R&S®ESCU
Pre-amplifier for Emission Measurement
User Manual

5602800602
Version 02

ROHDE&SCHWARZ
Make ideas real

This manual applies to the following R&S®ESCU models and its options:

- R&S ESCU08-20, 0.1 GHz to 8 GHz, 33 dB min. gain, DC Jack (order no.: 5602.9825.20)
- R&S ESCU08-21, 0.1 GHz to 8 GHz, 31 dB min. gain, R&S ESCU-Z01 (order no.: 5602.9825.21)
- R&S ESCU08-30, 0.1 GHz to 8 GHz, 41 dB min. gain, DC Jack (order no.: 5602.9825.30)
- R&S ESCU08-31, 0.1 GHz to 8 GHz, 39 dB min. gain, R&S ESCU-Z01 (order no.: 5602.9825.31)
- R&S ESCU18-40, 1 GHz to 18 GHz, DC Jack (order no.: 5602.9825.40)
- R&S ESCU18-41, 1 GHz to 18 GHz, R&S ESCU-Z01 (order no.: 5602.9825.41)
- R&S ESCU-Z10, bracket for R&S HF907 antenna (optional, order no.: 5602.9760.00)
- R&S ESCU-Z11, bracket for 3117 antenna (optional, order no.: 5602.9777.00)
- R&S ESCU-Z12, bracket for BBHA 9120 D antenna (optional, order no.: 5602.9783.00)
- R&S ESCU-Z13, bracket for BBHA 9120 E antenna (optional, order no.: 5602.9790.00)
- R&S ESCU-ZZA, bias unit 19" 1HU rackmount kit (optional, order no.: 5602.9060.00)

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5602.8006.02 | Version 02 | R&S®ESCU

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

Contents

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 ESCU is intended for improving the signal to noise floor margin in EMC testing of electronic components and devices in industrial, administrative, and laboratory environments.

Use the R&S ESCU only indoor and for its designated purpose. Observe the operating conditions and performance limits stated in the specifications.

If you are unsure as to appropriate use, contact Rohde & Schwarz customer support. See Chapter 5.3, "Contacting customer support", on page 29.

Target audience

This document targets at all users, including installers, operators, technicians, maintenance and service 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 in printed format. The printed "Rohde & Schwarz Instruments Safety Instructions (Multilingual)" (document number 1171.1771.01) 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 specifications document, manuals and the printed "Safety Instructions" document. If you are unsure about the appropriate use, contact Rohde & Schwarz customer support.

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 specifications document. 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 support at https://www.rohde-schwarz.com/support.

Lifting and carrying the product

The maximum weight of the product is provided in the specifications document. 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 outdoor use of your product, e.g. a protective cover, you can use the product outdoors.

You can operate the product up to an altitude of 2000 m above sea level. If a higher altitude is permissible, the value is provided in the specifications document. 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 specifications document.

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.

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 the product

Before connecting the interfaces and measuring inputs of the product to other products or electrical circuits, make sure that the other products or electrical circuits provide special protection against electric shock. This protection principle is referred to as SELV (safety extra-low voltage) and is based on a low voltage level and increased insulation. Exceptions are indicated by a measurement category on the product and given in the specifications document.

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 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.

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

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

Table 1-1: Labels regarding product and environment safety

	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. For more information, see "Disposing of electrical and electronic equipment" on page 33.
	Take care when handling electrostatic sensitive devices.
	Grounding terminal (earth ground contact)
	Read the manual for information.

1.3 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.

NOTICE

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

1.4 Korea certification class B

Korea certification class B

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

2 Documentation overview

The following documents are relevant when using the R&S ESCU preamplifier. Unless specified otherwise, you find the documents at:

www.rohde-schwarz.com/manual/escu

2.1 This manual

Describes the steps from delivery to installation of the accessory. A printed version is delivered with the R&S ESCU.

2.2 Related manuals

The R&S ESCU is used with other accessories and in a shielded chamber. Refer also to the user documentation delivered with the accessories and shielded chambers the R&S ESCU is designed for. This user documentation includes the safety instructions for the product, along with information on troubleshooting, maintenance tasks, transport and disposal.

Example:

An installation manual is delivered with the R&S ESCU-ZZA bias unit 19" 1HU rackmount kit.

Use this manual when installing a bias unit on a rack.

Safety information

Refer to Chapter 1, "Safety and regulatory information", on page 5 for the safety information of the R&S ESCU.

The R&S ESCU is delivered with a power supply unit. For safe usage of the power supply unit, refer to the manufacturer's safety information.

2.3 Specifications and brochures

The specifications document, also called data sheet, and brochure contain an overview of the R&S ESCU preamplifiers and its technical specifications.

See www.rohde-schwarz.com/brochure-datasheet/escu.

2.4 Calibration certificate

The document is available on https://gloris.rohde-schwarz.com/calcert. You need the device ID of your product, which you can find on a label on the side panel.

