R&S®PR100
Locating a signal source
Application brochure

ROHDE&SCHWARZ

Radiomonitoring & Radiolocation
Application Brochure | 01.00

R&S®PR100
Locating a signal source

Contents

This application brochure describes the procedure for locating a signal source using an R&S®PR100 portable receiver and an R&S®HE300 active directional antenna.

In all configurations, this portable receiver is ideal for detecting almost any signal source. The modular design makes it possible to adapt the receiver to specific customer requirements in order to find even weak signals in demanding scenarios.

Products from Rohde & Schwarz

- R&S®PR100 portable receiver
- R&S®HE300 active directional antenna
- R&S®PR100-DF direction finder upgrade kit
- R&S®ADD107 compact VHF/UHF DF antenna
- R&S®ADD207 compact UHF/SHF DF antenna

Introduction

Identifying the physical location of a signal source is one of the most frequently performed tasks in the field of radiomonitoring and radiolocation. The technical solutions employed range from single, portable devices to large, permanently installed systems.

The R&S®PR100 portable receiver is a compact and effective solution for pinpointing the origin of signals.

When the R&S®PR100 is upgraded with the optional R&S®PR100-DF direction finder upgrade kit to a portable direction finder, it is possible to quickly switch back and forth between a DF antenna (such as the R&S®ADD107 compact VHF/UHF DF antenna) and the R&S®HE300 active directional antenna. The user is able to combine both techniques (use of a genuine direction finder or of a directional antenna) when searching for a signal source. The DF antennas available for the R&S®PR100 can be attached to nearly any vehicle roof with the aid of a magnetic mount, without any additional installation effort. Operating from the vehicle, the R&S®PR100 uses DF functionality to narrow in on the target area.

To find the physical source of the signal once the target area has been determined, the R&S®HE300 is used instead of the DF antenna. Proceeding on foot, the user then homes in on the signal until its source is found.

Basic technical principles

Principle of operation

The R&S®PR100 is employed to determine a signal's angle of arrival (AoA) using either the directional antenna or the direction finder upgrade kit. In order to determine the position of a signal source from the signal's AoA, the system combines multiple measurements that were taken from different sites. In general, there are two different methods for determining the position: homing and triangulation.

Homing

When the homing technique is used, the user determines the direction of the incident signal and continuously follows this direction until the signal source is reached. When only one R&S®PR100 is available, this is often the fastest method.

Triangulation

Triangulation is performed with one or more receivers. In this case, the AoA for the signal that is to be located is determined based on fixed sites. Ideally, a clear point of intersection emerges when the results are superimposed; that point shows where the signal source can be expected. In practice, however, this method is only of limited use, especially in urban areas with high buildings where reflections and multipath propagation arise. As a result, acceptable results can only be expected when the DF sites have been selected with great care.

Manual direction finding (using an R&S®HE300 active directional antenna)

Evaluating the receive level of a mechanically rotating antenna is the simplest DF method. To perform triangulation, the antenna site and the angle of rotation must be known.

The antenna's directivity is determined by superimposing partial waves (their phase differences depend on the AoA). The maximum signal level at the antenna output arises when the antenna is held in the direction of the largest field strength.

A digital compass and a GPS receiver have been integrated into the handle of the R&S®HE300 active directional antenna (model .03), making it possible to evaluate the antenna's direction and geographical position directly in the R&S®PR100. Manual direction finding using the R&S®HE300 is described in detail beginning on page 6. In this case, the user evaluates the signal level in the receiver.

The R&S®PR100 receiver's signal processing concept enables it to detect even brief emissions with minimal signal levels. However, it is only possible to use the R&S®HE300 for radiolocation when the signal to be pinpointed is continuous or at least continuously pulsed. If, during a 360° rotation with the R&S®HE300, the signal level changes or the signal disappears completely, it is not possible to achieve reliable DF results. This is why it is difficult to locate brief radio interference or brief radiotelephone conversations when using this method.

To cover the R&S®HE300 antenna's entire frequency range (9 kHz to 7.5 GHz), four easy-to-exchange antenna elements are available. The antennas are optimized to achieve the best possible directional characteristics for their extensive frequency range.

