Портативный мониторинговый приемник PR200

AT A GLANCE

The R&S®PR200 portable monitoring receiver is engineered to effectively support your spectrum monitoring, interference hunting and site testing tasks. It reliably detects, analyzes and locates signals from 8 kHz to 8 GHz. Optimized for field operations, it provides a perfect balance between RF performance and operability, and offers a wide range of measurement functions also suitable for complex signals such as 5G signals.

The R&S®PR200 portable monitoring receiver with up to 40 MHz real-time bandwidth covers the frequency range from 8 kHz to 8 GHz. This range can be extended up to 20 GHz with the R&S®HE400DC SHF handheld antenna with integrated downconverter. The R&S®PR200 offers a perfect balance between RF performance, speed, usability and size, weight and power (SWaP) to handle typical tasks in every mobile spectrum monitoring, spectrum clearance, interference hunting and site testing mission in indoor and outdoor environments.

Apart from the polychrome spectrum display and fast spectral overviews with scan speeds of up to 47 GHz/s, the R&S®PR200 features analog demodulation and versatile signal measurements, including level measurements, field strength measurements and ITU-compliant modulation parameter measurements. The R&S®PR200 also provides time domain analysis with simultaneous signal representation in the frequency and time domains. The gated spectrum application can even uncover hard-to-detect interference signals by computing the real-time spectrum only within an adjustable time gate when matched to particular time slots in time division multiplexing networks.

For evaluation and analysis, the R&S®PR200 offers comprehensive visualization modes, a wide range of markers and signal measurement functions, extensive mapping features, I/Q data streaming, a history mode, audio and trace recording as well as LAN remote control for later replay and documentation.

In addition to manual homing direction finding with R&S®HE400 handheld directional antennas, the R&S®PR200 equipped with compact R&S®ADDx07 DF antennas can be upgraded to perform highly accurate angle of arrival (AoA) based direction finding from 20 MHz to 6 GHz. The high timestamp accuracy thanks to the internal GNSS module enables operation in a network of multiple receivers to perform precise time difference of arrival (TDOA) radiolocation.

The R&S®PR200 has an innovative application-based user interface to quickly switch between measurement tasks, enabling signals of interest to be detected, analyzed and located in the shortest possible time. Thanks to its powerful feature set, low weight of 3.5 kg (with battery) and its battery life of over 3.5 h, the R&S®PR200 is one of the most sophisticated and easy-to-operate instruments for on-site spectrum monitoring and interference hunting.

KEY FACTS

- Detect, analyze and locate RF signals from 8 kHz to 8 GHz; extendable up to 20 GHz with the R&S®HE400DC SHF directional antenna with integrated downconverter
- Extensive preselection filtering and automatic overload protection
- High-speed panorama scanning with up to 47 GHz/s over the entire frequency range
- Simultaneous measurements in the frequency and time domain with time-gated spectrum calculation
- Accurate AoA based direction finding from 20 MHz to 6 GHz with compact DF antennas
- Optimized for demanding field operation with minimal size, weight and power consumption
- Innovative application based user interface for convenient, simple and intuitive operation

TYPICAL APPLICATIONS

Spectrum monitoring in the field

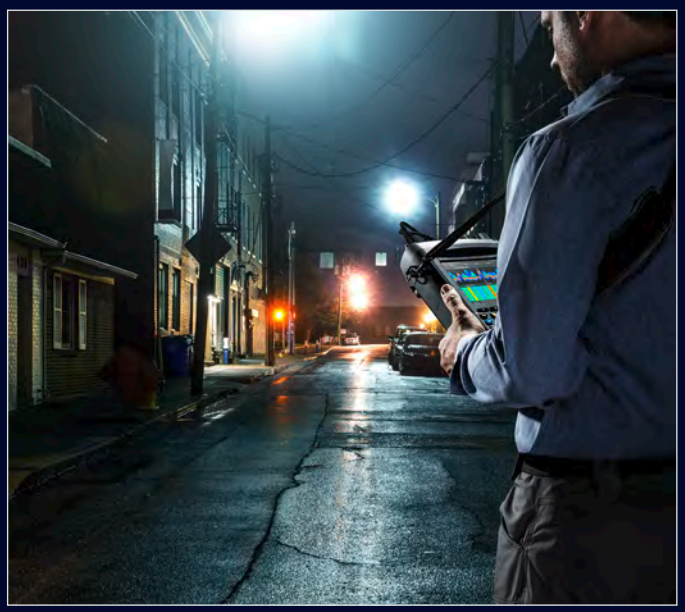
Spectrum monitoring helps detect and locate unknown interference signals, verify compliance with licenses, regulations and communications standards and facilitates network management. The R&S®PR200 is designed to perform these tasks during mobile operation in both indoor and outdoor environments. The wideband operation with gapless 40 MHz real-time processing, various spectrum scan modes and powerful measurement toolset including polychrome spectrum, time domain analysis, direction finding and ITU-compliant measurements enable efficient and convenient spectrum monitoring sessions in the field.

Interference hunting

With the rapid increase in wireless transmission devices in urban areas, a growing number of unwanted interference signals can disrupt the communications link quality. Mitigating these interferers is crucial to proper spectrum use. The R&S®PR200 is ideal for quickly detecting, analyzing and locating interferers in indoor and outdoor operations. Thanks to its real-time operation, polychrome spectrum and time domain analysis with time-gated spectrum function, even hard-to-detect interference can be spotted reliably. Once found, interferers can be located with manual homing and direction finding, automatic AoA-based direction finding or from a moving vehicle in combination with the PC-based R&S®MobileLocator software.

Many other applications

The R&S®PR200 is a powerful instrument for many other applications that require flexibility and mobility. Whether performing on-site signal measurements in the frequency and time domains to ensure proper network performance, online signal analysis in combination with PC-based signal analysis software in communication intelligence (COMINT) applications for the detecting and locating miniature transmitters indoors with a differential spectrum, the R&S®PR200 is a compact, battery-operated and easy-to-operate solution.



Reliable outdoor spectrum monitoring with the R&S®PR200

Manual homing direction finding with the R&S®PR200 and the R&S®HE400.

