

R&S®OSP-B157W8(PLUS)

R&S®OSP-B157WX

8-Port Modules for Switch Units

Getting Started



1178580802

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)

Software:

- R&S®RF Test Suite (R&S®EMC32 / R&S®AMS32 / R&S®WMS32), V 10.60 and later
- R&S®OSP Panel, V 02.47 and later

© 2019 Rohde & Schwarz GmbH & Co. KG

Mühlendorfstr. 15, 81671 München, Germany

Phone: +49 89 41 29 - 0

Fax: +49 89 41 29 12 164

Email: info@rohde-schwarz.com

Internet: www.rohde-schwarz.com

Subject to change – Data without tolerance limits is not binding.

R&S® is a registered trademark of Rohde & Schwarz GmbH & Co. KG.

Trade names are trademarks of the owners.

1178.5808.02 | Version 03 | R&S®OSP-B157W8^(PLUS) R&S®OSP-B157WX

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

Contents

1 Preface.....	5
2 Documentation Overview.....	9
2.1 Getting Started Manual.....	9
2.2 User Manual.....	9
2.3 Operating Manual of the Switch Unit.....	9
2.4 Help.....	10
2.5 Basic Safety Instructions.....	10
2.6 R&S OSP on the Internet.....	10
3 Preparing for Use.....	13
3.1 Unpacking and Checking.....	13
3.2 Mounting the Base Module.....	13
3.3 Mounting the Extension Module.....	19
3.4 Installing or Updating the Firmware.....	24
3.5 Putting into Operation.....	25
4 Tour of the Base Module.....	30
4.1 Connecting Devices to the Base Module.....	32
5 Tour of the Extension Module.....	35
5.1 Connecting Devices and a Base Module to the Extension Module	37
6 Operating the Modules.....	40
Index.....	42

1 Preface

The R&S OSP-B157W8 or R&S OSP-B157W8PLUS and R&S OSP-B157WX are standard 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 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 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 and 5 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 302 502, ETSI EN 300 440 and others.



Intended use

The R&S OSP-B157W8, R&S OSP-B157W8PLUS and R&S OSP-B157WX are designated for the development, production and verification of electronic components and devices in industrial and laboratory environments. Use the modules only for their designated purpose. Observe the operating conditions and performance limits stated in the data sheets.



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 "**extension module**".
- The R&S OSP is referred to as "**switch unit**".

Integration

- The base module R&S OSP-B157W8 or R&S OSP-B157W8PLUS is (or must be) integrated in an R&S OSP150 or R&S OSP120 switch unit.
- The extension module R&S OSP-B157WX is (or must be) integrated in an R&S OSP120 switch unit (not in an R&S OSP150).

Except for one optional additional single-slot module in slot A11 of the switch unit, no additional modules can be installed in a single switch unit beside one R&S OSP-B157W8, one R&S OSP-B157W8PLUS or one R&S OSP-B157WX. For all information related to the R&S OSP switch units, refer to their [operating manual](#).

Frequency ranges

Basically, the modules are designed to cover the 2.4 GHz and 5 GHz frequency bands. 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. 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 is 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, approximately at 100 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.

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

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 the 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 base module R&S OSP-B157W8PLUS

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

- Frequency range for signalling up to 7.5 GHz
- Additional step attenuator R2 for an extended attenuation range, see [Figure 4-3](#)

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 frequency extension module R&S OSP-B157WX

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 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.
- Additionally, 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.



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.

2 Documentation Overview

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

www.rohde-schwarz.com/manual/osp

2.1 Getting Started Manual

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

2.2 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.

2.3 Operating Manual of the Switch Unit

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

2.4 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 also be operated by the software R&S OSP Panel.

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.

2.5 Basic Safety Instructions

Contains safety instructions, operating conditions and further important information. The printed document is delivered with the switch unit.

2.6 R&S OSP on the Internet

The website www.rohde-schwarz.com/product/osp provides:

- 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 for R&S OSP switch units)
- [Brochures and Data Sheets](#)
- [Application Notes](#)
- [Drivers](#)
- The current firmware version with [OSA and release notes](#)
- The [R&S OSP Panel](#) software with [release notes](#)

- Related [documents and articles](#)
- News and information on software updates
- [Service Manual](#) (only for registered users)

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.

2.6.1 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.

2.6.2 Application Notes

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

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

2.6.3 Drivers

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

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

2.6.4 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 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.

2.6.5 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.

3 Preparing for Use

• Unpacking and Checking.....	13
• Mounting the Base Module.....	13
• Mounting the Extension Module.....	19
• Installing or Updating the Firmware.....	24
• Putting into Operation.....	25

3.1 Unpacking and Checking

If your delivery includes a module that is not mounted in a switch unit, be especially careful with unpacking the module, which is not protected in a casing.

Check the delivery for completeness according to the included shipment list. If the delivery is incomplete, contact Rohde & Schwarz.

Retain the original packing material. If the instrument needs to be transported or shipped later, you can use the material to protect the control elements and connectors.

Mounting modules into switch units

- If you have received one or more modules that are **already integrated** in switch units, you can skip the chapters [Mounting the Base Module](#) and [Mounting the Extension Module](#). Proceed with [Chapter 3.5, "Putting into Operation"](#), on page 25.
- If you have received one or more modules that are **not yet integrated** in switch units, proceed with chapters [Mounting the Base Module](#) and [Mounting the Extension Module](#).

3.2 Mounting the Base Module

Mounting the base module R&S OSP-B157W8 or R&S OSP-B157W8PLUS into an R&S OSP150 or R&S OSP120 switch unit requires the space of two slots: rear slots A12 and A13 together with front slots A12F and A13F. Typically, the rear slot A11 remains free, but optionally it can remain occupied by a single-slot module

(not operational). Only one base module fits into one R&S OSP150 or R&S OSP120 switch unit.

⚠ WARNING**Risk of electric shock**

Opening a switch unit implies the risk of touching current-carrying components and suffering an electric shock, if the device is not properly disconnected from grid power.

Before opening the casing, ensure that the switch unit is disconnected from the power supply by removing the plug from the rear AC power connector.

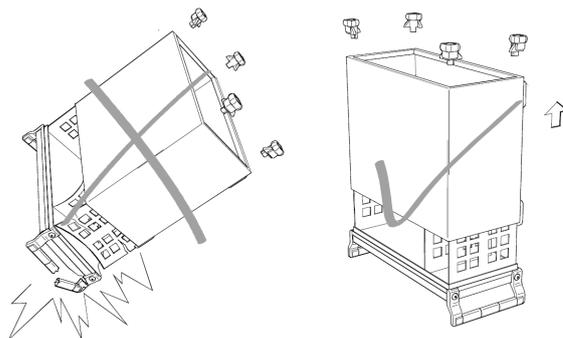
Observe the safety instructions for units with a removable casing.

