



## TestDrive GNSS - For Chip Vendor Selection

An automation and reporting tool for repeatable and cost-effective GNSS chip-set performance characterisation with a GNSS simulator

A Spirent Application Note for Designers, Integrators and Manufacturers of GNSS Devices



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# Scope

This Application Note has been written for designers and manufacturers of GNSS-enabled devices who are in the process of selecting a GNSS chipset as part of the design and specification process.

It sets out the benefits of using Spirent's **TestDrive-GNSS** receiver characterisation software to test the performance of different chipsets under a variety of simulated conditions.

It also provides a guide to using the TestDrive-GNSS tool, in order to help designers and testers to get the most relevant, accurate and comprehensive results during the testing process.

Throughout, we have assumed that the reader has a basic understanding of satellite navigation principles and an awareness of radio frequency (RF) simulation as a test method.

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## Introduction

Satellite positioning and navigation is rapidly becoming an integral capability in many business and consumer devices, from smartphones to smart running shoes. Designers and manufacturers of GNSS-enabled devices need to know they are making the right choices during the design, specification and build process, so the device performs as well as possible for the eventual end user.

Selecting the right GNSS chipset is a critical part of the specification process, and getting it wrong can be an expensive mistake. This is especially true in the highly fashion-driven smartphone industry, where the slightest technological weakness can – and usually does – lead to a mass of negative media coverage and a slew of customers threatening to defect to a competing handset.

While it's possible to test GNSS chipsets using available satellite signals in the live sky, this method is fundamentally flawed

because the same conditions can never be reproduced for re-testing. Far more reliable results can be obtained by simulating conditions in a lab environment, where different chipsets can be thoroughly and fairly tested in an identical environment.

Manual lab testing is a time-intensive process, however. Done properly, it requires one or more operators to spend days taking measurements, noting the results, reconfiguring the device, repeating the measurement and compiling reports by hand. When there is pressure on time or budgets, the thoroughness of the process may suffer, resulting in a hurried and incomplete evaluation of processor performance – and potentially the selection of the wrong chipset for the device.

To address these issues, Spirent has introduced TestDrive-GNSS, a fully automated testing tool for GNSS user equipment. This Application Note introduces the benefits of the TestDrive-GNSS tool and provides a guide to using it.

# PART ONE: Introducing TestDrive-GNSS

## Fast, Automated Performance Testing for GNSS-Enabled Devices

Spirent, the global leader in GNSS testing for the military, aerospace and electronics sectors, has introduced a fully automated testing solution for manufacturers of GNSS-enabled devices.

## Using RF Simulation for GNSS Testing

An RF Constellation Simulator reproduces the environment that a GNSS receiver will experience by modelling vehicle and satellite motion, signal characteristics, atmospheric and other effects. When connected to the RF simulator, the receiver will navigate according to the parameters of the test scenario.

A common misconception is that there is the need to exactly replicate real world conditions for a GNSS test to be valid. However, application of representative effects via RF simulation is proven (over 25 years of testing) to exercise receivers and adequately identify their limitations.

More importantly, RF simulation provides many advantages that ‘livesky’ testing with real GNSS signals cannot deliver. In particular, it gives complete repeatability, control and exact knowledge – down to bit level – of the signal which is stimulating the receiver.

TestDrive-GNSS provides SimGEN™, SimREPLAY and SimREPLAY*plus* customers with an integrated test solution that enables performance characterisation of GNSS User Equipment (UE) by means of RF simulation.

Figure 1 shows the concept of GNSS simulation using a Spirent GSS6700 simulator.

Designers and testers of GNSS equipment can use TestDrive-GNSS to:

- Control both the GNSS RF Simulator and the UE simultaneously
- Manage suites of tests
- Archive sets of results
- Generate summary reports in a number of common formats

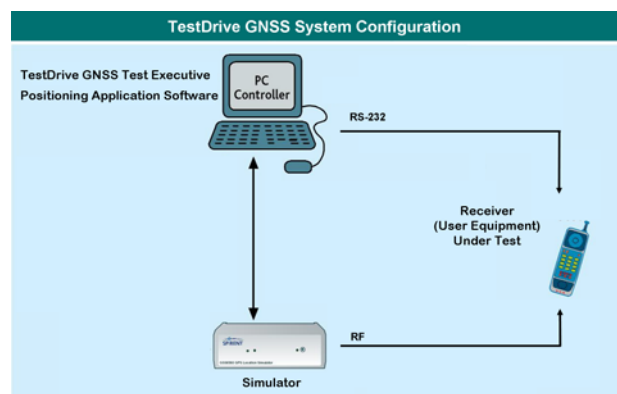


Figure 1 Example RF Simulation Flow

# Key Benefits: Get to Market Faster, at Lower Cost

TestDrive-GNSS delivers significant financial and commercial advantages to designers and manufacturers of GNSS-enabled devices:

