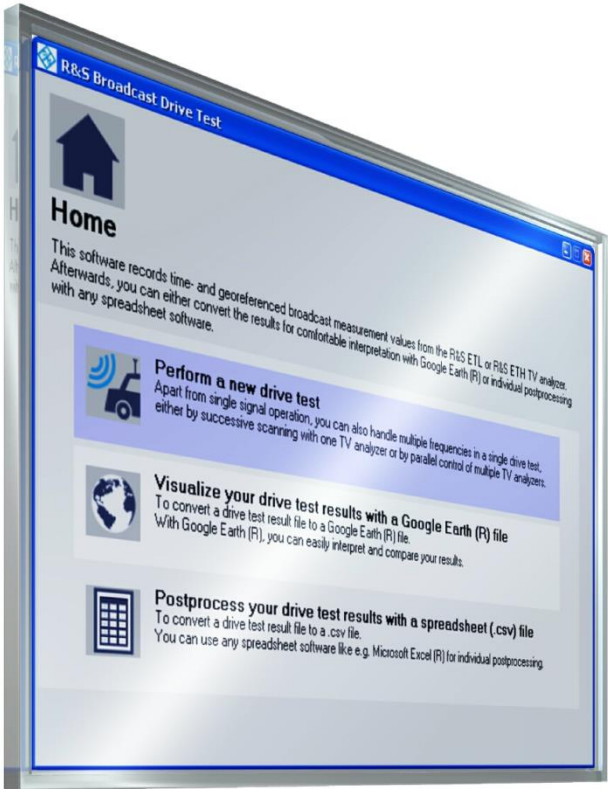


R&S®BCDRIVE

R&S®ETC-K930

Broadcast Drive Test

Manual



2115.1347.02 – 05

The Manual describes the following R&S®Broadcast Drive Test software.

- 2115.1360.02
- 2115.1360.03
- 2116.5146.02

The software contained in this product makes use of several valuable open source software packages. For information, see the "Open Source Acknowledgement" document, which is available for download from the Rohde & Schwarz Home Page (<http://www.rohde-schwarz.com>).

Rohde & Schwarz would like to thank the open source community for their valuable contribution to embedded computing.

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The following abbreviations are used throughout this manual:

R&S®XYZ is abbreviated as R&S XYZ

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1 Range of Functions

The R&S Broadcast Drive Test software controls one or more R&S ETL, R&S ETH or R&S ETC TV analyzers, including one GPS receiver, in order to efficiently analyze coverage for a large number of terrestrial broadcasting standards.

The test results are output as a *.kmz overlay file for Google Earth. They can be used to display the large volume of data gathered during a drive test on a map, with the location of each measured value identified.

The data can also be exported in the universal *.csv format to permit other types of postprocessing.

2 Getting Started

2.1 System Requirements

For details refer to the release notes.

2.2 Installation Instructions

For details refer to the release notes.

2.3 Prerequisites

R&S Broadcast Drive Test is purchased instrument-related:

- 2115.1360.02 for use with a specific R&S ETL
- 2115.1360.03 for use with a specific R&S ETH
- 2116.5146.02 for use with a specific R&S ETC

The delivery package contains the option key code for the stated instrument. This option key code has to be initially activated according to the instrument's manual.

2.3.1 Use with R&S ETL

Your R&S ETL has to be equipped with firmware version 3.40 or higher and the necessary options to handle the desired measurements for the selected standard. The R&S ETL-B203 (RF preselector) is also required, along with a reference isotropic test antenna.

For the use of a GPS receiver, the R&S ETL-K208 (Measurement Log) is mandatory. The R&S TSMX-PPS GPS receiver is recommended. Alternatively, also devices are supported, which use the NMEA protocol and emulate a virtual COM port.

If the test vehicle cannot provide AC voltage, the R&S ETL-B230 (12 V DC power supply) and the R&S ETL-B235 (Li-Ion battery pack with charger) are additionally available.

The user interface of R&S Broadcast Drive Test is optimized for installation and execution on the R&S ETL itself, making an additional control PC obsolete.