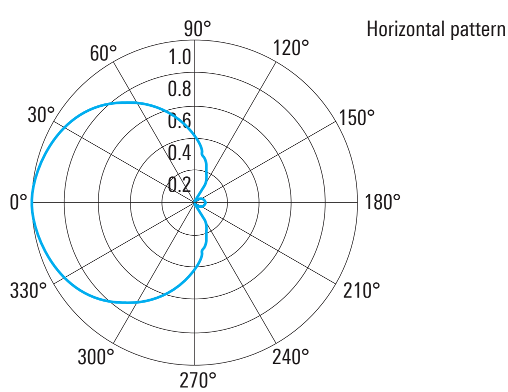
Automatic direction finding (using the R&S®PR100-DF direction finder upgrade kit)

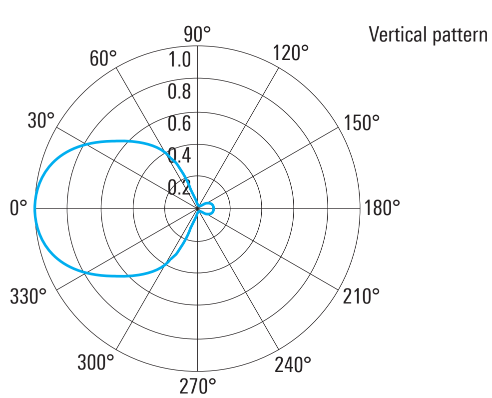
The R&S®PR100-DF direction finder upgrade kit turns the R&S®PR100 into a powerful and convenient portable direction finder. Depending on the frequency range, the system either employs the Watson-Watt DF method or the correlative interferometer method. For direction finding in the frequency range from 20 MHz to 6 GHz, the R&S®ADD107 (20 MHz to 1.3 GHz) and R&S®ADD207 (690 MHz to 6 GHz) compact DF antennas are available. Using a method patented by Rohde & Schwarz, the antenna elements in the DF antenna are switched sequentially to the receiver input; the precise DF result is calculated.

No manual intervention is required, making it possible to locate brief emissions (which was not possible through manual direction finding with the R&S®HE300). There is also no need for the user to determine DF results by comparing levels. This is done inside the direction finder using the DF antenna and various DF algorithms.

From a functional perspective, the direction finder upgrade kit makes the R&S®PR100 identical with the R&S®DDF007 portable direction finder. The conditions described in the application brochure entitled "Locating radio transmitters" (PD 3606.7099.92) also apply to the R&S®PR100 with the direction finder upgrade kit.

Antenna module radiation patterns from 0.5 GHz to 7.5 GHz





Manual DF mode

Prerequisites

Computer based training

Manual direction finding (using the R&S®HE300 active directional antenna) requires knowledge of how to operate the R&S®PR100 portable receiver. With the aid of the computer based training that is available free of charge, even inexperienced users can quickly learn how to use the receiver's clearly structured operating interface. A basic understanding of the propagation of electromagnetic waves is required. With this manual method, the quality of the results also depends on the user's level of experience.

Selecting the right accessories

The ordering information (page 14) provides an overview of all available accessories. Accessories should be selected carefully based on the intended application. The R&S®HA-Z222 carrying holster is highly recommended for longer periods of use. This holster includes a chest harness that minimizes the burden of carrying the device and a rain cover for use in harsh weather conditions. For use in vehicles, the R&S®HA-Z202 vehicle adapter is available; in this case, the R&S®PR100 is powered by the standard 12 V vehicle power supply.

Computer based training

The free computer based training guides users interactively through all R&S®PR100 functions and is an excellent way to become familiar with the receiver's operating concept (available as a DVD; PD 3606.6870.52).

OpenStreetMap (OSM)

OpenStreetMap (OSM) is a user-editable world map that is available at the following Internet address:
http://www.openstreetmap.org/

OSM is a wiki project that allows users to upload and edit geographical information such as GPS tracking data or the course of a road or river. This world map is growing daily.

OpenStreetMap data can be used freely under the terms of the Creative Commons Attribution-ShareAlike 2.0 license.

