

SYNCHRONIZED MULTICHANNEL HIGH-RESOLUTION POWER METER AND SWITCHING MODULES

Specifications

R&S®OSP-B157W8 PLUS

R&S®OSP-B157WX



Data Sheet
Version 02.00

ROHDE & SCHWARZ

Make ideas real



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Definitions

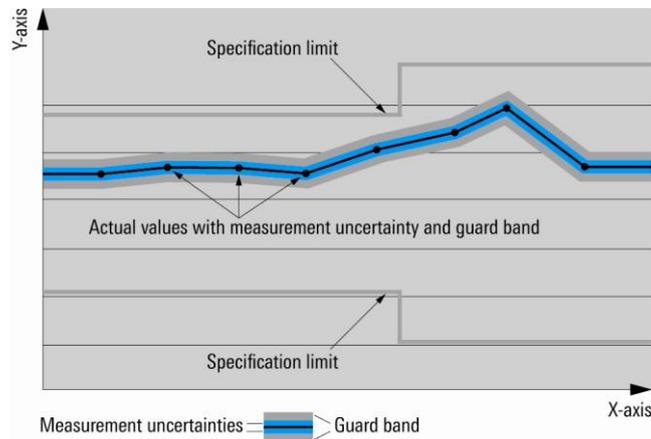
General

Product data applies under the following conditions:

- Three hours storage at ambient temperature followed by 30 minutes warm-up operation
- Specified environmental conditions met
- Recommended calibration interval adhered to
- All internal automatic adjustments performed, if applicable

Specifications with limits

Represent warranted product performance by means of a range of values for the specified parameter. These specifications are marked with limiting symbols such as $<$, \leq , $>$, \geq , \pm , or descriptions such as maximum, limit of, minimum. Compliance is ensured by testing or is derived from the design. Test limits are narrowed by guard bands to take into account measurement uncertainties, drift and aging, if applicable.



Specifications without limits

Represent warranted product performance for the specified parameter. These specifications are not specially marked and represent values with no or negligible deviations from the given value (e.g. dimensions or resolution of a setting parameter). Compliance is ensured by design.

Typical data (typ.)

Characterizes product performance by means of representative information for the given parameter. When marked with $<$, $>$ or as a range, it represents the performance met by approximately 80 % of the instruments at production time. Otherwise, it represents the mean value.

Nominal values (nom.)

Characterize product performance by means of a representative value for the given parameter (e.g. nominal impedance). In contrast to typical data, a statistical evaluation does not take place and the parameter is not tested during production.

Measured values (meas.)

Characterize expected product performance by means of measurement results gained from individual samples.

Uncertainties

Represent limits of measurement uncertainty for a given measurand. Uncertainty is defined with a coverage factor of 2 and has been calculated in line with the rules of the Guide to the Expression of Uncertainty in Measurement (GUM), taking into account environmental conditions, aging, wear and tear.

Device settings and GUI parameters are indicated as follows: "parameter: value".

Typical data as well as nominal and measured values are not warranted by Rohde & Schwarz.

Introduction

This data sheet refers to the combination of the R&S®OSP150 with the R&S®OSP-B157W8 PLUS module and its frequency extension R&S®OSP220 with the R&S®OSP-B157WX.

The R&S®OSP is a modular switch and control platform that enables you to perform RF switch and control tasks quickly. The flexibility of the R&S®OSP permits a broad scope of applications ranging from simple RF switch functions to RF wiring of complex systems such as EMC or regulatory test systems. For information on the R&S®OSP open switch and control platform and additional modules, please refer to the R&S®OSP data sheet (PD 5216.1340.22).

The R&S®OSP-B157W8, R&S®OSP-B157W8 PLUS and R&S®OSP-B157WX are standard modules for the R&S®OSP open switch and control platform and are intended for use with the R&S®WMS32 software. For information on the R&S®WMS32 wireless measurement system software, please refer to the R&S®WMS32 data sheet (PD 3607.4870.22).

The R&S®OSP-B157WX serves as a frequency extension for the R&S®OSP-B157W8 PLUS base module. While the extension forwards lower frequency signals to the base module, it can bypass higher frequency signals to an appropriate measurement channel.

