

R&S®OSP-B157W8PLUS R&S®OSP-B157WX/WN 8-Port Switch Modules Getting Started



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Version 04

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This document describes the following optional modules for the R&S®OSP switch unit family:

- R&S®OSP-B157W8 (order number 1527.1144.02)
- R&S®OSP-B157W8PLUS (order number 1527.1144.05)
- R&S®OSP-B157WX (order number 1531.4909.02)
- R&S®OSP-B157WN (order number 1531.5311.02)

Software:

- R&S®RF Test Suite (R&S®EMC32 / R&S®AMS32 / R&S®WMS32), V 11.50 and later
- R&S®OSP220 Firmware V 2.40 and later

The software contained in this product uses several valuable open source software packages. For information, see the "Open Source Acknowledgment" document, which is available for download from the R&S OSP product page at www.rohde-schwarz.com/manual/osp > www.rohde-schwarz.com/firmware/osp & www.rohde-schwarz.com/software/osp.

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

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Throughout this manual, products from Rohde & Schwarz are indicated without the ® symbol, e.g. R&S®OSP is indicated as R&S OSP.

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1 Safety and regulatory information

The product documentation helps you use the product safely and efficiently. Follow the instructions provided here and in the following chapters.

Intended use

The R&S OSP is designated for switching and control applications, including RF switching, in industrial, administrative, and laboratory environments.

The R&S OSP-B157W8, R&S OSP-B157W8PLUS, R&S OSP-B157WX and R&S OSP-B157WN are designated for the development, production and verification of electronic components and devices in industrial and laboratory environments.

Use these products only for their designated purpose. Observe the operating conditions and performance limits stated in the data sheets.

Target audience

This document is targeted at all users, including installers, operators, and maintenance personnel.

Where do I find safety information?

Safety information is part of the product documentation. It warns you of potential dangers and gives instructions on how to prevent personal injury or damage caused by dangerous situations. Safety information is provided as follows:

- In [Chapter 1.1, "Safety instructions"](#), on page 5. The same information is provided in many languages as printed "Safety Instructions". The printed "Safety Instructions" are delivered with the product.
- Throughout the documentation, safety instructions are provided when you need to take care during setup or operation.

1.1 Safety instructions

Products from the Rohde & Schwarz group of companies are manufactured according to the highest technical standards. To use the products safely, follow the instructions provided here and in the product documentation. Keep the product documentation nearby and offer it to other users.

Use the product only for its intended use and within its performance limits. Intended use and limits are described in the product documentation such as the data sheet, manuals and the printed "Safety Instructions". If you are unsure about the appropriate use, contact Rohde & Schwarz customer service.

Using the product requires specialists or specially trained personnel. These users also need sound knowledge of at least one of the languages in which the user interfaces and the product documentation are available.

Reconfigure or adjust the product only as described in the product documentation or the data sheet. Any other modifications can affect safety and are not permitted.

Never open the casing of the product. Only service personnel authorized by Rohde & Schwarz are allowed to repair the product. If any part of the product is damaged or broken, stop using the product. Contact Rohde & Schwarz customer service at <https://www.rohde-schwarz.com/support>.

Lifting and carrying the product

The maximum weight of the product is provided in the data sheet. You can lift or carry the product by yourself, if you can manage the weight on your own. Alternatively, you can use lifting or transporting equipment. Follow the instructions provided by the equipment manufacturer.

Choosing the operating site

Only use the product indoors. The product casing is not waterproof. Water that enters can electrically connect the casing with live parts, which can lead to electric shock, serious personal injury or death if you touch the casing. If Rohde & Schwarz provides accessories designed for your product, e.g. a carrying bag, you can use the product outdoors.

Unless otherwise specified, you can operate the product up to an altitude of 2000 m above sea level. The product is suitable for pollution degree 2 environments where nonconductive contamination can occur. For more information on environmental conditions such as ambient temperature and humidity, see the data sheet.

Setting up the product

Always place the product on a stable, flat and level surface with the bottom of the product facing down. If the product is designed for different positions, secure the product so that it cannot fall over.

Safety instructions

If the product has foldable feet, always fold the feet completely in or out to ensure stability. The feet can collapse if they are not folded out completely or if the product is moved without lifting it. The foldable feet are designed to carry the weight of the product, but not an extra load.

If stacking is possible, keep in mind that a stack of products can fall over and cause injury.

If you mount products in a rack, ensure that the rack has sufficient load capacity and stability. Observe the specifications of the rack manufacturer. Always install the products from the bottom shelf to the top shelf so that the rack stands securely. Secure the product so that it cannot fall off the rack.

Connecting to power

The product is an overvoltage category II product. Connect the product to a fixed installation used to supply energy-consuming equipment such as household appliances and similar loads. Keep in mind that electrically powered products have risks, such as electric shock, fire, personal injury or even death. Replace parts that are relevant to safety only by original parts, e.g. power cables or fuses.

Take the following measures for your safety:

- Before switching on the product, ensure that the voltage and frequency indicated on the product match the available power source. If the power adapter does not adjust automatically, set the correct value and check the rating of the fuse.
- Only use the power cable delivered with the product. It complies with country-specific safety requirements. Only insert the plug into an outlet with protective conductor terminal.
- Only use intact cables and route them carefully so that they cannot be damaged. Check the power cables regularly to ensure that they are undamaged. Also ensure that nobody can trip over loose cables.
- If you connect the product to an external power supply, use the one delivered with the product or recommended in the product documentation. The external power supply must conform to the country-specific regulations.
- Only connect the product to a power source with a fuse protection of maximum 20 A.
- Ensure that you can disconnect the product from the power source at any time. Pull the power plug to disconnect the product. The power plug must be easily accessible. If the product is integrated into a system that does not meet

Labels on the product





these requirements, provide an easily accessible circuit breaker at the system level.

Cleaning the product

Use a dry, lint-free cloth to clean the product. When cleaning, keep in mind that the casing is not waterproof. Do not use liquid cleaning agents.

Meaning of safety labels

Safety labels on the product warn against potential hazards.

	<p>Potential hazard</p> <p>Read the product documentation to avoid personal injury or product damage.</p>
	<p>Electrical hazard</p> <p>Indicates live parts. Risk of electric shock, fire, personal injury or even death.</p>
	<p>Hot surface</p> <p>Do not touch. Risk of skin burns. Risk of fire.</p>
	<p>Protective conductor terminal</p> <p>Connect this terminal to a grounded external conductor or to protective ground. This connection protects you against electric shock if an electric problem occurs.</p>




1.2 Labels on the product

Labels on the casing inform about:

- Personal safety, see ["Meaning of safety labels"](#) on page 8
- Product and environment safety, see [Table 1-1](#)
- Identification of the product, for example as in the top left of the product's front panel

Warning messages in the documentation

Table 1-1: Labels regarding product and environment safety

	Potential hazard Read the product documentation to avoid personal injury or product damage.
	China RoHS certification, certifies compliance with the Chinese government's regulation on the restriction of hazardous substances (RoHS).
	Labeling in line with EN 50419 for disposal of electrical and electronic equipment after the product has come to the end of its service life. See "Disposal" in the the operating manual or user manual of the R&S OSP.

1.3 Korea certification class B



이 기기는 가정용(B급) 전자파 적합기기로서 주로 가정에서 사용하는 것을 목적으로 하며, 모든 지역에서 사용할 수 있습니다.

1.4 Warning messages in the documentation

A warning message points out a risk or danger that you need to be aware of. The signal word indicates the severity of the safety hazard and how likely it will occur if you do not follow the safety precautions.

