R&S®TSMA6B Autonomous Mobile Network Scanner Getting Started

4901401002
Version 05

ROHDE&SCHWARZ
Make ideas real

This manual describes the following R&S®TSMA6B models:

- R&S®TSMA6B (4900.8005K20)

The software contained in this product uses several valuable open source software packages. For information, see the "Open Source Acknowledgment" document, which is available for download from the R&S TSMA6B product page at www.rohde-schwarz.com/product/tsmx > "Downloads" >"Firmware" .
Rohde & Schwarz would like to thank the open source community for their valuable contribution to embedded computing.

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4901.4010.02 | Version 05 | R&S®TSMA6B

Throughout this manual, products from Rohde & Schwarz are indicated without the ® symbol, e.g. R&S®TSMA6B is indicated as R&S TSMA6B.

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 TSMA6B is intended as an integrated solution for efficient drive and walk testing. It offers maximum performance, autonomy and connectivity with an integrated high- performance PC and a mobile network scanner to comply with the latest requirements for state-of-the-art mobile network testing. Together with optional equipment (battery pack, carrying bag) it is the ideal companion for remote or unattended operation during drive and walk test campaigns.

The R&S TSMA6B is intended to enhance the R&S TSMx scanner family via a vibration-proof mechanical connection to allow mobile operation. It contains two easily accessible, rechargeable and hot-swappable batteries.

Where do I find safety information?

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

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

1.1 Safety instructions

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

Use the product only for its intended use and within its performance limits. Intended use and limits are described in the product documentation such as the data

sheet, manuals and the printed "Safety Instructions". If you are unsure about the appropriate use, contact Rohde & Schwarz customer service.

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

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

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

Operating the product

The product is intended for mobile use. The maximum weight of the product is provided in the data sheet. If the product casing is not waterproof, use an adequate weather protection to carry the product outdoors with you.

When using the product in a vehicle or aircraft, make sure that the product is properly secured. If stacking is possible, secure the whole stack of products so that they cannot fall over and cause injury.

Observe the ambient conditions such as altitude, operating temperature and climatic loads; see the data sheet.

Due to their exposed location, mobile communications systems are at risk of damage from lightning. This also poses a risk to persons nearby. Vehicles carrying mobile communications systems require an electrically conductive body, a grounded antenna and also equipotential bonding that includes the cables routed into the vehicle.

Connecting to power

The product runs on DC voltage. For the specifications of the supply voltage for the product, refer to the data sheet. Under normal conditions, contact with DC voltage in this range poses a low risk of electric shock.

Take the following measures for your safety:

- If you connect the product to an external power supply, use one recommended in the product documentation.
- If you connect the product to a battery, observe the safety information delivered with the battery.

- Before switching on the product, ensure that the voltage and frequency indicated on the product match the available power source.
- Only use intact cables and route them carefully so that they cannot be damaged. Also ensure that nobody can trip over loose cables.

Handling batteries safely

The product contains exchangeable or built-in lithium polymer or lithium ion cells or batteries. The use of the word battery in the following always means all types. Only the battery contents are potentially hazardous. As long as a battery is undamaged and the seals remain intact, there is no danger.

Impact, shock or heat can cause damage such as dents, punctures and other deformations. A damaged battery poses a risk of personal injury. Handle a damaged or leaking battery with extreme care. Immediately ventilate the area since the battery releases harmful gases. If you come into contact with the battery fluid, immediately remove all contaminated clothing. Irritation can occur if the battery fluid comes in contact with your skin or eyes. Immediately and thoroughly rinse your skin or eyes with water and seek medical aid.

For safe handling, follow these rules:

- Do not short-circuit the battery.
- Do not mechanically damage the battery. Do not open or disassemble the battery.
- Do not expose the battery to high temperatures such as open flames, hot surfaces and sunlight.
- Only use the battery with the designated Rohde & Schwarz product.
- Only use the appropriate Rohde & Schwarz charger to charge the batteries. If the batteries are improperly charged, there is a risk of explosion. For charging and discharging temperature ranges, see the product documentation.
- Replace exchangeable batteries only with the same battery type.
- Store the battery in the product or use the product packaging.
- Dispose of exchangeable batteries separately from normal household waste as specified by the local waste disposal agency.

If you disregard these rules, you risk serious personal injury or even death due to explosion, fire or hazardous chemical substances. The product documentation provides further details.

If exchangeable batteries or products with built-in batteries are defective, contact the Rohde & Schwarz customer service. Rohde & Schwarz classifies the severity

of the defect. When returning batteries or Rohde & Schwarz products containing batteries, use a carrier qualified to transport dangerous goods and notify the carrier of this classification. Follow the carrier's transport stipulations in line with IATA-DGR, IMDG-Code, ADR or RID.

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.
	DC - direct current Connect to a DC power supply of the specified voltage range.

1.2 Labels on the product

Labels on the casing inform about:

- Personal safety, see "Meaning of safety labels" on page 8
- Product and environment safety, see Table 1-1
- Identification of the product, see bottom label of the R&S TSMA6B.

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 43.
	Labeling in line with directive 2006/66/EC for disposal of batteries after they have come to the end of their service life. For more information, see "Disposing batteries" on page 43.

1.3 WLAN/Bluetooth adapter

The R&S TSMA6B has built-in WLAN/Bluetooth module.

This wireless adapter complies with Part 15 of the FCC Rules and with Industry Canada license-exempt RSS standards. Operation of the device is subject to the following two conditions:

- This device may not cause harmful interference.
  Cet appareil ne peut pas causer d'interférences.
- This device must accept any interference that may cause undesired operation.
  Cet appareil doit accepter des interférences, y compris des interférences qui peuvent causer desopérations non désirées de l'appareil.

Radio frequency interference requirements

This wireless adapter is restricted to indoor use due to its operation in the 5.15 GHz to 5.25 GHz frequency range. The wireless adapter requires to be used indoors for the frequency range 5.15 GHz to 5.25 GHz to reduce the potential for harmful interference to co-channel Mobile Satellite systems. High power radars are allocated as primary users of the 5.25 GHz to 5.35 GHz and 5.65 GHz to 5.85 GHz bands. These radar stations can cause interference with and /or damage this device.