Both modules are typically used in the R&S®TS8997 automatic test system, which performs regulatory conformance tests of wireless short-range devices (SRD). Regarding R&S®OSP-B157W8 the test cases focus on the 2.4 GHz and 5 GHz frequency bands for Wi-Fi and for industrial, scientific and medical (ISM) applications. These tests are performed in line with selected FCC and ETSI standards. R&S®OSP-B157W8 PLUS addresses tests in frequency bands between 800 MHz and 7.5 GHz, however the upper band covers the frequency range from 6425 MHz to 7125 MHz between the incumbent services and MFCN (mobile/fixed communications network) services.

Designation of “module” versus “switch unit”

This data sheet uses the following nomenclature:

- The R&S®OSP-B157W8 PLUS hardware option is referred to as “basic module”.
- The R&S®OSP-B157WX hardware option is referred to as “extension module”.
- The R&S®OSP open switch and control platform is referred to as “switch unit”.

R&S®OSP150 with R&S®OSP-B157W8 PLUS

The R&S®OSP-B157W8 or R&S®OSP-B157W8 PLUS module is integrated in an R&S®OSP150 switch unit.



R&S®OSP150 with R&S®OSP-B157W8 PLUS (front view)

Key features of the R&S®OSP-B157W8 PLUS base module

The R&S®OSP-B157W8 PLUS 7.5 GHz module with up to eight channels is based on a printed RF switch board in solid-state relay (SSR) architecture. It allows flexible operation of the connected DUT (up to eight ports) and measuring instruments.

The module features the following:

- Signal conditioning via the integrated attenuators, couplers and combiners (without the need of additional amplifiers or filters in case of performing conducted measurements)
- RF switching for wireless test cases from 800 MHz to 7.5 GHz
- High dynamic range of step attenuator
- RF switching for spurious emission measurements up to 18 GHz (in combination with the R&S®OSP-B157WX up to 40 GHz)
- Power measurements in the 2.4 GHz and 5 GHz bands with specific evaluations in line with ETSI and FCC standards mentioned in that document
- Built-in digital control of the signal paths including A/D conversion of the power measurements
- Multiple trigger input and output options
- External clock input
- Analyzer video signal input
- LAN interface for remote control of the module using the R&S®WMS32 wireless measurement system software

Each of the eight configurable channels has the following integrated semiconductor components:

- An individually programmable attenuator
- An A/D converter for the power measurement results
- A power detector for synchronous RMS power measurement with high sampling rate and burst detection
- Solid-state switches, which enable the following:
 - Switching the (vector) signal generator output to the calibration port or to the DUT ports
 - Switching the measurement paths from DUT ports to a spectrum analyzer/test receiver or to the power measurement

These channels are conditioned via the integrated couplers, directional couplers, attenuators and combiners and distribute the signal from a companion device.

R&S®OSP220 with R&S®OSP-B157WX

The R&S®OSP-B157WX module is integrated in an R&S®OSP220 switch unit.



R&S®OSP220 with R&S®OSP-B157WX (front view)

Key features of the R&S®OSP-B157WX frequency extension module

The R&S®OSP-B157WX 40 GHz module is specially designed to extend the frequency range of the R&S®OSP-B157W8 PLUS to provide automatic spurious measurements up to 40 GHz.

It uses coaxial RF architecture and features the following:

- Electromechanical RF relay switches for flexible operation of up to eight DUT channels
- The module can forward incoming signals on each DUT channel to the connected DUT input of the R&S®OSP-B157W8 PLUS. This forwarding is used for measurements at frequencies up to 6 GHz, which the R&S®OSP-B157W8 can handle
- Alternatively, incoming signals on a single DUT channel can be switched to the module's RX port and on to a connected signal analyzer, receiver or other measuring instrument. This switching state is typically used for measurements at frequencies above 6 GHz and up to 40 GHz, which the R&S®OSP-B157W8 cannot handle (signals for spurious emission measurements up to 18 GHz are also switched to the instrument connected to the extension module's RX port)