3 Preparing for use

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

3.1 Lifting and carrying

For safety information, see "Lifting and carrying the product" on page 6.

3.2 Unpacking and checking

1. Unpack the product carefully.
2. Retain the original packing material. Use it when transporting or shipping the product later.
3. Using the delivery notes, check the equipment for completeness.
4. Check the product for damage.
   The following indicates that a product is damaged:
   - Bending or torsion or dent of the structure
   - Traces of any mechanical impact on the painting and on the product

   If the delivery is incomplete or equipment is damaged, contact Rohde & Schwarz.

3.3 Choosing the operating site

Specific operating conditions ensure proper operation and avoid damage to the product and connected devices. For information on environmental conditions such as ambient temperature and humidity, see the specifications document.

For safety information, see "Choosing the operating site" on page 6.

Electromagnetic compatibility classes

The electromagnetic compatibility (EMC) class indicates where you can operate the product. The EMC class of the product is given in the specifications document.

- Class B equipment is suitable for use in:
  - Residential environments
  - Environments that are directly connected to a low-voltage supply network that supplies residential buildings
- Class A equipment is intended for use in industrial environments. It can cause radio disturbances in residential environments due to possible conducted and radiated disturbances. It is therefore not suitable for class B environments.
  If class A equipment causes radio disturbances, take appropriate measures to eliminate them.

3.4 Setting up the product

You can position the product on a level surface on a table or in a system rack located in a laboratory. You can also place the product on the floor or behind an antenna in a shielded chamber.

If you are using the preamplifier with a bias unit, you can install the bias unit using the R&S ESCU-ZZA 19" 1HU rackmount kit (order no.: 5602.9060.00).

For safety information, see:

- "Setting up the product" on page 7
- "Intended use" on page 5

See also the user documentation for:

- The chamber used
- Other equipment used in the test setup
- R&S ESCU-ZZA 19" 1HU rackmount kit

3.4.1 Installing R&S ESCU on an antenna

This chapter describes the procedure to install the preamplifier onto double-ridged horn antennas. See "To install R&S ESCU onto an antenna" on page 17.

Each antenna uses different types of brackets. Use only the appropriate bracket. If ordered, the brackets for the respective antennas are included in the delivery in a separate packaging.

The list of compatible antennas includes:

- "R&S HF907 double-ridged waveguide horn antenna" on page 15
- "Double-ridged waveguide horn antenna 3117" on page 16
- "BBHA 9120 D double-ridged broadband horn antenna" on page 16
- "BBHA 9120 E double-ridged broadband horn antenna" on page 17

R&S HF907 double-ridged waveguide horn antenna

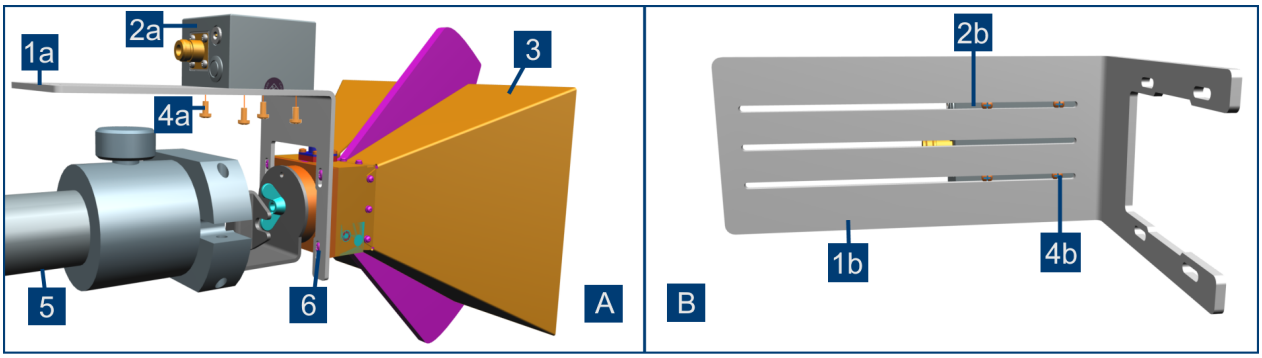

Figure 3-1: Installing a preamplifier onto an R&S HF907 antenna

A = Installing the preamplifier onto a bracket for R&S HF907 antenna (order no.: 5602.9760.00)
B = Bottom view of the bracket
1a and 1b = Bracket for R&S HF907 antenna (side and bottom view)
2a and 2b = Preamplifier (side and bottom view)
3 = R&S HF907 antenna (not included in the delivery)
4a and 4b = DIN7985 M3x6 screw (side and bottom view)
5 = Antenna mast (not included in the delivery)
6 = M4x12 combi screw for securing the bracket to the antenna (not included in the delivery)