HIGH-PERFORMANCE MONITORING WITH FAST SPECTRAL SCANS

Monitoring and direction finding over wide frequency ranges

The R&S®PR200 has a 40 MHz real-time bandwidth and covers the monitoring frequency range from 8 kHz to 8 GHz, which can be extended up to 20 GHz with the R&S®HE400DC SHF directional handheld antenna with integrated downconverter. When upgraded with the R&S®CS-DF option, the R&S®PR200 can perform angle of arrival (AoA) direction finding from 20 MHz to 6 GHz.

Automatic adaptation to unknown signal environments

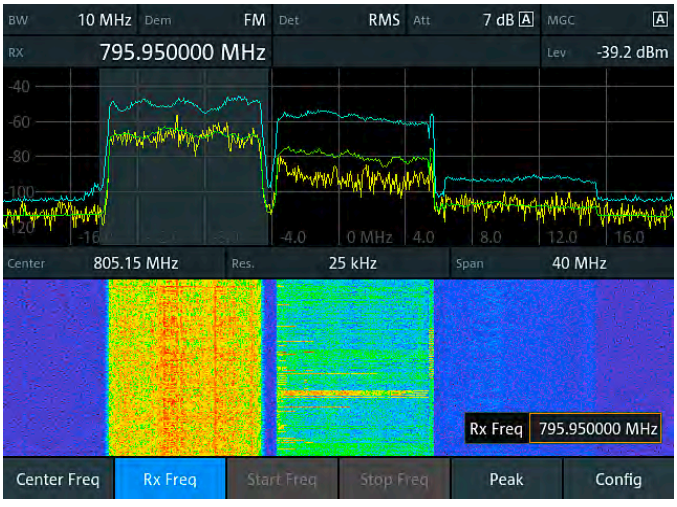
In contrast to spectrum analyzers, the R&S®PR200 is designed for operation on wideband antennas and features extensive preselection filtering to reduce signal load and protect against intermodulation from strong out-of-band signals. The R&S®PR200 also has an attenuator that can be operated manually or automatically. The automatic insertion of attenuation helps alleviate overload conditions in the receiver, which is essential when operating the instrument in unknown, dynamic or changing signal environments. Thanks to various preamplifier gain settings, the R&S®PR200 offers the sensitivity needed to reliably detect weak signals.

Efficient and intuitive spectrum monitoring

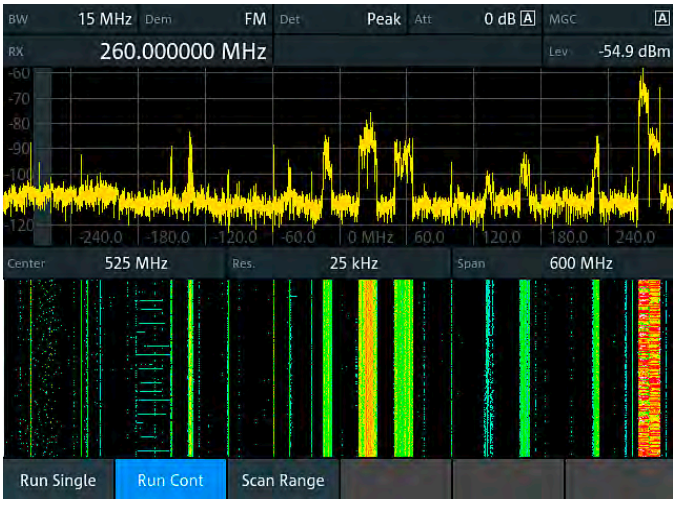
The R&S®PR200 provides a quick spectral overview with its well-organized spectrum and waterfall display. With up to three configurable spectrum traces and selectable resolution bandwidths, no signal goes unnoticed. Easily accessible marker sets and mathematical trace functions enable fast spectrum measurements and comparisons.

Fast spectral scans with dedicated scan modes

Whether the operational focus is on detecting unknown signals over wide frequency ranges or monitoring known communications channels, the R&S®PR200 offers various dedicated scan modes for every task. While the R&S®CS-PS panorama scan option provides a fast spectral overview with adjustable frequency resolution and speeds of up to 47 GHz/s, frequency scan (FSCAN) and memory scan (MSCAN) modes can scan through equispaced or distinct communications channels at up to 2000 channels/s. Configurable squelch levels and dwell times enable demodulation and listening into active channels while scanning.



40 MHz real-time bandwidth with an adjustable demodulation bandwidth (gray) and up to three configurable spectrum traces.



Fast spectral scan (panorama scan) with waterfall display across wide frequency ranges.

SEPARATE SPECTRUM AND DEMODULATION PATHS

Two digital receive paths for individual tasks

The R&S®PR200 features two parallel digital receive paths with up to 40 MHz bandwidth each. The real-time spectrum path enables fast detection and maximum scan speed, while the demodulation and measurement path enables accurate and intuitive measurements of signal parameters. This digital signal processing architecture enables many tasks such as spectral measurements and demodulation or time domain analysis to be performed simultaneously.

Wideband spectrum display during demodulation and measurement

During measurement, demodulation or content extraction of detected signals spectral situational awareness is typically compromised. The two parallel digital receive paths of the R&S®PR200 allow placement of a narrowband demodulation channel anywhere within the real-time bandwidth while maintaining a wideband overview of the real-time spectrum, tremendously reducing reaction times on emerging higher priority spectral events.