When testing multiple frequencies in parallel, only one GPS receiver, but a separate R&S ETL for each frequency is required. Link the R&S ETL TV analyzers via Ethernet cables and assign IP addresses that differ only in the last number of the four decimal numbers. The R&S Broadcast Drive Test software will then run on one of the R&S ETL TV analyzers and will automatically recognize all other connected R&S ETL TV analyzers.

2.3.2 Use with R&S ETH

Your R&S ETH has to be equipped with firmware version 4.40 or higher and the necessary options to handle the desired measurements for the selected standard. The R&S ETH-K1 (RF preselection) and the R&S ETH-K40 (remote control via LAN) option are also required, along with a reference isotropic test antenna and one R&S HA-Z240 GPS receiver.

Link every R&S ETH that you want to use in the drive test by Ethernet cables to the computer on which R&S Broadcast Drive Test is installed and executed. Assign IP addresses that differ only in the last number of the four decimal numbers to all participating LAN clients. The R&S Broadcast Drive Test software will automatically recognize all connected R&S ETH TV analyzers.

2.3.3 Use with R&S ETC

Your R&S ETC has to be equipped with firmware version 1.10 or higher and the necessary options to handle the desired measurements for the selected standard. The R&S ETC-K1 (RF preselection) option is also required, along with a reference isotropic test antenna and one R&S HA-Z240 GPS receiver.

Link every R&S ETC that you want to use in the drive test by Ethernet cables to the computer on which R&S Broadcast Drive Test is installed and executed. Assign IP addresses that differ only in the last number of the four decimal numbers to all participating LAN clients. The R&S Broadcast Drive Test software will automatically recognize all connected R&S ETC TV analyzers.

3 Graphical User Interface

The installation instructions are provided in the release notes.

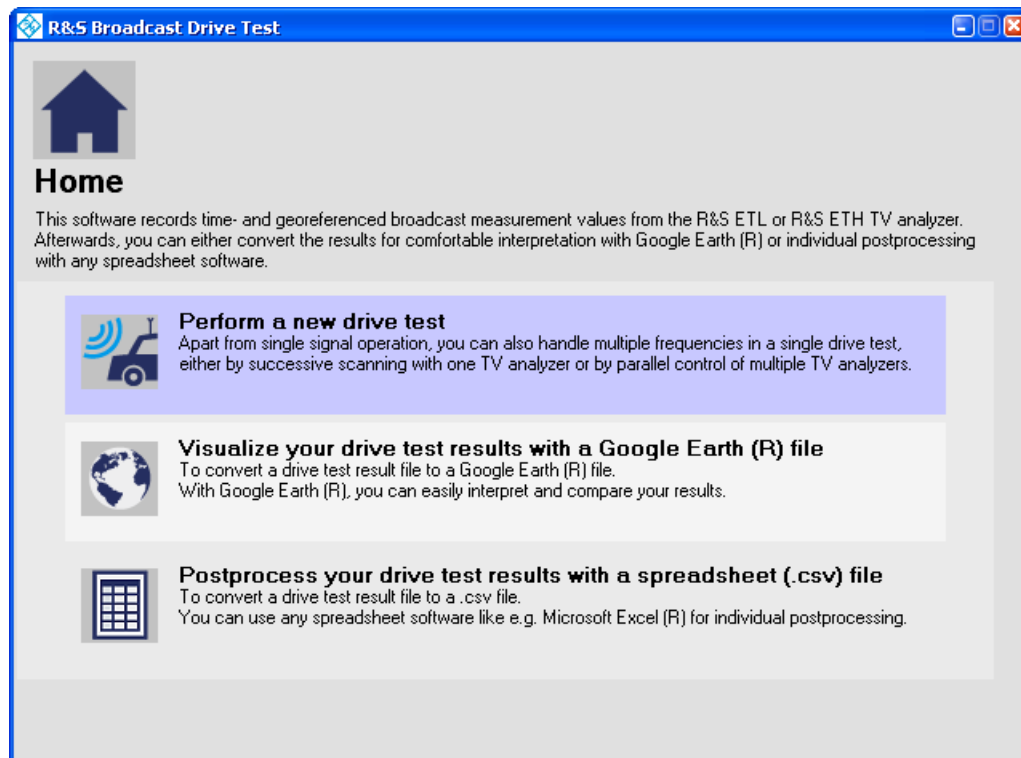


Fig. 1: Splash screen

The graphical user interface uses brief texts and tooltips to assist you in operating the software. The following sections describe the three main program functions.