Carefully follow the step-by-step instructions for module replacement to avoid injury and to help ensure safe operation.

⚠ WARNING**Risk of injuries**

When removing the rear feet, the switch unit can slip out of its casing.

To avoid the risk of personal injuries and any damage, put the switch unit onto its front handles before removing the rear feet and taking off the casing.



When mounting the casing back onto the switch unit, take care not to pinch your fingers. Also pay attention not to damage or pull off protruding parts, especially cables.

Screw the rear feet back on immediately after mounting the casing. Do not move the switch unit with the rear feet missing.

**Removing an existing (old) R&S OSP-B157 module**

If you want to install the R&S OSP-B157W8 or R&S OSP-B157W8PLUS in a switch unit, which is occupied by an existing module (for example R&S OSP-B157), first remove the existing module.

Remove the existing module in the reverse order of the mounting procedure, described in the [service manual](#) of the R&S OSP (1505.3896.82), for example chapter "Replacing the Option OSP-B157".

Mounting procedure for the R&S OSP-B157W8 or R&S OSP-B157W8PLUS

For mounting the module into an R&S OSP150 or R&S OSP120 switch unit:

1. Turn off the switch unit.
2. Unplug the power supply cable.
3. Disconnect all other cables, too.
4. If the switch unit holds any modules, remove these modules and their ribbon cables, except for a module in the rear slot A11.
5. If the rear slot A11 of the switch unit holds a module, we recommend removing it. (Optionally you can leave it there, but you cannot operate it due to missing control interfaces.)
6. If you have removed a module from rear slot A11, close the open slot with a blind plate, using the same screws that fixed the module.
7. If blind plates cover unused front slots A12F or A13F of the switch unit, remove these blind plates.
8. If blind plates cover unused rear slots A12 or A13 of the switch unit, remove these blind plates.
9. If a blind plate covers an unused rear slot A11 of the switch unit, leave it there.
10. Place the switch unit on its front handles.
11. Optionally, if at the switch unit's feet there are yellow stickers that you want to save, remove the blue rubber bumpers from the feet.
12. Screw off the switch unit's feet.
Removing these screws releases the switch unit's casing.
13. Push the switch unit's casing upwards.
14. Remove the casing from the switch unit.

15. Lay down the switch unit, with its open side facing upwards.
16. Unplug the CAN bus cable (W3) from connector X8 on the switch unit's main board and from the CAN connector on the switch unit's rear panel.
17. Remove the CAN connector from the switch unit's rear panel.
18. If your switch unit is an R&S OSP120:
 - Unplug the LAN cable (W4) from the RJ45 connector on the processor board and from the LAN connector on the switch unit's rear panel.
 - Remove the LAN connector from the switch unit's rear panel.
19. Remove the cable holder of the CAN (and LAN) cable.
20. Remove the rear panel strut between slot A12 and slot A13.
21. Screw the rear plate of the module to the switch unit's rear panel (10 counter-sunk screws, type Torx M2.5x8, included in the delivery; [step 34](#) uses 3 more of these screws).
22. Insert the guide cage into the switch unit's free space, with the protruding flange (item (2) in [Figure 3-1](#)) directed towards the switch unit's power supply and control board, as in [Figure 3-3](#).

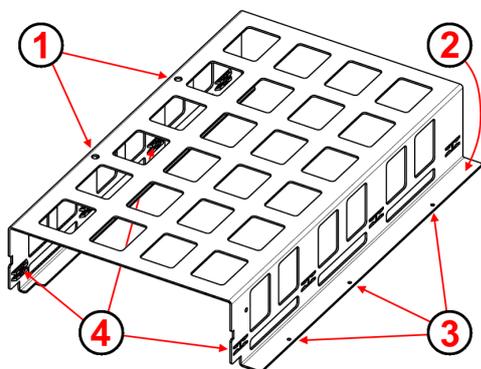


Figure 3-1: Guide cage for holding the module in the switch unit

- 1 = 2 holes for accessing 2 screw hole positions below
- 2 = Protruding flange
- 3 = 3 screw holes
- 4 = Guiding structure elements, into which you slide the module in [step 26](#)

23. Screw the guide cage to the switch unit's base plate (5 cylinder-head screws, type Torx M2.5x6, included in the delivery), items (1) and (3) in [Figure 3-1](#) or (5) and (6) in [Figure 3-3](#).

Mounting the Base Module

24. Connect the 4-pole connector at the short end of cable W20 (4 wires, red/black/black/gray) to the power input connector X201 of the module's RF board, item (9) in [Figure 3-3](#).
25. Connect the 4-pole connector at the long end of cable W20 (2 wires, brown/black) to the power input connector X203 of the module's data acquisition board, item (10) in [Figure 3-3](#).
26. In the open front panel of the switch unit, place the module's rear end just into the guiding structure elements of the guide cage, as shown in [Figure 3-3](#).

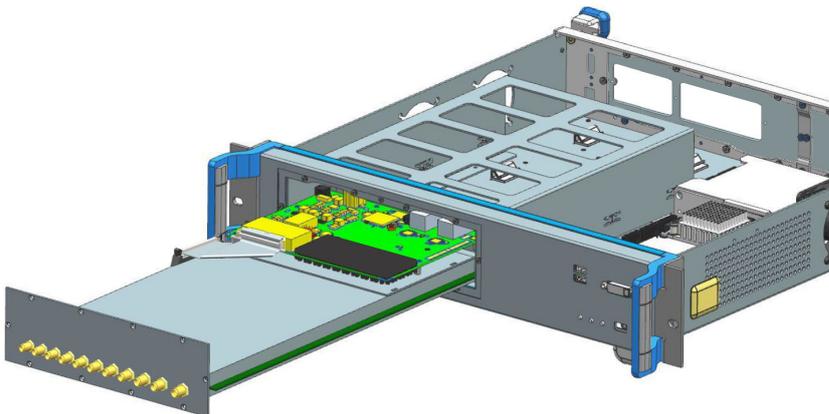


Figure 3-2: Placing the base module in the opened switch unit, before inserting it

27. Do not yet insert the module into the switch unit.
28. Insert the single end of cable W20 (with the 12-pole connector) through the open front panel of the switch unit while **passing the guide cage on its right-hand side**.
As a result, the cable enters the switch unit through a narrow gap between the front panel and the guide cage.
29. Connect the 12-pole connector of cable W20 to connector X12 on the switch unit's control board, item (8) in [Figure 3-3](#).
30. Push the module 80% of its length into the switch unit.
31. Fix the middle part of cable W20 by using the cable holder close to the front of the switch unit, item (11) in [Figure 3-3](#).
32. Push the module all the way into the switch unit, until the module's cover panel is level with the switch unit (item (2) in [Figure 3-3](#)).