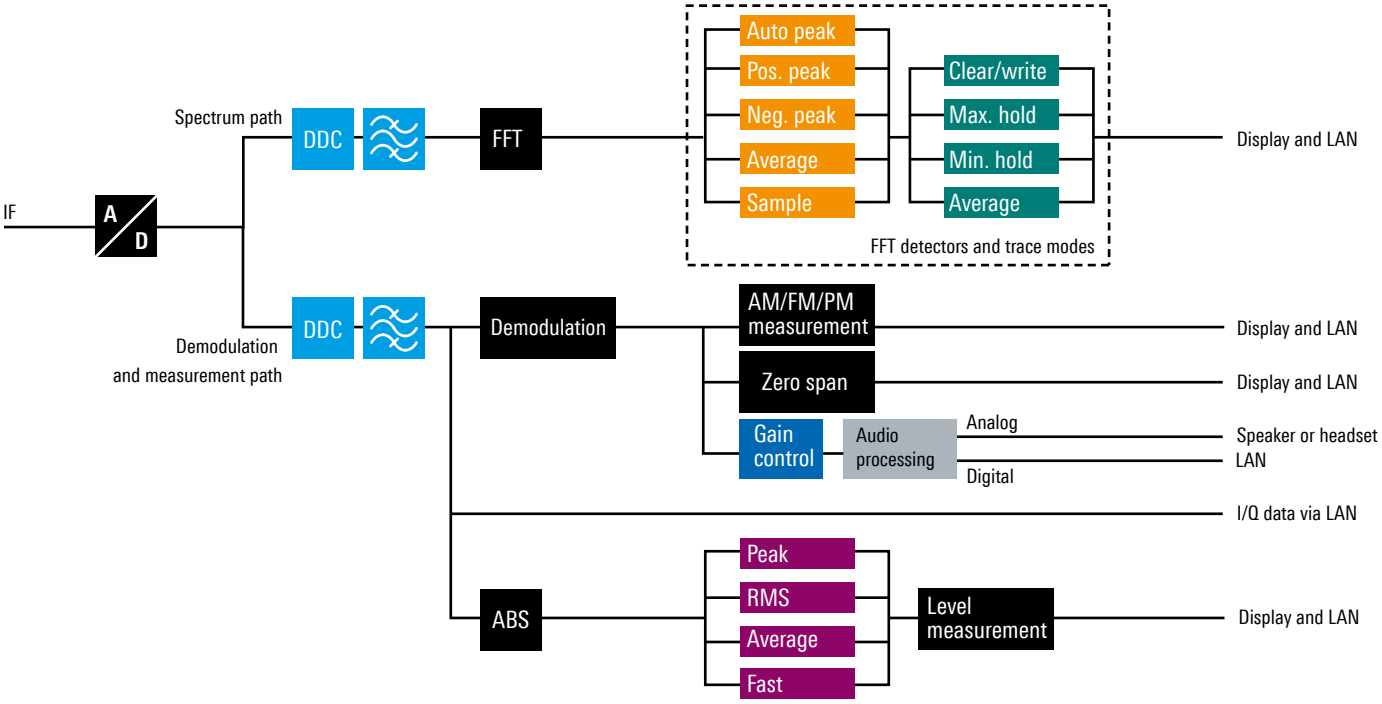
Detection and monitoring in real-time

The R&S®PR200 provides operation in real time for the spectrum display thanks to fast Fourier transform (FFT) signal processing with 50 % overlap implemented on a powerful FPGA. The R&S®PR200 can detect signals as short as 1.5 µs with 100 % probability of intercept (POI) while maintaining full amplitude accuracy. Various FFT detectors and spectrum trace modes help focus on detecting specific signal types. The waterfall display with a built-in history buffer and time resolution of up to 100 µs per line makes it possible to analyze short-time signals in great detail.

Signal measurements and demodulation

The demodulation and measurement path offers a wide array of functions for every task. In addition to accurate level measurements with several detectors, built-in analog demodulation including AM, FM and PM demodulators provide continuous and gain controlled audio output. Optional modulation measurements and time domain analysis complete the toolset. A seamless I/Q data stream is available for digital signal analysis in combination with PC-based signal analysis software.

Simplified diagram of digital signal processing in the R&S®PR200



MANUAL DIRECTION FINDING

Manual homing direction finding

With the R&S®PR200 connected to the R&S®HE400 handheld directional antenna, continuous unwanted emissions up to 8 GHz can be detected and manually located based on the received signal level in indoor and outdoor operation. The R&S®HE400DC SHF directional antenna with an integrated downconverter can be used for interference hunting up to 20 GHz. The built-in tone function also emits a tone with a varying pitch or pulse rate representing the received signal level that is then transmitted to the built-in speaker or a headset to aid in the homing operation.

Mobile app for convenient homing

The R&S®PR200 mobile app for iOS or Android smartphones helps simplify homing operations and allows users to focus on the task at hand. A smartphone running the R&S®PR200 mobile app can be easily mounted on the antenna handle with a commercial, off-the-shelf mobile phone holder. The app provides a spectrum view with various settings to control the R&S®PR200 with wireless LAN. A wireless connection can be set up between the receivers USB port and the mobile phone using an external Wi-Fi router.

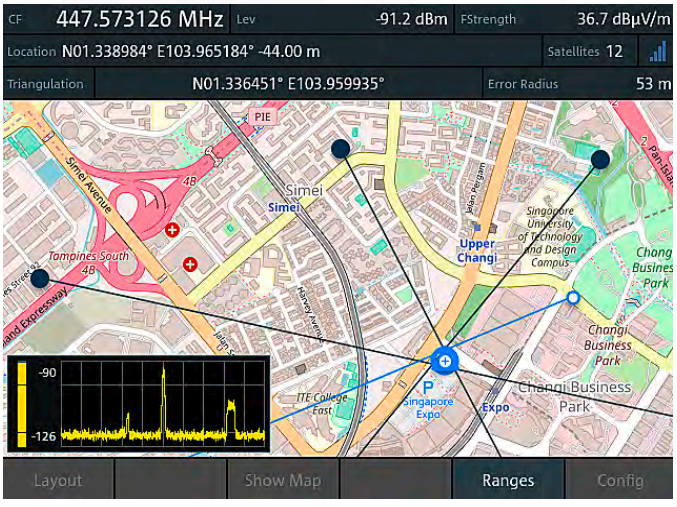
Triangulation based on manual DF results

The R&S®CS-MAP mapping option provides the R&S®PR200 with an integrated map display for localizing signals of interest. Once several DF results and positions have been recorded from the internal GNSS module, automatic triangulation determines the location of the interferer. All map applications include a convenient integrated spectral display, allowing users to keep track of signals during signal hunting and homing operations. OpenStreetMap (OSM) maps can be easily downloaded with the OSM wizard and transferred to the receiver via SD card, USB stick or the remote control PC drive.

