr>
<tr>
<td>Year</td>
<td>2003</td>
<td></td>
<td>1980 to 2079</td>
</tr>
<tr>
<td>Local zone hour</td>
<td>00</td>
<td>knots</td>
<td>Offset from UTC (set to 00)</td>
</tr>
<tr>
<td>Local zone minutes</td>
<td>00</td>
<td></td>
<td>Offset from UTC (set to 00)</td>
</tr>
<tr>
<td>Checksum</td>
<td>*4F</td>
<td></td>
<td>End of message termination</td>
</tr>
</tbody>
</table>

Output Messages
150—OkToSend

This message is being sent out during the trickle power mode to communicate with an outside program such as SiRFDemo to indicate whether the receiver is awake or not.

Table 1-14 contains the values for the following examples:

1. OkToSend

   \$PSRF150,1*3F

2. not OkToSend

   \$PSRF150,0*3E

*Table 1-14 OkToSend Message Data Format*

<table>
<thead>
<tr>
<th>Name</th>
<th>Example</th>
<th>Units</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message ID</td>
<td>$PSRF150</td>
<td></td>
<td>PSRF150 protocol header</td>
</tr>
<tr>
<td>OkToSend</td>
<td>1</td>
<td></td>
<td>1=OK to send, 0=not OK to send</td>
</tr>
<tr>
<td>Checksum</td>
<td>*3F</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;CR&gt; &lt;LF&gt;</td>
<td></td>
<td></td>
<td>End of message termination</td>
</tr>
</tbody>
</table>
Input Messages

NMEA input messages enable you to control the Evaluation Receiver while in NMEA protocol mode. The Evaluation Receiver may be put into NMEA mode by sending the SiRF binary protocol message “Switch to NMEA Protocol - Message I.D. 129” (see the SiRF Binary Protocol Reference Manual). This can be done by using a user program or by using the SiRFSDemo software and selecting Switch to NMEA Protocol from the Action menu (see the SiRF Evaluation Kit User Guide or the SiRFDemo User Guide). If the receiver is in SiRF binary mode, all NMEA input messages are ignored. Once the receiver is put into NMEA mode, the following messages may be used to command the module.

Transport Message

Table 2-1 describes the transport message parameters.

**Table 2-1  Transport Message parameters**

<table>
<thead>
<tr>
<th>Start Sequence</th>
<th>Payload</th>
<th>Checksum</th>
<th>End Sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>$PSRF&lt;MID&gt;¹</td>
<td>Data²</td>
<td>*CKSUM³</td>
<td>&lt;CR&gt; &lt;LF&gt;⁴</td>
</tr>
</tbody>
</table>

1. Message Identifier consisting of three numeric characters. Input messages begin at MID 100.
2. Message specific data. Refer to a specific message section for <data>…<data> definition.
3. CKSUM is a two-hex character checksum as defined in the NMEA specification, NMEA-0183 Standard For Interfacing Marine Electronic Devices. Use of checksums is required on all input messages.
4. Each message is terminated using Carriage Return (CR) Line Feed (LF) which is CR LF which is hex 0D 0A. Because \r\n are not printable ASCII characters, they are omitted from the example strings, but must be sent to terminate the message and cause the receiver to process that input message.

**Note** – All fields in all proprietary NMEA messages are required, none are optional. All NMEA messages are comma delimited.


NMEA Input Messages

Table 2-2 describes the NMEA input messages.

Table 2-2  NMEA Input Messages

<table>
<thead>
<tr>
<th>Message</th>
<th>MID</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SetSerialPort</td>
<td>100</td>
<td>Set PORT A parameters and protocol</td>
</tr>
<tr>
<td>NavigationInitialization</td>
<td>101</td>
<td>Parameters required for start using X/Y/Z^2</td>
</tr>
<tr>
<td>SetDGPSPort</td>
<td>102</td>
<td>Set PORT B parameters for DGPS input</td>
</tr>
<tr>
<td>Query/Rate Control</td>
<td>103</td>
<td>Query standard NMEA message and/or set output rate</td>
</tr>
<tr>
<td>LLANavigationInitialization</td>
<td>104</td>
<td>Parameters required for start using Lat/Lon/Alt^3</td>
</tr>
<tr>
<td>Development Data On/Off</td>
<td>105</td>
<td>Development Data messages On/Off</td>
</tr>
<tr>
<td>Select Datum</td>
<td>106</td>
<td>Selection of datum to be used for coordinate transformations.</td>
</tr>
<tr>
<td>MSK Receiver Interface</td>
<td>MSK</td>
<td>Command message to a MSK radio-beacon receiver.</td>
</tr>
</tbody>
</table>

1. Message Identification (MID).
2. Input coordinates must be WGS84.
3. Input coordinates must be WGS84.

Note – NMEA input messages 100 to 106 are SiRF proprietary NMEA messages. The MSK NMEA string is as defined by the NMEA 0183 standard.