General data of the R&S®OSP platform

| | | R&S®OSP220 | R&S®OSP150 | |
|---------------------------------|--|---|------------|---|
| Interfaces (front panel) | | | | |
| USB | for keyboard, mouse or USB stick | 2 | – | 2 × USB 2.0, type A connector (f) |
| HDMI™ | for external monitor, resolution 800 × 480 pixel | 1 | – | HDMI™, type A female connector |
| External trigger | input and output | 2 | – | BNC |
| Status display | display of TCP/IP address | 1 | – | black/white |
| Interfaces (rear panel) | | | | |
| LAN | remote control via LAN | 1 | 1 | Ethernet RJ-45 connector (f), 10/100 Mbit/s |
| USB | | 1 | – | USB 3.0, type A female connector |
| Protected memory slot | operating system | 1 | – | microSD card slot |
| Environmental conditions | | | | |
| Temperature ¹ | operating temperature range | 0 °C to +50 °C | | |
| | storage temperature range | –25 °C to +70 °C | | |
| Damp heat | | +40 °C, 90 % rel. humidity, constant, in line with EN 60068-2-30 | | |
| Mechanical resistance | | | | |
| Vibration | sinusoidal | 5 Hz to 55 Hz, 0.3 mm amplitude const., 55 Hz to 150 Hz, 0.5 g const., in line with EN 60068-2-6 | | |
| | random | 10 Hz to 300 Hz, acceleration 1.2 g (RMS) in line with EN 60068-2-64 | | |
| Shock | | 40 g shock spectrum, in line with EN 60068-2-27, MIL-STD-810E, method no. 516.4, procedure I | | |
| Power supply | | | | |
| Rated voltage | | 100 V to 240 V AC (± 10 %) | | |
| Rated frequency | | 50 Hz to 60 Hz (± 10 %) | | |
| Rated power | without modules | < 25 W | | |
| Max. input power | | 1.5 A to 3.6 A (max. 310 VA) | | |
| Dimensions (W × H × D) | R&S®OSP150 | 465.3 mm × 108.7 mm × 494.8 mm (18.32 in × 4.27 in × 19.5 in) for rack mounting (without modules) 19" 1/1, 2 RU, depth 450 mm (17.7 in) | | |
| | R&S®OSP220 | 444.7 mm × 107.6 mm × 471.9 mm (17.51 in × 4.24 in × 18.58 in) for rack mounting (without modules) 1/1 19", 2 RU, depth 425 mm (16.73 in) | | |
| Weight | R&S®OSP150 (without module) | approx. 4.5 kg (9.92 lb) | | |
| | R&S®OSP220 (without module) | approx. 6.85 kg (15.1 lb) | | |
| Product conformity | | | | |
| Electromagnetic compatibility | EU: EMC Directive 2014/30/EC | in line with EN 61326-1 (industrial environment), EN 61326-2-1, EN 55011 (class B) | | |
| Electrical safety | EU: Low Voltage Directive 2014/35/EC | in line with EN 61010-1, VDE certificate no.: 40022952 | | |
| | USA/Canada | CAN 22.2 No. 61010-1-04, UL 61010-1, cCSA _{UL} certificate no.: 1960595 | | |
| RoHS | RoHS Directive 2011/65/EC | in line with EN 50581 | | |

¹ Temperature ranges apply to all base units and R&S®OSP modules (unless a different range is specified for the respective module).

Module slots

| | | | |
|------------------------|------------|----------------------|-------------------------|
| Number of module slots | R&S®OSP220 | | 1 × R&S®OSP-B157WX |
| | R&S®OSP150 | | 1 × R&S®OSP-B157W8 PLUS |
| Output current | R&S®OSP150 | each control bus | max. 800 mA (28 V DC) |
| | | to all control buses | max. 2 A (28 V DC) |
| | R&S®OSP220 | each control bus | max. 800 mA (27 V DC) |
| | | to all control buses | max. 10 A (28 V DC) |

