

R&S®EPL

EMI Test Receiver

User Manual

dataTec

Mess- und Prüftechnik. Die Experten.

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Version 06

ROHDE & SCHWARZ
Make ideas real



This manual applies to the following R&S®EPL models with firmware version 1.30 and higher:

- R&S®EPL1000 (1350.4444K10)
- R&S®EPL1001 (1350.4444K11)
- R&S®EPL1007 (1350.4444K17)

In addition to the base unit, the following options are described:

- R&S®EPL1-B91, Internal Generator (1350.4073.02)
- R&S®EPL1-B2, Preselection (1350.4015.02)
- R&S®EPL1-B22, Preamplifier (1350.4496.02)
- R&S®FPL1-B4, OCXO (1323.1902.02)
- R&S®FPL1-B10, GPIB interface (1323.1890.02)
- R&S®FPL1-B30, DC Power supply (1323.1877.02)
- R&S®FPL1-B31, Optional battery pack (1323.1725.02)
- R&S®EPL1-K56, IF Analysis (1350.4067.02)



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

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1 Preface

1.1 About This Manual

This user manual describes general instrument functions and settings common to all applications and operating modes in the R&S EPL. Furthermore, it provides all the information specific to **EMI measurements in the receiver application**.

All other operating modes and applications are described in the specific application manuals.

The main focus in this manual is on the measurement results and the tasks required to obtain them. The following topics are included:

- **Welcome to the R&S EPL**
Introduction to and getting familiar with the instrument
- **Operating modes and applications**
The concept of using multiple operating modes
- **Measurements**
Descriptions of the individual measurements in the receiver application, including result types and configuration settings.
- **Common measurement settings**
Description of the measurement settings common to all measurement types with their corresponding remote control commands
- **Common measurement analysis and display functions**
Description of the settings and functions provided to analyze results independently of the measurement type with their corresponding remote control commands
- **Data management**
Description of general functions to handle data files (configuration and result data, not I/Q data)
- **General instrument setup**
Description of general instrument settings and functions that are independent of the current operating mode
- **Network and remote operation**
Information on setting up the instrument in a network and operating it remotely.
- **Remote commands**
Remote commands required to configure and run measurements in a remote environment, sorted by tasks
Remote commands required to set up the environment and to perform common tasks on the instrument, sorted by tasks
Programming examples demonstrate the use of many commands and can usually be executed directly for test purposes
- **Maintenance**
Information on tasks required to maintain operability of the instrument
- **Troubleshooting**
Hints and tips on how to handle errors

- **List of commands**
Alphabetical list of all remote commands described in the manual
- **Index**

1.2 Conventions used in the documentation

1.2.1 Typographical conventions

The following text markers are used throughout this documentation:

Convention	Description
"Graphical user interface elements"	All names of graphical user interface elements on the screen, such as dialog boxes, menus, options, buttons, and softkeys are enclosed by quotation marks.
[Keys]	Key and knob names are enclosed by square brackets.
Filenames, commands, program code	Filenames, commands, coding samples and screen output are distinguished by their font.
<i>Input</i>	Input to be entered by the user is displayed in italics.
Links	Links that you can click are displayed in blue font.
"References"	References to other parts of the documentation are enclosed by quotation marks.

1.2.2 Conventions for procedure descriptions

When operating the instrument, several alternative methods may be available to perform the same task. In this case, the procedure using the touchscreen is described. Any elements that can be activated by touching can also be clicked using an additionally connected mouse. The alternative procedure using the keys on the instrument or the on-screen keyboard is only described if it deviates from the standard operating procedures.

The term "select" may refer to any of the described methods, i.e. using a finger on the touchscreen, a mouse pointer in the display, or a key on the instrument or on a keyboard.

1.2.3 Notes on screenshots

When describing the functions of the product, we use sample screenshots. These screenshots are meant to illustrate as many as possible of the provided functions and possible interdependencies between parameters. The shown values may not represent realistic usage scenarios.

The screenshots usually show a fully equipped product, that is: with all options installed. Thus, some functions shown in the screenshots may not be available in your particular product configuration.

2 Safety and regulatory information

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

Intended use

The product is intended for the development, production and verification of electronic components and devices in industrial, administrative, and laboratory environments. Use the product only for its designated purpose. Observe the operating conditions and performance limits stated in the specifications document.

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 [Section 2.1, "Safety instructions"](#), on page 12. The same information is provided in many languages in printed format. The printed "Safety Instructions" for "Mains-Powered Products, Not Heavy" (document number 1171.1771.99) are delivered with the product.
- Throughout the documentation, safety instructions are provided when you need to take care during setup or operation.

2.1 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 skilled persons 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.

The product is heavy. Do not move or carry the product by yourself. A single person can only carry a maximum of 18 kg safely depending on age, gender and physical condition. Look up the maximum weight in the specifications document. Use the product handles to move or carry the product. Do not lift by the accessories mounted on the product. Accessories are not designed to carry the weight of the product.

To move the product safely, you can use lifting or transporting equipment such as lift trucks and forklifts. 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 or 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.
- If a product has an exchangeable fuse, its type and characteristics are indicated next to the fuse holder. Before changing the fuse, switch off the product and disconnect it from the power source. How to change the fuse is described in the product documentation.
- 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.

Using laser products

Lasers are classified according to their potential risk. If exposure to the laser beam is possible, the product is labeled as shown in the table explaining the safety labels.

- Class 1M lasers
Safe for the naked eye. If you look into the laser beam with optical instruments such as binoculars or eye loupes, you risk damaging your eyes.
- Class 2 lasers
If you stare into the beam, you risk damaging your eyes.

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 support. 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.

Using headphones

Take the following measures to prevent hearing damage. Before using headphones, check the volume and reduce it if necessary. If you monitor varying signal levels, take off the headphones and wait until the signal has settled. Then adjust the volume.

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 and its accessories warn against potential hazards.

	Potential hazard Read the product documentation to avoid personal injury or product damage.
	Heavy product Be careful when lifting, moving or carrying the product. Carrying the product requires a sufficient number of persons or transport equipment.
	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.
	DC - direct current Connect to a DC power supply of the specified voltage range.
	Laser beam The product contains a laser. Avoid exposure to the laser beam.
	Laser beam Avoid exposure to direct or reflected laser beam.

2.2 Labels on R&S EPL

Labels on the casing inform about:

- Personal safety, see ["Meaning of safety labels"](#) on page 16
- Product and environment safety, see [Table 2-1](#)
- Identification of the product, see [Section 6.2.15, "Device ID"](#), on page 50

Table 2-1: Labels regarding R&S EPL 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 672.
	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 of electrical and electronic equipment" on page 672.

2.3 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.

CAUTION

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

NOTICE

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

2.4 Korea certification class A



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

3 Documentation overview

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

www.rohde-schwarz.com/manual/EPL

3.1 Getting started manual

Introduces the R&S EPL 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 instrument. A PDF version is available for download on the Internet.

3.2 User manuals and help

Separate user manuals are provided for the base unit and the firmware applications:

- **Base unit manual**
Contains the description of all instrument modes and functions. It 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. Includes the contents of the getting started manual.
- **Firmware application manual**
Contains the description of the specific functions of a firmware application, including remote control commands. Basic information on operating the R&S EPL is not included.

The contents of the user manuals are available as help in the R&S EPL. The help offers quick, context-sensitive access to the complete information for the base unit and the firmware applications.

All user manuals are also available for download or for immediate display on the Internet.

3.3 Service manual

Describes the performance test for checking compliance with rated specifications, firmware update, troubleshooting, adjustments, installing options and maintenance.

The service manual is available for registered users on the global Rohde & Schwarz information system (GLORIS):

<https://gloris.rohde-schwarz.com>

3.4 Instrument security procedures

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

3.5 Printed safety instructions

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

3.6 Specifications and brochures

The specifications document, also known as the data sheet, contains the technical specifications of the R&S EPL. 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/EPL

3.7 Release notes and open source acknowledgment (OSA)

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

The software uses 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/EPL

3.8 Application notes, application cards, white papers, etc.

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

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

3.9 Video tutorials

Video tutorials that show you how to get started and perform basic tasks with the R&S EPL are available on the Rohde & Schwarz internet site:

https://www.rohde-schwarz.com/manual/r-s-fpl1000-trying-out-basic-measurement-tasks-manuals_78701-567115.html

Find various videos on Rohde & Schwarz products and test and measurement topics on YouTube: <https://www.youtube.com/@Rohde-Schwarz>

3.10 Calibration certificate

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

4 Key features

The R&S EPL sets standards in RF performance and usability. Outstanding key features are:

One instrument for multiple applications

- Receiver measurements (CISPR compliant)
- Spectrum analysis

Solid RF performance

- Low spurious response
- Low displayed average noise level (DANL)
- 12.8 MHz signal analysis bandwidth
- Low level measurement uncertainty
- Precise spectral measurements due to low phase noise

Intuitive user interface

- High-resolution display
- Multipoint touchscreen
- Flexible arrangement of results and MultiView
- Toolbar
- Quiet operation

Fully portable

- Battery pack and 12 V/24 V power supply
- Carrying bag and shoulder harness
- Low power consumption

5 Preparing for use

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

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5.1 Lifting and carrying

The carrying handles are designed to lift or carry the instrument. Do not apply excessive external force to the handles.

See "[Lifting and carrying the product](#)" on page 13.

5.2 Unpacking and checking

1. Unpack the R&S EPL carefully.
2. Retain the original packing material. Use it when transporting or shipping the R&S EPL 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.

5.3 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 13.

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.

5.4 Setting up the R&S EPL

The R&S EPL is designed for use either on a bench top or in a rack, or as a portable instrument (with optional battery operation) in a transport bag in the field.

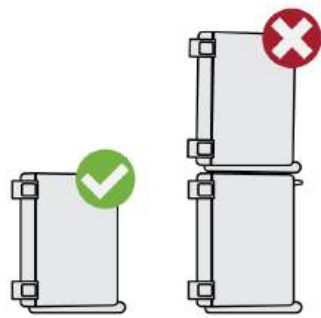
See also:

- ["Setting up the product"](#) on page 13
- ["Intended use"](#) on page 12

5.4.1 Placing the R&S EPL on a bench top

To place the product on a bench top

1. Place the product on a stable, flat and level surface.
2. **CAUTION!** The top surface of the product is too small for stacking. If you stack another product on top of the product, the stack can fall over and cause injury. If you want to save space, mount several products in a rack.



3. **CAUTION!** Foldable feet can collapse. For safety information, see "[Setting up the product](#)" on page 13.

Always fold the feet completely in or out. With folded-out feet, do not place anything on top or underneath.

4. **NOTICE!** Overheating can damage the product.

Prevent overheating as follows:

- Keep a minimum distance of 10 cm between the fan openings of the product and any object in the vicinity to provide sufficient airflow and ventilation.
- Do not place the product next to heat-generating equipment such as radiators or other products.

5.4.2 Mounting the R&S EPL in a rack

To prepare the rack

1. Observe the requirements and instructions in "[Setting up the product](#)" on page 13.
2. **NOTICE!** Insufficient airflow can cause overheating and damage the product.
Design and implement an efficient ventilation concept for the rack.

To mount the R&S EPL in a rack

1. Use an adapter kit to prepare the R&S EPL for rack mounting.
 - a) Order the rack adapter kit designed for the R&S EPL. For the order number, see the specifications document.
 - b) Mount the adapter kit. Follow the assembly instructions provided with the adapter kit.
2. Lift the R&S EPL to shelf height.
3. Grab the handles and push the R&S EPL onto the shelf until the rack brackets fit closely to the rack.
4. Tighten all screws in the rack brackets with a tightening torque of 1.2 Nm to secure the R&S EPL in the rack.

To unmount the R&S EPL from a rack

1. Loosen the screws at the rack brackets.
2. Remove the R&S EPL from the rack.
3. If placing the R&S EPL on a bench top again, unmount the adapter kit from the R&S EPL. Follow the instructions provided with the adapter kit.

5.4.3 Portable operation

An optional carrying bag designed specifically for the R&S EPL allows you to protect the instrument while working in the field. The bag includes ventilation areas at the position of the ventilation outlets in the casing to ensure air circulation. The transparent cover allows you to operate the instrument without removing it from the bag. With the help of the optional vest holster, you can carry the R&S EPL in its bag and keep your hands free. Together with the optional battery pack (see [Section 5.5.3, "Optional battery pack"](#), on page 27), and packed in the dedicated carrying bag, the R&S EPL is ideally suited for operation directly in the field, even in rough environments.



- Inspect the carrying bag for wear and tear before placing the instrument in it.

For details on optional accessories, see the R&S EPL data sheet.

5.5 Connecting to power

There are various options to supply power to the R&S EPL.

- The R&S EPL is equipped with an AC power supply connector.
- The R&S EPL can also be equipped with an optional (internal) DC power supply connector
The optional DC power supply is available with R&S FPL1-B30.
- The R&S EPL allows for battery operation if option R&S FPL1-B31 is installed.

5.5.1 Connecting the AC power

The R&S EPL can be used with different AC power voltages and adapts itself automatically to it. Refer to the datasheet for the requirements of voltage and frequency.

For safety information, see ["Connecting to power"](#) on page 14.

To connect the AC power



1. Plug the AC power cable into the AC power connector on the rear panel of the instrument. Only use the AC power cable delivered with the R&S EPL.

2. Plug the AC power cable into a power outlet with ground contact.

The required ratings are listed next to the AC power connector and in the data sheet.

For details on the connector, refer to [Section 6.2.1, "AC power supply connection and main power switch"](#), on page 45.

5.5.2 Connecting an optional DC power supply

The DC power supply is available with option R&S FPL1-B30.

The R&S EPL can also be equipped with an optional DC power supply connector. If installed, the R&S EPL can be operated by a DC voltage of +12 V to +24 V. For details on the connector see [Section 6.2.2, "Li-Ion battery packs and DC power connector"](#), on page 46.

If you use an external power supply unit to supply safety extra-low DC voltage (SELV) to the instrument, be sure to meet the requirements for reinforced/double insulation in accordance with DIN/EN/IEC 61010 (UL 3111, CSA C22.2 No. 1010.1) or DIN/EN/IEC 60950 (UL 1950, CSA C22.2 No. 950). Provide current limitation in accordance with DIN EN 61010-1 Appendix F2.1. Use a cable no longer than 3 m.

Also see ["Connecting to power"](#) on page 14.



DC connection

- ▶ Connect the DC power connector on the rear panel of the R&S EPL to the DC power source using a cable as described above.

5.5.3 Optional battery pack

The optional battery pack is available with R&S FPL1-B31.

As an alternative to the fixed AC or DC power supply, the R&S EPL also allows for battery operation. The "Battery Pack" option comprises two Li-ion batteries and an internal charger. The internal charger charges the batteries whenever the instrument is connected to AC power. During operation, if neither DC nor AC power is supplied, the R&S EPL automatically switches to battery operation.

The battery pack can be retrofitted by Rohde & Schwarz service.

For safety information, see "[Handling batteries safely](#)" on page 15.



Charging batteries

Charge the batteries before using battery operation for the first time. Following a long storage period, it can be necessary to charge and discharge the batteries several times to reach full capacity.

For batteries from third parties, follow the instructions provided by the manufacturer. For batteries manufactured by Rohde & Schwarz, observe the following:

- If inserted in the R&S EPL, batteries are charged via the common AC or DC power supply.
- You can also use the external battery charger R&S FSV-B34 to charge up to 4 batteries.
- Charge only in the temperature range specified in the data sheet. If the temperature exceeds those values, or the temperature varies strongly, charging is interrupted. If the battery temperature rises above +53 °C, charging is stopped.

- Try not to overcharge the battery too often because overcharging reduces the service life of the battery.



When the battery is being charged in standby mode, the [Power] LED blinks. During operation, the status bar indicates that the battery is being charged.

Remote command to determine the battery charge state:

[DIAGnostic:SERVice:BATTery:LEVel?](#) on page 583

Spare battery pack

The spare battery pack is available with R&S FPL1-Z4.

In addition to the optional internal battery pack, spare batteries are available for the R&S EPL. The spare battery pack comprises two additional Li-ion batteries.

Outside the R&S EPL, batteries can be charged using the external battery charger R&S FSV-B34. Even during battery operation, you can exchange the internal batteries while the R&S EPL is running, as long as one battery remains in the instrument. However, it is not recommended to operate the R&S EPL with only one battery for a longer period.

5.6 Switching on or off

Table 5-1: Overview of power states

Status	LED on Power key	Position of main power switch
Off	● gray	[0]
Standby	● orange	[I]
Ready	● green	[I]

To switch on the R&S EPL

The R&S EPL is off but connected to power.

1. Set the switch on the power supply to position [I].
See [Section 6.2.1, "AC power supply connection and main power switch"](#), on page 45.

The LED of the Power key is orange.

See [Section 6.1.2, "Power key"](#), on page 41.

Note: If the R&S EPL was disconnected from power before it was switched off regularly, it automatically switches back on when the power is reconnected. Using a LAN-controlled power switch, you can take advantage of this behavior to switch the device on and off remotely.

2. Press the Power key.

The LED changes to green.

The instrument operates on battery, DC, or AC power, whichever is supplied. The R&S EPL boots.

After booting, the instrument is ready for operation.

To shut down the product

The product is in the ready state.

- Press the [Power] key.

The operating system shuts down. The LED changes to orange. The product changes to standby state.

To disconnect from power

The R&S EPL is in the standby state.

1. **NOTICE!** Risk of data loss. If you disconnect the product from power when it is in the ready state, you can lose settings and data. Shut it down first.

Set the switch on the power supply to position [0].

See [Section 6.2.1, "AC power supply connection and main power switch"](#), on page 45.

The LED of the standby key is switched off.

2. Disconnect the R&S EPL from the power source.

5.7 Connecting to RF coaxial connectors

The most common interface used to provide signal input to the R&S EPL is the RF input 50 ohm connector.

The RF input can be coupled to the DUT by alternating current (AC) or direct current (DC). AC coupling blocks any DC voltage from the input signal. This is the default setting to prevent damage to the instrument. However, some specifications require DC coupling.

In this case, protect the instrument from damaging DC input voltages manually, e.g. by inserting a DC blocker or using a bias tee to bias your DUT and supply the DC input to the instrument. For details, refer to the specifications document.

To prepare for connecting

1. **NOTICE!** Damaged or not clean connections can lead to RF insertion loss and mismatch, and even premature wear of the connectors.

Before connecting to the port, inspect the RF connector visually. Check that it is clean, undamaged and mechanically compatible.

2. Use a high-quality RF cable that matches the RF connector type. See also ["Cable selection to minimize electromagnetic interference \(EMI\)"](#) on page 37.

You can connect to two kinds of connectors:

- "To connect to screwable connectors" on page 30
- "To connect to pluggable connectors" on page 30

To connect to screwable connectors

To connect the cable with the connector, proceed as follows:

1. Carefully align the connector of the cable and the connector along a common axis.
2. Mate the connectors along the common axis until the male pin of the inner connector engages with the female socket of the outer connector.
3. Turn the nut of the outer connector until the connectors are firmly coupled.
4. **NOTICE!** Excessive tightening can damage the connectors.
Using a calibrated torque wrench, torque the nut to the limit. Hold the opposite connector part stationary with a spanner.

To connect to pluggable connectors

The R&S EPL provides pluggable Bayonet Neill-Concelman (BNC) connectors.

To connect the RF cable with the BNC connector, proceed as follows:

1. Carefully align the connector of the cable and the BNC connector along a common axis.
2. Mate the connectors along the common axis until the male pin of the connector of the cable engages with the female socket of the BNC connector.

5.8 Connecting to LAN

You can connect the instrument to a LAN for remote operation via a PC.

Provided the network administrator has assigned you the appropriate rights and adapted the Windows firewall configuration, you can use the interface, for example:

- To transfer data between a controlling device and the test device, e.g. to run a remote control program
- To access or control the measurement from a remote computer using the "Remote Desktop" application (or a similar tool)
- To connect external network devices (e.g. printers)
- To transfer data from a remote computer and back, e.g. using network folders

Network environment

Before connecting the product to a local area network (LAN), consider the following:

- Install the latest firmware to reduce security risks.
- For internet or remote access, use secured connections, if applicable.

- Ensure that the network settings comply with the security policies of your company. Contact your local system administrator or IT department before connecting your product to your company LAN.
- When connected to the LAN, the product may potentially be accessed from the internet, which may be a security risk. For example, attackers might misuse or damage the product. For more information about IT security and how to operate the product in a secure LAN environment, see the Rohde & Schwarz white paper [1EF96: Malware Protection Windows 10](#).

► **NOTICE!** Risk of network failure.

Consult your network administrator before performing the following tasks:

- Connecting the instrument to the network
- Configuring the network
- Changing IP addresses
- Exchanging hardware

Errors can affect the entire network.

Connect the R&S EPL to the LAN via the LAN interface on the rear panel of the instrument.

Windows automatically detects the network connection and activates the required drivers.

By default, the R&S EPL is configured to use DHCP and no static IP address is configured.



The default instrument name is <Type><variant>-<serial_number>, for example, EPL1000-123456. For information on determining the serial number, see [Section 6.2.15, "Device ID"](#), on page 50.

For more information on LAN configuration, see [Section 14.5.4, "LAN settings"](#), on page 357.

5.9 Connecting a keyboard

The keyboard is detected automatically when it is connected. The default input language is English – US.

However, you can also connect foreign language keyboards; currently the following languages are supported for the R&S EPL:

- German
- Swiss
- French
- Russian

To configure the keyboard language

1. To access the Windows operating system, press the Windows key on the external keyboard.
2. Select "Start > Settings > Time & language > Region & language > Add a language" .

5.10 Connecting an external monitor

You can connect an external monitor (or projector) to the "DisplayPort" connector on the rear panel of the R&S EPL (see also [Section 6.2.14, "DisplayPort"](#), on page 49).

**Screen resolution and format**

The touchscreen of the R&S EPL is calibrated for a 16:10 format. If you connect a monitor or projector using a different format (e.g. 4:3), the calibration is not correct and the screen does not react to your touch actions properly.

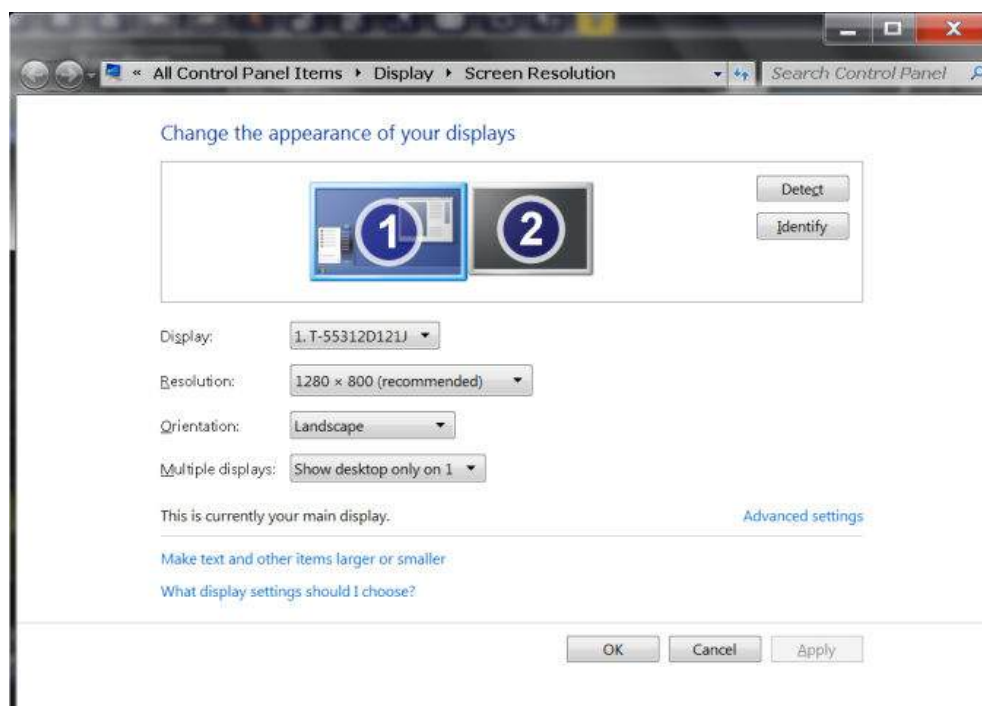
The touchscreen has a screen resolution of 1280x800 pixels. Usually, the display of the external monitor is a duplicate of the instrument's monitor.

If you configure the external monitor to be used as the *only* display in the Windows configuration dialog box ("Show only on 2"), the maximum screen resolution of the monitor is used. In this case, you can maximize the R&S EPL application window and see even more details. You cannot change the monitor's screen resolution via the standard Windows configuration dialog box.

The R&S EPL supports a minimum resolution of 1280x768 pixels.

1. Connect the external monitor to the R&S EPL.
2. Press the [Setup] key.
3. Press the "Display" softkey.
4. Select the "Configure Monitor" tab in the "Display" dialog box.

The standard Windows "Screen Resolution" dialog box is displayed.



5. If necessary, change the screen resolution. Consider the information in the note above.
6. Select the instrument for display:
 - "Display 1": internal monitor only
 - "Display 2": external monitor only
 - "Duplicate": both internal and external monitor
7. Tap "Apply" to try out the settings before they are accepted permanently, then you can easily return to the previous settings, if necessary.
8. Select "OK" if the settings are suitable.

5.11 Windows operating system

The instrument contains the Windows operating system which has been configured according to the instrument's features and needs. Changes in the system setup are only required when peripherals like a keyboard or a printer are installed or if the network configuration does not comply with the default settings. After the R&S EPL is started, the operating system boots and the instrument firmware is started automatically.

Tested software

The drivers and programs used on the instrument under Windows are adapted to the instrument. Only install update software released by Rohde & Schwarz to modify existing instrument software.

You can install additional software on the instrument; however, additional software can impair instrument function. Thus, run only programs that Rohde & Schwarz has tested for compatibility with the instrument software.

The following program packages have been tested:

- Symantec Endpoint Security – virus-protection software
- FileShredder - for reliable deletion of files on the hard disk

Service packs and updates

Microsoft regularly creates security updates and other patches to protect Windows-based operating systems. They are released through the Microsoft Update website and associated update server. Update instruments using Windows regularly, especially instruments that connect to a network.

Firewall settings

A firewall protects an instrument by preventing unauthorized users from gaining access to it through a network. Rohde & Schwarz highly recommends using the firewall on your instrument. Rohde & Schwarz instruments are shipped with the Windows firewall enabled. All ports and connections for remote control are enabled.

Note that changing firewall settings requires administrator rights.

Virus protection

Take appropriate steps to protect your instruments from infection. Use strong firewall settings and scan any removable storage device used with a Rohde & Schwarz instrument regularly. It is also recommended that you install anti-virus software on the instrument. Rohde & Schwarz does NOT recommend running anti-virus software in the background ("on-access" mode) on Windows-based instruments, due to potentially degrading instrument performance. However, Rohde & Schwarz does recommend running it during non-critical hours.

For details and recommendations, see the following Rohde & Schwarz white paper:

- [1EF96: Malware Protection Windows 10](#)

To access the "Start" menu

The Windows "Start" menu provides access to the Windows functionality and installed programs.

- ▶ Press the "Windows" key on the front panel, or press the "Windows" key or the [CTRL + ESC] key combination on the (external) keyboard.

The "Start" menu and the Windows taskbar are displayed.

All necessary system settings can be defined in the "Start > Settings" menu.

For required settings, refer to the Windows documentation and to the hardware description.

5.12 Logging on

Windows requires that users identify themselves by entering a user name and password in a login window. By default, the R&S EPL provides two user accounts:

- **"Instrument"**: a standard user account with limited access
- **"Admin"** (depends on firmware image): an administrator account with unrestricted access to the computer/domain

Some administrative tasks require administrator rights (e.g. adapting the auto-login function or configuring a LAN network). Refer to the description of the basic instrument Setup ([Setup] menu) to find out which functions are affected.

Passwords

For all default user accounts, the initial password is **894129**. Note that this password is very weak, and we strongly recommend that you change the password for both users after initial login. An administrator can change the password in Windows for any user at any time via "Start > Settings > Account > SignIn Options > Password > Change".

Auto-login

When shipped, the instrument automatically logs on the default "Instrument" user to Windows using the default password. This function is active until an administrator explicitly deactivates it or changes the password.



Changing the password and use of auto-login function

Note that when you change the default password, the default auto-login function no longer works!

In this case, you must enter the new password manually to log on.

Adapting the auto-login function to a new password

If you change the password that is used during auto-login, this function no longer works. Adapt the settings for the auto-login function first.



Changing the password for auto-login requires administrator rights.



1. Select the "Windows" icon in the toolbar to access the operating system of the R&S EPL (see also ["To access the \"Start\" menu\"](#) on page 34).
2. Open the
`C:\Users\Public\Documents\Rohde-Schwarz\Analyzer\user\AUTOLOGIN.REG` file in any text editor (e.g. Notepad).
3. In the line `"DefaultPassword"="894129"`, replace the default password (894129) by the new password for automatic login.
4. Save the changes to the file.

5. In the Windows "Start" menu, select "Run".
The "Run" dialog box is displayed.
6. Enter the command
`C:\Users\Public\Documents\Rohde-Schwarz\Analyzer\user\AUTOLOGIN.REG.`
7. Press [ENTER] to confirm.
The auto-login function is reactivated with the changed password. It is applied the next time you switch on the instrument.

Switching users when using the auto-login function

Which user account is used is defined during login. If auto-login is active, the login window is not displayed. However, you can switch the user account to be used even when the auto-login function is active.



1. Select the "Windows" icon in the toolbar to access the operating system of the R&S EPL (see also ["To access the \"Start\" menu\"](#) on page 34).
2. Press [CTRL] + [ALT] + [DEL], then select "Sign out".
The "Login" dialog box is displayed, in which you can enter the different user account name and password.

For information on deactivating and reactivating the auto-login function, see ["Deactivating the auto-login function\"](#) on page 370.

5.13 Checking the supplied options

The instrument can be equipped with both hardware and firmware options. To check whether the installed options correspond to the options indicated on the delivery note, proceed as follows.

1. Press [SETUP].
2. Press "System Config".
3. Switch to the "Versions + Options" tab in the "System Configuration" dialog box.
A list with hardware and firmware information is displayed.
4. Check the availability of the hardware options as indicated in the delivery note.

5.14 Performing a self-alignment

When temperature changes occur in the environment of the R&S EPL, or after updating the firmware, you have to perform a self-alignment to align the data to a reference source.

During self-alignment, do not connect a signal to the RF input connector. Running a self-alignment with a signal connected to the RF input can lead to false measurement results.

Performing a self-alignment

Before performing this alignment, make sure that the instrument has reached its operating temperature (for details, refer to the specifications document).

A message in the status bar ("Instrument warming up...") indicates that the operating temperature has not yet been reached.

Depending on the installation settings, an automatic self-alignment is performed after installation. A dialog box is displayed indicating how much warm-up time is still required before self-alignment can be performed.

1. Press [Setup].
2. Press "Alignment".
3. Select "Start Self Alignment" in the "Alignment" dialog box.

Once the system correction values have been calculated successfully, a message is displayed.



To display the alignment results again later

- Press [SETUP].
- Press "Alignment".

5.15 Considerations for test setup

An unsuitable test setup can damage the instrument and connected devices.

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 and LAN cables.
- Always terminate open cable ends.
- Ensure that connected external devices comply with EMC regulations.

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.

Electrostatically discharge the DUT with a short or match before connecting it to the instrument. Even residual charges on cables can cause damage when discharged by the instrument.

- **NOTICE!** Risk of instrument damage. Electrostatic discharge can cause an RF overload.

If the level at the input mixer is too high, a protection mechanism automatically turns off the connection between the RF input and the input mixer.

To avoid an RF overload in general, select an appropriate attenuation (at least 10 dB) to protect the input mixer.

Refer to the instructions in [Section 10.6.1, "Increasing measurement sensitivity \(or avoiding an input mixer overload\)"](#), on page 158 for more information about avoiding an RF overload.

Signal input and output levels

Information on signal levels is provided in the specifications document and on the instrument, next to the connector. Keep the signal levels within the specified ranges to avoid damage to the R&S EPL and connected devices.

When measuring unknown signals, attenuate the signal input by at least 10 dB. Using a 0 dB attenuation when measuring unknown signals can damage or destroy the input mixer.

6 Instrument tour

6.1 Front panel view

This chapter describes the front panel, including all function keys and connectors.



Figure 6-1: Front panel view of R&S EPL

- 1 = Power key
- 2 = USB (2.0) connectors
- 3 = System keys
- 4 = Touchscreen
- 5 = Function keys
- 6 = RF input 50 Ω connector
- 7 = Keypad + navigation controls
- 8 = Internal generator output 50 Ω connector (requires option R&S EPL1-B9 or R&S EPL1-B91)

6.1.1 Touchscreen

All measurement results are displayed on the screen on the front panel. Also, the screen display provides status and setting information and allows you to switch between various measurement tasks. The screen is touch-sensitive, offering an alternative means of user interaction for quick and easy handling of the instrument.



Figure 6-2: Touchscreen elements

- 1 = Toolbar with standard application functions, e.g. print, save/open file etc.
- 2 = Tabs for individual channel setups
- 3 = Channel setup bar for firmware and measurement settings
- 4 = Measurement results area
- 5 = Window title bar with diagram-specific (trace) information
- 6 = Softkeys for function access
- 7 = Diagram footer with diagram-specific information, depending on application
- 8 = Instrument status bar with error messages and date/time display

Any user interface elements that react to a click by a mouse pointer also react to a tap on the screen, and vice versa. Using touchscreen gestures, you can perform the following tasks (among others).

- Changing a setting
- Changing the display
- Changing the displayed result range in a diagram
- Moving a marker
- Zooming into a diagram
- Selecting a new evaluation method
- Scrolling through a result list or table
- Saving or printing results and settings

To imitate a right-click by mouse using the touchscreen, for example to open a context-sensitive menu for a specific item, press the screen for about 1 second.

For details on touchscreen gestures, see [Section 7.5, "Touchscreen gestures"](#), on page 64.

6.1.2 Power key

The [Power] key is located on the lower left corner of the front panel. It starts up and shuts down the instrument.

See also ["Connecting to power"](#) on page 14 and [Section 5.5, "Connecting to power"](#), on page 26.

6.1.3 USB

The front panel provides two female USB connectors (USB-A, 2.0 standard) to connect devices like a keyboard or a mouse. A memory stick can be connected to store and reload instrument settings and measurement data.

The rear panel provides further USB connectors (standard 3.0), see [Section 6.2.11, "USB"](#), on page 49.

6.1.4 System keys

System keys set the instrument to a predefined state, change basic settings, and provide print and display functions.

A detailed description of the corresponding functions is provided in the R&S EPL user manual.

Table 6-1: System keys

System key	Assigned functions
[Preset]	Resets the instrument to the default state.
[Setup]	Provides basic instrument configuration functions, e.g.: • Reference frequency (external/internal) • Date, time, display configuration • LAN interface • Firmware update and enabling of options • Information about instrument configuration incl. firmware version and system error messages • Service support functions (self-test etc.) • Self-alignment (with spectrum analysis option)
[Mode]	Manages channel setups
[Print]	Provides configuration settings for the print function
[FILE]	Provides save/recall functions for instrument settings and measurement results
	Switches between the on-screen keyboard display: • At the top of the screen • At the bottom of the screen • Off

6.1.5 Function keys

Function keys provide access to the most common measurement settings and functions.

A detailed description of the corresponding functions is provided in the R&S EPL user manual.

Table 6-2: Function keys

Function key	Assigned functions
[Freq]	Sets the center frequency and the start and stop frequencies for the frequency range under consideration. This key is also used to set the frequency offset and the signal track function.
[Span]	Sets the frequency span to be analyzed
[Ampt]	Sets the reference level, the displayed dynamic range, the RF attenuation and the unit for the level display Sets the level offset and the input impedance Activates the (optional) preamplifier
[BW]	Sets the resolution bandwidth and the video bandwidth.
[Sweep]	Provides functionality to configure the measurement, for example: - the measurement mode (single or continuous measurements) - the measurement time
[Trace]	Configures the graphical analysis of the measurement data.
[Meas]	Provides the measurement functions and data input and output.
[Meas Config]	Used to configure measurements.
[Lines]	Configures display lines and limit lines.
[Mkr]	Sets and positions the absolute and relative measurement markers (markers and delta markers).
[Mkr->]	Used for search functions of the measurement markers (maximum/minimum of the trace). Assigns the marker frequency to the center frequency, and the marker level to the reference level. Restricts the search area (Search Limits) and characterizes the maximum points and minimum points (Peak Excursion).
[Trig]	Sets the trigger mode, the trigger threshold, the trigger delay, and the gate configuration for gated sweep.
[Peak]	Performs a peak search for active marker. If no marker is active, normal marker 1 is activated and the peak search is performed for it.
[Run Single]	Starts and stops a single new measurement (Single Sweep Mode).
[Run Cont]	Starts and stops a continuous measurement (Continuous Sweep Mode).

6.1.6 Keypad

The keypad is used to enter numeric parameters, including the corresponding units. It contains the following keys:

Table 6-3: Keys on the keypad

Type of key	Description
Decimal point	Inserts a decimal point "." at the cursor position.
Sign key	Changes the sign of a numeric parameter. For alphanumeric parameters, inserts a "-" at the cursor position.
Unit keys (GHz/-dBm MHz/dBm, kHz/dB, Hz/dB etc.)	Adds the selected unit to the entered numeric value and complete the entry. For level entries (e.g. in dB) or dimensionless values, all units have the value "1" as multiplying factor. Thus, they have the same function as an [ENTER] key.
[ESC]	Closes all kinds of dialog boxes, if the edit mode is not active. Quits the edit mode, if the edit mode is active. In dialog boxes that contain a "Cancel" button it activates that button. For "Edit" dialog boxes the following mechanism is used: • If data entry has been started, it retains the original value and closes the dialog box. • If data entry has not been started or has been completed, it closes the dialog box.
 (BACKSPACE)	If an alphanumeric entry has already been started, this key deletes the character to the left of the cursor.
[ENTER]	• Concludes the entry of dimensionless entries. The new value is accepted. • With other entries, this key can be used instead of the "Hz/dB" unit key. • In a dialog box, selects the default or focused element.

6.1.7 Navigation controls

The navigation controls include a rotary knob and navigation keys. They allow you to navigate within the display or within dialog boxes.



Navigating in tables

The easiest way to navigate within tables (both in result tables and configuration tables) is to scroll through the entries with your finger on the touchscreen.

6.1.7.1 Rotary knob



The rotary knob has several functions:

- For numeric entries: increments (clockwise direction) or decrements (counter-clockwise direction) the instrument parameter at a defined step width
- In lists: toggles between entries
- For markers, limit lines, and other graphical elements on the screen: moves their position

- For active scroll bars: moves the scroll bar vertically
- For dialog boxes: Same effect as the Enter key when pressed

6.1.7.2 Navigation keys

You can use the navigation keys as an alternative to the rotary knob to navigate through dialog boxes, diagrams or tables.

Arrow Up/Arrow Down Keys

The <arrow up> or <arrow down> keys do the following:

- For numeric entries: increments (Arrow Up) or decrements (Arrow Down) the instrument parameter at a defined step width
- In a list: scrolls forward and backward through the list entries
- In a table: moves the selection bar vertically
- In windows or dialog boxes with a vertical scroll bar: moves the scroll bar

Arrow Left/Arrow Right Keys

The <arrow left> or <arrow right> keys do the following:

- In an alphanumeric edit dialog box, move the cursor.
- In a list, scroll forward and backward through the list entries.
- In a table, move the selection bar horizontally.
- In windows or dialog boxes with horizontal scroll bar, move the scroll bar.

6.1.8 RF INPUT 50 Ohm

Provides RF input from a connected device under test (DUT) to the R&S EPL, which is then analyzed in an RF measurement. Connect the DUT to the "RF Input" on the R&S EPL via a cable equipped with an appropriate connector. Do not overload the input. For maximum allowed values, see the data sheet.

See also [Section 5.15, "Considerations for test setup"](#), on page 37.

6.1.9 GEN output 50 Ohm

Provides signal output from the (optional) internal generator (requires Internal Generator option R&S EPL1-B9 or option R&S EPL1-B91). Output levels range from -60 dBm to +10 dBm, with a resolution of 0.1 dB. For details, see the data sheet.

6.2 Rear panel view

This figure shows the rear panel view of the R&S EPL. The individual elements are described in more detail in the subsequent sections.

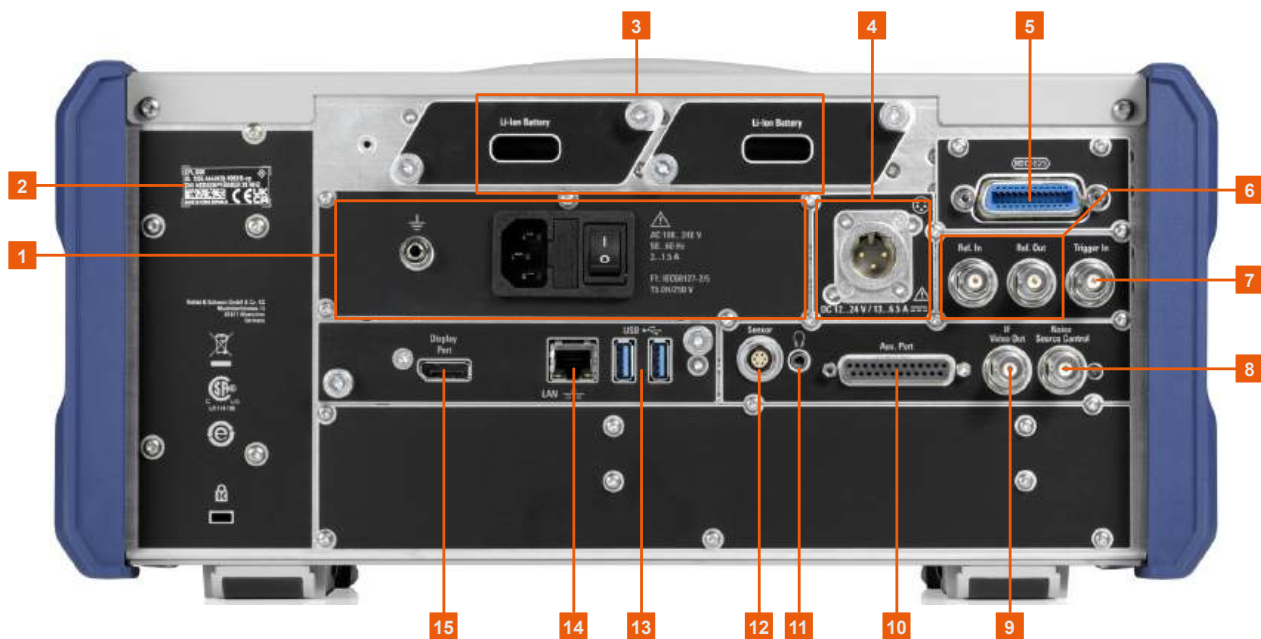


Figure 6-3: Rear panel view

- 1 = AC power supply, incl. main power switch with fuse and ground terminal
- 2 = Device ID with serial number and other labels
- 3 = Removable, rechargeable Li-Ion batteries
- 4 = DC power connector
- 5 = GPIB (IEC 625) interface
- 6 = Reference clock connectors
- 7 = Trigger input connector
- 8 = Noise source control
- 9 = "IF/Video out" connector
- 10 = Aux. Port
- 11 = Headphones connector
- 12 = Power sensor connector
- 13 = "USB" (3.0) connectors
- 14 = "LAN" connector
- 15 = "DisplayPort" connector for external display



The meanings of the labels on the R&S EPL are described in [Section 2.2, "Labels on R&S EPL"](#), on page 16.

6.2.1 AC power supply connection and main power switch

An AC power supply connector and main power switch are located in a unit on the rear panel of the instrument.

Main power switch function:

Position 1: The instrument is in operation.

Position O: The entire instrument is disconnected from the AC power supply.

For details, refer to ["Connecting to power"](#) on page 14 and [Section 5.5, "Connecting to power"](#), on page 26.

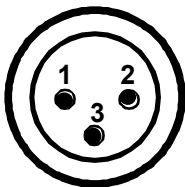
6.2.2 Li-Ion battery packs and DC power connector

The Li-Ion battery pack and DC power connector are available as an optional accessory (R&S FPL1-B31 and R&S FPL1-B30).

With the Li-ion battery pack, the R&S EPL can be operated independently of an AC or DC power supply. The instrument can house 2 Li-ion batteries which can be charged both via AC or DC power supply.

For safety information concerning batteries, see ["Handling batteries safely"](#) on page 15.

As an alternative, a DC power supply connector is available. DC power supplies from +12 V to +24 V and from 13 A to 6.5 A can be used. Connect the connector according to the following diagram:

	Pin	Description
	1	Plus
	2	Ground
	3	Not used

If you use an external power supply unit to supply safety extra-low DC voltage (SELV) to the instrument, be sure to meet the requirements for reinforced/double insulation in accordance with DIN/EN/IEC 61010 (UL 3111, CSA C22.2 No. 1010.1) or DIN/EN/IEC 60950 (UL 1950, CSA C22.2 No. 950). Provide current limitation in accordance with DIN EN 61010-1 Appendix F2.1.

Also see ["Connecting to power"](#) on page 14.

6.2.3 GPIB interface

The GPIB interface is available as an optional feature (R&S FPL1-B10).

The optional GPIB interface is in compliance with IEEE488 and SCPI. A computer for remote control can be connected via this interface. To set up the connection, a shielded cable is recommended.

For details, see [Section 14.1, "Remote control interfaces and protocols"](#), on page 328.

For more details, refer to "Setting Up Remote Control" in the user manual.

6.2.4 Ref. In / Ref. Out

The Ref. In connectors are used to provide an external reference signal to the R&S EPL.

The Ref. Out connectors can be used to provide a reference signal from the R&S EPL to other devices that are connected to this instrument.

Various connectors are provided for different reference signals:

Connector	Reference signal	Usage
Ref. In	10 MHz 10 dBm	To provide an external reference signal on the R&S EPL.
Ref. Out	10 MHz 10 dBm	To provide the internal reference signal from the R&S EPL to another device continuously. For the R&S EPL, this is also used to provide the optional OCXO reference signal to another device.

6.2.5 Trigger In

Use the female Trigger In connector to input an external trigger or gate data. Thus, you can control the measurement using an external signal. The voltage level is 1.4 V. The typical input impedance is 10 kΩ.

6.2.6 Noise Source Control

The Noise Source Control female connector is used to provide the supply voltage for an external noise source. For example, use it to measure the noise figure and gain of amplifiers and frequency converting devices.

Conventional noise sources require a voltage of +28 V to be switched on and 0 V to be switched off. The output supports a maximum load of 100 mA.

6.2.7 IF/Video Output

The female BNC connector can be used for various outputs in the Spectrum application:

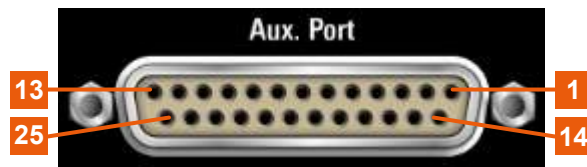
- Intermediate frequency (IF) output of approximately 20 MHz
- Video output (1V)

Which output is provided is defined in the software ("Overview" > "Output").

For details, see the R&S EPL Spectrum Mode user manual.

6.2.8 Aux. Port

A 25-pole SUB-D male connector used as an input and output for low-voltage TTL control signals (max. 5 V).



NOTICE

Short-circuit hazard

Always observe the designated pin assignment. A short-circuit can damage the port.

Table 6-4: Pin assignment for AUX port

Pin	Signal	Description
1	GND	Ground
2		not used for spectrum analysis
3	GND	Ground
4		not used for spectrum analysis
5	GND	Ground
6		not used for spectrum analysis
7	GND	Ground
8 to 11		not used for spectrum analysis
12	GND	Ground
13	+5 V / max. 250 mA	Supply voltage for external circuits
14 to 19	I/O_<no.>	Control lines for user ports (see user manual)
20	GND	Ground
21	READY FOR TRIGGER	Signal indicating that the instrument is ready to receive a trigger signal. The signal polarity is configurable. (See the R&S EPL user manual.)
22 to 25		not used for spectrum analysis
23	GND	Ground
24 to 25		not used for spectrum analysis

6.2.9 Headphones connector

The R&S EPL provides demodulators for AM and FM signals, which can be routed to the headphone connector. With headphones or an external loudspeaker connected to the 3.5 mm headphone socket, the displayed signal can be identified acoustically.

Note the safety information provided in ["Using headphones"](#) on page 15.

For details, see the R&S EPL Spectrum mode user manual.

6.2.10 Sensor connector

The LEMOSA female connector is used to connect power sensors of the R&S NRP-Zxy family. For a detailed list of supported sensors, see the data sheet.

6.2.11 USB

The rear panel provides two additional female USB (3.0 standard) connectors to connect external devices (see also [Section 6.1.3, "USB"](#), on page 41).

6.2.12 LAN

The R&S EPL is equipped with a 1 GBit Ethernet IEEE 802.3u network interface with Auto-MDI(X) functionality. The assignment of the RJ-45 connector supports twisted-pair category 5 UTP/STP cables in a star configuration (UTP stands for *unshielded twisted pair*, and STP for *shielded twisted pair*).

For details, see [Section 14, "Network operation and remote control"](#), on page 328.

6.2.13 DVI

You can connect an external monitor or other display device to the R&S EPL via the DVI (Digital visual interface) connector to provide an enlarged display.

For details, see [Section 5.15, "Considerations for test setup"](#), on page 37.

6.2.14 DisplayPort

You can connect an external monitor or other display device to the R&S EPL via the DisplayPort connector to provide an enlarged display.

For details, see [Section 5.15, "Considerations for test setup"](#), on page 37.

6.2.15 Device ID

The unique device identifier is provided as a barcode sticker on the rear panel of the R&S EPL.

It consists of the device order number and a serial number.



The serial number is used to define the **default instrument name**, which is:

<Type><variant>-<serial_number>

For example, EPL1000-123456.

The instrument name is required to establish a connection to the instrument in a LAN.

7 Operating the instrument

The following topics provide an overview on how to work with the R&S EPL. They describe what kind of information is displayed in the diagram area, how to interact with the R&S EPL, and how to use the online help.

• Understanding the display information	51
• Accessing functions	58
• Changing the focus	62
• Entering data	62
• Touchscreen gestures	64
• Displaying results	66
• Getting help	73
• Remote control	74

7.1 Understanding the display information

The following image shows the default display layout in the receiver application. All different information areas are labeled. They are explained in more detail in the following sections.



- 1 = Channel bar: shows firmware and measurement settings
- 2 = Window title bar: shows diagram-specific (trace) information
- 3 = Diagram area: contains the measurement results and other information related to the measurement (marker etc.)
- 4 = Diagram footer: shows diagram-specific information, depending on measurement application
- 5 = Instrument status bar: shows error messages, measurement progress, date/time etc.



Hiding elements in the display

You can hide some of the elements in the display, for example the status bar or channel bar, to enlarge the display area for the measurement results ("Setup" > "Display" > "Displayed Items").

For details, see the R&S EPL user manual.

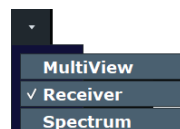
• Channel bar.....	52
• Window title bar.....	54
• Marker information.....	55
• Frequency and span information in diagram footer.....	56
• Instrument and status information.....	56
• Error information.....	57

7.1.1 Channel bar

Using the R&S EPL you can handle several different measurement tasks (channels) at the same time (although they can only be performed asynchronously). For each channel, a separate tab is displayed on the screen. To switch from one channel display to another, simply select the corresponding tab.

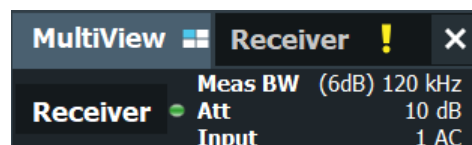


If many tabs are open, you can also select the tab selection list icon at the right end of the channel bar and select the channel you want to see.



MultiView tab

An additional tab labeled "MultiView" provides an overview of all active channels at a glance. In the "MultiView" tab, each individual window contains its own channel bar with an additional button. Tap this button to switch to the corresponding channel display quickly.



Icons in the channel bar

The star icon (★) on the tab label indicates that the displayed trace no longer matches the current instrument settings. This can be the case, for example, if a trace is frozen and the instrument settings are changed. When a new measurement is performed, the icon disappears.

The exclamation mark icon (⚠) indicates that an error or warning is available for that measurement channel. This is particularly useful if the MultiView tab is displayed.

The ⚙ icon indicates the currently active channel during an automatic measurement sequence (**sequencer** functionality).

Beneath the channel name, information about channel-specific settings for the measurement is displayed in the **channel bar**. Channel information varies depending on the active application.

The channel bar above the diagram also contains information about instrument settings.

Table 7-1: Contents of the channel bar (receiver application)

Label	Information
"Meas BW"	Type and bandwidth of the currently selected resolution filter. The filter type label either reads "6 dB" or "MIL". For 3 dB filters, the label is not displayed.
"Att(enuation)"	Currently defined RF attenuation.
"Input"	Currently used RF input, including the input coupling (AC or DC).
"Meas Time"	Currently defined measurement time. For a scan count > 1, the measurement time is the sum of all single measurements.
"Preamp(lifier)"	Currently selected preamplifier state.
"PS"	Current state of the preselector.
"Step"	Currently selected scan type and frequency step mode. • "LIN": Stepped scan with linear frequency steps. The frequency step size is a fix value in Hz. • "TD Scan": Time domain scan.
"Out"	Currently selected output type. If phones output is on, a corresponding icon is displayed.
"LISN"	Currently selected LISN and LISN phase. For R&S ENV216, it also shows the state of the highpass filter. Only displayed when a LISN is included in the measurement.
"SGL"	Indicates the progress of single measurements. The first number is the current measurement. The second number is the total number of measurements. Only displayed for single measurements and if the scan count is greater than 1.
"Frequency"	Current receiver frequency.
"75 Ω"	75 Ω input impedance has been selected.

Label	Information
"TRG"	Currently selected trigger source.
"TDF"	Currently selected transducers, including the input they have been assigned to.