Double-ridged waveguide horn antenna 3117

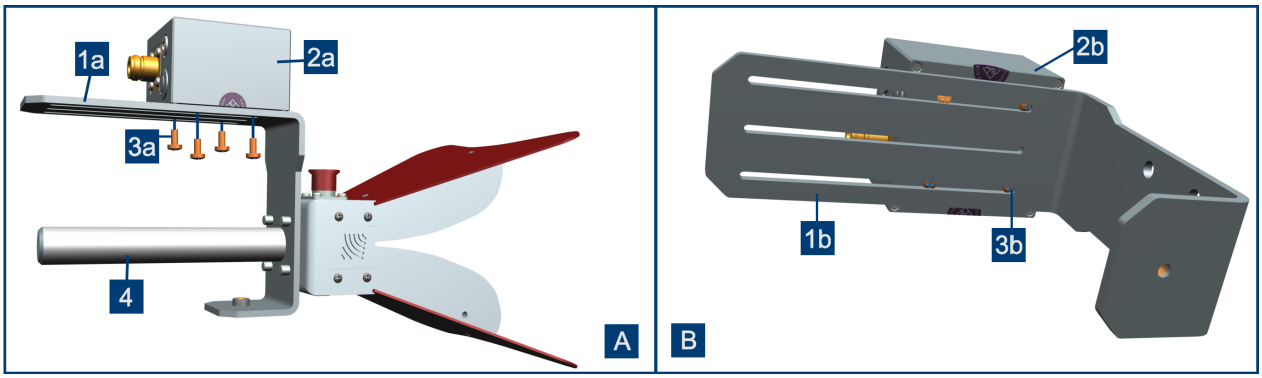

Figure 3-2: Installing a preamplifier onto an antenna 3117

A = Installing the preamplifier onto a bracket for antenna 3117 (order no.: 5602.9777.00)
B = Bottom view of the bracket
1a and 1b = Bracket for antenna 3117 (side and bottom view)
2a and 2b = Preamplifier (side and bottom view)
3a and 3b = DIN7985 M3x6 screw (side and bottom view)
4 = Antenna 3117 and its antenna mast (not included in the delivery)

BBHA 9120 D double-ridged broadband horn antenna

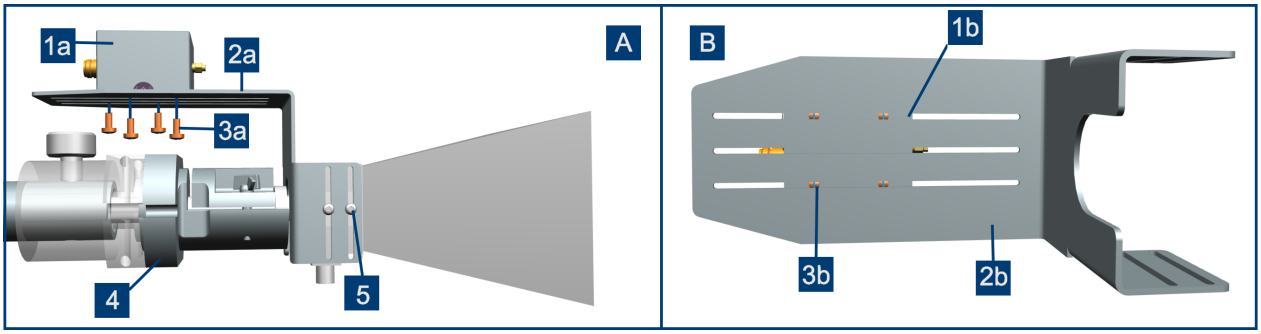

Figure 3-3: Installing a preamplifier onto a BBHA 9120 D antenna

A = Installing the preamplifier onto a bracket for BBHA 9120 D antenna (order no.: 5602.9783.00)
B = Bottom view of the bracket
1a and 1b = Preamplifier (side and bottom view)
2a and 2b = Bracket for BBHA 9120 D antenna (side and bottom view)
3a and 3b = DIN7985 M3x6 screw (side and bottom view)
4 = BBHA 9120 D antenna and its antenna mast (not included in the delivery)
5 = Screw fixing the bracket to the antenna (not included in the delivery)