R&S®PR100-GPS software interface for GPS

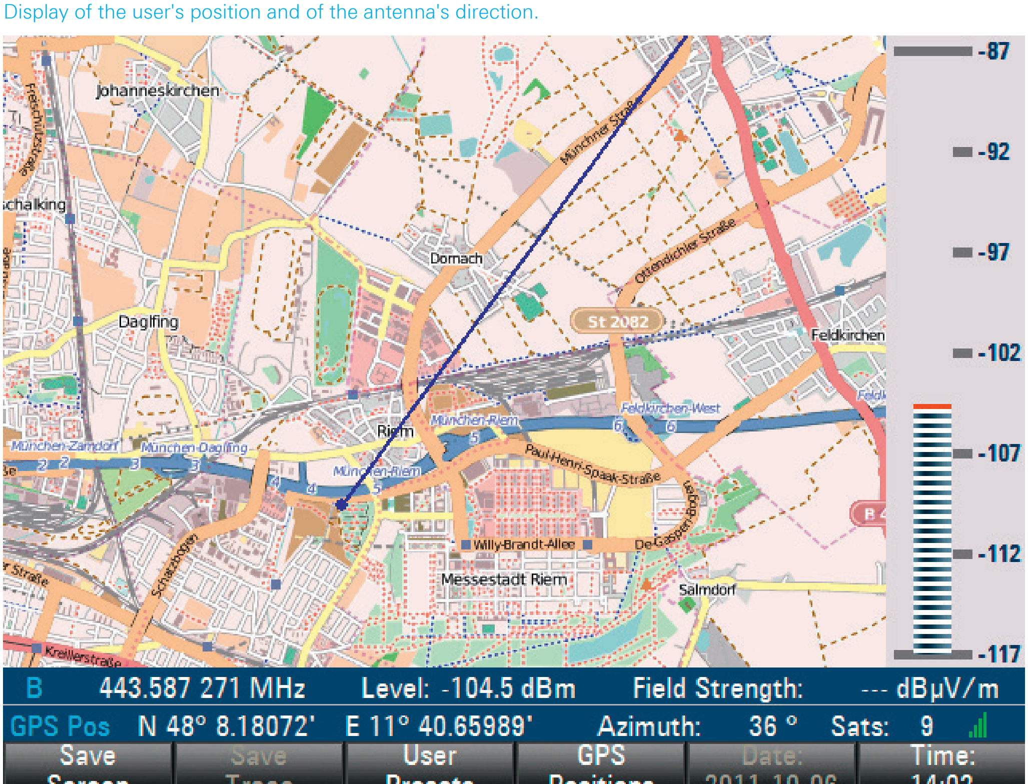
The R&S®PR100-GPS option enables users to display their position and the direction of the antenna on a map directly on the R&S®PR100. Maps are available on the Internet and can be downloaded using the R&S®OpenStreetMapWizard (OSMWizard) software. The map data is stored on the receiver's memory card and can be loaded from there.

The R&S®HE300 antenna can be ordered with either a mechanical or an electronic compass. The model with electronic compass contains an integrated GPS module. If the R&S®PR100-GPS option is installed, the R&S®PR100 displays the user's position and the antenna's direction based on the data from the electronic compass and the GPS module. The antenna's data cable connects directly to the receiver's AUX1 port. In the Configuration menu on the General Configuration tab, the user selects the antenna for AUX1 port as the accessory and sets AUX1 port to be the GPS and compass data source.

Based on the current geographical position, the R&S®PR100 automatically selects the right map from the maps stored on the SD card. By adjusting the zoom level, the user can change the size of the displayed map section. Valid GPS position data must be available, and a suitable map must be stored on the memory card.

If no additional technical aids (such as a separate GPS receiver) are employed, the R&S®PR100-GPS option is required in order to use the triangulation method for radiolocation. When using the homing method, it is helpful, but not imperative to have the user's current position and the antenna's direction displayed directly on the receiver. When locating the source of radio signals within buildings, GPS reception is not possible; consequently, neither the map display nor the GPS option is relevant.

Display of the user's position and of the antenna's direction.

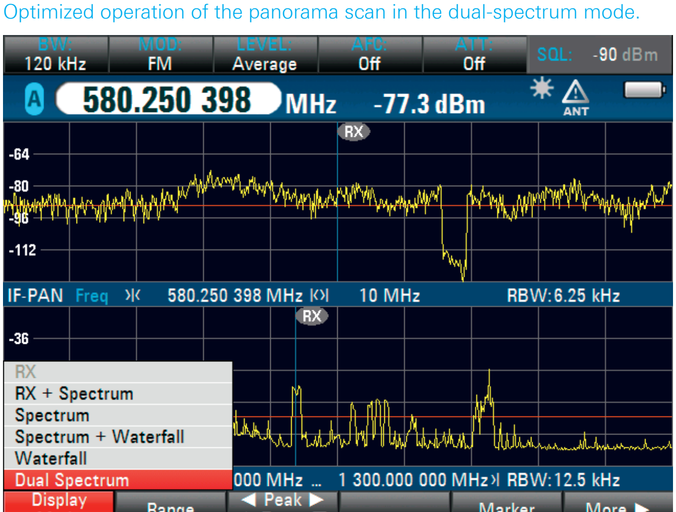


Identifying unknown frequencies

Using the R&S®HE300 antenna, the R&S®PR100 receives signals in the frequency range from 9 kHz to 7.5 GHz. The R&S®PR100-FP SHF frequency processing option and the R&S®HF907DC SHF directional antenna with downconverter extend the operating range to 18 GHz.