WARNING

Potentially hazardous situation. Could result in death or serious injury if not avoided.

CAUTION

Potentially hazardous situation. Could result in minor or moderate injury if not avoided.

NOTICE

Potential risks of damage. Could result in damage to the supported product or to other property.

1.5 Restrictions on opening a switch unit

Do not open an R&S OSP, to avoid personal injury and instrument damage. If opening is required for mounting a module, let Rohde & Schwarz personnel mount this module. See [Chapter 9, "Contacting customer support"](#), on page 42.

2 Welcome

The R&S OSP-B157W8 or R&S OSP-B157W8PLUS, R&S OSP-B157WX and R&S OSP-B157WN are modules for the open switch platform R&S OSP.

The R&S OSP-B157WX serves as a frequency extension for the base module R&S OSP-B157W8 or R&S OSP-B157W8PLUS. While the frequency extension forwards lower frequency signals to the base module, it can bypass higher frequency signals to an appropriate measurement channel.

The R&S OSP-B157WN enables radiated normalized measurements in an R&S TS7124 RF shielded box, while still allowing to switch back conveniently to conductive measurements.

The modules are typically used in the automatic test system **R&S TS8997** that performs regulatory conformance tests of wireless short range devices (SRDs). The tests cases are focused on the 2.4 GHz, 5 GHz and 6 GHz frequency bands for Wi-Fi® and ISM applications (industrial, scientific and medical). These tests are performed according to the standards FCC 15.407, ETSI EN 300 328, ETSI EN 301 893, ETSI EN 303 687, ETSI EN 302 502, ETSI EN 300 220-2 and others.



Designation "module" vs. "switch unit"

This manual uses the following nomenclature:

- The R&S OSP-B157W8 is referred to as "**base module**".
- The R&S OSP-B157W8PLUS is referred to as "**base module**".
- The R&S OSP-B157WX is referred to as "**frequency extension module**".
- The R&S OSP-B157WN is referred to as "**normalization extension module**".
- The R&S OSP is referred to as "**switch unit**".

Frequency ranges

Basically, the modules are designed to cover the 2.4 GHz and 5 GHz frequency bands, and with the R&S OSP-B157W8PLUS also the 6 GHz frequency band. However, some of the above mentioned regulatory ETSI and FCC tests include measuring spurious emissions up to 18 GHz or even up to 40 GHz.

Therefore, the frequency coverage of the modules is as follows:

- The R&S OSP-B157W8 operates in a frequency range up to 6 GHz (hence, 6 GHz band not supported), while the R&S OSP-B157W8PLUS operates in a frequency range up to 7.5 GHz. Both base modules offer a special by-path for spurious emissions measurements up to 18 GHz. The integrated power meter and signal conditioning are designed for in-band use only. The lower end of the frequency range of the R&S OSP-B157W8 and R&S OSP-B157W8PLUS depends on the selected paths and application. It starts, for example, at 450 MHz, if internal power measurements are involved, or approximately at 1 GHz, if directional couplers are involved.
- The R&S OSP-B157WX extends the spurious emissions frequency range up to 40 GHz. Signals to be measured in this frequency range are not forwarded to the DUT input ports of the base module, but bypassed directly to the signal analyzer.
- The R&S OSP-B157WN allows the required switching for normalized measurements and supports the frequency range of the base module.

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

The 6 GHz module R&S OSP-B157W8 with up to 8 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 8 ports) and measurement instruments.

The module features:

- Signal conditioning by integrated attenuators, couplers and combiners (without amplifiers or filters)
- RF switching for wireless test cases up to 6 GHz
- RF switching for spurious emission measurements up to 18 GHz (exception: if a frequency extension module R&S OSP-B157WX is present, these signals are handled within this extension module)
- Power measurements in the 2.4 GHz and 5 GHz bands with specific evaluations for wireless standards
- Built-in data acquisition board for control of the signal paths and for collection and A/D conversion of the power measurements
- Multiple trigger input and output options
- External clock input
- Video input

- LAN interface for remote control of the module operation by the test software R&S WMS32

Key features of the R&S OSP-B157W8PLUS base module

In addition to the features of the ".02" version R&S OSP-B157W8, the ".05" version of the module features:

- Power measurements in the 6 GHz band with specific evaluations for wireless standards
- Frequency range for signalling up to 7.5 GHz
- Additional step attenuator R2 for an extended attenuation range, see [Figure 5-3](#)

Each of the **8 configurable channels** in the R&S OSP-B157W8 and R&S OSP-B157W8PLUS has the following integrated semiconductor components:

- An individually programmable attenuator
- An analog power detector for synchronous RMS power measurement with high sampling rate and burst detection
- An A/D converter for the power measurement results
- Solid-state switches, which enable:
 - 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
 - Signal conditioning via the integrated couplers, directional couplers, attenuators and combiners

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

The 40 GHz module R&S OSP-B157WX is especially designed to provide RF switching for spurious measurements up to 40 GHz.

It uses coaxial RF architecture and features:

- Electromechanical RF relay switches for flexible operation of up to 8 DUT channels
- The module can forward incoming signals on each DUT channel to the connected DUT input of the R&S OSP-B157W8 or R&S OSP-B157W8PLUS. This forwarding is used for measurements at frequencies **up to 6 GHz**, which the

R&S OSP-B157W8 can handle, or **up to 7.5 GHz**, which the R&S OSP-B157W8PLUS can handle.

- Alternatively, incoming signals on *one single DUT channel* can be switched to the module's [Rx] port and on to a connected signal analyzer, receiver or other measurement instrument. This switching state is typically used for measurements at frequencies above 6 GHz or 7.5 GHz and **up to 40 GHz**, which the base modules cannot handle. (Signals for spurious emission measurements up to 18 GHz are also switched to the instrument connected to the frequency extension module's [Rx] port.)
- If the R&S OSP-B157WX forwards the DUT's signals, it also switches the signal analyzer path from its [RxOUT] port (input port) to its [Rx] port. This [Rx] port is connected to the signal analyzer or test receiver, while the [Rx] port of the R&S OSP-B157W8 or R&S OSP-B157W8PLUS is connected to the [RxOUT] port (input port) of the R&S OSP-B157WX.
- Also, you can add the signal of a companion device to one of the DUT paths via its internal switches and a directional coupler. The type of companion device depends on the DUT. For example, if your DUT is a Wi-Fi® transceiver, the companion device can be a wideband radiocommunication tester R&S CMW500. In this example, it would simulate a wireless router that maintains a bidirectional connection with the transceiver.

Key features of the R&S OSP-B157WN normalization extension module

If conductive measurements are impossible due to monolithic integral antennas, the R&S OSP-B157WN offers an innovative test method based on fixture approach with normalization procedure proposed by ETSI.

The R&S OSP-B157WN 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 conducted (up to eight ports) and normalized measurements in combination with an appropriate shielding box R&S TS7124.

The module features the following:

- Solid-state relay switches for flexible operation of up to eight DUT channels and normalized measurement
- High dynamic range of step attenuator
- LAN interface for remote control of the module using the R&S WMS32 wireless measurement system software
- The module can forward incoming signals on each DUT channel to the connected DUT input of the R&S OSP-B157W8PLUS. This forwarding is used for

conductive measurements at frequencies up to 7.5 GHz, which the R&S OSP-B157W8PLUS can handle.