4 Performing a New Drive Test

A wizard guides you through five dialog boxes. Simply follow the instructions on the screen.

1. "Basic Settings"
Specify the radio standard, units and output directory.
2. "Hardware Selection"
Select the R&S ETL, R&S ETH or R&S ETC you will use for the drive test. When selecting multiple TV analyzers, they have to be of the same type. Also the GPS receiver can be configured here by selecting 'Analyzer+GPS' for the related TV analyzer.
3. "Signal Selection"
Specify the frequencies to be measured and provide a description.
4. "Measurement Selection"
Define which measurements are to be performed for each frequency.
5. "Drive Test"
Start, pause and end your drive test.

As soon as you have collected data from a drive test, the results for each frequency are available in a separate *.dtr file. The file name is generated automatically in the following format:

[year]-[month]-[day] [hour]-[minute]-[second] [description].dtr

You can use the subsequently available functions to export these proprietary DTR files as KMZ or CSV files for postprocessing.

5 Graphical Evaluation

The graphical evaluation provides an overview of the recorded data on Google Earth software maps.

Using the wizard, generate a KMZ file for Google Earth:

1. Selecting the file(s):
Select the DTR file(s) to be exported.
2. Configuring the view:
Define how the results should be displayed in Google Earth.

Follow the on-screen instructions.

A progress bar will indicate the status of the conversion, and you will see a confirmation message when the conversion is complete.

To display the KMZ file, you must have Google Earth installed. If Google Earth is being launched for the first time, you must have access to the Internet to ensure that the necessary maps are downloaded. Each subsequent time the application is launched, the maps can be loaded from the local cache on the hard drive.

Within the Google Earth software 6.0 or higher, the KMZ file provides the following functions.