In order to track down an RF signal's point of origin, the transmit frequency must either be known in advance or it must be determined. When searching for sources of interference, the approximate frequency range is usually known. The user selects an R&S®HE300 antenna element that matches the frequency range in which a position fix is required. When detecting signals of unknown frequency, the first step is to determine the transmit frequency. Using the R&S®PR100-PS panorama scan option, the system scans the selected frequency range at a speed of up to 2 GHz/s. The user quickly receives an overview of the spectrum occupancy, making it easy to detect changes that are caused by illegal radio services, interference sources, temporary emissions, etc. When the user stops the panorama scan, the R&S®PR100 switches to audio-monitoring mode. Signals can then be demodulated without leaving the scan mode. The marker function makes it easy to select and demodulate the signal of interest and analyze its content. Using the dual-spectrum display mode, the receiver's display is split in half horizontally: The panorama scan is shown in the lower half and the real-time spectrum in the upper half of the display. Depending on whether the receiver is currently in scanning mode or audio-monitoring mode, either the upper or lower half of the display is active. If the signal of interest has not yet been found, the user continues with panorama scan.

Optimized operation of the panorama scan in the dual-spectrum mode.



Receiver settings for detecting known frequencies

When the frequency of the signal to be located is known, the receiver settings can be optimized for radiolocation. The receiver is put into fixed frequency mode (FFM), and the center frequency is set to the frequency of the signal that is to be located. In FFM, the R&S®PR100 displays a maximum bandwidth of 10 MHz in realtime. To locate the signal's origin, the bandwidth for the spectrum display and for the demodulation path are set to match the bandwidth of the signal to be located. If possible, the bandwidth of the demodulation path is set to the signal's exact bandwidth (max. 500 kHz in the R&S®PR100) in order to maximize the accuracy of the level measurement. The spectrum display's bandwidth should be large enough to keep adjacent signals in view and to clearly detect differences in the level of the signal to be located. It should also be possible to clearly differentiate the signal that is to be located from adjacent signals.

Reducing the bandwidth in the spectrum display simultaneously reduces the noise level in the display. However, zooming in too closely on the signal to be located, will result in the user quickly losing sight of adjacent signals. The bandwidth that is set in the spectrum display always represents a compromise and varies from user to user.

The recommended RX+Spectrum mode provides users with a clear display of the level measurement and enables them to simultaneously keep the signal in view within the spectrum. If desired, the compass data can be displayed on a compass rose.

Polarization of the signal to be located

The flexible concept of the R&S®HE300 not only makes it possible to quickly swap antenna elements for different frequency ranges: Each antenna element can be used for horizontally and vertically polarized signals. The element being used is removed from the handle, rotated 90° and then reinserted into the handle.

RX+Spectrum mode.

Other settings

Maximum signal level

In manual DF mode, the user has to determine the maximum signal level by rotating in place a full 360° and must be able to register even the smallest changes in level. Activating the Display Max Hold function helps: In the spectrum and in the level display, the maximum value is marked with a red line. When a new maximum value is reached, the red line marks this value for a user-defined period (Max Hold), and then the level falls back to the current measurement value. For manual DF mode, a Max Hold period of approximately 2 s is a good value since it allows the user to track changes in the signal level while rotating with the antenna.

Measurement settings

The following settings are recommended for optimal tracking of the signal level changes when rotating the directional antenna:

- Measure time: 200 ms
- Level: average
- IF-PAN display mode: normal
- Measuring mode: continuous

Homing in on a miniature transmitter.

Tone function

The tone function in the R&S®PR100 provides audible feedback of level differences. The tone can be heard over the built-in loudspeaker or via headphones [1]. This function is indispensable when using the homing method for radiolocation (and it helps when using the triangulation method). The tone function is activated via the RX ▷ Tone keys (F5). The receiver compares the measured level in the demodulation path with a value that can be set via the MST rotary knob and continually emits a tone. The higher the measured level (compared to the reference level), the higher the frequency of the tone. Changes in the level that arise while rotating with the antenna can now be heard as well as seen (on the display). The reference level must be adjusted continuously, especially when the homing method is used, because ideally the user comes closer and closer to the signal, causing the level of the received signal to rise. The reference level [2] should be set so that the R&S®PR100 emits a clearly audible tone, ensuring that even small changes in the level are easily perceived.