R&S®HE400DC SHF directional antenna with downconverter.

Interference hunting using the R&S®PR200 mobile app with gesture operation

The R&S®PR200 mobile app effectively aids homing operation.



Triangulation based on multiple DF results recorded at several locations.

AUTOMATIC DIRECTION FINDING AND RADIOLOCATION

Accurate AoA direction finding

The R&S®CS-DF direction finding option and the connected R&S®ADDx07 compact DF antennas upgrade the R&S®PR200 to a portable and easy-to-operate angle-of-arrival (AoA) based direction finder to obtain fast and highly accurate DF results in the range from 20 MHz to 6 GHz. Depending on the correlative interferometer method and the selected DF antennas and frequency bands, the R&S®PR200-based DF system can offer a typical system DF accuracy of 1° to 3° (RMS). Whether operated as a transportable DF system or installed in a commercial vehicle, it can handle virtually all types of interferers, irrespective of bandwidth and modulation type.

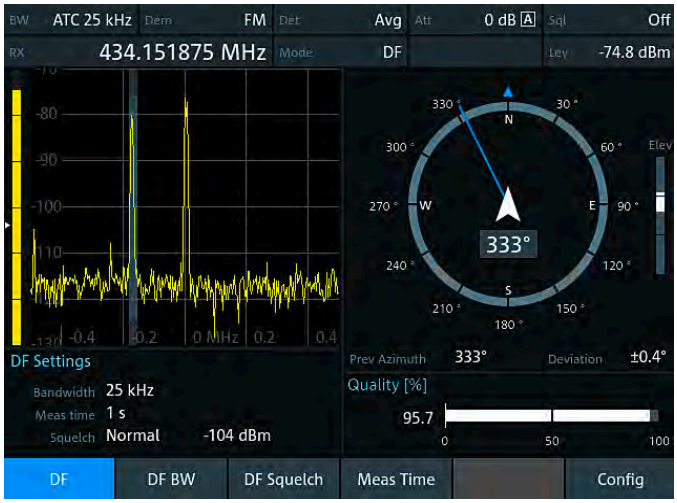
Triangulation of sporadic interferers

To locate sporadic interferers or public mobile radio emissions, a network of multiple transportable DF stations based on the R&S®PR200 can be set up at different locations for triangulation. The compact DF antennas are mounted on lightweight wooden tripods and installed temporarily at these exposed sites, such as the rooftop of tall buildings.

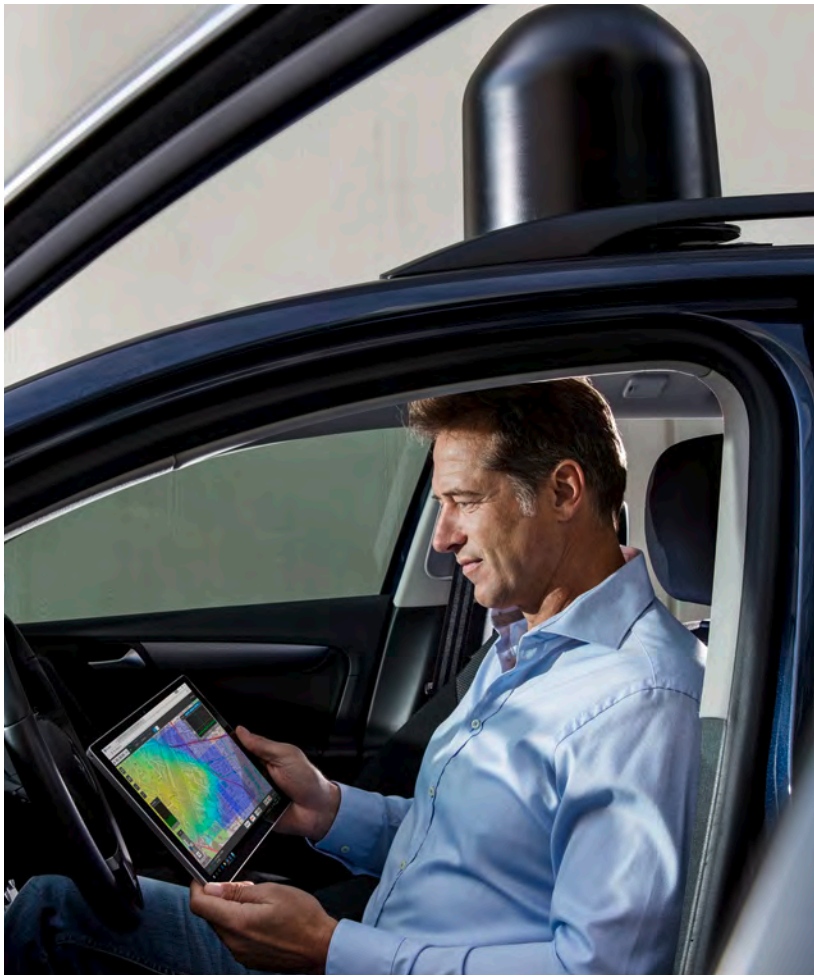
Radiolocation of emitters from a moving vehicle

To locate continuous emitters quickly and efficiently, the R&S®PR200 connected to compact DF antennas (R&S®ADD107 or R&S®ADD207) can be operated with the PC-based R&S®MobileLocator localization software [1], which turns any commercial vehicle into an accurate mobile direction finder. To overcome misleading information from reflections in urban multipath environments, hundreds of DF results per minute are fed to the R&S®MobileLocator software, which uses sophisticated statistical analysis to discard irrelevant readings.

[1] See R&S®MobileLocator product brochure (PD 3607.1271.12).



DF polar display for AoA direction finding with R&S®CS-DF option.



Mobile DF with R&S®ADD207 compact DF antenna and R&S®MobileLocator PC-based automatic radiolocation software.