Icons for individual settings

In the **receiver application**, a bullet next to the setting indicates that automatic settings are used, not user-defined settings.

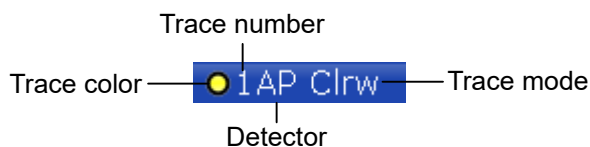
In **other applications**, a bullet next to the setting indicates that user-defined settings are used, not automatic settings. A green bullet indicates that this setting is valid and the measurement is correct. A red bullet indicates an invalid setting that does not provide useful results.

7.1.2 Window title bar

Each channel in the R&S EPL display can contain several windows. Each window can display either a graph or a table as a result of the channel measurement. Which type of result evaluation is displayed in which window is defined in the display configuration (see [Section 7.6, "Displaying results"](#), on page 66). The window's title bar indicates which type of evaluation is displayed.

Trace information in window title bar

Information on the displayed traces is indicated in the window title bar.



Trace color	Color of trace display in diagram
Trace no.	Number of the trace (1 to 6)

Detector	Abbreviation of the detector assigned to the trace: • AP Autopoint detector • Av Average detector • CA CISPR AV detector • Mi Min Peak / Negative Peak detector • Pk Max Peak / Positive Peak detector • QP Quasipeak detector • RA RMS Average detector • Rm RMS detector • Sa Sample detector
Trace Mode	Abbreviation of the trace mode: • Clrw Clear Write: Shows the currently measured values. • Max Max Hold: Shows the maximum values that have been measured. • Min Min Hold: Shows the minimum values that have been measured. • Average Average: Shows the averaged values that have been measured. • View View: Shows a trace which remains the same when you perform another measurement. • Transducer Transducer: Shows the correction values of active transducer factors.

7.1.3 Marker information

Marker information is provided either in the diagram grid or in a separate marker table, depending on the configuration.

Marker information in diagram grid

Within the diagram grid, the x-axis and y-axis positions of the last 2 markers or delta markers that were set are displayed, if available, as well as their index. The value in the square brackets after the index indicates the trace to which the marker is assigned. (Example: M2[1] defines marker 2 on trace 1.) For more than 2 markers, a separate marker table is displayed beneath the diagram by default.

Marker information in marker table

In addition to the marker information displayed within the diagram grid, a separate marker table can be displayed beneath the diagram. This table provides the following information for all active markers:

Label	Information
"Wnd"	Window type the marker is positioned in.
"Type"	Marker type: N (normal), D (delta), T (temporary, internal)
"Ref"	Reference (for delta markers)
"Trc"	Trace to which the marker is assigned
"X-value"	x-value of the marker
"Y-value"	y-value of the marker

7.1.4 Frequency and span information in diagram footer

The information in the diagram footer (beneath the diagram) depends on the current application.

The contents depend on the application and the result display.

Label	Information
CF	Center frequency
Span	Frequency span (frequency domain display)
ms/	Time per division (time domain display)
Pts	Number of measurement points or (rounded) number of currently displayed points in zoom mode
Start	Start frequency of the scan
Stop	Stop frequency of the scan

7.1.5 Instrument and status information

Global instrument settings and functions, the instrument status and any irregularities are indicated in the status bar beneath the diagram.



In the MultiView tab, the status bar always displays the information for the currently selected measurement.

The following information is displayed:

Instrument status

	The R&S EPL is configured for operation with an external reference. Selecting the "Ext Ref" icon opens a dialog box to configure the external reference.

Progress

The status of the current operation is displayed in the status bar.

Measuring ...



In the MultiView tab, the progress bar indicates the status of the currently selected measurement, not the measurement currently being performed by a sequencer, for example.

Date and time

The date and time settings of the instrument are displayed in the status bar.

**16.10.2020
10:43:58**

Selecting the date and time icon opens a dialog box to configure the date and time.

Error messages and warnings

If errors or irregularities are detected, a keyword and an error message, if available, are displayed in the status bar.

7.1.6 Error information

If errors or irregularities are detected, a keyword and an error message, if available, are displayed in the status bar.

UNICAL Sync Failed

Depending on the type of message, the status message is indicated in varying colors.

Table 7-2: Status bar information - color coding

Color	Type	Description
Red	Error	An error occurred at the start or during a measurement, e.g. due to missing data or wrong settings, so that the measurement cannot be started or completed correctly.
Orange	Warning	An irregular situation occurred during measurement, e.g. the settings no longer match the displayed results, or the connection to an external device was interrupted temporarily.
Gray	Information	Information on the status of individual processing steps.
No color	No errors	No message displayed - normal operation.
Green	Measurement successful	Some applications visualize that the measurement was successful by showing a message.



If any error information is available for a channel setup, an exclamation mark is displayed next to the channel setup name (■). This is particularly useful when the MultiView tab is displayed, as the status bar in the MultiView tab always displays the information for the currently selected channel setup only.

For a description of possible errors, see the R&S EPL user manual.

7.2 Accessing functions

All tasks necessary to operate the instrument can be performed using the user interface. Apart from instrument specific keys, all other keys that correspond to an external keyboard (for example arrow keys, [Enter] key) operate conform to Microsoft.

For most tasks, there are at least 2 alternative methods to perform them:

- Using the touchscreen
- Using other elements provided by the front panel, for example the keypad, rotary knob, or arrow and position keys.

The measurement and instrument functions and settings can be accessed by selecting one of the following elements:

- System and function keys on the front panel of the instrument
- Softkeys on the touchscreen
- Context menus for specific elements on the touchscreen
- Icons on the tool bar in the touchscreen
- Displayed setting on the touchscreen

• Toolbar	58
• Softkeys	60
• Context menus	61
• On-screen keyboard	61

7.2.1 Toolbar

The icons in the toolbar provide access to general functions.

For more information about configuring the toolbar, see [Section 13.6, "Toolbar configuration"](#), on page 310.



You can hide the toolbar display, for example when using remote control, in order to enlarge the display area for the measurement results ("Setup > Display > Displayed Items"). See the R&S EPL User Manual for details.

	Windows: opens the Windows "Start" menu and task bar.
	Open: opens a file from the instrument or an external device ("Save/Recall" menu).
	Store: stores data on the instrument or an external device ("Save/Recall" menu).
	Report Generator: opens the softkey menu to configure a report.
	Undo: reverts last operation
	Redo: repeats previously reverted operation
	Measurement zoom: applies to the next display you select; Displays a dotted rectangle in the diagram that can be expanded to define the zoom area; the selected diagram is replaced by a new diagram with adapted measurement settings which displays the selected extract of the trace. Also provides a context menu to determine the firmware behavior for touch gestures: • "Level Lock" (Default:) The reference level (and thus the attenuation) remains unchanged during touch gestures on the screen. • "X-Lock" The x-axis of the diagram is not changed during subsequent touch gestures. • "Y-Lock" The y-axis of the diagram is not changed during subsequent touch gestures. • "Adapt Measurement to Zoom (selected diagram)" Automatically adapts the measurement settings to the currently zoomed display
	Zoom mode: displays a dotted rectangle in the diagram that can be expanded to define the zoom area.
	Multiple zoom mode: multiple zoom areas can be defined for the same diagram.
	Zoom off: displays the diagram in its original size.
	SmartGrid: activates "SmartGrid" mode to configure the screen layout.
	Sequencer: opens the "Sequencer" menu to perform consecutive measurements.
	Generator state: turns the internal generator on and off.

	Generator config: Open the menu to configure the internal generator. Note that the full functionality of the internal generator is only available in the spectrum application.
	Help (+ Select): allows you to select an element for which context-specific help is displayed.
	Help: displays context-sensitive help topic for currently selected element.
	Create report: creates a new measurement report and deletes previous report data.
	Create report: creates a new measurement report without deleting previous report data.
	RF input off: Signal applied to the RF input is not measured (instead the signal path of the calibration signal is used). Note that this icon is only visible if you deliberately turn it on. ([SETUP] > "Display" > "Displayed Items" > "Input Terminator")
	Frequency lock: Frequency does not change when you turn the rotary knob. Only applies to the frequency. You can still change other parameters with the rotary knob.
	Print immediately: prints the current display (screenshot) as configured.

7.2.2 Softkeys

Softkeys are virtual keys provided by the software. Thus, more functions can be provided than those that can be accessed directly via the function keys on the instrument. Softkeys are dynamic: depending on the selected function key, a different list of softkeys is displayed on the right side of the screen.

A list of softkeys for a certain function key is also called a menu. Softkeys can either perform a specific function or open a dialog box.

Recognizing the softkey status by color

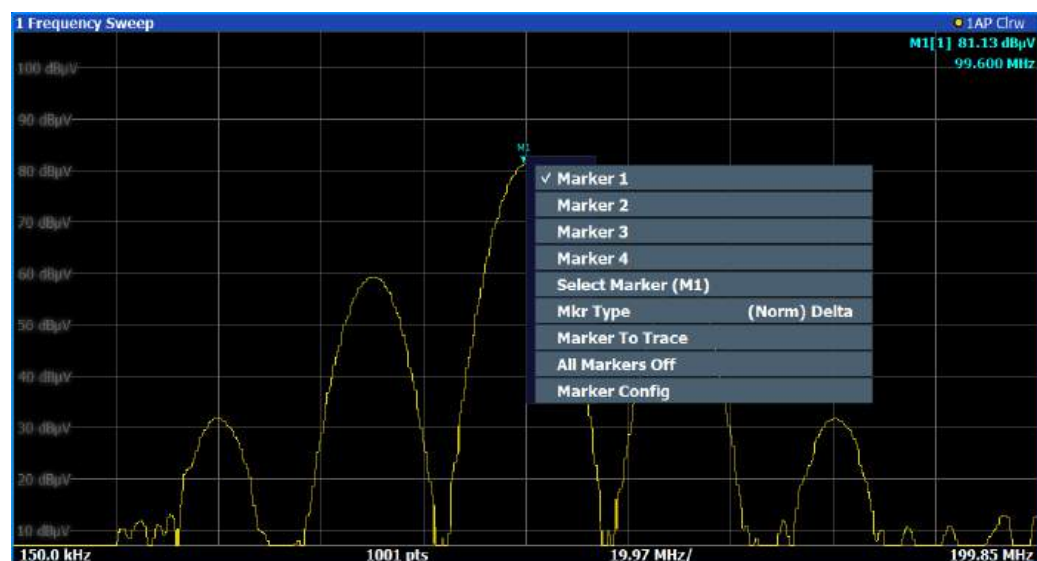
Color	Meaning
orange	associated dialog box is open
blue	associated function is active; for toggle keys: currently active state
gray text	instrument function is temporarily not available due to a specific setting or missing option



You can hide the softkey display, e.g. when using remote control, in order to enlarge the display area for the measurement results ("Setup > Display > Displayed Items"). See the User Manual for details.

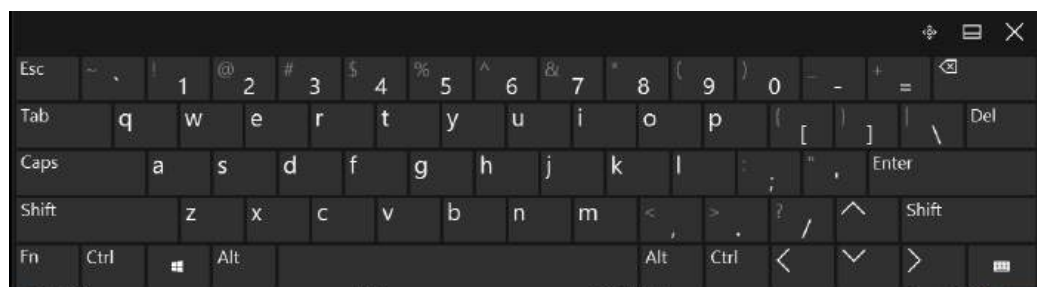
7.2.3 Context menus

Several items in the diagram area have context-sensitive menus (for example markers, traces or the channel bar). If you right-click on one of these items (or tap it for about 1 second), a menu is displayed which contains the same functions as the corresponding softkey. This is useful, for example, when the softkey display is hidden.



7.2.4 On-screen keyboard

The on-screen keyboard is an additional means of interacting with the instrument without having to connect an external keyboard.



The on-screen keyboard display can be switched on and off as desired using the "On-Screen Keyboard" function key beneath the screen.





You can use the TAB key on the on-screen keyboard to move the focus from one field to another in dialog boxes.

7.3 Changing the focus

Any interaction using the keypad, scrollbar or knobs always affects the currently focused element in the display, e.g. a dialog field, diagram, or table row. The currently focused element is indicated by a blue frame (dialog, window, table) or is otherwise highlighted (softkey, marker etc.). To move the focus, select the element on the touchscreen.

7.4 Entering data

You can enter data in dialog boxes using any of the following methods:

- Using the touchscreen, via the on-screen keyboard
- Using other elements provided by the front panel, e.g. the keypad, rotary knob, or navigation keys
The rotary knob acts like the [ENTER] key when it is pressed.
- Using a connected external keyboard



Transparent dialog boxes

You can change the transparency of the dialog boxes to see the results in the windows behind the dialog box. Thus, you can see the effects that the changes you make to the settings have on the results immediately.

To change the transparency, select the transparency icon at the top of the dialog box. A slider is displayed. To hide the slider, select the transparency icon again.



(The title bar of the dialog box is always slightly transparent and is not affected by the slider.)



Particularities in Windows dialog boxes

In some cases, e.g. if you want to install a printer, original Windows dialog boxes are used. In these dialog boxes, the rotary knob and function keys do not work. Use the touchscreen instead.

7.4.1 Entering numeric parameters

If a field requires numeric input, the keypad provides only numbers.

1. Enter the parameter value using the keypad, or change the currently used parameter value by using the rotary knob (small steps) or the [UP] or [DOWN] keys (large steps).
2. After entering the numeric value via keypad, press the corresponding unit key. The unit is added to the entry.
3. If the parameter does not require a unit, confirm the entered value by pressing [ENTER] or any of the unit keys. The editing line is highlighted to confirm the entry.

Digit-based data entry

By default, when you enter a numeric value in an input field, you overwrite the existing value. If you edit the value using the arrow keys or rotary knob, the value is increased or decreased linearly. An extended digit-based data entry mode allows you to edit individual digits and change the unit quickly.



1. In the input field for a numeric value, select the pencil icon to switch to extended data entry mode.
2. Use the left and right arrow keys to scroll through the individual digits of the indicated value.
3. Change the required digit using the up and down arrow keys or the rotary knob to scroll through the values 0 to 9.

The new value is applied immediately, without further confirmation.

Note:

- If you enter a digit using the keypad, the entire value is overwritten, as in normal data entry mode.
- To add a digit to the existing value, you must return to normal data entry mode. Select the pencil icon to toggle between entry modes.

4. To change the unit:
 - a) Press the right arrow key and scroll past the last digit to select the unit list.
 - b) Use the up and down arrow keys to scroll through the available units.
 - c) Press the left arrow key to return to the last digit of the numeric value.

The new unit is applied immediately, without further confirmation.



5. Select the "X" to close the input field.

7.4.2 Entering alphanumeric parameters

If a field requires alphanumeric input, you can use the on-screen keyboard to enter numbers and (special) characters (see [Section 7.2.4, "On-screen keyboard"](#), on page 61).

7.5 Touchscreen gestures

A touchscreen allows you to interact with the software using various finger gestures on the screen. The basic gestures supported by the software and most applications are described here. Further actions using the same gestures may be possible.



Tapping

Touch the screen quickly, usually on a specific element.

You can tap most elements on the screen; in particular, any elements you can also click on with a mouse pointer.

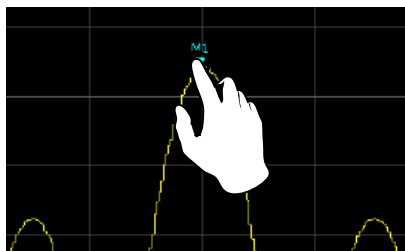
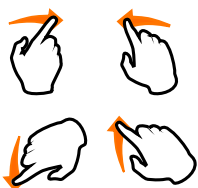


Figure 7-1: Tapping

Double-tapping

Tap the screen twice, in quick succession.

Double-tap a diagram or the window title bar to maximize a window in the display, or to restore the original size.



Dragging

Move your finger from one position to another on the display, keeping your finger on the display the whole time.

By dragging your finger over a table or diagram you can pan the displayed area of the table or diagram to show results that were previously out of view.

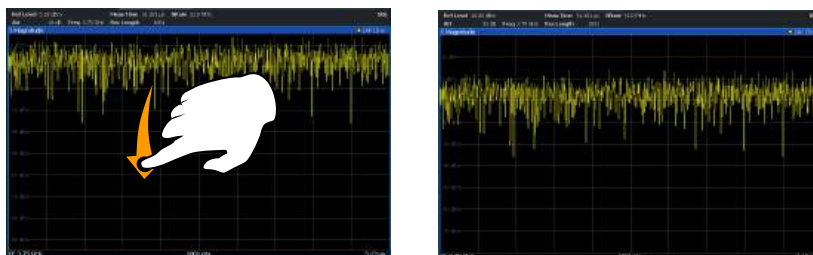
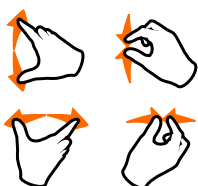


Figure 7-2: Dragging



Pinching and spreading two fingers

Move two fingers together on the display (pinch) or move two fingers apart on the display (spread).

When you pinch two fingers in the display, you decrease the size of the currently displayed area, showing the surrounding areas previously out of view.

When you spread two fingers in the display, you increase the size of the currently displayed area, showing more details.

You can pinch or spread your fingers vertically, horizontally, or diagonally. The direction in which you move your fingers determines which dimension of the display is changed.

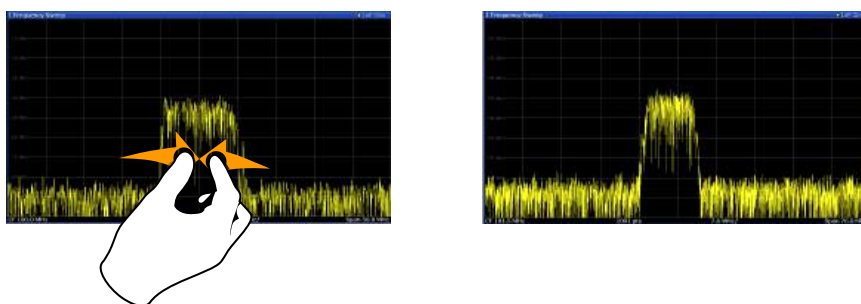


Figure 7-3: Pinching

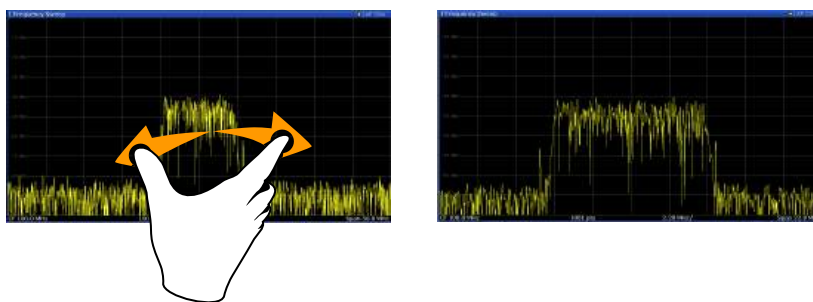


Figure 7-4: Spreading



Touch gestures in diagrams change measurement settings

When you change the display using touch gestures, the corresponding measurement settings are adapted. This is different to selecting an area on the screen in zoom mode, where merely the resolution of the displayed trace points is changed temporarily (graphical zoom).

Mouse vs. touch actions

Any user interface elements that react to actions by a mouse pointer also react to finger gestures on the screen, and vice versa. The following touch actions correspond to mouse actions:

Table 7-3: Correlation of mouse and touch actions

Mouse operation	Touch operation
Click	Tap
Double-click	Double-tap
Click and hold	Touch and hold
Right-click	Touch, hold for 1 second and release
Drag-&-drop (= click and hold, then drag and release)	Touch, then drag and release
n.a. (Change hardware settings)	Spread and pinch two fingers
Mouse wheel to scroll up or down	Swipe
Dragging scrollbars to scroll up or down, left or right	Swipe
In (graphical) Zoom mode only: dragging the borders of the displayed rectangle to change its size	Touch, then drag and release

Example:

You can scroll through a long table in conventional mouse operation by clicking in the table's scrollbar repeatedly. In touch operation, you would scroll through the table by dragging the table up and down with your finger.

7.6 Displaying results

The R&S EPL provides several instrument applications for different analysis tasks and different types of signals, for example the Receiver application, the Spectrum application or the I/Q Analyzer. For each application, a new measurement channel is created and displayed in a separate tab on the screen.

The results of a measurement channel can be evaluated in many different ways, both graphically and numerically. For each evaluation method the results are displayed in a separate window in the tab.

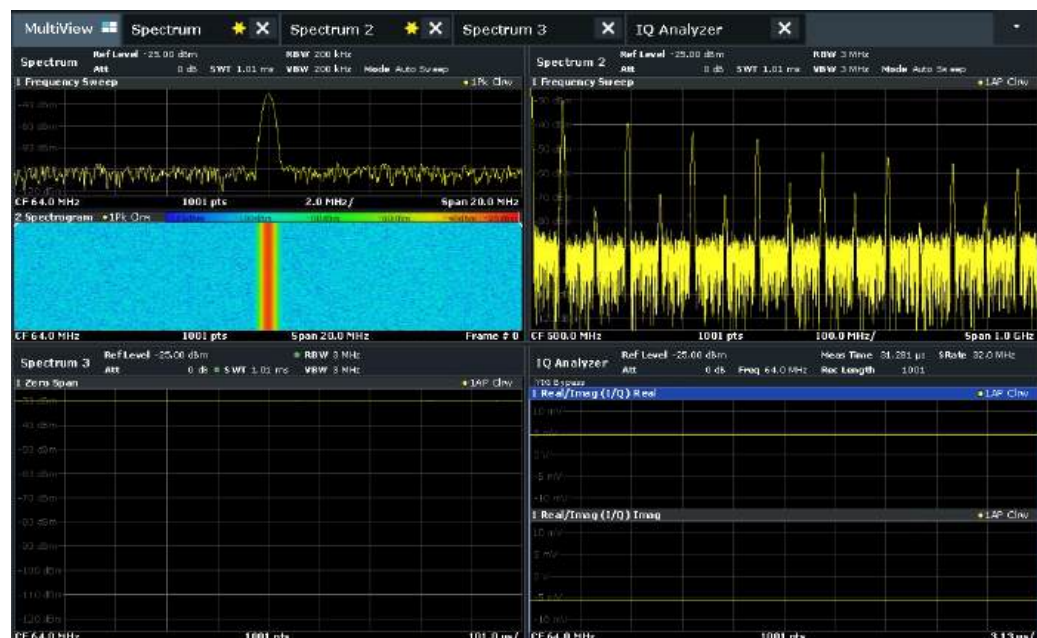
The R&S EPL allows you to configure the display to suit your specific requirements and optimize analysis.

7.6.1 Activating and deactivating channels

When you activate an application, a new measurement channel is created which determines the measurement settings for that application. The same application can be activated with different measurement settings by creating several channels for the same application. Whenever you switch channels, the corresponding measurement settings are restored. Each channel is displayed in a separate tab on the screen.

An additional tab ("MultiView") provides an overview of all currently active channels at once.

Only one measurement can be performed at any time, namely the one in the currently active channel. However, in order to perform the configured measurements consecutively, a Sequencer function is provided.



To start a new channel

1. Select [Mode].
2. In the "Mode" dialog box, select the required application on the "New Channel" tab. A new tab is displayed for the new channel.

Remote command:

`INSTRument:CREate[:NEW]` on page 388/ `INSTRument:CREate:DUPLICATE` on page 388

To change the application in an active channel

1. Select the tab of the channel you want to change.
2. Select [Mode].
3. In the "Mode" dialog box, select the new application to be displayed on the "Replace Current Channel" tab.
The selected application is displayed in the current channel.

Remote command:

`INSTRument:CREate:REPLace` on page 389

To close a measurement channel

Select the "Close" icon on the tab of the measurement channel.

The tab is closed, any running measurements are aborted, and all results for that channel are deleted.

Remote command:

`INSTRument:DELeTe` on page 389

7.6.2 Laying out the result display with the smartgrid

Measurement results can be evaluated in many different ways, for example graphically, as summary tables, statistical evaluations etc. Each type of evaluation is displayed in a separate window in the channel setup tab. Up to 16 individual windows can be displayed per channel setup (i.e. per tab). To arrange the diagrams and tables on the screen, the Rohde & Schwarz SmartGrid function helps you find the target position simply and quickly.

Principally, the layout of the windows on the screen is based on an underlying grid, the SmartGrid. However, the SmartGrid is dynamic and flexible, allowing for many different layout possibilities. The SmartGrid functionality provides the following basic features:

- Windows can be arranged in columns or in rows, or in a combination of both.
- Windows can be arranged in up to four rows and four columns.
- Windows are moved simply by dragging them to a new position on the screen, possibly changing the layout of the other windows, as well.
- All evaluation methods available for the currently selected measurement are displayed as icons in the evaluation bar. If the evaluation bar contains more icons than can be displayed at once on the screen, it can be scrolled vertically. The same evaluation method can be displayed in multiple windows simultaneously.
- New windows are added by dragging an evaluation icon from the evaluation bar to the screen. The position of each new window depends on where you drop the evaluation icon in relation to the existing windows.

- All display configuration actions are only possible in SmartGrid mode. When SmartGrid mode is activated, the evaluation bar replaces the current softkey menu display. When the SmartGrid mode is deactivated again, the previous softkey menu display is restored.
- [Background information: the smartgrid principle](#).....69
- [How to activate smartgrid mode](#).....70
- [How to add a new result window](#).....71
- [How to close a result window](#).....71
- [How to arrange the result windows](#).....71

7.6.2.1 Background information: the smartgrid principle

SmartGrid display

During any positioning action, the underlying SmartGrid is displayed. Different colors and frames indicate the possible new positions. The position in the SmartGrid where you drop the window determines its position on the screen.

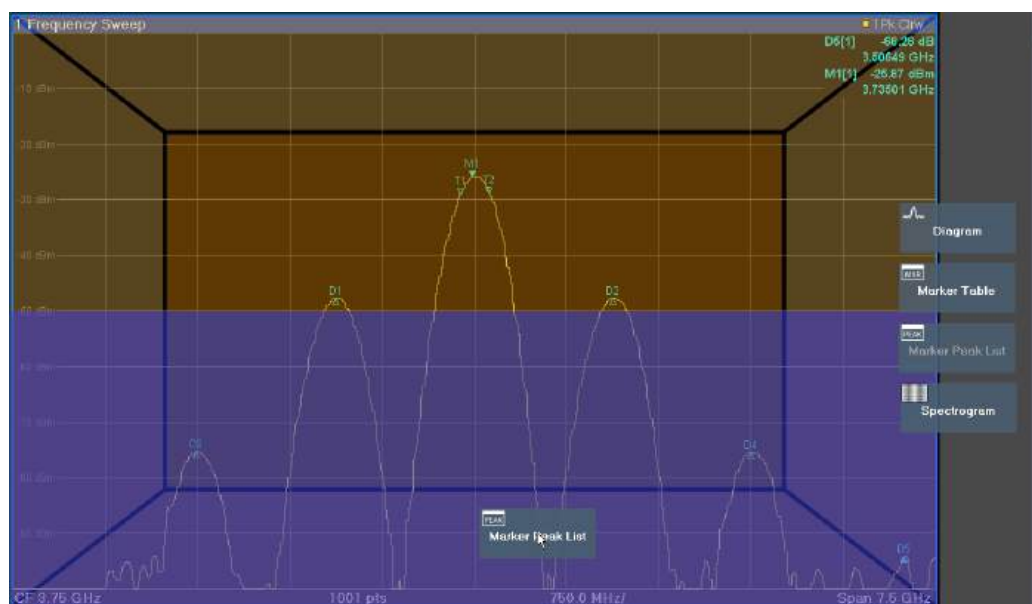


Figure 7-5: Moving a window in SmartGrid mode

The brown area indicates the possible "drop area" for the window, i.e. the area in which the window can be placed. A blue area indicates the (approximate) layout of the window as it would be if the icon were dropped at the current position. The frames indicate the possible destinations of the new window with respect to the existing windows: above/below, right/left or replacement (as illustrated in Figure 7-6). If an existing window would be replaced, the drop area is highlighted in a darker color shade.

Positioning the window

The screen can be divided into up to four rows. Each row can be split into up to four columns, where each row can have a different number of columns. However, rows

always span the entire width of the screen and may not be interrupted by a column. A single row is available as the drop area for the window in the SmartGrid. The row can be split into columns, or a new row can be inserted above or below the existing row (if the maximum of 4 has not yet been reached).

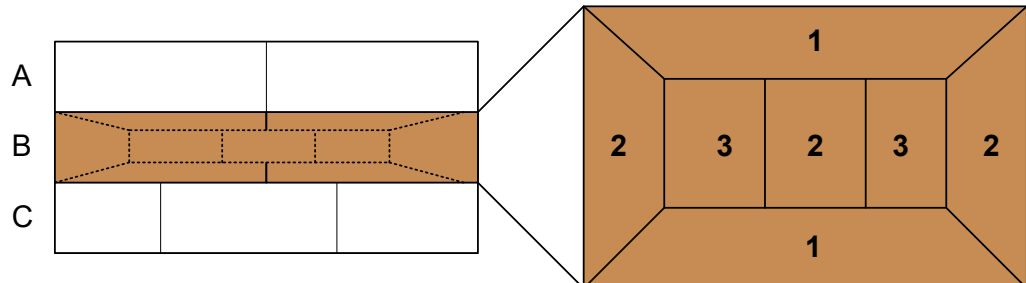


Figure 7-6: SmartGrid window positions

- 1 = Insert row above or below the existing row
- 2 = Create a new column in the existing row
- 3 = Replace a window in the existing row

SmartGrid functions

Once the evaluation icon has been dropped, icons in each window provide delete and move functions.



The "Move" icon allows you to move the position of the window, possibly changing the size and position of the other displayed windows.



The "Delete" icon allows you to close the window, enlarging the display of the remaining windows.

7.6.2.2 How to activate smartgrid mode

All display configuration actions are only possible in SmartGrid mode. In SmartGrid mode the evaluation bar replaces the current softkey menu display. When the SmartGrid mode is deactivated again, the previous softkey menu display is restored.

- To activate SmartGrid mode, do one of the following:



Select the "SmartGrid" icon from the toolbar.

- Select "Display Config" in the configuration "Overview".
- Select "Display Config" from the [Meas Config] menu.

The SmartGrid functions and the evaluation bar are displayed.



To close the SmartGrid mode and restore the previous softkey menu, select the "Close" icon, or press any key.

7.6.2.3 How to add a new result window

Each type of evaluation is displayed in a separate window. Up to 16 individual windows can be displayed per channel setup (i.e. per tab).

1. Activate SmartGrid mode.
All evaluation methods available for the currently selected measurement are displayed as icons in the evaluation bar.
2. Select the icon for the required evaluation method from the evaluation bar.
If the evaluation bar contains more icons than can be displayed at once on the screen, it can be scrolled vertically. Touch the evaluation bar between the icons and move it up or down until the required icon appears.
3. Drag the required icon from the evaluation bar to the SmartGrid, which is displayed in the diagram area, and drop it at the required position. (See [Section 7.6.2.5, "How to arrange the result windows"](#), on page 71 for more information on positioning the window).

Remote command:

`LAYout:ADD[:WINDow]?` on page 469 / `LAYout:WINDow<n>:ADD?` on page 473

7.6.2.4 How to close a result window

- To close a window, activate SmartGrid mode and select the "Delete" icon for the window.



Remote command:

`LAYout:REMove[:WINDow]` on page 471 / `LAYout:WINDow<n>:REMove` on page 474

7.6.2.5 How to arrange the result windows

1. Select an icon from the evaluation bar or the "Move" icon for an existing evaluation window.



2. Drag the evaluation over the SmartGrid.
A blue area shows where the window will be placed.
3. Move the window until a suitable area is indicated in blue.
4. Drop the window in the target area.
The windows are rearranged to the selected layout, and "Delete" and "Move" icons are displayed in each window.
5. To close a window, select the corresponding "Delete" icon.



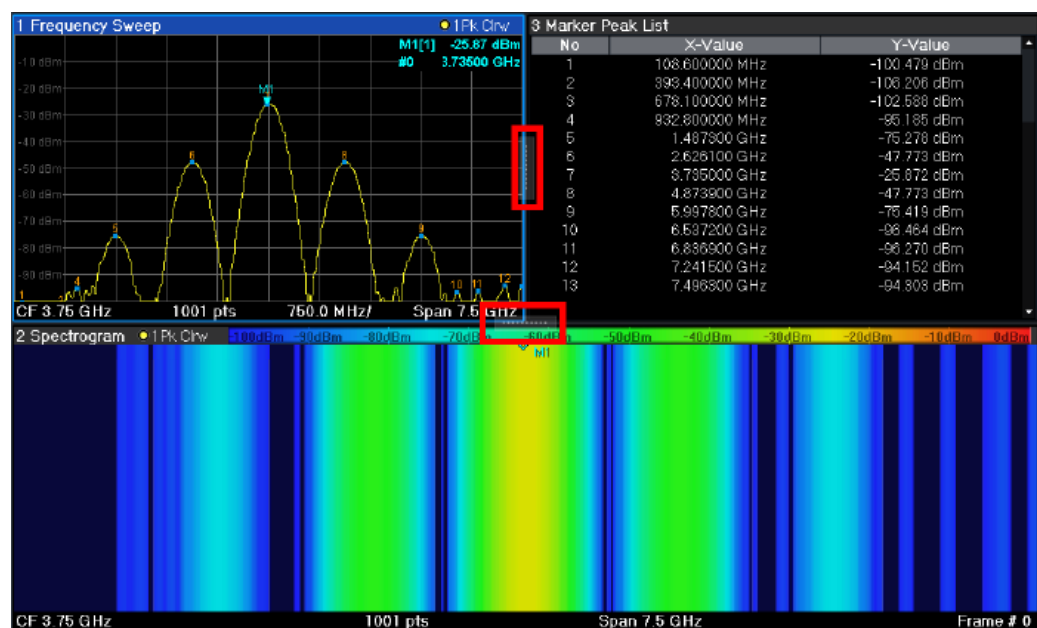
Remote command:

`LAYout:REPLace[:WINDow]` on page 471 / `LAYout:WINDow<n>:REPLace` on page 474

`LAYout:MOVE[:WINDow]` on page 471

7.6.3 Changing the size of windows

Each channel setup tab may contain several windows to evaluate the measurement results using different methods. A "splitter" allows you to change the size of neighboring windows.





The splitters are not available in SmartGrid mode.

- ▶ To change the size of two neighboring windows, drag the splitter between the windows in either direction.

7.6.4 Switching between a split and maximized window display

To get an overview of the results, displaying several windows at the same time may be helpful. However, the individual windows may become rather small. In this case it is useful to maximize an individual window to the entire screen temporarily in order to analyze the results in more detail.



To switch between a split and a maximized display without having to close and re-open windows, double-tap on the diagram you want to maximize. In maximized display, the currently focused window is maximized. In split display, all active windows are displayed. Another double-tap splits the windows again.

7.6.5 Changing the display

The display can be optimized for your individual needs. The following display functions are available and are described in detail in [Section 13.2, "Display settings"](#), on page 285 and [Section 11.1, "Result display configuration"](#), on page 177.

- Displaying a simulation of the entire front panel of the instrument on the screen ("Front Panel")
- Displaying the main function hardkeys in a separate window on the screen ("Mini Front Panel")
- Hiding or showing various screen elements
- Selecting a display theme and colors
- Changing the display update rate
- Activating or deactivating the touch-sensitivity of the screen
- Zooming into the diagram

7.7 Getting help

If any questions or problems concerning the R&S EPL arise, an extensive online help system is provided on the instrument and can be consulted at any time. The help system is context-sensitive and provides information specifically for the current operation or setting to be performed. In addition, general topics provide an overview on complete tasks or function groups as well as background information.

The online help can be opened at any time by selecting one of the "Help" icons on the toolbar or by pressing [F1] on an external or the on-screen keyboard.

To call context-sensitive help

- ▶ To display the "Help" dialog box for the currently focused screen element, e.g. a softkey or a setting in an opened dialog box, select the "Help" icon on the toolbar.



The "Help" dialog box "View" tab is displayed. A topic containing information about the focused screen element is displayed.

If no context-specific help topic is available, a more general topic or the "Content" tab is displayed.



For standard Windows dialog boxes (e.g. File Properties, Print dialog etc.), no context-sensitive help is available.

To display a help topic for a screen element not currently focused

1. Select the "Help pointer" icon on the toolbar.



The pointer changes its shape to a "?" and an arrow.

2. Select the screen element to change the focus.

A topic containing information about the selected (now focused) screen element is displayed.

7.8 Remote control

In addition to working with the R&S EPL interactively, located directly at the instrument, it is also possible to operate and control it from a remote PC. Various methods for remote control are supported:

- Connecting the instrument to a (LAN) network
(See the R&S EPL user manual.)
- Using the Windows Remote Desktop application in a LAN network
- Connecting a PC via the GPIB interface

How to configure the remote control interfaces is described in the User Manual.



The R&S EPL is delivered with *IECWIN* installed, the auxiliary remote control tool provided free of charge by Rohde & Schwarz.

For details on the IECWIN tool, see the "Network and Remote Control" chapter of the R&S EPL User Manual.

7.8.1 Remote desktop connection

Remote Desktop is a Windows application which can be used to access and control the instrument from a remote computer through a LAN connection. While the instrument is in operation, the instrument screen contents are displayed on the remote computer. Remote Desktop provides access to all of the applications, files, and network resources of the instrument. Thus, remote operation of the instrument is possible.

The Remote Desktop Client is part of the installed Windows operating system. For other versions of Windows, Microsoft offers the Remote Desktop Client as an add-on.

7.8.2 Connecting a PC via the GPIB interface

You can connect a PC to the R&S EPL via the GPIB interface to send remote commands to control and operate the instrument. You can configure the GPIB address and the ID response string. The GPIB language is set as SCPI by default but can be changed to emulate other instruments.

A GPIB interface is available on the rear panel of the R&S EPL if the option R&S FPL1-B10 is installed.

8 Applications

The R&S EPL allows you to perform all sorts of different analysis tasks on different types of signals, e.g. analog demodulation, I/Q analysis or basic spectrum analysis. Depending on the task or type of signal, a different set of measurement functions and parameters are required. Therefore, the R&S EPL provides various applications - some of which are included in the base unit, others are optional.

The default application when you start the R&S EPL is the Receiver application, with measurement functions to perform EMC measurements.

Channel setups

When you activate an application, a new channel setup is created which determines the measurement settings for that application. The same application can be activated with different measurement settings by creating several channel setups for the same application.

The number of channels that can be configured at the same time depends on the available memory on the instrument.

- [Available applications](#).....76
- [Starting an Application](#).....78
- [Running a sequence of measurements](#).....79

8.1 Available applications

Access: [Mode]

The R&S EPL provides some applications in the base unit while others are available only if the corresponding firmware options are installed.

Each application is described in a separate manual.



Spectrograms

Spectrogram measurements are not a separate application, but rather a trace evaluation method in the R&S EPL, thus they are available as an evaluation method in the "Display Config", not by creating a new channel setup. Spectrograms are configured and activated in the "Trace" settings.

Receiver

The Receiver application provides measurement functions to perform EMC measurements.

All functions of the Receiver application are described in this document.

Remote command:

INST:SEL REC, see [INSTrument\[:SElect\]](#) on page 391

Spectrum

In the Spectrum application the provided functions correspond to those of a conventional spectrum analyzer. The analyzer measures the frequency spectrum of the RF input signal over the selected frequency range with the selected resolution and sweep time. Alternatively, it displays the waveform of the video signal for a fixed frequency.

For details see the spectrum analyzer user manual.

Remote command:

INST:SEL SAN, see [INSTrument\[:SElect\]](#) on page 391

AM/FM/PM analog demod

The AM/FM/PM analog demodulation application provides measurement functions for demodulating AM, FM, or PM signals.

This application requires the optional firmware R&S FPL1-K7 to be installed.

For details see the analog demodulation user manual.

Remote command:

INST:SEL ADEM, see [INSTrument\[:SElect\]](#) on page 391

CISPR APD

The CISPR APD (Amplitude Probability Distribution) application provides measurement functions to determine the likelihood of emissions being above a certain level.

For details see [Section 9.4, "CISPR APD Measurements"](#), on page 127.

Note: The "CISPR APD Measurements" mode is not available for the R&S EPL 30 MHz model.

Remote command:

INST:SEL APD, see [INSTrument\[:SElect\]](#) on page 391

Click Rate Analyzer

The click rate analyzer application provides measurement and display functions for click rate measurements.

For details see the click rate analyzer user manual.

Remote command:

INST:SEL CRA, see [INSTrument\[:SElect\]](#) on page 391.

I/Q analyzer

The I/Q Analyzer application provides measurement and display functions for I/Q data.

For details see the I/Q analyzer user manual.

Remote command:

INST:SEL IQ, see [INSTrument\[:SElect\]](#) on page 391

Real-Time Spectrogram

The Real-Time Spectrogram application requires an instrument equipped with the Real-Time Spectrogram option. This application provides real-time spectrogram measurement functions.

For details see the R&S EPL Real-Time Spectrogram User Manual.

Remote command:

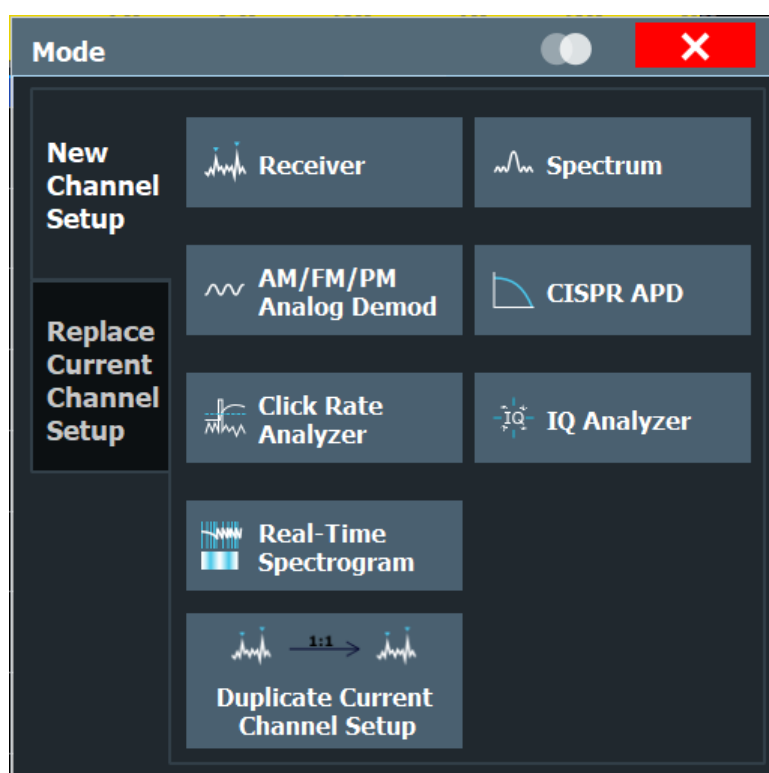
INST:SEL RTSG, see [INSTrument\[:SElect\]](#) on page 391

8.2 Starting an Application

Access

► [MODE] > "<application>"

The default application that is running when you start the R&S EPL is the Receiver application.



The remote commands required to perform these tasks are described in [Section 15.4, "Application selection"](#), on page 388.



The measurement channels are labeled with their default name. If that name already exists, a sequential number is added.

You can define a different channel name by selecting (double-click) the corresponding label.



In remote control, the name of the measurement channel can also be changed. For details and an overview of default names see [INSTrument:LIST?](#) on page 390.

Switching between applications

When you enter a new application, a set of parameters is passed on from the current application to the new one, for example the measurement frequency or the attenuation.

You can also define a fix set of parameters that are synchronized between applications. For more information see [Section 13.3, "Synchronizing measurement channel configuration"](#), on page 296.



To deactivate a channel, simply close the corresponding tab.

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New Channel setup

The applications selected on this tab are started in a new measurement channel, i.e. a new tab in the display.

Remote command:

[INSTrument:CREate\[:NEW\]](#) on page 388

[INSTrument\[:SElect\]](#) on page 391

Replace Current Channel setup

The applications selected on this tab are started in the currently displayed measurement channel, replacing the current application.

Remote command:

[INSTrument:CREate:REPLace](#) on page 389

Duplicate Current Channel

The currently active channel setup can be duplicated, i.e. a new channel setup of the same type and with the identical measurement settings is started. The name of the new channel setup is the same as the copied channel setup, extended by a consecutive number (e.g. "Spectrum" -> "Spectrum 2").

Remote command:

[INSTrument:CREate:DUPLicate](#) on page 388

8.3 Running a sequence of measurements

Only one measurement can be performed at any time, namely the one in the currently active channel setup. However, in order to perform the configured measurements consecutively, a Sequencer function is provided.

• The sequencer concept	80
• Sequencer settings	82
• How to set up the sequencer	82

8.3.1 The sequencer concept

The instrument can only activate one specific channel setup at any time. Thus, only one measurement can be performed at any time, namely the one in the currently active channel setup. However, in order to perform the configured measurements consecutively, a Sequencer function is provided, which changes the channel setup of the instrument as required. If activated, the measurements configured in the currently defined "Channel"s are performed one after the other in the order of the tabs.

For each individual measurement, the sweep count is considered. Thus, each measurement may consist of several sweeps. The currently active measurement is indicated by a  symbol in the tab label.

The result displays of the individual channel setups are updated in the tabs as the measurements are performed. Sequential operation itself is independent of the currently *displayed* tab.

Sequencer modes

Three different Sequencer modes are available:

- **Single Sequence**
Similar to single sweep mode; each measurement is performed once, until all measurements in all defined "Channel"s have been performed.
- **Continuous Sequence**
Similar to continuous sweep mode; the measurements in each defined "Channel" are performed one after the other, repeatedly, in the same order, until sequential operation is stopped. This is the default Sequencer mode.
- **Channel-defined Sequence**
First, a single sequence is performed. Then, only "Channel"s in continuous sweep mode are repeated continuously.

Example: Sequencer procedure

Assume the following active channel setup definition:



Tab name	Application	Sweep mode	Sweep count
Spectrum	Spectrum	Cont. Sweep	5
Spectrum 2	Spectrum	Single Sweep	6
Spectrum 3	Spectrum	Cont. Sweep	2
IQ Analyzer	IQ Analyzer	Single Sweep	7

For **Single Sequence**, the following sweeps will be performed:

5x Spectrum, 6x Spectrum 2, 2 x Spectrum 3, 7x IQ Analyzer

For **Continuous Sequence**, the following sweeps will be performed:

5x Spectrum, 6x Spectrum 2, 2 x Spectrum 3, 7x IQ Analyzer,

5x Spectrum, 6x Spectrum 2, 2 x Spectrum 3, 7x IQ Analyzer,

...

For **Channel-defined Sequence**, the following sweeps will be performed:

5x Spectrum, 6x Spectrum 2, 2 x Spectrum 3, 7x IQ Analyzer,

5x Spectrum, 2 x Spectrum 3,

5x Spectrum, 2 x Spectrum 3,

...

Run Single/Run Cont and Single Sweep/Sweep Continuous keys

While the Sequencer is active, the [Run Single] and [Run Cont] keys control the Sequencer, not individual sweeps. [Run Single] starts the Sequencer in single mode, while [Run Cont] starts the Sequencer in continuous mode.

The "Single Sweep" and "Continuous Sweep" *softkeys* control the sweep mode for the currently selected channel setup only; the sweep mode only has an effect the next time the Sequencer activates that channel setup, and only for a channel-defined sequence. In this case, a channel setup in single sweep mode is swept only once by the Sequencer. A channel setup in continuous sweep mode is swept repeatedly.

8.3.2 Sequencer settings



The "Sequencer" menu is available from the toolbar.

Functions of the Sequencer in the Receiver application described elsewhere:

- "Performing sequenced measurements" on page 86

Sequencer State.....	82
Sequencer Mode.....	82

Sequencer State

Activates or deactivates the Sequencer. If activated, sequential operation according to the selected Sequencer mode is started immediately.

Remote command:

`SYSTem:SEQuencer` on page 397

`INITiate:SEQuencer:IMMediate` on page 397

`INITiate:SEQuencer:ABORt` on page 396

Sequencer Mode

Defines how often which measurements are performed. The currently selected mode softkey is highlighted blue. During an active Sequencer process, the selected mode softkey is highlighted orange.

"Single Sequence"

Each measurement is performed once, until all measurements in all active channel setups have been performed.

"Continuous Sequence"

The measurements in each active channel setup are performed one after the other, repeatedly, in the same order, until sequential operation is stopped.

This is the default Sequencer mode.

Remote command:

`INITiate:SEQuencer:MODE` on page 397

8.3.3 How to set up the sequencer

In order to perform the configured measurements consecutively, a Sequencer function is provided.

1. Configure a channel setup for each measurement configuration as required, including the sweep mode.

2. In the toolbar, select the "Sequencer" icon.



The "Sequencer" menu is displayed.

3. Toggle the "Sequencer" softkey to "On".

A continuous sequence is started immediately.

4. To change the Sequencer mode and start a new sequence immediately, select the corresponding mode softkey, or press the [Run Single] or [Run Cont] key.

The measurements configured in the currently active channel setups are performed one after the other in the order of the tabs until the Sequencer is stopped. The result displays in the individual channel setups are updated as the measurements are performed.

To stop the sequencer

- To stop the Sequencer temporarily, press the highlighted [Run Single] or [Run Cont] key (not for a channel-defined sequence). To continue the Sequencer, press the key again.
To stop the Sequencer permanently, select the "Sequencer" icon in the toolbar and toggle the "Sequencer" softkey to "Off".

9 Measurements and result displays

The measurements and result displays available in the Receiver application allow you to analyze the frequency spectrum for possible interferers and the characteristics of those interferers.



The "CISPR APD Measurements" mode is not available for the R&S EPL 30 MHz model.

- [Performing measurements](#).....84
- [Bargraph configuration](#).....86
- [Test automation](#).....91
- [CISPR APD Measurements](#).....127

9.1 Performing measurements

The R&S EPL provides several approaches to do measurements and acquire the signal data.

Access: [SWEEP]

Functions in the "Sweep" menu described elsewhere:

- ["Measurement Time"](#) on page 89
- ["Selecting the scan type"](#) on page 101
- ["Select Frame"](#) on page 207
- [Section 9.3.3.1, "Designing a scan table"](#), on page 103

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Performing continuous measurements

When you measure continuously, the measurement is repeated until you deliberately stop it.

The duration of each individual measurement cycle (for example a single bargraph measurement) depends on the [measurement time](#) you have set for the measurement in question. After each measurement cycle, the data of the previous cycle is overwritten and replaced by the new data. Exception: When you are using a max or min hold function, the application keeps the highest or lowest values and replaces old data only if the current data contains a new maximum or minimum.

The R&S EPL allows you to select the measurement mode for the bargraph and the scan separately. When you select a continuous bargraph measurement, IF analysis (including the spectrogram) is also performed continuously. When you select a continuous scan, the scan spectrogram is also updated continuously. Running a continuous final measurement is not possible.

- To start a continuous scan, press either the [RUN CONT] key on the front panel or the "Continuous Scan" softkey in the "Sweep" menu.
- To start a continuous bargraph measurement, press the "Continuous Bargraph" softkey in the "Sweep" menu.

Note: Pressing the [RUN CONT] key again interrupts the scan (see [Section 9.3.3.2, "Interrupting a scan"](#), on page 104) and does not stop it.

Continuous measurements are the default measurement mode.

Remote command:

Selection: `INITiate<n>:CONTinuous` on page 394

Initialization: `INITiate<mt>[:IMMediate]` on page 395

Performing single measurements

When you run a single measurement, the measurement is performed once and then stopped. The duration of the measurement depends on the [measurement time](#).

Note that a single measurement does not necessarily consist of a *single* measurement. A single measurement can consist of several measurements, whose number you can define with the [Scan Count](#). In that case, the measurement stops when all measurements defined by the scan count or bargraph count are done.

The R&S EPL allows you to select the measurement mode for the bargraph and the scan separately. When you select a single bargraph measurement, IF analysis also stops when the bargraph measurement stops. Note, however, that the time defined for a single bargraph measurement can result in more than one update of the IF analysis trace (including the IF spectrogram). When you select a single scan, the spectrogram update also stops when the scan stops, but it can consist of several new lines in the spectrogram, depending on the configuration.

- To start a single scan, press either the [RUN SINGLE] key on the front panel or the "Single Scan" softkey in the "Sweep" menu.
- To start a single bargraph measurement, press the "Single Bargraph" softkey in the "Sweep" menu.

Note: Pressing the [RUN SINGLE] key again interrupts the scan (see [Section 9.3.3.2, "Interrupting a scan"](#), on page 104) and does not stop it.

Note on performing continuous [sequenced measurements](#):

When you are using the sequencer, you can select the measurement mode for each measurement channel that is part of the sequence.

Thus, the "Single Scan" and "Single Bargraph" softkeys only control the measurement mode for the currently selected measurement channel (for a channel defined sequence). In addition, the [RUN SINGLE] key in that case controls the sequencer, not a particular channel.

Remote command:

Selection: `INITiate<n>:CONTinuous` on page 394

Single scan or bargraph: `INITiate<mt>[:IMMediate]` on page 395

Single final measurement: `INITiate<mt>:FMEasurement` on page 395

Single test sequence: `INITiate<mt>:EMITest` on page 394

Performing sequenced measurements

When you run a sequenced measurement, you can combine measurements of several applications into a sequence of measurements. This sequence of measurements is either performed once (single sequence), indefinitely (continuous sequence) or a mixture of both (channel defined sequence).

For more information regarding the general functionality of the sequencer, see [Section 8.3, "Running a sequence of measurements"](#), on page 79.