Radiolocation using the homing method

Using the R&S®PR100 (in combination with the R&S®HE300) for homing primarily makes sense when the source of the signal is expected to be nearby. In this case, neither a map, GPS nor compass are absolutely necessary. The homing method is very easy to use inside buildings. It has proven to be an effective solution in environments subject to significant reflections. When using triangulation, the direction of a reflection can easily be misinterpreted as the bearing of the signal to be located. Using the homing method, the user quickly recognizes which maximum level is a reflection and which is the actual signal.

For homing, the center frequency of the R&S®PR100 is set to the frequency of the signal to be located (see page 9). It is important to select the right R&S®HE300 antenna element. Though the elements can also receive signals outside their specified frequency range, the antenna's directivity and sensitivity will not comply with the specified values.

[1] Headphones are recommended in order to reduce the influence of ambient noise and to avoid disturbing other people in the surrounding area.
[2] The reference level, or the level to which a 400 Hz tone is assigned, can be set between –14 dBμV and +94 dBμV.

First, the user determines the direction from which the signal arrives. Holding the directional antenna, the user rotates in place to complete a full circle within 25 s to 30 s and attempts to determine the maximum level based on the display and the acoustic tone that the receiver emits. The direction from which the signal with the maximum level is received is the direction in which the user should move in order to close in on the signal source.

The user continues to move in the direction of the strongest level. This requires slow, controlled movement with the directional antenna. Once the approximate direction of the incident wave is known, the user continues to move the directional antenna (moving it slightly side to side) toward the area with the strongest power level.

Ideally, the user moves closer and closer to the signal source until it is found. Since the received signal level rises continuously, it is important to constantly adjust the tone function's reference level in order to keep the tone within a clearly audible range. By again rotating in place, the user can be certain of moving toward the signal source and not following a reflection of the signal. If the signal source is located in an area accessible to the user, it can be unambiguously identified using the homing technique. This accuracy is essential when searching for interference sources or hidden miniature transmitters, since the actual source must be identified.

Example

The approximate maximum level is determined at a level of –104.5 dBm and an azimuth of 36°. The antenna is moved to the left until the level sinks to –107.5 dBm. The user notes the azimuth. The directional antenna is then moved to the right until the level sinks to –107.5 dBm. With a high degree of probability, the average of these two azimuth values is the direction from which the signal is actually arriving at the measurement site.

Instead of the –3 dB used in this example, it may sometimes be better to use –6 dB or –8 dB. This depends primarily on the antenna's radiation pattern and the ambient conditions.

Radiolocation using the triangulation method

For this method, an R&S®PR100 portable receiver and an R&S®HE300 antenna are used to determine the direction of the incident signal based on measurements taken from at least two different sites. Ideally, these measurements yield two straight lines on the map that intersect at the signal source's position. The result can be determined much faster when several users perform measurements using multiple receivers and directional antennas. The electronic compass and the GPS module housed in the antenna's handle are required in order to store the individual measurement results needed for triangulation. These measurements can be taken one after the other with a single device or simultaneously with multiple devices positioned at different sites.

The quality of the measurement results greatly depends on the choice of measurement sites. Ideally, the sites should be elevated and should have a clear line of sight to the signal source. Since the position of the signal source is unknown, the success of triangulation in densely built-up areas is severely limited; multipath propagation, shadow effects and reflections also falsify the measurement results significantly.

To perform triangulation, the R&S®PR100 is set to the ideal configuration for radiolocation; its center frequency is tuned to the frequency of the signal to be located (see page 9). Then the user determines the direction from which the signal is arriving. Holding the directional antenna, the user rotates in place to complete a full circle within 25 s to 30 s in order to get a general idea of the direction from which the signal is being received at the maximum level. There is often more than one maximum level, but usually the maximum level with the strongest overall power level is correct. If the selected site allows, the user can repeat this rotation at a second position that is only marginally different from the first position (just a few meters away) in order to eliminate any secondary maximum levels. The map display also helps the user determine the approximate maximum when the general target area is known in advance.

Once the user has an idea of the general direction from which the maximum level is emanating, this direction must be determined precisely (by viewing the level display) in order to use it for triangulation. From long distances away, even deviations of just a few degrees can lead to major errors. Based on the approximate maximum level, the user moves the directional antenna to the left and to the right until the displayed level value decreases by 3 dB. The exact maximum is exactly midway between these two values.