Dimensions (W × H × D) of R&S®OSP150

| | | |
|----------------------------------|---------------------------------|--|
| Module slot 1 | module slot without front panel | 95.6 mm × 52.6 mm × max. 70 mm (3.76 in × 2.07 in × max. 2.76 in) |
| Module slots 2, 3, 1F, 2F | module slot without front panel | 95.6 mm × 52.6 mm × max. 370 mm (3.76 in × 2.07 in × max. 14.57 in) |
| Double-width module slot 2 and 3 | module slot without front panel | 204.2 mm × 52.6 mm × max. 370 mm (8.04 in × 2.07 in × max. 14.57 in) |
| Triple-width module slot 1 to 3 | module slot without front panel | 312.8 mm × 52.6 mm × 70 mm, depth: in parts 370 mm (12.31 in × 2.07 in × 2.76 in, depth: in parts 14.57 in) |

Dimensions (W × H × D) of R&S®OSP220

| | | |
|----------------------------------|--|--|
| Standard rear module slot | RS01 | 95.6 mm × 52.6 mm × max. 70 mm (3.76 in × 2.07 in × max. 2.76 in) |
| Standard front module slot | FS03 (not for R&S®OSP230) | 95.6 mm × 52.6 mm × max. 70 mm (3.76 in × 2.07 in × max. 2.76 in) |
| Standard slots with higher depth | RS02, RS03, FS01, FS02 | 95.6 mm × 52.6 mm × max. 340 mm (3.76 in × 2.07 in × max. 13.38 in) |
| Double-width module slot | RS02 to RS03 and FS01 to FS02 | 204.2 mm × 52.6 mm × max. 340 mm (8.04 in × 2.07 in × max. 13.38 in) |
| Triple-width module slot | RS01 to RS03; FS01 to FS03 (not for R&S®OSP230) | 312.8 mm × 52.6 mm × 70 mm, (12.31 in × 2.07 in × 2.76 in, depth: in parts 340 mm (13.38 in) (FS01 + FS02, RS02 + RS03) |

Calibration interval

The R&S®OSP-B157W8 PLUS and R&S®OSP-B157WX modules are delivered optionally with a factory calibration in line with the standards of the German Calibration Service (DAkkS, formerly DKD). The calibration data is saved in the modules.

For a later recalibration, including the power detectors in the R&S®OSP-B157W8 PLUS, we recommend to send your switch unit (including the module) to your nearest Rohde & Schwarz service center.

| | | |
|---|--|--|
| Open switch and control platform | R&S®OSP | no calibration necessary |
| Synchronized multichannel high-resolution power meter and switching modules | R&S®OSP-B157W8 PLUS and R&S®OSP-B157WX | every 2 years unless otherwise specified |

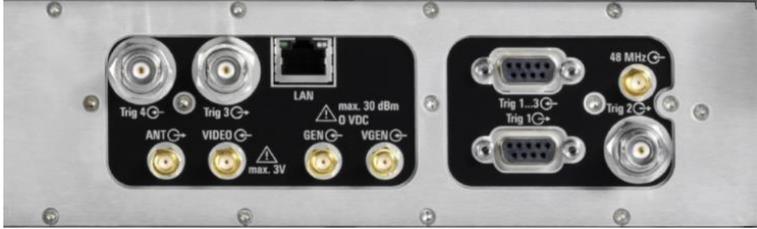
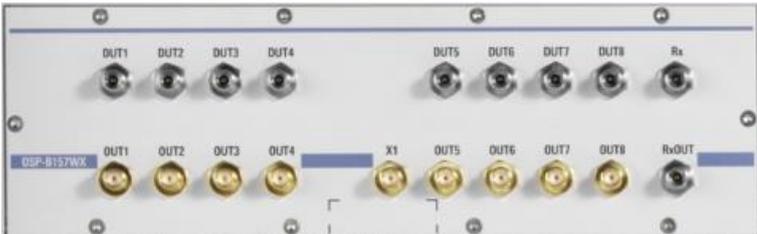


Rear view of the R&S®OSP-B157W8 PLUS basic module integrated in the R&S®OSP150



Rear view of the R&S®OSP-B157WX extension module integrated in the R&S®OSP220

Overview of special R&S®OSP modules for the R&S®TS8997

| Type (R&S®) | Module designation | View of module width |
|------------------------|---|--|
| <p>OSP-B157W8 PLUS</p> | <p>R&S®OSP module with integrated RF power meter, solid-state RF switch and signal conditioning</p> | <p>double-width module</p>   |
| <p>OSP-B157WX</p> | <p>R&S®OSP module with RF switch matrix and signal conditioning up to 40 GHz</p> | <p>double-width module</p>  |