In the receiver application, you can select whether to:

- Run a bargraph measurement each time the receiver application has its turn.
- Run a scan each time the receiver application has its turn.
- Skip measurements in the receiver application.

When you include the bargraph measurement in the sequence, IF analysis (including the spectrogram) is also done. When you include the scan in the sequence, spectrogram data is also collected (and a peak search and a final measurement are performed when you have defined a [test sequence](#) that covers these measurements).

Note the following effects of performing a scan in a sequence of measurements.

- Stopping a scan or final measurement aborts that measurement and resumes the measurement sequence in the next channel.
- Interrupting a scan is not possible.
- Interactive final measurements are not available.

Tip: Performing a *continuous* sequence with a *single* (bargraph or scan) measurement resets max hold values every time the sequencer starts a measurement in that receiver channel. To keep max hold values, use continuous measurements in the channel.

► To select the measurement to include in a sequence, select [SWEEP] > "Sequencer" until the required measurement is highlighted blue.

If you want to include a bargraph measurement *and* a scan in the sequence of measurements, you have to use two measurement channels.

Remote command:

See [Section 15.5, "Measurements and result displays"](#), on page 392.

9.2 Bargraph configuration

Access: [MEAS CONFIG] > "Bargraph Config"

Alternatively, you can access the dialog box by clicking on the bargraph once.

The bargraph result display is designed for measurements on a single frequency. It is a basic result display that shows the signal level at a particular frequency numerically and graphically as a bargraph. The length of the bar depends on the signal level at the current receiver frequency. If necessary, you can control the way the signal is evaluated by selecting different detectors.

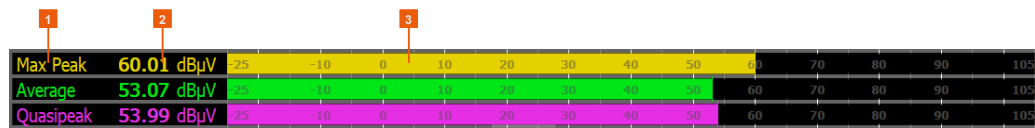


Figure 9-1: Overview of the bargraph result display

- 1 = detectors
 2 = measured levels (numerically)
 3 = measured levels (graphically)

The results in the bargraph are shown as soon as you enter the receiver application (for the frequency that is currently selected) and are updated continuously. The unit of the displayed power level is variable and depends on the unit you have set (by default, it is dBμV).

The bargraph range is always 100 dB, the minimum and maximum levels that are displayed are automatically adjusted, depending on the measurement configuration. When auto ranging has been turned off, the range depends on settings like the attenuation or gain. When auto ranging has been turned on, the range is adjusted to the signal level.

The R&S EPL supports the simultaneous use of up to four different detectors in the bargraph result display. If you select an additional detector, the R&S EPL adds the corresponding number of bargraphs to the result display. This way to display the signal levels provides an easy way to compare the signal level with different weighting factors.



Meaning of small vertical lines in the bargraph



Depending on the configuration, the following small vertical lines can appear in the bargraph.

- A small vertical line with the same color as the bargraph shows the highest value that has been measured on the currently selected frequency.
- A small red vertical line with an "SQ" label shows the [squell level](#) that you have defined for audio output over headphones.

Max hold bargraph

The max hold bargraph information, when it has been turned on, shows the highest signal level that has been measured since the measurement has begun. The max hold value remains effective, even if you change any receiver settings (for example the frequency or the attenuation) and is only reset when you deliberately do so. One max hold value is displayed for each of the active detectors.

When you turn on the max hold information, the diagram information is expanded by the peak level that has been measured since the max hold has been last reset (as a numerical value and including the frequency that value has been measured on). If a new peak level has been detected, the max hold values are updated accordingly.

The live results and the highest signal level for a particular frequency are still shown in the bargraph diagram as usual.



Min peak detector levels

Note that for the min peak detector, the peak level is not the highest level, but the lowest level.

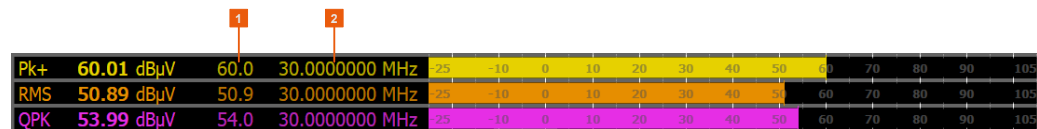


Figure 9-2: Screen layout of the bargraph result display with the max hold information

1 = maximum levels

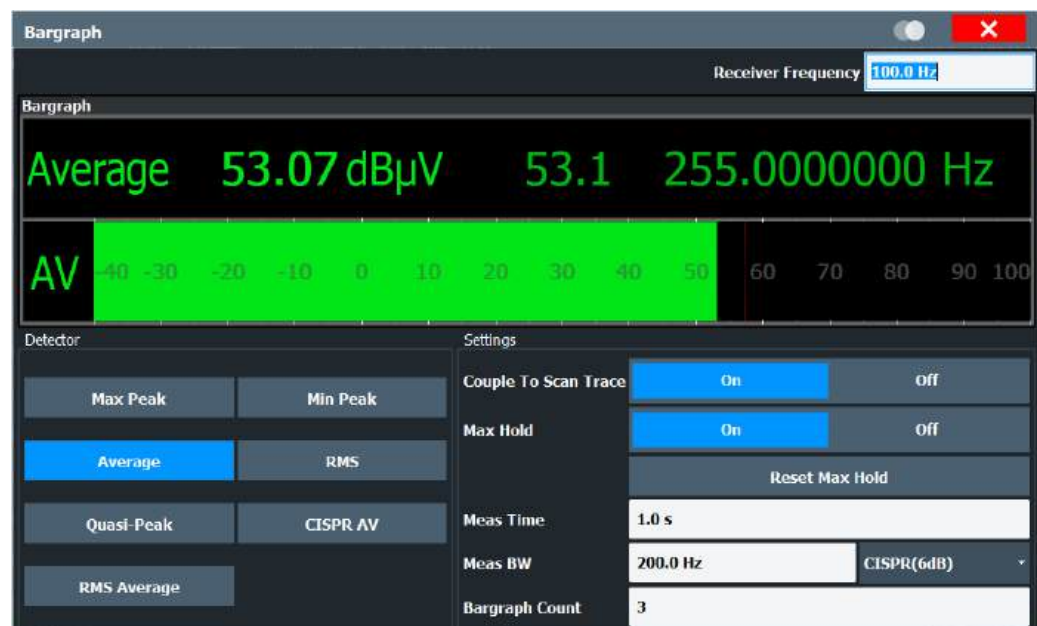
2 = frequency on which the maximum level has been measured; note that the minimum and RMS peaks have been measured at frequency different to the current receiver frequency

The "Bargraph" dialog box contains a preview of the measurement and all settings that you can apply to the bargraph.



Bargraph configuration

When you are performing a scan that is not based on a scan table, the R&S EPL applies the bargraph settings (detector, measurement time etc.) to the scan.



The remote commands required to configure the bargraph are described in [Section 15.5.4, "Bargraph configuration"](#), on page 404.

Functions to configure the bargraph described elsewhere:

- ["Receiver Frequency"](#) on page 167

- ["Detector"](#) on page 121

Couple to Scan Trace	89
Bargraph Max Hold	89
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Measurement Bandwidth	90
Filter Type	90

Couple to Scan Trace

Couples or decouples the bargraph detector and scan detectors.

Turning on the feature has the following effects.

- Turns on a scan detector for every active bargraph.
If you add a new bargraph detector, the corresponding scan trace is automatically turned on.
- Matches the scan trace number to the number of the bargraph.

If you couple bargraph and scan trace, the R&S EPL replaces the detectors of all other active scan traces with the new detector type.

Remote command:

[DISPlay:BARGraph:TCoupling\[:STATe\]](#) on page 405

Bargraph Max Hold

Turns the display of the highest level that has been measured on any frequency since the last "Max Hold Reset" on and off, regardless of the receiver settings.

When you turn on the max hold information, the R&S EPL shows the highest level that has been measured for each active bargraph (detector), including the frequency where it was measured.

Note: The little vertical line displayed in the bargraph does not represent the max hold value. Instead it shows the highest level that has been measured for the current receiver frequency.



You can reset the max hold bargraph with the "Reset Max Hold" button. After you have reset the max hold bargraph, it starts collecting maximum values again.

[More information](#)

Remote command:

Bargraph state: [DISPlay:BARGraph:PHOLd\[:STATe\]](#) on page 405

Bargraph reset: [DISPlay:BARGraph:PHOLd:RESet](#) on page 404

Measurement Time

Defines the measurement time used to analyze the signal.

You can define a different measurement time for the bargraph, each scan range defined in the scan table and the final measurement. If you perform a scan that is not based on a scan table ([Current](#) parameters), the measurement time for the scan is the same as for the bargraph.

Tip: Make sure to select a measurement time that is appropriate for the analyzed signal and that allows the various filters and detectors in the signal path to settle.

Note that the measurement time for IF analysis is calculated automatically based on the measurement time of the bargraph.

Remote command:

Bargraph: `[SENSe:]SWEep:TIME` on page 406

Scan table: `[SENSe:]SCAN<sr>:TIME` on page 413

Final measurement: `[SENSe:]FMEasurement:TIME` on page 425

Measurement Bandwidth

Defines the measurement bandwidth (or resolution bandwidth) used for the measurement.

You can define a different bandwidth for the bargraph and each scan range defined in the scan table. The R&S EPL displays an exclamation mark if the selected measurement bandwidth is not compatible to the bandwidth required by CISPR for the corresponding frequency range.

If you perform a scan that is not based on a scan table, the bandwidth for the scan is the same as for the bargraph.

The final measurement uses the bandwidths defined in the scan table, or, if the scan is not based on a scan table (**Current** parameters), the bandwidth of the bargraph.

The R&S EPL supports a selected set of resolution bandwidths. If you enter a number that is not supported, the R&S EPL rounds the value up to next available bandwidth.

More information

Remote command:

Bargraph: `[SENSe:]BANDwidth[:RESolution][:VALue]` on page 461

Scan table: `[SENSe:]SCAN<sr>:BANDwidth:RESolution` on page 409

Filter Type

Selects the type of resolution filter used in the measurement.

The available resolution bandwidths depend on the filter selection.

You can select from the following filter types.

- **Normal (3 dB)**
Gaussian filter with a 3 dB bandwidth.
- **Gauss (6 dB)**
Gaussian filter with a 6 dB bandwidth that complies with CISPR and MIL standards.
- **CISPR (6 dB)**
Gaussian filter with a 6 dB bandwidth that complies with CISPR standards.
- **MIL (6 dB)**
Gaussian filter with a 6 dB bandwidth that complies with military standards.

6 dB bandwidths correspond approximately to the pulse bandwidth.

3 dB bandwidths correspond approximately to the noise bandwidth.

More information

Remote command:

`[SENSe:]BANDwidth[:RESolution]:TYPE` on page 462

9.3 Test automation

Access: "Overview" > "Test Automation"

The "Test Automation" dialog box is a tool to configure and perform measurements in the Receiver application. The dialog box contains a tab for each typical stage in an EMC measurement (scan, peak search and final measurement). The dialog box also summarizes the measurement results for these stages in separate tabs.

• Background information	91
• Selecting a test sequence	100
• Performing a scan	103
• Performing a peak search	111
• Performing final measurements	118
• Configuring line impedance stabilization networks (LISN)	124

9.3.1 Background information

The following topics contains information that can be useful to configure automated test sequences.

• Selecting the measurement bandwidth	91
• Calculating the number of measurement points	92
• Line impedance stabilization network (LISN) control	94
• Overview of receiver measurements	95

9.3.1.1 Selecting the measurement bandwidth

The measurement bandwidth corresponds to the bandwidth of the resolution filter. The RF signal is evaluated and displayed according to the bandpass characteristics of the resolution filter.

The receiver application supports the following types of resolution filter.

- Filters with a 3 dB bandwidth
The R&S EPL provides bandwidths with a stepsize of 1-2-3-5-10-..... For details, refer to the data sheet.
- Filters with a 6 dB bandwidth
The 6 dB bandwidths are designed and required for receiver tests and measurements. The R&S EPL provides bandwidths that comply to commercial and military standards. For details, refer to the data sheet.

Note that the available bandwidth is limited by the current receiver frequency. The measurement bandwidth must be less than or equal to half of the current receiver frequency:

$$BW \leq f_{in} / 2$$

The resolution filters are implemented as digital Gaussian bandpass filters. Concerning the attenuation characteristic, the filters behave like analog filters, but their measurement speed is much higher than the measurement speed of comparable analog filters.

This is because the transient response can be compensated because the filters have an accurately defined behavior.

The highest sensitivity is obtained at the smallest bandwidth. If the bandwidth is increased, the reduction in sensitivity is proportional to the change in bandwidth. Increasing the bandwidth by a factor of 3 increases the displayed noise by approx. 5 dB (4.77 dB precisely). If the bandwidth is increased by a factor of 10, the displayed noise increases by a factor of 10 (= 10 dB).

The higher spectral resolution with smaller bandwidths leads to longer measurement times at each frequency, because the measurement time has to allow the resolution filters to settle during a sweep at all signal levels and frequencies to be displayed.

For large measurement bandwidths, signal parts that are very far away (for example from a different signal) are considered in the measurement and distort the results. The displayed noise increases.

For small measurement bandwidths, the measurement time increases.



Bandwidths and detectors

If you use the Quasipeak, CISPR Average or RMS Average detector, the R&S EPL by default couples the resolution bandwidth to the receiver frequency.

If you need a different bandwidth, you can decouple the bandwidth from the frequency. When decoupled, you can select any of the supported CISPR bandwidths.

9.3.1.2 Calculating the number of measurement points

The number of measurement points (or sweep points in some applications) determines the amount of data that is captured in one measurement. At each measurement point, the R&S EPL collects one set of data, which contains, for example, the signal level at a given frequency.

The effect of the number of measurement points on the measurement is that its number defines how much of the entire span is covered by a single data point.

Example:

Consider the following settings:

- Start frequency: 100 MHz
- Stop frequency: 900 MHz
- Number of measurement points: 1001

With said settings, each measurement point would cover a frequency range of about 800 kHz.

By increasing the number of measurement points, you can increase the reliability of the individual data points and thus the accuracy of the analyzed results. All of these data points are stored on the instrument, occupying a large amount of memory, and each measurement point increases the overall measurement time.

For details on how the number of measurement points affect the trace results on the screen, see [Section 11.3.1.1, "Working with trace detectors"](#), on page 186.

Measurement points in receiver application

In the receiver application, the number of measurement points considered in a scan is determined by the frequency range and the selected frequency step size: the R&S EPL runs a measurement every x Hz, so the actual number of measurement points depends on frequency range you are scanning. The maximum number of measurement points that a scan supports is 10,000,001 (this is only possible with two or less active traces).

The frequency step size depends on the frequency step mode and the type of scan you are using.

- **Scans without a scan table:**

The frequency step size depends on the measurement bandwidth.

Example:

Consider the following scan configuration:

- Start frequency: 150 kHz
- Stop frequency: 1 MHz
- Measurement bandwidth: 1 kHz

The measurement bandwidth of 1 kHz results in a frequency step size of 400 Hz. In that case, the number of measurement points in this example would be about 2100.

- **Scans with a scan table:**

The frequency step size is either determined automatically (in which case it depends on the measurement bandwidth) or manually (in which case you define the required step size)

Example:

Consider the following scan table settings for a given scan range:

- Start frequency: 150 kHz
- Stop frequency: 30 MHz
- Step size mode: linear
- Step size: 4 kHz

With said settings, the R&S EPL collects a dataset every 4 kHz, so the number of measurement points in this example would be about 7500.

Measurement points in spectrum application

In the spectrum application, a measurement point is called a sweep point. Instead of determining the number of measurement points based on other settings, you can select the number of measurement points manually. By default, the R&S EPL measures 1001 points in one measurement.

For spectrum measurements, you can also define a sweep count. The sweep count defines the number of measurements a single sweep is made up out of. If the sweep count is 0 or 1, the R&S EPL runs a single measurement from start to stop frequency. If the sweep count is greater than 1, the R&S EPL repeats the measurement from start to stop frequency a corresponding number of times.

For more information on the effects of the sweep count on the measurement results, see [Section 11.3.1.2, "Analyzing several traces - trace mode"](#), on page 191.

9.3.1.3 Line impedance stabilization network (LISN) control

When you do measurements on power lines, a Line Impedance Stabilization Network (LISN) allows you to determine the interference caused by power supplies and cables. The R&S EPL allows you to connect and control selected LISNs in such a test setup and considers the characteristics of the LISN during measurements. In addition to selecting a particular [LISN type](#), you can also select the [Phase](#) that you want to test for interference.

Control of a LISN and its phases is possible during scans and during the final measurement. You can control all available LISN phases as required and independently from each other.

If you select more than one phase, the R&S EPL measures all phase combinations and determines the maximum value.

Table 9-1: Supported networks and controllable phases

Network	Controllable phases
Two-line V-networks	
R&S ENV216	N, L1
R&S AMN6500	N, L1
Four-line V-networks	
R&S ENV4200	N, L1, L2, L3
R&S ENV432	N, L1, L2, L3

When you are using the R&S ENV216 network, you can protect the input with a 150 kHz [high-pass filter](#).

Connecting a LISN

A LISN is connected to the R&S EPL via its user port. To connect the LISN to the R&S EPL, a control line and an adapter are required.

The control line (or cable) controls which phase of the LISN is to be tested and outputs the information to the user port. Control lines for the supported LISNs are available as accessories from Rohde & Schwarz.

When you connect the LISN, make sure to use the correct pins on both sides of the test setup. Otherwise, the automatic phase control of the LISN might not work. The following illustrations show the correct pin assignment.

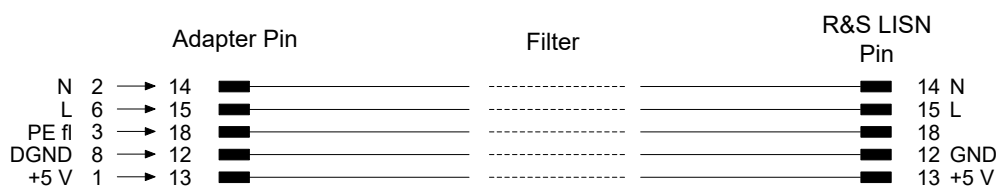


Figure 9-3: Connection from R&S EPL to R&S ENV216 or R&S AMN6500

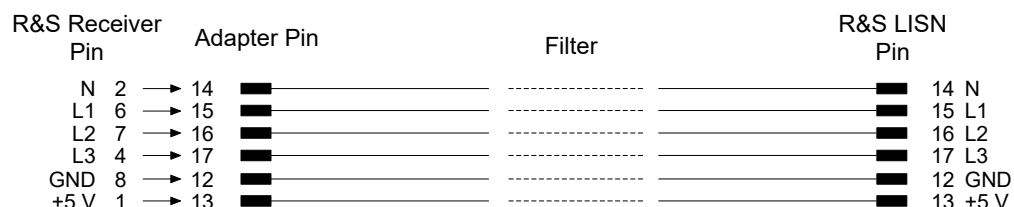


Figure 9-4: Connection from R&S EPL to R&S ENV4200 or R&S ENV432

To control the phase selection and PE simulating network of the V-Networks R&S ENV4200 or R&S ENV432, the +5 V supply voltage and some control lines have to be routed through the wall of the shielded room.

You can also use a direct connection without a filter, e.g. when you use the R&S EPL in a shielded room. In that case, you can use the following cables.

- R&S ENV216 or R&S AMN6500: EZ-21
- R&S ENV4200 or R&S ENV432: EZ-21

9.3.1.4 Overview of receiver measurements

The Receiver application provides several measurements and evaluation methods that are typical for EMC measurements.

- [Scan](#).....95
- [Peak search](#).....97
- [Final measurement](#).....98
- [IF analysis](#).....99

Scan

During a scan, the R&S EPL measures the signal strength of discrete frequencies over a custom frequency range. The frequency step size and measurement time for each frequency are arbitrary.

The scan parameters are either based on the current receiver settings or on the settings defined in a [Scan Table](#). You can take transducer factors or sets as well as limit lines into account. They can be defined and displayed separately, but are not included in the scan data record.

The scanned frequency range is defined by the start and stop frequency set independently of the scan table. A scan table can thus be defined for each measurement task.

You can either perform a continuous scan or a single scan. A single scan stops when it reaches the stop frequency. A continuous scan repeats the scan until you interrupt or abort it deliberately.

The maximal number of measured frequencies is limited to 4.000.000 per detector. The data can be stored for postprocessing. If the scan subranges are defined so that more than the possible values would be measured, a respective message is output upon the scan start. Afterwards the scan is performed up to the maximum value.

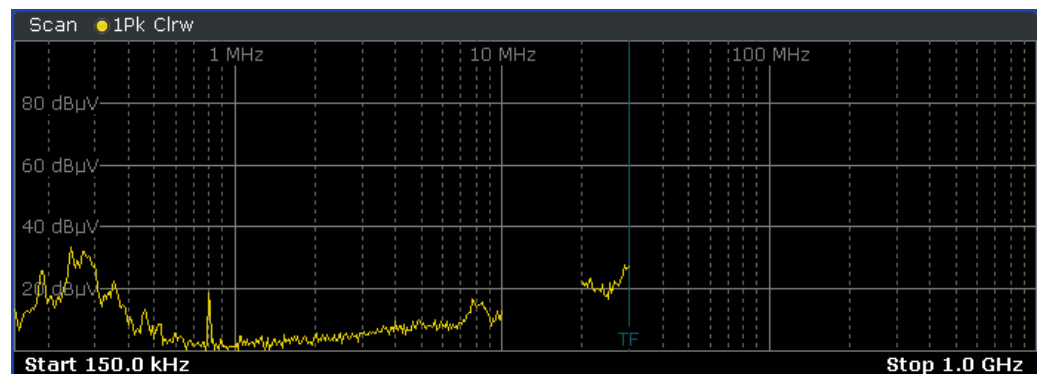


Figure 9-5: Scan on selected frequencies showing gaps in the trace

The R&S EPL offers the following scan methods:

- **Stepped scan in the frequency domain**
In stepped scan mode, step width and frequency spacing (step mode) can be selected.
- **Time domain scan in the frequency domain**
In time domain measurement systems, the spectrum at the receiver input is measured in parallel by using fast fourier transform (FFT) of frequency sections.



ADC calibration required

ADC calibration can become necessary if you have started a time domain scan during the warm-up period of the R&S EPL. If the message "ADC calibration required" appears, stop and restart the scan.

Stepped scans in the frequency domain

In stepped scan mode, the step width and the frequency spacing (step mode) can be selected. Linear, logarithmic or automatic frequency spacing is available. In automatic mode, the step width is selected so that it is always smaller than the bandwidth.

Receiver measurements may involve much time. Time saving procedures are explained in "[Peak search](#)" on page 97. They reduce the total measurement time by reducing the number of measurements to a minimum.

Nevertheless, this time is still very long, often in the order of hours, especially for the CISPR radiated emissions tests. A way out of this situation can be time-domain measurements.

Peak search

The Peak Search function of the R&S EPL can be used to create a peak list containing only the measurement values of high interferers. In a fast prescan the signal is measured against a limit line, and the level values above the set margin are written into the peak list. The resulting peak list then is used for the final measurement where only the frequencies in the peak list are measured with the required detector.

If the scan uses the detector stipulated by the specifications, the peak list already provides the final measurement data.

Data reduction using the peak list

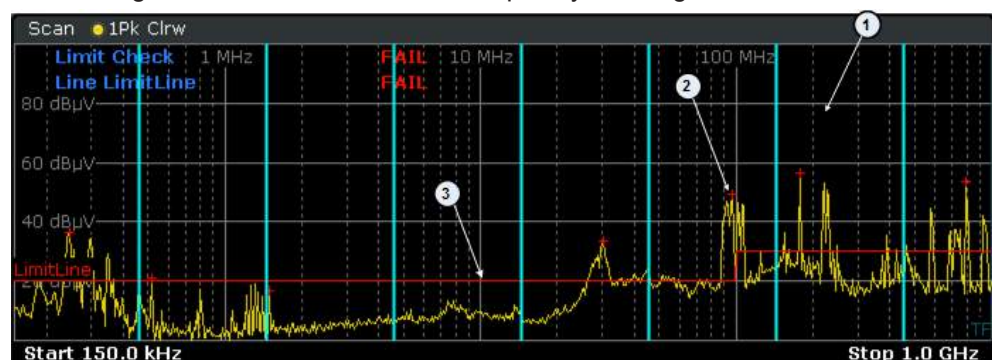
EMI measurements may take some time because the time constants of up to 160 ms prescribed by the standard for the quasipeak weighting lead to long measurement times per each value. In addition, some standards stipulate procedures for finding local EMI maxima such as shifting the absorbing clamp, variation of the test antenna height and rotating the DUT. Measuring with quasipeak weighting at each frequency and for each setting of the test configuration would lead to unacceptably long measurement times. For this reason, a method is used which reduces the time-consuming measurements to a minimum with an optimum reliability of detection.

Receiver measurements may take some time because of some specialties in the context of those measurements like variations of the test antenna or high time constants required by detectors or things like that. Because of this, the Receiver provides tools that reduce the efforts to a minimum while still providing an optimum measurement reliability.

The interference spectrum is first pre-analyzed in a fast prescan to optimize the duration of the measurement. Data reduction follows so that the time-consuming final measurement is performed only at critical frequencies.

Several data reduction methods are used:

- Generating subrange maxima (search method "Subranges").
The whole frequency range is divided into equidistant frequency subranges. A selectable number of subrange maxima are determined for each subrange. In the final measurement, the interference spectrum is further analyzed at frequencies with the highest interference level of a frequency subrange.



- 1 = Subrange
- 2 = Subrange maximum
- 3 = Limit line

- Determination of a specific number of peak values relative to the limit lines with the level values being independent of their frequency spectral distribution (search method "Peaks").
Determining the level maxima irrespective of their distribution in the frequency spectrum is suitable for measurement regulations that demand determination of the relatively highest level irrespective of the distribution in the measured frequency range, e.g. FCC.

If the prescan is performed in parallel with several detectors, typically Peak and Average, the maxima are determined separately for the two detectors so that the distribution of narrowband and wideband sources of interference can be taken into account.

For example, the frequency of the maximum determined with the average detector can be used for the final measurement performed with the CISPR Avg detector and the frequency found in the prescan carried out with the peak detector is taken for the final measurement using the quasipeak detector.

Consideration of the limit lines ensures that the final measurement is not performed at frequencies at which the inference level is far below the limit value. A margin below the limit line can be defined (in dB). Peak values measured in the margin area are also considered in the final measurement. The margin is valid for all limit lines. Each limit line is allocated to a trace, i.e. different limit lines are taken for the different detectors.

If no limit lines are activated, the measurement procedure is as if all measured values would exceed the limit line.

Data reduction by editing the peak list

As an alternative method, it is possible to preset a list of frequencies at which the final measurements are performed. A typical application is, for example, the statistical analysis of several units.

The peak list can be either edited manually or can be filled with desired values by adopting the marker values.

Final measurement

A final measurement is performed after data reduction, thus reducing the overall measurement time.

The final measurement analyzes only the data that still remains after the preliminary measurement stages, in other words those frequencies that have been collected in the peak list. Detectors defined for the final measurement replace those that have been used during preliminary measurements.

Because the peak list contains a manageable set of frequencies only, the final measurement is also usable in combination with a configuration that requires long measurement times. It is then still possible to perform the measurement in a reasonable time frame.

During the final measurement, the R&S EPL performs a measurement on each frequency in the peak list. When done, it updates the preliminary results in the peak list with those found during the final measurement.

Automatic vs interactive final measurements

The R&S EPL provides two methods to perform a final measurement: an automatic and interactive final measurement.

An automatic final measurement measures all frequencies in the peak list automatically. The measurement can be interrupted or aborted, or the measurement mode can be switched to interactive. Measurement settings can not be changed. The advantage is that the measurement runs on its own.

Control of the final measurement is possible in interactive final measurement mode.

In interactive final measurement mode, the R&S EPL stops on each frequency of the peak list. If required, the frequency can be fine tuned, e.g. if the interferer has shifted. For fine tuning, the bargraph display can be used to find the new peak value. The level measurement is performed only after initialization by the user.

It is possible to start with an automatic measurement and later change into interactive mode. Likewise, it is possible to start measuring in interactive mode and later change into automatic mode.

IF analysis

The IF spectrum analysis is a very comfortable means for exact frequency tuning of the receiver and for identification of signals and of their bandwidth.

In IF spectrum analysis, the spectrum of the RF input signal is displayed in the vicinity of the receiver frequency. The center frequency of the displayed spectrum is always the current receiver frequency.

The IF analysis provides a fast overview of the assignment of the spectrum adjacent to the measuring channel proper, or, with a large resolution bandwidth, the spectral distribution of a modulated signal in the channel. Interference of the received useful signal can also be detected quickly, whether it is CW interference appearing as unmodulated carrier or pulse-like interference which is represented in the form of narrow horizontal lines on the screen.

The accuracy of the frequency axis corresponds to the reference used (internal or external).

In contrast to normal spectrum analyzer operation, the measured values are determined using FFT from samples recorded from the A/D-converter. Thus the receiver stays tuned to the center frequency. It may continue to measure with the selected measurement time and display the signal level with the bargraph.

(For example, the quasipeak level measured with one second measurement time may be displayed in the upper half of the display while in the lower half the spectrum may be refreshed every few milliseconds.)

The measurement time of the bargraph may be longer than the measurement time of the IF analysis. If the measurement time of the bargraph is set to a smaller value than the measurement time of the IF analysis, the bargraph will as often be refreshed as the display of the IF analysis.

The level display of the IF analysis is unweighted. It is independent of the selected detector for the bargraph measurement, e.g. average or quasi peak. A maximum of

three traces can be displayed in parallel. The display mode "Clear / Write", "Max Hold", "Min Hold", "Average", "View" or "Blank" may be selected independent for each trace.



The displayed level values do have the full accuracy of the instrument only at the center frequency. At all other frequencies, the level is typically lower due to the frequency response of the IF filter and the preselector.

IF Analysis always applies resolution filters with a 6 dB bandwidth, while filters with a 3 dB bandwidth are not supported.

9.3.2 Selecting a test sequence

Access: "Overview" > "Test Automation" > "Overview"

The first tab of the "Test Automation" dialog box ("Overview") represents the measurement stages in an interactive diagram. You can add or remove certain stages from the measurement as required: you can, for example, configure a measurement that consists of a scan and a peak search, but no final measurement.

Possible combinations are:

- Perform a scan only.
- Perform a scan with a subsequent peak search and creation of the peak list.
(Remote command: `CALCulate<n>:PEAKsearch:AUTO` on page 416)
- Perform a scan with a subsequent peak search and a final measurement including the creation of a final peak list.
(Remote command: `CALCulate<n>:FMEasurement[:AUTO]` on page 424)

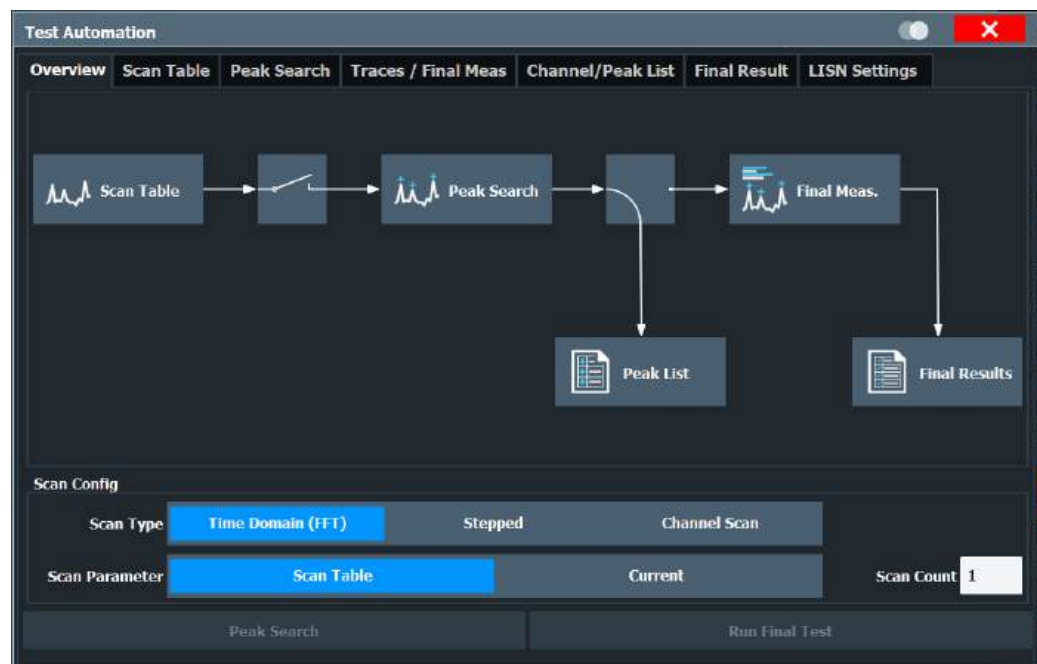


Figure 9-6: Overview of the test automation process

For more information on the individual measurement stages, see:

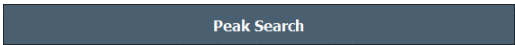
- **Scan**
["Scan"](#) on page 95
[Section 9.3.3, "Performing a scan"](#), on page 103
- **Peak search**
["Peak search"](#) on page 97
[Section 9.3.4, "Performing a peak search"](#), on page 111
- **Final measurement**
["Final measurement"](#) on page 98
[Section 9.3.5, "Performing final measurements"](#), on page 118

Starting a complete automated test sequence

- ▶ Press the [RUN SINGLE] key.
 The R&S EPL starts the test sequence. It stops the test sequence at the point that you have defined (either after the scan, the peak search or the final measurement).
Note: If you start the test sequence with the [RUN CONT] key, the R&S EPL starts a continuous scan. The test sequence is resumed only when you stop the scan deliberately.

Starting an independent peak search

- ▶ Press the "Peak Search" button.

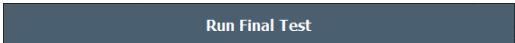


The R&S EPL starts a peak search on the current trace(s) of the scan diagram. When it is done, it opens the peak list.

If you have not yet performed a scan, the peak search button is unavailable.

Starting an independent final measurement

- ▶ Press the "Run Final Test" button.



The R&S EPL starts a final measurement based on the contents of the peak list. When it is done, it opens the final peak list.

If you have not yet performed a scan and peak search, the final measurement button is unavailable.

Selecting the scan type	101
Scan Count	102
Scan Parameter	103

Selecting the scan type

The R&S EPL provides several scan types. Depending on the selected scan type, the R&S EPL applies different methods to evaluate the applied signal.

The following scan types are supported.

- **Time Domain (FFT)**

Simultaneous measurements based on FFT operations on all individual frequencies in the frequency range you have defined. The frequency step size is variable because it depends on the selected measurement bandwidth.

(→ "Scan Type" > "TDomain")

- **Stepped**

Subsequent measurements on each individual frequency defined by the [frequency range](#) and the [frequency step size](#).

(→ "Scan Type" > "Stepped")

- **Channel Scan**

Measurement that allows you to scan automatically a set of predefined channels or frequencies from the [Peak/Channel List](#) to detect and measure signals.

(→ "Scan Type" > "Channel Scan")

Prerequisite: Set at least one [limit line](#).

The channel scan measures all frequencies defined in the "Peak/Channel List" one after the other until a limit line violation is detected. After a limit violation, the scan is interrupted and measurement continues on this frequency.

In automatic measurement, the scan is automatically resumed when the level falls below the limit value. In interactive measurement, the scan must be manually resumed (with "Next Frequency" softkey or `INITiate<mt>[:IMMEDIATE]` on page 395).

Violations are only considered if a limit line is assigned to each entry in the channel/peak list, corresponding to the respective trace numbers. In other words, if frequencies with trace 1 are listed in the channel list, the scan will only be stopped if a level violation occurs on a limit line that is also assigned to trace 1.

The receiver parameters will be taken from the scan table depending on the frequency if mode "Scan Table" is selected. In case of "Current", the currently adjusted receiver parameters are used for measurement.

If the [Peak/Channel List](#) is empty at the start of the channel scan, the error message "Empty Channel List" occurs in the status line.

Info: If "Channel Scan" is active, the peak list is automatically saved and remains for the next session.

Remote command:

`[SENSe:] FREQuency:MODE` on page 406

Scan Count

Defines the number of scans to be performed in a single measurement. The displayed trace represents an average over the scan count.

When you measure continuously, the R&S EPL calculates a moving average over the scan count.

The scan count is always the same as the "Bargraph Count" (and vice versa). The "Bargraph Count" defines the number of bargraph measurements performed in a single sweep.

Note that a scan count = 0 is not possible. The same applies to the bargraph count.

Remote command:

`[SENSe:] SWEep:COUNT` on page 413

Scan Parameter

Turns the scan table on and off.

"Scan Table" The R&S EPL performs scans based on the configuration defined in the scan table.

"Current" The R&S EPL performs scans on the general receiver configuration. The scan table becomes unavailable.

Remote command:
not supported

9.3.3 Performing a scan

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9.3.3.1 Designing a scan table

The scan table is a tool that reduces the effort of performing a scan. It divides a given frequency range into smaller portions.

In that way you are able to:

- keep the measurement times as low as possible by creating several frequency ranges and configuring each one most effectively
- configure some frequency ranges differently than others if the test scenario requires so and still run one measurement only
- skip parts of the spectrum that are of no interest for the measurement.

If you do not use the scan table ([Current](#) parameters), the R&S EPL uses the current instrument settings for the scan.

You can define up to 100 scan subranges within the complete scan range. The size of each subrange is arbitrary, depending on the measurement requirements. Just make sure that the ranges are within the overall scan range defined by the general start and stop frequencies. If the scan table defines a frequency range greater than the scan range, frequencies outside the scan range are not considered in the measurement.

To avoid situations like this, you can align the start and stop frequency of the scan to the frequency range defined by the scan ranges (see ["Adjusting the frequency axis"](#) on page 106).

Example:

In the picture below, the frequency range highlighted in red is covered by the scan table, but not by the overall scan range. Thus, it would not be considered in the scan.

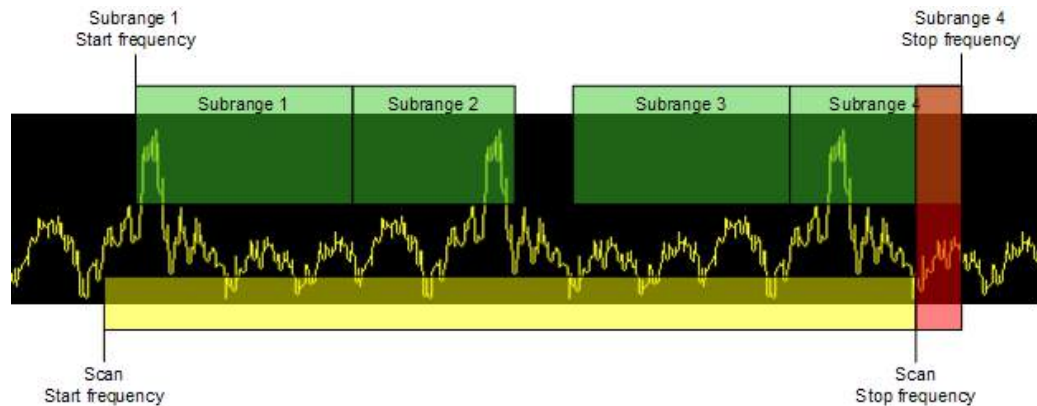


Figure 9-7: Scan range vs subranges of a scan

There may be gaps between the stop frequency of one range and the start frequency of the next, for example if parts of the spectrum are not necessary to be tested. Gaps between ranges are not considered in the scan.

9.3.3.2 Interrupting a scan

Access: [RUN SGL] / [RUN CONT] > "Hold Scan"

The R&S EPL allows you to hold a scan any time with the "Hold Scan" feature. If you hold it, the scan is interrupted immediately. When held, you can change settings that have a direct effect on the scan, for example the frequency.

When you are finished changing the configuration, you have several options on how to proceed.

- Continue at the receiver frequency
Resumes the scan at the receiver frequency the R&S EPL is currently tuned to. This is any frequency that is equal to or smaller than the hold frequency. If you do not change the frequency, resuming the scan at the receiver frequency is the same as resuming the scan at the hold frequency.
- Continue at the hold frequency
Resumes the scan at the frequency it has been interrupted at. For example, when you interrupt the scan at 20 MHz, the scan would continue at that frequency.
- Stop the scan
Aborts the scan altogether.



Changing channels while a scan is running

When you change the measurement channel while a scan is running (for example switch to a spectrum channel), the R&S EPL holds the scan. When you change back to the receiver channel in which the scan is running, you can resume the scan from the hold frequency.

9.3.3.3 Configuring the scan table

Access: "Overview" > "Test Automation" > "Scan Table"

By default, the scan table already contains one scan range with a typical configuration for these frequency ranges.

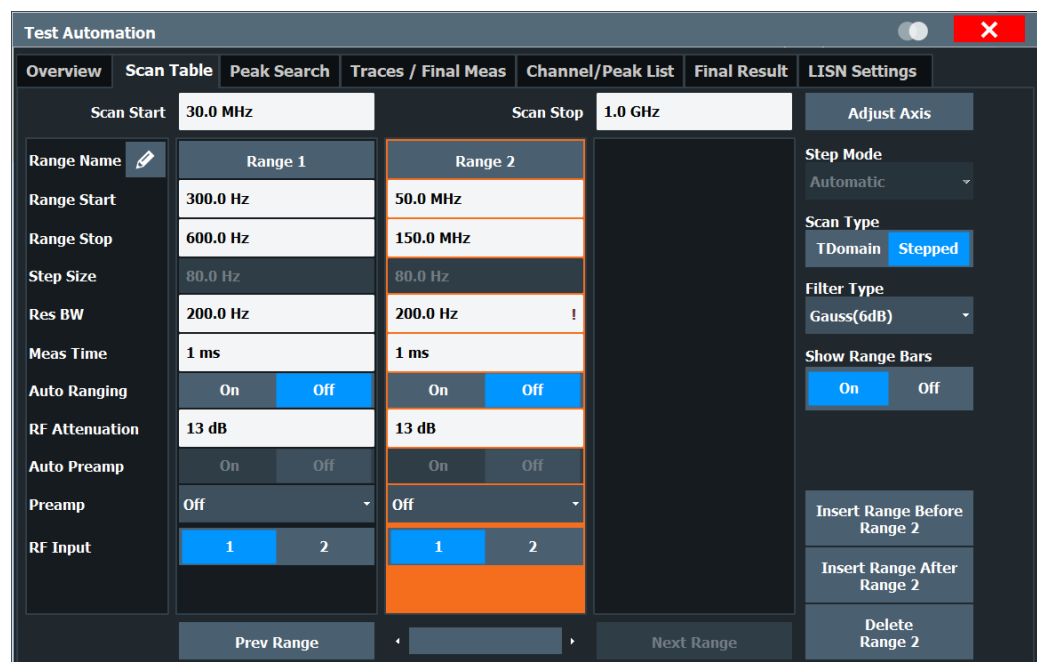


Figure 9-8: Overview of the "Scan Table"

The remote commands required to design a scan table are described in [Section 15.5.6, "Scan table configuration"](#), on page 407.

Functions in the "Scan Table" dialog box described elsewhere:

- [Scan Type](#)
- [Filter Type](#)

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Adding and removing scan ranges

The scan table splits the frequency range into several smaller scan ranges.

By default, there is already a predefined scan range (labeled "Range 1"). If necessary, you can add additional scan ranges or delete scan ranges that you no longer need.

You have the following options when you design the scan table.

- Add a new range to the left of the currently selected range (→ "Insert Range Before Range <x>" button).
- Add a new range to the right of the currently selected range (→ "Insert Range After Range <x>" button).
- Delete the currently selected range (→ "Delete Range <x>" button).
(The selected range is the range that is highlighted in orange. To select a range, select the "Range x" button at the top of each column, or navigate through the ranges with the "Prev Range" or "Next Range" buttons.)

Remote command:

Number of ranges: `[SENSe:]SCAN<sr>:RANGes[:COUNT]` on page 411

Tip: Selecting a range via SCPI is done with the suffix at `SCAN<range>`.

Delete a range: not supported by remote control

Defining a frequency range for the scan

The start and stop frequencies ("Scan Start" and "Scan Stop") define the global frequency range considered during a scan.

The minimum and maximum frequencies supported by the R&S EPL depend on the instrument model and are defined in the datasheet.

Note: Make sure that all scan ranges are within the global frequency range. Frequencies outside the global frequency range will not be considered in the measurement.

Remote command:

Start frequency: `[SENSe:]FREQuency:STARt` on page 408

Stop frequency: `[SENSe:]FREQuency:STOP` on page 408

Adjusting the frequency axis

When you design a scan table, the frequency range of the scan ranges may not be the same as the global frequency range you have defined for the scan.

The "Adjust Axis" button adjusts the global frequency range to the frequency range covered by the scan ranges.

Example: the global frequency range defines a range from 150 kHz to 500 MHz, while the scan ranges define a range from 150 kHz to 1 GHz. When you adjust the frequency, the R&S EPL automatically expands the global frequency range to 1 GHz.

On the other hand, when the global frequency range is larger than the scan ranges, adjusting the frequency contracts the global frequency range.

This feature is useful when the global frequency range is smaller than the scan ranges, because frequencies outside the global range are not considered in a scan based on a scan table.

Remote command:
not supported

Selecting the frequency step mode

The frequency step mode defines the way the measurement frequencies are selected within a scan range.

Note that the frequency stepsize for time domain scans is always selected automatically.

"AUTO" Linear frequency steps: the [Step Size](#) is coupled to the current resolution bandwidth and is about a third of the resolution bandwidth. In this way, the probability to detect all signals in the scan range is very high.

"Manual" Linear frequency steps: the [Step Size](#) is a fix value in Hz.

Remote command:
[\[SENSe:\] SWEep:SPACing](#) on page 414

Displaying range bars

The range bar is a green bar displayed at the bottom of the scan diagram. You can turn it on or off as you like with the "Show Range Bars" toggle button.

The range bar carries various useful information.

- The shade of green shows the measurement progress.
 - Dark green
Indicates that the scan of the corresponding scan range is done.
 - Light green
Indicates that the scan of the corresponding scan range is currently in progress.
If you interrupt the scan, the bar remains light green. The bar of the last scan range also remains light green when the scan is done completely.
- The bar contains the names of the corresponding scan ranges as defined in the scan table (for example "Range 1", "Range 2", etc.).

Remote command:
[\[SENSe:\] SCAN<sr>:BARS](#) on page 409

Configuring scan ranges

The main part of the scan table contains the configuration for each scan range. Each column of the table represents one scan range (labeled "Range 1", "Range 2", etc. by default).

You can change the labels of the scan ranges and assign a custom name to each range. When you select the pencil icon () , you can edit the range labels. To stop editing, select the pencil icon again.

For each scan range, you can customize the following parameters.

- ["Range Start and Range Stop"](#) on page 108
- ["Step Size"](#) on page 108
- ["Measurement Bandwidth"](#) on page 90

- "Measurement Time" on page 89
- "Auto Range" on page 109
- "Attenuation" on page 110
- "Preamplifier" on page 110
- "Input Selection" on page 110

Remote command:

[SENSe:] SCAN<sr>:NAME on page 411

Range Start and Range Stop ← Configuring scan ranges

Defines the frequency range of the selected scan range.

To avoid overlapping scan ranges, the start and stop frequencies of the next and previous ranges are adjusted if necessary.

Tip: Make sure that the start and stop frequencies of the scan ranges are within the [global frequency range](#).

Remote command:

Start frequency: [SENSe:] SCAN<sr>:START on page 412

Stop frequency: [SENSe:] SCAN<sr>:STOP on page 412

Step Size ← Configuring scan ranges

Defines the frequency step size of the selected scan range that is applied during a scan.

In case of a stepped scan, the value depends on the selected [step mode](#).

- When you have selected the automatic step mode, the step size is determined automatically. It is not possible to change the step size manually (however, it is displayed in the corresponding table cell as a read-only value).
- When you have selected manual step mode, the step size is a value in Hz (a measurement performed every x Hz).

Example: a step size of 4 kHz and a start frequency of 100 kHz does a measurement at 100 kHz, 104 kHz, 108 kHz etc.

For a time domain scan, the step size depends on the measurement bandwidth. It is displayed in the "Step Size" table cell as a read-only value.

Remote command:

[SENSe:] SCAN<sr>:STEP on page 412

Measurement Bandwidth ← Configuring scan ranges

Defines the measurement bandwidth (or resolution bandwidth) used for the measurement.

You can define a different bandwidth for the bargraph and each scan range defined in the scan table. The R&S EPL displays an exclamation mark if the selected measurement bandwidth is not compatible to the bandwidth required by CISPR for the corresponding frequency range.

If you perform a scan that is not based on a scan table, the bandwidth for the scan is the same as for the bargraph.

The final measurement uses the bandwidths defined in the scan table, or, if the scan is not based on a scan table ([Current](#) parameters), the bandwidth of the bargraph.

The R&S EPL supports a selected set of resolution bandwidths. If you enter a number that is not supported, the R&S EPL rounds the value up to next available bandwidth.

[More information](#)

Remote command:

Bargraph: `[SENSe:]BANDwidth[:RESolution][:VALue]` on page 461

Scan table: `[SENSe:]SCAN<sr>:BANDwidth:RESolution` on page 409

Measurement Time ← Configuring scan ranges

Defines the measurement time used to analyze the signal.

You can define a different measurement time for the bargraph, each scan range defined in the scan table and the final measurement. If you perform a scan that is not based on a scan table ([Current](#) parameters), the measurement time for the scan is the same as for the bargraph.

Tip: Make sure to select a measurement time that is appropriate for the analyzed signal and that allows the various filters and detectors in the signal path to settle.

Note that the measurement time for IF analysis is calculated automatically based on the measurement time of the bargraph.

Remote command:

Bargraph: `[SENSe:]SWEep:TIME` on page 406

Scan table: `[SENSe:]SCAN<sr>:TIME` on page 413

Final measurement: `[SENSe:]FMEasurement:TIME` on page 425

Auto Range ← Configuring scan ranges

Turns automatic configuration of the attenuation and gain on and off.

When you turn on auto ranging ("State"), the R&S EPL automatically selects an attenuation (and gain, if auto mode for the preamplifier is on) that allows for an ideal analysis of the received signal (without overloading the RF input).

Depending on your measurement task, select one of the following **auto range modes** ("Overview" > "Amplitude" > "Auto Range Mode").

- **Normal**

The "Normal" mode selects an attenuation and gain that results in a good signal-to-noise ratio.

Thus, it reduces the display of spurious products. It also leads to an increased display of the inherent noise (because of a higher attenuation).

- **Low noise**

The "Low Noise" mode selects an attenuation and gain that increases the sensitivity of the R&S EPL.

This mode gives a better impression of spurious products and is thus useful to analyze signals whose level is near the noise level. However, the signal-to-noise ratio in general can deteriorate.

Both auto range modes are designed to maintain the best dynamic range possible.

The auto ranging feature in the receiver remains active even if you change the attenuation and preamplifier properties in other measurement channels and then return to the receiver application.

Notice: For more information, see [Section 10.6.1, "Increasing measurement sensitivity \(or avoiding an input mixer overload\)"](#), on page 158.

Remote command:

General: `INPut:ATTenuation:AUTO` on page 458

Scan range: `[SENSe:]SCAN<sr>:INPut:ATTenuation:AUTO` on page 409

Auto range mode: `INPut:ATTenuation:AMODE` on page 458

Attenuation ← Configuring scan ranges

Defines the attenuation of the signal.

You can attenuate the signal in 1 dB steps. The range is specified in the datasheet.

Attenuation of less than 10 dB is only possible if you turn off [10 dB Minimum Attenuation](#).

For more information, see [Section 10.6.1.2, "Using the preamplifier"](#), on page 160.

Notice: For more information, see [Section 10.6.1, "Increasing measurement sensitivity \(or avoiding an input mixer overload\)"](#), on page 158.

The auto ranging feature in the receiver remains active even if you change the attenuation and preamplifier properties in other measurement channels and then return to the receiver application.

The R&S EPL also allows you to determine the best attenuation automatically.

- In the receiver application, turn on the "Auto Ranging" feature.
- In the other applications, select attenuation "Mode" → "Auto"

Remote command:

Global: `INPut:ATTenuation[:VALue]` on page 458

Scan range: `[SENSe:]SCAN<sr>:INPut:ATTenuation[:VALue]` on page 410

Attenuation mode: `INPut:ATTenuation:AUTO` on page 458

Preamplifier ← Configuring scan ranges

Configures the preamplifier.

The preamplifier amplifies the signal by 20 dB.

For more information, see [Section 10.6.1, "Increasing measurement sensitivity \(or avoiding an input mixer overload\)"](#), on page 158.

Remote command:

State (global): `INPut:GAIN:STATe` on page 459

State (scan range): `[SENSe:]SCAN<sr>:INPut:GAIN:STATe` on page 410

Mode (global): `INPut:GAIN:AUTO` on page 459

Mode (scan range): `[SENSe:]SCAN<sr>:INPut:GAIN:AUTO` on page 410

Input Selection ← Configuring scan ranges

Selects the RF input connector that is used for the scan.

Note that you cannot use both RF inputs simultaneously.

Remote command:

Global: `INPut:TYPE` on page 439

Scan range: `[SENSe:]SCAN<sr>:INPut:TYPE` on page 414

9.3.4 Performing a peak search

A peak search is meant to find signal peaks in the spectrum that you are analyzing. The results of the peak search are written into a peak list, which in turn is the basis for a final measurement.

This approach reduces the efforts required for the final measurement in that you have to test only a few selected frequencies that probably carry interfering signals.

Defining peak characteristics (or "When is a peak a peak?")

If a signal is, for example, very flat, contains a lot of noise or does not contain many peaks, the R&S EPL might miss potential peaks or detect peaks that really are no peaks.

To avoid such situations, you can define what a peak is according to the following criteria.