Canada-specific enhancement

When using IEEE 802.11a wireless LAN, this product is restricted to indoor use due to its operation in the 5.15 GHz to 5.25 GHz frequency range. Industry Canada requires this product to be used indoors for the frequency range of 5.15 GHz to 5.25 GHz to reduce the potential for harmful interference to co-channel mobile satellite systems. High power radar is allocated as the primary user of the 5.25 GHz to 5.35 GHz and 5.65 GHz to 5.85 GHz bands. These radar stations can cause interference with and/or damage to this device.

L'utilisation d'un réseau sans fil IEEE802.11a est restreinte à une utilisation en intérieur à cause du fonctionnement dans la bande de fréquence 5.15 GHz to 5.25 GHz. Industry Canada requiert que ce produit soit utilisé à l'intérieur des bâtiments pour la bande de fréquence 5.15 GHz - 5.25 GHz afin de réduire les possibilités d'interférences nuisibles aux canaux co-existants des systèmes de transmission satellites. Les radars de puissances ont fait l'objet d'une allocation primaire de fréquences dans les bandes 5.25 GHz-5.35 GHz et 5.65 GHz to 5.85 GHz. Ces stations radar peuvent créer des interférences avec ce produit et/ou lui être nuisible.

Usage in specific environments

- The use of wireless adapters in hazardous locations is limited by the constraints posed by the safety directors of such environments.
- The use of wireless adapters in hospitals is restricted to the limits set forth by each hospital.

Usage on aircraft

Regulations of the FCC, FAA and individual airlines prohibit airborne operation of some radio-frequency wireless devices (wireless adapters) because their signals could interfere with critical aircraft instruments.

Local restrictions on 802.11a, 802.11b, 802.11g, 802.11n, and 802.16e radio usage

Due to the fact that the frequencies used by 802.11a, 802.11b, 802.11g, 802.11n, and 802.16e wireless LAN devices may not yet be harmonized in all countries, 802.11a, 802.11b, 802.11g, 802.11n, and 802.16e products are designed for use only in specific countries, and are not allowed to be operated in countries other than those of designated use.

As a user of these products, you are responsible for ensuring that the products are used only in the countries for which they were intended and for verifying that they are configured with the correct selection of frequency and channel for the country of use. The device transmit power control (TPC) interface is part of the Intel® PROSet/Wireless Wi-Fi Connection Utility Software. Operational restrictions for Equivalent Isotropic Radiated Power (EIRP) are provided by the system manufacturer.

Any deviation from the permissible power and frequency settings for the country of use is an infringement of national law and may be punished as such.

1.4 Warning messages in the documentation

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

NOTICE

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

1.5 Korea certification class A

이 기기는 업무용(A급) 전자파 적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

2 Welcome

2.1 Documentation overview

This section provides an overview of the R&S TSMA6B user documentation. Unless specified otherwise, you find the documents at:

www.rohde-schwarz.com/manual/tsmx

2.1.1 Getting started manual

Introduces the R&S TSMA6B and describes how to set up and start working with the product. Includes basic operations, typical measurement examples, and general information, e.g. safety instructions, etc. A printed version is delivered with the product.

2.1.2 User manuals and help

Contains the description of all instrument modes and functions. Includes the contents of the getting started manual. Also describes the usage of options and extras (downconverter R&S TSMExxDC and battery pack R&S TSMA6B-BP.

2.1.3 Printed safety instructions

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

2.1.4 Data sheets and brochures

The data sheet contains the technical specifications of the R&S TSMA6B. It also lists the firmware applications 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/tsmx

2.1.5 Release notes and open source acknowledgment (OSA)

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

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

See www.rohde-schwarz.com/firmware/tsmx

2.2 Key features

As in-building traffic in cellular networks grows, there is an increased need for indoor measurements. While traditional drive test systems consist of a laptop with test mobile phones and scanners, there are also walk-test solutions that use tablets and smartphones.

The R&S TSMA6B enhances such solutions, providing the user with accurate insight into the RF environment.

The R&S TSMA6B combines the technology of the R&S TSME6 ultra-compact drive test scanner with a high-performance Intel processor. The scanner can run PC-based drive test software, and smartphones can be connected via USB.

With its ultra-broadband front end, the integrated scanner measures all supported technologies 350 MHz to 6000 MHz simultaneously. The future-proof architecture and the in-field upgradability for both, hardware and software, allow up to 4x4 MIMO measurements and pave the way for the upcoming 5G technology.

Outstanding key features are:

- No limitation in 3GPP (LTE, WCDMA, GSM, NB-IoT…) frequency bands up to 6 GHz incl. a Multi-GNSS receiver for uninterrupted location tracking
- More than 10 technologies simultaneously in one system
- Future-proof for upcoming 5G related measurements
- Compact and lightweight design with customized mechanical concept for cascading multiple scanner hardware
- Maximum connectivity supporting additional scanner hardware, Windows-based PC, Android-based UEs or tablets using wireless and wired connections

- Integrated 8th generation Intel quad-core processing unit

3 Preparing for use

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

3.1 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 equipment for damage.

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

3.2 Preparing for walk test

If you want to perform a walk test, the R&S TSMA6B needs weather protection. The R&S TSMA6-ZCB2 carrying bag is especially designed for this purpose. See also "Operating the product" on page 6.

3.3 Setting up indoors

3.3.1 Placing the product on a bench top

If you want to set up the R&S TSMA6B on a benchtop or prepare the R&S TSMA6B for mobile use, proceed as follows.

To place the product on a bench top

1. Place the R&S TSMA6B on a stable, flat and level surface.
2. If you want to stack R&S TSMx, proceed as described in the R&S TSMA6B user manual.
3. If you want to stack the R&S TSMA6B together with other products:
   a) Follow the instructions given for the other products.
   b) Place the R&S TSMA6B on top.

3.3.2 Mounting the product in a rack

To mount the product in a rack

1. Use an adapter kit to prepare the product for rack mounting.
   a) Order the rack adapter kit designed for the product. For the order number, see data sheet.
   b) Mount the adapter kit. Follow the assembly instructions provided with the adapter kit.
2. Grab the product by the handles and push it onto the shelf until the rack brackets fit closely to the rack.
3. Tighten all screws on the rack brackets with a tightening torque of 1.2 Nm to secure the product in the rack.

3.4 Considerations for test setup

Electromagnetic interference (EMI) can affect the measurement results.

To suppress electromagnetic radiation during operation:

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

Signal input and output levels

Information on signal levels is provided in the data sheet. Keep the signal levels within the specified ranges to avoid damage to the product and connected devices.