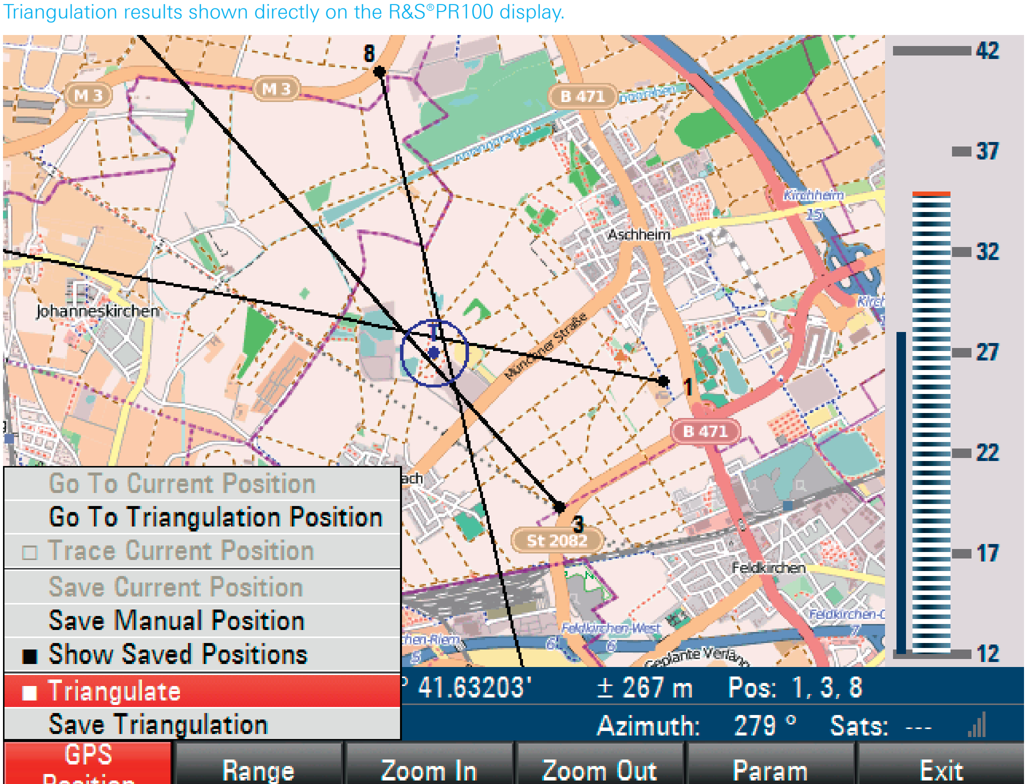
The user's own position and the direction of the antenna are displayed on the map. At the same time, the tone function outputs an acoustic signal (see page 10). The measured level value is displayed both as a level bar and numerically. The user is able to keep an eye on all of the required information and accurately determine the direction without having to switch back and forth between different displays. Once the exact direction has been determined, the Save Current Position function is used to store both the user's own position and the determined direction in the R&S®PR100.

The rest of the procedure depends on the number of available receivers and directional antennas: When several receivers and antennas are used, the measurement results (such as the GPS positions and directions) from all of the receivers can be combined on one R&S®PR100. If only one system is available, the user moves to another site and repeats the measurement there. Triangulation requires at least two measurements from different sites. The general rule is: the more measurements used for triangulation, the more precise the overall results. On an R&S®PR100, it is possible to combine a maximum of five measurements. When saving the individual measurements, the user can assign a user-defined name to each measurement; later, the user can select from a list the measurements to be used for triangulation.

The triangulation results are displayed directly on the map on the receiver's display. If only two results are used for triangulation, the point at which the two lines intersect (if they do intersect) is marked. If more than two results are used, the area where the lines intersect is displayed and a circle is drawn around the area of interest. The radius of this circle depends on the divergence in the measurement results.

The user can influence the overall results by deciding which measurements are to be used for triangulation. If the display measurements show that the measurement from one site is unusable, the user can remove it so that it is not included in the triangulation calculation. The result of triangulation is never the direct, physical discovery of a signal source; it is the precise definition of the target area. The many variables that contribute to the overall process (such as the choice of measurement sites and the exact determination of the direction of the maximum level) influence triangulation accuracy.

Triangulation results shown directly on the R&S®PR100 display.



Evaluating the results

Homing

Homing was successful when the signal source was located and directly identified. For documentation purposes, the source's GPS position data can be stored in the R&S®PR100 (if GPS reception is possible at that site). Depending on the specific application, the source is then turned off, removed or repaired.