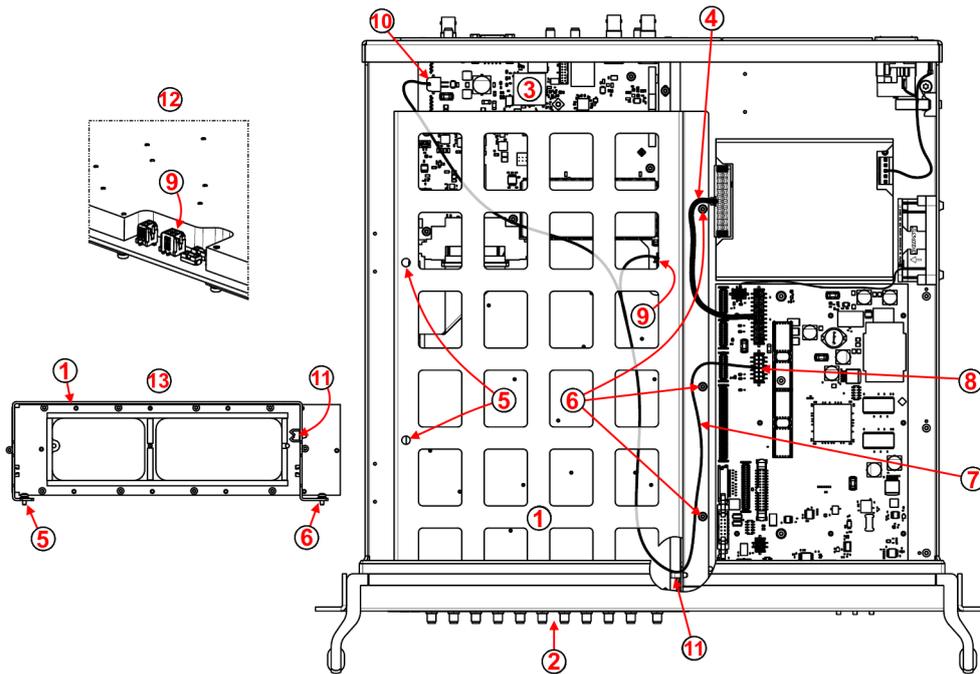


Figure 3-3: Opened switch unit with guide cage mounted and base module inserted

- 1 = Guide cage, mounted in the switch unit
- 2 = Front plate of the inserted module
- 3 = Rear end of the inserted module
- 4 = Secondary power cable for the control board, already existing in the switch unit
- 5 = 2 screws that you can reach through holes in the upper plate of the guide cage, fixing its left side
- 6 = 3 screws, fixing the protruding flange at the right side of the guide cage (underneath the secondary power cable)
- 7 = Cable W20 (here shown as partly visible through the guide cage)
- 8 = 12-pole connector of cable W20, connected to connector X12 of the switch unit's control board
- 9 = 4-pole connector at the short end of cable W20 (4 wires), plugged into connector X201 on the module's RF board (see detail at left-hand side)
- 10 = 4-pole connector at the long end of cable W20 (2 wires), plugged into connector X203 on the module's data acquisition board
- 11 = Cable holder for fixing cable W20
- 12 = Detail: identifying the connector for the short end (9) of cable W20
- 13 = Detail: view from the front of the switch unit (front panel not shown) through the empty guide cage towards the rear panel

33. Screw the module's front plate to the switch unit's front panel (10 countersunk screws, type Torx M2.5x6, included in the delivery).

34. Screw the module's rear plate, which you have already attached to the switch unit's rear panel ([step 21](#)), to the module (3 countersunk screws, type Torx M2.5x8, included in the delivery).

35. Place the switch unit on its front handles.
36. Shift the casing over the unit.
37. Push the switch unit's casing down to the stop.
38. Screw on the switch unit's feet.
Tightening these screws fixes the switch unit's casing to the unit.
39. If you have removed the blue rubber bumpers from the switch unit's feet, reattach them.
40. Lay down the unit.
41. Reconnect the power cable to the unit.

3.3 Mounting the Extension Module

Mounting the frequency extension module R&S OSP-B157WX into an R&S OSP120 switch unit requires the space of two slots: rear slots A12 and A13 together with front slots A12F and A13F. Typically, the rear slot A11 remains free, but optionally it can remain occupied by a single-slot module (not operational). Only one R&S OSP-B157WX module fits into one R&S OSP120 switch unit.

⚠ WARNING**Risk of electric shock**

Opening a switch unit implies the risk of touching current-carrying components and suffering an electric shock, if the device is not properly disconnected from grid power.

Before opening the casing, ensure that the switch unit is disconnected from the power supply by removing the plug from the rear AC power connector.

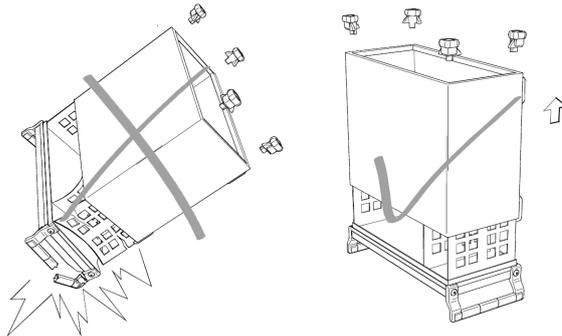
Observe the safety instructions for units with a removable casing.

Carefully follow the step-by-step instructions for module replacement to avoid injury and to help ensure safe operation.

⚠ WARNING**Risk of injuries**

When removing the rear feet, the switch unit can slip out of its casing.

To avoid the risk of personal injuries and any damage, put the switch unit onto its front handles before removing the rear feet and taking off the casing.



When mounting the casing back onto the switch unit, take care not to pinch your fingers. Also pay attention not to damage or pull off protruding parts, especially cables.

Screw the rear feet back on immediately after mounting the casing. Do not move the switch unit with the rear feet missing.

**Removing an existing (old) R&S OSP-B157 module**

If you want to install the R&S OSP-B157WX in a switch unit, which is occupied by an existing module (for example R&S OSP-B157), first remove the existing module.