- Alternatively, incoming signals from the probe antennas within the R&S TS7124 can be switched to the R&S OSP-B157W8PLUS



Screenshots

Sample screenshots in this documentation are used to illustrate as much as possible of the functions provided by the modules and of potential interdependencies between parameters. Note that:

- The values in these screenshots do **not** necessarily represent realistic application situations.
- Do not consider the values as recommended by Rohde & Schwarz.
- The screenshots shown can differ, depending on your particular equipment and configuration.

3 Documentation overview

This section provides an overview of the R&S OSP-B157W8, R&S OSP-B157W8PLUS, R&S OSP-B157WX and R&S OSP-B157WN user documentation. Unless specified otherwise, you find the documents at:

www.rohde-schwarz.com/manual/osp and www.rohde-schwarz.com/manual/osp-n

Further documents are available on the R&S OSP product page at:

www.rohde-schwarz.com/product/osp and www.rohde-schwarz.com/product/osp-n

3.1 Getting started manual

Introduces the modules and describes how to set up and start working with them. Includes safety instructions, key features, preparation, setup and basic operation. A printed version is delivered with the modules.

3.2 User manual

Contains the description of all functions of the modules. It includes the contents of the getting started manual and provides explanations, step-by-step procedures, figures and examples. The user manual supports you during your first experience with the product, from installation and configuration to various measurements. The content also provides an introduction to remote control, a complete description of the remote control commands with programming examples, and information on maintenance, instrument interfaces and error messages.

The user manual is available for download or for immediate display on the internet.

3.3 Operating manual of the legacy switch unit

Contains the description of all instrument modes and functions of the **1st** generation of the R&S OSP Open Switch and Control Platform (switch unit). It is available for download on the internet.

3.4 User manual of the 2nd-generation switch unit

Contains the description of all instrument modes and functions of the **2nd** generation of the R&S OSP Open Switch and Control Platform (switch unit). It is available for download on the internet.

3.5 Help

The R&S OSP-B157W8 and R&S OSP-B157W8PLUS are operated either by direct bus commands or by the software R&S WMS32, which is part of the R&S RF Test Suite. The R&S OSP-B157WX can be operated also by the software R&S OSP Panel or via the R&S OSP220 firmware. The R&S OSP-B157WN can be operated by the software R&S WMS32, only.

The software-embedded help content in the R&S RF Test Suite provides quick, context-sensitive access to information for the software packages R&S EMC32, R&S AMS32 and R&S WMS32. Refer to the R&S WMS32 part of this help content for application of the modules and switch units in the R&S TS8997 test system. The help content also describes templates for test cases that you can use in tests according to various FCC and ETSI standards. Examples are FCC 15.407, ETSI EN 300 328 or ETSI EN 301 893.

The software, which requires a license, is available at www.rohde-schwarz.com/software/emc32.

3.6 Instrument security procedures

Deals with security issues when working with the R&S OSP in secure areas. It is available for download on the Internet.

3.7 Printed safety instructions

Provides safety information in many languages. The printed document is delivered with the product.

3.8 R&S OSP on the internet

The websites www.rohde-schwarz.com/product/osp and www.rohde-schwarz.com/product/osp-n provide:

- Key facts, features and options for the family of R&S OSP switch units
- Rohde & Schwarz contacts for information, quotes, demos and calibration services
- Technical documentation (operating manual / user manual for R&S OSP switch units)
- [Brochures and data sheets](#)
- [Application notes](#)
- [Drivers](#)
- The legacy firmware with [OSA and release notes](#)
- The [R&S OSP Panel](#) software with [release notes](#) (only for legacy switch units)
- The [R&S OSP new generation](#) firmware with [OSA and release notes](#)
- Related [documents and articles](#)
- News and information on software updates
- [Service manual](#) (only for Rohde & Schwarz personnel)

For operation of the modules, refer to the documentation of the [R&S WMS32](#) software. The documentation is available as a help function in the R&S RF Test Suite, which requires a license and comprises the software packages

R&S EMC32, R&S AMS32 and R&S WMS32. Also, refer to the related release notes.

3.8.1 Brochures and data sheets

The data sheet contains the technical specifications of the R&S OSP. It also lists the options and their order numbers, and optional accessories.

The brochure provides an overview of the instrument and deals with the specific characteristics.

See www.rohde-schwarz.com/brochure-datasheet/osp and www.rohde-schwarz.com/brochure-datasheet/osp-n

3.8.2 Application notes

These documents deal with special applications or background information on particular topics.

Application notes and application cards deal with special applications or background information on particular topics.

See www.rohde-schwarz.com/application/osp and www.rohde-schwarz.com/application/osp-n.

3.8.3 Drivers

Up-to-date instrument drivers are available for download.

See www.rohde-schwarz.com/driver/osp and www.rohde-schwarz.com/driver/osp-n.

3.8.4 Release notes and open-source acknowledgment (OSA)

The release notes list new features, improvements and known issues of the current firmware or software version and describe the installation.

The software makes use of several valuable open source software packages. An open-source acknowledgment document provides verbatim license texts of the used open source software.

See www.rohde-schwarz.com/firmware/osp and www.rohde-schwarz.com/software/osp and www.rohde-schwarz.com/firmware/osp-n

3.8.5 Service manual

Describes handling failed modules, module replacement, troubleshooting and special remote control commands for service purposes. The document also contains spare part lists and mechanical drawings.

The service manual ("Classified Service Document") is available for Rohde & Schwarz personnel, only.

4 Preparing for use

Here, you can find basic information about setting up the product for the first time.

For the following preparation activities, refer to the [operating manual](#) or [user manual](#) of the R&S OSP:

- Lifting and carrying
- Unpacking and checking
- Choosing the operating site
- Setting up the product
- Considerations for test setup
- Preventing electrostatic discharge (ESD)
- Preventing electromagnetic interference (EMI)
- Preventing overload on internal terminations
- Connecting
 - Power and earth ground
 - LAN
 - External monitor, mouse and keyboard
 - RF and control cables
- Switching on or off
- Checking the installed modules
- Configuring the initial instrument settings

Apart from the activities listed above, preparing the modules for use requires the following:

- [Putting into operation](#)..... 21
- [Installing or updating the firmware](#)..... 25

4.1 Putting into operation

The modules described in this manual must be installed in an R&S OSP switch unit. Typically, the modules are preinstalled in the Rohde & Schwarz factory. If a module is not preinstalled, it must be installed by Rohde & Schwarz personnel, only. See [Chapter 9, "Contacting customer support"](#), on page 42.

Module installation


- The base module R&S OSP-B157W8 or R&S OSP-B157W8PLUS is (or must be) installed in one of the following switch units:
 - R&S OSP120
 - R&S OSP150
- The frequency extension module R&S OSP-B157WX is (or must be) installed in one of the following switch units:
 - R&S OSP120
 - R&S OSP220
 - R&S OSP230
- The normalization extension module R&S OSP-B157WN is (or must be) installed in one of the following switch units:
 - R&S OSP220
 - R&S OSP230

Only one optional additional single-slot module can be installed in the rear left slot of the switch unit, beside one R&S OSP-B157W8, one R&S OSP-B157W8PLUS, one R&S OSP-B157WX or one R&S OSP-B157WN. For all information related to the R&S OSP switch units, refer to their [operating manual](#) or to their [user manual](#).