Table 2-3 provides a summary of supported SiRF NMEA input messages by the specific SiRF platforms.

Table 2-3  Supported NMEA Input Messages

<table>
<thead>
<tr>
<th>Message ID</th>
<th>GSW2</th>
<th>SiRFXTrae</th>
<th>SiRFLoc</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>101</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>102</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>103</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>104</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>105</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>106</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>MSK</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

100—SetSerialPort

This command message is used to set the protocol (SiRF binary or NMEA) and/or the communication parameters (Baud, data bits, stop bits, and parity). Generally, this 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 the Evaluation Receiver restarts using the saved parameters.
Table 2-4 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

Table 2-4  Set Serial Port Data Format

<table>
<thead>
<tr>
<th>Name</th>
<th>Example</th>
<th>Units</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message ID</td>
<td>$PSRF100</td>
<td></td>
<td>PSRF100 protocol header</td>
</tr>
<tr>
<td>Protocol</td>
<td>0</td>
<td></td>
<td>0=SiRF binary, 1=NMEA</td>
</tr>
<tr>
<td>Baud</td>
<td>9600</td>
<td></td>
<td>4800, 9600, 19200, 38400</td>
</tr>
<tr>
<td>DataBits</td>
<td>8</td>
<td></td>
<td>8,7(^1)</td>
</tr>
<tr>
<td>StopBits</td>
<td>1</td>
<td></td>
<td>0,1</td>
</tr>
<tr>
<td>Parity</td>
<td>0</td>
<td></td>
<td>0=None, 1=Odd, 2=Even</td>
</tr>
<tr>
<td>Checksum</td>
<td>*0C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;CR&gt; &lt;LF&gt;</td>
<td></td>
<td>End of message termination</td>
<td></td>
</tr>
</tbody>
</table>

1. SiRF protocol is only valid for 8 data bits, 1 stop bit, and no parity.

101—NavigationInitialization

This command is used to initialize the Evaluation Receiver by providing current position (in X, Y, Z coordinates), clock offset, and time. This enables the Evaluation Receiver to search for the correct satellite signals at the correct signal parameters. Correct initialization parameters enable the Evaluation Receiver to acquire signals quickly.

Table 2-5 contains the input values for the following example:

Start using known position and time.

$PSRF101,-2686700,-4304200,3851624,96000,497260,921,12,3*1C

Table 2-5  Navigation Initialization Data Format

<table>
<thead>
<tr>
<th>Name</th>
<th>Example</th>
<th>Units</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message ID</td>
<td>$PSRF101</td>
<td></td>
<td>PSRF101 protocol header</td>
</tr>
<tr>
<td>ECEF X</td>
<td>-2686700</td>
<td>meters</td>
<td>X coordinate position</td>
</tr>
<tr>
<td>ECEF Y</td>
<td>-4304200</td>
<td>meters</td>
<td>Y coordinate position</td>
</tr>
<tr>
<td>ECEF Z</td>
<td>3851624</td>
<td>meters</td>
<td>Z coordinate position</td>
</tr>
<tr>
<td>ClkOffset</td>
<td>96000</td>
<td>Hz</td>
<td>Clock Offset of the Evaluation Receiver(^1)</td>
</tr>
<tr>
<td>TimeOfWeek</td>
<td>497260</td>
<td>seconds</td>
<td>GPS Time Of Week</td>
</tr>
<tr>
<td>WeekNo</td>
<td>921</td>
<td></td>
<td>GPS Week Number</td>
</tr>
<tr>
<td>ChannelCount</td>
<td>12</td>
<td></td>
<td>Range 1 to 12</td>
</tr>
<tr>
<td>ResetCfg</td>
<td>3</td>
<td></td>
<td>See Table 2-6 and Table 2-7</td>
</tr>
<tr>
<td>Checksum</td>
<td>*1C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;CR&gt; &lt;LF&gt;</td>
<td></td>
<td>End of message termination</td>
<td></td>
</tr>
</tbody>
</table>