Remove the existing module in the reverse order of the mounting procedure, described in the [service manual](#) of the R&S OSP (1505.3896.82), for example chapter "Replacing the Option OSP-B157".

Mounting procedure for the R&S OSP-B157WX

For mounting the module into an R&S OSP120 switch unit:

1. Turn off the switch unit.
2. Unplug the power supply cable.
3. Disconnect all other cables, too.

Mounting the Extension Module

4. If the switch unit holds any modules, remove these modules and their ribbon cables, except for a module in the rear slot A11.
5. If the rear slot A11 of the switch unit holds a module, we recommend removing it. (Optionally you can leave it there, but you cannot operate it due to missing control interfaces.)
6. If you have removed a module from rear slot A11, close the open slot with a blind plate, using the same screws that fixed the module.
7. If a blind plate covers the unused rear slot A11 of the switch unit, leave it there.
8. If you have removed one or two modules from rear slots A12 or A13, close the open slots with blind plates, using the same screws that fixed the modules.
9. If blind plates cover unused rear slots A12 or A13 of the switch unit, leave them there.
10. If blind plates cover unused front slots A12F or A13F of the switch unit, remove these blind plates.
11. Place the switch unit on its front handles.
12. Optionally, if at the switch unit's feet there are yellow stickers that you want to save, remove the blue rubber bumpers from the feet.
13. Screw off the switch unit's feet.
Removing these screws releases the switch unit's casing.
14. Push the switch unit's casing upwards.
15. Remove the casing from the switch unit.
16. Lay down the switch unit, with its open side facing upwards.
17. Unplug the CAN bus cable (W3) from connector X8 on the switch unit's main board, but not from the CAN connector on the switch unit's rear panel.
18. Unplug the LAN cable (W4) from the RJ45 connector on the processor board, but not from the LAN connector on the switch unit's rear panel.
19. Remove the cable holder of the CAN and LAN cable.
20. Screw the adapter plate (item (1) in [Figure 3-4](#)), which comes separately, to the base plate of the switch unit (12 cylinder-head screws, type Torx M2.5x6, included in the delivery).

Mounting the Extension Module

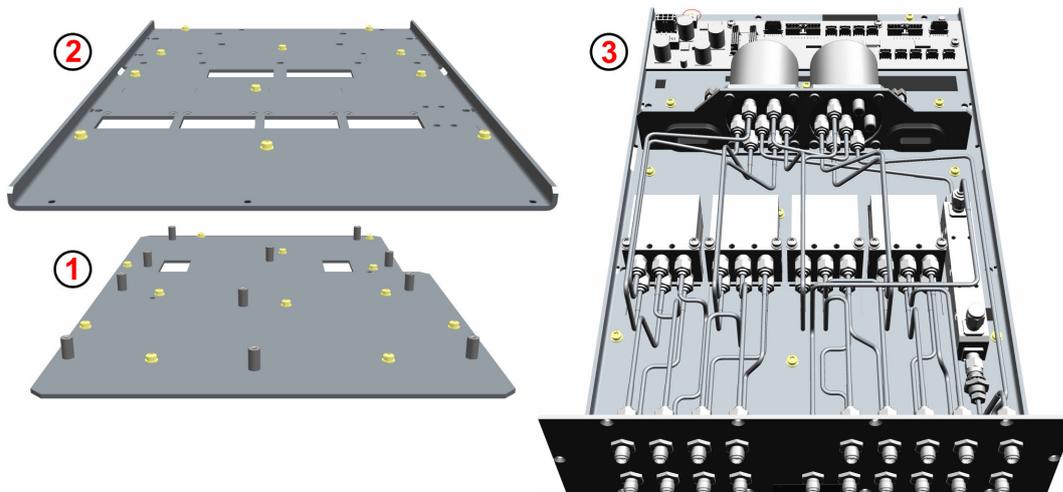


Figure 3-4: Overview of the parts for the fixation of module R&S OSP-B157WX

- 1 = Adapter plate with 11 threaded insert nuts (dark gray) and 12 screws (yellow) that fix the adapter plate to the base plate of the switch unit
- 2 = Ground plate of the module, here in an isolated presentation for better view of the 11 screws (yellow) that fix the module to the adapter plate
- 3 = Top view of the complete module with the same 11 screws highlighted as in the isolated presentation (2)

21. Insert the module into the switch unit from the front side (item (3) in [Figure 3-5](#)).

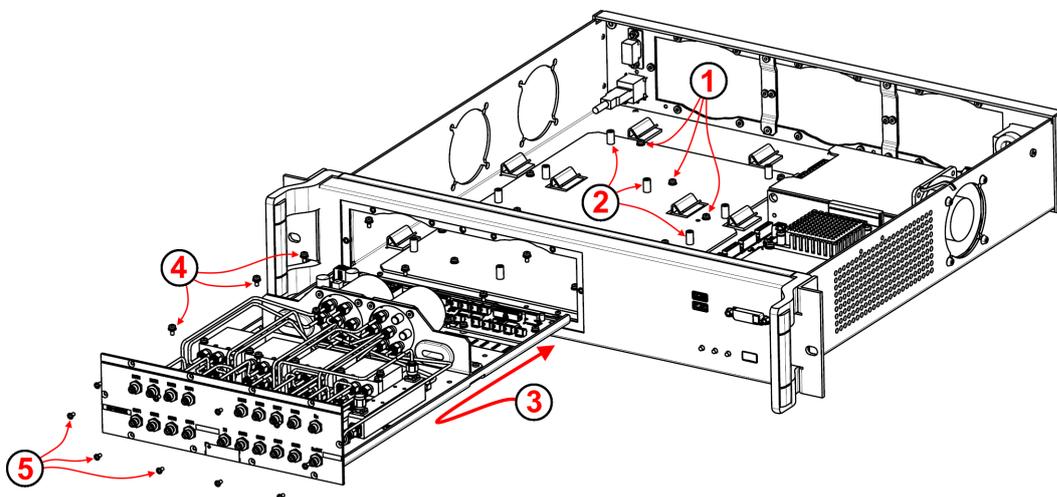


Figure 3-5: Inserting the module R&S OSP-B157WX

- 1 = 12 screws that fix the adapter plate to the base plate of the switch unit
- 2 = 11 threaded insert nuts that carry the module
- 3 = Inserting the module
- 4 = 11 screws that fix the module's ground plate to the adapter plate
- 5 = 10 countersunk screws that fix the module's cover panel to the front panel of the switch unit