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 data sheet.

- 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.

3.5 Connecting antennas

The SMA connector is sensitive to mechanical stress. Use the following handling precautions.

- Always use a torque wrench and mount the cable end with 60 Ncm.
- Do not stack adapters directly at the SMA connector. If you need to use adapters (e.g: SMA to N), then always use a specific adapter cable (Rohde & Schwarz order no. 4900.1700.00).

To connect RF and GPS antenna

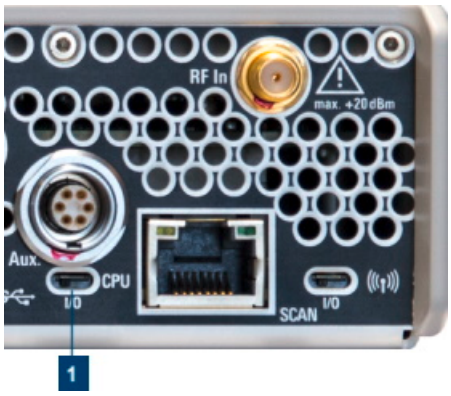
1. Connect the RF antenna to the RF IN connector (see Figure 4-2 - 10).
2. Connect the GPS antenna to the GPS ANT port (see Figure 4-2 - 12).

3.6 Selecting operation mode (normal/scanner)

To use the R&S TSMA6B in normal mode

The scanner and the CPU are active. The scanner is connected to the CPU via internal LAN interface.

1. Switch off the R&S TSMA6B, see Chapter 3.13, "Switching on or off R&S TSMA6B", on page 30.
2. Use a pointed object to push the CPU switch (1) to position I (left).



1 = CPU switch, position I (left)

3. Switch on the R&S TSMA6B (see Chapter 3.13, "Switching on or off R&S TSMA6B", on page 30).

To use the R&S TSMA6B in scanner mode

Only the scanner is active. The internal CPU is not powered. You can use the R&S TSMA6B like an R&D TSME6 and access via the "SCAN" port, which serves as the LAN interface to connect with the PC.

The scanner is accessible via the LAN port marked with SCAN (2).

1. Switch off the R&S TSMA6B, see Chapter 3.13, "Switching on or off R&S TSMA6B", on page 30.
2. Use a pointed object to push the CPU switch (1) to position 0 (right).

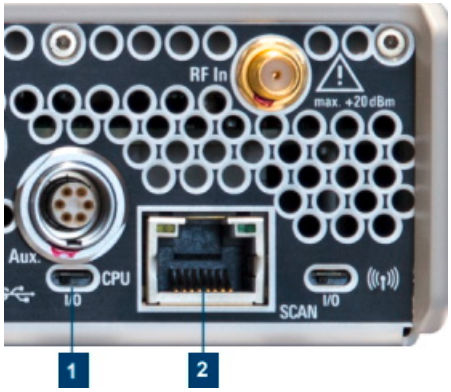


Figure 3-1: Switch to scanner mode

1 = CPU switch, position 0 (right)
2 = SCAN port (see "SCAN port - GBit LAN interface - external R&S TSME4/6 (RJ45 connector)" on page 36)

3. Switch on the R&S TSMA6B (see Chapter 3.13, "Switching on or off R&S TSMA6B", on page 30).

In scanner mode, the "Mode" LED is blinking blue.

3.7 Connecting devices for local operation (mouse, keyboard, monitor) (optional)

To connect devices

► Connect mouse and keyboard to a free USB port (see Figure 4-2 - 4, 16) and a monitor to the appropriate monitor port (HDMI, USB-C), (see Figure 4-2 - 14, 17).

3.8 Using external SSD R&S TSMA6B-BEB (optional)

Correct connection between R&S TSMA6B and SSD

The option is pre-assembled and can only be ordered from the factory. With this option, the system disk (SSD) is mounted in an external SSD enclosure and connected via the USB3.1 port of the R&S TSMA6B (see Figure 3-2). There is no internal disk assembled / fitted when ordered with this hardware option.

There is only one USB port which is allowed to connect the TSMA6B-BEB option (see Figure 3-2).