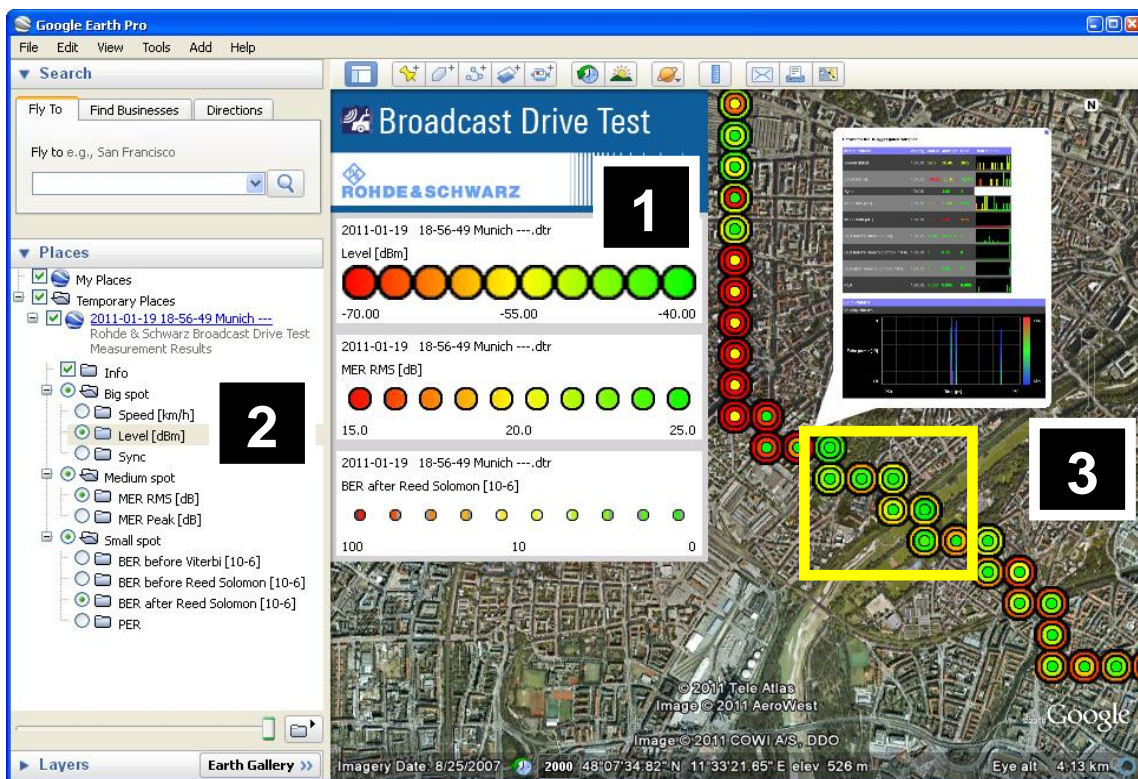


Fig. 2: Functionality in Google Earth

Traffic light system with color gradients

(see Fig. 2, pane 1)

Based on user-defined limit values, every numeric measured value can be displayed on the map as a spot ranging in color from red to yellow to green. This makes critical regions easy to recognize. Spots are shown semi-transparent, if they represent at least some measurements without valid GPS coordinates, which have been interpolated instead.

Correlation analysis

(see Fig. 2, pane 2)

Up to three independent color gradients can be displayed at the same time, differentiated by the size of the measurement points. The color spots can be used to represent different types of measured values for the same frequency; for example, you can see how the receive field strength, modulation error ratio and bit error ratio relate to one another. You can also directly compare a single measured value type across multiple frequencies. To do this, open multiple KMZ files at the same time and select a different measurement point size for each. Google Earth also allows you to integrate external data, such as 3D buildings or coverage forecasts.

Zoom-based aggregation of measured values and detailed view

(see Fig. 2, pane 3)

When you reduce the zoom level in Google Earth, adjacent measurement points are automatically combined so that the result represents the poorest value of all those recorded. This keeps the display easy to read, because adjacent symbols will never overlap. You can also use this function to analyze coverage for larger regions with a large amount of measurement data: Starting at the lowest zoom level that displays the entire region on one screen, selectively enlarge the critical areas. In this detailed analysis, you can click every measurement point on the map to open an extensive view with all results for that location, including graphics showing multipath reception and frequency distributions for all numeric measured values.

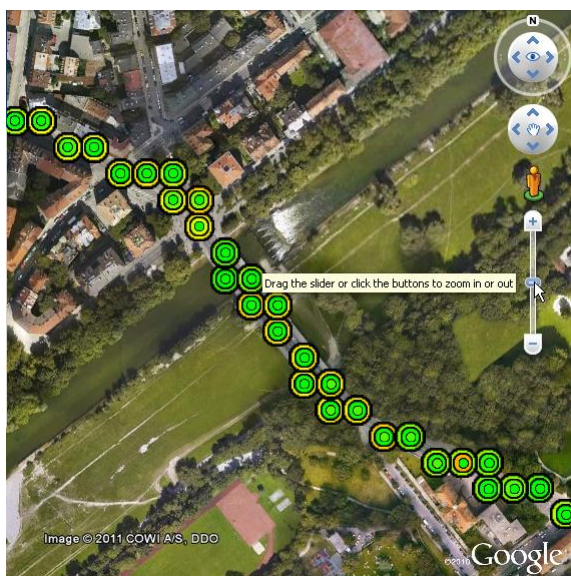


Fig. 3: Detailed view of area outlined in yellow in Fig. 2

6 Tabular Evaluation

Using the tabular evaluation, you can postprocess the recorded test data based on your definitions.

- ▶ Use the wizard to select the DTR file(s) to be exported.

The following CSV files are generated with the specified name and target folder:

Configuration

Contains the drive test configuration to ensure that results can be reproduced.

Measurements

Contains all numeric measurements, together with the location and time stamps.