- **Peak excursion**
The peak excursion is a relative threshold. The signal level must increase by the threshold value before falling again before a peak is detected. To avoid identifying noise peaks instead of a real signal peak, enter a peak excursion that is higher than the difference between the highest and the lowest value measured for the displayed inherent noise.
- **Limit lines** (not mandatory)
The signal level must be above the limit line (= fail the limit check) to be considered as a peak.
- **Limit margin** (only if a limit line is active)
The level margin defines the distance relative to a limit line that a signal may at most have so that it will be identified as a peak.

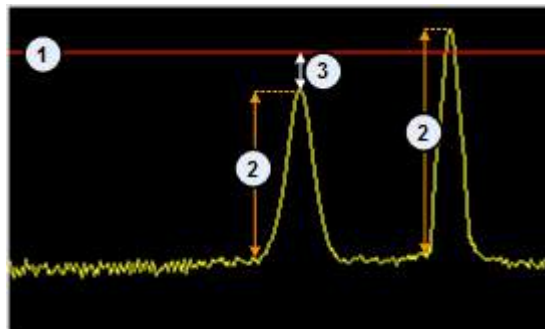


Figure 9-9: Peak definition

- 1 = Limit line
- 2 = Peak excursion
- 3 = Limit margin

Thus, a potential peak is written into the peak list under the following conditions.

Measurements without limit lines:

- If a signal meets the condition defined by the peak excursion.

Measurements with limit lines:

- If a signal level fails a limit check and meets the condition defined by the peak excursion.
- If a signal level passes a limit check, but is within the limit margin ("x dB below the limit"), and still meets the peak excursion.

In the diagram, the peaks are labeled with a colored symbol. Color and type of symbol depend on the trace the peak is on.

Selecting the search method (or "How the search is performed?")

The automatic peak search that is part of automated tests is an easy way to find peaks: the R&S EPL searches for peaks after the scan is done based on the conditions you have defined for the peak search (peak excursion and limit margin). It then writes the peaks into the peak list.

Alternatively, the R&S EPL allows you to edit peak lists and manually add or delete frequencies. To create a peak list manually, you can, for example, use markers to search for peaks, or, if you already know where peaks occur, add each frequency individually.

Controlling the size of the peak list

The size of the peak list is variable. The peak list can contain up to 500 entries (= frequencies). By default, the peak search adds peaks until the maximum size of the peak list has been reached and regardless of the distribution of the peaks. If there are more peaks than the size of the peak list allows for, the R&S EPL removes the frequencies with the smallest signal levels. If there are fewer peaks than the list allows for, the size of the list is reduced accordingly.

The R&S EPL also provides the possibility to split the spectrum into several equidistant subranges and look for a defined number of peaks in each subrange with the result that peak list entries are distributed equally over the measurement range.

- [Configuring a peak search](#)..... 112
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- [Modifying a peak list \(alternate method\)](#)..... 117

9.3.4.1 Configuring a peak search

Access: "Overview" > "Test Automation" > "Peak Search"

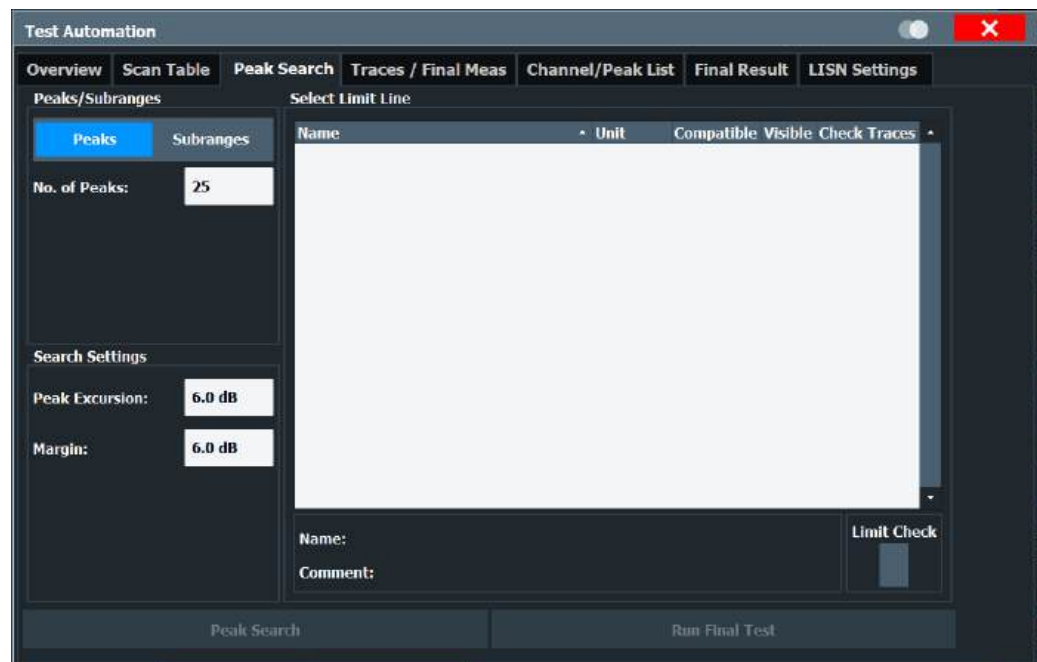


Figure 9-10: Overview of the "Peak Search" configuration

The remote commands required to configure the peak search are described in [Section 15.5.7, "Peak search"](#), on page 414.

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Selecting the peak search method

Selects the peak search mode.

More information.

"Peaks"	Looks for a particular number of peaks over the complete scan range.
"Subranges"	Divides the scan range into smaller, equidistant subranges and looks for a particular number of peaks in each subrange.

Remote command:

`CALCulate<n>:PEAKsearch:METHod` on page 417

Controlling the size of the peak list

Defines the number of peaks that are transferred to the peak list.

The contents of the peak list depend on the selected [search mode](#).

- **"Peaks"**
When you have selected the "Peaks" search mode, define the **number of peaks** the R&S EPL looks for during a peak search.
The range is from 1 to 500 peaks.
- **"Subranges"**

When you have selected the "Subranges" search mode, define the **number of subranges** you want to split the frequency range into, and the **number of peaks** the R&S EPL looks for in each subrange.

You can define up to 50 subranges, with each subrange containing a maximum number of 10 peaks. All subranges span the same frequency range.

Remote command:

Number of peaks: `CALCulate<n>:PEAKsearch:SUBRanges[:VALue]`

on page 418

Number of subranges: `CALCulate<n>:PEAKsearch:SUBRanges[:VALue]`

on page 418

Peaks per subrange: `CALCulate<n>:PEAKsearch:SUBRanges:PCount`

on page 417

Defining peak characteristics

Defines the characteristics of a signal that identify it as a peak.

The **peak excursion** defines the minimum level by which a signal must rise or fall so that it will be identified as a maximum or a minimum during the peak search.

The **margin** defines the distance relative to a limit line that a signal may at most have so that it will be identified as a peak.

(Note: a limit line margin defined for the limit line itself (see [Margin](#)) is ignored for a peak search.)

For more information, see ["Defining peak characteristics \(or "When is a peak a peak?"\)"](#) on page 111.

Remote command:

Peak excursion: `CALCulate<n>:MARKer<m>:PEXCursion` on page 415

Margin: `CALCulate<n>:PEAKsearch:MARGIN` on page 417

Selecting a limit line

Selects one or more limit lines to evaluate for a peak search.

The table shows all limit lines available on the R&S EPL that are compatible to the current measurement configuration. You can activate the limit line by marking the corresponding checkbox and assigning the limit line to a trace.

For more information on designing, editing and managing limit lines in general, see [Section 11.5, "Display and limit lines"](#), on page 230.

For more information on the effects of a limit line on the peak search, see ["Defining peak characteristics \(or "When is a peak a peak?"\)"](#) on page 111.

Remote command:

See [Section 15.7.5.2, "Limit lines"](#), on page 518.

Enabling and disabling limit checks

Turns limit checks for pre-measurement on and off.

By disabling limit checks, FAIL messages for limit line violations during premeasurements will no longer be displayed.

9.3.4.2 Modifying a peak list

Access: "Overview" > "Test Automation" > "Peak List"

The peak list contains the frequencies on which the peak search has identified peaks. It can be used as the basis of the final measurement.



Modifying a peak list (alternate way)

The R&S EPL also provides an alternate way to modify a peak list.

[More information.](#)

Overview	Scan Table	Peak Search	Traces / Final Meas	Peak List	Final Result	LISN Settings
Trace1: ANOTHER ONE						
Trace/Detector	Frequency	Level	DeltaLimit	Comment		
1 Max Peak	1.2750 MHz	84.21 dBµV	83.21 dB		X	
1 Max Peak	3.5250 MHz	84.21 dBµV	83.21 dB		X	
1 Max Peak	5.7750 MHz	84.21 dBµV	83.21 dB		X	
1 Max Peak	8.0250 MHz	84.21 dBµV	83.21 dB		X	
1 Max Peak	10.2750 MHz	84.21 dBµV	83.22 dB		X	
1 Max Peak	12.5250 MHz	84.21 dBµV	83.34 dB		X	
1 Max Peak	14.7750 MHz	84.21 dBµV	83.45 dB		X	
1 Max Peak	17.0250 MHz	84.21 dBµV	83.56 dB		X	
1 Max Peak	19.2750 MHz	84.21 dBµV	83.67 dB		X	
1 Max Peak	21.5250 MHz	84.21 dBµV	83.79 dB		X	
1 Max Peak	23.7750 MHz	84.21 dBµV	83.90 dB		X	
1 Max Peak	26.0250 MHz	84.21 dBµV	84.01 dB		X	

Frequency: 150.0 kHz

Insert

Delete Peak Entry

Clear All Entries

Sorting: Frequency Delta Limit

Export: Decim Sep . , Peak List Export

Symbols: Symbols On Off

Figure 9-11: Overview of the peak list

Reading the peak list

The table at the top of the dialog contains information when you measure with limit lines. Each cell of the table represents a trace and shows the limit lines that are assigned to that trace. In the screenshot above, for example, the limit line named "Another One" is active and assigned to Trace 1.

The main table shows the following information for each peak in the peak list. The size of the table depends on the number of peaks that have been found.

- **Trace / Detector**
Shows the number of the trace and the detector used for that trace.
- **Frequency**
Shows the frequency where the peak was found.
- **Level**
Shows the absolute level value of the peak. The unit depends on the unit you have selected.

- **Delta Limit**
Shows the distance of the peak to the nearest limit line that has been assigned to the corresponding trace. The distance is a value in dB. Available if you are using limit lines.
- **Comment**
Allows you to add a comment to each peak as required (only possible after a peak search has been done).
- 
Deletes the corresponding row from the peak list.

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↳ Adding the current frequency to the peak list.....	116
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Displaying peaks as symbols.....	117

Editing a peak list

The R&S EPL allows you to edit a peak list that has been created, or even create a peak list that is not based on an automatic peak search.

- **Add a new frequency**
To add a new peak to the peak list, enter a **frequency** in the corresponding field and add it to the list with the "Insert" button.
Tip: Alternatively, you can add the current receiver frequency including the measured level with the [Add to Peak List](#) softkey.
The new frequency is added to the list regardless if the level threshold conditions have been fulfilled for that frequency.
Note that the frequency has to be in the displayed frequency range.
- **Delete a frequency**
To remove a peak from the peak list, select the corresponding peak list row and delete it with the "Delete Peak Entry" button.
Alternatively, use the  button in the peak list itself.
You can also delete the complete peak list with the "Clear All Entries" button.

Remote command:

Add frequency: [CALCulate<n>:PEAKsearch:ADD](#) on page 415

Clear list: [CALCulate<n>:PEAKsearch:CLEar\[:IMMediate\]](#) on page 416

Adding the current frequency to the peak list ← Editing a peak list

The receiver application allows you to add the current receiver frequency manually to the peak list.

Use one of the following ways to add a frequency to the peak list.

- Use the "Add to Peak List" softkey available in the "Meas Config" softkey menu, to add the values for all active detectors of the current bargraph measurement.
- Use the "Add to Peak List" softkey available in the "Mkr →" softkey menu, to add the values of the selected marker.
- Use the "Insert" button available in the "Peak List" result display, to add a certain frequency for all active traces.

Remote command:

[CALCulate<n>:PEAKsearch:ADD](#) on page 415

Sorting the peak list

By default, the R&S EPL sorts the peaks by their "Frequency" in ascending order.

Alternatively, you can sort the peak list by the distance of a peak to the limit line (→ "Delta Limit"). This is also done in ascending order.

Sorting by the delta limit is available when a limit line is active and evaluated.

Remote command:
not supported

Exporting a peak list

The peak list can be exported to a file with the "Peak List Export" button.

This button opens a dialog box to export and save the contents of the peak list in ASCII format to a `.dat` file.

The file consists of a header and the results of the scan or the final measurement.

- The header is a list of general instrument settings and characteristics. It consists of three columns, each column separated by a semicolon: `<parameter>;<value>;<unit>`.
- The results are split into several data sections, one for each active trace. The data section begins with the entry `Trace <x> [Final] :`, followed by the trace characteristics and the peak list data itself.

For more information on exporting data, see [Section 11.3.9.1, "Reference: ASCII file export format"](#), on page 214.

By default, decimal places are separated by a point in the exported list. If necessary, you can use a comma instead of a point as the decimal separator.

Remote command:

Peak list of the scan: `MMEMory:STORe:PLISt` on page 419

Peak list of the final measurement: `MMEMory:STORe:FINAl` on page 419

Decimal separator: `FORMat:DEXPort:DSEParator` on page 537

Displaying peaks as symbols

Turns the labels on the peak position in the diagram on and off.

The peak labels have a different color and shape depending on the trace they are on. Trace 1, for example, has red crosses as the peak label. By default they are on.

Remote command:

`DISPlay[:WINDow<n>]:TRACe<t>:SYMBol` on page 418

9.3.4.3 Modifying a peak list (alternate method)

Access:  > "Peak List"

In addition to the method described in [Section 9.3.4.2, "Modifying a peak list"](#), on page 115, the Receiver application provides another approach to modify and edit a peak list.

3 Peak List					
Trace	Detector	Frequency	Level	Alimit	Comment
---	Min Peak	255.0 Hz	40.01 dBµV	---	
---	Average	255.0 Hz	53.07 dBµV	---	
---	RMS	255.0 Hz	50.89 dBµV	---	
---	Max Peak	255.0 Hz	60.01 dBµV	---	
---	Min Peak	255.0 Hz	40.01 dBµV	---	
---	Average	255.0 Hz	53.07 dBµV	---	
Peak Search		Add to Peak List	Symbols: On	Sort by Freq	Export Separator: .

Reading the peak list

The peak list result display basically contains the same information as the "Peak List" dialog box.

More information

Note that the "Comment" column is read-only in the peak list result display. If you would like to add a comment to a peak, you have to do it in the "Peak List" dialog box.

Modifying the contents of the peak list

When the result display is active, you can modify the peak list directly from within the result display with the corresponding buttons (only visible if the result display spans the whole screen).

- **Peak Search**
Performs a single peak search based on the current scan data.
- **Add to Peak List**
→ ["Adding the current frequency to the peak list"](#) on page 116
- **Symbols**
→ ["Displaying peaks as symbols"](#) on page 117
- **Sort by Freq** and **Sort by Delta**
→ ["Sorting the peak list"](#) on page 117
- **Export** and **Separator**
→ ["Exporting a peak list"](#) on page 117

9.3.5 Performing final measurements

During the final measurement, the R&S EPL does a measurement on each frequency in the peak list. When done, it updates the preliminary results in the peak list with those found during the final measurement. To avoid several tests with different detectors, you can use several detectors at the same time during the final measurement.

In case you are using a scan table in the test sequence, the final measurement is based on the contents of the scan table. When the scan table has been [turned off](#), the final measurement is based on the current bargraph configuration.

Automatic vs interactive final measurements

The R&S EPL provides two methods to run a final measurement: an automatic final measurement and an interactive one.

An automatic final measurement measures all frequencies in the peak list automatically with limited means of interaction. During an automatic measurement, you can still inter-

rupt ("Hold Final Meas") and resume the measurement or abort it completely ("Stop Final Meas"). But you will not be able to change the measurement configuration. The advantage is that you can let the measurement run on its own and do not have to operate the R&S EPL.

If you want to be able to control the final measurement, for example to change the configuration during the measurement, the R&S EPL also provides an interactive final measurement (which you can select even after you have started an automatic final measurement).

When you use the interactive final measurement, the R&S EPL interrupts the measurement before it measures a frequency part of the peak list. In this way, you can customize the measurement configuration for each frequency.



Availability of measurement parameters

When you interrupt the scan or the final measurement, you can change only parameters that have an immediate effect on the measurement. All other parameters (e.g. trigger settings) are unavailable.

Sequence for an interactive measurement

If you select the interactive final measurement, the R&S EPL initiates the following sequence.

1. The R&S EPL tunes to the first frequency in the peak list. The measurement configuration is as defined previously.
2. The R&S EPL positions a marker on that frequency and interrupts the measurement.
3. While the measurement is interrupted, you can change any setting that is available. In addition, you have several options on how to proceed.
 - Skip the current frequency.
Positions the marker on the next frequency in the peak list without performing a final measurement on the current frequency.
 - Get max hold result for the current frequency.
Writes the highest level that was measured for that frequency during the scan to the final peak list without performing a final measurement.
 - Stop the final measurement.
 - Perform a measurement on the current frequency.
4. When the final measurement for the current frequency is done, the R&S EPL replaces the scan result in the peak list with the result of the final measurement. If the frequency has drifted compared to the one of the scan, it also updates the frequency in the peak list.
5. The R&S EPL continues with the next frequency in the peak list, positions the marker on that frequency etc.
6. When all frequencies in the peak list are finished, the R&S EPL opens the "Final Peak List", a table that contains the results for the final measurement.



Note that it is possible to start with an automatic measurement and later change into interactive mode. Likewise, it is possible to start measuring in interactive mode and later change into automatic mode.

- [Configuring traces](#)..... 120
- [Working with the final measurement results](#)..... 122

9.3.5.1 Configuring traces

Access: "Overview" > "Test Automation" > "Trace / Final Meas"

Note that the dialog box to configure traces contains the same functions as the dialog box to configure the final measurement, but with a slightly different layout.

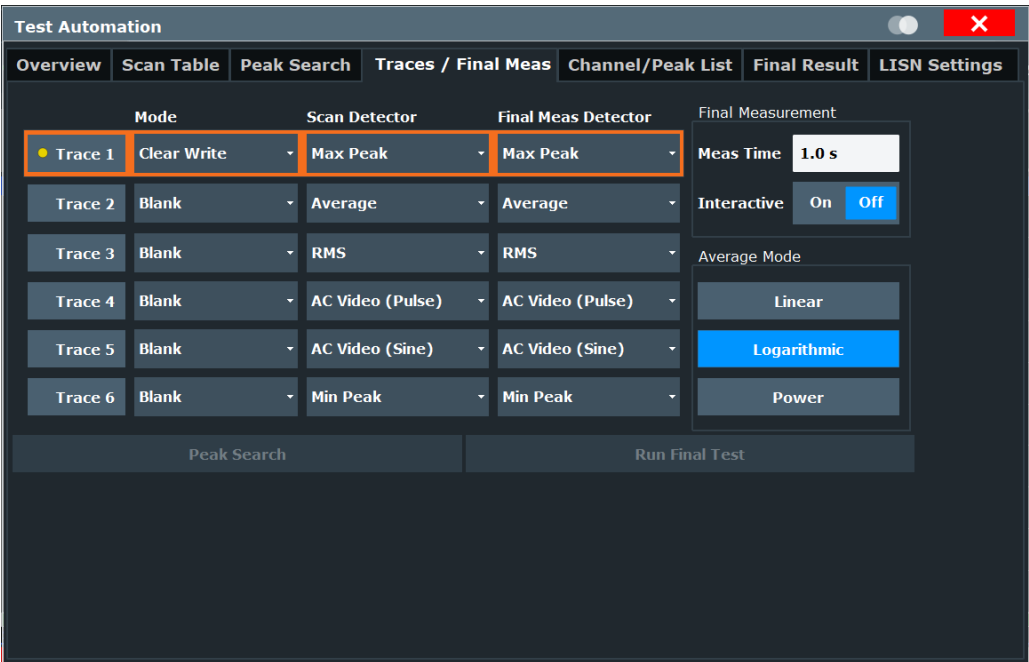


Figure 9-12: Overview of the Final Meas configuration

The remote commands required to configure the final measurement are described in [Section 15.5.9, "Final measurement \(and trace\) configuration"](#), on page 424.

Functions in the "Trace / Final Meas" dialog box described elsewhere:

- ["Measurement Time"](#) on page 89
- | | |
|------------------------------------|-----|
| Trace Mode | 120 |
| Detector | 121 |
| Interactive | 122 |
| Average Mode | 122 |

Trace Mode

Defines the update mode for subsequent traces.

For more information, see [Section 11.3.1.2, "Analyzing several traces - trace mode"](#), on page 191.

"Clear Write"	Displays the level that has been measured last at each trace point. The old trace is overwritten.
"Max Hold"	Displays and saves the highest level that has been measured over several measurements at each trace point.
"Min Hold"	Displays and saves the lowest level that has been measured over several measurements at each trace point.
"Average"	Displays and saves the average level that has been determined over several measurements at each trace point. The number of measurements depends on the Scan Count .
"View"	Freezes the contents of the trace memory and displays the corresponding trace. The trace is not updated when you start another measurement.
"Blank"	Removes the trace from the diagram.
"Transducer"	Draws a trace that shows the correction values of all active transducer factors in the currently selected frequency range. In case transducer factors overlap each other, the correction values are aggregated. Available for Trace 1 and in the receiver application only. Note: When you select the "Transducer" trace, the application temporarily removes all other traces from the diagram. You can restore the scan traces by selecting the original trace mode of trace 1 again.

Remote command:

[DISPlay\[:WINDow<n>\]:TRACe<t>:MODE](#) on page 426

View transducer: [\[SENSe:\]CORRection:TRANsducer:VIEW](#) on page 424

Detector

Selects the trace detector.

Note: In the receiver application, you can apply different detectors to the bargraph, the scan and the final measurement.

"Max Peak"	Selects the Max or Positive Peak detector.
"Min Peak"	Selects the Max or Positive Peak detector.
"RMS"	Selects the RMS detector.
"Average"	Selects the Average detector.
"Quasipeak"	Selects the Quasipeak detector.
"CISPR Average"	Selects the CISPR Average detector.
"RMS Average"	Selects the RMS Average detector.
"None"	Ignores the corresponding trace during the final measurement. Available for the final measurement.

Remote command:

Bargraph: `[SENSe:] DETector<t>:RECeiver[:FUNCTION]` on page 405

Scan: `[SENSe:] DETector<t>[:FUNCTION]` on page 407

Final measurement: `[SENSe:] DETector<t>:FMEasurement` on page 425

Interactive

Turns interactive measurements on and off.

For more information, see ["Automatic vs interactive final measurements"](#) on page 118.

Remote command:

`[SENSe:] FMEasurement:AUTO` on page 425

Average Mode

Defines the mode with which the trace is averaged over several measurements.

This setting is generally applicable if trace mode "Average" is selected.

For FFT sweeps, the setting also affects the VBW (regardless of whether the trace is averaged).

"Linear"	The power level values are converted into linear units before averaging. After the averaging, the data is converted back into its original unit.
"Logarithmic"	For logarithmic scaling, the values are averaged in dBm. For linear scaling, the behavior is the same as with linear averaging.
"Power"	Activates linear power averaging. The power level values are converted into unit Watt before averaging. After the averaging, the data is converted back into its original unit. Use this mode to average power values in Volts or Amperes correctly. In particular, for small VBW values (smaller than the RBW), use power averaging mode for correct power measurements in FFT sweep mode.

Remote command:

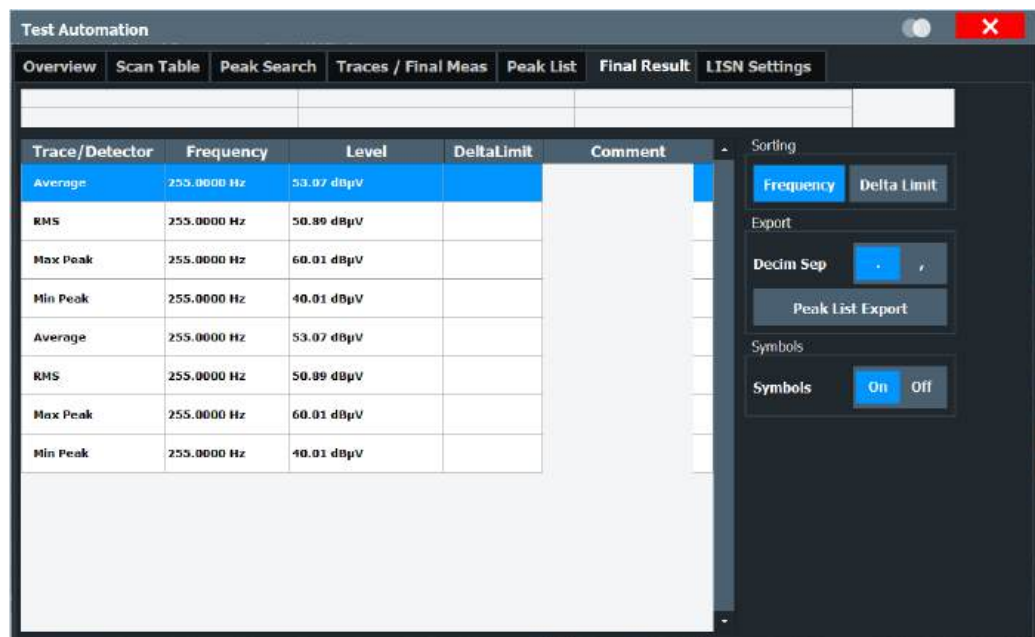
`[SENSe:] AVERage<n>:TYPE` on page 427

9.3.5.2 Working with the final measurement results

Access: "Overview" > "Test Automation" > "Final Result"

When the final measurement is done, the R&S EPL writes the results into a table that looks and feels similar to the peak list. Editing entries is, however, not possible.

The list contains all frequencies that have been measured during the final measurement.



Trace/Detector	Frequency	Level	DeltaLimit	Comment
Average	255.0000 Hz	53.07 dBµV		
RMS	255.0000 Hz	50.89 dBµV		
Max Peak	255.0000 Hz	60.01 dBµV		
Min Peak	255.0000 Hz	40.01 dBµV		
Average	255.0000 Hz	53.07 dBµV		
RMS	255.0000 Hz	50.89 dBµV		
Max Peak	255.0000 Hz	60.01 dBµV		
Min Peak	255.0000 Hz	40.01 dBµV		

Figure 9-13: Overview of the "Final Results" table

The functionality and information provided by the final results dialog box is similar to that provided by the peak list.

Functions to manage final results described elsewhere:

- ["Sorting the peak list"](#) on page 117
- ["Exporting a peak list"](#) on page 117
- ["Displaying peaks as symbols"](#) on page 117



Alternate way to modify the final results

Like the peak list, you can also modify the final results directly via the "Final Meas" result display.

[More information.](#)

- Select the "SmartGrid" icon () and start the "Final Meas" result display.

The remote commands required to manage final results are described in [Section 15.5.9, "Final measurement \(and trace\) configuration"](#), on page 424 and [Section 15.5.10, "Final results"](#), on page 428.

Reading the peak list

The table at the top of the dialog contains information when you measure with limit lines. Each cell of the table represents a trace and shows the limit lines that are assigned to that trace.

The main table shows the following information for each frequency that has been measured. The size of the table depends on the number of peaks that have been found.

- **Rows with no highlighting**

Limit check for the corresponding frequency has passed.

- **Rows in red highlighting**
Limit check for the corresponding frequency has failed. This indicates a potential interferer.
- **Rows in blue highlighting**
Indicates the currently selected row.
- **Trace / Detector**
Shows the number of the trace and the detector used for that trace.
- **Frequency**
Shows the frequency where the peak was found.
- **Level**
Shows the absolute level value of the peak. The unit depends on the unit you have selected.
The result also contains information about the phase that was measured when you are working with a LISN (L1, L2, L3, N).
- **Delta Limit**
Shows the distance of the peak to the nearest limit line that has been assigned to the corresponding trace. The distance is a value in dB. Available if you are using limit lines.
- **Comment**
Allows you to add a comment to each result as required.

9.3.6 Configuring line impedance stabilization networks (LISN)

Access: "Overview" > "Test Automation" > "LISN"

The R&S EPL supports several LISN models and provides functionality to control these devices.

For more information about using a LISN, see [Section 9.3.1.3, "Line impedance stabilization network \(LISN\) control"](#), on page 94.

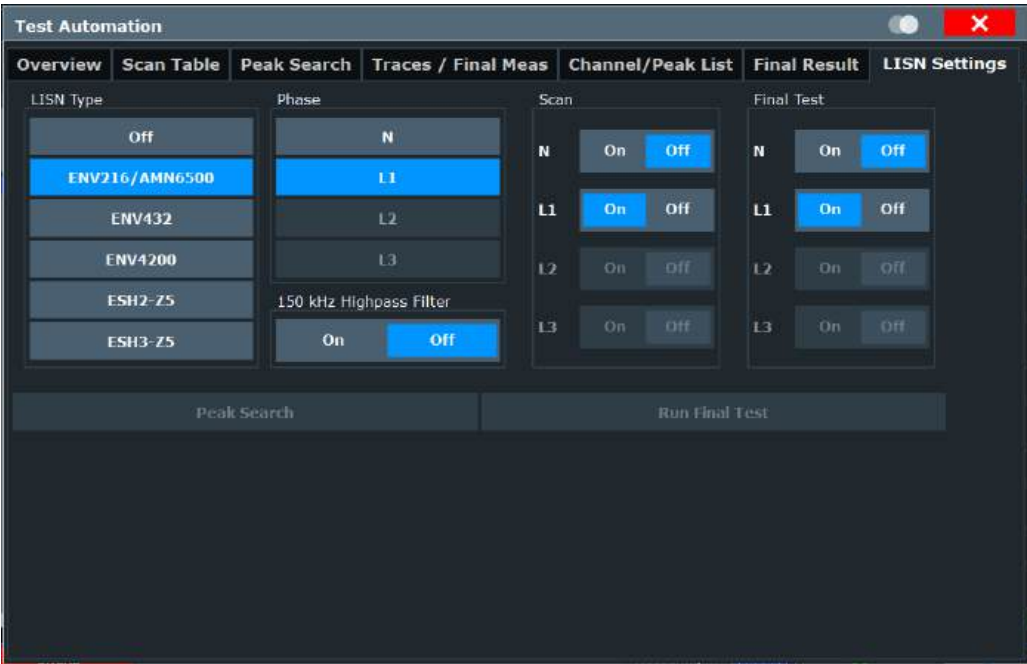


Figure 9-14: Overview of the "LISN" configuration

Note: the "Scan" and "Final Test" blocks are available in the Receiver application.

The remote commands required to configure the LISN are described in [Section 15.5.11, "LISN configuration"](#), on page 432.

LISN type	125
Phase	125
High-Pass Filter 150 kHz	126

LISN type

Selects the LISN used for the measurement.

The following LISNs are supported by the R&S EPL:

- R&S ENV216
- R&S AMN6500
- R&S ENV432
- R&S ENV4200
- R&S ESH2-Z5
- R&S ESH3-Z5

Select "Off" when you are performing measurements without a LISN.

[More information](#)

For more information about configuring and using a LISN, refer to the R&S EPL base unit user manual.

Remote command:

`INPut:LISN[:TYPE]` on page 434

Phase

Selects the LISN phase to be measured.

Phases L2 and L3 are available when you are using the R&S ENV4200, R&S 432 or R&S ESH2-Z5 (four-line networks).

In the spectrum application, the I/Q analyzer and the analog demodulator, you can measure on one phase at a time (N, L1, L2 **or** L3).

In the receiver application, phase selection works as follows.

- You can measure more than one phase in a single measurement (N, L1, L2 **and** / **or** L3).

Instead of selecting the phase in the "Phase" column of the dialog, select the phases you want to measure in the "Scan" or the "Final Test" column ("On" considers the phase in the measurement, "Off" ignores the phase in the measurement).

If you are measuring more than one phase, the R&S EPL performs a measurement for each of the selected phases.

- You can select different phase (combinations) for the scan and the final measurement.

The selection in the "Scan" and "Final Test" blocks of the dialog box override the selection in the "Phase" block of the dialog.

Example:

- Phase L1 is selected in the "Phase" block.
- Phase L1 and N are selected in the "Scan" block.
- Phase L1 is off in the "Final Test" block, but phase N is on.



→ During the scan, the R&S EPL measures both selected phases.

→ During the final measurement, the R&S EPL measures phase N, but not phase L1.

→ The phase selected in the "Phase" block is ignored for both the scan and the final measurement.

When scan and final measurement are done, the general phase (here: L1) becomes the selected phase again.

More information

Remote command:

`INPut:LISN:PHASe` on page 433

Scan: `[SENSe:]SCAN<sr>:LISN:PHASe` on page 432

Final measurement: `[SENSe:]FMEasurement:LISN:PHASe` on page 432

High-Pass Filter 150 kHz

Turns the high-pass filter on the LISN on and off.

The filter protects the receiver input from high signal levels below 150 kHz.

Available for measurements with R&S ENV216 and R&S AMN6500.

More information

Remote command:

`INPut:LISN:FILTER:HPASs[:STATe]` on page 433

9.4 CISPR APD Measurements

Access: [MODE] > "CISPR APD"



The "CISPR APD Measurements" mode is not available for the R&S EPL 30 MHz model.

The Amplitude Probability Distribution (APD) is a statistical measurement that shows the "cumulative distribution of the probability of time that the amplitude of disturbance exceeds a specified level" (CISPR 16-1-1, Amendment 1:2005). So, basically, the measurement determines the likelihood that a disturbance is above a specified level at a particular frequency (the measurement is usually performed on a fixed frequency).

The amplitude of the disturbance is expressed in terms of the corresponding field strength or voltage at the receiver input.

The APD is measured at the output of the envelope detector. Therefore, the APD yields the probability information over the entire disturbance envelope within the measurement bandwidth and a particular period of time.

The APD function has the following advantages.

- It provides an alternative way to present peak and average measurements (for example for microwave ovens in accordance with CISPR 11).
- It is able to calculate true average values.
- It shows high sensitivity and allows you to measure, for example, a single impulse.
- It allows you to measure unsteady levels.



APD vs CISPR APD

Note that the R&S EPL also provides an APD measurement for general purposes in the spectrum application.

This general APD function does not comply with CISPR 16-1-1 in various aspects and cannot be used for CISPR APD measurements.

Remote command:

`CALCulate:STATistics:CAPD[:STATe]` on page 391

The result display is made up out of a diagram and a table.

- The diagram contains a graphical representation of the measurement results (the probability with which a particular amplitude occurs).
The x-axis represents the amplitude, the y-axis the (cumulative) probability.
- The table ("Result Summary") contains the number of samples used in the calculation and, for each trace, the following values:
 - Average amplitude
 - Peak amplitude

Configuring CISPR APD measurements

Most of the settings available in the CISPR APD application are similar to settings already available in the receiver application or the spectrum application.

All parameters specific to the CISPR APD application are described below.

- Frequency and span settings: are similar to those in the spectrum application. Refer to the documentation of the spectrum application for a detailed description of these parameters (including remote commands).
- Amplitude settings: are similar to those in the spectrum application. Refer to the documentation of the spectrum application for a detailed description of these parameters (including remote commands).
- Scale settings: are similar to those of the APD measurement available in the spectrum application. Refer to the documentation of the spectrum application for a detailed description of these parameters (including remote commands).
- Preselector settings: are similar to those in the receiver application. Refer to [Section 10.5.3, "Configuring the signal path \(Preselector\)"](#), on page 137 for a detailed description of these parameters (including remote commands).
- Auto settings: are similar to those in the spectrum application. Refer to the documentation of the spectrum application for a detailed description of these parameters (including remote commands).
- Bandwidth settings: are similar to those in the receiver application.
 - ["Measurement Bandwidth"](#) on page 90 (called "Analysis BW" in the CISPR APD application, but it is the same)
 - ["Measurement Time"](#) on page 89 (called "Acquisition Time" in the CISPR APD application, but it is the same)
- Sweep settings: are similar to those in the receiver application.
 - ["Measurement Time"](#) on page 89 (called "Acquisition Time" in the CISPR APD application, but it is the same)
 - ["Scan Count"](#) on page 102 (called "Sweep / Average Count" in the CISPR APD application, but is the same)
- Trace settings: are similar to those in the spectrum application. Refer to the documentation of the spectrum application for a detailed description of these parameters (including remote commands).
- Trigger settings: are similar to those in the spectrum application (gated measurements are not supported). Refer to the documentation of the spectrum application for a detailed description of these parameters (including remote commands).
- General measurement settings: are similar to those in the receiver application.
 - ["Measurement Bandwidth"](#) on page 90 (called "Analysis BW" in the CISPR APD application, but it is the same)
 - ["Measurement Time"](#) on page 89 (called "Acquisition Time" in the CISPR APD application, but it is the same)
 - ["Percent Marker"](#) on page 129
- Lines settings: are not available in the CISPR APD application.

- Input source settings are similar to those in the receiver application.
See [Section 10.5.2, "Configuring the input"](#), on page 136 for a detailed description of these parameters (including remote commands).
- Output settings: are similar to those available in the receiver application.
See [Section 10.5.4, "Configuring outputs \(IF / video / demodulation\)"](#), on page 139
- Marker settings: are similar to those in the receiver application.
See [Section 11.4, "Marker usage"](#), on page 216 for a detailed description of these parameters (including remote commands).
- Marker functions: are not available in the CISPR APD application.

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Percent Marker

Defines a probability value. Thus, the power which is exceeded with a given probability can be determined very easily. If marker 1 is deactivated, it is switched on automatically.

Remote command:

[CALCulate<n>:MARKer<m>:Y:PERCent](#) on page 434

10 Common measurement settings

Basic measurement settings that are common to many measurement tasks, regardless of the application or operating mode, are described here. If you are performing a specific measurement task, or an application other than the receiver application, be sure to check the specific application or mode description for settings that may deviate from these common settings.

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• Using the user port panel.....	132
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• Amplitude and vertical axis configuration.....	158
• Frequency and span configuration.....	164
• Bandwidth and filter configuration.....	170
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10.1 Using the fast access panel

Access:  > "Fast Access"

The "Fast Access" panel is designed to provide fast access to a (predefined) set of settings that you are using regularly, and change these settings without accessing dialog boxes or softkey menus. The contents of the fast access panel are user-definable.

When you add the fast access panel to the user interface, it shows the settings that you can control through the panel. Using the "Up" () or "Down" () feature changes the value of the corresponding setting. The stepsize is the same as if you were using the cursor keys on the front panel.



The advantage of the fast access panel is that it is easier and faster to change various settings in a single panel without having to find and access dialog boxes or softkey menus first. In addition, you can still view results while changing parameters, without dialog boxes blocking the view.

Example: Steps necessary to change the attenuation without the fast access panel

1. Press the [AMPT] key.
2. Press the "Ampt Config" softkey.
3. Select the "Attenuation" parameter.
4. Turn the rotary knob or enter the attenuation manually to change the attenuation.
When you want to change the attenuation again, you have to repeat that procedure. Plus, almost the whole time, the result displays are blocked by a dialog box.
5. (...)

Example: Steps necessary to change the attenuation when you have assigned that parameter to the fast access panel

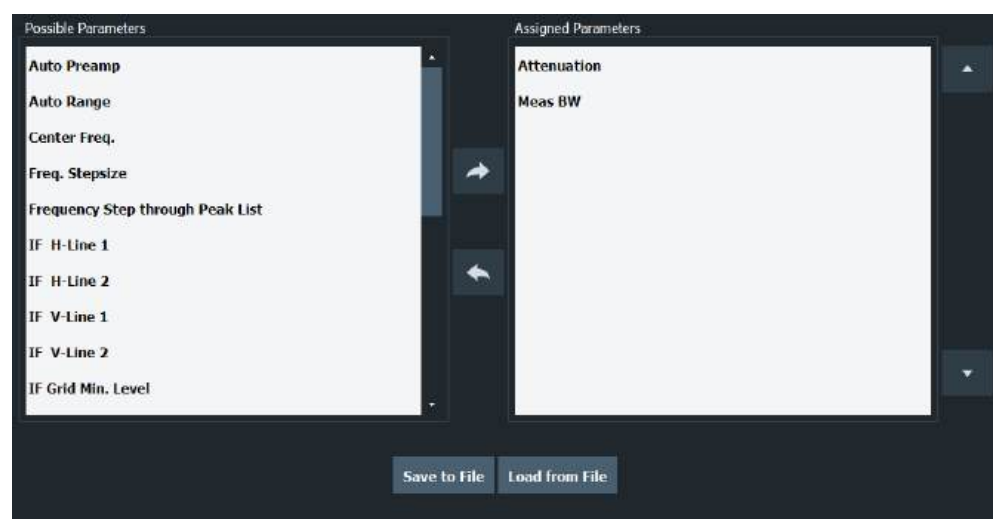
1. Add the fast access panel to the user interface.
2. Use the cursor keys in the panel to increase or decrease the attenuation.
When you want to change the attenuation again, simply hit the "Up" or "Down" key.
Plus, you are able to see the results all the time.

Note: The parameter stepsize of the knobs is the same as if you were using the cursor keys.

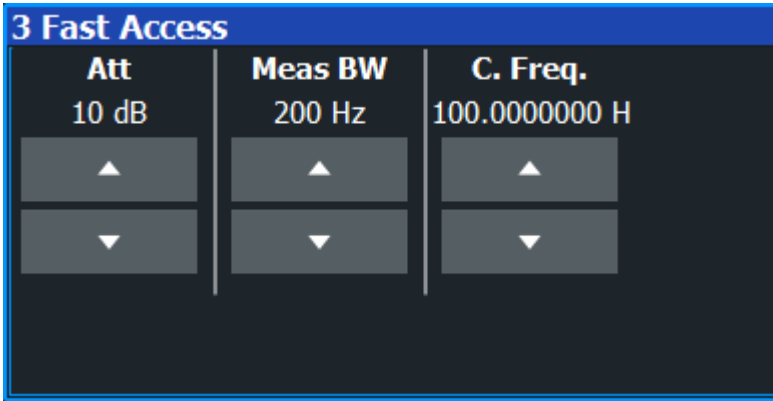
The fast access panel carries a few predefined settings. However, you can substitute the predefined settings, or add a few more, and thus define the contents of the fast access panel as you like.

Assigning functions to the fast access panel

1. Select "Setup" > "Fast Access".
The R&S EPL opens a dialog box to configure the fast access display.
You can access the fast access display via the SmartGrid .



- To assign an additional function to the panel, select one of the parameters in the left menu and move it to the right menu with the right arrow key (). Alternatively, you can move items via drag & drop.



- To remove a function from the panel, select one of the parameters in the right menu and move it to the left menu with the left arrow key ().
- Save the configuration to a file and restore it later on.
 "File Explorer": Instead of using the file manager of the R&S EPL firmware, you can also use the Microsoft Windows File Explorer to manage files.

10.2 Using the user port panel

Access:  > "User Port"

The "User Port" panel is designed to configure the optional user port (AUX port) on the rear of the R&S EPL. Using the user port, you can transmit bit patterns in two directions, depending on the actual selected signal direction.

When you add the user port panel to the user interface, you can configure the user ports as required.

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User port configuration

You can configure the user port as an input or an output by selecting the signal "Direction".

- When you configure the user port as an output, you can select the required bit patterns by changing the state of the individual ports ("Port <x>"). An active port shows a green LED.



- When you configure the user port as an input, you can read out the user port configuration. The value is displayed in the panel. Individual port selection becomes unavailable.



For more information about the pin to bit assignment, refer to the description of the remote command.

Remote command:

Output state: `OUTPut:UPORt:STATe` on page 442

Set bit pattern: `OUTPut:UPORt[:VALue]` on page 441

Input state: `INPut:UPORt:STATe` on page 441

Query bit pattern: `INPut:UPORt[:VALue]` on page 441

10.3 The notes display

Access:  > "Notes"

The "Notes" display is designed to add comments or explanations to the current measurement.



The content of the "Notes" display can also be included in test reports, see [Section 12.6.2, "Creating a test report"](#), on page 281.

Remote commands:

Add notes display: `LAYout:ADD[:WINDow]?` on page 469

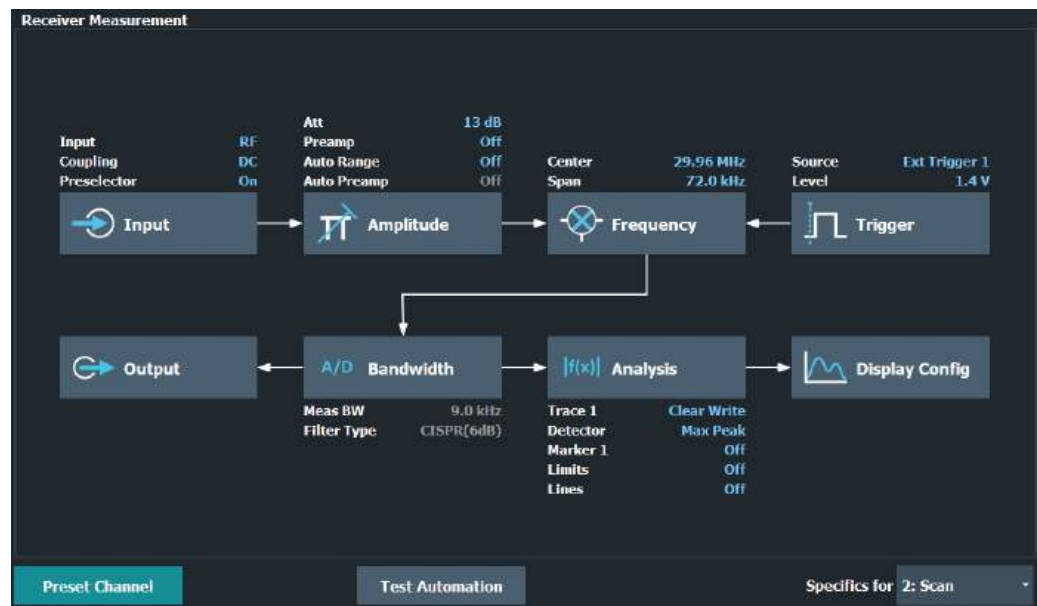
Set and query content: `DISPlay[:WINDow<n>][:SUBWindow<w>]:NOTes:TEXT` on page 559

Append content: `DISPlay[:WINDow<n>][:SUBWindow<w>]:NOTes:APPend:TEXT` on page 559

Clear notes display: `DISPlay[:WINDow<n>][:SUBWindow<w>]:NOTes:CLear`
on page 559

10.4 Configuration overview

Throughout the measurement channel configuration, an overview of the most important currently defined settings is provided in the configuration "Overview". The configuration overview is displayed when you select the "Overview" softkey, which is available at the bottom of all softkey menus.



In addition to the main measurement settings, the configuration overview provides quick access to the main settings dialog boxes. Thus, you can easily configure an entire measurement channel from input over processing to output and analysis by stepping through the dialog boxes as indicated in the "Overview".

To configure settings

► Select any button to open the corresponding dialog box.

- [Input](#)
- [Amplitude](#)
- [Frequency](#)
- [Trigger](#)
- [Output](#)
- [Bandwidth](#)
- [Analysis](#)
- [Display Config](#)

(For more information about the "Test Automation" button, see [Section 9.3, "Test automation"](#), on page 91.)

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Preset Channel setup

Select "Preset Channel" in the lower left-hand corner of the "Overview" to restore all measurement settings *in the current channel setup* to their default values.

Note: Do not confuse "Preset Channel" with the [Preset] key, which restores the entire instrument to its default values and thus closes *all channel setups* on the R&S EPL (except for the default channel setup)!

See ["Preset Mode"](#) on page 304

Remote command:

[SYSTem:PRESet:CHANnel\[:EXEC\]](#) on page 548

Specific Settings for

The channel setup can contain several windows for different results. Thus, the settings indicated in the "Overview" and configured in the dialog boxes vary depending on the selected window.

Select an active window from the "Specific Settings for" selection list that is displayed in the "Overview" and in all window-specific configuration dialog boxes.

The "Overview" and dialog boxes are updated to indicate the settings for the selected window.

When you select the "Bargraph" item from the dropdown menu, changes are also applied to the scan. If settings are not available for the Bargraph (for example trace settings), changes only apply to the scan. The same applies to numerical result displays (for example the "Peak List").

10.5 Data input and output

The R&S EPL can analyze signals from different input sources and provide various types of output (such as video or trigger signals).

• Basics on RF input	135
• Configuring the input	136
• Configuring the signal path (Preselector)	137
• Configuring outputs (IF / video / demodulation)	139
• Configuring LISNs	142
• Configuring additional outputs	142
• Internal generator	143

10.5.1 Basics on RF input

To analyze a radio frequency (RF) signal from a connected device under test (DUT), you provide the RF input to the R&S EPL via the 50 Ω RF input connector.

RF input protection

Protect the RF input connector of the R&S EPL against signal levels that exceed the ranges defined in the specifications document. The R&S EPL is equipped with an overload protection mechanism for DC and signal frequencies up to 30 MHz. This mechanism becomes active as soon as the power at the input mixer exceeds the specified limit. It ensures that the connection between RF input and input mixer is cut off.

When the overload protection is activated, an error message is displayed in the status bar ("INPUT OVLD"), and a message box informs you that the RF input was disconnected. Furthermore, a status bit (bit 3) in the `STAT:QUES:POW` status register is set. In this case, you must decrease the level at the RF input connector and then close the message box. Then measurement is possible again. Reactivating the RF input is also possible via the remote command `INPut:ATTenuation:PROTection:RESet`.

If necessary, define an attenuation to protect the input mixer from high RF input levels. High input levels cannot only damage the instrument, they can also lead to incorrect measurement results.

See also [Section 10.6, "Amplitude and vertical axis configuration"](#), on page 158.

AC/DC coupling

You can couple the RF input to the DUT by alternating current (AC) or direct current (DC). AC coupling blocks any DC voltage from the input signal. AC coupling is the default setting to prevent damage to the instrument. However, some specifications require DC coupling. In this case, you must protect the instrument from damaging DC input voltages manually. For details, refer to the specifications document.

10.5.2 Configuring the input

Access: "Overview" > "Input" > "Input Source"

The default input source for the R&S EPL is "Radio Frequency", i.e. the signal at the [RF Input] connector on the front panel of the R&S EPL. In the receiver application, the "Radio Frequency" is the only available input source.

Input Source		Preselector		
Radio Frequency	☒ Input 1 ☐ Input 2			
	Input 1		Input 2	
	Input Coupling	☒ AC ☐ DC	☒ AC ☐ DC	
	Impedance	☒ 50Ω ☐ 75Ω	☒ 50Ω ☐ 75Ω	
			Pulse Limiter	☒ On ☐ Off

Functions in the "Input" dialog box described elsewhere:

- "Input Selection" on page 110

Input Coupling.....	137
Impedance.....	137
Pulse Limiter.....	137

Input Coupling

The RF input is coupled by direct current (DC).

Make sure to protect the instrument from damaging DC input voltages. For details, refer to the specification document.

Remote command:

Not applicable

Impedance

For some measurements, the reference impedance for the measured levels of the R&S EPL can be set to 50 Ω or 75 Ω .

Select 75 Ω if the 50 Ω input impedance is transformed to a higher impedance using a 75 Ω adapter of the RAZ type. (That corresponds to 25 Ω in series to the input impedance of the instrument.) The correction value in this case is 1.76 dB = 10 log (75 Ω /50 Ω).

This value also affects the unit conversion.

Remote command:

INPut: IMPedance on page 439

Pulse Limiter

The pulse limiter is a protection mechanism against high-level pulses or signals (which can damage the input mixer).

The pulse limiter is always on. However, it works only if the attenuation is at least 10 dB. The pulse limiter has no effect for attenuation smaller than 10 dB.

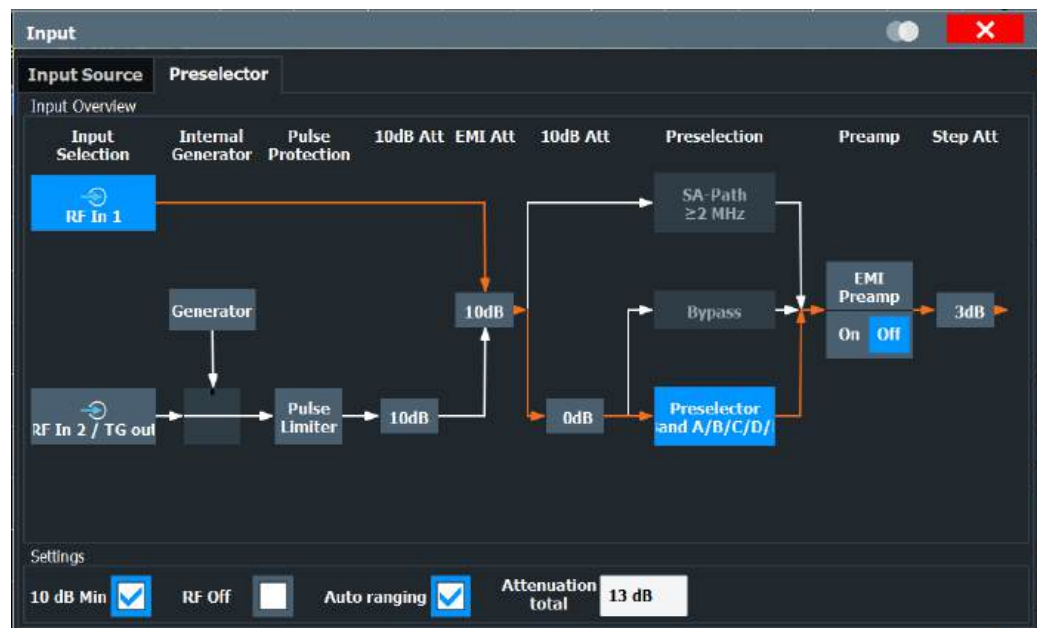
Remote command:

Not applicable

10.5.3 Configuring the signal path (Preselector)

Access: "Overview" > "Input" > "Preselector"

The "Preselector" configuration tab allows you to filter signals before they are processed by the main receiver.



The orange arrow in the dialog box represents the current signal path. Grey arrows represent other possible signal paths.