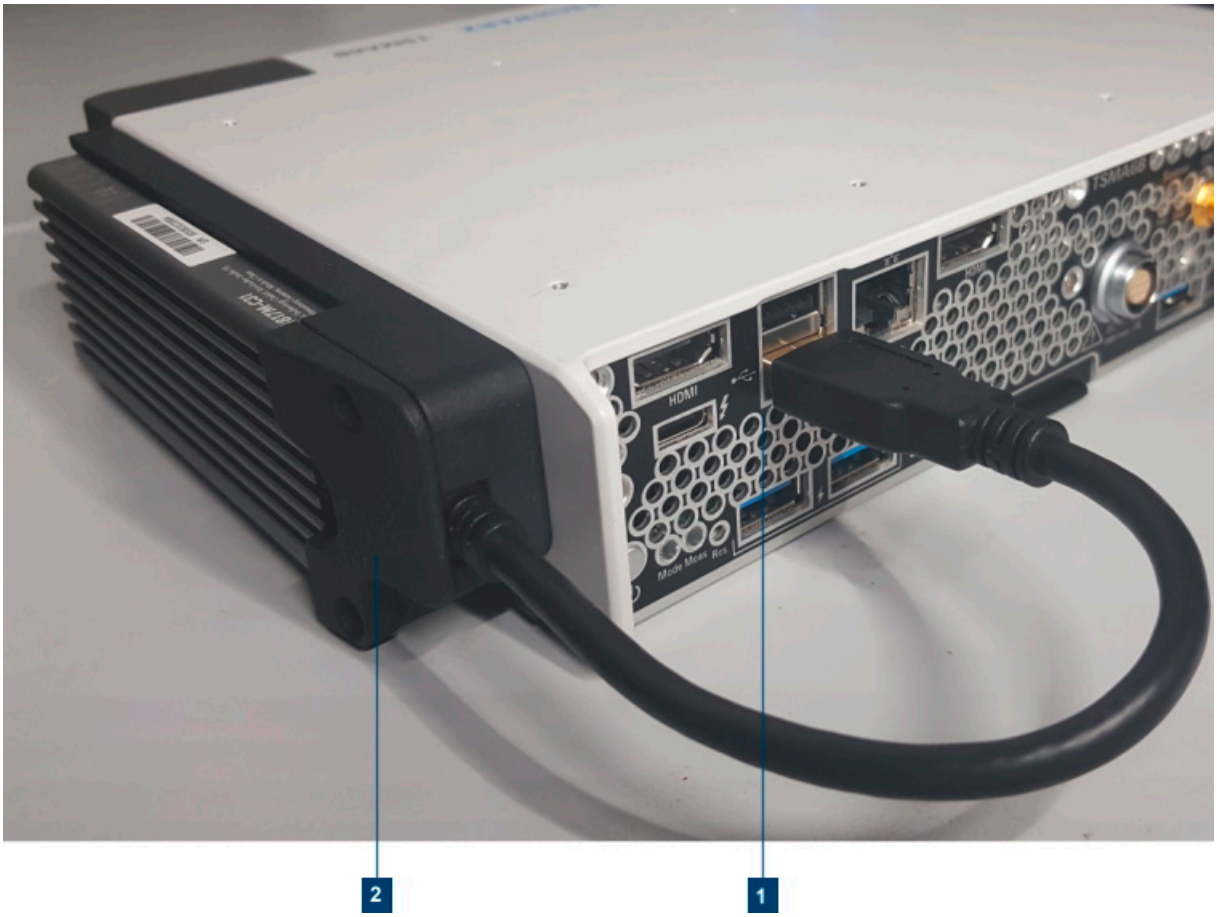


Figure 3-2: R&S TSMA6B - removable disk option

1 = USB connection between R&S TSMA6B and SSD
2 = External enclosure with SSD

To remove the SSD enclosure

1. Push the tab (1) backwards and hold this position.
2. Remove the SSD enclosure from the mount in the direction of the arrow see Figure 3-3.

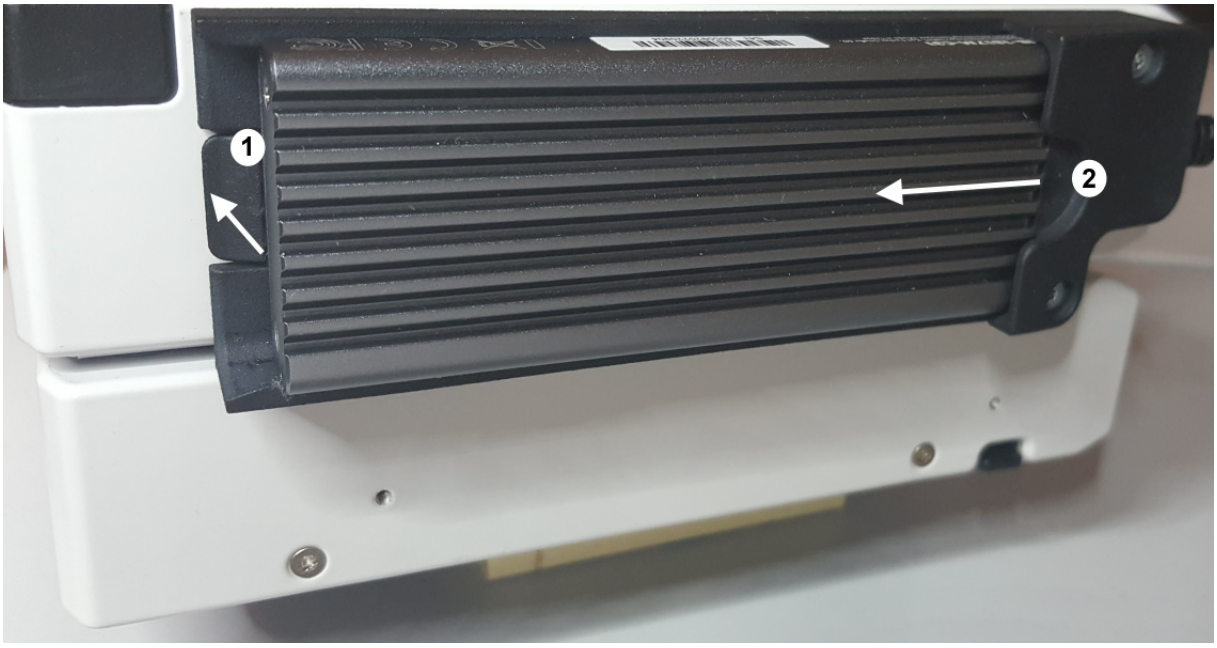


Figure 3-3: Remove SSD enclosure

1 = Tab
2 = Direction to remove external disk

3.9 Connecting LAN

The R&S TSMA6B provides two different LAN interfaces.

- SCAN port:
  GBit LAN interface with a fix IP address as default setting. It used to connect a second scanner.
- LAN port:
  GBit LAN interface with auto IP address as default setting. It is used to connect the R&S TSMA6B to a LAN and allows the remote control of the R&S TSMA6B.

3.10 Connecting USB to LAN adapter (optional)

To extend the available number of Gbit LAN ports, various optional USB to LAN adapters are available:

- R&S TSPC-U2L (Single Gbit LAN port adapter)
- R&S TSPC-U2L2 (Dual Gbit LAN port adapter)
- R&S TSPC-U2L4 (USB-C to 4-port Ethernet)

For R&S TSPC-U2L4, no driver needs to be loaded. The firmware automatically configures the port (see "Configuration" > "Connectivity" > "LAN EXT2 / EXT3 / EXT5 / EXT6").

For R& TSPC-U2L and R&S TSPCU2L2, check if driver updates are required.

For information how to connect an additional adapter, see https://www.rohde-schwarz.com/driver/tsma6/.

3.11 Connecting test mobile phones (optional)

When you connect a test mobile phone to a USB port for the first time, the installation of the appropriate drivers is mandatory.

Currently following driver is available.

- Samsung USB driver

For information how to connect Qualcomm based mobiles and required driver updates, see https://www.rohde-schwarz.com/driver/tsma6/.

To connect test mobile phones

► Connect test mobile phones to USB 3.0 / USB-C ports (see Figure 4-2 - 4, 17).

For information on how to connect other test mobile phones and install appropriate drivers, refer to related manuals (e.g. R&S SmartONE user manual).

3.12 Connecting to power

This section describes how to connect the R&S TSMA6B to a power supply unit.

3.12.1 Connecting to a vehicle DC power supply via cigarette lighter

The R&S TSMA6B is delivered with a 12 V DC power supply cable with a cigarette lighter connector.