Mounting the Extension Module

22. Push the module all the way into the switch unit, until the module's cover panel is level with the switch unit.
23. Screw the ground plate (item (2) and (3) in [Figure 3-4](#)) to the adapter plate (11 cylinder-head screws, type Torx M2.5x6, included in the delivery).
24. Screw the module's front plate to the switch unit's front panel (item (5) in [Figure 3-5](#), 10 countersunk screws, type Torx M2.5x6, included in the delivery).
25. Connect the cables (included in the delivery) as follows between the **interface board** of the module R&S OSP-B157WX and the **main board** of the switch unit:

Interface board connector	Cable	Main board connector
X15 (power input)	6-wire cable	X12 (power supply)
X13 (interface slot A12)	26-pin ribbon cable	X4 (interface slot A12)
X19 (interface slot A13)	26-pin ribbon cable	X13 (interface slot A13)

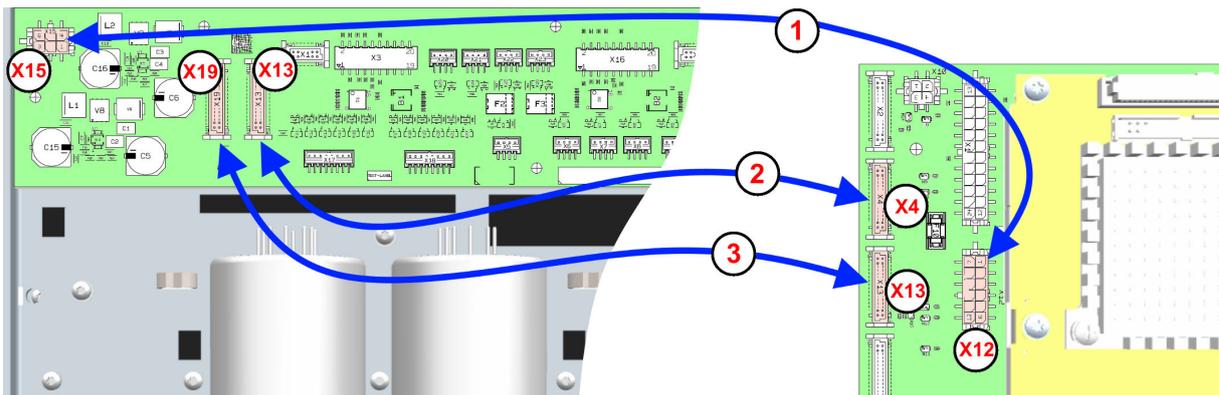


Figure 3-6: Cable connections for controlling the frequency extension module

- Left = Interface board of the module R&S OSP-B157WX
- Right = Main board of the switch unit
- 1 = 6-wire power cable
- 2 and 3 = 26-pin ribbon cables
- X... = Connector numbers, see labels on the boards

26. Reconnect the CAN cable (W3) to connector X8 on the switch unit's main board).
27. Reconnect the LAN cable (W4) to the RJ45 connector on the switch unit's processor board.
28. Place the switch unit on its front handles.
29. Shift the casing over the unit.

30. Push the switch unit's casing down to the stop.
31. Screw on the switch unit's feet.
Tightening these screws fixes the switch unit's casing to the unit.
32. If you have removed the blue rubber bumpers from the switch unit's feet, reattach them.
33. Lay down the unit.
34. Reconnect the power cable to the unit.

3.4 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 3-7](#)) to open this dialog:

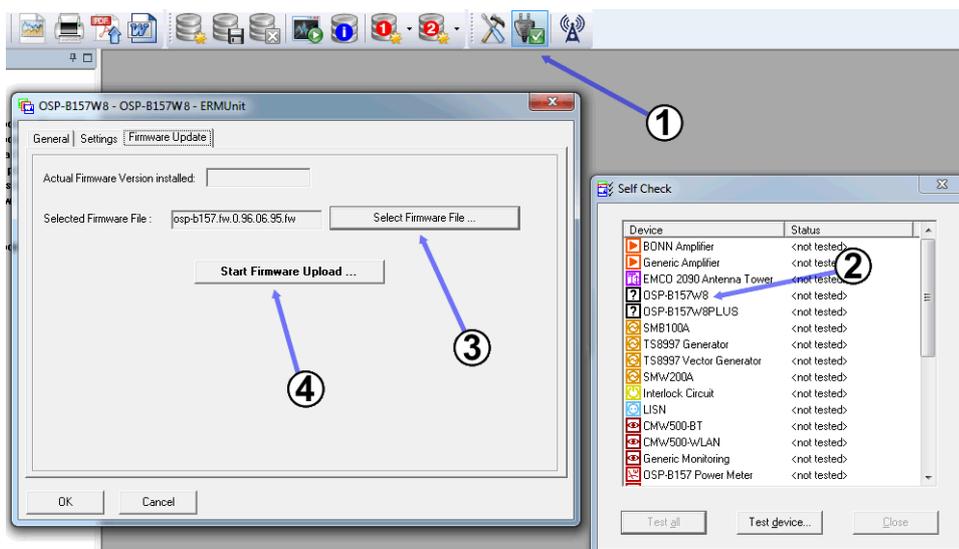


Figure 3-7: Firmware installation or update in R&S WMS32

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 and click "Test device".

3. In the "Firmware Update" tab of the next dialog, click "Select Firmware File" and browse to the correct file.
4. 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.

3.5 Putting into Operation

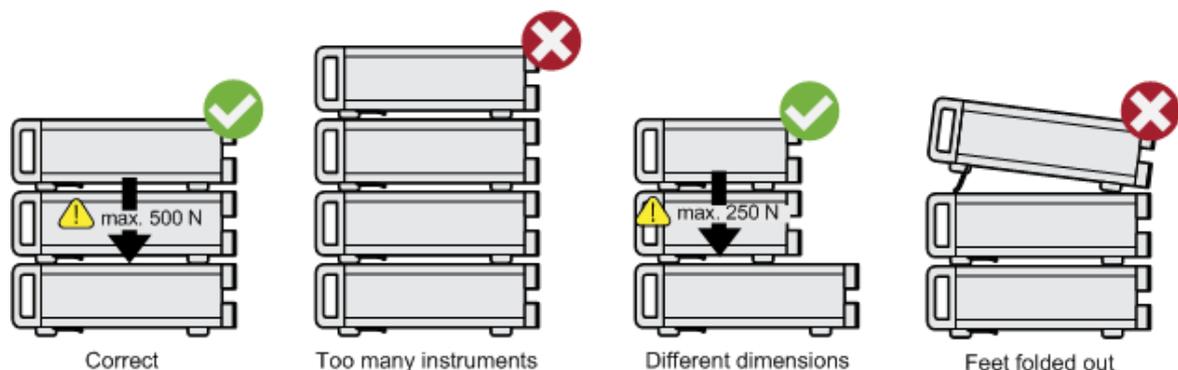
For using the base module and the extension module in the R&S TS8997 Regulatory Test System for Wireless Devices, mount the switch units into the test system's 19" rack. This procedure is described in the [operating manual](#) of the R&S OSP and in the mounting instructions supplied with the R&S ZZA-211 rack adapter (order number 1096.3260.00).