Functions of the "Preselector" dialog box described elsewhere:

- [Generator state](#)
The generator block in the diagram turns blue to indicate that the generator is on.
- ["Pulse Limiter"](#) on page 137
- ["Attenuation"](#) on page 110
The preselector dialog indicates how the total attenuation is distributed over the individual attenuators (attenuator and step attenuator).
- ["Preamplifier"](#) on page 110
- ["10 dB Minimum Attenuation"](#) on page 162
- ["Auto Range"](#) on page 109



The content of the dialog box varies depending on the instrument model and the currently selected application.

Generator	138
RF Off	139
Preselection filter	139
Bypass	139

Generator

Turns the internal generator on and off.

For details, see [Section 10.5.7, "Internal generator"](#), on page 143.

Remote command:

[OUTPut \[: STATE\]](#) on page 450

RF Off

Turns off the RF input. The R&S EPL no longer processes signals if you turn off the RF input. You can also no longer configure the signal path.

Preselection filter

Routes the signal through the preselection filters. The filter is automatically selected according to the measurement frequencies while sweeping.

For R&S EPL1001 and R&S EPL1007, the preselection filters are only available with the R&S EPL-B2 option.

Remote command:

`INPut:PRESelection[:STATe]` on page 440

Bypass

The "Bypass" function enables a signal path without a filter. When activated, the signal skips the preselector and connects to the downstream components of the receiver.

The "Bypass" can be applied to signals across the entire frequency range, from 0 kHz up to the maximum sweep frequency.

Only available in the receiver application if the R&S EPL-B2 option is not installed.

Tip: The bypass function does not increase the [relays cycle counter](#).

Remote command:

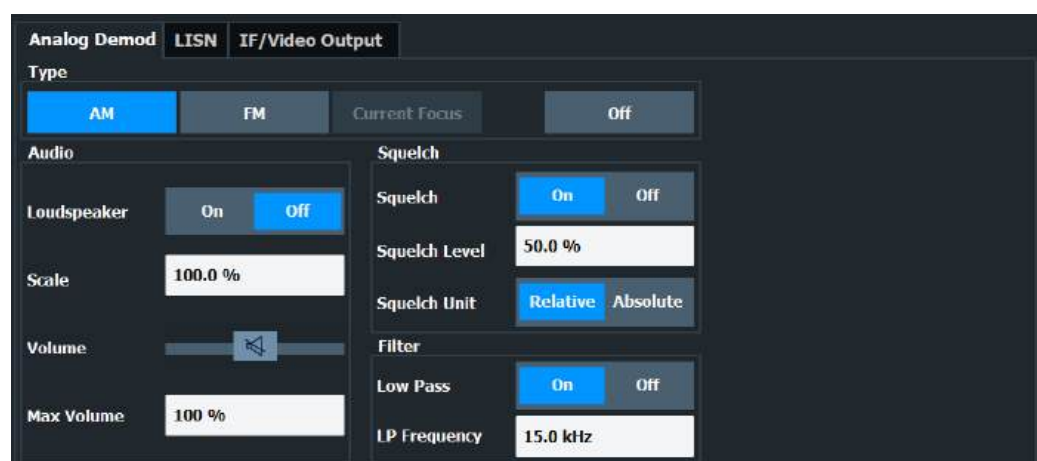
`INPut:PRESelection:BYPass` on page 440

10.5.4 Configuring outputs (IF / video / demodulation)

Access: "Overview" > "Output" > "Output Config"

The R&S EPL provides several outputs. The R&S EPL allows you to configure the output as required.

For details on the connectors refer to [Section 6.2.7, "IF/Video Output"](#), on page 47.



The remote commands required to configure the outputs are described in [Section 15.6.2, "Output configuration"](#), on page 442.

Selecting the output type.....	140
L Configuring the output of the IF signal.....	140
L Configuring the output of the Video signal.....	140
L Configuring the output of an AM signal.....	140
L Configuring the output of an FM signal.....	141
Controlling and configuring the output.....	141
L IF Output Frequency.....	141
L Low Pass.....	141
L Loudspeaker.....	141
L Squelch.....	141
L Scale.....	142
Controlling the volume.....	142

Selecting the output type

Selects the type of analog signal you want to output.

"IF Output"	Outputs the IF signal (see "Configuring the output of the IF signal" on page 140 for available settings). Access: "Output" > "IF / Video Output"
"Video"	Outputs the video signal (see "Configuring the output of the Video signal" on page 140 for available settings). Access: "Output" > "IF / Video Output"
"AM"	Outputs the AM demodulated signal (see "Configuring the output of an AM signal" on page 140 for available settings). Access: "Output" > "Analog Demod"
"FM"	Outputs the FM demodulated signal (see "Configuring the output of an FM signal" on page 141 for available settings). Access: "Output" > "Analog Demod"
"Current Focus"	Outputs the data of the currently selected measurement window (highlighted with a blue frame). Available in the Analog Modulation Analysis application.
"Off"	Turns off the output. Note that you can only turn off audio output (AM / FM). One of either IF or video output is always on.

Remote command:

[OUTPut<ou>:IF\[:SOURce\]](#) on page 444

Configuring the output of the IF signal ← Selecting the output type

For the output of the IF signal, you can adjust the following parameters.

- ["IF Output Frequency"](#) on page 141

Configuring the output of the Video signal ← Selecting the output type

Additional settings for video signal output are not supported.

Configuring the output of an AM signal ← Selecting the output type

For the output of AM demodulated signals, you can adjust the following parameters.

- ["Scale"](#) on page 142
- ["Low Pass"](#) on page 141

- ["Loudspeaker"](#) on page 141

Configuring the output of an FM signal ← Selecting the output type

For the output of FM demodulated signals, you can adjust the following parameters.

- ["Scale"](#) on page 142
- ["Low Pass"](#) on page 141
- ["Loudspeaker"](#) on page 141

Controlling and configuring the output

Depending on the selected [output type](#), you can configure one or more of the following output characteristics.

IF Output Frequency ← Controlling and configuring the output

Defines the output frequency of the IF signal.

The IF signal has a fixed output frequency of 25 MHz.

Remote command:

not supported

Low Pass ← Controlling and configuring the output

Turns a low pass filter to control the frequencies that are output on and off.

When you turn on the filter, you can define its **cutoff frequency**. The available cutoff frequencies depend on the type of output and the individual settings of the selected [output type](#).

Remote command:

[OUTPut<ou>:IF:LPASs\[:STATe\]](#) on page 443

[OUTPut<ou>:IF:LPASs:FREQuency:MANual](#) on page 443

Loudspeaker ← Controlling and configuring the output

Turns the loudspeaker on and off.

When you turn on this feature, you can listen to the signal with speakers or headphones connected to the headphone jack on the rear panel. To control the volume of the output, use either the volume control knob on the front panel or the [volume slider](#).

Squelch ← Controlling and configuring the output

You can suppress noise during audio output over the headphone jack for demodulated AM or FM signals with the "Squelch" feature.

When you turn on this feature, you can define a relative "Squelch Level" in %, below which the signal is not demodulated (and thus not audible). The squelch level is indicated by a red line in the diagram.

Alternatively, you can define the squelch level as an absolute value ("Squelch Unit"). The unit depends on the unit you have currently selected for the measurement.

Remote command:

[\[SENSe:\]DEMod:SQUelch\[:STATe\]](#) on page 445

[\[SENSe:\]DEMod:SQUelch:LEVel](#) on page 444

Absolute squelch level: [\[SENSe:\]DEMod:SQUelch:LEVel:ABSolute](#) on page 445

Scale ← Controlling and configuring the output

Defines the scale for the data you are transferring.

The unit depends on the signal type you are transferring.

- AM signals: a value in %.
- FM signals: a value in Hz

Remote command:

`OUTPut<ou>:IF:SCALe[:VALue]` on page 443

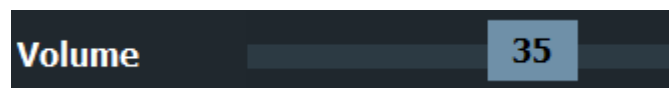
Controlling the volume

CAUTION! Risk of hearing damage. To protect your hearing, make sure that the volume setting is not too high before putting on the headphones.

When you output an audio signal and listen to it with headphones, for example, you can control the volume of the output.

Use the **volume control slider** to define the volume. The volume is a percentage from 0 % to 100 % with 100 % being the loudest.

Tip: You can open the volume control easily with the loudspeaker icon the the status bar ( 50 %).



In addition to simply changing the volume, you can also define a **maximum volume level**. The maximum volume level limits the audio output to a certain level.

The slider will not go further than this level.

Remote command:

Volume: `SYSTem:SPEaker:VOLume` on page 446

Maximum volume: `SYSTem:SPEaker:MAXVolume` on page 446

Mute: `SYSTem:SPEaker:MUTE` on page 446

10.5.5 Configuring LISNs

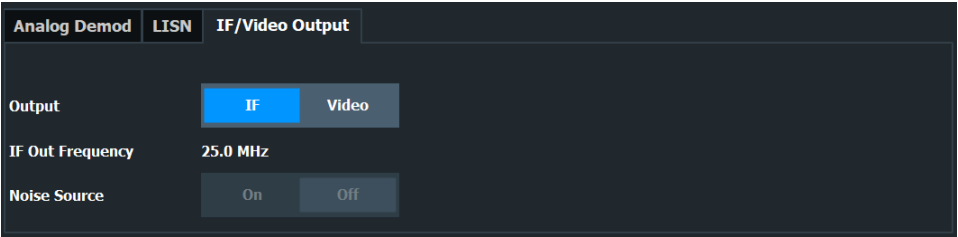
For more information, see [Section 9.3.6, "Configuring line impedance stabilization networks \(LISN\)"](#), on page 124.

10.5.6 Configuring additional outputs

Access: "Overview" > "Output" > "IF/Video Output"

The R&S EPL provides additional outputs that you can use for various tasks.

Note that the "Noise Source" output is not available in the receiver application.



The remote commands required to configure the outputs are described in [Section 15.6.2.2, "Additional output"](#), on page 447.

Functions in the "IF/Video Output" dialog box described elsewhere:

- [Output type IF and video](#)

[Noise Source Control](#)..... 143

Noise Source Control

Enables or disables the 28 V voltage supply for an external noise source connected to the "Noise source control / Power sensor") connector. By switching the supply voltage for an external noise source on or off in the firmware, you can enable or disable the device as required.

External noise sources are useful when you are measuring power levels that fall below the noise floor of the R&S EPL itself, for example when measuring the noise level of an amplifier.

In this case, you can first connect an external noise source (whose noise power level is known in advance) to the R&S EPL and measure the total noise power. From this value, you can determine the noise power of the R&S EPL. Then when you measure the power level of the actual DUT, you can deduct the known noise level from the total power to obtain the power level of the DUT.

Remote command:
[DIAGnostic:SErvice:NSource](#) on page 447

10.5.7 Internal generator

Access: "GEN State"

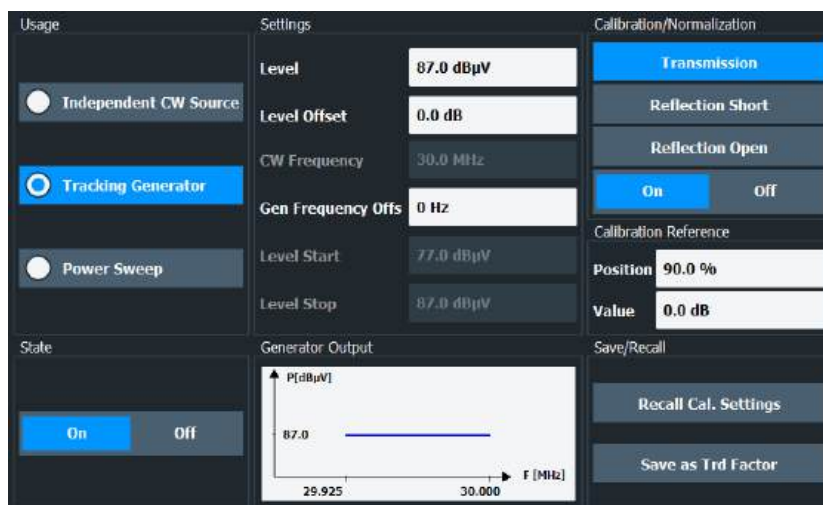
Access: "GEN Config"

The internal generator provides a signal at the generator output on the front panel of the R&S EPL.



Note that the full set of generator settings is only available in the spectrum application. The other applications only provide the following subset of settings.

- Generator state
- Output level
- Level offset
- Frequency



The remote commands required to configure the internal generator are described in [Section 15.6.3, "Generator configuration"](#), on page 447.

- [Basics on the internal generator](#)..... 144
- [Configuring the generator](#)..... 151
- [How to work with the tracking generator](#)..... 156

10.5.7.1 Basics on the internal generator

The internal generator emits a signal at a specified frequency. The generated signal is sent to the GEN Output 50 Ω connector. You can connect your DUT to the output connector, thus allowing the analyzer to control the input signal for the device directly.

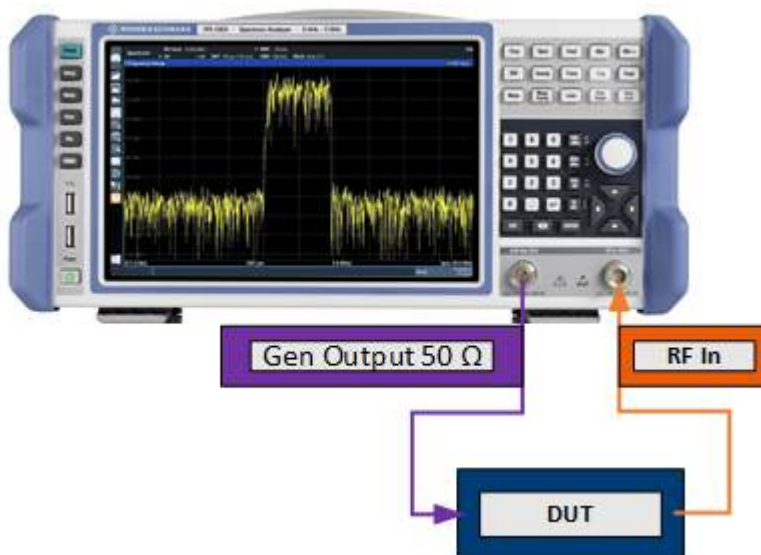
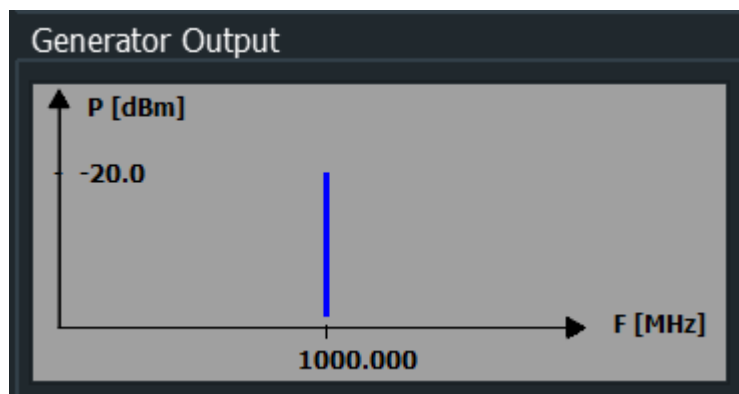


Figure 10-1: Test setup using the internal generator

You can enable or disable and configure the generator individually for each application. Different usages are provided for various measurement scenarios.

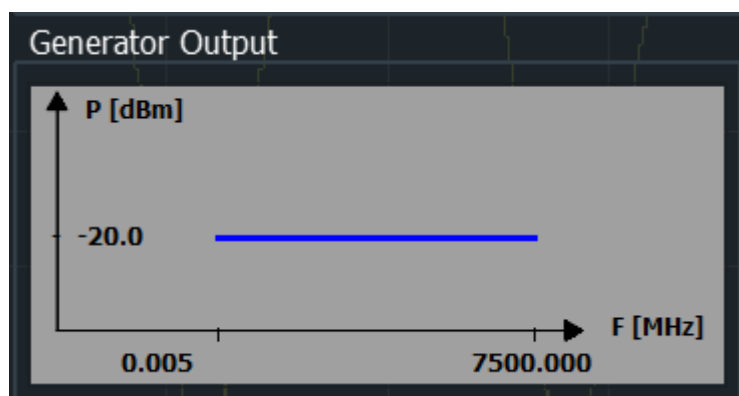
Independent CW source

The internal generator can be used as an independent CW source for a DUT in all applications on the R&S EPL. In this case, the frequency of the internal generator is independent of the analyzer input.



Tracking generator

The frequency of the internal generator can be coupled to the input frequency of the analyzer, so that the input signal for the DUT tracks (or follows) the input signal of the analyzer. This function is referred to as a tracking generator.



Frequency coupling is useful for test scenarios for which a signal generator is required, but an additional instrument is too expensive or takes up too much space.

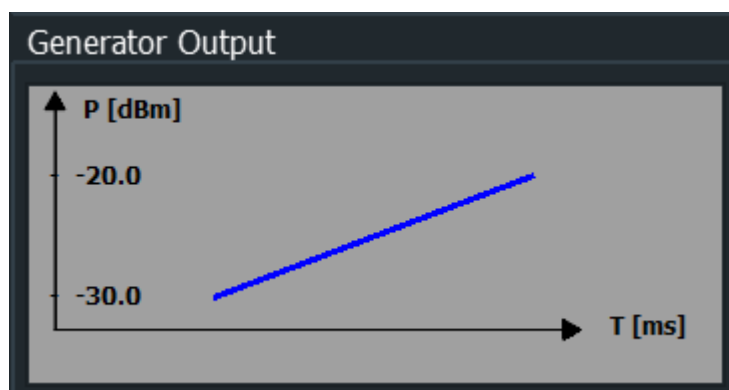
When using the internal generator as a tracking generator, the R&S EPL also allows you to set a frequency offset for frequency-converting measurements.

Using the internal generator as a tracking generator is only available in the Spectrum application for frequency sweeps. If you switch to another application, a currently active tracking generator is disabled.

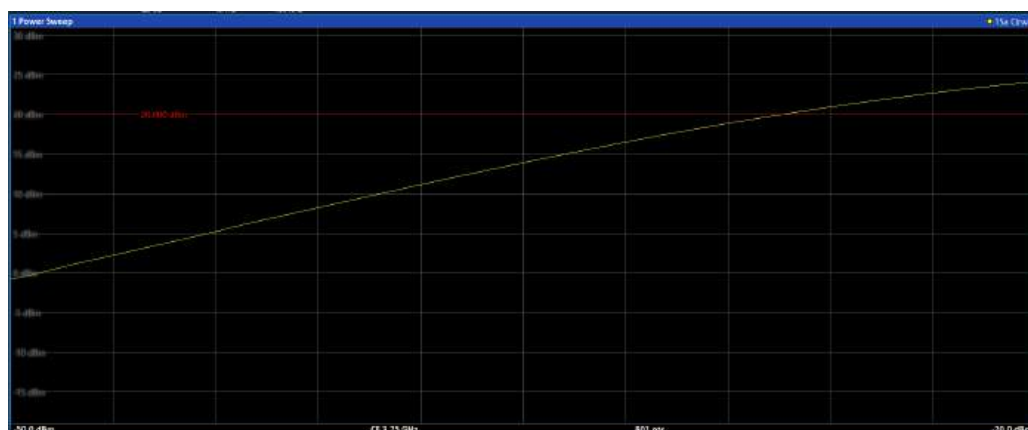
Power sweep

For a power sweep measurement, the internal generator signal remains at a fixed frequency, but increases its power level within a specified range over time. The default frequency of the internal generator is coupled to the (center) frequency of the analyzer

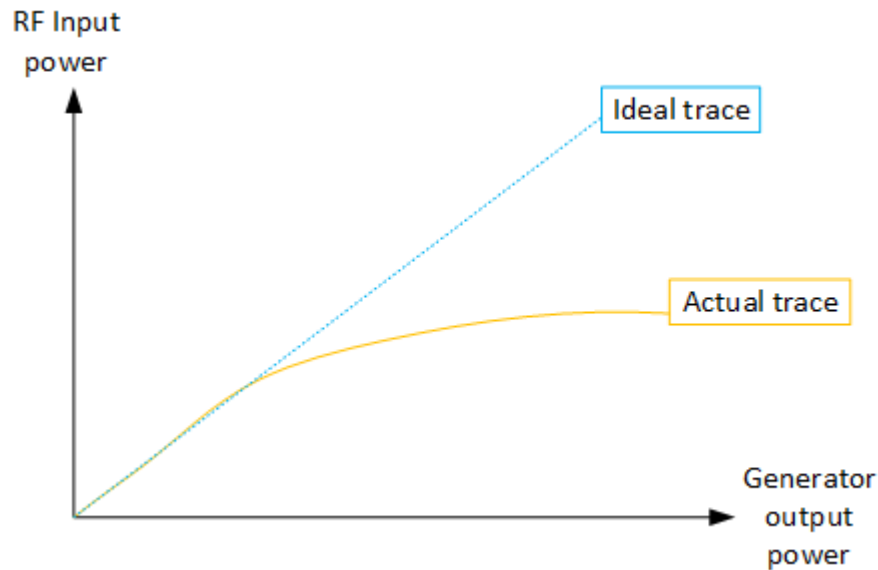
and can be set from 5 kHz to the maximum frequency of the R&S EPL. However, you can define an offset for the internal generator frequency.



As a result, the measured power levels at the RF input are displayed versus the provided power levels of the internal generator output.



Thus, you can use the internal generator signal as a reference input signal for your power-converting DUT. Then you can compare the DUT input to its output at the RF input of the analyzer. Ideally, the result is a linear trace, that is: the output is directly proportional to the input power. Any distortion to the linear trace indicates the effects of the DUT. This result is useful, for example, to determine the compression point for amplifiers.



Calibration mechanism

A common measurement setup includes a signal generator, a device under test (DUT), and a signal and spectrum analyzer. Therefore, it is useful to measure the attenuation or gain caused by the cables and connectors from the signal generator and the signal analyzer in advance. The known level offsets can then be removed from the measurement results to obtain accurate information on the DUT.

Calculating the difference between the currently measured power and a reference trace is referred to as *calibration*. Thus, the measurement results from the internal generator - including the inherent distortions - can be used as a reference trace to calibrate the measurement setup.

The inherent frequency and power level distortions can be determined by enabling the use of the internal generator as a tracking generator. The analyzer sends a predefined list of frequencies to the internal generator. The frequency list for the calibration sweep contains 201 values by default, divided in equidistant frequencies between the analyzer's start and stop frequency. The internal generator then sends a signal with the specified level at each frequency in the predefined list. The analyzer measures the signal and determines the level offsets to the expected values.

Saving calibration results

A reference dataset for the calibration results is stored internally as a table of value pairs (frequency/level), one for each sweep point. The measured offsets can then be used as calibration factors for subsequent measurement results. The calibration data can also be stored permanently with the instrument settings using the "Save" function in the toolbar.

The calibration can be performed using either transmission or reflection measurements. The selected type of measurement used to determine the reference trace is included in the reference dataset.

Normalization

Once the measurement setup has been calibrated and the reference trace is available, subsequent measurement results can be corrected according to the calibration factors, if necessary. Correction is done by subtracting the reference trace from the measurement results. The resulting level values are provided in dB. This process is referred to as *normalization*. Normalization is automatically enabled after calibration, but it can be enabled or disabled as required. If normalization is enabled, "NOR" is displayed in the channel bar, next to the indication that a tracking generator is being used ("Trk.Gen"). The normalized trace from the calibration sweep is a constant 0 dB line, as $\text{<calibration trace> - <reference trace> = 0}$.

As long as the same settings are used for measurement as for calibration, the normalized measurement results should not contain any inherent frequency or power distortions. Thus, the measured DUT values are very accurate.

Approximate normalization

If any of the calibration measurement settings are changed, the stored reference trace is no longer identical to the new measurement results. However, if the measurement settings do not deviate too much, the measurement results can still be normalized *approximately* using the stored reference trace. Approximate normalization is indicated by the "APX" label in the channel bar (instead of "NOR").

Approximate normalization occurs if one or more of the following values deviate from the calibration settings:

- Coupling (RBW, VBW, SWT)
- Reference level, RF attenuation
- Start or stop frequency
- Output level of internal generator
- Detector (max. peak, min. peak, sample, etc.)
- Frequency deviation at a maximum of 201 points within the set sweep limits (corresponds to a doubling of the span)

Differences in level settings between the reference trace and the current instrument settings are taken into account automatically. If the span is reduced, a linear interpolation of the intermediate values is applied. If the span increases, the values at the left or right border of the reference dataset are extrapolated to the current start or stop frequency, i.e. the reference dataset is extended by constant values.

Thus, the instrument settings can be changed in a wide area without giving up normalization. This reduces the necessity to carry out a new normalization to a minimum.

The normalized trace in the display

The normalized reference trace is also displayed in the spectrum diagram, by default at the top of the diagram (90% of the window height). It is indicated by a red line labeled "NOR", followed by the current reference value. However, it can be shifted vertically to reflect an attenuation or gain caused by the measured DUT (see also ["Shifting the reference line \(and normalized trace\)"](#) on page 150).

Restoring the calibration settings

If the measurement settings no longer match the instrument settings with which the calibration was performed (indicated by the "APX" or no label next to "Trk.Gen" in the channel bar), you can restore the calibration settings, which are stored with the reference dataset on the R&S EPL.

Storing the normalized reference trace as a transducer factor

The (inverse) normalized reference trace can also be stored as a *transducer factor* for use in other R&S EPL applications that do not support the use of the tracking generator. The normalized trace data is converted to a transducer with unit dB and stored in a file with the specified name and the suffix `.tdf` under

C:\ProgramData\Rohde-Schwarz\ZNL-FPL\trd. The frequency points are allocated in equidistant steps between the start and stop frequency.

Defining transducer factors are useful, for example, to determine the effects of a particular device component and then remove these effects from a subsequent measurement which includes this component.

For an example, see ["How to remove the effects of a particular component from measurement results using calibration"](#) on page 157.



Note that the *normalized* measurement data is stored, not the original *reference* trace! Thus, if you store the normalized trace directly after calibration, without changing any settings, the transducer factor is 0 dB for the entire span (by definition of the normalized trace).

Reference trace, reference line and reference level

Reference trace

The calibration results are stored internally on the R&S EPL as a *reference trace*. For each measured sweep point, the offset to the expected values is determined. If normalization is activated, the offsets in the reference trace are removed from the current measurement results to compensate for the inherent distortions.

Reference line

The reference line is defined by the [Reference Value](#) and [Reference Position](#) in the "Internal Generator" > "Source Calibration" settings. It is similar to the reference level defined in the "Amplitude" settings. However, as opposed to the reference *level*, this reference *line* only affects the y-axis scaling in the diagram. It has no effect on the expected input power level or the hardware settings.

The reference line determines the range and the scaling of the y-axis, just as the reference level does.

The normalized reference trace (0 dB directly after calibration) is displayed on this reference line, indicated by a red line in the diagram. By default, the reference line is displayed at the top of the diagram (90% of the window height). If you shift the reference line, the normalized trace is shifted, as well.

Shifting the reference line (and normalized trace)

You can shift the reference line - and thus the normalized trace - in the result display by changing the [Reference Position](#) or the [Reference Value](#).

If the DUT inserts a gain or an attenuation in the measurement, this effect can be reflected in the result display on the R&S EPL. To reflect a power offset in the measurement trace, change the [Reference Value](#).

Displayed information and errors

Channel bar

If internal generator control is active, some additional information is displayed in the channel bar.

Label	Description
"CWSource:" <source power>	Internal generator in operation as independent CW source with specified level
"Trk.Gen:" <source power>	Internal generator active; signal sent with <source power> level
"NOR"	Normalization on; No difference between reference setting and measurement
"APX" (approximation)	Normalization on; Deviation from the reference setting occurs

Error and status messages

The following status and error messages can occur during internal generator control.

Message	Description
"Generator Frequency Limits Exceeded!"	The allowed frequency ranges for the generator were exceeded (see data sheet)
"Generator Level Overrange" / "Generator Level Underrange"	The power level exceeds the range specified in the data sheet
"Generator Maximum Level Exceeded"	The power level exceeds the maximum available output level of the internal generator



Overloading

At a reference level of -13 dBm and at an internal generator output level of the same value, the R&S EPL operates without overrange reserve. That means the R&S EPL is in danger of being overloaded if a signal is applied whose amplitude is higher than the reference line. In this case, an overload message is displayed in the status line.

Overloading can be avoided as follows:

- Reducing the output level of the internal generator ("[Level](#)" on page 151)
- Increasing the reference level

10.5.7.2 Configuring the generator

You can select one of several types of signal provided by the internal generator:

- "Independent CW source settings" on page 151: constant frequency and power level
- "Tracking generator settings" on page 152: constant power level, frequency follows analyzer frequency (only available for frequency sweeps in the Spectrum application)
- "Power sweep" on page 145: constant frequency, linearly increasing power level (only available in the Spectrum application)

SCPI commands

`SOURce<si>:FREQuency:COUPling[:STATe]` on page 451

`SOURce<si>:POWer:MODE` on page 452

- Independent CW source settings..... 151
- Tracking generator settings..... 152
- Power sweep settings..... 155

Independent CW source settings

Access: "GEN Config" > "Independent CW Source"

The preview in the dialog box visualizes the configured signal from the internal generator.

State.....	151
Level.....	151
Level Offset.....	151
CW Frequency.....	152

State

Enables or disables the internal generator. The generator signal is output at the GEN Output 50 Ω connector on the front panel.

Remote command:

`OUTPut[:STATe]` on page 450

Level

Defines the output power of the internal generator.

The default output power is -20 dBm. The range is from -60 dBm to +10 dBm.

EPL1007: For frequencies above 1 GHz, a range of +10 to -30 dBm applies.

Remote command:

`SOURce<si>:POWer[:LEVel][:IMMediate][:AMPLitude]` on page 451

Level Offset

Defines an offset to the output power of the internal generator.

Used to adapt the level display, for example to cable loss.

Remote command:

[SOURce<si>:POWER\[:LEVel\] \[:IMMediate\]:OFFSet](#) on page 451

CW Frequency

Defines the frequency of the independent CW source. The step size depends on the measurement mode.

If the internal generator is used as a tracking generator, the frequency is coupled to the frequency of the analyzer. Thus, this setting is not available.

Remote command:

[SOURce<si>:INTernal:FREQuency](#) on page 450

Tracking generator settings

Access: "GEN Config" > "Tracking Generator"

The tracking generator signal is only available for frequency sweeps in the spectrum application.

The preview in the dialog box visualizes the configured signal from the internal tracking generator.

State	152
Level	152
Level Offset	152
CW Frequency	153
Frequency Offset	153
Calibrate Transmission	153
Calibrate Reflection Short	153
Calibrate Reflection Open	153
Normalization state	154
Reference Position	154
Reference Value	154
Recall Cal. Settings	154
Save as Trd Factor	155

State

Enables or disables the internal generator. The generator signal is output at the GEN Output 50 Ω connector on the front panel.

Remote command:

[OUTPut \[:STATe\]](#) on page 450

Level

Defines the output power of the internal generator.

The default output power is -20 dBm. The range is from -60 dBm to +10 dBm.

EPL1007: For frequencies above 1 GHz, a range of +10 to -30 dBm applies.

Remote command:

[SOURce<si>:POWER\[:LEVel\] \[:IMMediate\] \[:AMPLitude\]](#) on page 451

Level Offset

Defines an offset to the output power of the internal generator.

Used to adapt the level display, for example to cable loss.

Remote command:

`SOURce<si>:POWer[:LEVel][:IMMediate]:OFFSet` on page 451

CW Frequency

Defines the frequency of the independent CW source. The step size depends on the measurement mode.

If the internal generator is used as a tracking generator, the frequency is coupled to the frequency of the analyzer. Thus, this setting is not available.

Remote command:

`SOURce<si>:INTernal:FREQuency` on page 450

Frequency Offset

Shifts the frequency of the internal generator by the defined offset.

The default frequency of the internal generator is coupled to the (center) frequency of the analyzer and can be set from 5 kHz to the maximum frequency of the R&S EPL.

Remote command:

`SOURce<si>:INTernal:FREQuency:OFFSet` on page 452

Calibrate Transmission

Starts a transmission type measurement to determine a reference trace. This trace is used to calculate the difference for the normalized values.

Remote command:

`[SENSe:]CORRection:METHod` on page 448

Calibrate Reflection Short

Starts a short-circuit reflection type measurement to determine a reference trace for calibration.

If both calibrations (open circuit, short circuit) are carried out, the calibration trace is calculated by averaging the two measurements. The order of the two calibration measurements is irrelevant.

Remote command:

`[SENSe:]CORRection:METHod` on page 448

Selects the reflection method.

`[SENSe:]CORRection:COLLect[:ACQuire]` on page 448

Starts the sweep for short-circuit calibration.

Calibrate Reflection Open

Starts an open-circuit reflection type measurement to determine a reference trace for calibration.

If both reflection-type calibrations (open circuit, short circuit) are carried out, the reference trace is calculated by averaging the two measurements. The order of the two calibration measurements is irrelevant.

Remote command:

`[SENSe:]CORRection:METHod` on page 448

Selects the reflection method.

[\[SENSe:\]CORRection:COLLect\[:ACQuire\]](#) on page 448

Starts the sweep for open-circuit calibration.

Normalization state

Switches the normalization of measurement results on or off. This function is only available if the memory contains a reference trace, that is, after a calibration has been performed.

Remote command:

[\[SENSe:\]CORRection\[:STATe\]](#) on page 447

Reference Position

Defines the position of the reference line in percent of the total y-axis range.

The top of the diagram is 100%, the bottom is 0%. By default, the 0 dB line is displayed at 90% of the diagram height.

This setting is only available if normalization is on (see ["Normalization state"](#) on page 154).

The reference line defined by the reference value and reference position is similar to the reference level defined in the "Amplitude" settings. However, this reference line only affects the y-axis scaling in the diagram, it has no effect on the expected input power level or the hardware settings.

The normalized trace (0 dB directly after calibration) is displayed on this reference line, indicated by a red line in the diagram. If you shift the reference line, the normalized trace is shifted, as well.

Remote command:

[DISPlay\[:WINDow<n>\]\[:SUBWindow<w>\]:TRACe<t>:Y\[:SCALe\]:RPOSition](#) on page 449

Reference Value

Defines an offset for the position of the reference line.

This setting can be used to shift the reference line and thus the normalized trace, similar to the reference level defined in the "Amplitude" settings shifts the reference level *in the display*.

Shifting the normalized trace is useful, for example, to reflect an attenuation or gain caused by the measured DUT. If you then zoom into the diagram around the normalized trace, the measured trace still remains fully visible.

Remote command:

[DISPlay\[:WINDow<n>\]\[:SUBWindow<w>\]:TRACe<t>:Y\[:SCALe\]:RVALue](#) on page 450

Recall Cal. Settings

Restores the settings that were used during source calibration. This can be useful if instrument settings were changed after calibration (e.g. center frequency, frequency deviation, reference level, etc.).

Remote command:

[\[SENSe:\]CORRection:RECall](#) on page 449

Save as Trd Factor

Uses the normalized measurement data to generate a transducer factor. The trace data is converted to a transducer with unit dB and stored in a file with the specified name and the suffix .trd under

C:\ProgramData\Rohde-Schwarz\ZNL-FPL\trd. The frequency points are allocated in equidistant steps between start and stop frequency.

The generated transducer factor can be further adapted using the "Transducer" function in the [Setup] menu.

"File Explorer": Instead of using the file manager of the R&S EPL firmware, you can also use the Microsoft Windows File Explorer to manage files.

Note: Note that the *normalized* measurement data is used, not the *reference* trace! Thus, if you store the normalized trace directly after calibration, without changing any settings, the transducer factor is 0 dB for the entire span (by definition of the normalized trace).

Remote command:

[SENSe:]CORRection:TRANsducer:GENerate on page 449

Power sweep settings

Access: "GEN Config" > "Power Sweep"

The power sweep is only available in the spectrum application.

The preview in the dialog box visualizes the configured signal from the internal tracking generator.

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Frequency Offset.....	156
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State

Enables or disables the internal generator. The generator signal is output at the GEN Output 50 Ω connector on the front panel.

Remote command:

OUTPut [:STATe] on page 450

Level Offset

Defines an offset to the output power of the internal generator.

Used to adapt the level display, for example to cable loss.

Remote command:

SOURce<si>:POWer[:LEVel][:IMMediate]:OFFSet on page 451

PS Frequency

Defines the frequency of the internal generator signal for a power sweep measurement. This frequency corresponds to the center frequency of the RF measurement.

Remote command:

[\[SENSe:\] FREQuency:CENTer](#) on page 456

Frequency Offset

Shifts the frequency of the internal generator by the defined offset.

The default frequency of the internal generator is coupled to the (center) frequency of the analyzer and can be set from 5 kHz to the maximum frequency of the R&S EPL.

Remote command:

[SOURce<si>:INTernal:FREQuency:OFFSet](#) on page 452

Level Start / Level Stop

Defines the start and stop levels of the output power of the internal generator. The power increases linearly within this range. Only ascending values are allowed, that is: the level start value must be lower than the level stop value.

The range is from -60 dBm to +10 dBm.

If a [Level Offset](#) is defined, the "Level Start" / "Level Stop" values are indicated with the offset applied.

Remote command:

[SOURce<si>:POWer:STARt](#) on page 452

[SOURce<si>:POWer:STOP](#) on page 453

Calibrate Transmission

Starts a transmission type measurement to determine a reference trace. This trace is used to calculate the difference for the normalized values.

Remote command:

[\[SENSe:\]CORRection:METHod](#) on page 448

Normalization state

Switches the normalization of measurement results on or off. This function is only available if the memory contains a reference trace, that is, after a calibration has been performed.

Remote command:

[\[SENSe:\]CORRection\[:STATe\]](#) on page 447

10.5.7.3 How to work with the tracking generator

The following step-by-step instructions demonstrate how to work with the optional tracking generator.



For remote operation, see [Section 15.6.9, "Programming example for a tracking generator"](#), on page 466.

- [How to calibrate a measurement setup using a tracking generator](#)..... 157
- [How to remove the effects of a particular component from measurement results using calibration](#)..... 157
- [How to compensate for additional gain or attenuation after calibration](#)..... 157

How to calibrate a measurement setup using a tracking generator



1. If the measurement setup does not require the full span of the R&S EPL, change the "Frequency Start" and "Frequency Stop" values ([FREQ] > "Frequency Config").
2. Select the "GEN Config" tool on the toolbar.
3. Select the "Usage": "Tracking Generator".
4. Set the "State" to "On".
5. Define the generator output level as the "Level".
6. Optionally, to define a constant level offset for the tracking generator, define a "Level Offset".
7. Select the "Source Calibration" type: "Transmission" to perform a calibration sweep and store a reference trace for the measurement setup.
Normalization is automatically set to "On".
8. Optionally, shift the reference line further down in the result display by decreasing the "Reference": "Position".

The measurement setup is now calibrated. Subsequent measurement results are normalized, so that any unwanted effects from the cables and connectors are removed.

How to remove the effects of a particular component from measurement results using calibration

1. Set up the measurement, including the component, and perform a calibration as described in ["How to calibrate a measurement setup using a tracking generator"](#) on page 157.
2. After calibration, select "Save as Trd Factor" to store the normalized reference trace as a transducer factor.
3. Select [Setup] > "Transducer".
4. Select the stored transducer in the list of available transducers and select the "Active" setting for it.
5. Perform any measurement with the setup that contains the calibrated component.

The measurement results do not include the effects from the component.

How to compensate for additional gain or attenuation after calibration

If a gain or an attenuation is inserted in the measurement after calibration, this effect can be reflected in the display of the normalized trace on the R&S EPL. Thus, the measured trace and the normalized trace are not so far apart in the display, so that you can zoom into the normalized trace without cropping the measurement trace.

Prerequisite: a calibration has been performed for the original measurement setup, except for the component causing an additional gain or attenuation (as described in ["How to calibrate a measurement setup using a tracking generator"](#) on page 157.)

1. Insert the additional component in the calibrated measurement setup and perform a new measurement.



2. Select the "GEN Config" tool on the toolbar.
3. With active normalization, set the "Calibration Reference": "Value" to the same value as the gain or attenuation the inserted component causes.
4. Optionally, shift the reference line further down in the result display by decreasing the "Calibration Reference": "Position".

The normalized reference trace moves to the position of the measured trace.

5. Optionally, zoom into the measured trace by changing the y-axis scaling (or the range: "AMPT > Scale Config > Range").

The measured trace is still fully visible, and the absolute values are still valid.

10.6 Amplitude and vertical axis configuration

In the Receiver application, measurement results usually consist of the measured signal levels (amplitudes) displayed on the vertical (y-)axis for the determined frequency spectrum or for the measurement time (horizontal, x-axis). The settings for the vertical axis, regarding amplitude and scaling, are described here.

- [Increasing measurement sensitivity \(or avoiding an input mixer overload\)](#)..... 158
- [Amplitude settings](#)..... 161
- [Diagram scale](#)..... 163
- [Preselector](#)..... 164

10.6.1 Increasing measurement sensitivity (or avoiding an input mixer overload)

Measurements often confront you with unknown or unintentional signals with unknown signal levels (and often with pulse characteristics). Such signals can either have very weak signal levels, in which case you might miss them during the measurement. Or they can have very strong signal levels, in which case they can damage the input mixer.

Protecting the input mixer

Always consider how to protect the input mixer from damage when setting up a measurement.

- **NOTICE!** EMC measurements often measure unknown signals that contain pulses with possibly strong signal levels. Strong signal levels can damage the input mixer.

Read the following topics carefully before you apply a signal to learn more about protecting the input mixer and avoid an overload.

Note that pulses have different level characteristics. Refer to the specifications document for more information on the allowed maximum pulse energy.

The signal level at the input mixer is calculated as follows.

Mixer Level = Input Level - attenuation + gain



The R&S EPL is equipped with an overload protection mechanism. This mechanism becomes active as soon as the signal level at the input mixer exceeds the specified limit. It ensures that the connection between RF input and input mixer is cut off.

In this case, you must decrease the level at the RF input connector and then close the message box. Then measurements are possible again.

- [Using the RF attenuator](#)..... 159
- [Using the preamplifier](#)..... 160
- [Using the preselector](#)..... 160

10.6.1.1 Using the RF attenuator

The first tool provided by the R&S EPL to control measurement sensitivity is the RF attenuator.

The RF attenuator is available in all hardware configurations of the R&S EPL.

Attenuation has the following effects on the measurement:

- High attenuation protects the input mixer: the main purpose of the attenuator is to protect the input mixer.
- High attenuation makes sure that the measurement results are reliable (signals that are stronger than allowed can distort the results)
- High attenuation helps you to avoid intermodulation
- High attenuation increases inherent noise (i.e. the noise floor) and thus decreases measurement sensitivity: if you increase attenuation by 10 dB, the sensitivity is reduced by 10 dB (in other words: the displayed noise increases by 10 dB)

Depending on the required test setup, you must find a compromise between a high sensitivity, low intermodulation and input mixer protection. We recommend to let the R&S EPL determine the ideal attenuation automatically.

You can determine the attenuation automatically with the auto ranging feature in the receiver application and the auto attenuation feature in the other applications. Determining the attenuation automatically might not necessarily utilize the maximum dynamic range, but still yields valid and reliable results.

When you select the attenuation manually and are measuring unknown signals, especially DUTs with a high RFI voltage, always select the highest possible attenuation level before you apply the signal.

If you need a better sensitivity or signal-to-noise ratio, make sure that the applied signal does not exceed the specified limits, before you lower the attenuation.

For further protection of the input mixer, the R&S EPL does not allow you to select attenuation levels of less than 10 dB unless you explicitly turn on this feature ("[10 dB Minimum Attenuation](#)").

Protecting the input mixer

1. **NOTICE!** EMC measurements often measure unknown signals that contain pulses with possibly strong signal levels. Strong signal levels can damage the input mixer. Select an appropriate attenuation when you measure unknown signals or RFI voltage in combination with an artificial network (LISN). Do not apply a 0 dB attenuation for such measurements. During phase switching, such test setups generate very strong pulses which can damage the input mixer.
2. Make sure that the signal level at the RF input does not exceed the allowed limits when you allow attenuation of less than 10 dB in combination with auto ranging. Exceeding the limits can damage the input mixer.

10.6.1.2 Using the preamplifier

The second tool that allows you to control measurement sensitivity is the preamplifier.

Signal gain has the following effects on the measurement:

- The preamplifier allows you to detect even weak signals.
- The preamplifier reduces the noise figure of the R&S EPL and thus increases its sensitivity. Thus, it is recommended to use the preamplifier for measurements that require maximum sensitivity.
- The preamplifier reduces the dynamic range. To perform a measurement using the maximum dynamic range, turn off the preamplifier.
- The preamplifier is located after the preselection filters, reducing the risk of overloading the input mixer by strong out-of-band signals.

The gain of the preamplifier is automatically considered in the level display. The disadvantage of a lower large-signal immunity (intermodulation) is reduced by the "preselector".

10.6.1.3 Using the preselector

The "preselector" is another tool to control measurement sensitivity.

Preselection has the following effects on the measurement:

- Preselection rejects most of the spectral energy which helps to protect the input mixer and thus makes sure that the measurement results are valid and reliable.
- Preselection filters out signals that you do not want to be displayed (selectivity) and thus allows you to analyze only the frequency range you are interested in.

The preselector of the R&S EPL consists of several filters which are automatically applied during measurements. The filter that is used depends on the frequency that is currently measured. You can see the list of filters and the progress in the "Preselector" result display. The currently applied filter is indicated by a green LED, filters that are outside the scan range are ignored.

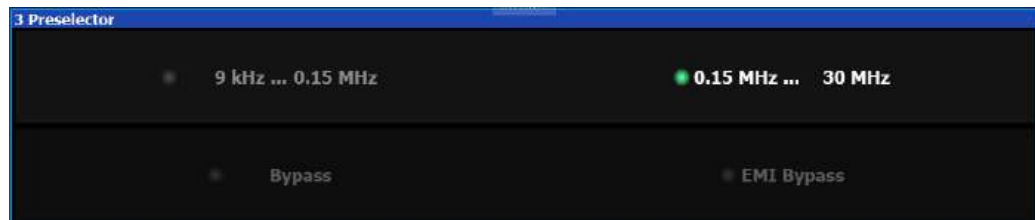


Figure 10-2: Preselector result display. The green LED indicates the currently applied filter.



Using the preselector

Switching the filters is a mechanical process. Avoid excessive filters switches, because the hardware can wear out.

Note that results in a frequency band are only displayed if there is at least one valid measurement point in the corresponding range. If a particular measurement point is captured by more than one filter, the R&S EPL displays the combined results.

10.6.2 Amplitude settings

Access: "Overview" > "Amplitude" > "Amplitude"

Amplitude settings determine how the R&S EPL processes or displays the input signals.



Functions in the "Amplitude" dialog box described elsewhere:

- "Attenuation" on page 110
- "Auto Range" on page 109

- "Preamplifier" on page 110
- "Input Coupling" on page 137
- "Impedance" on page 137

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L dBx/MHz.....	162

10 dB Minimum Attenuation

Turns the availability of attenuation levels of less than 10 dB on and off.

When you turn on this feature, the attenuation is always at least 10 dB. This minimum attenuation protects the input mixer and avoids accidental setting of 0 dB, especially if you measure EUTs with high RFI voltage.

When you turn it off, you can also select attenuation levels of less than 10 dB.

The setting applies to a manual selection of the attenuation as well as the automatic selection of the attenuation.

Notice: For more information, see [Section 10.6.1, "Increasing measurement sensitivity \(or avoiding an input mixer overload\)"](#), on page 158.

Remote command:

`INPut:ATTenuation:PROtection[:STATe]` on page 459

Unit

Selects the unit displayed on the vertical axis.

The unit on the vertical axis represents the unit the results are evaluated in. You can select one of the following units: dBm, dBμV, dBpW, dBμA, dBmV, dBpT.

Remote command:

`CALCulate<n>:UNIT:POWer` on page 457

dBx/MHz ← Unit

Turns the display of results in units relative to a 1 MHz bandwidth on and off.

You can normalize the following units to 1 MHz.

Unit	Relative unit
dBμV	dBμV/MHz
dBμV/m	dBμV/mMHz (Available for active transducers only.)
dBmV	dBmV/MHz
dBμA	dBμA/MHz
dBμA/m	dBμA/mMHz (Available for active transducers only.)
dBpW	dBpW/MHz
dBpT	dBpT/MHz

The conversion to 1 MHz bandwidth is realized via the pulse bandwidth of the selected resolution bandwidth.

Example:

Conversion example for dBµV:

$$P[\text{dB}\mu\text{V}/\text{MHz}] = P[\text{dB}\mu\text{V}] - 20 \cdot \log\left(\frac{B_{\text{imp}}[\text{MHz}]}{1\text{MHz}}\right)$$

P = Displayed level
B_{imp} = Pulse bandwidth of the selected RBW

If you are using another unit, replace "dBµV" with the corresponding unit.

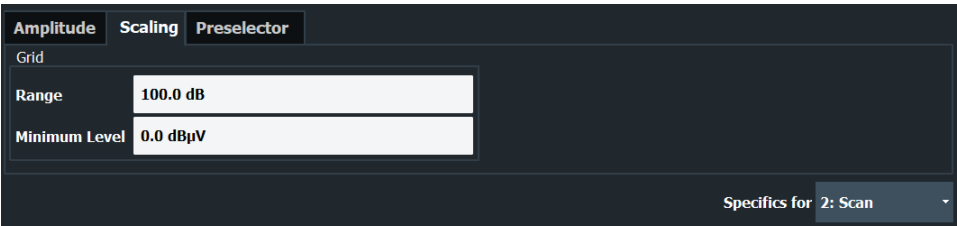
The conversion is also possible when a transducer defines the used unit.

Remote command:
CALCulate<n>:UNIT:POWer on page 457

10.6.3 Diagram scale

Access: "Overview" > "Amplitude" > "Scaling"

Scaling settings configure the vertical axis of diagrams.



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Grid Range / Minimum Level

Defines the scale of the vertical diagram axis.

The display ranges go from 10 dB to 200 dB in 0.01 dB steps. Invalid entries or combinations of range and minimum level are rounded off to the nearest valid value.

- **"Range"**
Defines the level display range for the scan diagram.
- **"Minimum Level"**
Defines the minimum level of the display range.

Remote command:
Range: DISPLAY[:WINDow<n>][:SUBWindow<w>]:TRACe<t>:Y[:SCALE]
on page 460
Min. level: DISPLAY[:WINDow<n>]:TRACe<t>:Y[:SCALE]:BOTTom on page 460

10.6.4 Preselector

For more information see [Section 10.5.3, "Configuring the signal path \(Preselector\)"](#), on page 137.

10.7 Frequency and span configuration

The frequency and span settings define the scope of the signal and spectrum that you want to analyze.

- [Impact of the frequency and span settings](#)..... 164
- [Frequency and span settings](#)..... 167

10.7.1 Impact of the frequency and span settings

Some background knowledge on the impact of the described settings is provided here for a better understanding of the required configuration.

- [Defining the scope of the measurement - frequency range](#)..... 164
- [Coping with large frequency ranges - logarithmic scaling](#)..... 165
- [Keeping the center frequency stable - signal tracking](#)..... 165

10.7.1.1 Defining the scope of the measurement - frequency range

The frequency range defines the scope of the signal and spectrum to be analyzed.

In the receiver application, the R&S EPL supports several measurement concepts.

- Measurements over a specified frequency range
The frequency range is defined by start and stop frequency. This concept is usually used by scans. If you are using a scan table, you can split the frequency range into several smaller subranges.
- Measurements on a single frequency
The measurement is performed on a single frequency. This concept is used by bar-graph measurements, for example.
- Measurements on a set of single frequencies
The measurement is performed on a set of single frequencies that are within a specified frequency range. This concept is used by the final measurement, for example.
- Measurements within a frequency span around the receiver frequency
The measurement shows the spectrum around the receiver frequency in greater detail. This concept is used by the IF analysis.

In any way, make sure that the receiver frequency is at least twice as large as the resolution bandwidth. If you use a frequency that is lower or equal to the measurement bandwidth, the R&S EPL automatically reduces the measurement bandwidth.

10.7.1.2 Coping with large frequency ranges - logarithmic scaling

In a linear display, the frequencies are distributed linearly across the x-axis. That means the entire frequency range is divided by the number of measurement points, and the distance between measurement points is equal. Linear scaling is useful to determine precise frequencies within a small range.



Figure 10-3: Linear x-axis scaling: the distance between the measurement points is equal, e.g. 200 kHz

However, if high and low frequencies appear in the same display, it is difficult to determine individual frequencies precisely or to distinguish frequencies that are close together.

In a logarithmic display, lower frequencies are distributed among a much larger area of the display, while high frequencies are condensed to a smaller area. Now it is much easier to distinguish several lower frequencies, as they are spread over a wider area. Logarithmic scaling is useful for overview measurements when a large frequency range must be displayed in one diagram.

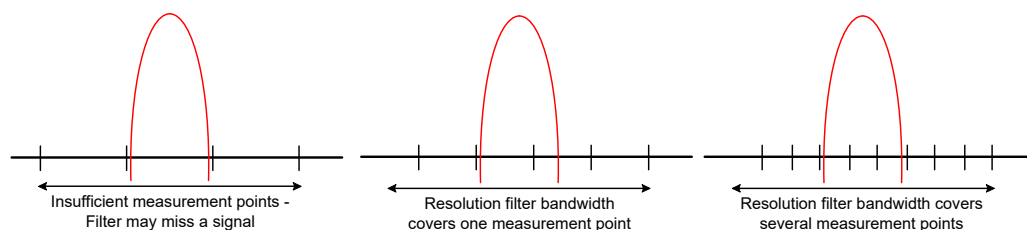
However, with logarithmic scaling, the frequency resolution between two measurement points deteriorates with higher frequencies.



Figure 10-4: Logarithmic x-axis scaling: the distance between measurement points is variable

In the spectrum from 10 Hz to 100 Hz, the distance is a few Hz. Between 100 MHz and 1 GHz, the distance is several MHz.

