



TestDrive GNSS - For Certification

An automation and reporting tool for repeatable and efficient verification and certification testing of GNSS devices 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 vendors and manufacturers of GNSS-enabled devices who are submitting a device for certification by one or more certification authorities.

It sets out the benefits of using Spirent's TestDrive-GNSS receiver characterisation software to conduct a range of standard performance tests on the equipment and

report on their results. It also provides a guide to using the TestDrive-GNSS tool, in order to help users 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.

Introduction

Satellite positioning and navigation is a very fast-moving market, and vendors and manufacturers of GNSS-enabled devices need to get new products to market quickly in order to reap the most commercial benefit.

One of the key delaying factors in bringing a new receiver or device to market is the certification process. Vendors need to be sure that the device will pass certification first time, otherwise months can be lost in rework and resubmission. That means testing the product to the same exacting

standards as the testing house will conduct - as thoroughly and cost-effectively as possible.

Spirent's TestDrive-GNSS testing software enables vendors and manufacturers of GNSS receivers to set up and automate industry-standard tests prior to submitting the product to a testing house or certification authority.

This Application Note introduces the benefits of the TestDrive-GNSS tool during the certification process, and provides a practical guide to using it.

PART ONE: Introducing TestDrive-GNSS

Fast, Automated Performance Testing for GNSS-Enabled Devices

Spirent, the global leader in GNSS testing, has introduced a fully automated performance testing solution for GNSS-enabled equipment.

TestDrive-GNSS works with the [GSS6700](#) and [GSS8000](#) series of Spirent Multi-GNSS simulators to create an integrated test solution that enables performance characterisation of GNSS receiver equipment by means of RF simulation. It is compatible with Spirent's SimGEN™, SimREPLAY and SimREPLAY*plus* RF simulation software.

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 'live sky' 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. It can also be

used to simulate signals from satellite constellations that are not yet in orbit, or fully operational – such as Compass and Galileo.

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

Designers of GNSS receivers can use TestDrive-GNSS to:

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

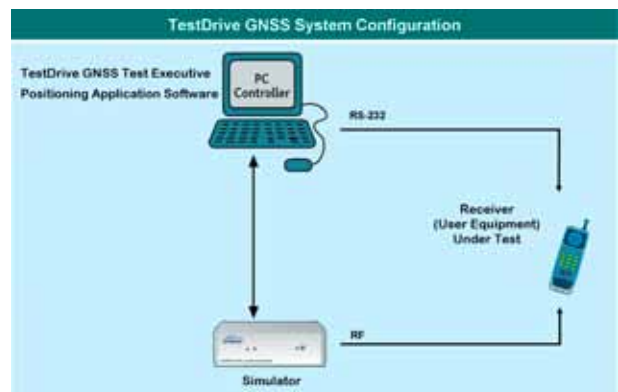


Figure 1 Example RF Simulation Flow

Key Benefits: Get to Market Faster, at Lower Cost

TestDrive-GNSS delivers significant advantages to manufacturers and OEM partners using GNSS receivers during the certification process:

Greater certainty: TestDrive-GNSS can automate industry-standard tests, enabling new devices to be tested to the same standards required by certification authorities prior to submission. Key tests that can be automated with TestDrive-GNSS include time to first fix, acquisition sensitivity, tracking sensitivity, re-acquisition time, and static and dynamic navigation accuracy.

Faster time to market: By removing the need to write custom testing software and by automating individual tests and test suites, TestDrive-GNSS significantly reduces the testing timescale, enabling new devices to be submitted for certification earlier.

Lower costs: TestDrive-GNSS minimises the amount of human intervention required in the testing process, significantly reducing the cost of resourcing the process prior to submitting the product for certification.

Automated reporting: Test-Drive GNSS provides automated, easy-to-understand reports for every test conducted, which can be included as part of the submission process.

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 designers and manufacturers can agree and implement a common set of standards for performance testing of devices incorporating the approved receiver.

A world-class testing partner: Spirent has been the global leader in GNSS testing for 25 years, and is trusted by organisations in all sectors to deliver accurate and reliable test solutions. Spirent works with standards bodies worldwide to help define tests and standards for positioning and networking equipment.