Module specifications

R&S®OSP-B157W8 PLUS basic module with integrated power meter for the R&S®TS8997

| | | |
|--|---|---|
| RMS power meter, high sampling rate, deep memory | SMA female with port saver | 8 ports, 7.5 GHz (18 GHz) |
| Generators and analyzer port | SMA female | 3 ports, 7.5 GHz (18 GHz) |
| Companion port and X1 | SMA female | 7.5 GHz |
| LAN | RJ-45 | remote control port |
| Clock | SMA (f) | external 48 MHz clock input |
| Trigger | 2 × 9-pin D-Sub, 3 × BNC connector (f) | trigger in and out |
| Video | SMA (f) | video in |
| Dimensions (W × H × D) | standard width | 210.5 mm × 65.5 mm × 410.1 mm (8.29 in × 2.58 in × 16.15 in) |
| Slot position | | 1, 2 and 3 |
| Weight | | approx. 4 kg (8.82 lb) |

| RF signal conditioning | | |
|---|--|--|
| Frequency range | overall system | 30 MHz to 40 GHz ² |
| Frequency range of R&S®OSP-B157W8 PLUS | RF paths spurious | 30 MHz to 18 GHz |
| | RF paths inband | 800 MHz to 7.5 GHz |
| | power measurement | 800 MHz to 7.5 GHz, calibrated for complete frequency range |
| Number of DUT antenna ports | | 8 |
| Maximum input power of R&S®OSP-B157W8 | | 30 dBm |
| Insertion loss | module has a complex path switching schematic with more than 70 signal paths; the signal paths are designed to cover all requirements of the supported ETSI and FCC standards in 2.4 GHz and 5 GHz bands | |
| Dynamic range of step attenuator for DUT4 to COMP | up to 3 GHz | 50 dB |
| | up to 6 GHz | 40 dB |
| | up to 7.5 GHz | 30 dB |
| Power measurement | | |
| Absolute measurement uncertainty | for CW signal at +23 °C, 0 dBm input, 0 dB attenuation | ± 0.5 dB for 2.4 GHz and 5 GHz ISM bands |
| VSWR | inband | < 1.8 |
| | outband | < 3 |
| Frequency response accuracy | at +23 °C | < 0.3 dB |
| Measurement error due to modulation | | < 0.3 dB |
| Measurement error due to linearity | | 0.1 dB + 0.005 dB/dB |
| Resolution | | 0.01 dB |
| Measurement error due to temperature | | 0.025 dB/°K |
| Sampling rate per channel | | max. 10 Msample/s |
| Synchronization error port to port | | < 100ns |
| Noise floor | 2.4 GHz | < -48 dBm |
| | 5 GHz | < -38 dBm |
| Max. measurement duration | | 100 s at 1 Msample/s |
| Signal bandwidth | | > 300 MHz |
| Operating temperature range | overall system and R&S®OSP-B157W8 PLUS | +5 °C to +40 °C |

² In combination with R&S®OSP-B157WX.

R&S®OSP-B157WX frequency extension module for the R&S®TS8997

| | | |
|------------------------------|--|---|
| Number and type of relays | | 8 x SPDT, 2 x SP6T |
| Relay type | | coaxial relay, 2.92 mm, K (f) |
| Frequency range | | DC to 40 GHz |
| Relay impedance | | 50 Ω |
| Termination impedance | | 50 Ω (ext.) |
| Switching time | | 10 ms (nom.) |
| Current consumption (module) | | max. 675 mA (+28 V DC) |
| Dimensions (W x H x D) | | 107.6 mm x 65.5 mm x 88.0 mm (4.24 in x 2.58 in x 3.46 in) |
| Slot position | | 1, 2 front |
| Weight | | approx. 1 kg (2.20 lb) |

