SL869 DGPS Application Note

80405NT11319A r0 – 2014-10-28
**APPLICABILITY TABLE**

<table>
<thead>
<tr>
<th>PRODUCT</th>
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</thead>
<tbody>
<tr>
<td>SL869</td>
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1. Introduction

1.1. Scope

The scope of this document is to give an overview of Differential GNSS, how it can be implemented in the SL869 Telit GNSS Receiver, and actual test results.

1.2. Audience

This document is intended for designers implementing the SL869 onto a DGPS platform.

1.3. Contact Information, Support

For general contact, technical support, to report documentation errors and to order manuals, contact Telit Technical Support Center (TTSC) at:

TS-EMEA@telit.com
TS-AMERICAS@telit.com
TS-APAC@telit.com

Alternatively, use:


For detailed information about where you can buy the Telit modules or for recommendations on accessories and components visit:

http://www.telit.com

To register for product news and announcements or for product questions contact Telit Technical Support Center (TTSC).

Our aim is to make this guide as helpful as possible. Keep us informed of your comments and suggestions for improvements.

Telit appreciates feedback from the users of our information.

1.4. Text Conventions

Danger – This information MUST be followed or catastrophic equipment failure or bodily injury may occur.

Caution or Warning – Alerts the user to important points about integrating the module, if these points are not followed, the module and end user equipment may fail or malfunction.

Tip or Information – Provides advice and suggestions that may be useful when integrating the module.

All dates are in ISO 8601 format, i.e. YYYY-MM-DD.
1.5. Related Documents

- SL869 Hardware User Guide, 1VV0301001
- SL869 Software User Guide, 1VV0301002
- SL869 EVK User Guide, 1VV0301004
2. **Overview**

A one-time commonly used technique for improving the accuracy of GNSS receivers was Differential GPS, “DGPS”. Now with multiple satellite constellations available it can be referred to as Differential GNSS. Using Differential GNSS, the position of a fixed GNSS receiver antenna is placed over a known surveyed reference point. This receiver is commonly referred to as the “Base”, or “Reference” Station. The reference station determines ranges to the various GNSS satellites in view and computes a position. This position is compared internally to the known reference point. In most cases this computed position will be in error from the surveyed referenced point. The error usually results from a combination of satellite ephemeris and clock errors along with atmospheric delay. From the comparison, differences in pseudorange measurements of the satellites can be determined. These differences are converted into corrections which can be sent to local “rover” receivers. The rover receivers receive and apply the corrections to their computed position. The result is usually a more accurate result.

It must be noted that Differential GNSS requires a data link between the reference station and the rover receiver, and corrections must be applied in real time. The proximity of the reference and rover will determine the effect of the corrections. In other words, the closer the rover is to the base station, the better. Usually a range of a few tens of kilometers is acceptable.
3. Performance

NOTE: The following test was performed in a lab environment with simulated satellite signals and corrections. Results may differ under live satellite conditions.

3.1. Test results of the SL869 with the application of DGPS corrections.

Equipment Used
1. GSS6700 Multi-GNSS Simulator
2. PC running TelitView and Positioning Application Tool (RTCM scenario)
3. Device Under Test “DUT” (SL869 Rev F)
4. RTCM build SL869STD_v3.1.12.0_N115_DBG_USB_ONLY_RTCM_BOOT.bin

Test Procedure
1. Ensure an RTCM Build (as noted above), is loaded on the device under test (USB Detect disabled, and NMEA is the default on the SL869 USB port. RTCM is assigned to Port 0 of the EVK. The RTCM port defaults to 115200 baud.)
2. Verify Com ports on EVK.

3. Open SimREPLAY and select an RTCM Scenario.
4. Connect the RTCM output from the Simulator to Serial Port titled RTCM above on the DUT. (To Connect RTCM correction, click the tab titled Options, then down to the RS232 port Settings option.)
5. Once RS232 Port Setting is open, input the proper Com Ports and select Not Used for the port that outputs NMEA. For the port using RTCM, select RTCM output. “See example below”.

![Figure 3-2 SimREPLAY Port Settings](image)

6. Open TelitView.
7. Connect the Device and Begin Recording.
8. Begin the Simulator Scenario.
9. Wait until the receiver obtains a DGPS fix (reference the “D” in the last parameter of RMC message.)
10. After collecting data with RTCM corrections applied, replay Scenario without RTCM corrections and compare the two.

![Figure 3-3 Port Settings-RTCM Output](image)
Pass/Fail Criteria

Passes if receiver enters DGPS mode and position accuracy shows improvement.

Results

<table>
<thead>
<tr>
<th>CEP</th>
<th>With RTCM</th>
<th>Without RTCM</th>
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<tbody>
<tr>
<td>50%</td>
<td>0.21m</td>
<td>3.85m</td>
</tr>
<tr>
<td>90%</td>
<td>0.36m</td>
<td>4.85m</td>
</tr>
<tr>
<td>95%</td>
<td>0.36m</td>
<td>4.90m</td>
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<tr>
<td>98%</td>
<td>1.30m</td>
<td>5.11m</td>
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Table 3-1 RTCM Accuracy Results

Figure 3-4 RTCM Accuracy Results image
4. Document History

<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
<th>Changes</th>
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<tr>
<td>0</td>
<td>2014-10-28</td>
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