1. Check the rating of the vehicle DC power supply.
2. Connect the 7-pin connector to DC IN.
3. Connect the cigarette lighter adapter to the 12 V outlet of the vehicle.

3.12.2 Connecting to the vehicle power supply via terminal

1. Ensure that the rating of the DC supply network matches the requirements printed on the casing next to the DC input, see (6) in Figure 4-2.
2. Demount the cigarette lighter adapter from the cable.
3. Connect the open ends of the cable to the DC supply.
   Ensure that the polarity is correct (see Figure 3-4).

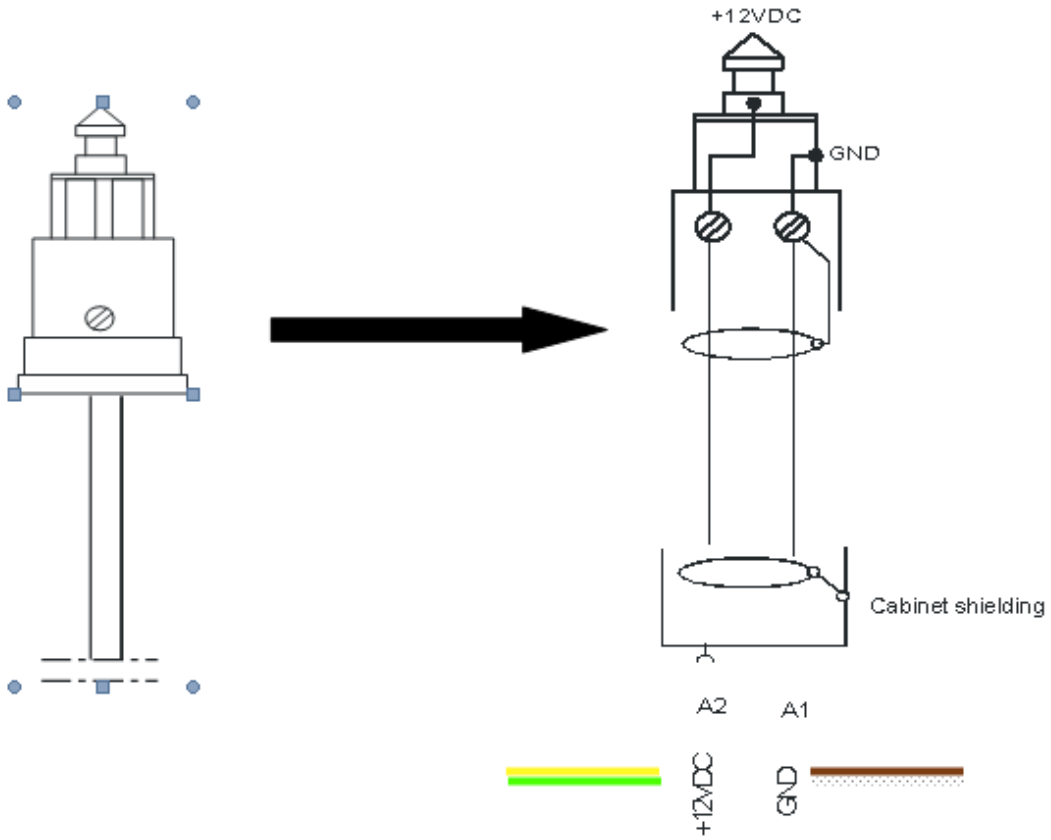


Figure 3-4: Supplied power cable with cigarette lighter adapter

+12 V DC = green/yellow cabling
GND = brown/white cabling

3.12.3 Connecting to an AC power supply

If you operate the product with an external power supply, you can use it indoors only in pollution degree 2 environments where nonconductive contamination can occur. Suitable AC power supplies are listed in the data sheet. They differ in the output power:

- R&S TSMA6-Z1 has an output power of 105 W and is suitable for multiple R&S TSMx products.

1. Ensure that the required ratings listed in the data sheet are matched.
2. Connect the round connector to DC IN.
   Note:
   If the R&S TSMA6B is connected with an R&S TSMA6B-BP, DC power must be connected to the R&S TSMA6B-BP (1).

Do not connect the DC power to the R&S TSMA6B (2).

Figure 3-5: DC IN connectors

1 = DC IN connector R&S TSMA6B-BP
2 = DC IN connector R&S TSMA6B

3. Insert the AC power plug into a power outlet with ground contact.

3.12.4 Connecting to a battery pack

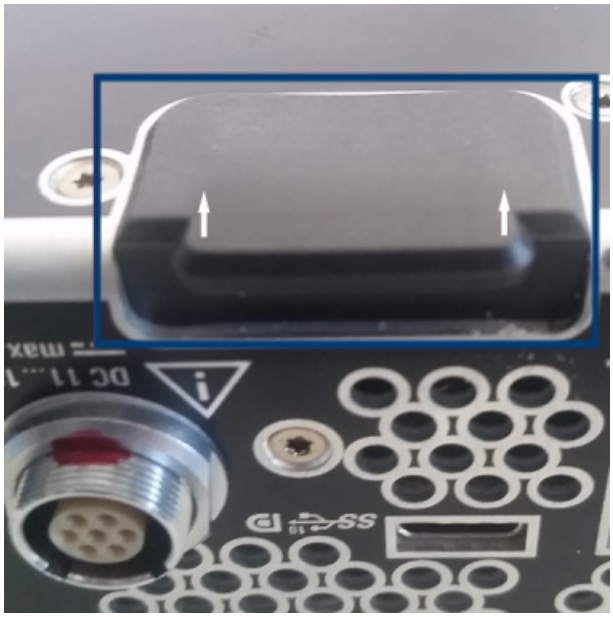
You can use the R&S TSMA6B-BP battery pack as power supply.

If you use an R&S TSMA6B together with an R&S TSMAx-BP, connect the DC power to the DC IN connector of the R&S TSMAx-BP (see Figure 3-5).

If the R&S TSMA6B is not used for more than one day, remove the batteries from R&S TSMA6B-BP to prevent discharge. For details, see the manual of the R&S TSMA6B-BP battery pack.