BBHA 9120 E double-ridged broadband horn antenna

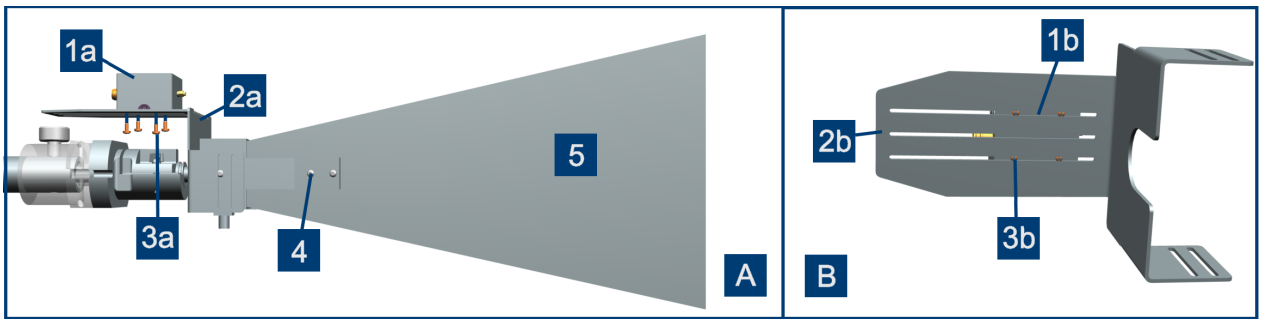

Figure 3-4: Installing a preamplifier onto a BBHA 9120 E antenna

A = Installing the preamplifier onto a bracket for BBHA 9120 E antenna (order no.: 5602.9790.00)
B = Bottom view of the bracket
1a and 1b = Preamplifier (side and bottom view)
2a and 2b = Bracket for BBHA 9120 E antenna (side and bottom view)
3a and 3b = DIN7985 M3x6 screw (side and bottom view)
4 = Screw fixing the bracket to the antenna (not included in the delivery)
5 = BBHA 9120 E antenna and its antenna mast (not included in the delivery)

To install R&S ESCU onto an antenna

Prerequisite: You have installed the antenna.

1. Secure the appropriate bracket onto the antenna with the screws provided with the antenna.
2. Place the preamplifier onto the bracket.
3. Using four DIN7985 M3x6 screws, secure the preamplifier onto the bracket.

3.5 Considerations for test setup

Cable selection to minimize electromagnetic interference (EMI)

Electromagnetic interference (EMI) can affect the measurement results.

To suppress electromagnetic radiation during operation:

- Use high-quality shielded cables, for example, double-shielded RF cables.
- Always terminate open cable ends.
- Ensure that connected external devices comply with EMC regulations.

Signal input levels

The maximum input signal level is +15 dBm.

Keep the signal levels within the specified range to avoid damage to the product and connected devices.

See also Chapter 3.7, "Connecting to an RF source", on page 19.

Preventing electrostatic discharge (ESD)

Electrostatic discharge is most likely to occur when you connect or disconnect a DUT.

► **NOTICE!** Electrostatic discharge can damage the electronic components of the product and the device under test (DUT).

Ground yourself to prevent electrostatic discharge damage:

a) Use a wrist strap and cord to connect yourself to ground.
b) Use a conductive floor mat and heel strap combination.

3.6 Connecting to power

For safety information, see the manufacturer's instructions on the external power supply unit and "Connecting to power" on page 7.

The delivered power supply unit converts alternating voltages to 12 V DC. The acceptable input voltage is between 100 V AC and 230 V AC.

See also its specifications.

Always connect the product to the power source **after** you have connected all other cables, including the ground cable.

If you switch on the product with open terminals, switch off the product immediately using the pushbutton. Then terminate all the connectors before proceeding.

To connect to power

1. Connect the power supply cable to the power adapter.
   Only use the power cable and adapter delivered with the product.

2. **NOTICE!** Risk of damaging the product. Leaving the devices dangling in mid-air using cables can break the connectors or the cable. Install the devices **only** on a flat surface.

   Plug the AC power cable into a power outlet with ground contact.
   A type C AC plug is delivered with the product. If you are using a different socket type, use an appropriate adapter.

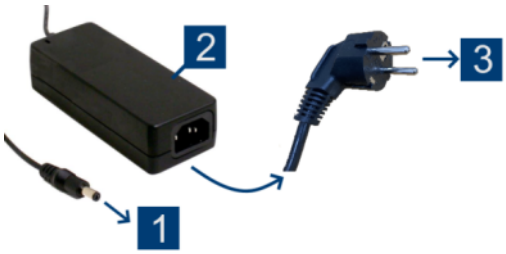

Figure 3-5: Power supply unit

1 = DC power jack
2 = Adapter
3 = Type C AC plug to connect to the AC power socket

3. Connect the power supply unit's DC power jack (1 in Figure 3-5) to the following connectors:
   - For preamplifiers: [DC In X2] connector (5 in Figure 3-6).
   - For bias unit: [DC In] connector (8 in Figure 3-7)
4. If available, ground the bias unit using the grounding terminal ⏚. Tighten the grounding screw with a maximum torque of 0.2 Nm. Grounding is necessary to eliminate signal noise.
5. Install the remaining cables before switching on the product.

3.7 Connecting to an RF source

A typical RF source for the R&S ESCU preamplifier can be an antenna, an RF generator or a vector network analyzer, for example.

The preamplifier has a female 2.92 mm K type input connector for RF signals. It is also compatible with the SMA type.

No RF cable or adapter is included in the delivery.

To connect the preamplifier to an RF source

Prerequisite: You provide an RF cable with at least one 2.92 mm K type **male** connector. The product is securely fixed on a **flat surface**.