COMPREHENSIVE SIGNAL MEASUREMENTS

Level and field strength measurements

The R&S®PR200 features simultaneous level measurements of up to three detectors with peak indicators. When equipped with the R&S®CS-FS field strength measurement option and paired with the R&S®HE400 handheld antenna, the R&S®PR200 performs field strength measurements in line with ITU-R SM.378-7. The connected R&S®HE400xx antenna module is automatically recognized and the prestored antenna factors in the R&S®PR200 are applied to convert the received signal level to field strength. The measured field strength values are automatically tabulated and displayed on the receiver.

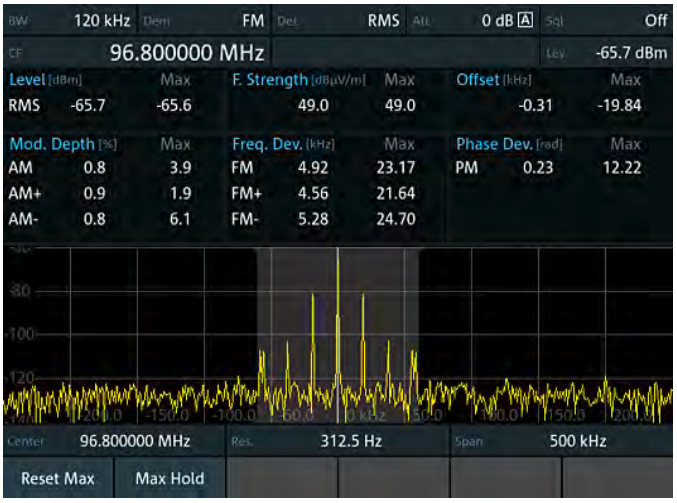
Analog modulation measurements

The R&S®CS-MM modulation measurement option enables simultaneous measurements of the modulation parameters for AM, FM and PM modulated signals in line with the ITU Handbook on Spectrum Monitoring, Edition 2011. The modulation depth, frequency deviation and phase deviation can be determined concurrently. Digitally modulated signals can be analyzed, classified and demodulated with the PC-based R&S®CA100 signal analysis software [1], which also enables manual parameter measurements in line with ITU-R SM.1600 once upgraded with the R&S®CA100IS option.

[1] See "R&S®CA100 Signal Analysis and Signal Processing Software" (PD 3606.9340.12).

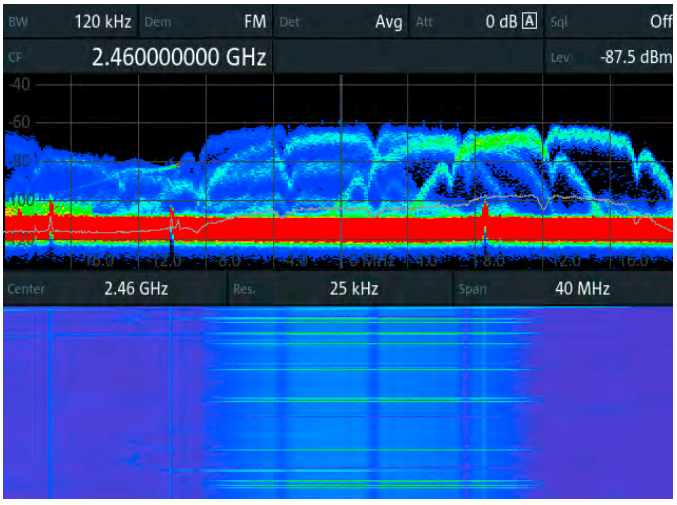
Polychrome spectrum to distinguish superimposed signals

The R&S®CS-PC polychrome spectrum option makes it possible to separate superimposed, pulsed signals that cannot be differentiated with conventional methods such as spectrum, waterfall and the max. hold detector. To detect such pulsed interferers in a complex signal scenario, the frequency of the signal level occurrence is color-coded in the spectrum. The waterfall display can track changes in signal variation over time adding another dimension to characterize the signal.



ITU-compliant measurements of AM depth, FM deviation and PM deviation in a single view.

The results of up to three level detectors along with their field strength measurements can be displayed simultaneously.



Polychrome spectrum uses color coding to indicate the relative level occupancy over time.

ADVANCED TIME DOMAIN ANALYSIS

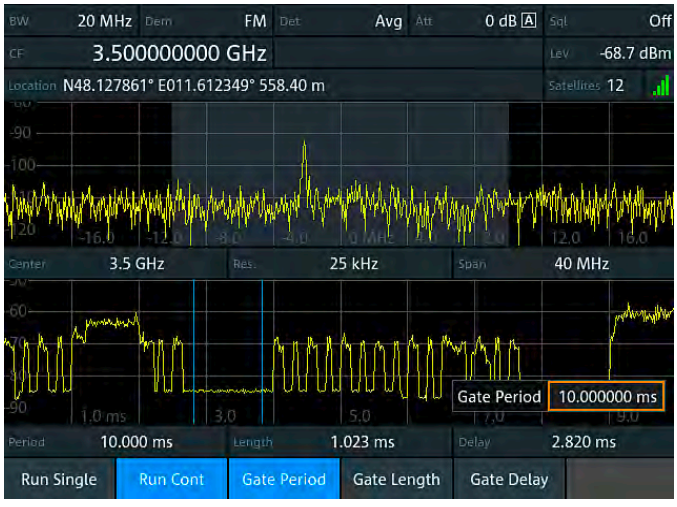
Measurements in the frequency and time domain

The R&S®CS-ZS time domain measurement option provides simultaneous signal representation in the frequency and time domain with up to 40 MHz real-time bandwidth. Thanks to various trigger and measurement functions, the time-dependent behavior of pulsed or burst signals can be evaluated while accounting for the spectrum. This is especially useful when analyzing the transmission modes or time slot occupancy in time division duplex (TDD) networks such as 5G-TDD and LTE-TDD or time division multiple access (TDMA) networks such as TETRA, GSM or DECT. The R&S®PR200 is well equipped for a large variety of performance and compliance measurements used in 5G mobile site testing such as bandwidth, occurrence, timing, and level measurements of SSB (SS/PBCH signal) blocks in 5G networks.