⚠ WARNING**Risk of injury when stacking instruments**

A stack of instruments can tilt over and cause injury if not stacked correctly. Furthermore, the instruments at the bottom of the stack can be damaged due to the load imposed by the instruments on top.

Observe the following instructions when stacking instruments:

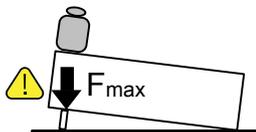
- Never stack more than three instruments. If you need to stack more than three instruments, install them in a rack.
- The overall load imposed on the lowest instrument must not exceed 500 N.
- It is best if all instruments have the same dimensions (width and length). If you need to stack smaller instruments on the top, the overall load imposed on the lowest instrument must not exceed 250 N.
- If the instruments have foldable feet, fold them in completely.



⚠ CAUTION**Risk of injury if feet are folded out**

The feet can fold in if they are not folded out completely or if the instrument is shifted, which can cause damage or injury.

- Fold the feet completely in or out to ensure stability of the instrument. Never shift the instrument when the feet are folded out.
- When the feet are folded out, do not work under the instrument or place anything underneath.
- The feet can break if they are overloaded. The overall load on the folded-out feet must not exceed 100 N.

**NOTICE****Risk of instrument damage due to insufficient airflow in a rack**

If you mount several instruments in a rack, you need an efficient ventilation concept to ensure that the instruments do not overheat. Insufficient airflow for a longer period can disturb the operation and even cause damage.

For putting the modules into operation after they are mounted inside a switch unit and optionally inside a rack, proceed as described in the [operating manual](#) of the R&S OSP. This manual also contains valuable information on the switch unit's setup, on remote operation, on working with the operating system, and much more.



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.

For [operating](#) the R&S OSP-B157W8 or R&S OSP-B157W8PLUS and the R&S OSP-B157WX, refer to their **user manual**, available for download at www.rohde-schwarz.com/manual/osp.



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 3-8: 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.

Refer to the switch unit's [operating manual](#) for more operation information regarding, for example, power supply, connection, grounding, ambient conditions, ventilation, system integration, switching on or reaching the currentless state.

4 Tour of the Base Module

The base module R&S OSP-B157W8 or R&S OSP-B157W8PLUS must be **mounted** in an R&S OSP150 or R&S OSP120 switch unit.

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

Operation is described in the module's **user manual** and in the **operating manual** of the R&S OSP switch units (see chapter on R&S EMC32 software).

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

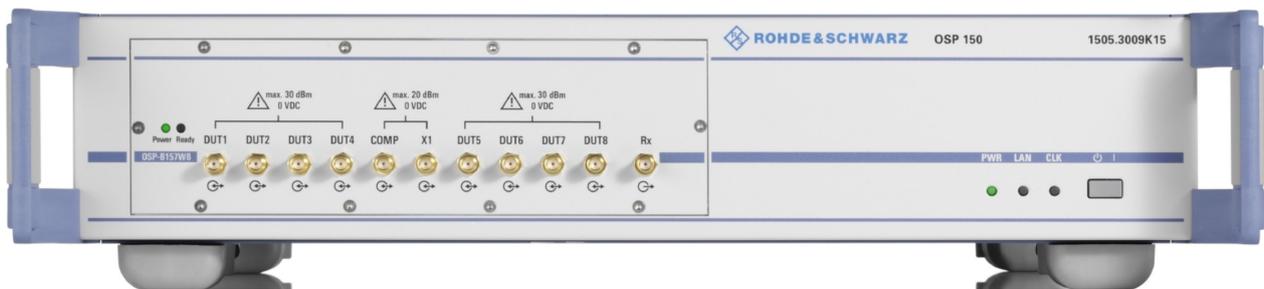


Figure 4-1: R&S OSP-B157W8 mounted in R&S OSP150 (front panel view)

Less frequently used connectors are on the rear panel:



Figure 4-2: R&S OSP-B157W8 mounted in R&S OSP150 (rear panel view)

For an overview of the connectors, see [Table 4-1](#).

 As the LAN and CAN connectors on the rear panel of the switch unit are disabled, use the RJ45 LAN connector of the module R&S OSP-B157W8 or R&S OSP-B157W8PLUS itself (top center in [Figure 4-2](#)) for remote control.