1. **NOTICE!** Risk of damaging RF connectors. The maximum torque of the connectors on the product is 0.4 Nm. Each cable connector type has its maximum torque limit.
   Misaligned mating and excessive tightening can damage RF connectors. Take care to align the male and female connectors precisely, and to apply the correct **torque**. Refer to the specifications of the cable and application note www.rohde-schwarz.com/appnote/1MA99.

   Connect the antenna's RF cable to the [RF In] female 2.92 mm K type connector of the preamplifier (6 in Figure 3-6).
   If the connector type of the RF cable is different, use an appropriate adapter.

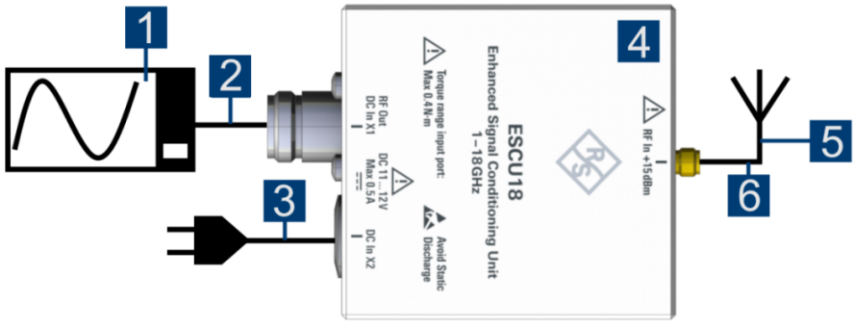

Figure 3-6: Preamplifier setup with a power supply unit only

1 = Measuring device, such as a spectrum analyzer
2 = RF cable with an N type male connector at one end (not included in the delivery)
3 = Power supply unit
4 = R&S ESCU18 preamplifier
5 = Antenna
6 = RF cable with a 2.92 mm male connector at one end (not included in the delivery)

2. Using a torque wrench, tighten the RF connector.

To disconnect an RF source

1. Press the preamplifier's pushbutton to switch it off.

   The LED on the pushbutton is off.
   If a bias unit is available, the [STATUS] LED indicator turns amber.
   See also Table 5-1.

2. If available, press the bias unit's pushbutton to switch it off.

   The LED on the pushbutton, [STATUS] and [FAULT] are off.

See also Table 5-1.

3. Using a torque wrench, loosen the RF connectors in the setup (Figure 3-6).
4. Disconnect the cables.

3.8 Connecting to other devices

The test setup for using the preamplifier with or without a bias unit differs.

To complete the setup without a bias unit

Prerequisite: You provide an RF cable with at least one N-type **male** connector. The product is securely fixed on a **flat surface**.

1. **NOTICE!** Risk of damaging RF connectors. The maximum torque of the connectors on the product is 0.4 Nm. Each cable connector type also has its maximum torque limit.
   Misaligned mating and excessive tightening can damage RF connectors. Take care to align the male and female connectors precisely, and to apply the correct **torque**. Refer to the specifications of the cable and application note www.rohde-schwarz.com/appnote/1MA99.

   Connect the RF cable to the [RF Out/DC In X1] female N type connector of the preamplifier (2 in Figure 3-6).
   If the connector type of the RF cable is different, use an appropriate adapter.
2. Using a torque wrench, tighten the RF cable.

To complete the setup with a bias unit

Prerequisite: You provide an RF cable with at least one 2.92 mm K type **male** connector and an RF cable with at least one N type **male** connector. The product is securely fixed on a **flat surface**.

1. **NOTICE!** Risk of damaging RF connectors. The maximum torque of the connectors on the product is 0.4 Nm. Each cable connector type also has its maximum torque limit.
   Misaligned mating and excessive tightening can damage RF connectors. Take care to align the male and female connectors precisely, and to apply the correct **torque**. Refer to the specifications of the cable and application note www.rohde-schwarz.com/appnote/1MA99.

Connect the RF cable to the [RF Out] female 2.92 mm K type connector of the bias unit (2 in Figure 3-7).
If the connector type of the RF cable is different, use an appropriate adapter.