Time gated spectrum measurements

The R&S®PR200 gated spectrum application leverages the simultaneous frequency and time domain representation and enables real-time spectrum measurements within a freely selectable gate in the time domain. Matched to less occupied time slots such as the uplink slot, hard-to-detect stationary or dynamic interference signals can be uncovered and investigated. Subsequent manual homing direction finding can locate the interference source. The gated spectrum application is ideal for effective interference hunting in TDD and TDMA networks.

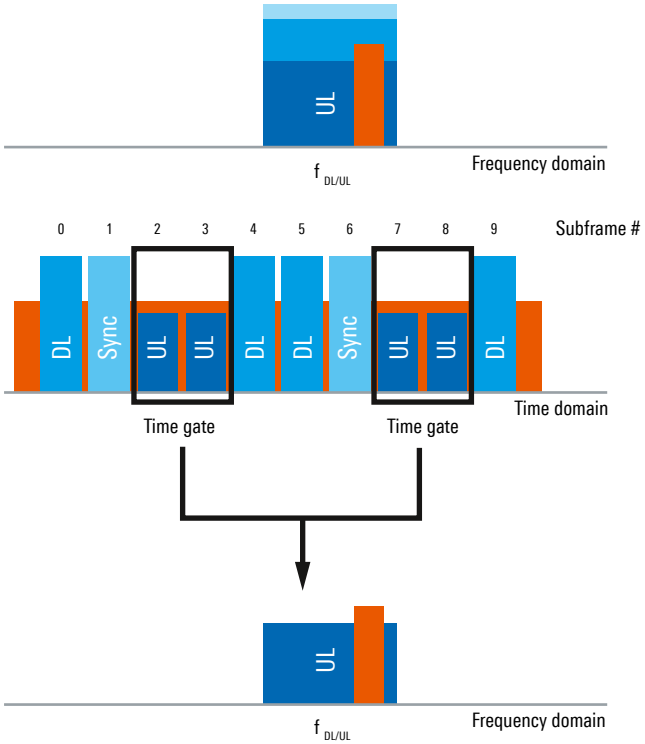
Simultaneous display of the frequency domain (top) and the time domain (bottom)



The real-time spectrum is computed from the adjustable time gate.

Interference hunting in TDD networks

With time gated spectrum measurements, the interference signal shown in red can be isolated in the spectrum by matching the time gate to the uplink time slot.



RECORDING AND DOCUMENTATION

History mode and history buffer export

If a signal is missed during observation, users can activate the history mode with the play & pause button to review the signal in the spectrum. The R&S®PR200 history memory buffer can store minutes of recordings and has a time resolution of up to 100 µs per line in the waterfall display. The history buffer can be exported to the internal memory, a USB stick or an SD card.

Trace and audio recording and replay

The R&S®CS-IR trace recording and replay option allows users to record monitoring traces with demodulated audio and geolocation, which can be replayed on the device or via the PC-based R&S®PR200 GUI. Recorded information is saved internally or onto a USB stick or SD card. Recording and replay is particularly useful for continuous measurements in unattended or mobile monitoring missions or simply for documentation. Recordings made during mobile operations can be replayed on a map with the R&S®CS-MAP mapping option.

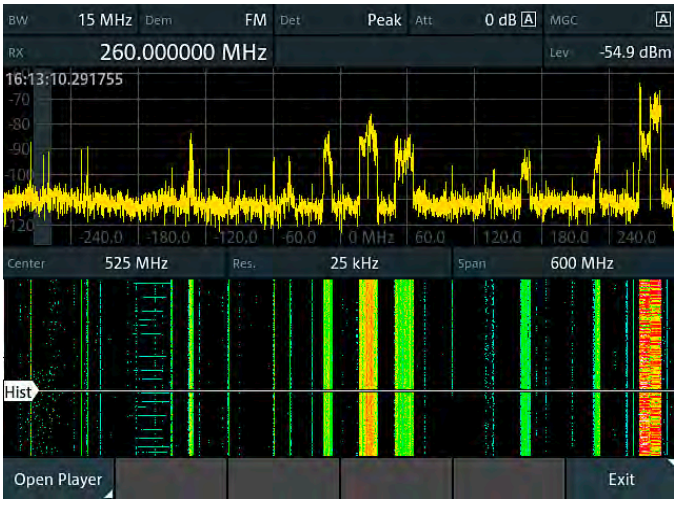
High-precision timestamps for synchronization

Equipped with the R&S®CS-TSA time stamp accuracy option, the R&S®PR200 built-in GNSS module provides extremely precise timestamps for measured I/Q data with an RMS error of less than 50 ns. The R&S®PR200 can also be operated as a sensor in a network of multiple receivers for accurate TDOA radiolocation. The R&S®CS-TSA option supports third-party navigation equipment such as gyro compasses or external GPS receivers (NMEA 0183) via the Aux 2 port.

Coverage measurements with digital maps

In addition to map display and triangulation, the R&S®CS-MAP mapping option enables easy level mapping, which is ideal for typical geotagging applications such as coverage measurements, interference hunting and transmitter range testing. While on the move, both the received signal strength and the receiver's GNSS position are collected and saved. Measurements are either triggered manually as "save an event" or automatically over distance or time. The results are overlaid on the map as a color-coded track, where different colors represent different signal strength levels. During level mapping, the spectral overview is maintained with the integrated spectrum view.

Replay and LAN remote control using the R&S®PR200 GUI running on a Windows laptop or tablet



A missed signal event during the panorama scan is revisted using the history mode.