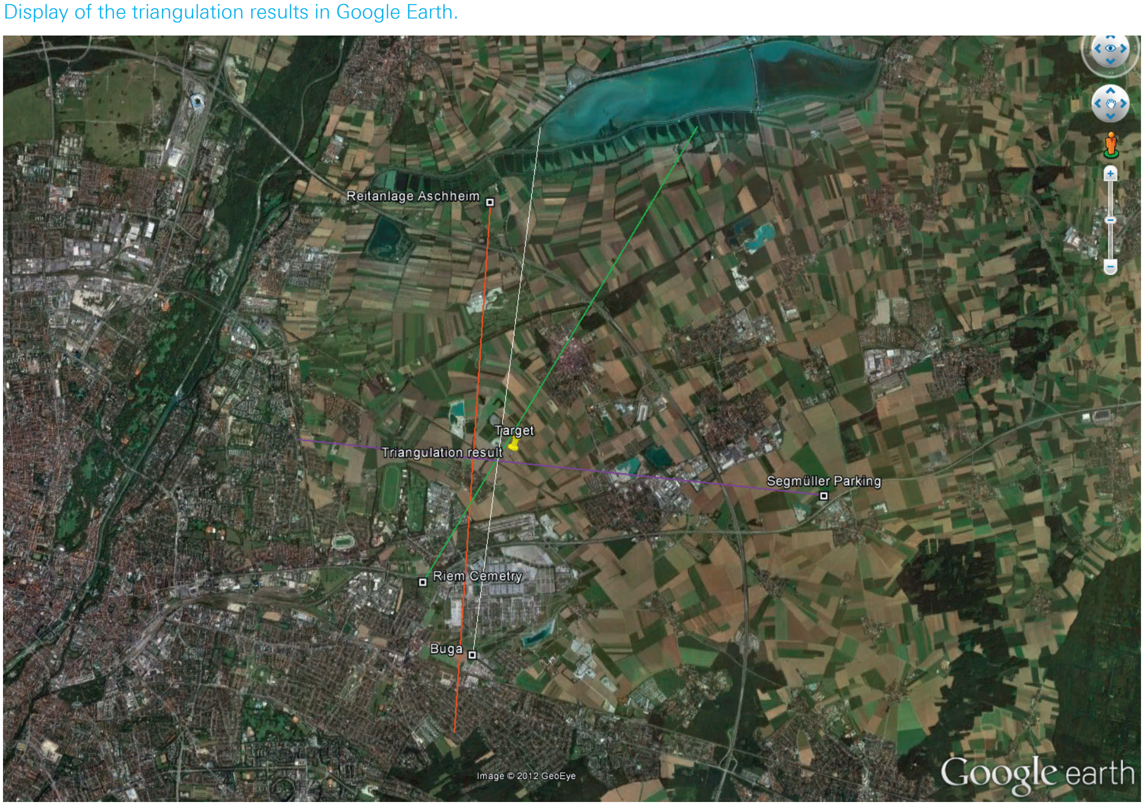
Triangulation

The evaluation of triangulation results can lead to a diverse range of steps. Here too, the goal is, of course, to locate and identify the signal source. If the triangulation results lead to an area that the user can access (such as a specific residential area or a group of buildings), the homing method can be used to determine the signal source. That is the case for most applications. Consequently, triangulation is often used to provide a basis for narrowing down the search for a signal source that could be anywhere within a large area.

If the user does not have access to the area that the triangulation results have specified (for instance, because they indicate a point that is inside a large warehouse or production building on corporate grounds or on top of a high mast), or the target is located in an inaccessible military zone, it is usually necessary to pass on the triangulation results to another organization. This could, for example, be a notice sent by a regulatory authority to a cellular network operator requesting that the base stations on one of its masts be checked to make sure they are operating properly. Screenshots of the R&S®PR100 display showing the results of the triangulation can be used as documentation.

If the map display is insufficient, the results have to be exported. All stored GPS positions with the signal's direction and frequency information are stored as a .GPX file on the receiver's SD card. This data format is often used to store geodata. The values from this file can be imported for documentation purposes or they can be passed on for import into other programs, such as Google Earth. When the .GPX file is imported into Google Earth, Google Earth automatically recognizes the stored positional data from the .GPX file, but the stored antenna directional information has to be entered manually.

Display of the triangulation results in Google Earth.