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

PART TWO: Using TestDrive-GNSS

Generating a Test Suite

The most simple test suite contains a single test case. Each line in a test suite can be one of several different test types. Different tests are used to measure different performance criteria. A unique set of parameters applies to each test type. Refer to the user manual for a detailed description of all supported test types.

Firstly, create a new suite from the **File > New > Suite** menu.

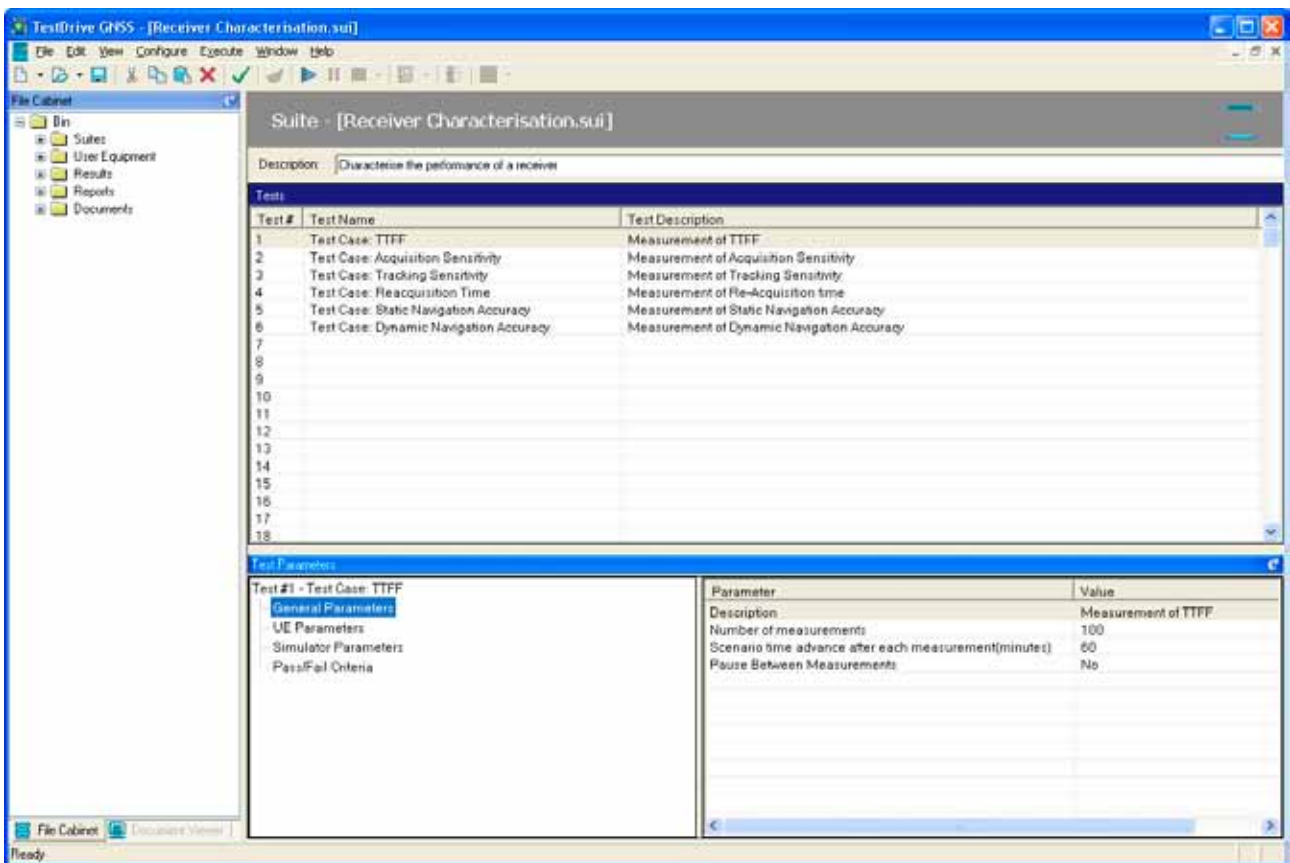


Figure 2 Creating a new suite

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.