Rack mounting

For using the base module and the frequency extension module in the R&S TS8997 Regulatory Test System for Wireless Devices, mount the switch units into the test system's 19" rack. This procedure is described in the [operating manual](#) or [user manual](#) of the R&S OSP and in the mounting instructions supplied with its rack adapter kits:

- For R&S OSP120 and R&S OSP150, use rack adapter R&S ZZA-211 (order no. 1096.3260.00)
- For R&S OSP220 and R&S OSP230, use rack adapter R&S ZZA-KNA21 (order no. 1177.8026.00)

 Unlike all other modules for R&S OSP switch units, the R&S OSP-B157W8 and R&S OSP-B157W8PLUS are not equipped with on-board memory to store the switching configuration of the module's signal paths. Therefore, the hosting switch unit cannot recognize the module. Instead, the module's LAN interface must be connected to the control computer and the switching configuration must be saved as a "Hardware Setup" in the R&S WMS32 software. In this software, the switching configuration of the R&S OSP-B157W8 and R&S OSP-B157W8PLUS is already implemented.

The extension modules R&S OSP-B157WX and R&S OSP-B157WN have no LAN interface, but are recognized and controlled directly by the hosting switch unit.

Connecting the modules

For connecting the modules among each other and to test instruments, proceed as described in the following chapters:

- [Chapter 5.1, "Connecting devices to the base module"](#), on page 28
- [Chapter 6.1, "Connecting equipment to the frequency extension module"](#), on page 33
- [Chapter 7.1, "Connecting equipment to the normalization extension module"](#), on page 38

Use RF connector adapters as port savers

SMA and K-type RF connectors have a limited lifetime. It is typically limited to 500 connector mating cycles, due to normal wear. After this number of mating cycles, the connectors must be replaced.

- The **SMA connectors on the 8 DUT ports** at the front panel of the R&S OSP-B157W8 and R&S OSP-B157W8PLUS **are soldered in**. Therefore, their replacement is a costly and time-consuming procedure, which must be handled by Rohde & Schwarz [service](#).

To save the lifetime of these RF connectors, use the 2.92 mm K-type RF connector adapters as port savers on the original connectors. A set of 8 adapters is included in the delivery. Fix the adapters with a torque of 0.8 Nm to 1.1 Nm.

Leave the port saver adapters on the ports and connect your DUT channels to these adapters, until the lifetime of the adapters is reached, due to wear. Then replace the worn port saver adapters for new ones.



Figure 4-1: Port saver adapter

- If any SMA or K-type connectors of the R&S OSP-B157WX are worn, replacing these connectors is much more simple, because they are not soldered in.

Further operation and handling information

Also refer to the [operating manual](#) or [user manual](#) of the R&S OSP for the following information, and more:

- Ambient conditions
- Setup
- Local or remote operation
- Transporting
- Replacing fuses
- Storage and disposal

4.2 Installing or updating the firmware

For installing or updating the firmware of the R&S OSP-B157W8 or R&S OSP-B157W8PLUS, use the R&S WMS32 software package in the R&S RF Test Suite. Click "Self Check" (labeled (1) in [Figure 4-2](#)) to open this dialog:

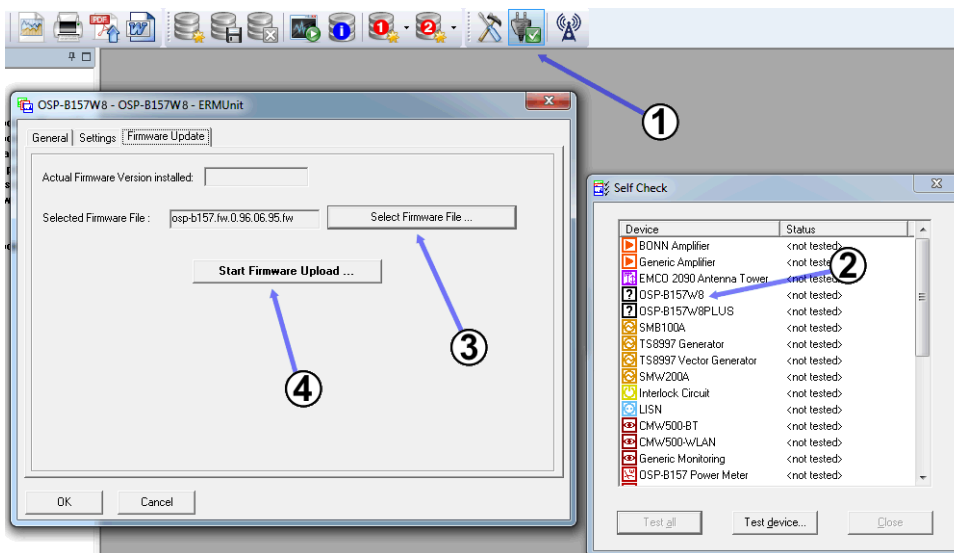


Figure 4-2: Firmware installation or update in R&S WMS32

Proceed as follows:

1. Click "Self Check".
2. Select the "R&S OSP-B157W8" or "R&S OSP-B157W8PLUS" entry in the device list of the "Self Check" dialog.
3. Click "Test device".
4. In the "Firmware Update" tab of the next dialog, click "Select Firmware File".
5. Browse to the correct file.
6. Click "Start Firmware Upload".

The firmware is installed or updated automatically.
During this process, the power LED flashes green.

When the installation or update is completed, the base module restarts and is ready for use.

5 Tour of the base module

The base module R&S OSP-B157W8 or R&S OSP-B157W8PLUS must be installed in a switch unit as described in [Chapter 4.1, "Putting into operation"](#), on page 21.

On the front panel, the R&S OSP-B157W8 or R&S OSP-B157W8PLUS has RF connectors for up to eight DUT channels and for the test instruments:

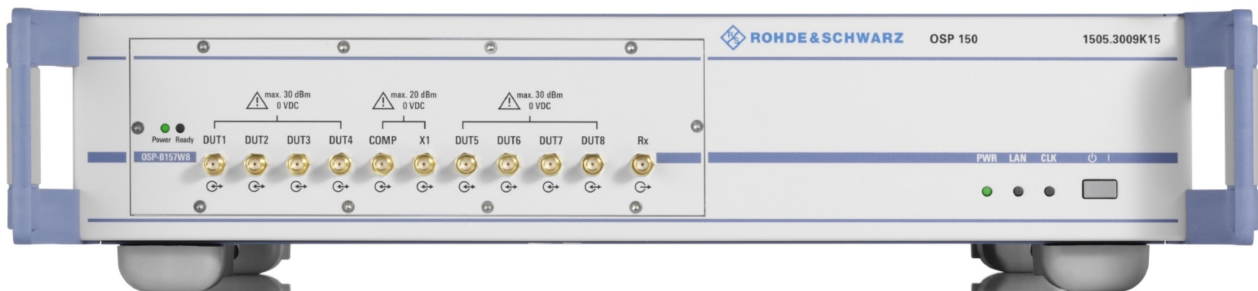


Figure 5-1: R&S OSP-B157W8 mounted in R&S OSP150 (front panel view)

Additional connectors are on the rear panel:



Figure 5-2: R&S OSP-B157W8 mounted in R&S OSP150 (rear panel view)

For an overview of the connectors, see [Table 5-1](#).



Use the base module's LAN connector for remote control

The module is operated remotely via Ethernet (LAN) by the test software R&S WMS32, which must be installed on your control computer.

As the LAN and CAN connectors on the rear of the R&S OSP are disabled, use the RJ45 LAN connector of the module R&S OSP-B157W8 or R&S OSP-B157W8PLUS itself (top center in [Figure 5-2](#)) for remote control.