**Faster time to market:** By removing the need to write custom testing software and by speeding up testing time, TestDrive-GNSS can reduce the testing process from months to days – so new devices can be delivered to market faster than competing products

**Lower costs:** TestDrive-GNSS decimates the number of man-hours that need to be devoted to testing, significantly reducing the cost of resourcing the testing process.

**Better performance:** TestDrive-GNSS ensures that each chipset is thoroughly tested under identical simulated conditions, so manufacturers can be confident they are choosing the best performing receiver for the device.

**Rapid return on investment:** Once acquired, TestDrive-GNSS can be used to automate all future testing needs, significantly reducing testing budgets and delivering a rapid return on investment.

## **Improved value chain collaboration:**

Tests and test sequences specified with TestDrive-GNSS can be shared throughout the value chain, so chip manufacturers, device designers and device manufacturers can agree and implement a common set of standards for performance testing.

**Faster certification:** The detailed test reports produced by TestDrive-GNSS can be submitted to certification authorities as evidence of device performance, speeding up time to certification.

**A world-class testing process:** Spirent has been the global leader in connectivity testing for 25 years, and is trusted by many organisations in the military, aerospace, networking, and electronics sectors to deliver detailed, accurate and reliable test results for all devices and conditions.

For more about the benefits of using Spirent for automated GNSS testing, visit [www.spirent.com/positioning](http://www.spirent.com/positioning) or read the Spirent blog at [www.spirent.com/Blog/Positioning.aspx](http://www.spirent.com/Blog/Positioning.aspx).



To select a test type when adding a new test:

- Click on a blank cell in the Test Name column of the suite window.
- Right-click on the cell to display the Insert Test menu.
- Select the desired test from the menus.

Figure 3 illustrates an example of adding a new UE Acquisition Sensitivity Test to a test suite.