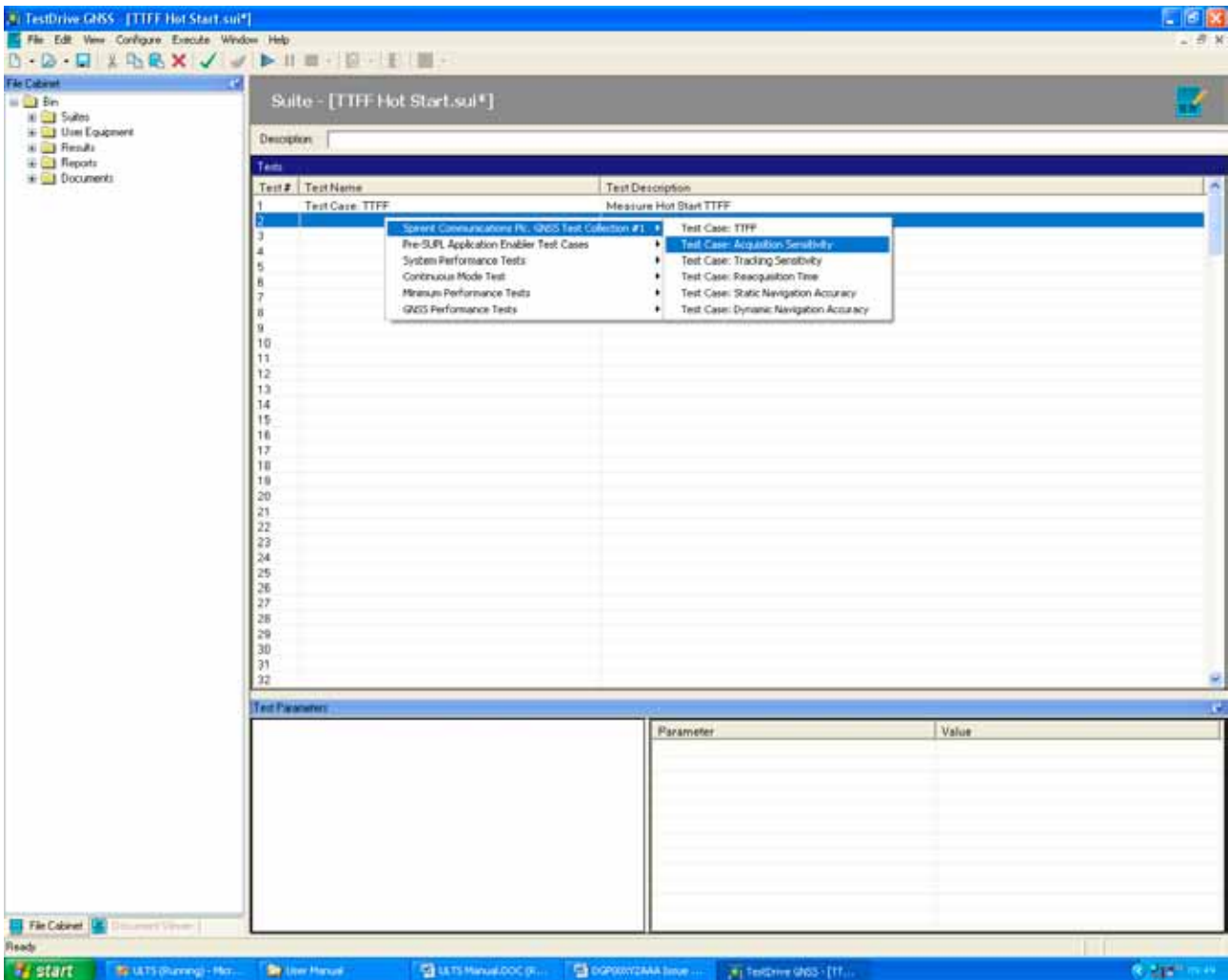


Figure 3: Adding a test to a test suite

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.

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**.