Thus, for logarithmic x-axis scaling, the number of measurement points must be sufficiently high in order to distinguish high frequencies precisely. The resolution bandwidth should cover at least one measurement point (that means: the distance between two measurement points should not exceed the RBW). If this condition is not met, signals or interferers could be missed, especially narrowband interferers.



10.7.1.3 Keeping the center frequency stable - signal tracking

Note: in the Receiver application, signal tracking is available for the IF analysis.

If the signal drifts on the display but you want to keep the center frequency on the signal peak, the center frequency can be adjusted automatically using **signal tracking**. In this case, the signal trace is surveyed in a specified bandwidth around the expected center frequency. After each sweep, the center frequency is set to the maximum signal found within the searched bandwidth. If no maximum signal above a defined threshold value is found in the searched bandwidth, the center frequency remains unchanged. The search bandwidth and the threshold value are shown in the diagram by red lines which are labeled as "TRK".

Frequency	
Frequency	Signal Tracking
State	On Off
Tracking Bandwidth	10.0 Hz
Tracking Threshold	-13.0 dBµV
Signal Track Trace	1

Signal Tracking

Access: "Overview" > "Frequency" > "Signal Tracking" tab

Defines the settings for signal tracking. These settings are only available for spans > 0.

If activated, after each sweep, the center frequency is set to the maximum level of the specified "Signal Track Trace" found within the searched "Tracking Bandwidth".

If the signal level does not pass the "Tracking Threshold", the center frequency is not changed.

Remote command:

[CALCulate<n>:MARKer<m>:FUNCTION:STRack\[:STATE\]](#) on page 454

[CALCulate<n>:MARKer<m>:FUNCTION:STRack:BANDwidth](#) on page 454

[CALCulate<n>:MARKer<m>:FUNCTION:STRack:THReshold](#) on page 454

[CALCulate<n>:MARKer<m>:FUNCTION:STRack:TRACe](#) on page 455

10.7.2 Frequency and span settings

Access (general frequency settings): "Overview" > "Frequency" > "Frequency"

Access (signal tracking): "Overview" > "Frequency" > "IF Signal Tracking"

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Receiver Frequency

Defines the receiver frequency.

For a scan, make sure to define a frequency that is at least twice as large as the resolution bandwidth. If you use a frequency that is lower, the R&S EPL automatically reduces the bandwidth.

Tip: In the scan diagram, you can add a vertical line that represents the frequency that the R&S EPL is currently tuned to (**Tuned Frequency**, available in the "Lines" menu).

Tip: You can lock the frequency with the corresponding button in the toolbar. If you turn on the frequency lock, the frequency does not change when you turn the rotary knob. Changing the frequency with the cursor keys or the numeric keys still works.

Remote command:

[SENSe:] FREQuency:CENTer on page 456

Synchronizing the receiver frequency to the marker frequency ← Receiver Frequency

When you are using a marker in the "Scan" result display, you can synchronize the receiver frequency with the current marker position by just moving the marker.

The R&S EPL provides two methods to synchronize marker and receiver frequency.

- "Marker Tracking"
Tracks the marker position when you move the marker and automatically synchronizes the receiver frequency with the new marker position.
In that case, the bargraph always shows the level at the current marker position.

- "Tune to Marker"
Synchronizes the receiver frequency and the current marker position once.
(In fact, this function only has an effect when "Marker Tracking" is turned off, because otherwise, the marker position and frequency are synchronized automatically.)

The R&S EPL always synchronizes to the position of the currently selected marker, even if it is a relative delta marker.

The "Marker Tracking" and "Tune to Marker" softkeys are available in the "Marker To" softkey menu (accessible via the [MKR →] key).

Remote command:

Marker tracking: `CALCulate<n>:MARKer<m>:COUPled[:STATe]` on page 498

Tune to Marker: `CALCulate<n>:MARKer<m>:FUNCTION:CENTer` on page 453

Start / Stop Frequency

Defines the start and stop frequencies for the scan.

The range for the start frequency is $f_{\min}$ to $(f_{\max} - 10 \text{ Hz})$.

The range for the stop frequency is $(f_{\min} + 10 \text{ Hz})$ to $f_{\max}$.

$f_{\min}$ and $f_{\max}$ are defined in the datasheet.

Remote command:

Start frequency: `[SENSe:]FREQuency:START` on page 408

Stop frequency: `[SENSe:]FREQuency:STOP` on page 408

Frequency Axis Scale

Selects the scale of the frequency axis.

Logarithmic scaling is only available for $f_{\text{stop}} \geq 1.4 * f_{\text{start}}$.

More information

"Linear" Selects a linear scaling of the frequency axis.

"Logarithmic" Selects a logarithmic scaling of the frequency axis.

Remote command:

`DISPlay[:WINDow<n>]:TRACe<t>:X:SPACing` on page 455

Frequency Stepsize

Defines the stepsize by which the receiver frequency is increased or decreased when you change it with the arrow keys or the rotary knob.

Note that the rotary knob and the arrow keys apply different steps.

When you turn on "Wheel = Up / Down", the rotary knob and cursor keys have the same step size (that of the cursor keys).

- "Coarse"
- The stepsize is coupled to the receiver frequency.
 - When you change the frequency with the rotary knob, the R&S EPL increases or decreases the 4th digit of the receiver frequency.
 - When you change the frequency with the arrow keys, the R&S EPL increases or decreases the 2nd digit of the receiver frequency.

"Fine"	The stepsize is coupled to the receiver frequency. • When you change the frequency with the rotary knob, the R&S EPL increases or decreases the 7th digit of the receiver frequency. • When you change the frequency with the arrow keys, the R&S EPL increases or decreases the 5th digit of the receiver frequency.
"Manual"	The stepsize is a fixed custom value. • When you change the frequency with the rotary knob, the R&S EPL increases or decreases the frequency by 10 % of the manual stepsize. • When you change the frequency with the arrow keys, the R&S EPL increases or decreases the frequency by the manual stepsize.
"Frequency = Stepsize"	The stepsize is equal to the current receiver frequency. This option is useful for measurements of the harmonic content of a signal. Each change of the frequency selects the next harmonic.
"<x> * Meas BW"	The stepsize is a percentage of the measurement bandwidth (10 %, 50 % or a custom percentage).

Remote command:

[SENSe:]FREQuency:CENTer:STEP on page 456

Couple Bargraph Settings

Couples or decouples the bargraph settings to the scan settings (or scan range if you are using a scan table).

"Off"	Bargraph settings and scan settings are independent.
"Last Scan"	Uses the configuration of the last scan.
"Scan Table"	Uses the current configuration of the scan table, if you have changed it since the last scan. (If you have not changed anything, the configuration of the last scan is still in effect.)

Remote command:

[SENSe:]FREQuency:SCOuPled on page 457

IF Analysis

Defines the span and resolution bandwidth for IF analysis.

The **"Span"** defines the spectrum that is analyzed around the receiver frequency. When you change the span, the receiver frequency remains the same.

Tip: In the "IF Span" softkey menu, you can quickly set the **"Full IF Span"** and the **"Last IF Span"** with the corresponding softkeys. The last span is the span that was selected prior to the current span. You can access the "IF Span" menu via the [SPAN] key.

The **"Resolution Bandwidth"** (RBW) selects the width of the resolution filter that is used for IF spectrum analysis. Note that the available resolution bandwidths depend on the currently selected span.

In addition, you can couple the IF span to the [Measurement Bandwidth](#) (used for the bargraph).

When "IF Span Coupled" has been turned on, the IF span is a function of the measurement bandwidth.

Remote command:

Span: `[SENSe:]FREQuency:SPAN` on page 457

Full span: `[SENSe:]FREQuency:SPAN:FULL` on page 457

RBW: `[SENSe:]BANDwidth:IF` on page 461

IF span coupled: `[SENSe:]BANDwidth:SCPL` on page 461

IF Signal Tracking

Defines the characteristics for signal tracking.

When you turn on signal tracking, the R&S EPL tracks the signal and updates the receiver frequency accordingly. The signal is assumed to be at highest level that has been found within the **tracking bandwidth**. The tracking bandwidth defines a search area around the receiver frequency.

You can also define a **tracking threshold**. If the signal level does not pass the threshold, the center frequency is not changed.

If you use more than one trace, you can select the **trace** signal tracking is applied to.

Signal tracking is available for IF spectrum analysis and for spans > 0.

[More information.](#)

Remote command:

State: `CALCulate<n>:MARKer<m>:FUNCTION:STRack[:STATe]` on page 454

Bandwidth: `CALCulate<n>:MARKer<m>:FUNCTION:STRack:BANDwidth`
on page 454

Threshold: `CALCulate<n>:MARKer<m>:FUNCTION:STRack:THReshold`
on page 454

Trace: `CALCulate<n>:MARKer<m>:FUNCTION:STRack:TRACe` on page 455

10.8 Bandwidth and filter configuration

The basic bandwidth, filter and sweep settings that apply to most measurements are described here. These parameters define how the data is measured and which filters are used.

- [Impact of bandwidth and filter settings](#)..... 170
- [Bandwidth and filter settings](#)..... 171

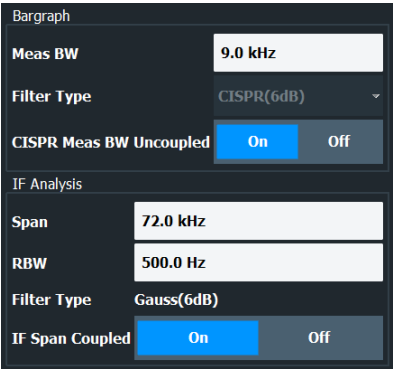
10.8.1 Impact of bandwidth and filter settings

For more background information about bandwidths and filters refer to the following topics:

- [Section 9.3.1.1, "Selecting the measurement bandwidth"](#), on page 91

10.8.2 Bandwidth and filter settings

Access: "Overview" > "Bandwidth"



Functions in the "Bandwidth" dialog box described elsewhere:

- ["IF Analysis"](#) on page 169
- ["Measurement Bandwidth"](#) on page 90
- ["Filter Type"](#) on page 90

[CISPR RBW Uncoupled](#).....171

CISPR RBW Uncoupled

Cancels the coupling of the IF bandwidth to the frequency range with the activated quasipeak detector, CISPR average or RMS average detector.

See also [Section 11.3.1.1, "Working with trace detectors"](#), on page 186.

Remote command:

`[SENSe:]BANDwidth[:RESolution]:AUTO` on page 462

10.9 Trigger and gate configuration

Triggering means to capture the interesting part of the signal. Choosing the right trigger type and configuring all trigger settings correctly allows you to detect various incidents in your signals.

Gating allows you to restrict measurement analysis to the important part or parts of the signal, for example bursts.

- [Basics on triggered and gated measurements](#).....171
- [Triggering measurements](#)..... 174

10.9.1 Basics on triggered and gated measurements

- [Trigger offset](#)..... 172
- [Gated measurements](#).....172

10.9.1.1 Trigger offset

An offset can be defined to delay the measurement after the trigger event, or to include data before the actual trigger event in time domain measurements (pre-trigger offset). Pre-trigger offsets are possible because the R&S EPL captures data continuously in the time domain, even before the trigger occurs.

See ["Trigger Offset"](#) on page 175.

10.9.1.2 Gated measurements

Like a gate provides an opening in a fence, a gated measurement lets data from the input signal pass in defined areas only. The *gate* controls exactly when data is included in the measurement results and when not. The gate is opened by the trigger source, which is also the gate source.

Gates can be used in two different modes:

- **Level:** The gate opens and the measurement starts when a defined level in the gate source is exceeded and stops when the gate source drops below the "Gate Level".
Using a pulsed gate signal in level mode, the following behavior can be achieved: When the gate source signal is active, the input signal data is collected; when the gate signal is inactive, the input signal is ignored.
- **Edge:** The gate opens and the measurement starts when a defined level in the gate source is exceeded and stops when the defined "Gate Length" is reached.

Additionally, a delay time can be defined so that the first few measurement points after the gate opening are ignored.

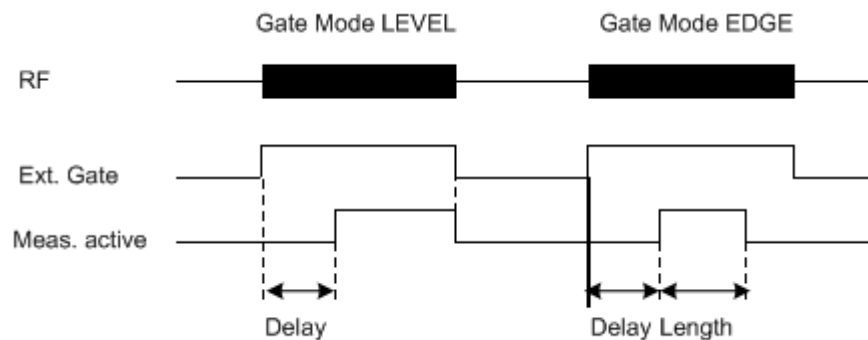


Figure 10-5: Effects of Gate mode, Gate delay and Gate length

Example:

By using a gate in sweep mode and stopping the measurement while the gate signal is inactive, the spectrum for pulsed RF carriers can be displayed without the superposition of frequency components generated during switching. Similarly, the spectrum can also be analyzed for an inactive carrier. The sweep can be controlled by an external gate or by the internal power trigger.

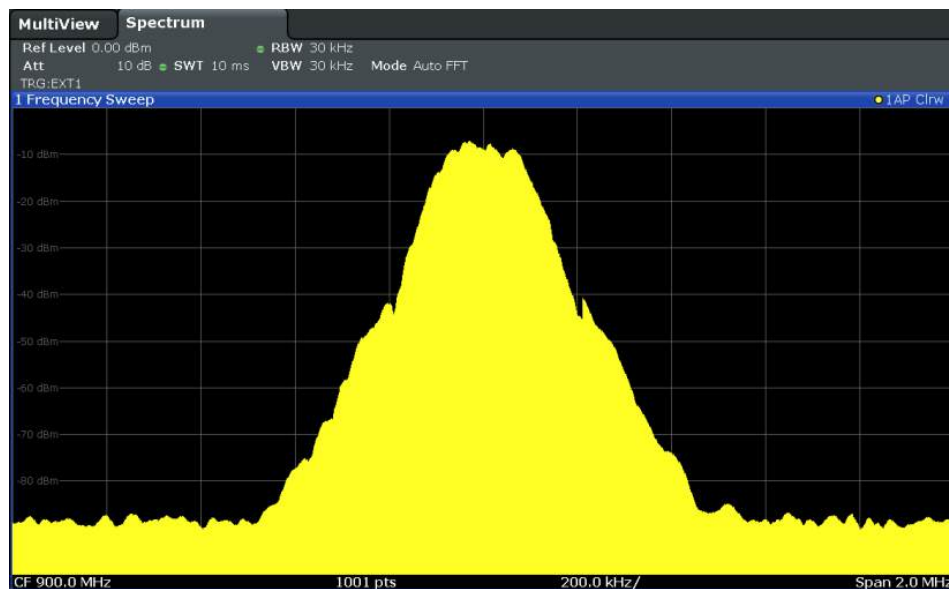


Figure 10-6: GSM signal with GATE OFF

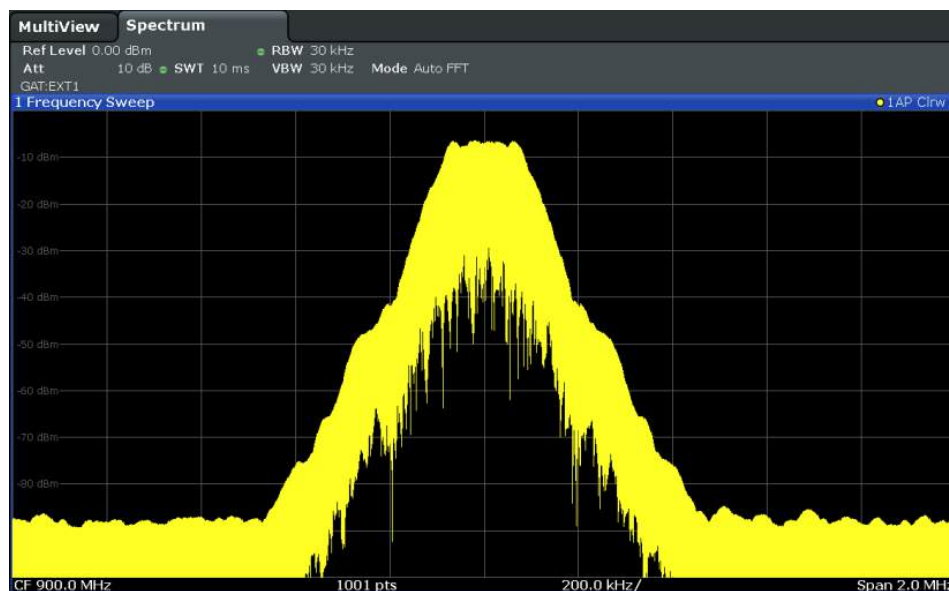


Figure 10-7: GSM signal with GATE ON

To indicate that a gate is used for the sweep, "GAT" and the gate source is displayed in the channel bar.

Gated measurements in receiver application

Gated measurements are also available in the receiver application. Basically, they work like gated measurements in the spectrum application with some distinctive features.

In the receiver application, a gated measurement affects the bargraph, scan and final measurement. They are useful, for example, when you only want to collect measurement data during times when a DUT is actually running and emits potential interfering signals, or in case you already know that interferers occur regularly and want to collect measurement data during the time when the interference is not present.

The following distinctive features apply.

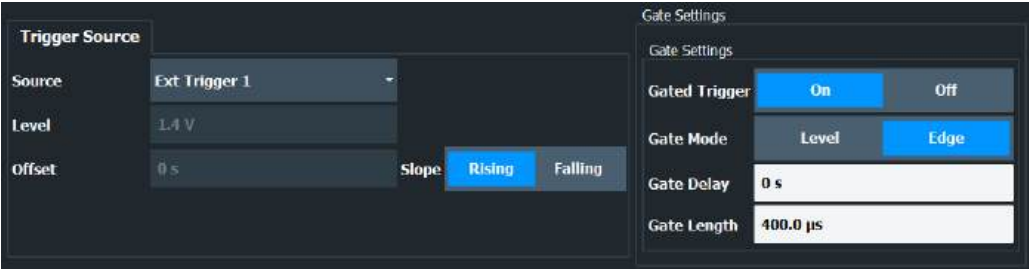
- The scan is interrupted when the gate is closed. When it reopens, the scan is resumed on the last measured frequency (just like if you have interrupted the scan deliberately).
- Each measurement point is measured for a certain period of time (defined by the [measurement time](#)). If the gate closes before the R&S EPL is done with any particular measurement point, the remaining time is measured when the gate opens again. The actual results in that case are the sum of the partial measurements.
Example: The measurement time is 1 second. The gate closes after 0.6 seconds. The data that has already been collected is kept. When the gate opens again, the R&S EPL resumes the measurement for another 0.4 seconds, and combines the two partial measurements.

10.9.2 Triggering measurements

Access (trigger source): "Overview" > "Trigger" > "Trigger Source"

Access (gate settings): "Overview" > "Trigger" > "Trigger Source"

Access (trigger input / output): "Overview" > "Trigger" > "Trigger In / Out"



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 L External Trigger 1..... 175

Trigger Level..... 175

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Trigger Source

Selects the trigger source.

If you select a trigger source other than "Free Run", "TRG" is displayed in the channel bar and the trigger source is indicated.

Remote command:

[TRIGger\[:SEquence\]:SOURce](#) on page 465

Free Run ← Trigger Source

No trigger source is considered. Data acquisition is started manually or automatically and continues until stopped explicitly.

In its default state, the R&S EPL performs free run measurements.

Remote command:

[TRIGger\[:SEquence\]:SOURce](#) on page 465

External Trigger 1 ← Trigger Source

Data acquisition starts when the TTL signal fed into the specified input connector meets or exceeds the specified trigger level.

For details, see the "Instrument Tour" section in the R&S EPL Getting Started manual.

Remote command:

TRIG:SOUR EXT

[TRIGger\[:SEquence\]:SOURce](#) on page 465

Trigger Level

Defines the trigger level for the selected trigger source.

The trigger level is always 1.4 V.

Remote command:

n/a

Trigger Offset

Defines the time offset between the trigger event and the start of the sweep.

For more information, see [Section 10.9.1.1, "Trigger offset"](#), on page 172.

"values > 0" Measurement starts after the trigger event has occurred.

"values < 0" Measurement starts before the trigger event occurs (pretrigger).
The maximum allowed range is limited by the measurement time.
Pretriggering is possible in the time domain.

Remote command:

[TRIGger\[:SEquence\]:HOLDoff\[:TIME\]](#) on page 464

Trigger Slope

Selects the polarity of the trigger source.

The trigger slope is unavailable for the free run trigger.

"Rising"	The measurement starts when the signal rises to the trigger level.
"Falling"	The measurement starts when the signal falls down to the trigger level.

Remote command:

[TRIGger \[: SEquence \] : SLOPe](#) on page 465

Gated Trigger

Switches gated triggering on or off.

Note: Gating is not available for time domain scans and measurements on I/Q based data.

Remote command:

[\[SENSE: \] SWEEp: EGATe](#) on page 464

Gate Mode

Sets the gate mode.

For more information, see [Section 10.9.1.2, "Gated measurements"](#), on page 172

"Edge"	The trigger event for the gate to open is the detection of the signal edge. After the gate signal has been detected, the gate remains open until the gate length is over.
"Level"	The trigger event for the gate to open is a particular power level. After the gate signal has been detected, the gate remains open until the signal disappears.

Remote command:

[\[SENSE: \] SWEEp: EGATe: TYPE](#) on page 464

Gate Delay

Defines the delay time between the gate signal and the continuation of the measurement.

In the Spectrum application, the delay position on the time axis in relation to the measurement is indicated by a line labeled "GD".

For more information, see [Section 10.9.1.2, "Gated measurements"](#), on page 172

Remote command:

[\[SENSE: \] SWEEp: EGATe: HOLDoff](#) on page 463

Gate Length

Defines how long the gate is open when it is triggered.

The gate length can only be set in the edge-triggered gate mode. In the level-triggered mode the gate length depends on the level of the gate signal.

The gate length in relation to the sweep is indicated by a line labeled "GL".

In the Spectrum application, the gate length in relation to the measurement is indicated by a line labeled "GL".

For more information, see [Section 10.9.1.2, "Gated measurements"](#), on page 172

Remote command:

[\[SENSE: \] SWEEp: EGATe: LENGTH](#) on page 463

11 Common analysis and display functions

General methods and basic settings to display and analyze measurements, regardless of the operating mode, are described here. If you are performing a specific measurement task, using an application other than the Receiver application, be sure to check the specific application or mode description for settings and functions that may deviate from these common settings.



The analysis settings and functions are available via the "Analysis" dialog box, which is displayed when you select the "Analysis" button in the "Overview". Additional measurement-specific analysis functions may be available in separate tabs in the "Analysis" dialog box.

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• Zoomed displays	182
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• Display and limit lines	230

11.1 Result display configuration

Measurement results can be evaluated in many different ways, for example graphically, as tables, statistical evaluations. Thus, the result display is highly configurable to suit your specific requirements and optimize analysis. Here you can find out how to work and lay out the result display.

General display settings that are usually configured during initial instrument setup, independently of the current measurement, for example which items or colors are displayed on the screen, are described in [Section 13.2, "Display settings"](#), on page 285.

• Basic evaluation methods	177
• Laying out the result display with the smartgrid	178

11.1.1 Basic evaluation methods

Measurement results can be displayed and evaluated using various different methods, also at the same time. You can control the type and number of results displays and evaluation methods with the SmartGrid functionality.

For more information about the features available through the SmartGrid, refer to the following topics.

- **Bargraph**
 - [Section 9.2, "Bargraph configuration"](#), on page 86
- **Scan**
 - ["Scan"](#) on page 95
 - [Section 9.3.3, "Performing a scan"](#), on page 103

- **IF analysis**
 - ["IF analysis"](#) on page 99
 - ["IF Analysis"](#) on page 169
- **Spectrogram** (for scan and IF analysis)
 - [Section 11.3.1.3, "Working with spectrograms"](#), on page 192
 - [Section 11.3.7, "Spectrogram settings"](#), on page 205
- **Marker table**
 - ["Marker information in marker table"](#) on page 218
- **Peak list**
 - [Section 9.3.4, "Performing a peak search"](#), on page 111
- **Final measurement**
 - ["Final measurement"](#) on page 98
 - [Section 9.3.5, "Performing final measurements"](#), on page 118
- **Preselector**
 - [Section 10.5.3, "Configuring the signal path \(Preselector\)"](#), on page 137
- **Fast access**
 - [Section 10.1, "Using the fast access panel"](#), on page 130
- **User port**
 - [Section 10.2, "Using the user port panel"](#), on page 132
- **Notes**
 - [Section 10.3, "The notes display"](#), on page 133

For more information about the SmartGrid in general, see [Section 7.6.2, "Laying out the result display with the smartgrid"](#), on page 68.

11.1.2 Laying out the result display with the smartgrid

Measurement results can be evaluated in many different ways, for example graphically, as summary tables, statistical evaluations etc. Each type of evaluation is displayed in a separate window in the channel setup tab. Up to 16 individual windows can be displayed per channel setup (i.e. per tab). To arrange the diagrams and tables on the screen, the Rohde & Schwarz SmartGrid function helps you find the target position simply and quickly.

Principally, the layout of the windows on the screen is based on an underlying grid, the SmartGrid. However, the SmartGrid is dynamic and flexible, allowing for many different layout possibilities. The SmartGrid functionality provides the following basic features:

- Windows can be arranged in columns or in rows, or in a combination of both.
- Windows can be arranged in up to four rows and four columns.
- Windows are moved simply by dragging them to a new position on the screen, possibly changing the layout of the other windows, as well.
- All evaluation methods available for the currently selected measurement are displayed as icons in the evaluation bar. If the evaluation bar contains more icons

than can be displayed at once on the screen, it can be scrolled vertically. The same evaluation method can be displayed in multiple windows simultaneously.

- New windows are added by dragging an evaluation icon from the evaluation bar to the screen. The position of each new window depends on where you drop the evaluation icon in relation to the existing windows.
- All display configuration actions are only possible in SmartGrid mode. When SmartGrid mode is activated, the evaluation bar replaces the current softkey menu display. When the SmartGrid mode is deactivated again, the previous softkey menu display is restored.
- [Background information: the smartgrid principle](#).....179
- [How to activate smartgrid mode](#).....180
- [How to add a new result window](#).....181
- [How to close a result window](#).....181
- [How to arrange the result windows](#).....182

11.1.2.1 Background information: the smartgrid principle

SmartGrid display

During any positioning action, the underlying SmartGrid is displayed. Different colors and frames indicate the possible new positions. The position in the SmartGrid where you drop the window determines its position on the screen.

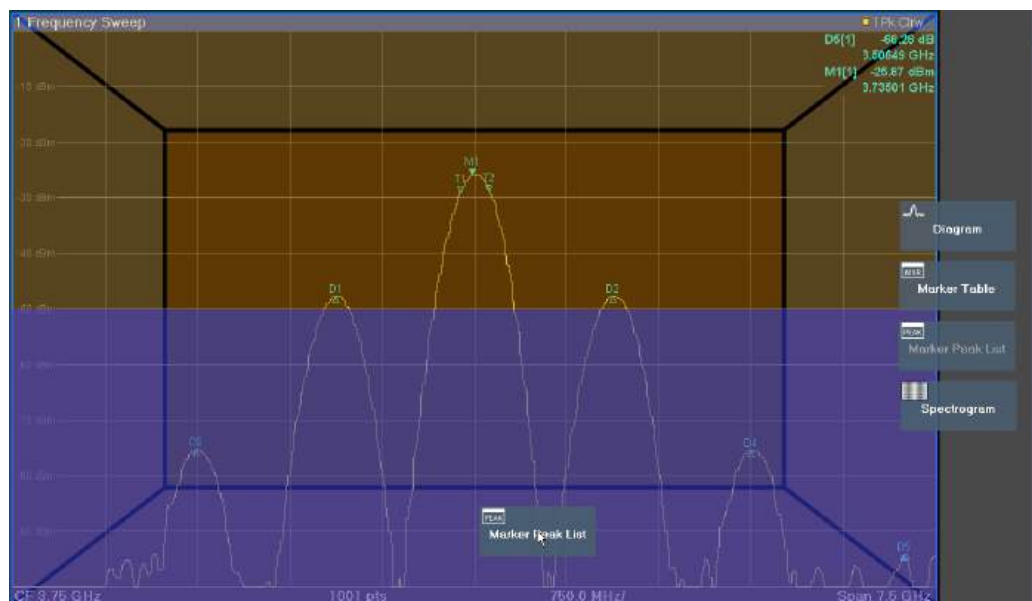


Figure 11-1: Moving a window in SmartGrid mode

The brown area indicates the possible "drop area" for the window, i.e. the area in which the window can be placed. A blue area indicates the (approximate) layout of the window as it would be if the icon were dropped at the current position. The frames indicate the possible destinations of the new window with respect to the existing windows:

above/below, right/left or replacement (as illustrated in Figure 7-6). If an existing window would be replaced, the drop area is highlighted in a darker color shade.

Positioning the window

The screen can be divided into up to four rows. Each row can be split into up to four columns, where each row can have a different number of columns. However, rows always span the entire width of the screen and may not be interrupted by a column. A single row is available as the drop area for the window in the SmartGrid. The row can be split into columns, or a new row can be inserted above or below the existing row (if the maximum of 4 has not yet been reached).

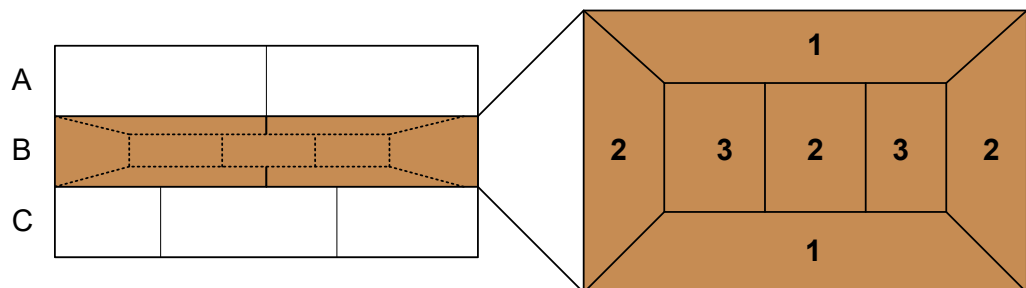


Figure 11-2: SmartGrid window positions

- 1 = Insert row above or below the existing row
- 2 = Create a new column in the existing row
- 3 = Replace a window in the existing row

SmartGrid functions

Once the evaluation icon has been dropped, icons in each window provide delete and move functions.



The "Move" icon allows you to move the position of the window, possibly changing the size and position of the other displayed windows.



The "Delete" icon allows you to close the window, enlarging the display of the remaining windows.

11.1.2.2 How to activate smartgrid mode

All display configuration actions are only possible in SmartGrid mode. In SmartGrid mode the evaluation bar replaces the current softkey menu display. When the SmartGrid mode is deactivated again, the previous softkey menu display is restored.

- To activate SmartGrid mode, do one of the following:



Select the "SmartGrid" icon from the toolbar.

- Select "Display Config" in the configuration "Overview".
- Select "Display Config" from the [Meas Config] menu.

The SmartGrid functions and the evaluation bar are displayed.



To close the SmartGrid mode and restore the previous softkey menu, select the "Close" icon, or press any key.

11.1.2.3 How to add a new result window

Each type of evaluation is displayed in a separate window. Up to 16 individual windows can be displayed per channel setup (i.e. per tab).

1. Activate SmartGrid mode.

All evaluation methods available for the currently selected measurement are displayed as icons in the evaluation bar.

2. Select the icon for the required evaluation method from the evaluation bar.
If the evaluation bar contains more icons than can be displayed at once on the screen, it can be scrolled vertically. Touch the evaluation bar between the icons and move it up or down until the required icon appears.
3. Drag the required icon from the evaluation bar to the SmartGrid, which is displayed in the diagram area, and drop it at the required position. (See [Section 7.6.2.5, "How to arrange the result windows"](#), on page 71 for more information on positioning the window).

Remote command:

`LAYout:ADD[:WINDow]?` on page 469 / `LAYout:WINDow<n>:ADD?` on page 473

11.1.2.4 How to close a result window

- To close a window, activate SmartGrid mode and select the "Delete" icon for the window.



Remote command:

`LAYout:REMove[:WINDow]` on page 471 / `LAYout:WINDow<n>:REMove` on page 474

11.1.2.5 How to arrange the result windows

1. Select an icon from the evaluation bar or the "Move" icon for an existing evaluation window.



2. Drag the evaluation over the SmartGrid.
A blue area shows where the window will be placed.
3. Move the window until a suitable area is indicated in blue.
4. Drop the window in the target area.
The windows are rearranged to the selected layout, and "Delete" and "Move" icons are displayed in each window.
5. To close a window, select the corresponding "Delete" icon.



Remote command:

[LAYout:REPLace\[:WINDow\]](#) on page 471 / [LAYout:WINDow<n>:REPLace](#) on page 474

[LAYout:MOVE\[:WINDow\]](#) on page 471

11.2 Zoomed displays

You can zoom into the diagram to visualize the measurement results in greater detail. Using the touchscreen or a mouse pointer you can easily define the area to be enlarged.

Zooming into the diagram actually changes the scale of the two diagram axes. New start and stop frequencies are defined as well as a new range for the y-axis, depending on the area you have zoomed into.

For more information see [Section 11.2.2, "How to zoom into the diagram in receiver mode"](#), on page 185.



In the Receiver application, multiple zoom (🔍) is not available.

- [Zoom functions](#).....183
- [How to zoom into the diagram in receiver mode](#).....185

11.2.1 Zoom functions

Access: 

Single Zoom.....	183
Multi-Zoom.....	183
Measurement Zoom.....	183
L Level Lock.....	184
L X-Lock.....	184
L Y-Lock.....	184
L Adapt Measurement to Zoom (selected diagram).....	184
Restore Original Display.....	184

Single Zoom



A single zoom replaces the current diagram by a new diagram which displays an enlarged extract of the trace. This function can be used repetitively until the required details are visible.

Remote command:

`DISPlay[:WINDow<n>][:SUBWindow<w>]:ZOOM[:STATe]` on page 479

`DISPlay[:WINDow<n>][:SUBWindow<w>]:ZOOM:AREA` on page 478

Multi-Zoom



In multiple zoom mode, you can enlarge several different areas of the trace simultaneously. An overview window indicates the zoom areas in the original trace, while the zoomed trace areas are displayed in individual windows. The zoom area that corresponds to the individual zoom display is indicated in the lower right corner, between the scrollbars.

Remote command:

`DISPlay[:WINDow<n>][:SUBWindow<w>]:ZOOM:MULTiple<zn>[:STATe]`
on page 479

`DISPlay[:WINDow<n>][:SUBWindow<w>]:ZOOM:MULTiple<zn>:AREA`
on page 479

Measurement Zoom

As opposed to the graphical zoom, which is merely a visual tool, the measurement zoom adapts the measurement settings such that the data you are interested in is displayed in the required detail. In measurement zoom mode, you can change the display using touch gestures. This is the default operating mode of the R&S EPL.

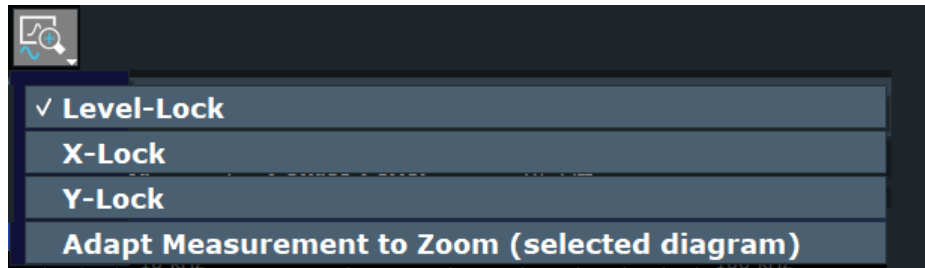
For details on touch gestures see "Operating Basics" in the R&S EPL Getting Started manual.

Note: The measurement settings are adapted to practical values based on a suitable grid for the current settings, rather than to unwieldy values that reflect precisely the pixel you happen to tap.

If the measurement zoom leads to undesirable results, you can easily return to the original measurement settings using the "UNDO" function.

When you select the "Measurement Zoom" icon, then tap in a diagram, a dotted rectangle is displayed which you can drag to define the zoom area. This allows you to define the zoom area more precisely than by spreading two fingers in the display.

The measurement zoom function provides further options in a context-sensitive menu, which is displayed when you tap the icon for about a second (or right-click it). These options concern the behavior of the firmware for subsequent touch gestures on the screen. Note that these settings remain unchanged after a channel preset.



Level Lock ← Measurement Zoom

If activated (default), the reference level (and thus the attenuation) is locked, that is: remains unchanged during touch gestures on the screen.

X-Lock ← Measurement Zoom

If activated, the x-axis of the diagram is not changed during subsequent touch gestures.

Y-Lock ← Measurement Zoom

If activated, the y-axis of the diagram is not changed during subsequent touch gestures.

Adapt Measurement to Zoom (selected diagram) ← Measurement Zoom

If you already performed a graphical zoom using the "Single Zoom" on page 183 or "Multi-Zoom" on page 183 functions, this function automatically adapts the measurement settings to maintain the currently zoomed display.

Restore Original Display



Restores the original display, that is, the originally calculated displays for the entire capture buffer, and closes all zoom windows.

Note: This function only restores graphically zoomed displays. Measurement zooms, for which measurement settings were adapted, are recalculated based on the adapted measurement settings. In this case, the zoomed display is maintained.

Remote command:

`DISPlay[:WINDow<n>][:SUBWindow<w>]:ZOOM[:STATe]` on page 479

11.2.2 How to zoom into the diagram in receiver mode

Basically, zooming into a diagram in Receiver mode works the same as in other applications. However, the zoom function in Receiver mode is not merely a visual tool, but actually changes settings. Also, the multiple zoom is not available.

The remote commands required to zoom into a display are described in [Section 15.7.2, "Zoomed displays"](#), on page 477.

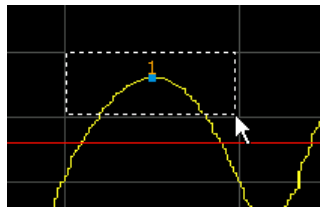
To zoom into the diagram at one position

1. 

Click on the "Single Zoom" icon in the toolbar.

Zoom mode is activated.

2. Select the area in the diagram to be enlarged on the touchscreen. The selected area is indicated by a dotted rectangle.



When you leave the touchscreen, the diagram is replaced by the zoomed trace area.

When the zoom is done, the R&S EPL changes the start and stop frequencies, based on the selected zoom area, and adjusts the range of the y-axis. Consequently, future measurements will only span the frequency range of the zoom area. Results yielded prior to the zoom may be lost.

Note that a zoom may also change other measurement settings (for example the measurement bandwidth), depending on the characteristics of the zoom area compared to the original one.

Scrolling in the zoomed display

Because zooming defines a new measurement range, scrolling in diagrams that have been zoomed into is not possible.

Restoring the original display

To restore the original display, you have to restore the measurement configuration manually by entering the recent start and stop frequencies, bandwidths etc.

11.3 Trace configuration

A trace is a collection of measured data points. The trace settings determine how the measured data is analyzed and displayed on the screen.

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11.3.1 Basics on traces

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11.3.1.1 Working with trace detectors

A trace displays the values measured at the measurement points (also known as sweep points in some applications). Usually, however, the number of measurement points considered during a measurement is much larger than the number of measurement points that can be displayed simultaneously.

For more information on measurement points, see [Section 9.3.1.2, "Calculating the number of measurement points"](#), on page 92.

Example:

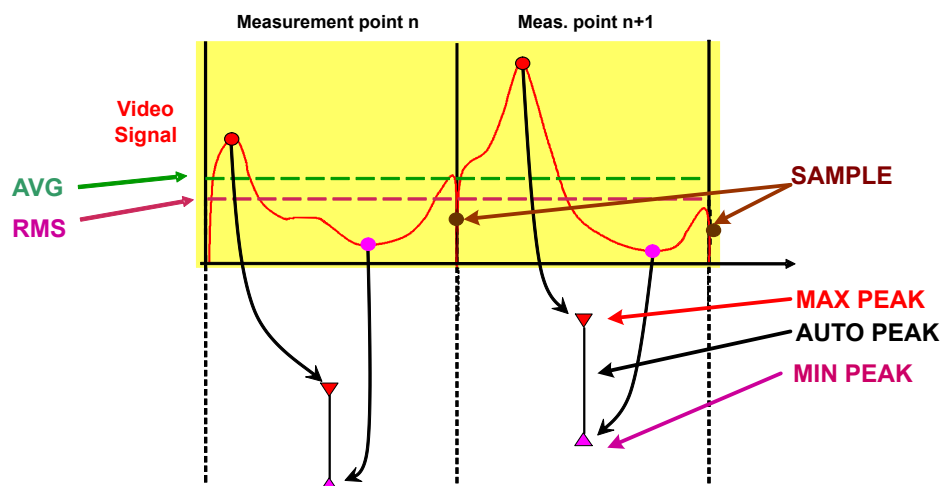
Consider the following configuration:

- Start frequency: 150 kHz
- Stop frequency: 30 MHz
- Step size: 4 kHz
- Measurement time: 100 ms

With said settings, the R&S EPL measures with a dwell time of 100 ms every 4 kHz, so the number of measurement points in that example would be about 7500.

The trace detector's task is to find a good way to combine the measurement points.

The result obtained from the selected detector for any measurement point is displayed as the value at this frequency point in the trace.



The detectors of the R&S EPL are implemented as digital devices. All detectors work in parallel in the background, which means that the measurement speed is independent of the detector combination used for different traces.

However, you should select a measurement time that is sufficient for the detector that requires the longest measurement time.

You can use several detectors simultaneously. The simultaneous use of several detectors (multiple detection) has advantages for EMC measurements, which often require different weightings: you can test different weightings with a single measurement. In the receiver application, you can even apply different detectors to the bargraph measurement, the scan and the final measurement.

The currently active detector is indicated in the trace information (see the abbreviation in brackets). Note that the detectors mentioned below may not be supported by all applications available for the R&S EPL.



Combining trace detectors

Some detector combinations are not supported in the receiver application. Possible combinations depend on the measurement type.

If you combine two or more detectors that are not compatible, the R&S EPL automatically turns off one of the traces.

Automatic selection of the detector

Available in the spectrum application.

The application automatically selects an appropriate detector, depending on the selected trace mode.

Trace mode	Detector
"Clear Write"	"Auto Peak"
"Max Hold"	"Positive Peak"
"Min Hold"	"Negative Peak"

Trace mode	Detector
"Average"	"Sample Peak"
"View"	–
"Blank"	–

The auto peak detector

Available in the spectrum application (but not for the Spectrum Emission Mask).

Combines the peak detectors ([Positive and Negative Peak](#)).

The auto peak detector determines the maximum and the minimum value of the levels measured at the individual frequencies which are displayed in one sample point.

The positive peak (or max peak) and negative peak (or min peak) detector

The positive and negative peak detectors display the maximum or minimum level that has been detected during the measurement.

Tips regarding measurement time:

- Unmodulated signals can be measured with the shortest possible measurement time.
- Pulsed signals require a measurement time that is longer than the expected pulse length. At least one pulse needs to be covered by the measurement time.

The peak detectors are digital detectors. Therefore, discharging is irrelevant even with long measurement times.

The average detector

The average detector displays the average level of the samples that have been captured during the measurement.

For average detection, the video voltage (envelope of IF signal) is averaged over the measurement time. Averaging is digital, i.e. the digitized values of the video voltage are summed up and divided by the number of samples at the end of the measurement time. This corresponds to a filtering with a rectangular window in the time domain and a filtering with $\sin x/x$ characteristic in the frequency domain.

Tips regarding measurement time:

- Unmodulated signals can be measured with the shortest possible measurement time.
- Modulated signals require a measurement time determined by the lowest modulation frequency to be averaged.
- Pulsed signals require a measurement time that is long enough to capture a sufficient number of pulses. For averaging, a sufficient number of pulses is a number greater than 10.

The RMS detector

The RMS detector evaluates the root mean square (RMS) value over the current measurement time and displays the resulting value. The integration time corresponds to the measurement time.

Tips regarding measurement time:

- Unmodulated signals can be measured with the shortest possible measurement time.
- Modulated signals require a measurement time determined by the lowest modulation frequency to be averaged.
- Pulsed signals require a measurement time that is long enough to capture a sufficient number of pulses. For averaging, a sufficient number of pulses is a number greater than 10.



The RMS detector and the video bandwidth

When you are using the RMS detector in the spectrum application, the video bandwidth (VBW) in the hardware is bypassed.

Duplicate trace averaging with small VBWs and the RMS detector is therefore not possible. However, the VBW is still considered for calculating the measurement time. This results in a longer measurement time for small VBW values. Thus, you can reduce the VBW to get more stable traces even when you are using the RMS detector. Normally, if the RMS detector is used the measurement time should be increased to get more stable traces.

The sample detector

The sample detector displays the first level value that has been measured in a particular statistical bin. All other values that have been measured in such a bin are ignored.

The quasipeak detector

The quasipeak detector displays the maximum value weighted to CISPR 16-1-1 that was detected during the measurement.

Depending on the selected frequency, the R&S EPL automatically selects the detectors and IF bandwidths defined for bands A and B listed in the following table:

	Band A	Band B	Band C/D
Frequency range	< 150 kHz	150 kHz to 30 MHz	> 30 MHz
Resolution bandwidth	200 Hz	9 kHz	120 kHz

The coupling of the resolution bandwidth to the frequency range with activated quasipeak detector can be canceled using the "CISPR RBW uncoupled" softkey.

Tips regarding measurement time:

- The relatively long time constants of the quasipeak detector result in long measurement times to yield valid results.

- Unknown signals should be measured with a measurement time of at least 1 s. This ensures correct weighting of pulses down to a pulse frequency of 5 Hz.
- Known signals can be measured with a much shorter measurement time.

After internal switching, the R&S EPL waits until the measurement result has stabilized before it starts the actual measurement. Since the level does not change during a frequency scan, known signals (e.g. broadband RFI) can be correctly measured with a much shorter measurement time.

The CISPR average detector

The CISPR Average detector displays a weighted average signal level according to CISPR 16-1-1. The average value according to CISPR 16-1-1 is the maximum value of the linear average that has been detected during the measurement.

The detector is used, for example, to measure pulsed sinusoidal signals with a low pulse frequency. It is calibrated with the rms value of an unmodulated sinusoidal signal. Averaging is with lowpass filters of the 2nd order (simulation of a mechanical instrument).

The lowpass time constants and the IF bandwidths are fixed depending on the frequency. The main parameters are listed in the following table:

	Band A	Band B	Band C/D	Band E
Frequency range	< 150 kHz	150 kHz to 30 MHz	30 MHz to 1 GHz	> 1 GHz
Resolution bandwidth	200 Hz	9 kHz	120 kHz	1 MHz

The coupling of the resolution bandwidth to the frequency range with activated CISPR average detector can be canceled using the "CISPR RBW uncoupled" softkey.

Tips regarding measurement time:

- The relatively long time constants of the quasipeak detector result in long measurement times to yield valid results.
- Unknown signals should be measured with a measurement time of at least 1 s. This ensures correct weighting of pulses down to a pulse frequency of 5 Hz.
- Unmodulated sinusoidal signals and signals with a high modulation frequency can be measured with a much shorter measurement time.
- Slowly fluctuating signals or pulsed signals require longer measurement times.



Measurement times shorter than 20 ms

With measurement times shorter than 20 ms the detector weighting changes to plain average weighting.

When you change the receiver frequency or the attenuation, the R&S EPL waits until the lowpass filter has settled before starting the measurement. The measurement time in that case depends on the resolution bandwidth and the characteristics of the signal.

The RMS average detector

The RMS Average detector is a combination of the RMS detector (for pulse repetition frequencies above a corner frequency) and the Average detector (for pulse repetition frequencies below the corner frequency). It thus achieves a pulse response curve with the following characteristics: 10 dB/decade above the corner frequency and 20 dB/decade below the corner frequency. The average value is determined by lowpass filters of the 2nd order (simulation of a mechanical instrument).

The detector is used, for example, to measure broadband emissions and may replace the quasipeak detector in the future.

The filter bandwidth of the detector are coupled to the receiver frequency.

Table 11-1: RMS Average detector

	Band A	Band B	Band C/D	Band E
Frequency range	< 150 kHz	150 kHz to 30 MHz	30 MHz to 1 GHz	> 1 GHz
Resolution band-width	200 Hz	9 kHz	120 kHz	1 MHz
Corner frequency	10 Hz	100 Hz	100 Hz	1 kHz

Regarding measurement time, see CISPR Average detector.



Measurement times shorter than 20 ms

With measurement times shorter than 20 ms the detector weighting changes to plain RMS weighting.

11.3.1.2 Analyzing several traces - trace mode

If several measurements are performed one after the other, or continuous measurements are performed, the trace mode determines how the data for subsequent traces is processed. After each measurement, the trace mode determines whether:

- The data is frozen ("View")
- The data is hidden ("Blank")
- The data is replaced by new values ("Clear Write")
- The data is replaced selectively ("Max Hold", "Min Hold", "Average")



Each time you change the trace mode, the selected trace memory is cleared.

The R&S EPL supports the following trace modes:

Table 11-2: Overview of available trace modes

Trace Mode	Description
Blank	Hides the selected trace.
Clear Write	Overwrite mode: the trace is overwritten by each measurement. This is the default setting. All available detectors can be selected.
Max Hold	The maximum value is determined over several measurements and displayed. The R&S EPL saves the measurement result in the trace memory only if the new value is greater than the previous one. This mode is especially useful with modulated or pulsed signals. The signal spectrum is filled up upon each measurement until all signal components are detected in a kind of envelope. This mode is not available for statistics measurements.
Min Hold	The minimum value is determined from several measurements and displayed. The R&S EPL saves the measurement result in the trace memory only if the new value is lower than the previous one. This mode is useful for example for making an unmodulated carrier in a composite signal visible. Noise, interference signals or modulated signals are suppressed, whereas a CW signal is recognized by its constant level. This mode is not available for statistics measurements.
Average	The average is formed over several measurements and displayed. This mode is not available for statistics measurements.
View	The current contents of the trace memory are frozen and displayed.
Transducer	Draws a trace that shows the correction values of all active transducer factors in the currently selected frequency range.



If a trace is frozen ("View" mode), you can change the measurement settings, apart from scaling settings, without impact on the displayed trace. The fact that the displayed trace no longer matches the current measurement settings is indicated by a yellow asterisk  on the tab label.

If you change any parameters that affect the scaling of the diagram axes, the R&S EPL automatically adapts the trace data to the changed display range. Thus, you can zoom into the diagram after the measurement to show details of the trace.

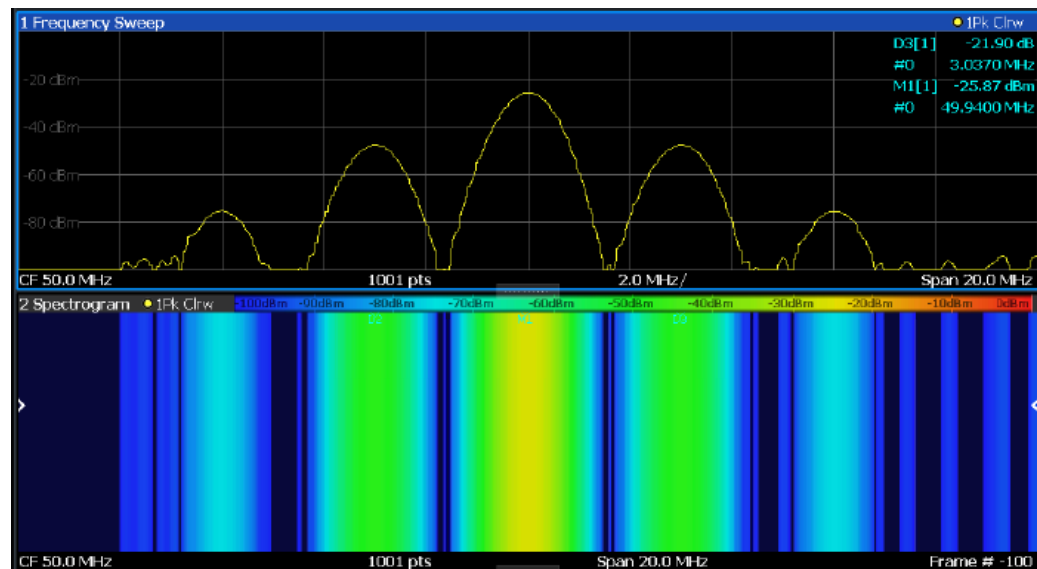
11.3.1.3 Working with spectrograms

In addition to the standard "level versus frequency" or "level versus time" traces, the R&S EPL also provides a spectrogram display of the measured data.

A spectrogram shows how the spectral density of a signal varies over time. The x-axis shows the frequency, the y-axis shows the time. A third dimension, the power level, is indicated by different colors. Thus you can see how the strength of the signal varies over time for different frequencies.

Example:

(Note that this example is based on data recorded in the Spectrum application. The basic principle of a spectrogram in the Receiver application is the same.)



In this example, you see the spectrogram for the calibration signal of the R&S EPL, compared to the standard spectrum display. Since the signal does not change over time, the color of the frequency levels does not change over time, i.e. vertically. The legend above the spectrogram display describes the power levels the colors represent.