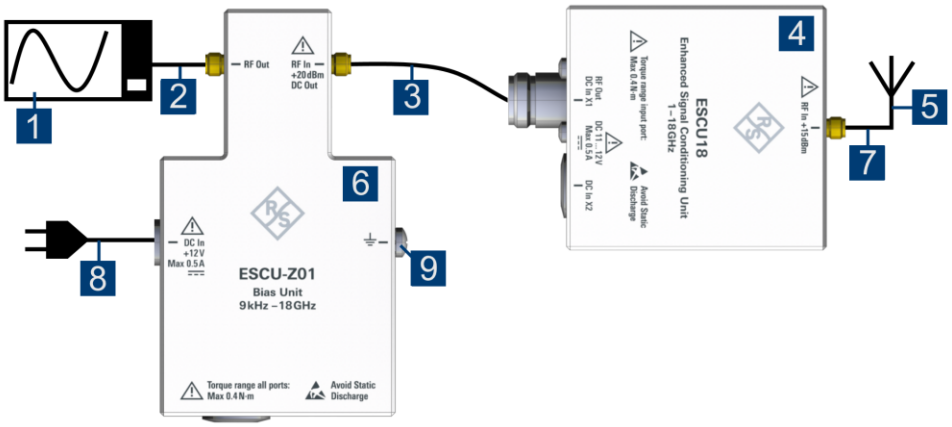

Figure 3-7: Preamplifier setup with a bias unit

1 = Measuring device, such as a spectrum analyzer
2 and 7 = RF cable with a 2.92 mm male connector at one end (not included in the delivery)
3 = RF cable with a 2.92 mm male connector and an N type male connector (not included in the delivery)
4 = R&S ESCU18 preamplifier
5 = Antenna
6 = R&S ESCU-Z01 bias unit
8 = Power supply unit
9 = Ground

2. Connect the other end of the RF cable to a measuring device as required in your test setup.
3. **NOTICE!** Risk of damaging devices. The bias unit provides DC power over an RF cable to the preamplifier. If the preamplifier is used with a bias unit, check that the [RF Out] and [RF In] connectors on the bias unit are connected according to Figure 3-7.

   Connect the RF cable to the [RF In/DC Out] female 2.92 mm K type connector of the bias unit (3 in Figure 3-7).
   If the connector type of the RF cable is different, use an appropriate adapter.
4. Connect the N-type connector end of the RF cable to the [RF Out/DC In X1] of the preamplifier.
5. Using a torque wrench, tighten the RF connector.

To disconnect the test setup

1. Press the preamplifier's pushbutton to switch it off.

   The LED on the pushbutton is off.
   If a bias unit is available, the [STATUS] LED indicator turns amber.
   See also Table 5-1.

2. If available, press the bias unit's pushbutton to switch it off.

   The LED on the pushbutton, [STATUS] and [FAULT] are off.
   See also Table 5-1.

3. Using a torque wrench, loosen the connectors in the setup (Figure 3-6 or Figure 3-7).

4. Disconnect the cables.

3.9 Switching on or off

The preamplifier is powered directly using the power supply unit (Figure 3-6) or a bias unit (Figure 3-7).

For details on the LED indicators on the preamplifier and bias unit, see Table 5-1.

To switch on the preamplifier

Prerequisite: All the connectors on the preamplifier are terminated.

1. If available, push the pushbutton on the bias unit.

   The pushbutton of the bias unit is latched and the bias unit is in the standby mode. The LED indicator on the pushbutton turns green, the [STATUS] LED indicator turns amber and the [FAULT] LED indicator is off.

2. Push the pushbutton on the preamplifier.

   The pushbutton of the preamplifier is latched and the LED indicator on the pushbutton of the preamplifier turns green.
   If the test setup has a bias unit, the LED indicator on the pushbutton of the bias unit is green, the [STATUS] LED indicator on the bias unit turns green and the [FAULT] LED indicator is off.

To switch off the product

Prerequisite: The preamplifier and the bias unit, if available, are powered and switched on.

1. Push the pushbutton on the preamplifier.

   The pushbutton on the preamplifier is latched off and the LED indicator on the pushbutton turns off.
   If the test setup has a bias unit, the LED indicator on the pushbutton of the bias unit is green, the [STATUS] LED indicator on the bias unit turns amber and the [FAULT] LED indicator is off.

2. Push the pushbutton on the bias unit.

   The pushbutton of the bias unit is latched off and the bias unit is switched off. The LED indicator on the pushbutton and the [STATUS] LED indicator on the bias unit are off and the [FAULT] LED indicator is off.

To disconnect from power

1. Press the preamplifier's pushbutton to switch it off.

   The LED on the pushbutton is off.
   If a bias unit is available, the [STATUS] LED indicator turns amber.

2. If available, press the bias unit's pushbutton to switch it off.

   The LED on the pushbutton, [STATUS] and [FAULT] are off.

3. **NOTICE!** Risk of damaging equipment. Disconnecting cables while the preamplifier is switched on can damage it. Ensure that the LED on the pushbutton is unlit before disconnecting any cable.

   Disconnect the test setup from the mains power supply.

4 About R&S ESCU

The R&S ESCU preamplifier is designed to boost an incoming weak signal and improve the sensitivity of the receiver system. It also improves the signal-to-noise floor margins.

There are various models available for different frequency ranges. These models have similar installation procedures but different specifications.

For details, refer to the product's specifications. See Chapter 2.3, "Specifications and brochures", on page 12.

The meanings of the labels on the product are described in Table 1-1.

The following section explains the connections on the product. See also the specifications.

4.1 Preamplifier

The maximum input signal level is +15 dBm, see also "Signal input levels" on page 18.