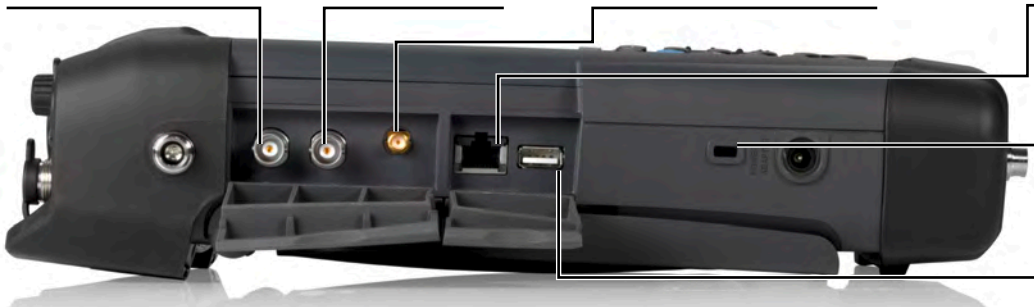
Coverage measurements via level mapping with integrated spectrum view

R&S®PR200 OPERATING ELEMENTS

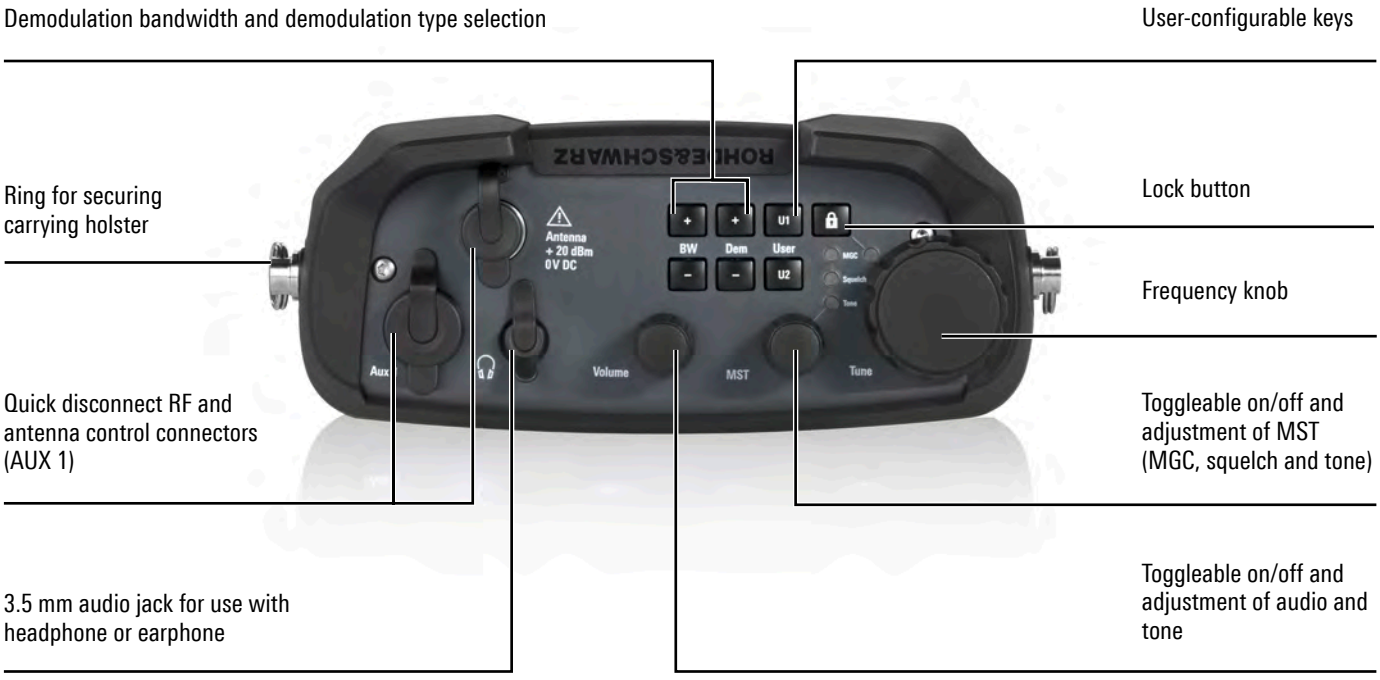
FRONT PANEL

SIDE PANELS

Left side

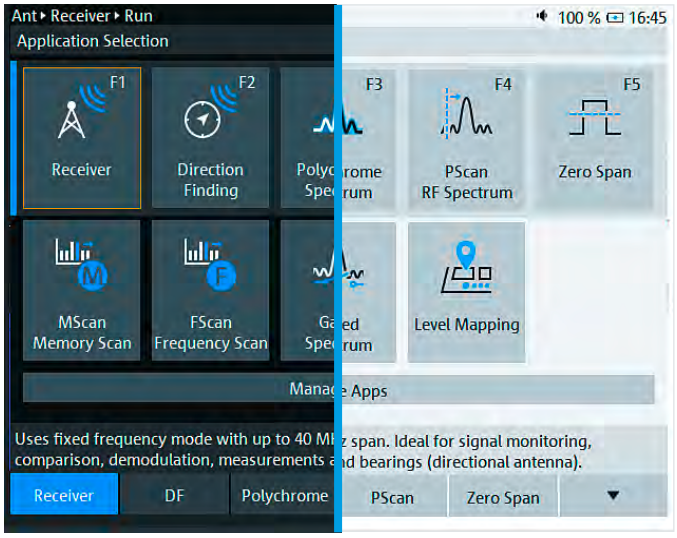


TOP PANEL



Right side

DESIGNED FOR USE IN THE FIELD



Application cockpit for convenient, easy and fast navigation between various functions (right: high color contrast).

- Fast boot time
- Intuitive, application-oriented operation
- Enhanced color schemes for operation in bright and low ambient light conditions
- High frequency accuracy, accurate positioning and time stamps with built-in GNSS
- Weighs approx. 3.5 kg including battery
- Typically up to 3.5 h on a single battery charge; compartment for easy battery replacement
- Portrait orientation for easy receiver holding and operation
- Dialog boxes with guidance for compass calibration
- Built-in self-test for troubleshooting and maintenance
- Tested in line with MIL-PRF-28800F environmental standard; suitable for outdoor and rugged use
- Quick disconnect and use with handheld antennas and compact DF antennas
- Wide range of setup and transport accessories, e.g. for homing (on foot), tripod (stationary) and mobile (on the move) applications

Quick disconnect and use with antennas.

The R&S®PR200 has a fold-out support for desk top use and also the R&S®HA-Z222 carrying with sun shade.