Result display

The spectrogram result can consist of the following elements:

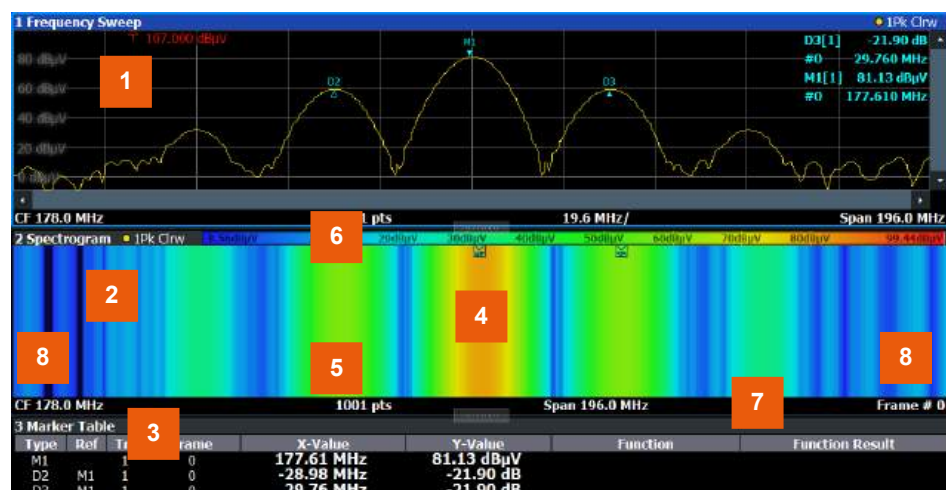


Figure 11-3: Screen layout of the spectrogram result display

- 1 = Spectrum result display
- 2 = Spectrogram result display
- 3 = Marker list
- 4 = Marker
- 5 = Delta marker
- 6 = Color map
- 7 = Timestamp / frame number
- 8 = Current frame indicator

For more information about spectrogram configuration, see [Section 11.3.7, "Spectrogram settings"](#), on page 205.

Remote commands:

Activating and configuring spectrograms:

[Section 15.7.3.5, "Spectrogram configuration"](#), on page 485

Storing results:

[MMEMory:STORe<n>:SPECtrogram](#) on page 572

• Time frames	194
• Markers in the spectrogram	195
• Color maps	195

Time frames

The time information in the spectrogram is displayed vertically, along the y-axis. Each line (or trace) of the y-axis represents one or more captured measurement and is called a **time frame** or simply "frame". As with standard spectrum traces, several measured values are combined in one measurement point using the selected detector.

Frames are sorted in chronological order, beginning with the most recently recorded frame at the top of the diagram (frame number 0). With the next measurement, the previous frame is moved further down in the diagram, until the maximum number of captured frames is reached. The display is updated continuously during the measurement, and the measured trace data is stored. Spectrogram displays are continued even after single measurements unless they are cleared manually.

The maximum number of frames that you can capture depends on the number of measurement points that are analyzed during the measurement.



The scaling of the time axis (y-axis) is not configurable. However, you can enlarge the spectrogram display by maximizing the window using "Split/Maximize".



Tracking absolute time - timestamps

Alternatively to the frame count, the absolute time (that is: a *timestamp*) at which a frame was captured can be displayed. While the measurement is running, the timestamp shows the system time. In single measurement mode or if the measurement is

stopped, the timestamp shows the time and date at the end of the measurement. Thus, the individual frames can be identified by their timestamp or their frame count.

When active, the timestamp replaces the display of the frame number in the diagram footer (see [Figure 11-3](#)).

Displaying individual frames

The spectrogram diagram contains all stored frames since it was last cleared. Arrows on the left and right border of the spectrogram indicate the currently selected frame. The scan or spectrum diagrams always display the spectrum for the currently selected frame.

The current frame number is indicated in the diagram footer, or alternatively a timestamp, if activated. The current frame, displayed at the top of the diagram, is frame number 0. Older frames further down in the diagram are indicated by a negative index, e.g. "-10". You can display the spectrum diagram of a previous frame by changing the current frame number.

Markers in the spectrogram

Markers and delta markers are shaped like diamonds in the spectrogram. They are only displayed in the spectrogram if the marker position is inside the visible area of the spectrogram. If more than two markers are active, the marker values are displayed in a separate marker table.

In the spectrum result display, the markers and their frequency and level values (1) are displayed as usual. Additionally, the frame number is displayed to indicate the position of the marker in time (2).



In the spectrogram result display, you can activate up to 16 markers or delta markers at the same time. Each marker can be assigned to a different frame. Therefore, in addition to the frequency you also define the frame number when activating a new marker. If no frame number is specified, the marker is positioned on the currently selected frame. All markers are visible that are positioned on a visible frame. Special search functions are provided for spectrogram markers.

In the spectrum result display, only the markers positioned on the currently selected frame are visible. In "Continuous Sweep" mode, this means that only markers positioned on frame 0 are visible. To view markers that are positioned on a frame other than frame 0 in the spectrum result display, you must stop the measurement and select the corresponding frame.

Color maps

The color display is highly configurable to adapt the spectrograms to your needs. You can define:

- Which colors to use (Color scheme)
- Which value range to apply the color scheme to

- How the colors are distributed within the value range, i.e. where the focus of the visualization lies (shape of the color curve)

The individual colors are assigned to the power levels automatically by the R&S EPL.

The Color Scheme

- **Hot**



Uses a color range from blue to red. Blue colors indicate low levels, red colors indicate high ones.

- **Cold**



Uses a color range from red to blue. Red colors indicate low levels, blue colors indicate high ones.

The "Cold" color scheme is the inverse "Hot" color scheme.

- **Radar**



Uses a color range from black over green to light turquoise with shades of green in between. Dark colors indicate low levels, light colors indicate high ones.

- **Grayscale**



Shows the results in shades of gray. Dark gray indicates low levels, light gray indicates high ones.

The value range of the color map

If the measured values only cover a small area in the spectrogram, you can optimize the displayed value range. Then it becomes easier to distinguish between values that are close together. Display only parts of interest.

The shape and focus of the color curve

The color-mapping function assigns a specified color to a specified power level in the spectrogram display. By default, colors on the color map are distributed evenly. However, to visualize a certain area of the value range in greater detail than the rest, you can set the focus of the color mapping to that area. Changing the focus is performed by changing the shape of the color curve.

The color curve is a tool to shift the focus of the color distribution on the color map. By default, the color curve is linear. If you shift the curve to the left or right, the distribution becomes non-linear. The slope of the color curve increases or decreases. One end of the color palette then covers a large range of results, while the other end distributes several colors over a relatively small result range.

You can use this feature to put the focus on a particular region in the diagram and to be able to detect small variations of the signal.

Example:

In the color map based on the linear color curve, the range from -100 dBm to -60 dBm is covered by blue and a few shades of green only. The range from -60 dBm to -20 dBm is covered by red, yellow and a few shades of green.

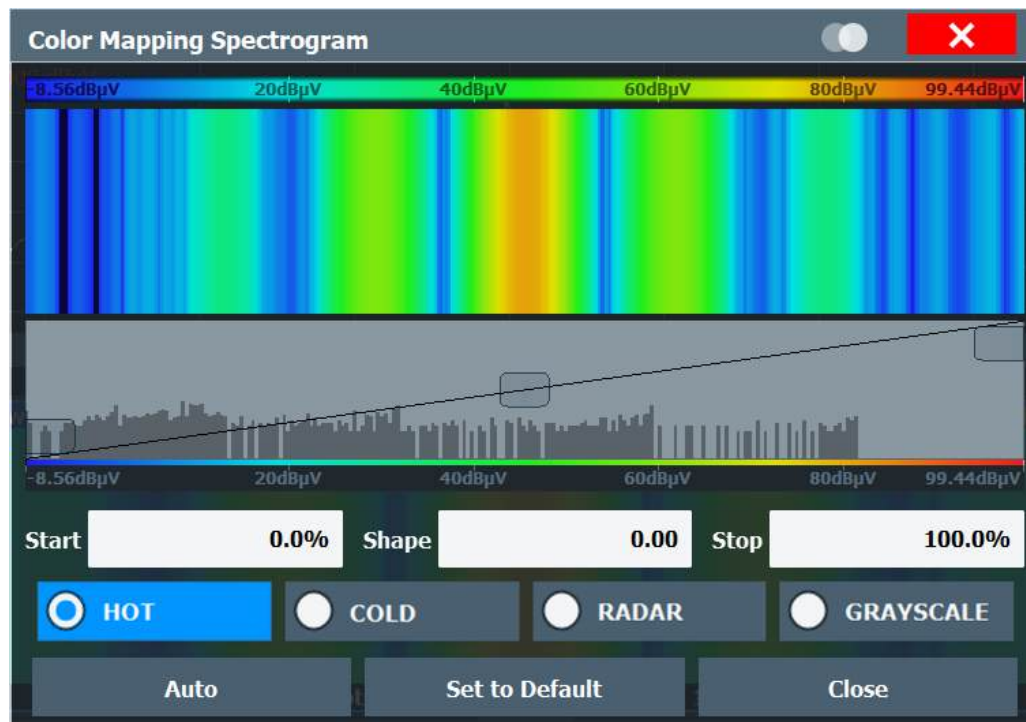


Figure 11-4: Spectrogram with (default) linear color curve shape = 0

The sample spectrogram is dominated by blue and green colors. After shifting the color curve to the left (negative value), more colors cover the range from -100 dBm to -60 dBm (blue, green and yellow). This range occurs more often in the example. The range from -60 dBm to -20 dBm, on the other hand, is dominated by various shades of red only.

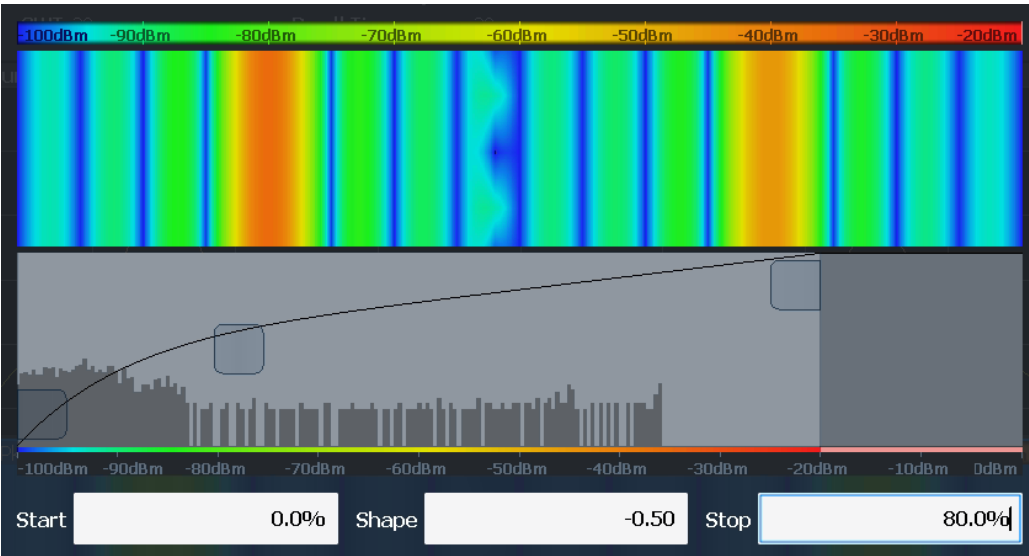


Figure 11-5: Spectrogram with non-linear color curve (shape = -0.5)

11.3.2 Trace configuration

Access: "Overview" > "Analysis" > "Traces"

A trace is a collection of measured data points. The trace settings determine how the measured data is analyzed and displayed on the screen.

Trace configuration for the scan diagram

The contents of the "Traces" tab of the "Trace Configuration" are the same as the [Traces / Final Meas](#) tab of the "Test Automation" dialog box.

Trace configuration for IF analysis

IF analysis supports a maximum of three traces. The "Traces" dialog box available for IF analysis supports the following functions:

- ["Trace Mode"](#) on page 120
- ["Predefined Trace Settings - Quick Config"](#) on page 198

[Predefined Trace Settings - Quick Config](#)..... 198

Predefined Trace Settings - Quick Config

Commonly required trace settings have been predefined and can be applied very quickly by selecting the appropriate button.

Function	Trace Settings	
Preset All Traces	Trace 1:	Clear Write
		Blank
Set Trace Mode	Trace 1:	Max Hold

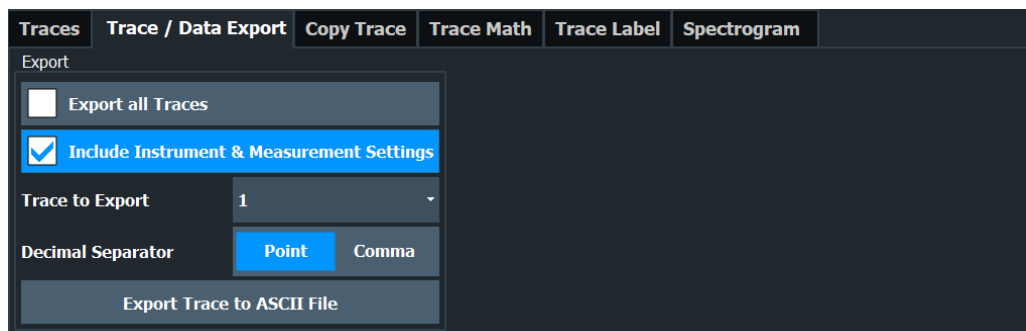
Function	Trace Settings	
Max Avg Min	Trace 2:	Average
	Trace 3:	Min Hold
		Blank
Set Trace Mode Max ClrWrite Min	Trace 1:	Max Hold
	Trace 2:	Clear Write
	Trace 3:	Min Hold
		Blank

11.3.3 Trace export

Access: "Overview" > "Analysis" > "Traces" > "Trace Export"

The R&S EPL provides various evaluation methods for the results of the performed measurements. If you want to evaluate the data with other, external applications, you can export the measurement data to a standard ASCII format file (DAT or CSV).

You can also import existing trace data from a file, for example as a reference trace. The trace import is available in the spectrum application.



The remote commands required to export traces are described in [Section 15.7.3.1, "Trace export"](#), on page 481.

Export all Traces and all Table Results	199
Include Instrument & Measurement Settings	200
Trace to Export	200
Decimal Separator	200
Export Trace to ASCII File	200
L File Type	201
L Decimal Separator	202
L Column Separator	202
L File Explorer	202

Export all Traces and all Table Results

Selects all displayed traces and result tables (e.g. "Result Summary", marker table etc.) in the current application for export to an ASCII file.

Alternatively, you can select one specific trace only for export (see [Trace to Export](#)).

The results are output in the same order as they are displayed on the screen: window by window, trace by trace, and table row by table row.

Remote command:

`FORMat:DEXPort:TRACes` on page 481

Include Instrument & Measurement Settings

Includes additional instrument and measurement settings in the header of the export file for result data.

Remote command:

`FORMat:DEXPort:HEADer` on page 481

Trace to Export

Defines an individual trace to be exported to a file.

This setting is not available if [Export all Traces and all Table Results](#) is selected.

Decimal Separator

Defines the decimal separator for floating-point numerals for the data export/import files. Evaluation programs require different separators in different languages.

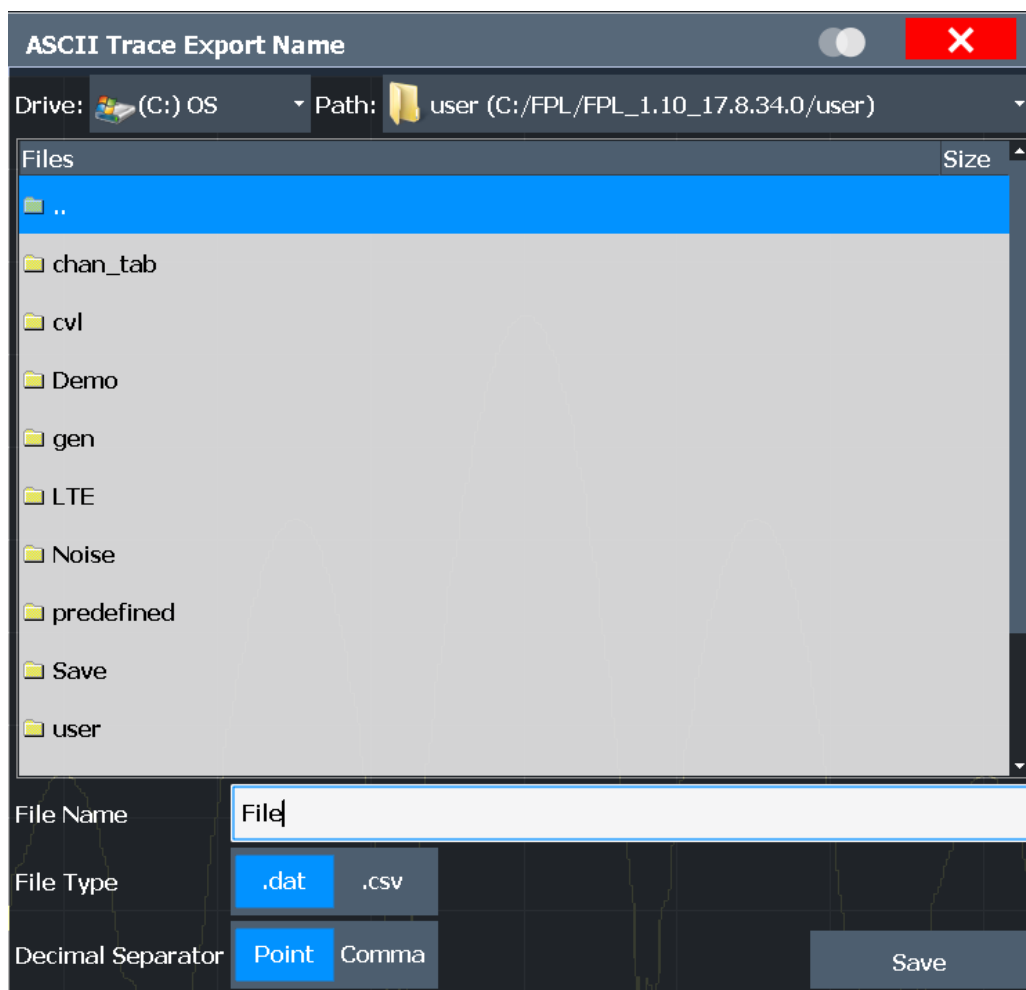
Remote command:

`FORMat:DEXPort:DSEParator` on page 537

Export Trace to ASCII File

Saves the selected trace or all traces in the currently active result display to the specified file and directory in the selected ASCII format.

"File Explorer": Instead of using the file manager of the R&S EPL firmware, you can also use the Microsoft Windows File Explorer to manage files.



If the spectrogram display is selected when you perform this function, the entire histogram buffer with all frames is exported to a file. The data for a particular frame begins with information about the frame number and the time that frame was recorded. For large history buffers the export operation can take some time.

For details on the file format in the Spectrum application, see [Section 11.3.9.1, "Reference: ASCII file export format"](#), on page 214.

Remote command:

[MMEMory:STORe<n>:TRACe](#) on page 572

[MMEMory:STORe<n>:SPECTrogram](#) on page 572

File Type ← Export Trace to ASCII File

Determines the format of the ASCII file to be imported or exported.

Depending on the external program in which the data file was created or is evaluated, a comma-separated list (CSV) or a plain data format (DAT) file is required.

Remote command:

[FORMat:DEXPort:FORMat](#) on page 482

Decimal Separator ← Export Trace to ASCII File

Defines the decimal separator for floating-point numerals for the data export/import files. Evaluation programs require different separators in different languages.

Remote command:
[FORMat:DEXPort:DSEParator](#) on page 537

Column Separator ← Export Trace to ASCII File

Selects the character that separates columns in the exported ASCII file. The character can be either a semicolon, a comma or a tabulator (tab).

Example for semicolon:

```
Type;EPL1000;Version;1.00;Date;01.Jan 3000;
```

Example for comma:

```
Type,EPL1000,
Version,1.00,
Date,01.Jan 3000,
```

Example for tabulator (tab after the last column is not visible):

```
Type      EPL1000
Version    1.00
Date      01.Jan 3000
```

The selected column separator setting remains the same, even after a preset.

Remote command:
[FORMat:DEXPort:CSEParator](#) on page 481

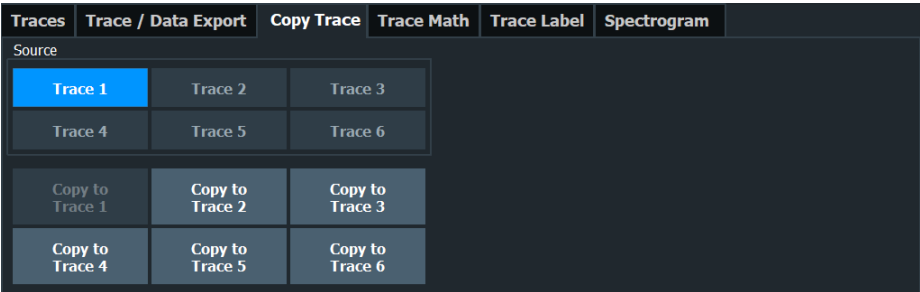
File Explorer ← Export Trace to ASCII File

Opens the Microsoft Windows File Explorer.

Remote command:
not supported

11.3.4 Copying traces

Access: "Overview" > "Analysis" > "Traces" > "Copy Trace"



The remote commands required to copy traces are described in [Section 15.7.3, "Trace configuration"](#), on page 481.

[Copy Trace](#).....203

Copy Trace

Access: "Overview" > "Analysis" > "Traces" > "Copy Trace"

Or: [TRACE] > "Copy Trace"

Copies trace data to another trace.

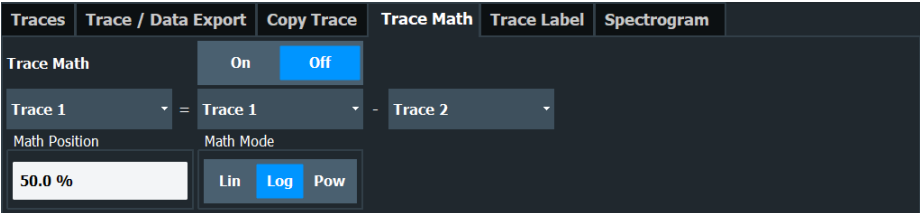
Remote command:

TRACe<n>:COPY on page 482

11.3.5 Trace mathematics

Access: "Overview" > "Analysis" > "Traces" > "Trace Math"

Trace mathematics allow you to combine the data of several traces and write the results to a new trace.



Trace Math Function.....	203
Trace Math Position.....	203
Trace Math Mode.....	204

Trace Math Function

Trace mathematics subtract the data of one trace from another trace and write the results to a third trace.

When you turn on trace mathematics, you can select all parameters in the equation arbitrarily from the corresponding dropdown menus (both operands and the result). For example, you can subtract trace 1 from trace 3 and write the results to trace 5.

The result is a trace in dB that refers to the zero point defined with the Trace Math Position setting.

Note that all traces in the equation must have a trace mode other than "Blank" or "View".

You can turn off all trace mathematics with the "Trace Math Off" feature.

Remote command:

CALCulate<n>:MATH<t>:EXPRession[:DEFine] on page 483

CALCulate<n>:MATH<t>:STATe on page 484

Trace Math Position

Defines the zero point on the y-axis of the resulting trace in % of the diagram height. The range of values extends from -100 % to +200 %.

Remote command:

CALCulate<n>:MATH<t>:POSition on page 484

Trace Math Mode

Defines the mode for the trace math calculations.

- "Lin" Activates linear subtraction, which means that the power level values are converted into linear units prior to subtraction. After the subtraction, the data is converted back into its original unit. This setting takes effect if the grid is set to a linear scale. In this case, subtraction is done in two ways (depending on the set unit):
- The unit is set to either W or dBm: the data is converted into W prior to subtraction, i.e. averaging is done in W.
 - The unit is set to either V, A, dBmV, dBμV, dBμA or dBpW: the data is converted into V prior to subtraction, i.e. subtraction is done in V.
- "Log" Activates logarithmic subtraction. This subtraction method only takes effect if the grid is set to a logarithmic scale, i.e. the unit of the data is dBm. In this case the values are subtracted in dBm. Otherwise (i.e. with linear scaling) the behavior is the same as with linear subtraction.
- "Power" Activates linear power subtraction. The power level values are converted into unit Watt prior to subtraction. After the subtraction, the data is converted back into its original unit. Unlike the linear mode, the subtraction is always done in W.

Remote command:

`CALCulate<n>:MATH<t>:MODE` on page 483

11.3.6 Trace Labels

Access: "Overview" > "Analysis" > "Traces" > "Trace Label"

Trace labels are a way to assign a descriptive label to traces instead of the general "Trace <x>" label (default). The labels you use are arbitrary and are displayed in the diagram area. The font color corresponds to the color of the respective trace (for example yellow trace: yellow font).

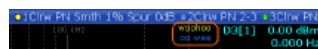


Figure 11-6: Example: the yellow and blue traces have a label.

You can define trace labels in the "Trace Label" tab of the "Trace" dialog box.

Traces	Trace / Data Export	Copy Trace	Trace Math	Trace Label	Spectrogram
	State	Text			
Trace 1	☒	Name of first trace			
Trace 2	☒	Name of another trace			
Trace 3	☐	Trace 3			
Trace 4	☐	Trace 4			
Trace 5	☐	Trace 5			
Trace 6	☐	Trace 6			

How to assign trace labels

Trace labels can be configured via the "Trace Labels" dialog box.

1. Turn on the trace label for a specific trace and assign a label in the corresponding input field.
Note that a trace must be active. Otherwise assigning a label is not possible.
2. Move the trace label to any position on the display by dragging it to the new position.

Remote command:

State: `DISPlay[:WINDow<n>]:TRACe<t>:LABel[:STATe]` on page 484

Label: `DISPlay[:WINDow<n>]:TRACe<t>:LABel:TEXT` on page 485

11.3.7 Spectrogram settings

Access: "Overview" > "Analysis" > "Traces" > "Spectrogram"

Functions to configure spectrograms described elsewhere:

- Color mapping: [Section 11.3.7.2, "Color map settings"](#), on page 208
- Markers: [Section 11.4.3.2, "Marker search \(spectrogram\)"](#), on page 227

Spectrograms in the I/Q analyzer and analog demodulator

Basically, spectrograms in those applications work the same as in the Receiver or Spectrum application.

However, in the I/Q Analyzer and Analog Demodulator, they have the following distinctive features.

- Not all result displays support spectrograms.
- Compared to the Receiver or Spectrum application, a spectrogram can not be added as an independent result display. Instead, spectrograms relate to a certain measurement window (or result display). Result diagram and spectrogram are a single entity in that case and can not be divided.

To view results in a spectrogram, select a window (indicated by a blue frame), then select [TRACE] > "Spectrogram Config".

Spectrograms are either displayed in "Split" mode (spectrogram is displayed below the trace diagram), in "Full" mode (trace diagram is not displayed), or not displayed at all ("Off").

When the "Spectrogram Config"softkey is greyed out, spectrograms are not supported by the selected result display.

- General spectrogram settings.....206
- Color map settings.....208

11.3.7.1 General spectrogram settings

Access: "Overview" > "Analysis" > "Traces" > "Spectrogram"

Traces	Trace / Data Export	Copy Trace	Trace Math	Trace Label	Spectrogram
State	On	Off			
3D Spectrogram	On	Off			
Settings					
Select Frame	0 s				
History Depth	877				
3D Display Depth	300				
Trace	1				
Time Stamp	On	Off			
Recording Interval	1				
Color Mapping					
Clear Spectrogram					

State.....	206
3D Spectrogram State.....	207
Select Frame.....	207
History Depth.....	207
3-D Display Depth.....	207
Trace.....	207
Time Stamp.....	207
Recording Interval.....	208
Color Mapping.....	208
Clear Spectrogram.....	208

State

Activates and deactivates the spectrogram result display.

In the receiver application, the R&S EPL always records spectrogram data. The "State" function simply controls the spectrogram visibility.

Remote command:

CALCulate<n>:SPECTrogram[:STATe] on page 489

3D Spectrogram State

Activates and deactivates a 3-dimensional spectrogram. As opposed to the common 2-dimensional spectrogram, the power is not only indicated by a color mapping, but also in a third dimension, the z-axis.

Remote command:

[CALCulate<n>:SPECTrogram:THReedim\[:STATe\]](#) on page 489

Select Frame

Selects a specific frame, loads the corresponding trace from the memory, and displays it in the Spectrum window.

Note that activating a marker or changing the position of the active marker automatically selects the frame that belongs to that marker.

This function is only available in single sweep mode or if the sweep is stopped, and only if a spectrogram is selected.

The most recent frame is number 0, all previous frames have a negative number.

Remote command:

[CALCulate<n>:SPECTrogram:FRAME:SElect](#) on page 486

History Depth

Sets the number of frames that the R&S EPL stores in its memory.

The maximum size of the spectrogram history depends on the available memory.

If the memory is full, the R&S EPL deletes the oldest frames stored in the memory and replaces them with the new data.

Remote command:

[CALCulate<n>:SPECTrogram:HDEPth](#) on page 486

3-D Display Depth

Defines the number of frames displayed in a 3-dimensional spectrogram.

Trace

Selects the trace the spectrogram is based on.

You can select any trace that is currently active, including the trace that shows the results of [trace mathematics](#).

Remote command:

[CALCulate<n>:SPECTrogram:TRACe](#) on page 487

Time Stamp

Activates and deactivates the timestamp. The timestamp shows the system time while the measurement is running. In single sweep mode or if the measurement is stopped, the timestamp shows the time and date of the end of the measurement.

When active, the timestamp replaces the display of the frame number.

Remote command:

[CALCulate<n>:SPECTrogram:TSTamp\[:STATe\]](#) on page 488

[CALCulate<n>:SPECTrogram:TSTamp:DATA?](#) on page 487

Recording Interval

Defines a recording interval for the IF spectrogram result display. For example if the recording interval is set to 5, only every fifth scan is taken from the IF analysis diagram and displayed in the IF spectrogram. This prevents the IF spectrogram from getting filled up too fast.

Remote command:

`CALCulate<n>:SPECTrogram:FRAMe:RINTerval` on page 489

Color Mapping

Opens the "Color Mapping" dialog.

For details see "Color maps" on page 195.

Clear Spectrogram

Resets the spectrogram result display and clears the history buffer.

This function is only available if a spectrogram is selected.

Remote command:

`CALCulate<n>:SPECTrogram:CLEar[:IMMediate]` on page 486

11.3.7.2 Color map settings

Access: "Overview" > "Analysis" > "Traces" > "Spectrogram" > "Color Mapping"

or: [TRACE] > "Spectrogram Config" > "Color Mapping"

In addition to the available color settings, the dialog box displays the current color map and provides a preview of the display with the current settings.

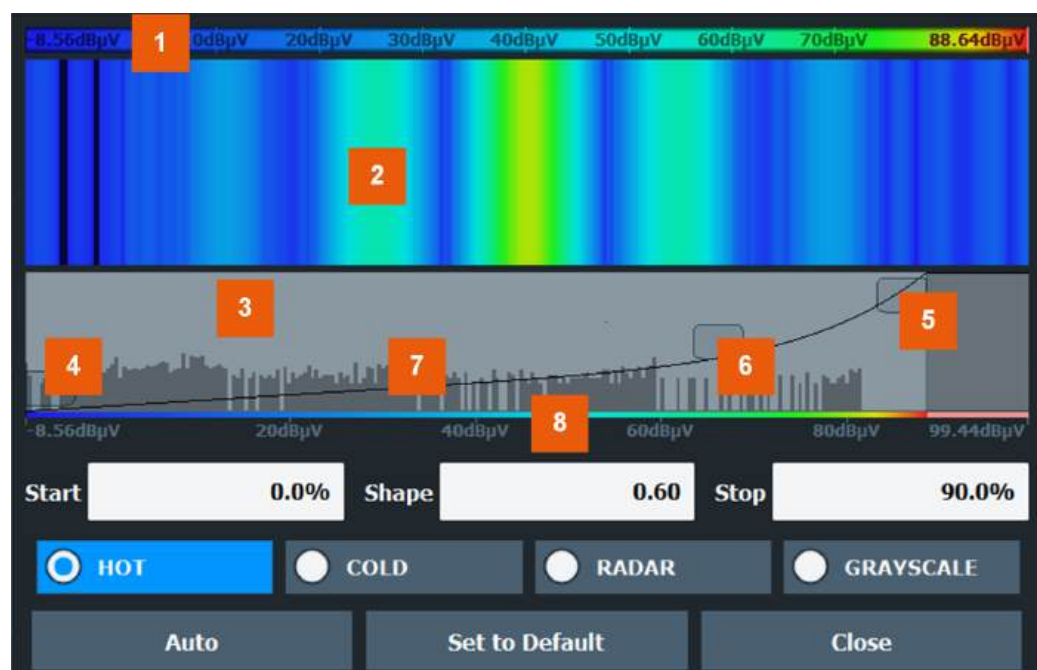


Figure 11-7: Color Mapping dialog box

- 1 = Color map: shows the current color distribution
- 2 = Preview pane: shows a preview of the spectrogram with any changes that you make to the color scheme
- 3 = Color curve pane: graphical representation of all settings available to customize the color scheme
- 4/5 = Color range start and stop sliders: define the range of the color map or amplitudes for the spectrogram
- 6 = Color curve slider: adjusts the focus of the color curve
- 7 = Histogram: shows the distribution of measured values
- 8 = Scale of the horizontal axis (value range)

The remote commands required to configure the color map are described in "[Color map configuration](#)" on page 490.

Start / Stop	209
Shape	209
Hot/Cold/Radar/Grayscale	209
Auto	209
Set to Default	209
Close	209

Start / Stop

Defines the lower and upper boundaries of the value range of the spectrogram.

Remote command:

[DISPlay\[:WINDow<n>\]:SPECTrogram:COLor:LOWer](#) on page 490

[DISPlay\[:WINDow<n>\]:SPECTrogram:COLor:UPPer](#) on page 491

Shape

Defines the shape and focus of the color curve for the spectrogram result display.

"-1 to <0" More colors are distributed among the lower values

"0" Colors are distributed linearly among the values

">0 to 1" More colors are distributed among the higher values

Remote command:

[DISPlay\[:WINDow<n>\]:SPECTrogram:COLor:SHApe](#) on page 490

Hot/Cold/Radar/Grayscale

Sets the color scheme for the spectrogram.

Remote command:

[DISPlay\[:WINDow<n>\]:SPECTrogram:COLor\[:STYLE\]](#) on page 491

Auto

Defines the color range automatically according to the existing measured values for optimized display.

Set to Default

Sets the color mapping to the default settings.

Remote command:

[DISPlay\[:WINDow<n>\]:SPECTrogram:COLor:DEFault](#) on page 490

Close

Saves the changes and closes the dialog box.

11.3.8 How to configure traces

- [How to export trace data and numerical results](#).....210
- [How to display and configure a spectrogram](#).....210

11.3.8.1 How to export trace data and numerical results

The measured trace data and numerical measurement results in tables can be exported to an ASCII file. For each measurement point, the measured trace position and value are output.

The file is stored with a `.DAT` or `.CSV` extension. For details on the storage format, see [Section 11.3.9.1, "Reference: ASCII file export format"](#), on page 214.

To export trace data and table results

1. Select [TRACE] > "Trace Config" > "Trace / Data Export" tab.
2. Select "Export all Traces and all Table Results" to export all available measurement result data for the current application, or select a specific "Trace to Export".
3. Optionally, select "Include Instrument & Measurement Settings" to insert additional information in the export file header.
4. Select "Export Trace to ASCII File".
5. In the file selection dialog box, select the storage location and file name for the export file.
6. If necessary, change the decimal separator for the ASCII export file.
7. Select the data format of the ASCII file.
8. Select "Save" to close the dialog box and export the data to the file.

11.3.8.2 How to display and configure a spectrogram

Step-by-step instructions on how to display and configure a spectrogram are provided here. For details on individual functions and settings see [Section 11.3.7, "Spectrogram settings"](#), on page 205.

The remote commands required to perform these tasks are described in [Section 15.7.3.5, "Spectrogram configuration"](#), on page 485.

The following tasks are described here:

- ["To display a spectrogram"](#) on page 211
- ["To remove the spectrogram display"](#) on page 211
- ["To set a marker in the spectrogram"](#) on page 211
- ["To configure a spectrogram"](#) on page 211
- ["To select a color scheme"](#) on page 212
- ["To set the value range graphically using the color range sliders"](#) on page 213

- ["To set the value range of the color map numerically"](#) on page 213
- ["To set the color curve shape graphically using the slider"](#) on page 214
- ["To set the color curve shape numerically"](#) on page 214

To display a spectrogram

1. In the "Overview", select "Display", then drag the evaluation type "Spectrogram" to the diagram area.
Alternatively:
 - a) Select [TRACE] and then "Spectrogram Config".
 - b) Toggle "Spectrogram" to "On".
2. To clear an existing spectrogram display, select "Clear Spectrogram".
3. Start a new measurement using [RUN SINGLE] or [RUN CONT].
The spectrogram is updated continuously with each new sweep.
4. To display the spectrum diagram for a specific time frame:
 - a) Stop the continuous measurement or wait until the single sweep is completed.
 - b) Select the frame number in the diagram footer.
 - c) Enter the required frame number in the edit dialog box.
Note that the most recent sweep is frame number 0, all previous frames have negative numbers.

To remove the spectrogram display

1. Select [TRACE] and then "Spectrogram Config".
2. Toggle "Spectrogram" to "Off".
The standard spectrum display is restored.

To set a marker in the spectrogram

1. While a spectrogram is displayed, select [MARKER].
2. Select a "Marker" softkey.
3. Enter the frequency or time (x-value) of the marker or delta marker.
4. Enter the frame number for which the marker is to be set, for example 0 for the current frame, or -2 for the second to last frame. Note that the frame number is always 0 or a negative value!
The marker is only visible in the spectrum diagram if it is defined for the currently selected frame. In the spectrogram result display all markers are visible that are positioned on a visible frame.

To configure a spectrogram

1. Configure the spectrogram frames:
 - a) Select [SWEEP].
 - b) Select "Sweep Config".

- c) In the "Sweep/Average Count" field, define how many sweeps are to be analyzed to create a single frame.
 - d) In the "Frame Count" field, define how many frames are to be plotted during a single sweep measurement.
 - e) To include frames from previous sweeps in the analysis of the new frame (for "Max Hold", "Min Hold" and "Average" trace modes only), select "Continue Frame" = "On".
2. Define how many frames are to be stored in total:
 - a) Select [TRACE] and then "Spectrogram Config".
 - b) Select "History Depth".
 - c) Enter the maximum number of frames to store.
3. Optionally, replace the frame number by a time stamp by toggling "Time Stamp" to "On".
4. If necessary, adapt the color mapping for the spectrogram to a different value range or color scheme as described in ["How to configure the color mapping"](#) on page 212.

How to configure the color mapping

The color display is highly configurable to adapt the spectrogram to your needs.

The settings for color mapping are defined in the "Color Mapping" dialog box. To display this dialog box, do one of the following:

- Select the color map in the window title bar of the "Spectrogram" result display.

To select a color scheme

You can select which colors are assigned to the measured values.

- In the "Color Mapping" dialog box, select the option for the color scheme to be used.

Editing the value range of the color map

The distribution of the measured values is displayed as a histogram in the "Color Mapping" dialog box. To cover the entire measurement value range, make sure the first and last bar of the histogram are included.

To ignore noise in a spectrogram, for example, exclude the lower power levels from the histogram.

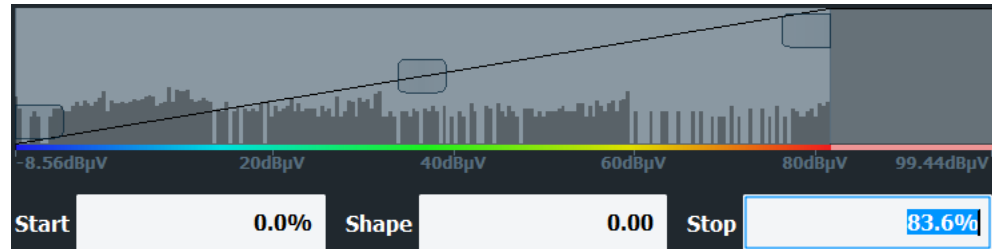


The value range of the color map must cover at least 10% of the value range on the horizontal axis of the diagram, that means, the difference between the start and stop values must be at least 10%.

The value range of the color map can be set numerically or graphically.

To set the value range graphically using the color range sliders

1. Select and drag the bottom color curve slider (indicated by a gray box at the left of the color curve pane) to the lowest value you want to include in the color mapping.
2. Select and drag the top color curve slider (indicated by a gray box at the right of the color curve pane) to the highest value you want to include in the color mapping.



To set the value range of the color map numerically

1. In the "Start" field, enter the percentage from the left border of the histogram that marks the beginning of the value range.
2. In the "Stop" field, enter the percentage from the right border of the histogram that marks the end of the value range.

Example:

The color map starts at -110 dBm and ends at -10 dBm (that is: a range of 100 dB). In order to suppress the noise, you only want the color map to start at -90 dBm. Thus, you enter 10% in the "Start" field. The R&S EPL shifts the start point 10% to the right, to -90 dBm.



Adjusting the reference level and level range

Since the color map is configured using percentages of the total value range, changing the reference level and level range of the measurement (and thus the power value range) also affects the color mapping in the spectrogram.

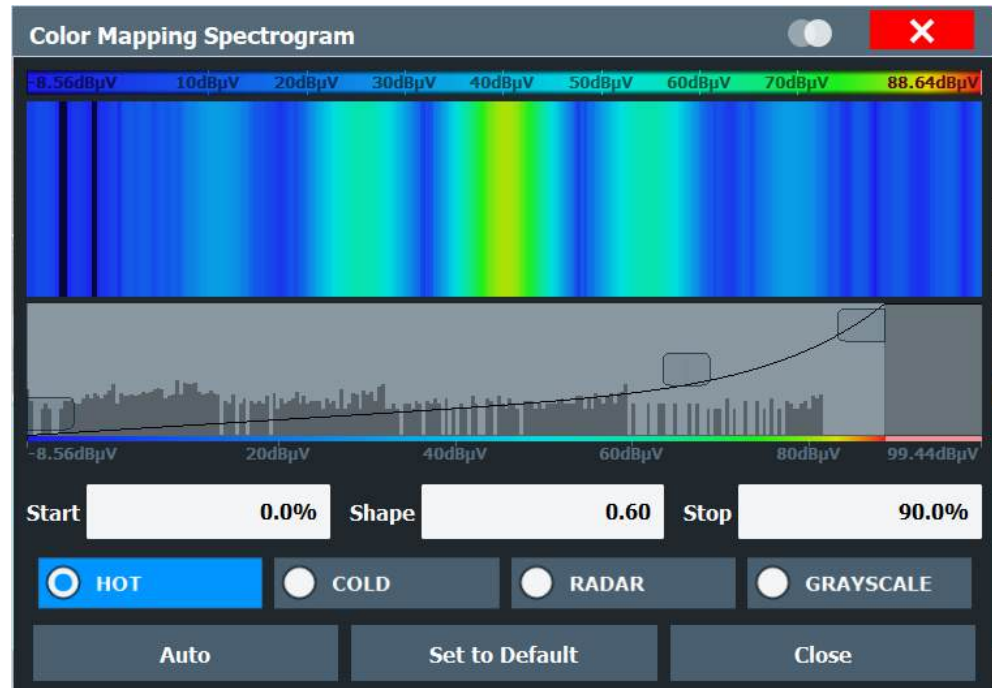
Editing the shape of the color curve

The color curve is a tool to shift the focus of the color distribution on the color map. By default, the color curve is linear, i.e. the colors on the color map are distributed evenly. If you shift the curve to the left or right, the distribution becomes non-linear. The slope of the color curve increases or decreases. One end of the color palette then covers a large number of results, while the other end distributes several colors over a relatively small result range.

The color curve shape can be set numerically or graphically.

To set the color curve shape graphically using the slider

- Select and drag the color curve shape slider (indicated by a gray box in the middle of the color curve) to the left or right. The area beneath the slider is focused, i.e. more colors are distributed there.



To set the color curve shape numerically

- In the "Shape" field, enter a value to change the shape of the curve:
 - A negative value (-1 to <0) focuses the lower values
 - 0 defines a linear distribution
 - A positive value (>0 to 1) focuses the higher values

11.3.9 References

- [Reference: ASCII file export format](#)..... 214

11.3.9.1 Reference: ASCII file export format

Trace data can be exported to a file in ASCII format for further evaluation in other applications. This reference describes in detail the format of the export files for result data.

(For details see [Section 11.3.8.1, "How to export trace data and numerical results"](#), on page 210).

The file consists of the header information (general configuration of the measurement) and the measurement results. Optionally, the header can be excluded from the file.

The data of the file header consist of three columns, each separated by a semicolon: parameter name; numeric value; basic unit. The data section starts with the keyword "Trace <n>" (<n> = number of stored trace). The measured data follows in one or several columns (depending on the measurement), which are also separated by a semicolon.

The results are output in the same order as they are displayed on the screen: window by window, trace by trace, and table row by table row.

Generally, the format of this ASCII file can be processed by spreadsheet calculation programs, e.g. MS Excel. Different language versions of evaluation programs can require a different handling of the decimal point. Thus, you can define the decimal separator to use (decimal point or comma).

If the spectrogram display is selected when you select "ASCII Trace Export", the entire histogram buffer with all frames is exported to a file. The data corresponding to a particular frame begins with information about the frame number and the time that frame was recorded.

Header	
Type; <instrument_model>;	Instrument model
Version;1.00;	Firmware version
Date;01. Jan 3000;	Date of data set storage
Mode;Receiver;	Application
Start;150000.000000;Hz;	Scan start
Stop;1000000.000000;Hz;	Scan stop
X-Axis;LIN;	Scale of the x-axis
Scan Count;1;	Scan count
Transducer Input1;;;;;;	List of transducer on input 1
Transducer Input2;;;;;;	List of transducer on input 2
Preselector;	Preselector configuration
State;On;	
Filter Split;On;	
Notch Filter 1;On;	State of the first notch filter
Notch Filter 2;Off;	State of the second notch filter

Data section (scan ranges)	
Scan 1:	
Start;150000.000000;Hz;	Start frequency of the scan range
Stop;29998500.000000;Hz;	Stop frequency of the scan range
Step;4500.000000;Hz;	Frequency stepsize applied in the scan range
RBW;9000.000000;Hz;	Measurement bandwidth applied in the scan range
Meas Time;0.001000;s;	Measurement time in the scan range
Auto Ranging;OFF;	State of the auto ranging feature
RF Att;10.000000;dB;	Attenuation applied in the scan range
Auto Preamp;OFF; Preamp;0.000000;dB;	Preamplifier information for the scan range
RF Input;1;	RF input used in the scan range
Scan 2:	
(...)	

Data section (traces)	
Trace 1:	
Trace Mode;CLR/WRITE;	Trace mode
Scan Detector;MAX PEAK;	Detector type
X-Unit;Hz;	Unit of the x-axis
Y-Unit;Hz;	Unit of the y-axis
Values;1343;	Number of measurement points
150000.000000;3.541122; 154500.000000;5.776306;[...]	String of results
Trace 2:	
(...)	

11.4 Marker usage

Markers help you analyze your measurement results by determining particular values in the diagram. Thus you can extract numeric values from a graphical display both in the time and frequency domain.



Markers in spectrogram displays

In the spectrogram result display, you can activate up to 17 markers or delta markers at the same time. Each marker can be assigned to a different frame. Therefore, in addition to the frequency you also define the frame number when activating a new marker. If no frame number is specified, the marker is positioned on the currently selected frame. All markers are visible that are positioned on a visible frame.

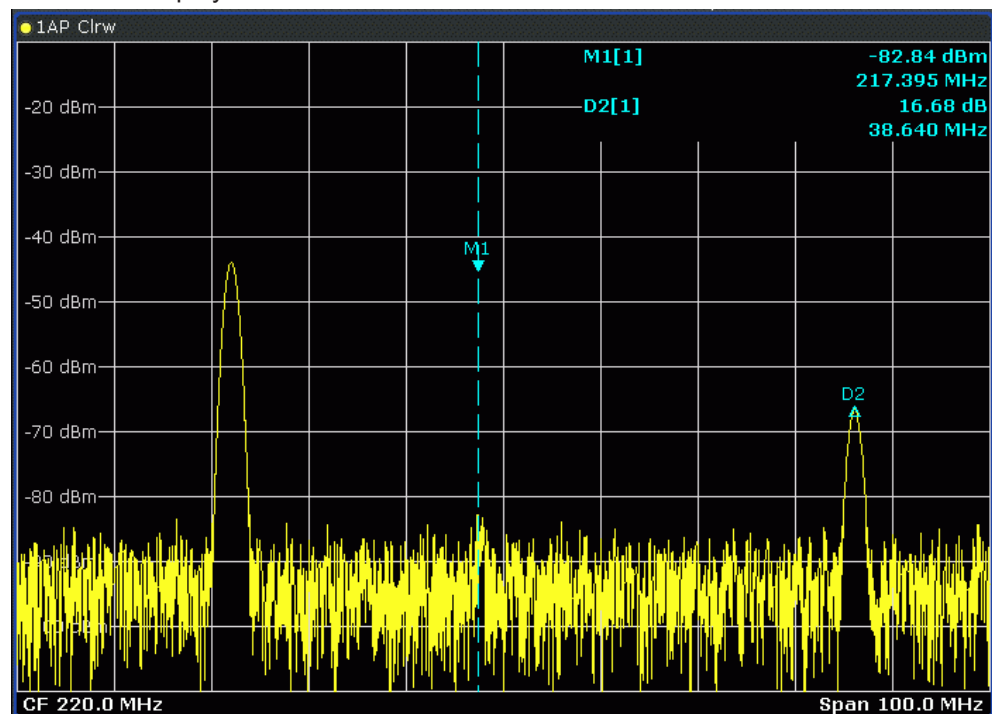
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- [Marker settings](#).....221
- [Marker search settings and positioning functions](#)..... 225

11.4.1 Basics on markers

Some background knowledge on marker settings and functions is provided here for a better understanding of the required configuration settings.

Markers are used to mark points on traces, to read out measurement results and to select a display section quickly. The R&S EPL provides 16 markers per display window. In the Spectrum application, the same markers are displayed in all windows.

- The easiest way to work with markers is using the touch screen. Simply drag the marker and drop it at the required position. When a marker label is selected, a vertical line is displayed which indicates the marker's current x-value.



- Alternatively, change the position of the selected marker using the rotary knob. By default, the marker is moved from one pixel to the next. If you need to position the marker more precisely, change the step size to move from one measurement point to the next (General Marker Setting).
- You can also set an active marker to a new position by defining its x-position numerically. When you select the softkey for a marker, an edit dialog box is displayed.
- The most commonly required marker settings and functions are also available as softkeys or via the context menu. Tap the marker on the touch screen and hold your finger for about 2 seconds until the context menu is opened, then select the required entry.
- Softkeys for active markers (displayed on the screen) are highlighted blue. The softkey for the currently selected marker (for which functions are performed) is highlighted orange.
- To set individual markers very quickly, use the softkeys in the "Marker" menu.
- To set up several markers at once, use the "Marker" dialog box.

- To position the selected marker to a special value, use the softkeys in the "Marker To" menu.
- [Marker results](#)..... 218
- [Searching for signal peaks](#)..... 219

11.4.1.1 Marker results

Normal markers point to a trace point on the x-axis and display the associated numeric value for that trace point. Delta markers indicate an offset between the level at the delta marker position and the level at the position of the assigned reference marker, in dB.

The results can be displayed directly within the diagram area or in a separate table. By default, the first two active markers are displayed in the diagram area. If more markers are activated, the results are displayed in a marker table.

Marker information in diagram area

By default, the results of the last two markers or delta markers that were activated are displayed in the diagram area.

D2[1]	-21.90 dB
	-3.9180 GHz
M1[1]	-25.87 dBm
	13.1970 GHz

The following information is displayed there:

- The marker type (M for normal, D for delta, or special function name)
- The marker number
- The assigned trace number in square brackets []
- The marker value on the y-axis, or the result of the marker function
- The marker position on the x-axis

Marker information in marker table

In addition to the marker information displayed within the diagram area, a separate marker table may be displayed beneath the diagram. This table provides the following information for all active markers:

Table 11-3: Contents of the marker table in the Receiver application

Wnd	Window type the marker is positioned in.
Type	Marker type: N (normal), D (delta), T (temporary, internal) and number
Ref	Reference marker for delta markers
Trc	Trace to which the marker is assigned
X-value	X-value of the marker
Y-value	Y-value of the marker

11.4.1.2 Searching for signal peaks

A common measurement task is to determine peak values, i.e. maximum or minimum signal levels. The R&S EPL provides various peak search functions and applications:

- Setting a marker to a peak value once (Peak Search)
- Searching for a peak value within a restricted search area (Search Limits)
- Creating a marker table with all or a defined number of peak values for one measurement (Marker Peak List)
- Updating the marker position to the current peak value automatically after each measurement (Auto Peak Search)
- Creating a fixed reference marker at the current peak value of a trace (Fixed Reference)

Note that the marker peak search is independent of the peak search available for automated test sequences. For more information, see [Section 9.3.4, "Performing a peak search"](#), on page 111.

Peak search limits

The peak search can be restricted to a search area. The search area is defined by limit lines which are also indicated in the diagram. In addition, a minimum value (threshold) can be defined as a further search condition.

When is a peak a peak? - Peak excursion

During a peak search, for example when a marker peak table is displayed, noise values may be detected as a peak if the signal is very flat or does not contain many peaks. Therefore, you can define a relative threshold ("Peak excursion"). The signal level must increase by the threshold value before falling again before a peak is detected. To avoid identifying noise peaks as maxima or minima, enter a peak excursion value that is higher than the difference between the highest and the lowest value measured for the displayed inherent noise.

Effect of peak excursion settings (example)

The following figure shows a trace to be analyzed.