1. Use 0 for last saved value if available. If this is unavailable, a default value of 96,000 is used.
Table 2-6  Reset Configuration - Non SiRFLoc Platforms

<table>
<thead>
<tr>
<th>Hex</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x01</td>
<td>Hot Start— All data valid</td>
</tr>
<tr>
<td>0x02</td>
<td>Warm Start— Ephemeris cleared</td>
</tr>
<tr>
<td>0x03</td>
<td>Warm Start (with Init)—Ephemeris cleared, initialization data loaded</td>
</tr>
<tr>
<td>0x04</td>
<td>Cold Start—Cancels all data in memory</td>
</tr>
<tr>
<td>0x08</td>
<td>Clear Memory—Cancels all data in memory and resets the receiver back to factory defaults</td>
</tr>
</tbody>
</table>

Table 2-7  Reset Configuration - SiRFLoc Specific

<table>
<thead>
<tr>
<th>Hex</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x00</td>
<td>Perform a hot start using internal RAM data. No initialization data is used.</td>
</tr>
<tr>
<td>0x01</td>
<td>Use initialization data and begin in start mode. Uncertainties are 5 seconds time accuracy and 300 km position accuracy. Ephemeris data in SRAM is used.</td>
</tr>
<tr>
<td>0x02</td>
<td>No initialization data is used, ephemeris data is cleared, and warm start performed using remaining data in RAM.</td>
</tr>
<tr>
<td>0x03</td>
<td>Initialization data is used, ephemeris data is cleared, and warm start performed using remaining data in RAM.</td>
</tr>
<tr>
<td>0x04</td>
<td>No initialization data is used. Position, time and ephemeris are cleared and a cold start is performed.</td>
</tr>
<tr>
<td>0x08</td>
<td>No initialization data is used. Internal RAM is cleared and a factory reset is performed.</td>
</tr>
</tbody>
</table>

102—SetDGPSPort

This command is used to control the serial port used to receive RTCM differential corrections. Differential receivers may output corrections using different communication parameters. If a DGPS receiver is used that has 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 battery-backed SRAM and the receiver restarts using the saved parameters.

Table 2-8 contains the input values for the following example:

Set DGPS Port to be 9600,8,N,1.

$PSRF102,9600,8,1,0*12

Table 2-8  Set DGPS Port Data Format

<table>
<thead>
<tr>
<th>Name</th>
<th>Example</th>
<th>Units</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message ID</td>
<td>$PSRF102</td>
<td>PSRF102 protocol header</td>
<td></td>
</tr>
<tr>
<td>Baud</td>
<td>9600</td>
<td>4800, 9600, 19200, 38400</td>
<td></td>
</tr>
<tr>
<td>DataBits</td>
<td>8</td>
<td>8,7</td>
<td></td>
</tr>
<tr>
<td>StopBits</td>
<td>1</td>
<td>0,1</td>
<td></td>
</tr>
<tr>
<td>Parity</td>
<td>0</td>
<td>0=None, 1=Odd, 2=Even</td>
<td></td>
</tr>
<tr>
<td>Checksum</td>
<td>*12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;CR&gt; &lt;LF&gt;</td>
<td></td>
<td>End of message termination</td>
<td></td>
</tr>
</tbody>
</table>
103—Query/Rate Control

This command is used to control the output of standard NMEA messages GGA, GLL, GSA, GSV, RMC, and VTG. 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 2-9 contains the input values for the following examples:

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

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

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

Table 2-9  Query/Rate Control Data Format (See example 1)

<table>
<thead>
<tr>
<th>Name</th>
<th>Example</th>
<th>Units</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message ID</td>
<td>$PSRF103</td>
<td></td>
<td>PSRF103 protocol header</td>
</tr>
<tr>
<td>Msg</td>
<td>00</td>
<td></td>
<td>See Table 2-10</td>
</tr>
<tr>
<td>Mode</td>
<td>01</td>
<td></td>
<td>0=SetRate, 1=Query</td>
</tr>
<tr>
<td>Rate</td>
<td>00</td>
<td>seconds</td>
<td>Output—off=0, max=255</td>
</tr>
<tr>
<td>CksumEnable</td>
<td>01</td>
<td></td>
<td>0=Disable Checksum, 1=Enable Checksum</td>
</tr>
<tr>
<td>Checksum</td>
<td>*25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;CR&gt; &lt;LF&gt;</td>
<td></td>
<td></td>
<td>End of message termination</td>
</tr>
</tbody>
</table>