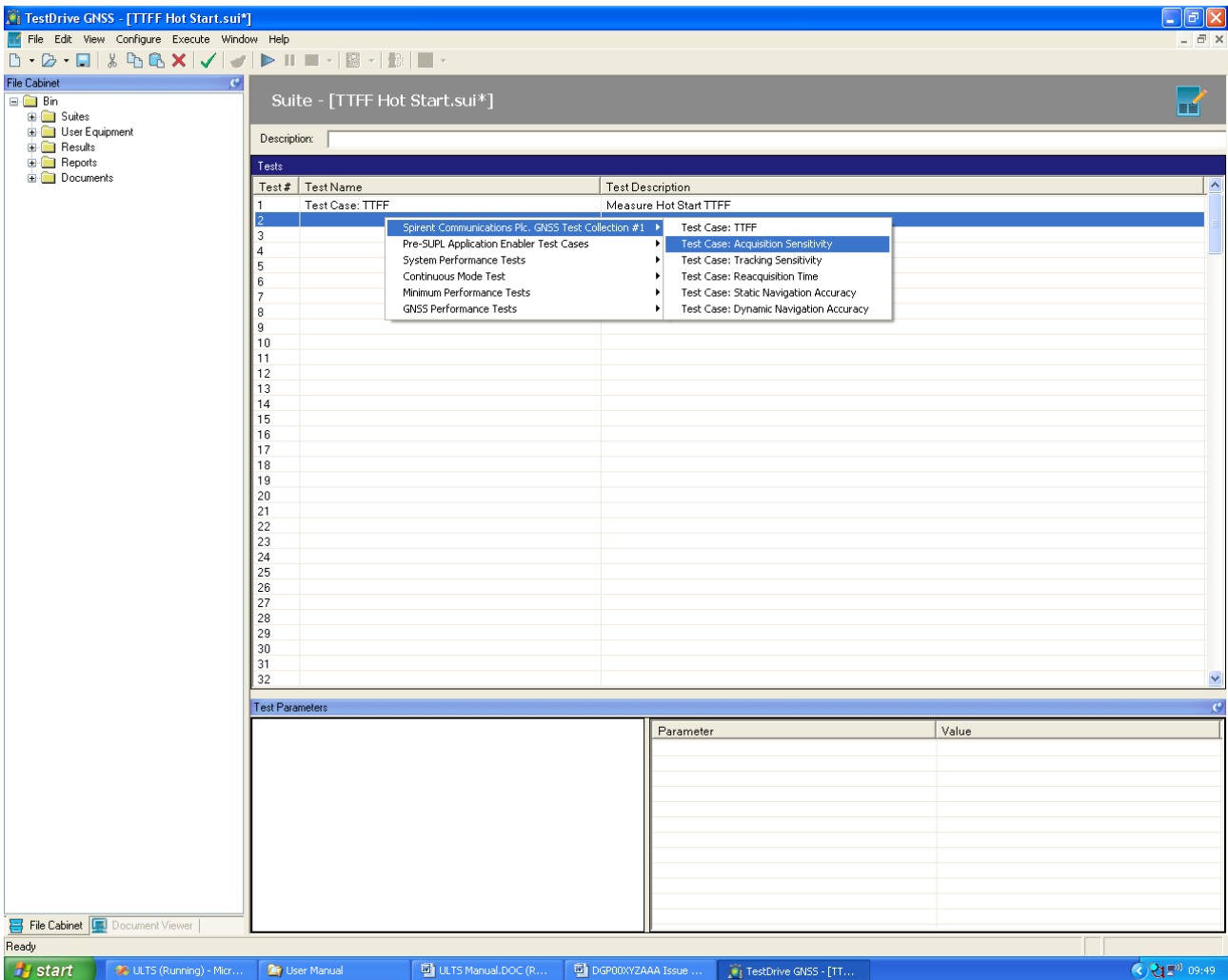


Figure 3: Adding a test to a test suite

# Editing Test Parameters

Each test supported by TestDrive-GNSS includes a number of customisable test parameters that you can modify. Test parameters can be numerical values (e.g. *Number of Measurements*), text values (e.g. *Test Description*), or a list of selectable values (e.g. *Pause Between Measurements*).

To change the value of a particular test parameter:

- Click a specific line in the Tests pane to select the test.
- Select the parameter sub-group in the tree view on the left side of the Test Parameters pane.
- Click the parameter you want to edit and type or select a new value.

Figure 4 shows an example of selecting ‘Pause Between Measurements’ from the General Parameters sub-group of a test case.

Before running a Test Suite, it should be validated to help avoid test execution errors. TestDrive can analyse an entire suite for test setup and parameter value problems before execution. Validation checks test conditions against the current system configuration and alerts you if the system does not contain sufficient hardware to perform certain tests.

Although this does not guarantee flawless execution, it significantly reduces the risk of problems during execution by detecting them beforehand.

To validate the Test Suite click the Validate Suite icon from the Toolbar or select **Execute > Validate**.