The R&S OSP-B157W8 and R&S OSP-B157W8PLUS operate according to the following circuit diagram:

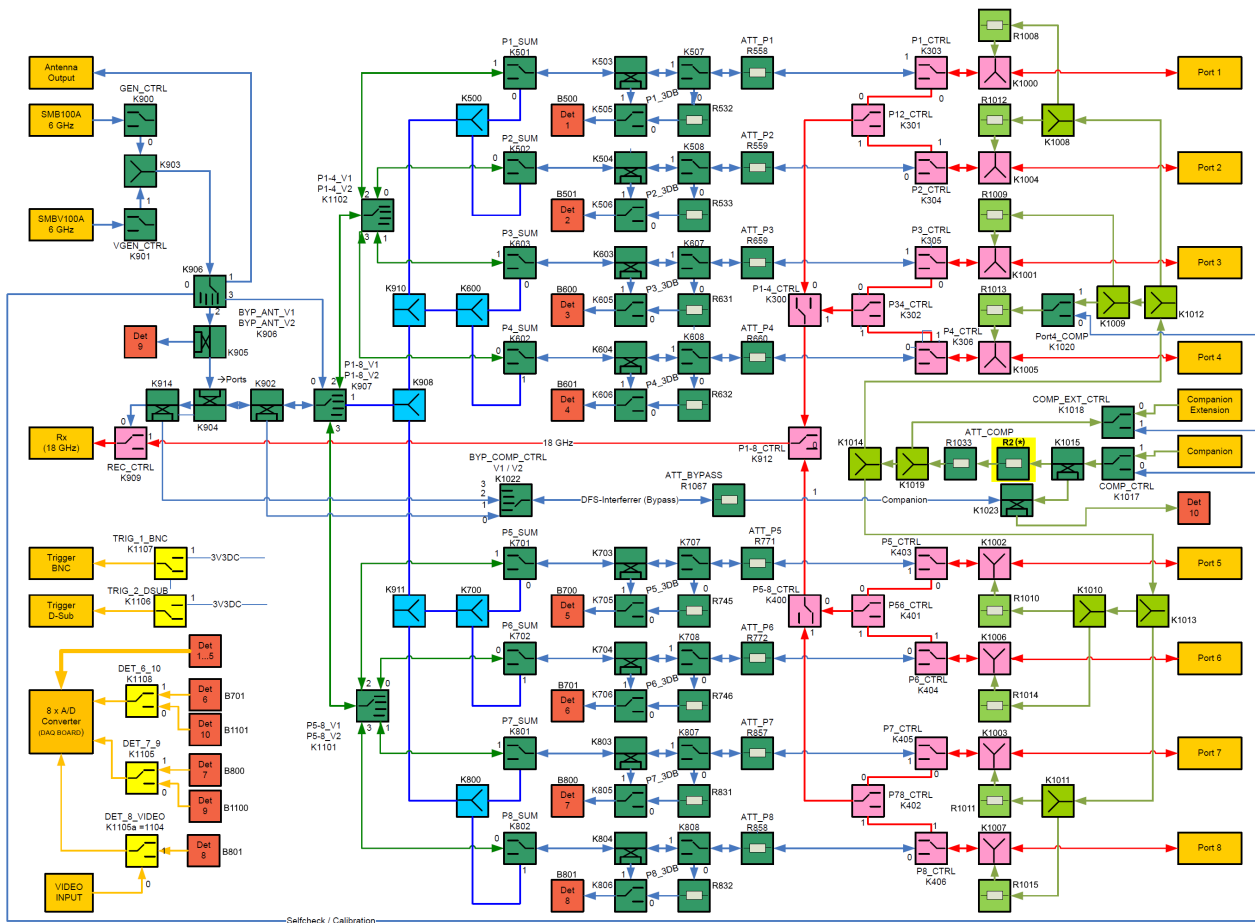


Figure 5-3: Circuit diagram of the R&S OSP-B157W8 and R&S OSP-B157W8PLUS RF board

- Orange, right = Front DUT and instrument ports
- Orange, left = Instrument or trigger ports, and data acquisition board
- Yellow = 1-to-2 switches
- Red = Power detectors
- Green = 1-to-n switches, attenuators or bi-directional couplers
- Blue = Splitters/combiners
- Pink = 1-to-2 switches or splitters/combiners in the 18 GHz by-path
- Light green = Attenuators or splitters/combiners
- (*), yellow highlighted = Step attenuator R2, only available in R&S OSP-B157W8PLUS, controlled together with step attenuator R1033 in the companion path

With this RF circuitry, the R&S OSP-B157W8 or R&S OSP-B157W8PLUS can operate flexibly in a test system in a multitude of ways.

- Incoming signals on each **DUT** channel can be handled as follows:
 - Signals can be individually attenuated.

Connecting devices to the base module

- Signals can be switched to one or more instrument ports of the module.
- The power level can be measured by internal detectors.
- Incoming signals on each **instrument** port can be handled as follows:
 - Signals can be individually attenuated.
 - Signals can be switched to one or more DUT ports of the module.
 - The power level can be measured by internal detectors.

The exact behavior of the module is test-case-specific and depends on the applicable test standard. This flexibility allows setting up and handling complex test and measurement sequences with the connected devices.

5.1 Connecting devices to the base module

The base module has various external connectors on its front and rear panel: SMA for RF signals, BNC for analog and digital trigger control, D-Sub 9 for digital trigger control and LAN for Ethernet access. The details of these connections are described in [Table 5-1](#).

Observe maximum RF input power and no DC voltage

The front RF connectors and some rear RF connectors have the following limitations:

- A maximum tolerable input power level (dBm), specified on the front and rear panels
- No tolerance for a direct current (DC) voltage share in the input signal

Do not exceed the dBm levels and "0 VDC" limits that are indicated on the front and rear panels. If an input signal exceeds these limits, it can damage the internal circuits of the module.

To connect test devices to the base module

1. Identify the connections that your test setup requires.
2. Establish all required connections according to the following table.
3. For Ethernet (LAN) connection, use the rear RJ45 connector in the **base module**, not in the switch unit.

Connecting devices to the base module

Table 5-1: External connectors overview of the R&S OSP-B157W8 or R&S OSP-B157W8PLUS

Panel	Label	Direction	Signal	Type	Value range
Front	DUT1 .. . DUT8	BiDir (*)	Device under test, channel 1 to 8, max. 30 dBm	RF SMA	1 GHz to 18 GHz
Front	COMP	BiDir	Companion device, max. 20 dBm	RF SMA	1 GHz to 6 GHz
Front	X1	BiDir	Companion device exten- sion (to R&S OSP- B157WX)	RF SMA	1 GHz to 18 GHz
Front	Rx	Out (**)	Spectrum analyzer / test receiver	RF SMA	1 GHz to 18 GHz
Rear	Trig 4	In	Trigger input Ch4	Digital BNC	High: 3.3 V, low: 0 V
Rear	Trig 3	Out	Trigger output Ch3	Digital BNC	High: 3.3 V, low: 0 V
Rear	LAN	BiDir	Ethernet	Digital RJ45	
Rear	ANT	Out	Antenna output	RF SMA	1 GHz to 18 GHz
Rear	VIDEO	In	Video input, max. 3 V	Analog SMA	DC to 1 MHz
Rear	GEN	In	Signal generator, max. 30 dBm	RF SMA	1 GHz to 18 GHz
Rear	VGEN	In	Vector signal generator	RF SMA	1 GHz to 18 GHz
Rear	Trig 1...3	In	Trigger input Ch1, Ch2, Ch3	Digital D-Sub 9 Pin 1,2,3: sig- nal Pin 5: ground	High: 3.3 V, low: 0 V
Rear	48 MHz	In	External clock input 48 MHz	RF SMA	48 MHz ± 200 kHz
Rear	Trig 1	Out	Trigger output Ch1	Digital D-Sub 9 Pin 1: signal Pin 5: ground	High: 3.3 V, low: 0 V
Rear	Trig 2	Out	Trigger output Ch2	Analog BNC	High: 3.3 V, low: 0 V

If you use the base module R&S OSP-B157W8 or R&S OSP-B157W8PLUS in combination with the [frequency extension module](#) R&S OSP-B157WX, make the following changes to the connections listed above:

- (*)

Connecting devices to the base module

Connect the ports of your DUT to the frequency extension instead of the base module.