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

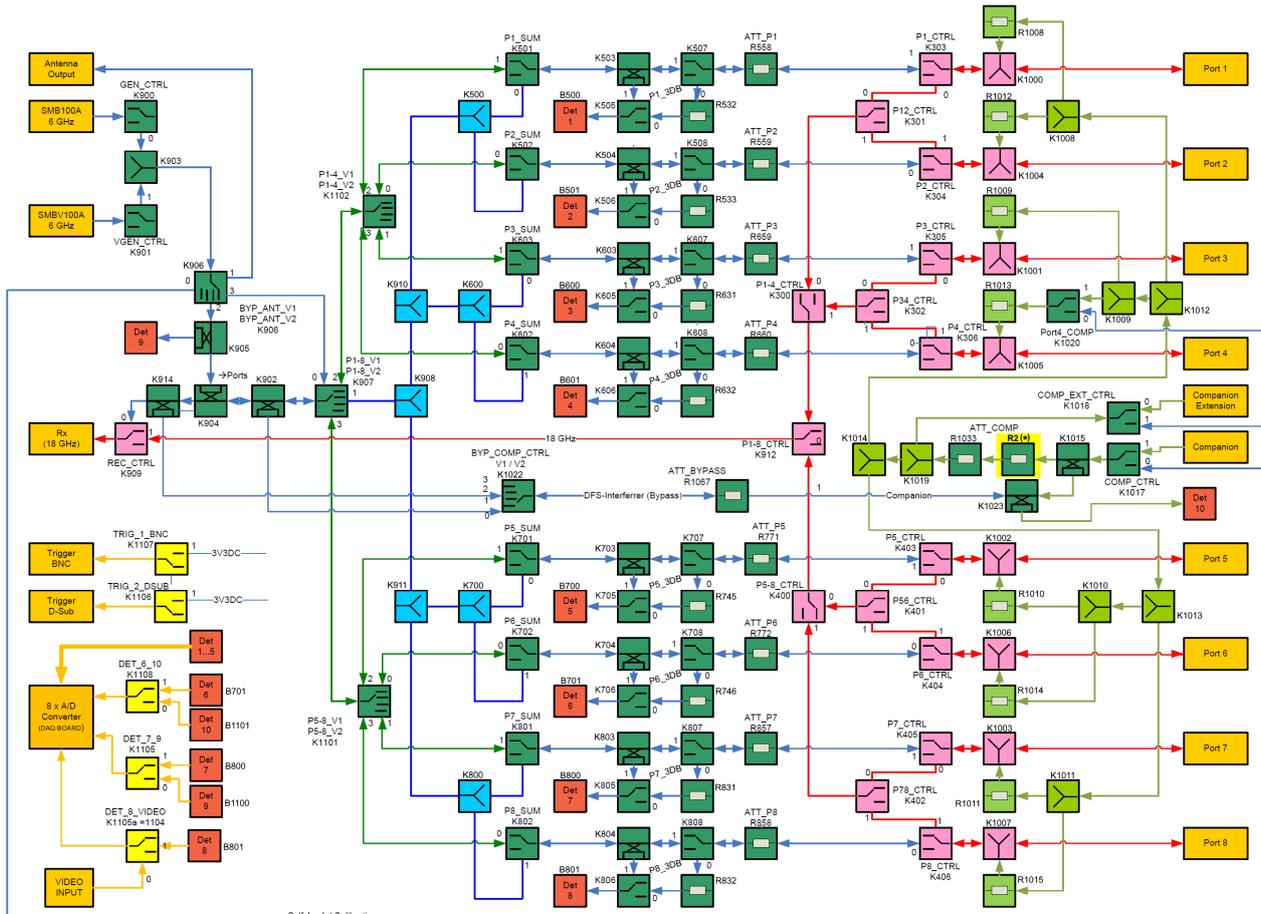


Figure 4-3: Circuit diagram of the R&S OSP-B157W8 and R&S OSP-B157W8PLUS RF board

- 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.
 - 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.

4.1 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 4-1](#).

NOTICE

Observe maximum input power and no DC voltage

All front connectors and some rear connectors have the following limitations:

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

If the input signals exceed these limits, the internal circuits of the module can be damaged.

Do not exceed the dBm levels and "0 VDC" limits that are indicated on the front and rear panels.

Connecting Devices to the Base Module

Depending on the switch unit that you use, the following additional connectors are available:

- If you use an R&S OSP150 switch unit, its rear panel has a power supply connector with fuse.
- If you use an R&S OSP120 switch unit, its front panel has a DVI video monitor interface and two USB 2.0 ports (all inactive in this setup). Its rear panel has a power supply connector with fuse.

For information on the various connectors of the switch unit and for replacing the fuse, refer to the [operating 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 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).

The following table describes all other external connectors of the base module.

Table 4-1: 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

Connecting Devices to the Base Module

Panel	Label	Direction	Signal	Type	Value range
Rear	Trig 1...3	In	Trigger input Ch1, Ch2, Ch3	Digital D-Sub 9 Pin 1,2,3: signal 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 [extension module](#) R&S OSP-B157WX, make the following changes to the connections listed above:

- (*)
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 5-4](#).
- (**)
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 5-4](#).

5 Tour of the Extension Module

The frequency extension module R&S OSP-B157WX must be [mounted](#) in an R&S OSP120 switch unit.

This switch unit has front connectors for a USB keyboard, USB mouse and DVI display for manual operation. However, we recommend connecting the switch unit via Ethernet (LAN) to your control computer for remote operation by the software R&S OSP Panel.

Operation is described in the module's [user manual](#) and in the [operating manual](#) of the R&S OSP switch units.

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 5-1: R&S OSP-B157WX mounted in R&S OSP120 (front panel view)

The module has no rear connectors, but just blind plates. The only connectors on the rear panel are the switch unit's power supply, LAN interface and CAN bus port.



Figure 5-2: R&S OSP-B157WX mounted in R&S OSP120 (rear panel view)



Use the switch unit's LAN connector for remote control

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.

For an overview of the connectors, see [Chapter 5.1](#).

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

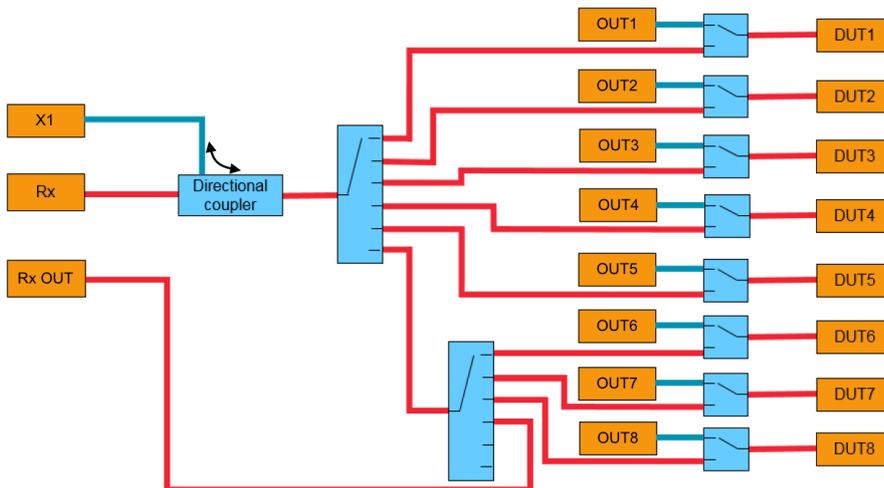


Figure 5-3: Circuit diagram of the R&S OSP-B157WX RF board

- 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

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**

You must 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.

5.1 Connecting Devices and a Base Module to the 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.

NOTICE**Observe maximum 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, be aware of the following limitations for the front ports:

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

If the forwarded signals exceed these limits, the internal circuits of the base module can be damaged.

Do not exceed the dBm levels and "0 VDC" limits that are indicated on the front (and rear) panels of the R&S OSP-B157W8 or R&S OSP-B157W8PLUS.

Connecting 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.

Connecting Devices and a Base Module to the Extension Module

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.