To connect a battery pack

1. Remove the cover cap from the docking connector of the R&S TSMA6/6B.



2. Screw the collar screws (standard accessory of R&S TSMA6B-BP) on the top of the R&S TSMA6B with a Torx 8 screw driver.
   - Torque: 0.66 Nm ± 0.05 Nm

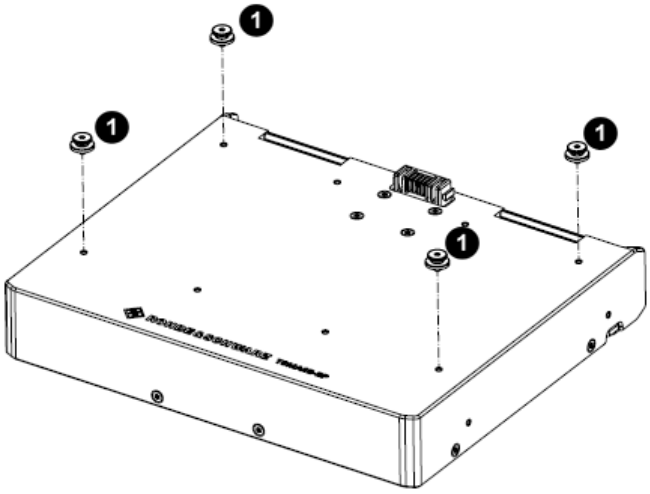


Figure 3-6: Collar screws

1 = Collar screws

3. Align the collar screws with the snap-in holes on the bottom of an R&S TSMA6/6B and press the device down.

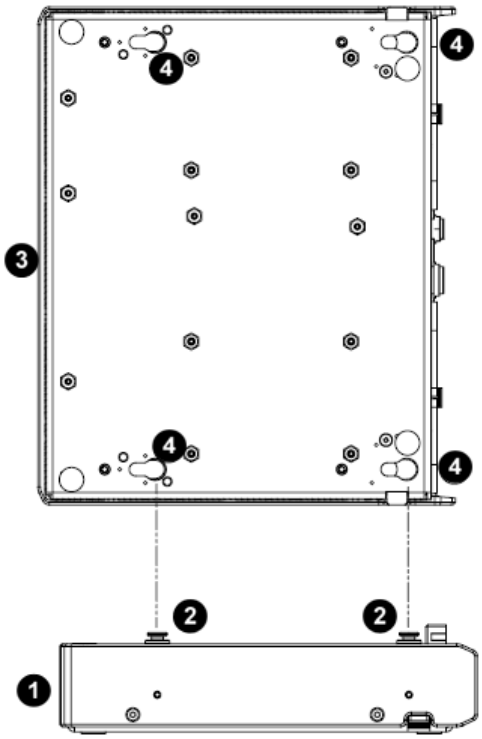


Figure 3-7: Aligning R&S TSMA6B-BP and R&S TSMA6/6B

1 = R&S TSMA6B-BP
2 = Collar screws
3 = R&S TSMA6/6B
4 = Snap in holes on the bottom pane of R&S TSMA6/6B

4. Move the R&S TSMA6/6B to the rear side (2) until you hear a click when the collar screws are locked in.

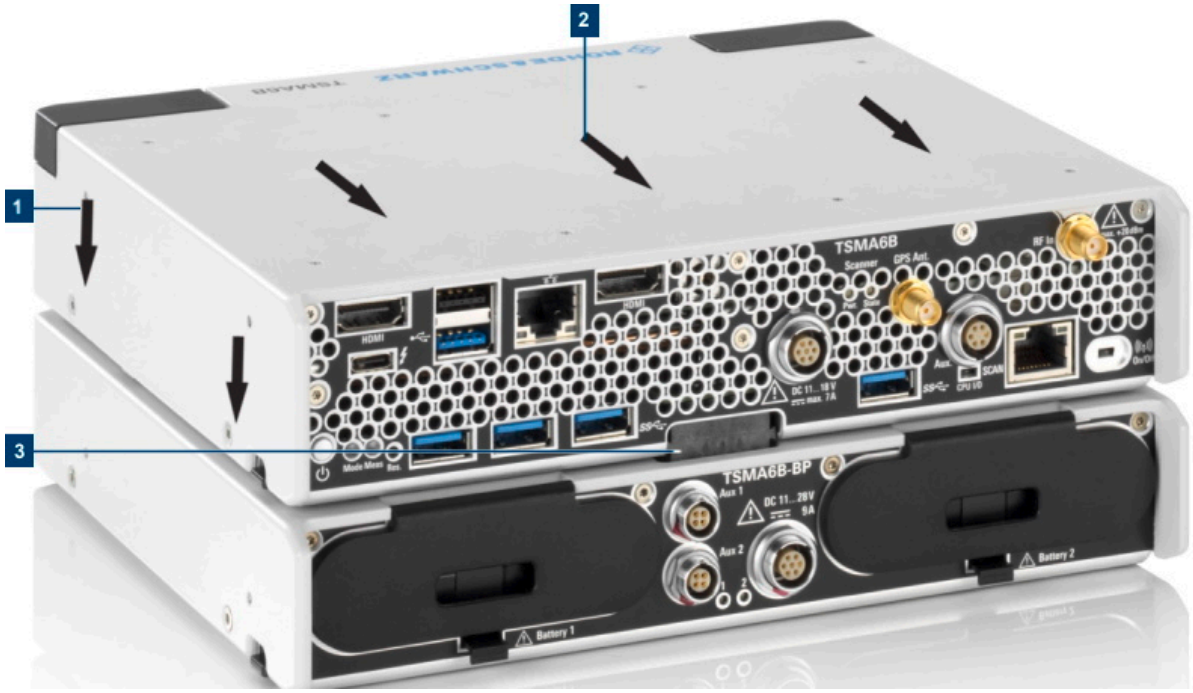


Figure 3-8: Connected R&S TSMA6/6B and R&S TSMA6B-BP

1 = Attach R&S TSMA6B to R&S TSMA6B-BP
2 = Move R&S TSMA6/6B to the rear side
3 = Power connection established (docking connector is snapped in)

3.13 Switching on or off R&S TSMA6B

The behavior depends on the configured "Startup Settings".

- "Auto Power ON"
  The R&S TSMA6B starts automatically.
- "Remember Last State"
  If you have powered down the R&S TSMA6B in the previous measurement session, you have to switch on the device next time manually.

To switch on the device

The device is off but connected to power.

► Press the power on/off button.

The Pwr LED starts green blinking. After booting, the color changes to green resp. blue continuous depending on the state of the WLAN access point (see Table 4-1).

To shut down the device

► Press the power on/off button.

The Pwr LED starts blinking green. The operating system shuts down and the Pwr LED is switched off.