And connect the DUT ports of the base module to the [OUT1] to [OUT8] ports of the frequency extension module, as in [Figure 6-4](#).

- (**)
Connect the signal analyzer or test receiver to the [Rx] port of the frequency extension instead of the base module.
And connect the [Rx] port of the base module to the [RxOUT] port of the frequency extension module, as in [Figure 6-4](#).

Supply and control connectors

Besides the module's connectors, the switch unit has additional connectors for power supply, external monitor, mouse and keyboard. For information on the switch unit's connectors and on replacing the fuse, refer to the [operating manual](#) and [user manual](#) of the R&S OSP.

Connect the power supply connector to an isolated ground receptacle of your mains grid. The supply voltage must be between 110 VAC and 240 VAC with frequencies ranging from 50 Hz to 60 Hz. Within these ranges, the device automatically adapts to the supply voltage. To turn the power on or off, put the AC power switch into position I (on) or 0 (off).

6 Tour of the frequency extension module

The frequency extension module R&S OSP-B157WX must be installed in a switch unit as described in [Chapter 4.1, "Putting into operation"](#), on page 21.

On the front panel, the R&S OSP-B157WX has the connectors for up to eight DUT channels with corresponding forwarding (loop-through) output ports and the connectors for the test instruments:



Figure 6-1: R&S OSP-B157WX mounted in R&S OSP120 (front panel view)

The module has no rear connectors, but blind plates only. The only connectors on the rear panel are the switch unit's power supply and control connectors.



Figure 6-2: R&S OSP-B157WX mounted in R&S OSP120 (rear panel view)

For an overview of the connectors, see [Chapter 6.1](#).



Use the switch unit's LAN connector for remote control

The module is operated remotely via Ethernet (LAN) by the firmware of the switch unit that houses the frequency extension module. This switch unit is controlled by the test software R&S WMS32, which must be installed on your control computer.

In contrast with the [base module](#), the frequency extension module has no LAN connector of its own.

For controlling the R&S OSP-B157WX, use the RJ45 LAN connector on the rear panel of the switch unit.

Hence, for controlling a combination of both the R&S OSP-B157W8 or R&S OSP-B157W8PLUS and R&S OSP-B157WX in an R&S TS8997 test system, use two LAN cables to connect the modules to the test systems' Ethernet switch.

The R&S OSP-B157WX operates according to the following circuit diagram:

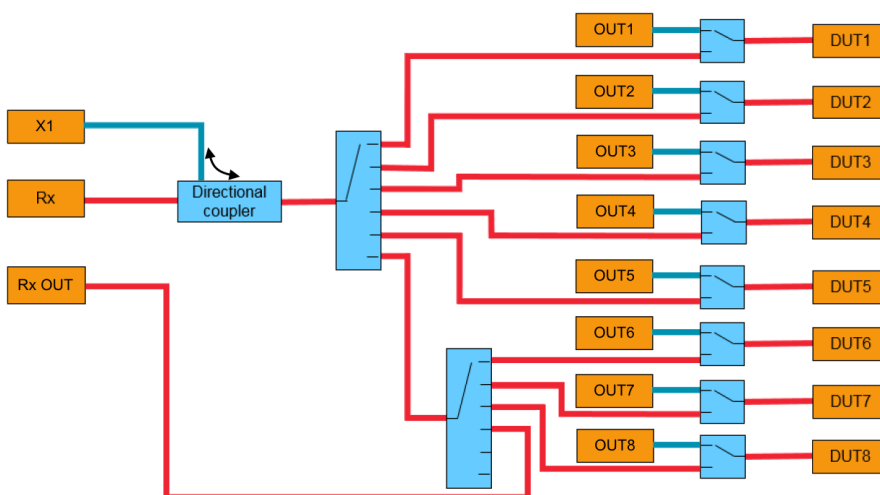


Figure 6-3: Circuit diagram of the R&S OSP-B157WX RF board

Orange, right = 8 DUT input and output ports (front connectors)
 Orange, left = 3 instrument ports (also front connectors)
 Blue squares = SPDT (1-to-2) relays
 Blue upright rectangles = SP6T (1-to-6) relays
 Blue horizontal rectangle = Directional coupler

Connecting equipment to the frequency extension module

With this RF circuitry, the R&S OSP-B157WX is operated in the test system as follows:

- Incoming signals on each DUT channel are forwarded to the connected DUT input of the base module R&S OSP-B157W8 (supporting **up to 6 GHz**) respectively R&S OSP-B157W8PLUS (supporting **up to 7.5 GHz**).
- Incoming signals on *one single DUT channel* at frequencies **above 6 GHz** respectively **above 7.5 GHz** are switched to the module's [Rx] port.

Optionally, the control system can switch an [RxOUT] signal (instead of a DUT) or a [X1] signal (companion device, in addition to a DUT) to the module's [Rx] port.

NOTICE**Signal paths for different frequency ranges**

Define the signal paths in such a way that the test system performs out-of-band measurements up to 40 GHz via the R&S OSP-B157WX.

6.1 Connecting equipment to the frequency extension module

We recommend placing the R&S OSP-B157WX on top of the base module or mounting the two modules in the same arrangement into a 19" rack.

Observe maximum RF input power and no DC voltage

The R&S OSP-B157WX typically forwards RF signals from a DUT to the R&S OSP-B157W8 or R&S OSP-B157W8PLUS. Hence, if you connect the R&S OSP-B157WX to the base module, adhere to the following limitations for the front RF connectors:

- A maximum tolerable input power level (dBm), specified on the base module
- No tolerance for a direct current (DC) voltage share in the input signal

Do not exceed the dBm levels and "0 VDC" limits that are indicated on the base module. If an input signal exceeds these limits, it can damage the internal circuits of the module.

Connecting equipment to the frequency extension module

To connect the R&S OSP-B157WX

1. Connect the port [OUT1] of the R&S OSP-B157WX to the port [DUT1] of the R&S OSP-B157W8 or R&S OSP-B157W8PLUS.
2. Proceed in the same way for the remaining channels 2 through 8, as required in your test setup.
3. Connect the port [DUT1] of the R&S OSP-B157WX to channel 1 of your DUT.
4. Proceed in the same way for the remaining channels 2 through 8, as required in your test setup.
5. For your companion device (which is connected to the [COMP] port of the base module), connect the port [X1] of the R&S OSP-B157WX to the port [X1] of the R&S OSP-B157W8 or R&S OSP-B157W8PLUS.
6. Connect the port [RxOUT] of the R&S OSP-B157WX to the port [Rx] of the R&S OSP-B157W8 or R&S OSP-B157W8PLUS.