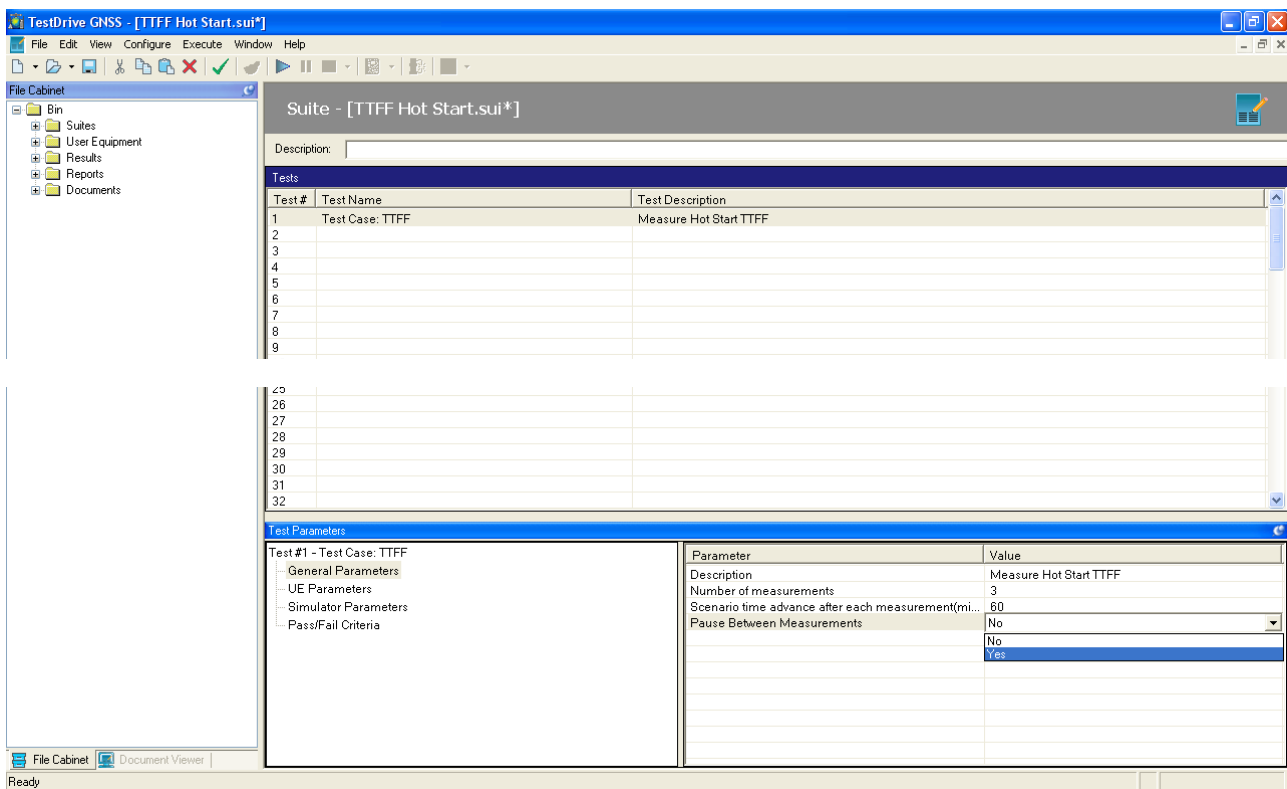


Figure 4: Selecting ‘Pause between measurements’ from the ‘General Parameters’

# Configuring User Equipment

Before executing a test suite it is necessary to configure the user equipment.

Open a new user equipment file by selecting the **File > New > User Equipment** option from the menus.

Choose settings which represent the receiver connection to your computer. An example of such a configuration is displayed in Figure 5.