Figure 3-9: Power button

For the power state LEDs, see Table 4-1.

For a coldstart, hold the power on/off button at least 5 s.

3.14 Calibrating GPS for dead reckoning

The following steps are necessary to enable untethered dead reckoning with the integrated receiver (see "GPS Ant. connector (SMA) - GPS antenna input" on page 37) of the R&S TSMA6B.

1. Mount the R&S TSMA6B device fixed to the frame of a car.
2. Power on the R&S TSMA6B device.
3. Activate "Dead Reckoning" in the used software (for details, refer to R&S ROMES, R&S NESTOR or R&S ViCom documentation).
4. Wait until the used software reports a "3D fix" (time may vary depending on the configured GNSS).
5. To calibrate the instrument, perform the following driving procedures in a safe environment.

a) 720 degrees right turn
b) 720 degrees left turn
c) Drive in a straight line with a velocity exceeding 40 km/h.

After finishing the calibration, the used software should report a fix state "GPS +DR" or "3D+DR", in case satellite reception is lost the fix state will change to "DR only".

If using "DR only", the accuracy of the reported position will decrease over time. If it falls below a certain threshold, the receiver reports the state "No Fix".

The GPS calibration is saved in the module. Whenever the device is switched off, the calibration procedure must be repeated for the next usage of dead reckoning.

4 Instrument tour

The meanings of the labels on the product are described in Chapter 1.2, "Labels on the product", on page 8.

4.1 Front panel tour

The front panel of the R&S TSMA6B does not provide any connectors or control elements for operation. The black caps on the left and right contain the WLAN antennas. For details, see Chapter 4.4, "Built-In WLAN / Bluetooth adapter", on page 40.

Figure 4-1: R&S TSMA6B - Front Panel

4.2 Rear panel tour

The following figure provides an overview of the control elements and the connectors on the rear panel of the instrument.

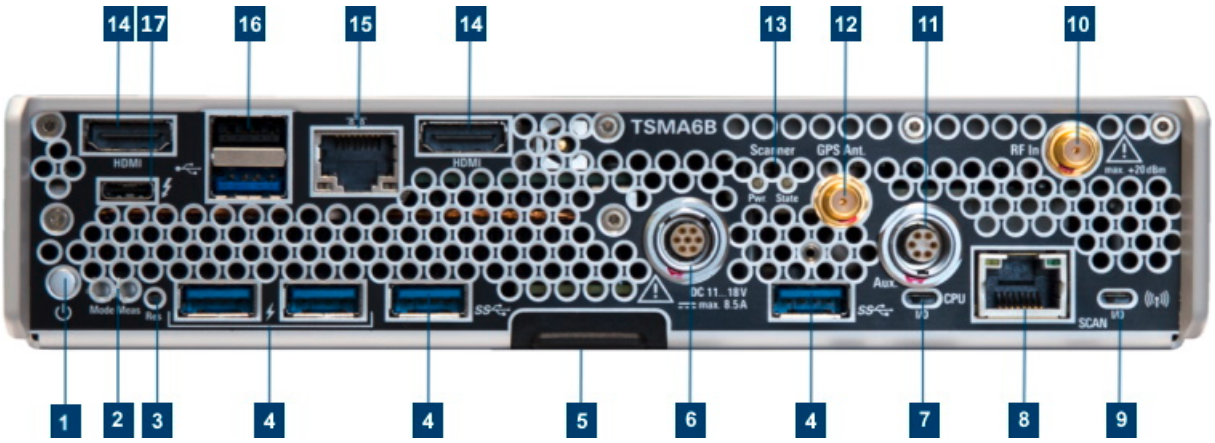


Figure 4-2: R&S TSMA6B - Rear Panel

1 = "Power on/off" on page 34
2 = "Status LEDs - Mode, Meas" on page 34
3 = "Restore button" on page 35
4 = "USB 3.0 (2x 1.5 A, 2x 0.9 A, Type A)" on page 35
5 = "Docking connector" on page 36
6 = "DC IN connector" on page 36
7 = "Switch Normal mode - Scan mode" on page 36
8 = "SCAN port - GBit LAN interface - external R&S TSME4/6 (RJ45 connector)" on page 36
9 = "WLAN/Bluetooth on/off" on page 37
10 = "RF IN connector (SMA)" on page 37
11 = "AUX connector (SMA) - synchronization R&S TSME4/6 / R&S TSMExxDC" on page 37
12 = "GPS Ant. connector (SMA) - GPS antenna input" on page 37
13 = "Status LEDs - Scanner Pwr / State" on page 37
14 = "HDMI connector (2x)" on page 38
15 = "LAN port - remote control (RJ45 connector)" on page 38
16 = "USB 2.0/USB 3.0 (2x, Type A)" on page 38
17 = "USB-C (multiport for Thunderbolt, display and standard USB-C 3.1)" on page 39

Power on/off

See (1) in Figure 4-2.

Turns the device on and off.

For details, see Chapter 3.13, "Switching on or off R&S TSMA6B", on page 30.

Status LEDs - Mode, Meas

See (2) in Figure 4-2.

The status LEDs Mode and Meas indicate different states of the R&S TSMA6B.

Table 4-1: Power states

Device	
Mode LED	**State**
---	Power off
Green (BLINKING, 1/s)	Power on / power down (in progress)
Green (CONT.)	Power on (finished) / WLAN access point off
Blue (CONT.)	Power on (finished) / WLAN access point on
Blue (BLINKING, 1/s)	Restore/Backup/FW, SW installation (in progress)
Green (BLINKING, 1/5s)	Delayed start activated
Blue (BLINKING, 1/2s)	Scanner mode
Blue (BLINKING rapidly)	Selftest Failed/Scanner Interface not accessible

Table 4-2: Measurement states (SmartONE only)

Device	
Meas LED	**State**
Yellow (CONT.)	SW loading
Green (CONT.)	SW ready
Green (BLINKING, 1/2s)	SW measuring
Green (BLINKING rapidly)	SW recording
Yellow (BLINKING, 2/s)	SW warning
Red (BLINKING rapidly)	SW error

Restore button

See (3) in Figure 4-2.

System recovery to factory or user default.

Use a slim, dull object for pressing the button.

Min button hold time for detection: 20 sec

USB 3.0 (2x 1.5 A, 2x 0.9 A, Type A)

See (4) in Figure 4-2.

Connecting external storage devices, data sticks and test mobile phones.