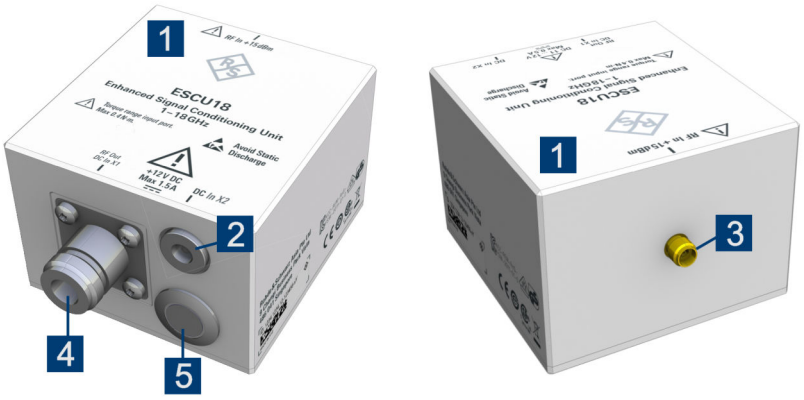

Figure 4-1: Front and rear view of an R&S ESCU18 preamplifier

1 = R&S ESCU18 preamplifier
2 = "[DC In X2]" on page 26 input voltage connector (not available if the preamplifier is powered by a bias unit)
3 = "[RF In + 15 dBm]" on page 26 RF input connector
4 = "[RF Out/DC In X1]" on page 26 connector
5 = On/Off "Pushbutton" on page 26

[RF Out/DC In X1]
An N type female RF output connector to connect to devices such as a spectrum analyzer. See Chapter 3.8, "Connecting to other devices", on page 21.

When used with a bias unit, this connector receives DC voltage from the bias unit.

[DC In X2]
A 12 V DC input voltage connector. See Chapter 3.6, "Connecting to power", on page 18.

Not available if the preamplifier is powered by a bias unit.

[RF In + 15 dBm]
A 2.92 mm female RF connector to connect to RF source such as an antenna. See Chapter 3.7, "Connecting to an RF source", on page 19.

Pushbutton
A latching pushbutton with an LED ring indicator to switch the preamplifier on or off. See Chapter 3.9, "Switching on or off", on page 23.

4.2 Bias unit

The R&S ESCU-Z01 bias unit is an option to power a preamplifier via a coaxial cable. It allows the test setup to use shorter cables and provides a better indication of the setup condition with its fault and error LED indicators. It has an in-built electronic circuit to protect the device from short circuit.

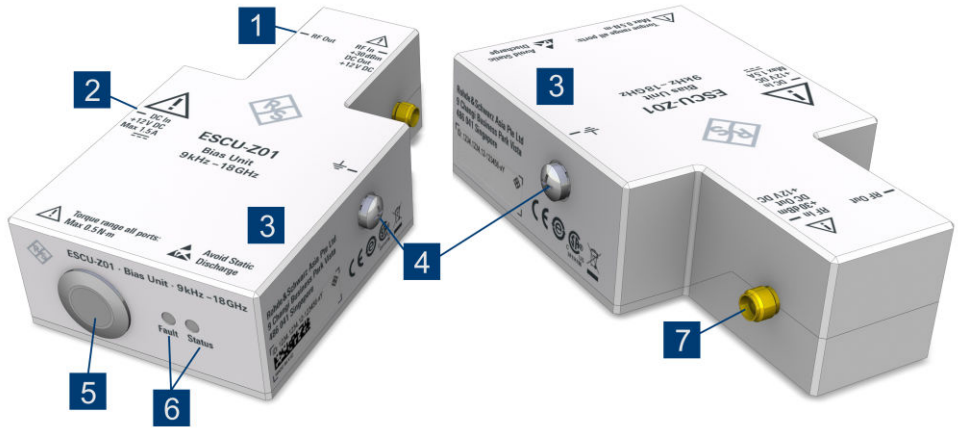

Figure 4-2: Bias unit

1 = "[RF Out]" on page 27 RF output connector (not shown)
2 = "[DC In]" on page 27 input voltage connector (not shown)
3 = R&S ESCU-Z01 bias unit
4 = "Ground" on page 27 connector
5 = On/off "Pushbutton" on page 27
6 = "Fault LED" on page 27 and "Status LED" on page 27 indicators
7 = "[RF In/DC Out]" on page 27 RF input connector

[RF Out]
A 2.92 mm female RF output connector to connect to devices such as a spectrum analyzer. See Chapter 3.8, "Connecting to other devices", on page 21.

[RF In/DC Out]
A 2.92 mm female RF output connector to provide DC voltage to the preamplifier. See Chapter 3.8, "Connecting to other devices", on page 21.

[DC In]
A 12 VDC input voltage connector. See Chapter 3.6, "Connecting to power", on page 18.

Ground
A protective ground terminal to eliminate noise. See Chapter 3.6, "Connecting to power", on page 18.