Table 2-10 Messages

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>GGA</td>
</tr>
<tr>
<td>1</td>
<td>GLL</td>
</tr>
<tr>
<td>2</td>
<td>GSA</td>
</tr>
<tr>
<td>3</td>
<td>GSV</td>
</tr>
<tr>
<td>4</td>
<td>RMC</td>
</tr>
<tr>
<td>5</td>
<td>VTG</td>
</tr>
<tr>
<td>6</td>
<td>MSS (If internal beacon is supported)</td>
</tr>
<tr>
<td>7</td>
<td>Not defined</td>
</tr>
<tr>
<td>8</td>
<td>ZDA (if 1PPS output is supported)</td>
</tr>
<tr>
<td>9</td>
<td>Not defined</td>
</tr>
</tbody>
</table>

Note – In TricklePower mode, update rate is specified by the user. When switching to NMEA protocol, the message update rate is also required. The resulting update rate is the product of the TricklePower Update rate and the NMEA update rate (i.e., TricklePower update rate = 2 seconds, NMEA update rate = 5 seconds, resulting update rate is every 10 seconds, (2 X 5 = 10)).
104—LLANavigationInitialization

This command is used to initialize the Evaluation Receiver by providing current position (in latitude, longitude, and 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 enable the receiver to acquire signals quickly.

Table 2-11 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

Table 2-11 LLA Navigation Initialization Data Format

<table>
<thead>
<tr>
<th>Name</th>
<th>Example</th>
<th>Units</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message ID</td>
<td>PSRF104</td>
<td></td>
<td>PSRF104 protocol header</td>
</tr>
<tr>
<td>Lat</td>
<td>37.3875111</td>
<td>degrees</td>
<td>Latitude position (Range 90 to -90)</td>
</tr>
<tr>
<td>Lon</td>
<td>-121.97232</td>
<td>degrees</td>
<td>Longitude position (Range 180 to -180)</td>
</tr>
<tr>
<td>Alt</td>
<td>0</td>
<td>meters</td>
<td>Altitude position</td>
</tr>
<tr>
<td>ClkOffset</td>
<td>96000</td>
<td>Hz</td>
<td>Clock Offset of the Evaluation Receiver¹</td>
</tr>
<tr>
<td>TimeOfWeek</td>
<td>237759</td>
<td>seconds</td>
<td>GPS Time Of Week</td>
</tr>
<tr>
<td>WeekNo</td>
<td>1946</td>
<td></td>
<td>Extended GPS Week Number (1024 added)</td>
</tr>
<tr>
<td>ChannelCount</td>
<td>12</td>
<td>Range 1 to 12</td>
<td></td>
</tr>
<tr>
<td>ResetCfg</td>
<td>1</td>
<td></td>
<td>See Table 2-12</td>
</tr>
<tr>
<td>Checksum</td>
<td>*07</td>
<td></td>
<td>End of message termination</td>
</tr>
</tbody>
</table>

¹. Use 0 for last saved value if available. If this is unavailable, a default value of 96,000 is used.

Table 2-12 Reset Configuration

<table>
<thead>
<tr>
<th>Hex</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x01</td>
<td>Hot Start— All data valid</td>
</tr>
<tr>
<td>0x02</td>
<td>Warm Start—Ephemeris cleared</td>
</tr>
<tr>
<td>0x03</td>
<td>Warm Start (with Init)—Ephemeris cleared, initialization data loaded</td>
</tr>
<tr>
<td>0x04</td>
<td>Cold Start—Cleans all data in memory</td>
</tr>
<tr>
<td>0x08</td>
<td>Clear Memory—Cleans all data in memory and resets receiver back to factory defaults</td>
</tr>
</tbody>
</table>

105—Development Data On/Off

Use this command to enable development data information if you are having trouble getting commands accepted. Invalid commands generate debug information that enables the you to determine the source of the command rejection. Common reasons for input command rejection are invalid checksum or parameter out of specified range.
Table 2-13 contains the input values for the following examples:

1. Debug On
   
   \$PSRF105,1*3E

2. Debug Off
   
   \$PSRF105,0*3F

<table>
<thead>
<tr>
<th>Table 2-13 Development Data On/Off Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>Message ID</td>
</tr>
<tr>
<td>Debug</td>
</tr>
<tr>
<td>Checksum</td>
</tr>
</tbody>
</table>

106—Select Datum

GPS receivers perform initial position and velocity calculations using an earth-centered earth-fixed (ECEF) coordinate system. Results may be converted to an earth model (geoid) defined by the selected datum. The default datum is WGS 84 (World Geodetic System 1984) which provides a worldwide common grid system that may be translated into local coordinate systems or map datums. (Local map datums are a best fit to the local shape of the earth and not valid worldwide.)

Table 2-14 contains the input values for the following examples:

1. Datum select TOKYO_MEAN
   
   \$PSRF106,178*32

<table>
<thead>
<tr>
<th>Table 2-14 Select Datum Data Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>Message ID</td>
</tr>
<tr>
<td>Datum</td>
</tr>
<tr>
<td>Checksum</td>
</tr>
<tr>
<td>&lt;CR&gt; &lt;LF&gt;</td>
</tr>
</tbody>
</table>
**MSK—MSK Receiver Interface**

Table 2-15 contains the values for the following example:

$GPMSK,318.0,A,100,M,2,*45$

<table>
<thead>
<tr>
<th>Name</th>
<th>Example</th>
<th>Units</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message ID</td>
<td>$GPMSK$</td>
<td></td>
<td>MSK protocol header</td>
</tr>
<tr>
<td>Beacon Frequency</td>
<td>318.0</td>
<td>kHz</td>
<td>Frequency to use</td>
</tr>
<tr>
<td>Beacon Bit Rate</td>
<td>100</td>
<td>Bits per second</td>
<td></td>
</tr>
<tr>
<td>Auto/Manual Bit Rate</td>
<td>M</td>
<td>A : Auto, M : Manual</td>
<td></td>
</tr>
<tr>
<td>Interval for Sending $--MSS$</td>
<td>2</td>
<td>sec</td>
<td>Sending of MSS messages for status</td>
</tr>
</tbody>
</table>

1. If Auto is specified the previous field value is ignored.
2. When status data is not to be transmitted this field is null.

**Note** – The NMEA messages supported by the Evaluation 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.
**ADDITIONAL AVAILABLE PRODUCT INFORMATION**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1050-0042</td>
<td>NMEA Reference Manual</td>
</tr>
<tr>
<td>1050-0041</td>
<td>SiRF Binary Protocol Reference Manual</td>
</tr>
<tr>
<td>1065-0136</td>
<td>Product Inserts</td>
</tr>
<tr>
<td>1050-0056</td>
<td>SiRFstarIII System Development Kit User Guide</td>
</tr>
<tr>
<td>1050-0054</td>
<td>SSDK Board System Development Kit Reference Manual</td>
</tr>
<tr>
<td>1050-0055</td>
<td>GSP3 Chip System Development Kit Reference Manual</td>
</tr>
<tr>
<td>1055-1034</td>
<td>GSP3 Data Sheet</td>
</tr>
<tr>
<td>1055-1035</td>
<td>GRF3w Data Sheet</td>
</tr>
</tbody>
</table>

Available on the Developer Web Site

**APNT3001**  SSIII System Guidelines and Considerations  
**APNT3002**  PCB Design Guidelines for SSIII Implementations  
**APNT3003**  Back-Up Power Operation for SSIII Architectures  
**APNT3004**  Troubleshooting Notes for SSIII Board Development  
**APNT3005**  Co-Location and Jamming Considerations for SSIII Integration  
**APNT3006**  GPIO Pin Functionality for SSIII  
**APNT3007**  I/O Message Definitions for SSIII  
**APNT3008**  Implementing User Tasks in the SSIII Architecture  
**APNT3009**  Effects of User Tasks on GPS Performance for SSIII  
**APNT3010**  Advanced Power Management (APM) Considerations for SSIII  
**APNT3011**  Multi-ICE Testing Issues for SSIII  
**APNT3012**  Production Testing of SSIII Modules  
**APNT3014**  Automotive Design Considerations for SSIII

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