Automatic direction finding with compact DF antenna on a magnet mount (requires R&S®CS-DF option)

OPERATOR TRAINING COURSES

Our R&S®PR200 operator training courses range from eTraining courses and virtual classroom courses to classroom courses that include theory and practical exercises. They cover the most important topics to effectively help users with their operational tasks.

In these courses, participants learn how to configure the R&S®PR200 and use its scanning and spectrum measurement functions to detect signals of interest. They become familiar with the real-time capabilities and related functions to characterize the signal parameters. Optionally, they will use the R&S®HE400 handheld directional antenna to localize interference sources with homing and triangulation. Where automatic direction finding is important, participants will learn how to configure and set up the R&S®PR200 with our R&S®ADDx07 compact DF antennas. Finally, they can operate the R&S®PR200 with the R&S®MobileLocator software for the automatic localization of interferers from a moving vehicle.

Courses are mostly instructor-led with an interactive approach. The instructor uses a mixture of question and answer sessions, continuous assessment and a final exam to ensure an effective knowledge transfer. All training participants receive a certificate after the completion of each course. In eTraining courses, participants can conveniently follow the guided exercises with their own R&S®PR200 device. In virtual classroom courses, modules are available in several web sessions with a trainer who demonstrates how to operate the R&S®PR200. The participants can ask questions at any time. In the classroom-based training courses, extensive hands-on exercises improve familiarity with the R&S®PR200.

To benefit from these courses, participants should have a certain level of basic receiver and direction-finding knowledge. However, we also offer receiver and direction-finding basics as eTraining courses to refresh or to fill in any gaps. Please contact the local sales office for more information.

R&S®PR200 Web-based operator trainings			
Course title	**Target audience**	**Objective**	**Duration**
Module 1: Receiver operations	Operators of the R&S®PR200	Participants configure and operate the R&S®PR200 as a receiver.	4 eTrainings; with approx. 1 hour duration per eTraining
Module 2: Operations with R&S®HE400	Operators of the R&S®PR200 with R&S®HE400	Participants configure and operate the R&S®PR200 with the R&S®HE400 to localize a signal source.	1 hour
Module 3: Direction finder operations	Operators of the R&S®PR200 with R&S®ADDx07 compact DF antennas	Participants configure and operate the R&S®PR200 with R&S®ADDx07 to perform automatic direction finding.	1 hour
Module 4: Operations with R&S®MobileLocator	Operators of the R&S®PR200 with R&S®MobileLocator	Participants set up, configure and operate R&S®MobileLocator in a vehicle to localize a signal source.	1 hour
R&S®PR200 Classroom operator trainings			
Course title	**Target audience**	**Objective**	**Duration**
Receiver operations and operations with R&S®HE400	Operators of the R&S®PR200 with R&S®HE400	Participants configure and operate the R&S®PR200 with the R&S®HE400 to localize a signal source.	1 day
Receiver operations, operations with R&S®HE400, direction finder and R&S®MobileLocator	Operators of the R&S®PR200 with R&S®HE400, R&S®ADDx07 compact DF antennas and R&S®MobileLocator	Participants configure and operate the R&S®PR200 with R&S®HE400, R&S®ADDx07 and R&S®MobileLocator. They can install the system in a vehicle and localize a signal source.	2 days

ORDERING INFORMATION

Designation	Type	Order No.
Base unit (including accessories supplied such as power cable, manual)		
Portable monitoring receiver	R&S®PR200	4500.5002.02
Software options		
Panorama scan	R&S®CS-PS	4500.7070.02
Polychrome spectrum	R&S®CS-PC	4500.7040.02
Field strength measurement	R&S®CS-FS	4500.7211.02
Modulation measurement	R&S®CS-MM	4500.7340.02
Time domain measurement	R&S®CS-ZS	4500.7111.02
Direction finding upgrade	R&S®CS-DF	4500.7370.02
Trace recording and replay	R&S®CS-IR	4500.7240.02
Timestamp accuracy and external GNSS	R&S®CS-TSA	4500.7170.02
Mapping and geotagging application	R&S®CS-MAP	4500.7140.02
External accessories (PC software, add-ons, peripherals, etc.)		
Documentation of calibration values	R&S®CS-DCV	4500.7011.02
Accessories for power supply and transportation of R&S®PR200		
Car adapter, connector for cigarette lighter	R&S®HA-Z302	1321.1340.02
Battery charger, for R&S®HA-Z306 lithium-ion 6.4 Ah battery pack	R&S®HA-Z303	1321.1328.02
Lithium-ion 6.4 Ah battery pack	R&S®HA-Z306	1321.1334.02
Carrying holster including chest harness and rain cover	R&S®HA-Z222	1309.6198.00
Sun roof and carrying handle, accessory for R&S®HA-Z222	R&S®PR100-AP1	3589.9458.00
Suitcase kit, for R&S®PR200 hard-shell transit case with headphones, telescopic antenna and storage space for R&S®PR200 and mains adapter	R&S®PR100SC	4071.9258.02
Handheld directional antennas		
For detailed information on handheld directional antennas and accessories, see Handheld directional antennas, PD 3606.9140.12		
Compact DF antennas		
For detailed information on compact DF antennas and accessories, see R&S ADDx advanced single-channel DF antenna, PD 3606.8295.12		

Operator training courses		
Designation	**Type**	**Order No.**
Web-based operator training module 1: receiver operations	R&S®WT-PR200-1	3665.6866.02
Web-based operator training module 2: operations with R&S®HE400	R&S®WT-PR200-2	3665.6743.02
Web-based operator training module 3: direction finder operations	R&S®WT-PR200-3	3665.6737.02
Web-based operator training module 4: operations with R&S®MobileLocator	R&S®WT-PR200-4	3665.6720.02
Classroom operator training: receiver operations and operations with R&S®HE400 (1 day)	R&S®CT-PR200ST	3665.6714.02
Classroom operator training: receiver operations, operations with R&S®HE400, direction finder and R&S®MobileLocator (2 days)	R&S®CT-PR200EX	3665.6708.02

Service options	
Extended warranty, one/two/three/four year	Please contact your local sales office.
Extended warranty with calibration coverage, one/two/three/four year	
Extended warranty with accredited calibration coverage, one/two/three/four year	