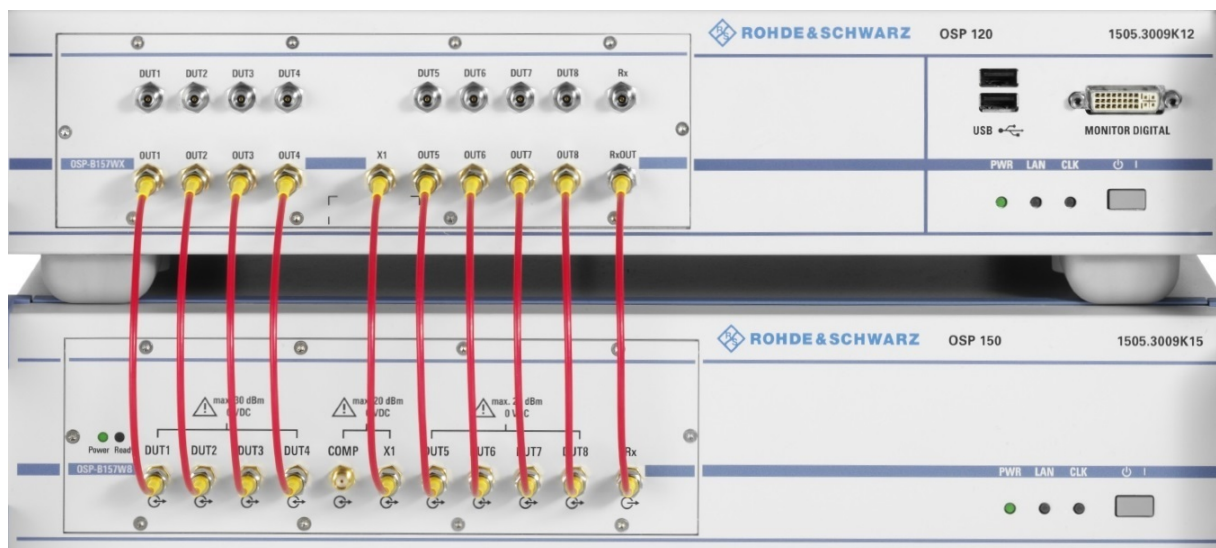


Figure 6-4: Connected modules, upper = R&S OSP-B157WX, lower = R&S OSP-B157W8 or R&S OSP-B157W8PLUS

7. Connect the port [Rx] of the R&S OSP-B157WX to the input port of your measurement instrument, for example a spectrum analyzer or test receiver.
8. On the rear panel of the R&S OSP-B157WX, connect the switch unit's RJ45 [LAN] port for remotely controlling the R&S OSP-B157WX as described in the [operating manual](#) of the R&S OSP switch units. Note that this usage is different from the [base module](#), where you must use the module's LAN port instead

Connecting equipment to the frequency extension module

of the switch unit's LAN port. Do not use the CAN port for controlling the R&S OSP-B157WX.

- Connect the power supply connector to an isolated ground receptacle of your mains grid. The supply voltage must be between 110 VAC and 240 VAC with frequencies ranging from 50 Hz to 60 Hz. Within these ranges, the device is automatically adapted to the supply voltage. To turn the power on or off, put the AC power switch into position I (on) or 0 (off).

Table 6-1: External connectors overview of the R&S OSP-B157WX

Panel	Label	Direction	Signal	Type	Frequency range
Front	DUT1 .. . DUT8	BiDir	Device under test, channel 1 to 8, max. 30 dBm	RF K-type	1 GHz to 40 GHz
Front	OUT1 .. . OUT8	BiDir	Forwarding DUT1 to 8 to the base module	RF SMA	1 GHz to 7.5 GHz
Front	X1	BiDir	Companion device (from the base module)	RF SMA	1 GHz to 6 GHz
Front	Rx	Out	Spectrum analyzer / test receiver	RF K-type	1 GHz to 40 GHz
Front	RxOUT	In	Spectrum analyzer / test receiver (from the base module)	RF SMA	1 GHz to 6 GHz



Note that "**RxOUT**" is - despite its name - an **input port** for signals coming from the "Rx" port of the R&S OSP-B157W8 or R&S OSP-B157W8PLUS base module. The label "RxOUT" was chosen due to the connection with the Rx output port of the base module.

Supply and control connectors

Besides the module's connectors, the switch unit has additional connectors for power supply, external monitor, mouse and keyboard. For information on the switch unit's connectors and on replacing the fuse, refer to the [operating manual](#) and [user manual](#) of the R&S OSP.

Connect the power supply connector to an isolated ground receptacle of your mains grid. The supply voltage must be between 110 VAC and 240 VAC with frequencies ranging from 50 Hz to 60 Hz. Within these ranges, the device automatically adapts to the supply voltage. To turn the power on or off, put the AC power switch into position I (on) or 0 (off).

7 Tour of the normalization extension module

The normalization extension module R&S OSP-B157WN must be installed in a switch unit as described in [Chapter 4.1, "Putting into operation"](#), on page 21.

On the front panel, the R&S OSP-B157WN has the connectors for up to eight DUT channels with corresponding forwarding (loop-through) output ports that you must connect as described in [Chapter 7.1, "Connecting equipment to the normalization extension module"](#), on page 38. Also, three ports for the companion device are available on the front panel (including loop-through):

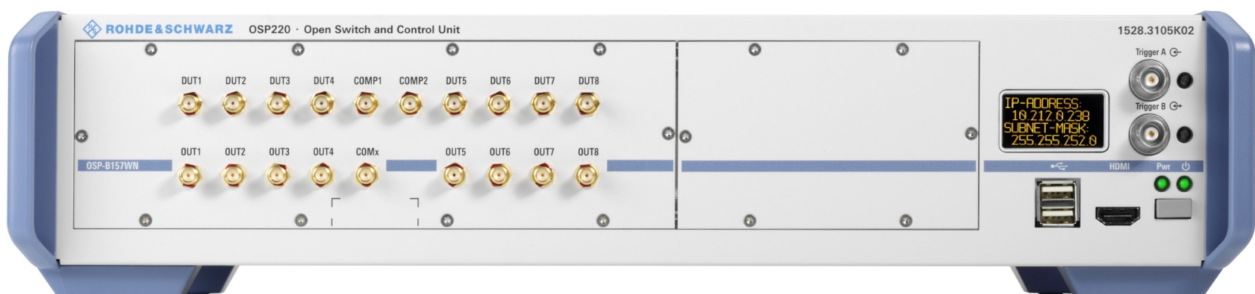


Figure 7-1: R&S OSP-B157WN mounted in R&S OSP220 (front panel view)

The module has six rear connectors [ANT1] to [ANT6] for six probe antennas, used to perform radiated normalized measurements in an R&S TS7124 RF shielded box. Connect the additional [GEN W(8)] connector to the [ANT] port of the R&S OSP-B157W8 or R&S OSP-B157W8PLUS to inject signals from a signal generator into the R&S TS7124.



Figure 7-2: R&S OSP-B157WN mounted in R&S OSP220 (rear panel view)

For an overview of the connectors, see [Chapter 7.1](#).

**Use the switch unit's LAN connector for remote control**

The module is operated remotely via Ethernet (LAN) by control commands (SCPI) from the software R&S WMS32, which must be installed on your control computer.

In contrast with the [base module](#), the normalization extension module has no LAN connector of its own.

For controlling the R&S OSP-B157WN, use the RJ45 LAN connector on the rear panel of the switch unit.