- 2x USB 3.0 with a power limit of 1.5 A/port

- 2x USB 3.0 with a power limit of 0.9 A/ port


Overall USB current (USB-C, USB 3.0 and USB 2.0 combined): max. 3 A

Docking connector

See (5) in Figure 4-2.

Connector for the battery pack unit R&S TSMA6/B-BP.

DC IN connector

See (6) in Figure 4-2.

Connecting external DC power supply.

Ensure that the voltage and current indicated on the R&S TSMA6B match the available power source.

Input voltage range: 11 V to 18 V

Input current: max. 8.5 A

For connecting to power, see Chapter 3.12, "Connecting to power", on page 25.

Switch Normal mode - Scan mode

See (7) in Figure 4-2.

Switches between scanner mode (scanner only) and normal mode (CPU and scanner).

For details, see Chapter 3.6, "Selecting operation mode (normal/scanner)", on page 20.

SCAN port - GBit LAN interface - external R&S TSME4/6 (RJ45 connector)

See (8) in Figure 4-2.

The SCAN port provides a high-speed 1 Gbit Ethernet interface with an RJ 45 connector. It is used to connect the R&S TSMA6B to a separate R&S TSME6 as

a second scanner used for MIMO scenarios and for increasing bandwidth and measurement rate.

WLAN/Bluetooth on/off

See (9) in Figure 4-2.

Switches WLAN and Bluetooth on and off.

RF IN connector (SMA)

See (10) in Figure 4-2.

RF input of the device.

The maximum input power is +20 dBm/10 V DC.

Do not overload the maximum allowed input of +20 dBm.

Non-compliance destroys the input mixer.

AUX connector (SMA) - synchronization R&S TSME4/6 / R&S TSMExxDC

See (11) in Figure 4-2.

The AUX connector has two functions.

- Input/output: Synchronization with up to 4 connected R&S TSME6 resp. R&S TSMExxDC (requires sync cable R&S TSME6-ZC2, order no. 4900.1800.02 or R&S TSME6-ZC4, order no. 4900.1817.02)
- Input: Synchronization of R&S TSMA6B with an external 10 MHz reference (requires dedicated sync cable)

GPS Ant. connector (SMA) - GPS antenna input

See (12) in Figure 4-2.

Active GPS antenna port (output voltage 3V, max 25 mA).

Status LEDs - Scanner Pwr / State

See (13) in Figure 4-2.

The status LEDs Scanner State and Scanner Pwr indicate different states of the R&S TSMA6B.

Scanner		
Pwr LED	**State LED**	**State**
Green (BLINKING rapidly => ON)	Red (Off-On < 5s => Off)	Scanner configuration ongoing
Green	Green	Connected
Green	Green (BLINKING rapidly)	Measuring
Green	Red (BLINKING, 2/s)	Temperature warning
Green	Red	Temperature error
n.a.	Red (BLINKING, 2/s)	Scanner error Temperature warning
n.a.	Red	Scanner error Temperature error

HDMI connector (2x)

See (14) in Figure 4-2.

Connecting an external monitor (max. resolution: 2560 x 1600 pixel).

LAN port - remote control (RJ45 connector)

See (15) in Figure 4-2.

High-speed 1 Gbit Ethernet interface with an RJ 45 connector. Use it to connect the R&S TSMA6B to a LAN/WAN.

The LAN interface can be used for the following scenarios.

- Remote Control via web-GUI
- Remote Control via Remote Desktop Connection
- LAN interface in NESTOR Probe Mode

Table 4-3: LAN port LEDs

Status	LED
Link status	Yellow
Activity status	Green

USB 2.0/USB 3.0 (2x, Type A)

See (16) in Figure 4-2.

Connecting external devices, e.g. keyboard, mouse or software dongle.

- 1x USB 2.0 with a power limit of 0.5 A/port
- 1x USB 3.0 with a power limit of 0.9 A/ port

Overall USB current (USB-C, USB 3.0 and USB 2.0): max. 3 A

USB-C (multiport for Thunderbolt, display and standard USB-C 3.1)

See (17) in Figure 4-2.

Connecting external storage devices, tablets and test mobile phones.

Total power (USB-C): max. 3 A

Overall USB current (USB-C, USB 3.0 and USB 2.0): max. 3 A

4.3 Built-In GPS receiver

The integrated multi-GNSS (GPS / BeiDou / Galileo / GLONASS) receiver enables the use of three satellite systems in parallel. It offers an accuracy improvement of 30 % to 50 % by using a second constellation of satellites.

Following combinations are allowed:

- GPS only
- GPS / GLONASS / Galileo
- GPS / BeiDou

The R&S TSMA6B can perform dead reckoning in tunnels to provide position information even if no satellites are available. The dead reckoning is performed by the device with its built-in electronic gyroscopes.

For enabling untethered dead reckoning, see Chapter 3.14, "Calibrating GPS for dead reckoning", on page 31.

Depending on the intended use, the respective valid regulations regarding lightning protection of the antennas and regarding vehicle installation must be observed during installation.

4.4 Built-In WLAN / Bluetooth adapter

The R&S TSMA6B has a built-in WLAN/Bluetooth module (Intel® AX200).

The R&S TSMA6B WLAN / Bluetooth adapter allows the following modes.

- Client connection to a distant WLAN network
- Serving as a WLAN access point

Per default, the R&S TSMA6B WLAN access point is switched on. The login credentials are found on the bottom label of the device. The WLAN / Bluetooth can be switched off (flight mode) via rear panel switch.

Configure the WLAN and Bluetooth settings via web-GUI.

For regulatory information, see Chapter 1.3, "WLAN/Bluetooth adapter", on page 8.

5 Transporting

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.

Transport altitude

Unless otherwise specified in the data sheet, the maximum transport altitude without pressure compensation is 4500 m above sea level.

6 Maintenance, storage and disposal

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.

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

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

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 6-1: 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.

Disposing batteries

A product that contains a battery cannot be disposed of in the normal household waste after it has come to the end of its service life. It is labeled as follows:

Figure 6-2: Disposal information in line with EU battery directive

Dispose of batteries as specified by the local waste disposal agency. Alternatively, you can contact the Rohde & Schwarz local service representative.

For information on returning batteries to Rohde & Schwarz subsidiaries, see "Handling batteries safely" on page 7.

7 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 7-1: QR code to the Rohde & Schwarz support page

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