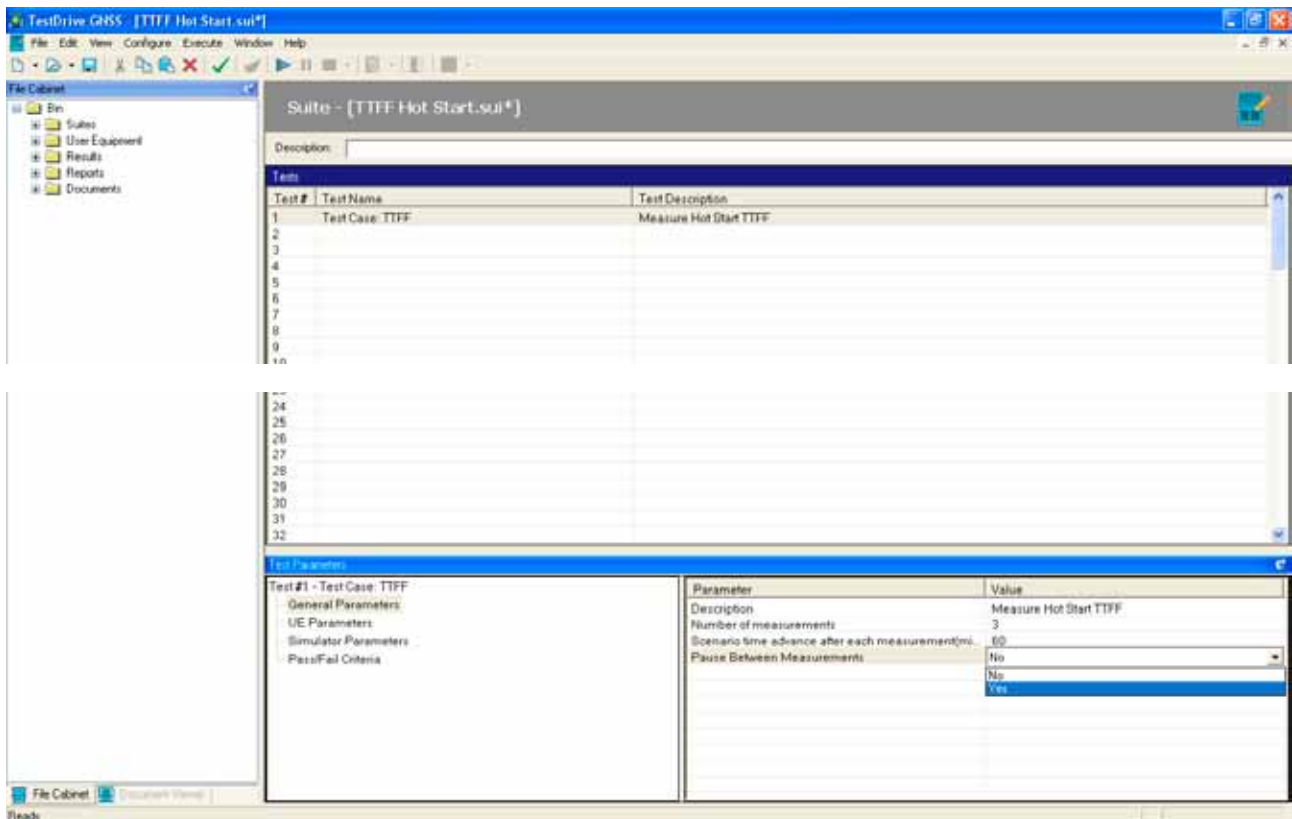


Figure 4 shows an example of selecting 'Pause Between Measurements' from the General Parameters sub-group of a test case.

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.