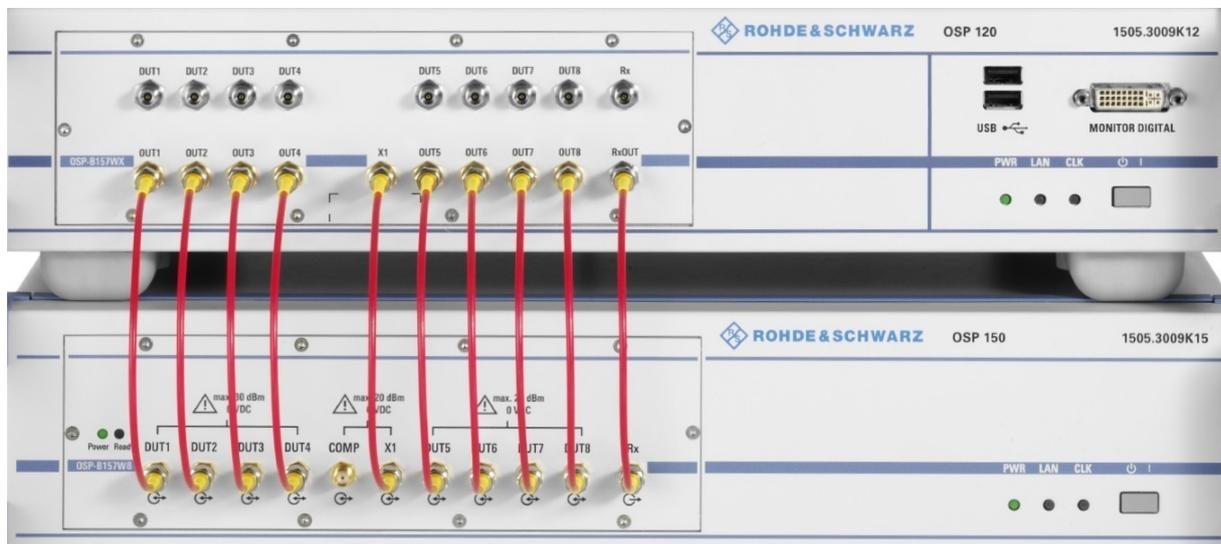


Figure 5-4: Connected modules, upper = R&S OSP-B157WX, lower = R&S OSP-B157W8 or R&S OSP-B157W8PLUS

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 of the switch unit's LAN port. Do not use the CAN port for controlling the R&S OSP-B157WX.
9. 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

Connecting Devices and a Base Module to the Extension Module

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 5-1: External connectors overview of the R&S OSP-B157WX

Panel	Label	Direction	Signal	Type	Value 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 6 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 SMA	1 GHz to 40 GHz
Front	RxOUT	In	Spectrum analyzer / test receiver (from the base module)	RF SMA	1 GHz to 6 GHz
Front	USB (2x, only R&S OSP120)		disabled		
Front	MONITOR DIGITAL (only R&S OSP120)		disabled		
Rear	LAN	BiDir	Ethernet	Digital RJ45	
Rear	CAN		disabled		



Note that "**RxOUT**" is - in spite of 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.

6 Operating the Modules

Observe the safety instructions in [Chapter 3.5, "Putting into Operation"](#), on page 25.

NOTICE

Risk of instrument damage due to inappropriate operating conditions

An unsuitable operating site or test setup can damage the instrument and connected devices. Before switching on the instrument, observe the information on appropriate operating conditions provided in the data sheet. In particular, ensure the following:

- All fan openings are unobstructed and the airflow perforations are unimpeded. A minimum distance of 10 cm to other objects is recommended.
- The instrument is dry and shows no sign of condensation.
- The instrument is positioned as described in the following sections.
- The ambient temperature does not exceed the range specified in the data sheet.
- Signal levels at the input connectors are all within the specified ranges.
- Signal outputs are connected correctly and are not overloaded.

The base and extension modules [mounted](#) in the switch units are remotely operated via Ethernet (LAN) by the test software R&S WMS32 (V10.60 or later).

Additionally, configuration of the R&S OSP-B157WX requires the software R&S OSP Panel.

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 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 and R&S OSP-B157WX
- The **operating manual** of the 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.

Index

Symbols

2.4 GHz frequency band	5
5 GHz frequency band	5
6 GHz	6
7.5 GHz	7
18 GHz	6
40 GHz	7

A

Adapters (connector)	29
Airflow	27
Application notes	11
Attenuation, extended range	7

B

Brochures	11
-----------------	----

C

Checking	13
Circuit diagram	
R&S OSP-B157W8 / R&S OSP-	
B157W8PLUS	31
R&S OSP-B157WX	36
Configuration	
Memory	28
Connecting devices	
R&S OSP-B157W8 / R&S OSP-	
B157W8PLUS	32
R&S OSP-B157WX	37
Connectors	
Adapters	29
Overview (base module)	33
Overview (extension module)	37

D

Data sheets	11
Drivers	11

F

Frequency ranges	6
Front panel	
R&S OSP-B157W8 / R&S OSP-	
B157W8PLUS	30
R&S OSP-B157WX	35

G

Getting started	9
-----------------------	---

H

Help	10
------------	----

I

Integration	5
Intended use	5

K

Key features	
R&S OSP-B157W8	6
R&S OSP-B157W8PLUS	7
R&S OSP-B157WX	7

L

LAN

R&S OSP-B157W8 / R&S OSP-	
B157W8PLUS	31
R&S OSP-B157WX	36
Level (input power) limit	32, 37
Load (weight) maximum	26

M

Manuals

Getting started manual	9
Help	10
Internet	10
Operating manual (switch unit)	9
Service manual	12
User manual (modules)	9
Mating cycles	29
Module	5
Existing (old) R&S OSP-B157	15, 20
Mounting	
R&S OSP-B157W8 / R&S OSP-	
B157W8PLUS	13
R&S OSP-B157WX	19

O

Operating manual	9
------------------------	---

P

Port savers	29
Power (input level) limit	32, 37

R

R&S OSP-B157 (existing old module) 15,
20

Rear panel

R&S OSP-B157W8 / R&S OSP-
B157W8PLUS30

R&S OSP-B157WX 35

Release notes 11

Removing

Existing module R&S OSP-B157 .. 15, 20

RF board

R&S OSP-B157W8 / R&S OSP-
B157W8PLUS31

R&S OSP-B157WX 36

RF connectors 29

S

Safety instructions 10

Screenshots 8

Service manual12

Stacking26

Switch unit 5

U

Unpacking 13

User manual 9

V

Ventilation27