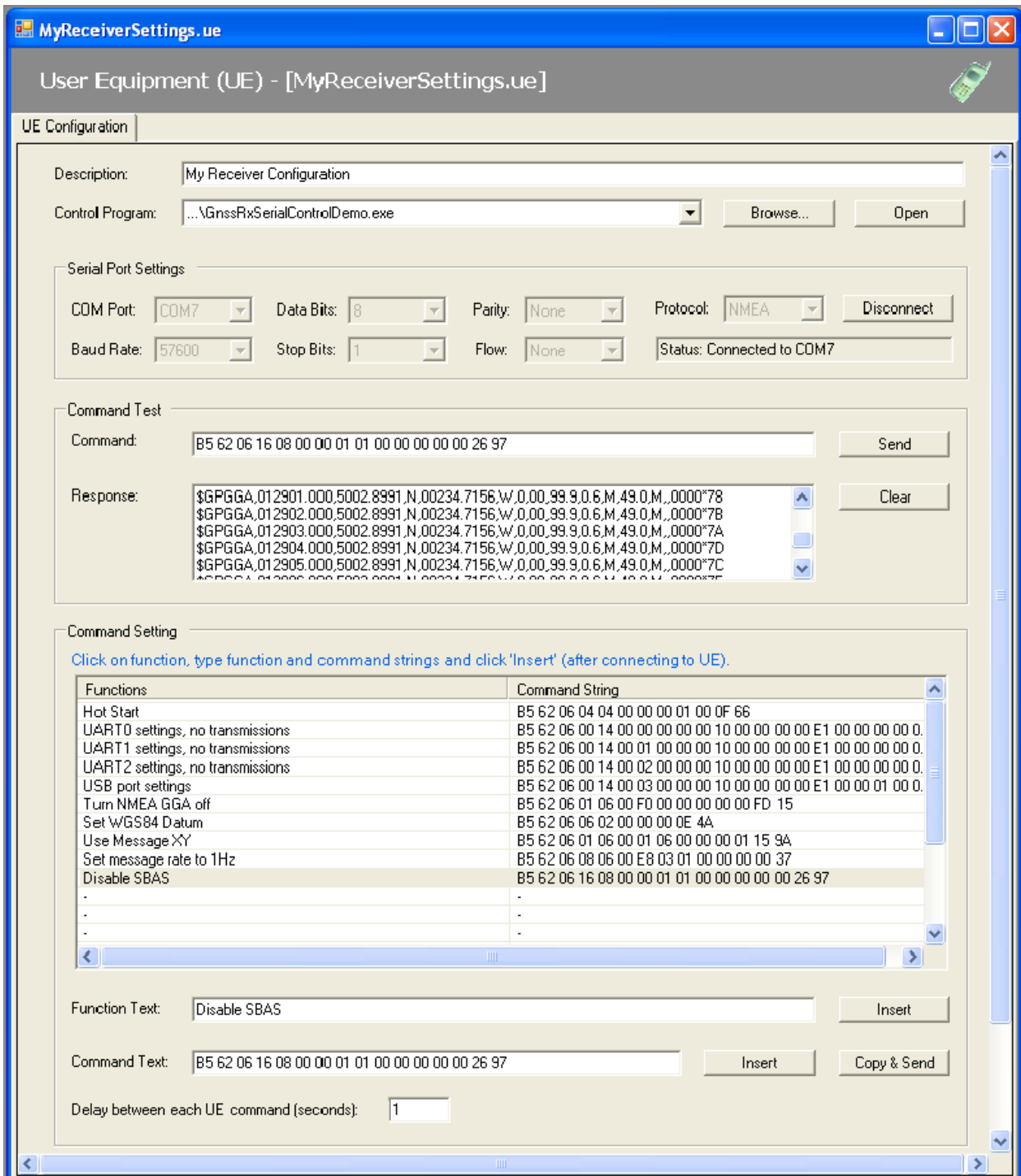


Figure 5: Configuring the user equipment



## Executing a Test

Once the UE settings have been configured and saved you may run the Test Suite by selecting **Execute > Run**. The Execute Automatic Test dialog box is displayed, allowing you to set several run specific options. Figure 6 gives an example of the Execute Automatic Test dialog box. When the test has completed the results will be stored in a file called TableView.csv which is located in the folder specified in Figure 6. This file can be used for further analysis.

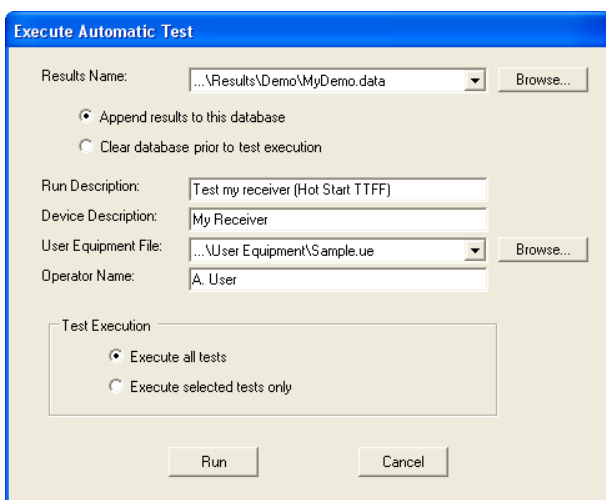


Figure 6: Execute Automatic test dialog box

Note: If the user is employing user equipment which responds with NMEA statements then the monitoring algorithm will determine that a measurement is successful by examining the NMEA GGA (Global Positioning System Fix Data) position fix flag in addition to the plan and spherical position error metrics specified in the test. If the user is employing user equipment which responds with the SiRF binary protocol then message 41 (Geodetic Navigation Data) will be examined to establish whether a fix has occurred in addition to the plan and spherical position error metrics specified in the test.

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## Generating a Test Report

Test Reports can be generated from the current set of test results loaded in application memory by selecting **Execute > Generate Report** from the menu.

You can print or save reports in a variety of standard file formats including Adobe Acrobat (.PDF), Microsoft Excel (.CSV) and Microsoft Word (.DOC). To review reports after saving them, load the report documents with the appropriate associated application.

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## Archiving Test Results

To archive a set of test results select **File > Zip Active Results**.

## For More Information

Please visit our website: <http://www.spirent.com/positioning> and do not hesitate to contact your nearest Spirent representative for more detailed information. To find the appropriate contact details please visit the 'Contact Us' page on the website and select your location and application.



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