Ordering information

Designation	Type, description	Order No.
Base unit		
Portable Receiver	R&S®PR100	4079.9011.02
	IF spectrum (max. 10 MHz), spectrogram (waterfall display), 6-cell lithium-ion battery, plug-in power supply, SD card for storing user settings, shoulder strap	
Documentation of Calibration Values	R&S®PR100-DCV	4071.9906.02
Software options		
Panorama Scan	R&S®PR100-PS	4071.9306.02
	RF scan, high-speed FFT scan across user-selectable scan range, selectable spectral resolution (bin width)	
Internal Recording	R&S®PR100-IR	4071.9358.02
	recording of measured data in the receiver (64 Mbyte RAM) or on SD card, recording of audio data in WAV format (replay using Windows Media Player, for example), recording of I/Q data, spectra and spectrogram (waterfall) data, R&S®PR100-Control software for viewing measured data on customer PC	
Remote Control	R&S®PR100-RC	4071.9406.02
	remote control of receiver via LAN interface (SCPI protocol); transfer of measured data via LAN interface; transfer of demodulated I/Q data (up to 500 kHz bandwidth) via LAN interface; R&S®PR100-Control software (for remote control, data recording and data playback via PC)	
Externally Triggered Measurements	R&S®PR100-ETM	4071.9458.02
	an external sensor (not supplied with the receiver) triggers a measurement in the R&S®PR100; the sensor is connected via the AUX interface	
Field Strength Measurement	R&S®PR100-FS	4071.9506.02
	the field strength is calculated using antenna factors stored in the receiver; the receiver displays the field strength directly in dBµV/m	
SHF Frequency Processing	R&S®PR100-FP	4071.9558.02
	the R&S®HF907DC antenna's downconverter unit is connected to the receiver via a control cable; the receiver recalculates the downconverted signals to display them with their original frequencies up to 18 GHz and with the sidebands in their original positions, so the user does not need to convert signals subsequently (antenna and downconverter not supplied with the R&S®PR100-FP option)	
GPS Software Interface	R&S®PR100-GPS	4071.9958.02
	for processing of data stream from external GPS module (external GPS module not included)	
Direction Finder Upgrade Kit	R&S®PR100-DF	4096.2805.02
	for upgrading the R&S®PR100 receiver to a portable direction finder (DF antenna and cable set not included)	
Accessories		
Battery Pack	R&S®PR100-BP	4071.9206.02
	6-cell lithium-ion battery, charging cradle, plug-in power supply	
Suitcase Kit	R&S®PR100-SC	4071.9258.02
	hard shell transit case (with extra space for accessories), headphones and telescopic antenna	
Vehicle Adapter	R&S®HA-Z202	1309.6117.00
Carrying Holster	R&S®HA-Z222	1309.6198.00
	chest strap, pouch and rainproof cover	
Carrying Bag	R&S®HA-Z220	1309.6175.00
	soft carrying bag	
GPS Receiver	R&S®HA-Z240	1309.6700.03
	external GPS receiver for the R&S®PR100	

Designation	Type, description	Order No.
Active Directional Antenna	R&S®HE300	4067.5900.02
	three antenna modules covering the range from 20 MHz to 7.5 GHz, handle with integrated switchable preamplifier, hard shell transit case with extra space for the R&S®PR100 (model with mechanical compass)	
Active Directional Antenna	R&S®HE300	4067.5900.03
	three antenna modules covering the range from 20 MHz to 7.5 GHz, handle with integrated switchable preamplifier, hard shell transit case with extra space for the R&S®PR100 (model with electronic compass and integrated GPS module)	
HF Option for R&S®HE300	R&S®HE300HF	4067.6806.02
	loop antenna from 9 kHz to 20 MHz for the R&S®HE300 active directional antenna	
SHF antenna and accessories		
SHF Directional Antenna with Downconverter	R&S®HF907DC	4070.8006.02
Cable Set	R&S®HF907DC-K1	4070.8958.02
Tripod Adapter	R&S®HF907DC-Z1	4079.3113.02
Carrying Case	R&S®HF907DC-Z2	4079.3207.02
DF antennas and accessories		
Compact VHF/UHF DF Antenna	R&S®ADD107	4090.7005.02
Compact UHF/SHF DF Antenna	R&S®ADD207	4096.0002.02
Vehicle Adapter with Magnetic Mount	R&S®ADD17XZ3	4090.8801.02
Wooden Tripod	R&S®ADD17XZ6	4090.8860.02
Cable Set with Converter	R&S®ADD17XZ5	4090.8660.02

Service you can rely on

- Worldwide
- Local and personalized
- Customized and flexible
- Uncompromising quality
- Long-term dependability

About Rohde & Schwarz

Rohde & Schwarz is an independent group of companies specializing in electronics. It is a leading supplier of solutions in the fields of test and measurement, broadcasting, radiomonitoring and radiolocation, as well as secure communications. Established more than 75 years ago, Rohde & Schwarz has a global presence and a dedicated service network in over 70 countries. Company headquarters are in Munich, Germany.

Environmental commitment

- Energy-efficient products
- Continuous improvement in environmental sustainability
- ISO 14001-certified environmental management system

Certified Quality System
ISO 9001

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Data without tolerance limits is not binding | Subject to change

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