RF characteristics

| Type | Parameter | DC to 6 GHz | 6 GHz to 12.4 GHz | 12.4 GHz to 18 GHz | 18 GHz to 26.5 GHz | 26.5 GHz to 40 GHz |
|---------------------------------------|-------------------------------|----------------|----------------------|-----------------------|-----------------------|-----------------------|
| SPDT, ext. terminated, failsafe | VSWR | ≤ 1.30 | ≤ 1.40 | ≤ 1.50 | ≤ 1.90 | ≤ 2.3 |
| | insertion loss | < 1 dB | < 4 dB | < 5 dB | < 6 dB | < 9 dB |
| | isolation | ≥ 70 dB | ≥ 60 dB | ≥ 60 dB | ≥ 55 dB | ≥ 50 dB |
| | average power | 40 W | 30 W | 25 W | 10 W | 5 W |
| | number of switching cycles | 1 million | | | | |

Ordering information

| Designation | Type | Order No. |
|---|---------------------|--------------|
| Basic module | | |
| Open switch and control platform | R&S®OSP150 | 1505.3009.15 |
| Synchronized multichannel high-resolution power meter and switching module, 8-port R&S®OSP150 module with integrated RF power meter, solid-state RF switch and signal conditioning up to 7.5 GHz/18 GHz, for EMC and RF spectrum matters (ERM) measurements for R&S®TS8997 test system, incl. R&S®WMS32-WB software option | R&S®OSP-B157W8 PLUS | 1527.1144.05 |
| Accredited calibration for R&S®OSP150 with R&S®OSP-B157W8 PLUS in line with ISO 17025 and ISO 9001 certified, traceability to national and international standards | R&S®ACAOSP-B15 | 3598.1079.03 |
| Scope of delivery: power cord, getting started guide, operating manual, 50 Ω SMA type termination, SMA plug jack adapter | | |
| Extension module | | |
| Open switch and control platform | R&S®OSP220 | 1528.3105.02 |
| Frequency extension module 8-port R&S®OSP120 RF switch matrix and signal conditioning module up to 40 GHz for EMC and RF spectrum matters (ERM) measurements used in R&S®TS8997 test system | R&S®OSP-B157WX | 1531.4909.02 |
| Accredited calibration for R&S®OSP220 with R&S®OSP-B157WX in line with ISO 17025 and ISO 9001 certified, traceability to national and international standards | R&S®ACAOSP220 | 3598.2746.03 |
| Scope of delivery: power cord, getting started guide, operating manual, connection cables, USB 3.0 flash drive with calibration data | | |

| Service options | | |
|--|-----------|---|
| Extended warranty, one year | R&S®WE1 | Please contact your local Rohde & Schwarz sales office. |
| Extended warranty, two years | R&S®WE2 | |
| Extended warranty, three years | R&S®WE3 | |
| Extended warranty, four years | R&S®WE4 | |
| Extended warranty with calibration coverage, two years | R&S®CW2 | |
| Extended warranty with calibration coverage, three years | R&S®CW3 | |
| Extended warranty with calibration coverage, four years | R&S®CW4 | |
| Documentation of calibration values | R&S®DCV-1 | 0240.2187.14 |

Extended warranty with a term of one to four years (WE1 to WE4)

Repairs carried out during the contract term are free of charge³. Necessary calibration and adjustments carried out during repairs are also covered. Simply contact the forwarding agent we name; your product will be picked up free of charge and returned to you in top condition a couple of days later.

Extended warranty with calibration (CW1 to CW4)

Enhance your extended warranty by adding calibration coverage at a package price. This package ensures that your Rohde & Schwarz product is regularly calibrated, inspected and maintained during the term of the contract. It includes all repairs³ and calibration at the recommended intervals as well as any calibration carried out during repairs or option upgrades.

For the R&S®TS8997 regulatory test system for wireless devices product brochure, see PD 3606.8095.12.

For the R&S®WMS32 wireless measurement system software data sheet, see PD 3607.4870.22.

For the R&S®TS8997 service level agreement for R&S®TS8997, see PD 3607.3351.32.

For the R&S®OSP open switch and control platform data sheets, see PD 5213.9928.22 and PD 5216.1340.22.

Certificates



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³ Excluding defects caused by incorrect operation or handling and force majeure. Wear-and-tear parts are not included.

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