Pushbutton
A latching pushbutton with an LED ring indicator to switch the bias unit on or off. See Chapter 3.9, "Switching on or off", on page 23.

Fault LED
A fault indicator. See Chapter 5, "Troubleshooting", on page 28.

Status LED
A setup status indicator. See Chapter 5, "Troubleshooting", on page 28.

5 Troubleshooting

If the preamplifier or the bias unit is not functioning normally, switch it off then on using its pushbutton.

For details on the possible fault conditions, see:

- Chapter 5.1, "Preamplifier without a bias unit", on page 28
- Chapter 5.2, "Preamplifier with a bias unit", on page 28

If the problem persists, contact Rohde & Schwarz, see Chapter 5.3, "Contacting customer support", on page 29.

5.1 Preamplifier without a bias unit

If the preamplifier is powered directly by the power adapter, the preamplifier does not display any fault or warning indications. The LED indication on the preamplifier's pushbutton only indicate the presence of input voltage. It is not a representation of the preamplifier's working condition. See also the specifications for the power consumption.

Figure 5-1: Preamplifier's pushbutton LED indication

5.2 Preamplifier with a bias unit

The LED indicators on the bias unit provide a better indication of the status of the preamplifier. Table 5-1 shows the different LED status indicators and what the states mean.

Correct the problem to resolve the issue.

Table 5-1: LED indicators and the status of the devices

LED indicators				Devices conditions
On the bias unit			On the pre-amplifier	
Pushbutton	**[FAULT]**	**[STATUS]**	**Pushbutton**	
Unlit	Unlit	Unlit	Unlit	The bias unit and preamplifier are switched off and are in the off state.
Green	Unlit	Amber	Unlit	The bias unit is switched on. The preamplifier is switched off and is not drawing any current.
Green	Red	Unlit	Unlit	Overload mode (load current is > 500 mA). The preamplifier draws excessive current at the [RF Out/DC In X1] connector.
Green	Red	Unlit	Unlit	The preamplifier is in a short-circuit condition. No DC voltage is present at the preamplifier's connector.
Green	Red	Unlit	Green	The bias unit and preamplifier are operating but do not comply with the specification. The voltage of the preamplifier at the [RF Out/DC In X1] connector is ≤ 10.8 V.
Green	Unlit	Green	Green	The bias unit and the preamplifier are switched on.

5.3 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 5-2: QR code to the Rohde & Schwarz support page

6 Calibration

The R&S ESCU preamplifier is typically used inside a chamber. We recommend that you calibrate the preamplifier and bias unit, if available, with the actual test setup to ensure an accurate overall correction factor of the signal path.

Perform the calibration at the ambient temperature specified in the specifications.

If you are calibrating the bias unit only, power **off** the bias unit during calibration to avoid damaging the device.

Refer to the specifications for the recommended calibration interval.

Perform a recalibration if the following occur:

- The system is moved.
- The setup has changed.
- The immediate surrounding of the laboratory environment has changed.

When in doubt, contact Rohde & Schwarz, see Chapter 5.3, "Contacting customer support", on page 29.

7 Maintenance and lifecycle

The product does not require regular maintenance. It only requires occasional cleaning. It is however advisable to check the nominal data from time to time.

7.1 Cleaning

How to clean the product is described in "Cleaning the product" on page 8.

Do not use any liquids for cleaning. Cleaning agents, solvents, acids and bases can damage the front panel labeling, plastic parts and display.

Before cleaning the product, ensure that it has been switched off, and the power cable is disconnected.

7.2 Storage

Protect the product against dust. Ensure that the environmental conditions, e.g. temperature range and climatic load, meet the values specified in the specifications.

7.3 Transporting

Lifting and carrying

For safety information, see "Lifting and carrying the product" on page 6.

Packing

Use the original packaging material. It consists of antistatic wrap for electrostatic protection and packing material designed for the product.

If you do not have the original packaging, use similar materials that provide the same level of protection. You can also contact your local Rohde & Schwarz service center for advice.

Securing

When moving the product in a vehicle or using transporting equipment, make sure that the product is properly secured. Only use items intended for securing objects.

7.4 Disposal

Rohde & Schwarz is committed to making careful, ecologically sound use of natural resources and minimizing the environmental footprint of our products. Help us by disposing of waste in a way that causes minimum environmental impact.

Disposing of electrical and electronic equipment

A product that is labeled as follows cannot be disposed of in normal household waste after it has come to the end of its life. Even disposal via the municipal collection points for waste electrical and electronic equipment is not permitted.

Figure 7-1: Labeling in line with EU directive WEEE

Rohde & Schwarz has developed a disposal concept for the eco-friendly disposal or recycling of waste material. As a manufacturer, Rohde & Schwarz completely fulfills its obligation to take back and dispose of electrical and electronic waste. Contact your local service representative to dispose of the product.

Index