Hence, for controlling a combination of multiple modules in an R&S TS8997 test system, use LAN cables to connect the modules to the Ethernet switch of the test system.

You can use the R&S OSP-B157WN in the test system as follows:

Conducted measurements:

- The R&S OSP-B157WN forwards signals from each connected DUT to the corresponding DUT port of the base module R&S OSP-B157W8 or R&S OSP-B157W8PLUS, and in the opposite direction. This routing allows conducted measurements with the R&S TS8997 test system.

Radiated normalized measurements:

- For transmitter measurements in an R&S TS7124 RF shielded box, the R&S OSP-B157WN forwards signals from the connected six probe antennas to the corresponding antenna ports of the base module R&S OSP-B157W8 or R&S OSP-B157W8PLUS.
- The R&S OSP-B157WN forwards signals from the companion device to one of two different probe antennas in the R&S TS7124 to establish over-the-air (OTA) communication between the DUT and the companion device.
- The R&S OSP-B157WN forwards signals from signal generators connected to the base module R&S OSP-B157W8 or R&S OSP-B157W8PLUS to one of two different probe antennas in the R&S TS7124 to inject additional RF signals.

7.1 Connecting equipment to the normalization extension module

We recommend placing the R&S OSP-B157WN on top of the base module R&S OSP-B157W8 or R&S OSP-B157W8PLUS. If a frequency extension module R&S OSP-B157WX is also part of your system, we recommend placing this frequency extension module on top of the R&S OSP-B157WN. Mounting the two or three modules in the same arrangement into a 19" rack is also possible.

Observe maximum RF input power and no DC voltage

The R&S OSP-B157WN typically forwards RF signals from a DUT to the R&S OSP-B157W8 or R&S OSP-B157W8PLUS. Hence, if you connect the R&S OSP-B157WN to the base module, be aware of the following limitations for the front RF connectors:

- A maximum tolerable input power level (dBm), specified on the base module
- No tolerance for a direct current (DC) voltage share in the input signal

Do not exceed the dBm levels and "0 VDC" limits that are indicated on the base module. If an input signal exceeds these limits, it can damage the internal circuits of the module.

To connect the R&S OSP-B157WN

1. Connect the port [OUT1] of the R&S OSP-B157WN to the port [DUT1] of the R&S OSP-B157W8 or R&S OSP-B157W8PLUS.
2. Proceed in the same way for the remaining channels 2 through 8, as required in your test setup.
3. Connect the port [DUT1] of the R&S OSP-B157WN to one of the following:
 - a) Connect it directly to channel 1 of your DUT.
 - b) Or connect it to the port [OUT1] of the R&S OSP-B157WX, if this frequency extension module is part of your system.
4. Proceed in the same way for the remaining channels 2 through 8, as required in your test setup.
5. Connect your companion device to the [COMP1] port of the R&S OSP-B157WN.

Connecting equipment to the normalization extension module

6. [COMP1] port of the base module), connect the port [X1] of the R&S OSP-B157WN to the port [X1] of the R&S OSP-B157W8 or R&S OSP-B157W8PLUS.
7. Connect the port [COMx] of the R&S OSP-B157WN to the port [COMP] of the R&S OSP-B157W8 or R&S OSP-B157W8PLUS.



Figure 7-3: Connected modules, upper = R&S OSP-B157WX, middle = R&S OSP-B157WN, lower = R&S OSP-B157W8 or R&S OSP-B157W8PLUS

8. Connect the port [RxOUT] of the R&S OSP-B157WX (if part of your system) to the port [Rx] of the R&S OSP-B157W8 or R&S OSP-B157W8PLUS.
9. Connect the port [X1] of the R&S OSP-B157WX (if part of your system) to the port [X1] of the R&S OSP-B157W8 or R&S OSP-B157W8PLUS.
10. On the rear panel of the R&S OSP-B157WN, connect the six antenna ports [ANT...] to the corresponding antenna ports of the R&S TS7124 RF shielded box.
11. On the rear panel of the R&S OSP-B157WN, connect the [GEN W(8)] port to the [ANT] port on the rear panel of the R&S OSP-B157W8 or R&S OSP-B157W8PLUS.

Connecting equipment to the normalization extension module

Table 7-1: External connectors overview of the R&S OSP-B157WN

Panel	Label	Direction	Signal	Type	Frequency range
Front	DUT1 .. . DUT8	BiDir	Frequency extension module or device under test, channel 1 to 8, max. 30 dBm	RF SMA	1 GHz to 13 GHz
Front	OUT1 .. . OUT8	BiDir	Forwarding DUT1 to 8 to the base module	RF SMA	1 GHz to 13 GHz
Front	COMx	BiDir	Forwarding companion device to the base module	RF SMA	1 GHz to 7.5 GHz
Front	COMP1	BiDir	Companion device	RF SMA	1 GHz to 7.5 GHz
Front	COMP2	BiDir	Companion device (optional)	RF SMA	1 GHz to 7.5 GHz
Rear	ANT1 ... ANT6	BiDir	Feed signals to probe antennas in the R&S TS7124	RF SMA	1 GHz to 7.5 GHz
Rear	GEN W(8)	In	Injects incoming signals from a signal generator into the R&S TS7124	RF SMA	1 GHz to 7.5 GHz

Supply and control connectors

Besides the module's connectors, the switch unit has additional connectors for power supply, external monitor, mouse and keyboard. For information on the switch unit's connectors and on replacing the fuse, refer to the [operating manual](#) and [user manual](#) of the R&S OSP.

Connect the power supply connector to an isolated ground receptacle of your mains grid. The supply voltage must be between 110 VAC and 240 VAC with frequencies ranging from 50 Hz to 60 Hz. Within these ranges, the device automatically adapts to the supply voltage. To turn the power on or off, put the AC power switch into position I (on) or 0 (off).

8 Operating the modules

Observe the safety instructions in [Chapter 4.1, "Putting into operation"](#), on page 21.


The base and extension modules [mounted](#) in the switch units are remotely operated via Ethernet (LAN) by the test software R&S WMS32. Use a software version as specified on the rear cover page of this manual.

Manual operation of the modules or remote control operation via the R&S OSP Panel software tool is not possible.

The modules R&S OSP-B157W8, R&S OSP-B157W8PLUS and R&S OSP-B157WX are delivered with a factory calibration, conforming to the standards of the German national accreditation body. The calibration data is saved in the modules.

For configuration and operation of the modules, their remote control, measurement examples, maintenance and troubleshooting, refer to the following documentation:

- The [user manual](#) of the R&S OSP-B157W8, R&S OSP-B157W8PLUS, R&S OSP-B157WX and R&S OSP-B157WN
- The [user manual](#) of the 2nd-generation R&S OSP switch units
Or the [operating manual](#) of the legacy R&S OSP switch units (see chapter on R&S EMC32 software)
- The [help function](#) of the R&S WMS32 software package, which is part of the [R&S RF Test Suite](#) (requires a license)

 We recommend that you [Use RF connector adapters as port savers](#) for the DUT ports of the module R&S OSP-B157W8 and R&S OSP-B157W8PLUS.

9 Contacting customer support

Technical support – where and when you need it

For quick, expert help with any Rohde & Schwarz product, contact our customer support center. A team of highly qualified engineers provides support and works with you to find a solution to your query on any aspect of the operation, programming or applications of Rohde & Schwarz products.

Contact information

Contact our customer support center at www.rohde-schwarz.com/support, or follow this QR code:



Figure 9-1: QR code to the Rohde & Schwarz support page

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