Echo pattern

Contains the sampling points for the graphical waveform of the channel impulse response, together with the location and time stamps.

7 Troubleshooting

No TV analyzer was found for controlling in the drive test

The selected R&S ETL, R&S ETH or R&S ETC must be switched on and ready for operation.

If the R&S Broadcast Drive Test software is installed on a different computer or R&S ETL, the IP addresses may differ only in the last number of the four decimal numbers. Check the network cabling as well as the firewall settings.

Broadcast Drive Test option missing

On this TV analyzer, the R&S Broadcast Drive Test option key code has not yet been entered (see chapter 2.3).

No GPS receiver was found for the drive test

One TV analyzer must be connected to a GPS receiver to provide the coordinates for the drive test (see chapter 2.3).

In case the R&S ETL is used with a different GPS receiver than the recommended R&S TSMX-PPS¹, it is required to manually install the related GPS driver on the R&S ETL operating system beforehand and to determine the assigned virtual COM port number (listed in the Microsoft Windows device manager). This COM port number then has to be entered in the GPS configuration within the 'Hardware Selection' dialog (see chapter 4).

Signal quality during the drive test is worse than expected

In the case of multipath reception, the Doppler shift will cause the signal quality to decrease as the vehicle speed increases. Therefore, the signal quality does not represent stationary reception conditions. Continuous testing during the drive can be used for the following purposes:

- Analysis of the receive field strength, since this is not affected by the Doppler shift.
- Analysis of broadcast services that are intended for mobile reception, and therefore explicitly include the Doppler shift in their coverage requirements.
- Scheduling of subsequent stationary measurements, which are then reduced to locations where mobile reception was not possible.

Slow measurement speed, if one TV analyzer is handling multiple frequencies

Handling multiple frequencies sequentially instead of permanently measuring on a single frequency requires additional switching and synchronization time. However, deselecting BER measurements (see step 4 in chapter 4) can significantly reduce the extra amount of time needed. Level-only measurements will provide the fastest performance.

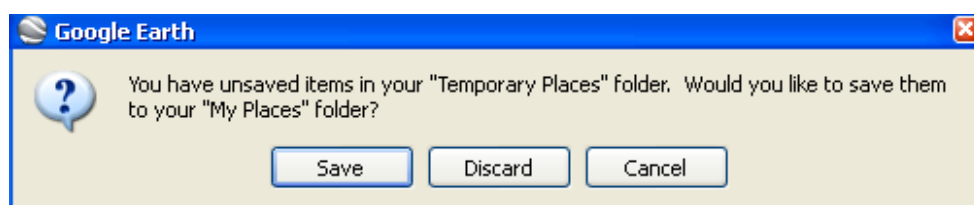
¹ The R&S TSMX-PPS driver is already preinstalled since R&S ETL firmware version 2.40 or higher.

Slow drive test result export speed when run on R&S ETL

It is recommended to additionally install the R&S Broadcast Drive Test software on a external PC with higher processing power to achieve higher export speeds for the drive test result files (*.dtr).

Google Earth KMZ file analysis does not show expected elements

- Use the latest Google Earth software version (6.0 or higher)
- It may happen, that after closing and reopening the same KMZ file in Google Earth, some measurement spots are no longer drawn on certain zoom levels. In this case, please restart Google Earth.
- When quitting Google Earth, you are asked whether you want to save the currently opened KMZ files from “Temporary Places” to “My Places”:



The KMZ files saved to the “My Places” folder will be automatically loaded in future startups of Google Earth. Since it has however been observed, that the contents of those files have not always been displayed as intended, it is recommended to answer the upper dialog with “Discard” and to remove all already existing R&S Broadcast Drive Test KMZ files from the “My Places” folder.

Manually opened KMZ files will always be added to the “Temporary Folder” and thus reliably be displayed correctly.

Slow Google Earth KMZ file analysis

Compared to R&S Broadcast Drive Test version 1.00, KMZ files created by version 2.00 or higher are presented significantly faster in Google Earth, no matter by which version the drive test itself was carried out.