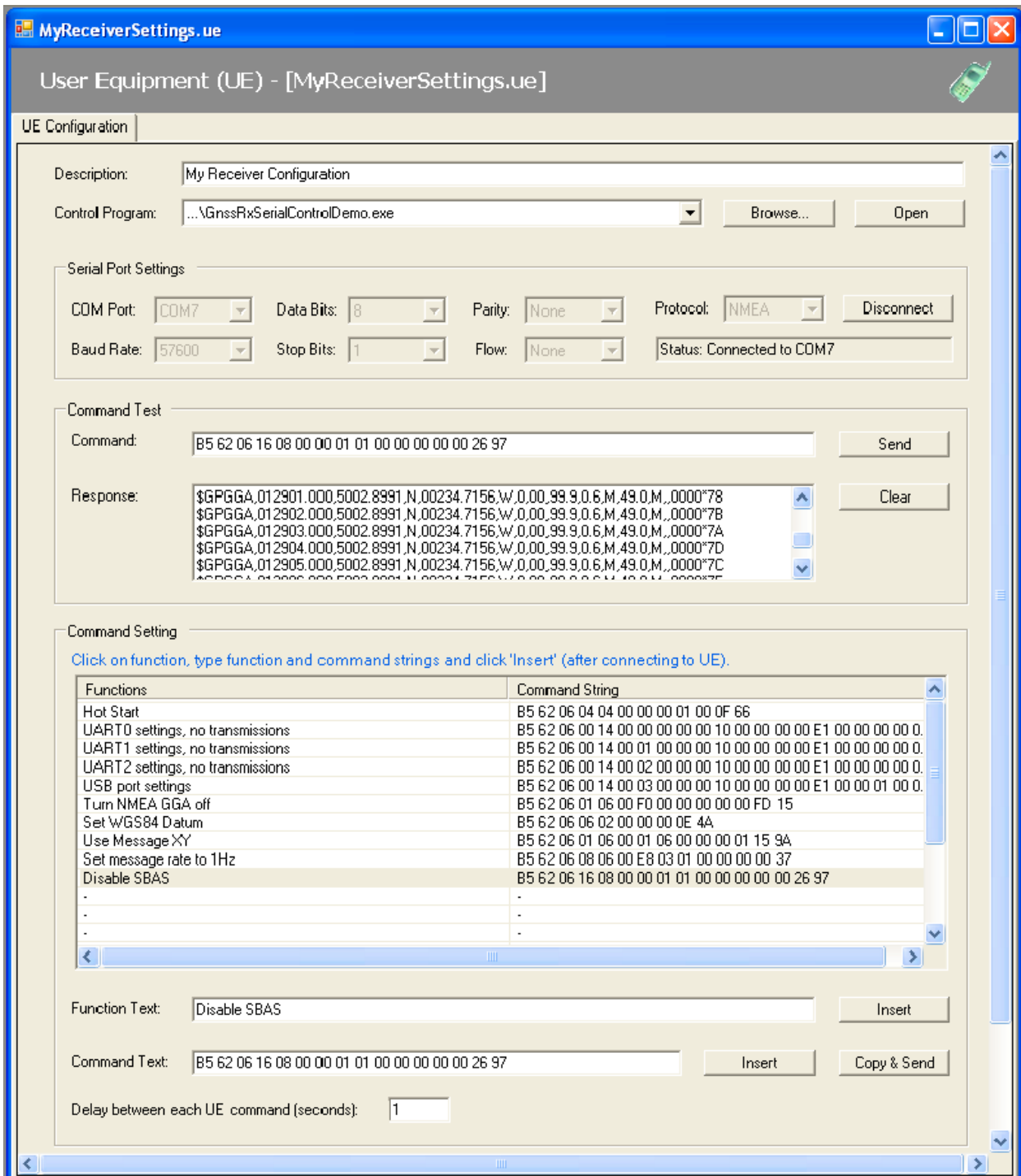


Figure 5: Configuring the user equipment

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.

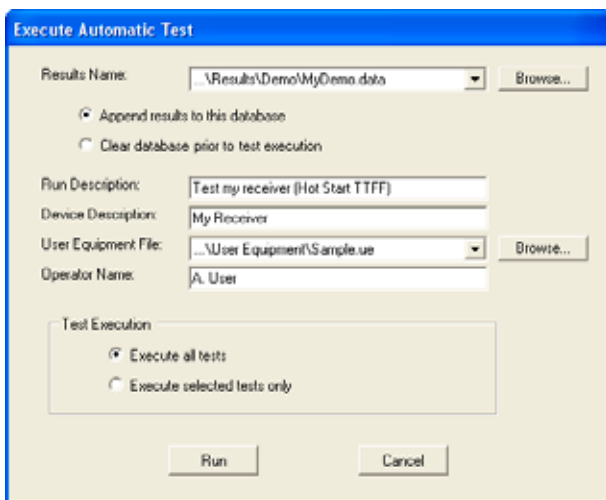


Figure 6: Execute Automatic test dialog box

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.

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.

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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