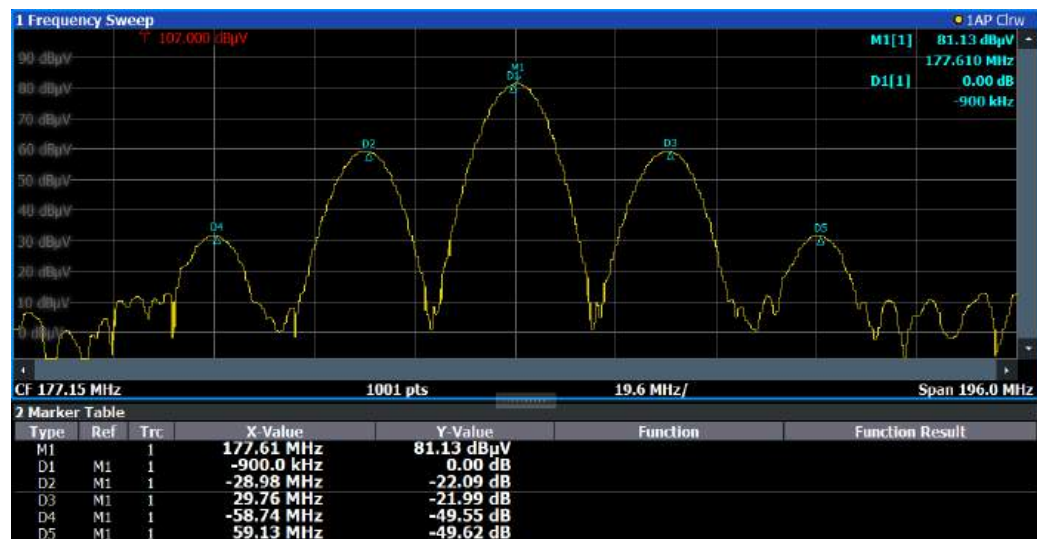


Figure 11-8: Trace example

The following table lists the peaks as indicated by the marker numbers in the diagram above, as well as the minimum decrease in amplitude to either side of the peak:

Marker #	Min. amplitude decrease to either side of the signal
1	30 dB
2	29.85 dB
3	20 dB
4	10 dB
5	18 dB

In order to eliminate the smaller peaks M3, M4 and M5 in the example above, a peak excursion of at least 20 dB is required. In this case, the amplitude must rise at least 20 dB before falling again before a peak is detected.

Marker peak list

The marker peak list determines the frequencies and levels of peaks in the spectrum. It is updated automatically after each measurement. How many peaks are displayed can be defined, as well as the sort order. In addition, the detected peaks can be indicated in the diagram. The peak list can also be exported to a file for analysis in an external application.

Automatic peak search

A peak search can be repeated automatically after each measurement in order to keep the maximum value as the reference point for a phase noise measurement. This is useful to track a drifting source. The delta marker 2, which shows the phase noise measurement result, keeps the delta frequency value. Therefore the phase noise measurement leads to reliable results in a certain offset although the source is drifting.

In the Receiver application, the R&S EPL provides an automatic peak search. In that case, the R&S EPL searches for peaks when a scan is over. The search results are added to the marker peak list as usual and are the basis for the final measurement. For more information, see [Section 9.3.4, "Performing a peak search"](#), on page 111.

Using a peak as a fixed reference marker

Some results are analyzed in relation to a peak value, for example a carrier frequency level. In this case, the maximum level can be determined by an initial peak search and then be used as a reference point for further measurement results.

11.4.2 Marker settings

Access: "Overview" > "Analysis" > "Marker"

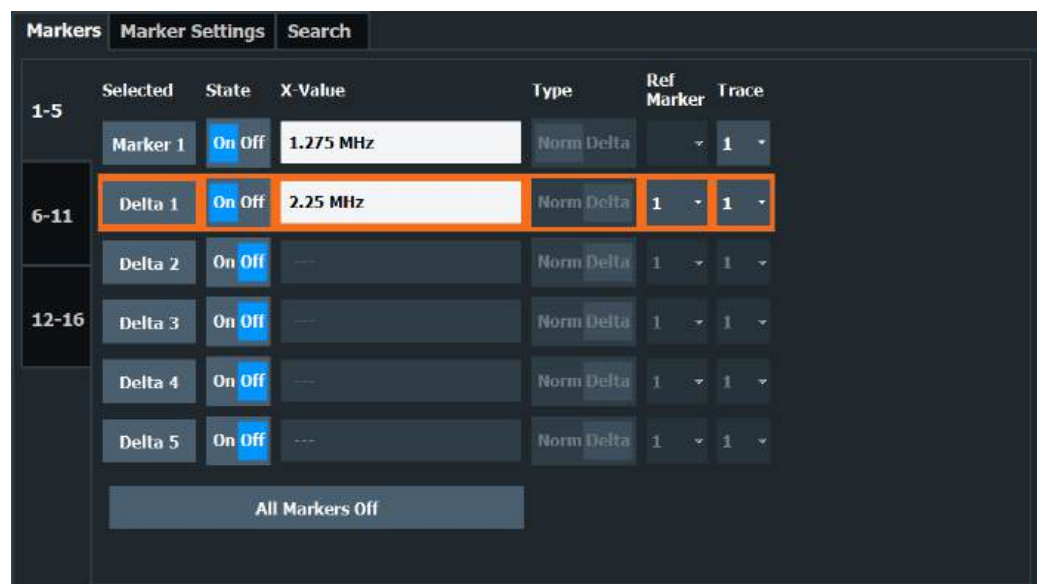
The remote commands required to define these settings are described in [Section 15.7.4, "Markers"](#), on page 492

- [Individual marker setup](#).....221
- [General marker settings](#).....224

11.4.2.1 Individual marker setup

Access: "Overview" > "Analysis" > "Marker" > "Markers"

Up to 17 markers or delta markers can be activated for each window simultaneously. Initial marker setup is performed using the "Marker" dialog box.



The markers are distributed among 3 tabs for a better overview. By default, the first marker is defined as a normal marker, whereas all others are defined as delta markers with reference to the first marker. All markers are assigned to trace 1, but only the first marker is active.

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Select Marker.....	223
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Selected Marker

Marker name. The marker which is currently selected for editing is highlighted orange.

Remote command:

Marker selected via suffix <m> in remote commands.

Marker State

Activates or deactivates the marker in the diagram.

Remote command:

`CALCulate<n>:MARKer<m>[:STATe]` on page 495

`CALCulate<n>:DELTamarker<m>[:STATe]` on page 494

Marker Position X-value

Defines the position (x-value) of the marker in the diagram. For normal markers, the absolute position is indicated. For delta markers, the position relative to the reference marker is provided.

Remote command:

`CALCulate<n>:MARKer<m>:X` on page 496

`CALCulate<n>:DELTamarker<m>:X` on page 494

Frame (Spectrogram only)

Spectrogram frame the marker is assigned to.

Remote command:

`CALCulate<n>:MARKer<m>:SPECTrogram:FRAMe` on page 508

`CALCulate<n>:DELTamarker<m>:SPECTrogram:FRAMe` on page 512

Marker Type

Toggles the marker type.

The type for marker 1 is always "Normal", the type for delta marker 1 is always "Delta". These types cannot be changed.

Note: If normal marker 1 is the active marker, switching the "Mkr Type" activates an additional delta marker 1. For any other marker, switching the marker type does not activate an additional marker, it only switches the type of the selected marker.

"Normal"	A normal marker indicates the absolute value at the defined position in the diagram.
"Delta"	A delta marker defines the value of the marker relative to the specified reference marker (marker 1 by default).

Remote command:

`CALCulate<n>:MARKer<m>[:STATe]` on page 495

`CALCulate<n>:DELTamarker<m>[:STATe]` on page 494

Reference Marker

Defines a marker as the reference marker which is used to determine relative analysis results (delta marker values).

Remote command:

`CALCulate<n>:DELTamarker<m>:MREference` on page 493

Assigning the Marker to a Trace

The "Trace" setting assigns the selected marker to an active trace. The trace determines which value the marker shows at the marker position. If the marker was previously assigned to a different trace, the marker remains on the previous frequency or time, but indicates the value of the new trace.

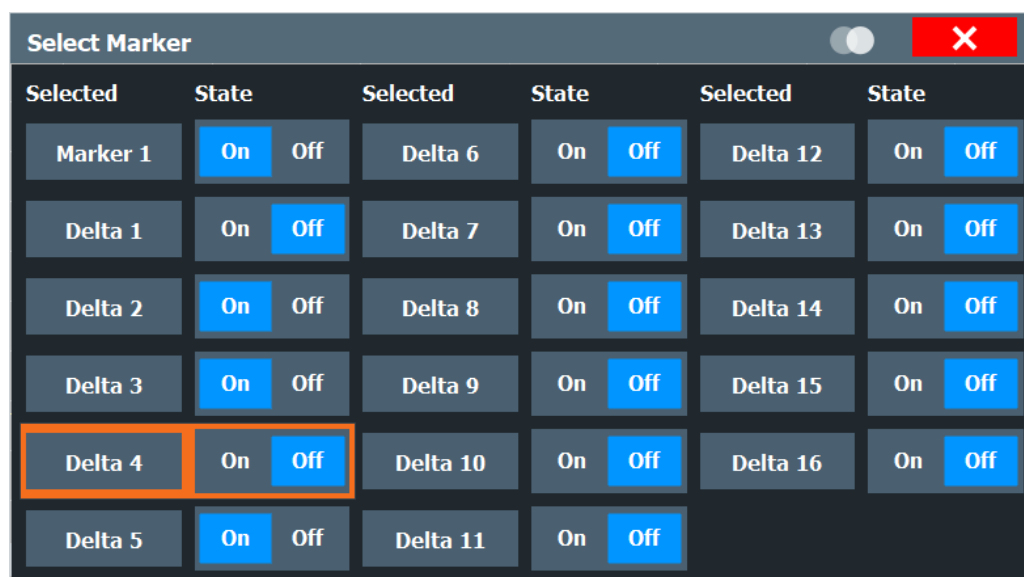
If a trace is turned off, the assigned markers and marker functions are also deactivated.

Remote command:

`CALCulate<n>:MARKer<m>:TRACe` on page 495

Select Marker

The "Select Marker" function opens a dialog box to select and activate or deactivate one or more markers quickly.



Remote command:

`CALCulate<n>:MARKer<m>[:STATe]` on page 495

`CALCulate<n>:DELTamarker<m>[:STATe]` on page 494

All Markers Off

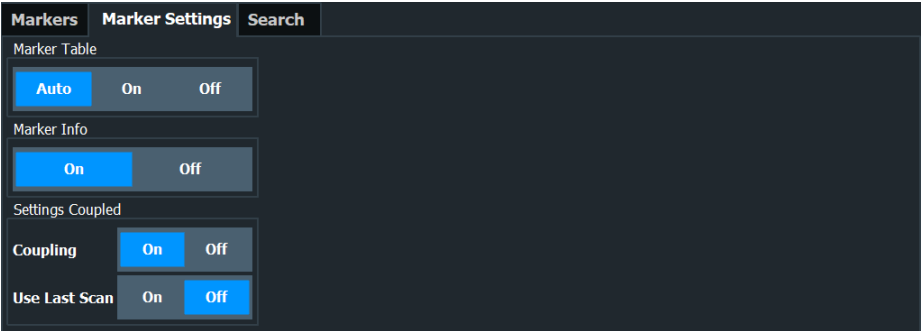
Deactivates all markers in one step.

Remote command:
CALCulate<n>:MARKer<m>:AOFF on page 495

11.4.2.2 General marker settings

Access: "Overview" > "Analysis" > "Marker" > "Marker Settings"

Some general marker settings allow you to influence the marker behavior for all markers.



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Marker Table Display

Defines how the marker information is displayed.

- "On" Displays the marker information in a table in a separate area beneath the diagram.
- "Off" No separate marker table is displayed.

Remote command:
DISPlay[:WINDow<n>]:MTABLE on page 498

Marker Info

Turns the marker information displayed in the diagram on and off.

● 1AP Clrw	
M1[1]	81.13 dBµV 177.610 MHz
D2[1]	-22.18 dB -28.980 MHz

Remote command:
DISPlay[:WINDow<n>]:MINFo[:STATe] on page 497

Settings Coupled

Couples or decouples the receiver settings to the scan range settings when you use [Tune to Marker](#).

When you turn on this feature, the R&S EPL changes the receiver settings according to the scan range the marker frequency is currently in.

In addition, you can select which settings the R&S EPL applies with the "Use Last Scan" feature.

- When you turn it on, the R&S EPL uses the configuration of the last scan.
- When you turn it off, the R&S EPL uses the current configuration of the scan table, if you have changed it since the last scan.
(If you have not changed anything, the configuration of the last scan is still in effect.)

Remote command:

[CALCulate<n>:MARKer<m>:SCOupled\[:STATe\]](#) on page 497

[CALCulate<n>:MARKer<m>:SCOupled:LSCan](#) on page 496

11.4.3 Marker search settings and positioning functions

Several functions are available to set the marker to a specific position very quickly and easily, or to use the current marker position to define another characteristic value. In order to determine the required marker position, searches may be performed. The search results can be influenced by special settings.

Most marker positioning functions and the search settings are available in the [MKR →] menu.

Search settings are also available via the [Marker] key or in the vertical "Marker Config" tab of the "Analysis" dialog box (horizontal "Search Settings" tab).

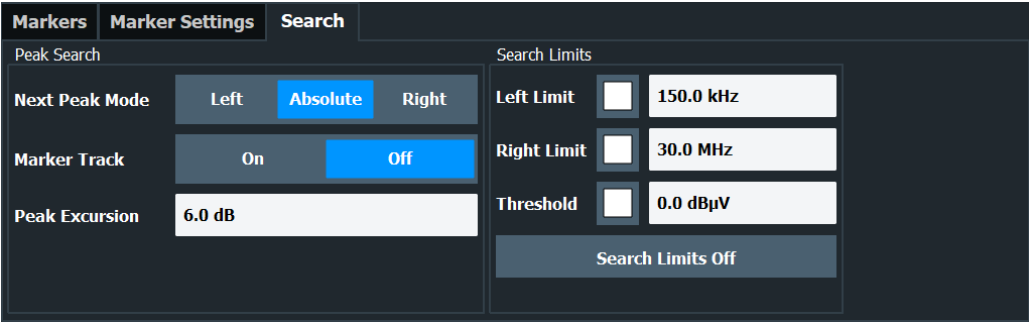
For more information on searching for signal peaks see [Section 11.4.1.2, "Searching for signal peaks"](#), on page 219.

- [Marker search](#).....225
- [Marker search \(spectrogram\)](#).....227
- [Marker positioning](#).....228

11.4.3.1 Marker search

Access: "Overview" > "Analysis" > "Marker" > "Search"

Markers are commonly used to determine peak values, i.e. maximum or minimum values, in the measured signal. Configuration settings allow you to influence the peak search results.



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Search Mode for Next Peak

Selects the search mode for the next peak search.

- "Left" Determines the next maximum/minimum to the left of the current peak.
- "Absolute" Determines the next maximum/minimum to either side of the current peak.
- "Right" Determines the next maximum/minimum to the right of the current peak.

Remote command:
Find a list of remote commands in [Section 15.7.4, "Markers"](#), on page 492.

Peak Excursion

Defines the minimum level value by which a signal must rise or fall so that it is identified as a maximum or a minimum by the search functions.
Entries from 0 dB to 80 dB are allowed; the resolution is 0.1 dB. The default setting for the peak excursion is 6 dB.

Remote command:
`CALCulate<n>:MARKer<m>:PEXCursion` on page 415

Search Limits (Left / Right)

If activated, limit lines are defined and displayed for the search. Only results within the limited search range are considered.

Remote command:
`CALCulate<n>:MARKer<m>:X:SLIMits[:STATe]` on page 499
`CALCulate<n>:MARKer<m>:X:SLIMits:LEFT` on page 499
`CALCulate<n>:MARKer<m>:X:SLIMits:RIGHT` on page 499

Search Threshold

Defines an absolute threshold as an additional condition for the peak search. If enabled, only peaks that exceed the threshold are detected.

Remote command:
CALCulate<n>:THReshold:STATe on page 500
CALCulate<n>:THReshold on page 500

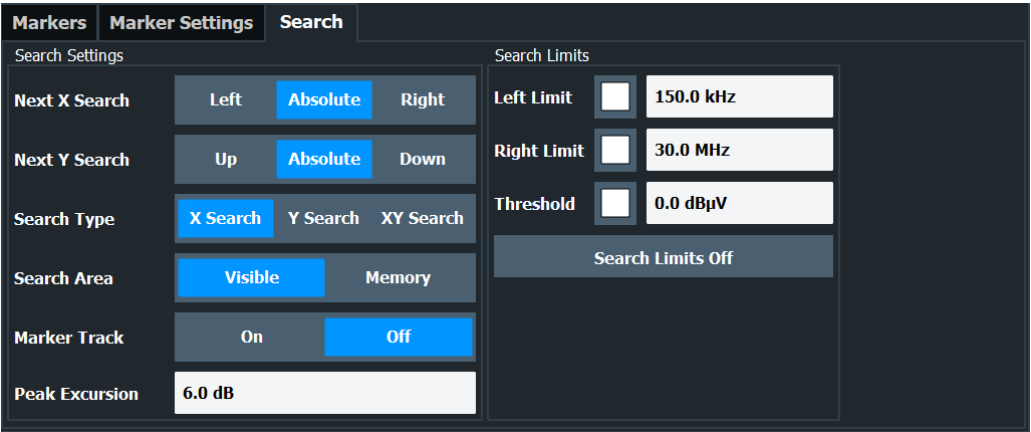
Search Limits Off
Deactivates the search range limits.
Remote command:

CALCulate<n>:MARKer<m>:X:SLIMits[:STATe] on page 499
CALCulate<n>:THReshold:STATe on page 500

11.4.3.2 Marker search (spectrogram)

Access: "Overview" > "Analysis" > "Marker" > "Search"
These settings are only available for spectrogram displays.

Spectrograms show not only the current measurement results, but also the measure-
ment history. Thus, when searching for peaks, you must define the search settings
within a single time frame (x-direction) and within several time frames (y-direction).



Marker search functions for the spectrogram described elsewhere:

- [Marker Track](#)
- ["Peak Excursion"](#) on page 226
- ["Search Limits \(Left / Right\)"](#) on page 226
- ["Search Threshold"](#) on page 226
- ["Search Limits Off"](#) on page 227

Search Mode for Next Peak in X-Direction	227
Search Mode for Next Peak in Y-Direction	228
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Search Mode for Next Peak in X-Direction
Selects the search mode for the next peak search within the currently selected frame.
"Left" Determines the next maximum/minimum to the left of the current peak.

"Absolute"	Determines the next maximum/minimum to either side of the current peak.
"Right"	Determines the next maximum/minimum to the right of the current peak.

Remote command:

Find a list of remote commands in [Section 15.7.4.6, "Spectrogram markers"](#), on page 507.

Search Mode for Next Peak in Y-Direction

Selects the search mode for the next peak search within all frames at the current marker position.

"Up"	Determines the next maximum/minimum above the current peak (in more recent frames).
"Absolute"	Determines the next maximum/minimum above or below the current peak (in all frames).
"Down"	Determines the next maximum/minimum below the current peak (in older frames).

Remote command:

Find a list of remote commands in [Section 15.7.4.6, "Spectrogram markers"](#), on page 507.

Marker Search Type

Defines the type of search to be performed in the spectrogram.

"X-Search"	Searches only within the currently selected frame.
"Y-Search"	Searches within all frames but only at the current frequency position.
"XY-Search"	Searches in all frames at all positions.

Remote command:

Find a list of remote commands in [Section 15.7.4.6, "Spectrogram markers"](#), on page 507.

Marker Search Area

Defines which frames the search is performed in.

"Visible"	Only the visible frames are searched.
"Memory"	All frames stored in the memory are searched.

Remote command:

[CALCulate<n>:MARKer<m>:SPECTrogram:SARea](#) on page 508

[CALCulate<n>:DELTAmarker<m>:SPECTrogram:SARea](#) on page 512

11.4.3.3 Marker positioning

The following functions set the currently selected marker to the result of a peak search or set other characteristic values to the current marker value. These functions are available as softkeys in the "Marker To" menu, which is displayed when you press the [MKR →] key.

Functions to position markers in the Spectrum application described elsewhere:

- "Settings Coupled" on page 225

Peak Search.....	229
Search Next Peak.....	229
Search Minimum.....	229
Search Next Minimum.....	229

Peak Search

Sets the selected marker/delta marker to the maximum of the trace. If no marker is active, marker 1 is activated.

For spectrogram displays, define which frame the peak is to be searched in.

Remote command:

`CALCulate<n>:MARKer<m>:MAXimum[:PEAK]` on page 501

`CALCulate<n>:DELTamarker<m>:MAXimum[:PEAK]` on page 504

Search Next Peak

Sets the selected marker/delta marker to the next (lower) maximum of the assigned trace. If no marker is active, marker 1 is activated.

For spectrogram displays, define which frame the next peak is to be searched in.

Remote command:

`CALCulate<n>:MARKer<m>:MAXimum:NEXT` on page 501

`CALCulate<n>:MARKer<m>:MAXimum:RIGHT` on page 502

`CALCulate<n>:MARKer<m>:MAXimum:LEFT` on page 501

`CALCulate<n>:DELTamarker<m>:MAXimum:NEXT` on page 504

`CALCulate<n>:DELTamarker<m>:MAXimum:RIGHT` on page 504

`CALCulate<n>:DELTamarker<m>:MAXimum:LEFT` on page 503

Search Minimum

Sets the selected marker/delta marker to the minimum of the trace. If no marker is active, marker 1 is activated.

For spectrogram displays, define which frame the minimum is to be searched in.

Remote command:

`CALCulate<n>:MARKer<m>:MINimum[:PEAK]` on page 503

`CALCulate<n>:DELTamarker<m>:MINimum[:PEAK]` on page 505

Search Next Minimum

Sets the selected marker/delta marker to the next (higher) minimum of the selected trace. If no marker is active, marker 1 is activated.

For spectrogram displays, define which frame the next minimum is to be searched in.

Remote command:

`CALCulate<n>:MARKer<m>:MINimum:NEXT` on page 502

`CALCulate<n>:MARKer<m>:MINimum:LEFT` on page 502

`CALCulate<n>:MARKer<m>:MINimum:RIGHT` on page 503

`CALCulate<n>:DELTamarker<m>:MINimum:NEXT` on page 505

`CALCulate<n>:DELTamarker<m>:MINimum:LEFT` on page 505

`CALCulate<n>:DELTamarker<m>:MINimum:RIGHT` on page 505

11.5 Display and limit lines

Display and limit lines help you analyze a measurement trace.

Access: "Overview" > "Analysis" > "Lines"

For remote operation, see [Section 15.7.5, "Display and limit line configuration"](#), on page 515 .

- [Display lines](#).....230
- [Limit lines](#).....232

11.5.1 Display lines

11.5.1.1 Basics on display lines

Display lines help you analyze a trace – as do markers. The function of a display line is comparable to that of a ruler that can be shifted on the trace in order to mark absolute values. They are used exclusively to visually mark relevant frequencies or points in time (zero span), as well as constant level values. It is not possible to check automatically whether the points are below or above the marked level values - use limit lines for that task (see [Section 11.5.2.1, "Basics on limit lines"](#), on page 232).

Two different types of display lines are provided:

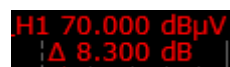
- Two horizontal lines: "Horizontal Line 1" and "Horizontal Line 2".
These lines are continuous horizontal lines across the entire width of a diagram and can be shifted up and down.
- 2 vertical lines: "Vertical Line 1" to "Vertical Line 2"
These lines are continuous vertical lines across the entire height of the diagram and can be shifted left and right.

Labels

Each line is identified by one of the following abbreviations in the diagrams:

- H1: "Horizontal Line 1"
- H2: "Horizontal Line 2"
- V1: "Vertical Line 1"
- V2: "Vertical Line 2"
- TF: "Tuned Frequency Line"
- Each label also shows the absolute position of the corresponding line, for example "H1 70.000 dBμV".

If you turn on both horizontal lines or both vertical lines, the label of the first line also shows the distance to the second line, for example "H1 70.000 dBμV, Δ 8.250 dB".



11.5.1.2 Display line settings

Access: "Overview" > "Analysis" > "Lines" > "Display Lines"

2 vertical and 2 horizontal lines can be defined in the display.

Two vertical, two horizontal lines and one tuned frequency line can be defined in the display.

Line Config

Limit Lines

Display Lines

Vertical Line 1	☐	150.0 kHz
Vertical Line 2	☐	1.0 GHz
Horizontal Line 1	☐	100.0 dBµV
Horizontal Line 2	☐	0.0 dBµV
Tuned Frequency Line 1	☒	100.0 MHz

Vertical Line <x>.....231

Horizontal Line 1/ Horizontal Line 2..... 231

Tuned Frequency..... 231

Vertical Line <x>

Activates a vertical display line in the diagram at the specified point of the x-axis, depending on the scale of the axis.

If you activate both vertical lines, the label of the first vertical line shows the distance to second vertical line.

Remote command:

CALCulate<n>:FLINe<dl> on page 516

CALCulate<n>:TLINe<dl> on page 517

Horizontal Line 1/ Horizontal Line 2

Activates a horizontal display line (H1 or H2) in the diagram at the specified point of the y-axis.

If you activate both horizontal lines, the label of the first horizontal line shows the distance to second vertical line.

Remote command:

CALCulate<n>:DLINe<dl> on page 515

CALCulate<n>:DLINe<dl> on page 515

Tuned Frequency

Turns a display line that represents the currently selected receiver frequency on and off.

The tuned frequency line is labeled "TF" in the diagram.

Remote command:

[CALCulate<n>:TFLine:STATe](#) on page 517

11.5.1.3 Defining display lines

Display lines are configured in the "Lines Config" dialog box.

1. Select [Lines] > "Lines Config" > "Display Lines".
2. To define a vertical line:
 - a) Select "Vertical Line" <1 to 2>.
 - b) Enter the x-value at which the line is to be displayed.
3. To define a horizontal line:
 - a) Select "Horizontal Line" 1 or 2.
 - b) Enter the y-value at which the line is to be displayed.



Proceed in the same way for the "Tuned Frequency Line".

11.5.2 Limit lines

Limit lines allow you to check automatically whether the measured points are below or above specified values.

- [Basics on limit lines](#).....232
- [Limit line settings and functions](#).....236
- [How to define limit lines](#).....243
- [Reference: limit line file format](#).....247

11.5.2.1 Basics on limit lines

Limit lines are used to define amplitude curves or spectral distribution boundaries in the result diagram which are not to be exceeded. They indicate, for example, the upper limits for interference radiation or spurious waves which are allowed from a device under test (DUT). When transmitting information in TDMA systems (e.g. GSM), the amplitude of the bursts in a time slot must adhere to a curve that falls within a specified tolerance band. The lower and upper limits may each be specified by a limit line. Then, the amplitude curve can be controlled either visually or automatically for any violations of the upper or lower limits (GO/NOGO test).

The R&S EPL supports limit lines with a maximum of 200 data points. Eight of the limit lines stored in the instrument can be activated simultaneously. The number of limit lines stored in the instrument is only limited by the capacity of the storage device used.

Limit line data can also be exported to a file in ASCII (CSV) format for further evaluation in other applications. Limit lines stored in the specified ASCII (CSV) format can also be imported to the R&S EPL for other measurements.

Compatibility

Limit lines are compatible with the current measurement settings, if the following applies:

- The x unit of the limit line has to be identical to the current setting.
- The y unit of the limit line has to be identical to the current setting with the exception of dB based units; all dB based units are compatible with each other.

Validity

Only limit lines that fulfill the following conditions can be activated:

- Each limit line must consist of a minimum of 2 and a maximum of 200 data points.
- The frequencies/times for each data point must be defined in ascending order; however, for any single frequency or time, two data points may be entered (to define a vertical segment of a limit line).
- Gaps in frequency or time are not allowed. If gaps are desired, two separate limit lines must be defined and then both enabled.
- The entered frequencies or times need not necessarily be selectable in R&S EPL. A limit line may also exceed the specified frequency or time range. The minimum frequency for a data point is -200 GHz, the maximum frequency is 200 GHz. For the time range representation, negative times may also be entered. The allowed range is -1000 s to +1000 s.

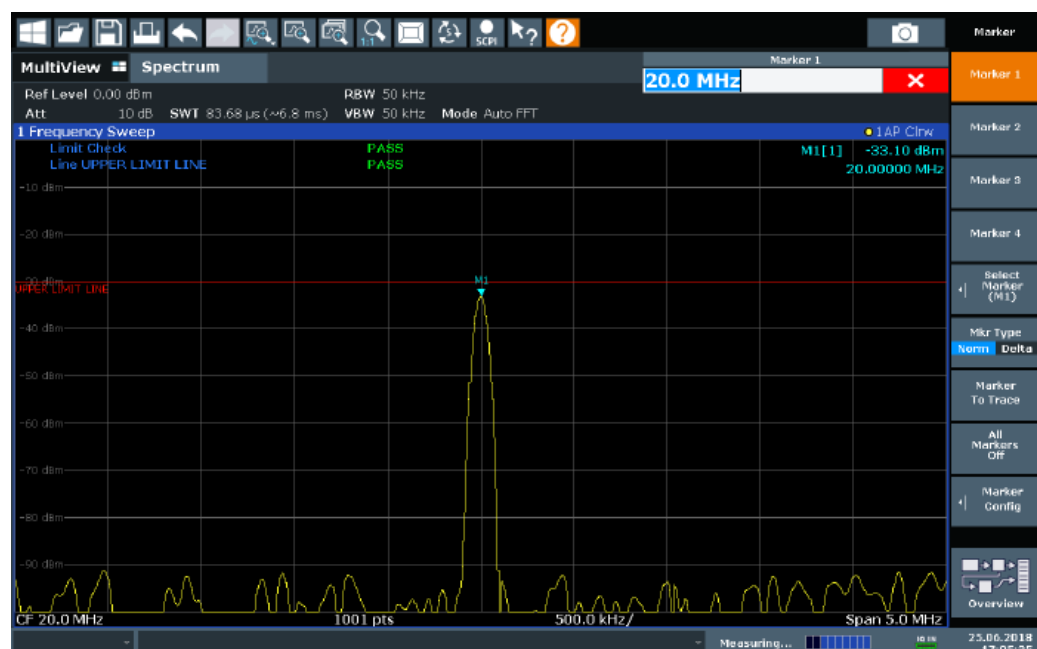


Figure 11-9: Example for an upper limit line

Limits and Margins

Limit lines define strict values that must not be exceeded by the measured signal. A **margin** is similar to a limit, but less strict and it still belongs to the valid data range. It can be used as a warning that the limit is almost reached. The margin is not indicated by a separate line in the display, but if it is violated, a warning is displayed. Margins are defined as lines with a fixed distance to the limit line.

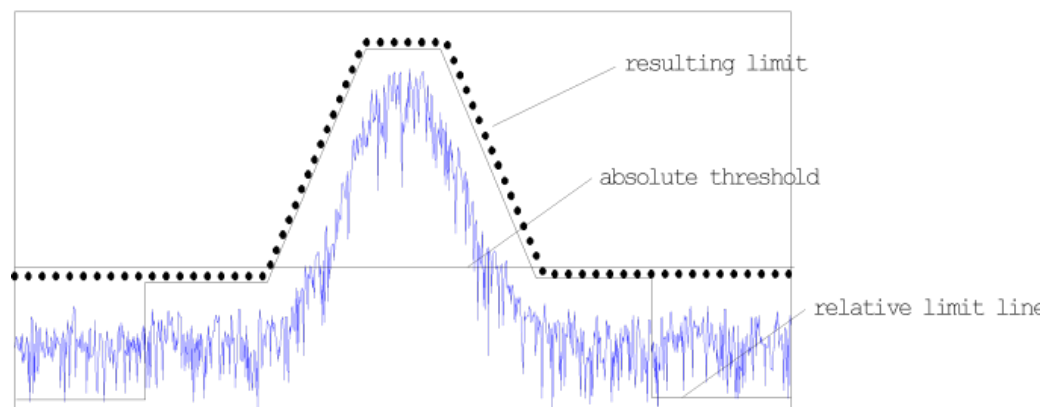
To check the signal for maximum levels you must define an **upper limit**, whereas to check the signal for minimum levels you must define a **lower limit**.

Limits can be defined relative to the reference level, the beginning of the time scale, or the center frequency, or as absolute values.

Relative scaling is suitable, for example, if masks for bursts are to be defined in zero span, or if masks for modulated signals are required in the frequency domain.

Thresholds

If the y-axis for the limit line data points uses relative scaling, an additional absolute **threshold** can be defined for the limit check. In this case, both the threshold value and the relative limit line must be exceeded before a violation occurs.



Offsets and Shifting

A configured limit line can easily be moved vertically or horizontally. Two different methods to do so are available:

- An **offset** moves the entire line in the diagram without editing the configured values or positions of the individual data points. This option is only available if relative scaling is used.
Thus, a new limit line can be easily generated based upon an existing limit line which has been shifted horizontally or vertically.
- Defining a **shift** width for the values or position of the individual data points changes the line configuration, thus changing the position of the line in the diagram.

Limit Check Results

A limit check is automatically performed as soon as any of the limit lines is activated ("Visibility" setting). Only the specified "Traces to be Checked" are compared with the

active limit lines. The status of the limit check for each limit line is indicated in the diagram. If a violation occurs, the limit check status is set to "MARG" for a margin violation, or to "Fail" for a limit violation.



Figure 11-10: Margin violation for limit check

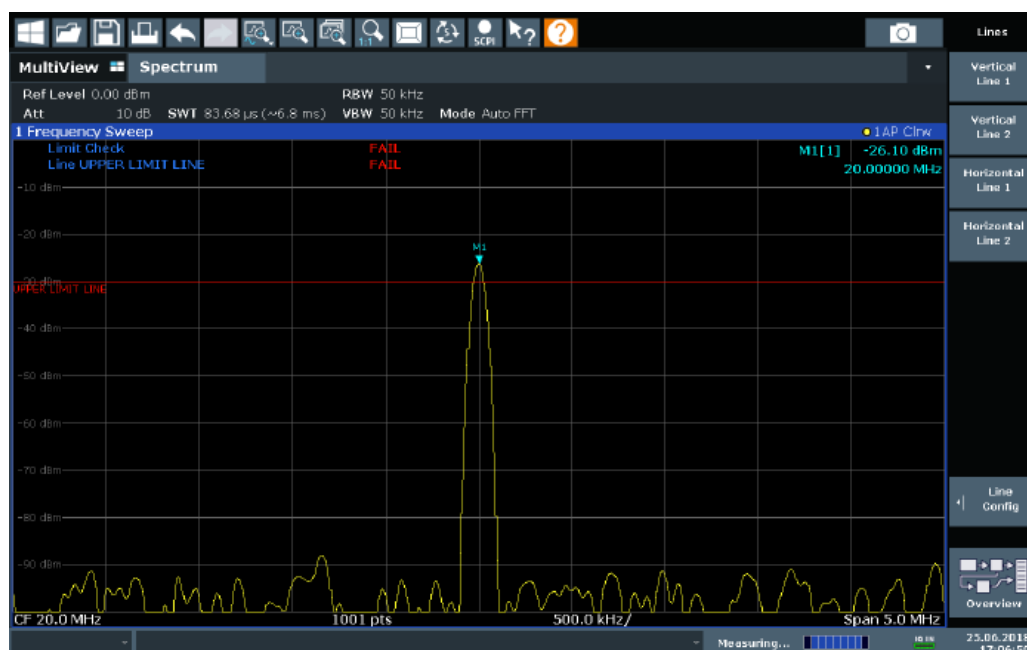


Figure 11-11: Limit violation for limit check



Storing and Recalling Limit Lines

Limit lines can be stored with the configuration settings so they can be recalled for other measurements at a later time (see [Section 12.3, "Storing and recalling instrument settings and measurement data"](#), on page 250). Note, however, that any changes made to the limit lines *after* storing the configuration file cannot be restored and will be overwritten by the stored values when the configuration file is recalled. Always remember to store the settings again after changing the limit line values.

After recalling measurement settings, the limit line values applied to the measurement may be different to those displayed in the "Limit Lines" dialog box; see ["Saving and recalling transducer and limit line settings"](#) on page 251.

11.5.2.2 Limit line settings and functions

Access: "Overview" > "Analysis" > "Lines"

or: [LINES] > "Line Config"

Up to 8 limit lines can be displayed simultaneously in the R&S EPL. Many more can be stored on the instrument.



Stored limit line settings

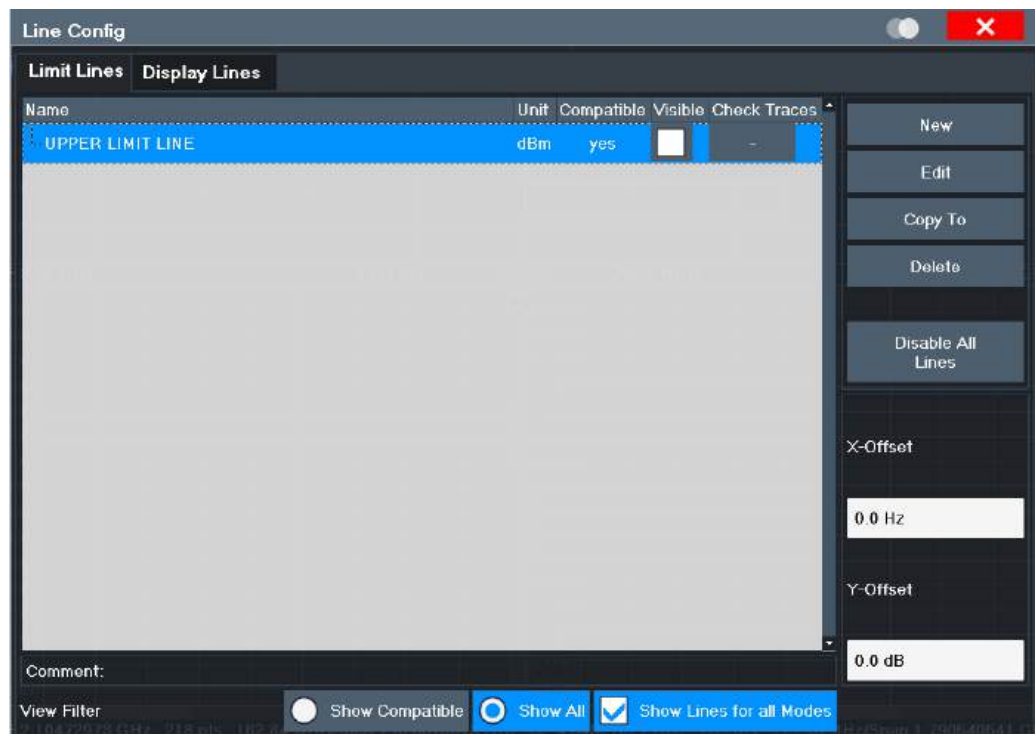
When storing and recalling limit line settings, consider the information provided in ["Saving and recalling transducer and limit line settings"](#) on page 251.

- [Limit line management](#).....236
- [Limit line details](#).....239

Limit line management

Access: "Overview" > "Analysis" > "Lines" > "Limit Lines"

or: [LINES] > "Line Config" > "Limit Lines"



For the limit line overview, the R&S EPL searches for all stored limit lines with the file extension `.LIN` in the `limits` subfolder of the main installation folder. The overview allows you to determine which limit lines are available and can be used for the current measurement.

For details on settings for individual lines see ["Limit line details"](#) on page 239.

For more basic information on limit lines see [Section 11.5.2.1, "Basics on limit lines"](#), on page 232.

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Name

The name of the stored limit line.

Unit

The unit in which the y-values of the data points of the limit line are defined.

Compatibility

Indicates whether the limit line definition is compatible with the current measurement settings.

For more information on which conditions a limit line must fulfill to be compatible, see ["Compatibility"](#) on page 233.

Visibility

Displays or hides the limit line in the diagram. Up to 8 limit lines can be visible at the same time. Inactive limit lines can also be displayed in the diagram.

Remote command:

`CALCulate<n>:LIMit<li>:LOWer:STATe` on page 520

`CALCulate<n>:LIMit<li>:UPPer:STATe` on page 522

`CALCulate<n>:LIMit<li>:ACTive?` on page 518

Traces to be Checked

Defines which traces are automatically checked for conformance with the limit lines. As soon as a trace to be checked is defined, the assigned limit line is active. One limit line can be activated for several traces simultaneously. If any of the "Traces to be Checked" violate any of the active limit lines, a message is indicated in the diagram.

Remote command:

`CALCulate<n>:LIMit<li>:TRACe<t>:CHECK` on page 521

Comment

An optional description of the limit line.

Included Lines in Overview (View Filter)

Defines which of the stored lines are included in the overview.

"Show Compatible"	Only compatible lines Whether a line is compatible or not is indicated in the Compatibility setting.
"Show All"	All stored limit lines with the file extension <code>.LIN</code> in the <code>limits</code> subfolder of the main installation folder.

X-Offset

Shifts a limit line that has been specified for relative frequencies or times (x-axis) horizontally.

This setting does not have any effect on limit lines that are defined by absolute values for the x-axis.

Remote command:

`CALCulate<n>:LIMit<li>:CONTRol:OFFSet` on page 519

Y-Offset

Shifts a limit line that has relative values for the y-axis (levels or linear units such as volt) vertically.

This setting does not have any effect on limit lines that are defined by absolute values for the y-axis.

Remote command:

[CALCulate<n>:LIMit:LOWer:OFFSet](#) on page 520

[CALCulate<n>:LIMit:UPPer:OFFSet](#) on page 522

Limit Check

Turns limit checks for pre-measurement on and off.

Remote command:

[CALCulate<n>:LIMit:CHECK](#) on page 532

Create New Line

Creates a new limit line.

Edit Line

Edit an existing limit line configuration.

Copy Line

Copy the selected limit line configuration to create a new line.

Remote command:

[CALCulate<n>:LIMit:COPY](#) on page 519

Delete Line

Delete the selected limit line configuration.

Remote command:

[CALCulate<n>:LIMit:DELeTe](#) on page 520

Disable All Lines

Disable all limit lines in one step.

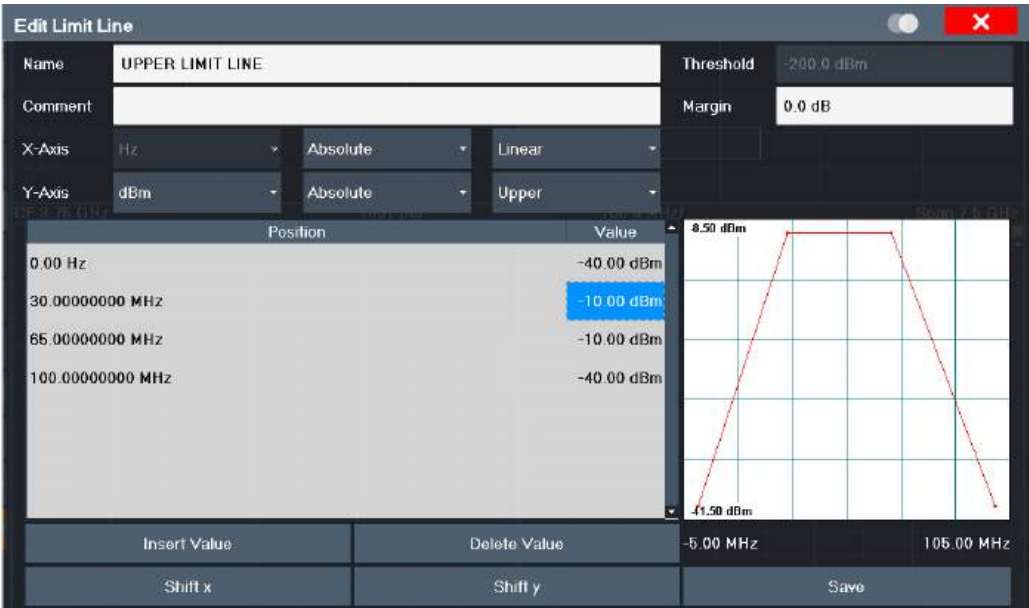
Remote command:

[CALCulate<n>:LIMit:STATe](#) on page 521

Limit line details

Access: "Overview" > "Analysis" > "Lines" > "Limit Lines" > "New" / "Edit" / "Copy To"

or: [LINES] > "Line Config" > "Limit Lines" > "New" / "Edit" / "Copy To"



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Name
 Defines the limit line name. All names must be compatible with Windows conventions for file names. The limit line data is stored under this name (with a .LIN extension).

Remote command:
[CALCulate<n>:LIMit:NAME](#) on page 528

Comment
 Defines an optional comment for the limit line.
 Remote command:
[CALCulate<n>:LIMit:COMMeNt](#) on page 524

Threshold
 Defines an absolute threshold value (only for relative scaling of the y-axis).

Remote command:

`CALCulate<n>:LIMit<li>:LOWer:THReshold` on page 528

`CALCulate<n>:LIMit<li>:UPPer:THReshold` on page 530

Margin

Defines a margin for the limit line. The default setting is 0 dB (i.e. no margin).

Remote command:

`CALCulate<n>:LIMit<li>:LOWer:MARGin` on page 526

`CALCulate<n>:LIMit<li>:UPPer:MARGin` on page 529

X-Axis

Describes the horizontal axis on which the data points of the limit line are defined.

Includes the following settings:

- Unit:
 - "Hz": for frequency domain
 - "s": for time domain
- Scaling mode: absolute or relative values
For relative values, the frequencies are referred to the currently set center frequency. In the time domain, the left boundary of the diagram is used as the reference.
- Scaling: linear or logarithmic

Remote command:

`CALCulate<n>:LIMit<li>:CONTrol:MODE` on page 525

`CALCulate<n>:LIMit<li>:CONTrol:DOMain` on page 524

`CALCulate<n>:LIMit<li>:CONTrol:SPACing` on page 526

Y-Axis

Describes the vertical axis on which the data points of the limit line are defined.

Includes the following settings:

- Level unit
- Scaling mode: absolute or relative (dB/%) values
Relative limit values refer to the reference level.
- Limit type: upper or lower limit; values must stay above the lower limit and below the upper limit to pass the limit check

Remote command:

`CALCulate<n>:LIMit<li>:UNIT` on page 528

`CALCulate<n>:LIMit<li>:LOWer:MODE` on page 527

`CALCulate<n>:LIMit<li>:UPPer:MODE` on page 529

`CALCulate<n>:LIMit<li>:LOWer:SPACing` on page 527

`CALCulate<n>:LIMit<li>:UPPer:SPACing` on page 530

Data Points

Each limit line is defined by a minimum of 2 and a maximum of 200 data points. Each data point is defined by its position (x-axis) and value (y-value). Data points must be defined in ascending order. The same position can have two different values.

Remote command:

`CALCulate<n>:LIMit<li>:CONTrol[:DATA]` on page 524

`CALCulate<n>:LIMit<li>:LOWer[:DATA]` on page 526

`CALCulate<n>:LIMit<li>:UPPer[:DATA]` on page 529

Insert Value

Inserts a data point in the limit line above the selected one in the "Edit Limit Line" dialog box.

Delete Value

Deletes the selected data point in the "Edit Limit Line" dialog box.

Shift x

Shifts the x-value of each data point horizontally by the defined shift width (as opposed to an additive offset defined for the entire limit line, see "[X-Offset](#)" on page 238).

Remote command:

`CALCulate<n>:LIMit<li>:CONTrol:SHIFt` on page 525

Shift y

Shifts the y-value of each data point vertically by the defined shift width (as opposed to an additive offset defined for the entire limit line, see "[Y-Offset](#)" on page 238).

Remote command:

`CALCulate<n>:LIMit<li>:LOWer:SHIFt` on page 527

`CALCulate<n>:LIMit<li>:UPPer:SHIFt` on page 530

Save

Saves the currently edited limit line under the name defined in the "Name" field.

Import

Opens a file selection dialog box and loads the limit line from the selected file in .CSV format.

"File Explorer": Instead of using the file manager of the R&S EPL firmware, you can also use the Microsoft Windows File Explorer to manage files.

Note that a valid import file must contain a minimum of required information for the R&S EPL.

Remote command:

`MMEMory:LOAD<n>:LIMit` on page 523

File Explorer ← Import

Opens the Microsoft Windows File Explorer.

Remote command:

not supported

Export

Opens a file selection dialog box and stores the currently displayed limit line to the defined file in .CSV format.

"File Explorer": Instead of using the file manager of the R&S EPL firmware, you can also use the Microsoft Windows File Explorer to manage files.

The limit line can be imported again later by the R&S EPL for use in other measurements.

Remote command:

[MMEMory:STORe<n>:LIMit](#) on page 523

File Explorer ← Export

Opens the Microsoft Windows File Explorer.

Remote command:

not supported

11.5.2.3 How to define limit lines

Access: "Overview" > "Analysis" > "Lines" > "Limit Lines"

or: [LINES] > "Line Config" > "Limit Lines"

The following tasks are described here:

- ["How to find compatible limit lines"](#) on page 243
- ["How to activate and deactivate a limit check"](#) on page 243
- ["How to edit existing limit lines"](#) on page 244
- ["How to copy an existing limit line"](#) on page 244
- ["How to delete an existing limit line"](#) on page 244
- ["How to configure a new limit line"](#) on page 244
- ["How to move the limit line vertically or horizontally"](#) on page 245

How to find compatible limit lines

- In the "Line Config" dialog box, select the "View Filter" option: "Show Compatible".

All stored limit lines with the file extension `.LIN` in the `limits` subfolder of the main installation folder of the instrument that are compatible to the current measurement settings are displayed in the overview.

How to activate and deactivate a limit check

A limit check is automatically performed as soon as any of the limit lines is activated.

1. To activate a limit check:
Select the "Check Traces" setting for a limit line in the overview and select the trace numbers to be included in the limit check. One limit line can be assigned to several traces.

The specified traces to be checked are compared with the active limit lines. The status of the limit check is indicated in the diagram.
2. To deactivate a limit line, deactivate all "Traces to be Checked" for it.
To deactivate all limit lines at once, select "Disable All Lines".

The limit checks for the deactivated limit lines are stopped and the results are removed from the display.

How to edit existing limit lines

Existing limit line configurations can be edited.

1. In the "Line Config" dialog box, select the limit line.
2. Select "Edit".
3. Edit the line configuration as described in ["How to configure a new limit line"](#) on page 244.
4. Save the new configuration by selecting "Save".

If the limit line is active, the edited limit line is displayed in the diagram.

How to copy an existing limit line

1. In the dialog box, select the limit line.
2. Select "Line Config" "Copy To".
3. Define a new name to create a new limit with the same configuration as the source line.
4. Edit the line configuration as described in ["How to configure a new limit line"](#) on page 244.
5. Save the new configuration by selecting "Save".

The new limit line is displayed in the overview and can be activated.

How to delete an existing limit line

1. In the "Line Config" dialog box, select the limit line.
2. Select "Delete".
3. Confirm the message.

The limit line and the results of the limit check are deleted.

How to configure a new limit line

1. In the "Line Config" dialog box, select "New".

The "Edit Limit Line" dialog box is displayed. The current line configuration is displayed in the preview area of the dialog box. The preview is updated after each change to the configuration.
2. Define a "Name" and, optionally, a "Comment" for the new limit line.
3. Define the x-axis configuration:
 - Time domain or frequency domain
 - Absolute or relative limits
 - Linear or logarithmic scaling

4. Define the y-axis configuration:
 - Level unit
 - Absolute or relative limits
 - Upper or lower limit line
5. Define the data points: minimum 2, maximum 200:
 - a) Select "Insert Value".
 - b) Define the x-value ("Position") and y-value ("Value") of the first data point.
 - c) Select "Insert Value" again and define the second data point.
 - d) Repeat this to insert all other data points.

To insert a data point before an existing one, select the data point and then "Insert Value".

To insert a new data point at the end of the list, move the focus to the line after the last entry and then select "Insert Value".

To delete a data point, select the entry and then "Delete Value".
6. Check the current line configuration in the preview area of the dialog box. If necessary, correct individual data points or add or delete some.

If necessary, shift the entire line vertically or horizontally by selecting "Shift x" or "Shift y" and defining the shift width.
7. Optionally, define a "Margin" at a fixed distance to the limit line.

The margin must be within the valid value range and is not displayed in the diagram or preview area.
8. Optionally, if the y-axis uses relative scaling, define an absolute "Threshold" as an additional criteria for a violation.
9. Save the new configuration by selecting "Save".

The new limit line is displayed in the overview and can be activated.

How to move the limit line vertically or horizontally

A configured limit line can easily be moved vertically or horizontally. Thus, a new limit line can be easily generated based upon an existing limit line which has been shifted horizontally.

1. In the "Line Config" dialog box, select the limit line.
2. To shift the complete limit line parallel in the horizontal direction, select "X-Offset" and enter an offset value.

To shift the complete limit line parallel in the vertical direction, select "Y-Offset" and enter an offset value.
3. To shift the individual data points of a limit line by a fixed value (all at once):
 - a) Select "Edit".
 - b) In the "Edit Limit Line" dialog box, select "Shift x" or "Shift y" and define the shift width.
 - c) Save the shifted data points by selecting "Save".

If activated, the limit line is shifted in the diagram.

How to export a limit line

Limit line configurations can be stored to an ASCII file for evaluation in other programs or to be imported later for other measurements.

1. In the "Line Config" dialog box, select the limit line.
2. Select "New" or "Edit".
3. Define the limit line as described in ["How to configure a new limit line"](#) on page 244.
4. Select "Export" to save the configuration to a file.
You are asked whether you would like to save the configuration internally on the R&S EPL first.
5. Select a file name and location for the limit line.
6. Select the decimal separator to be used in the file.
7. Select "Save".

The limit line is stored to a file with the specified name and the extension .CSV.
For details on the file format see [Section 11.5.2.4, "Reference: limit line file format"](#), on page 247.

How to import a limit line

Limit line configurations that are stored in an ASCII file and contain a minimum of required data can be imported to the R&S EPL.

For details on the required file format see [Section 11.5.2.4, "Reference: limit line file format"](#), on page 247.

1. In the "Line Config" dialog box, select the limit line.
2. Select "New" or "Edit".
3. Select "Import" to load a limit line from a file.
You are asked whether you would like to save the current configuration on the R&S EPL first.
4. Select the file name of the limit line.
5. Select the decimal separator that was used in the file.
6. Select "Select".
The limit line is loaded from the specified file and displayed in the "Edit Limit Line" dialog box.
7. Activate the limit line as described in ["How to activate and deactivate a limit check"](#) on page 243.

11.5.2.4 Reference: limit line file format

Limit line data can be exported to a file in ASCII (CSV) format for further evaluation in other applications. Limit lines stored in the specified ASCII (CSV) format can also be imported to the R&S EPL for other measurements (see ["How to import a limit line"](#) on page 246). This reference describes in detail the format of the export/import files for limit lines. Note that the **bold** data is **mandatory**, all other data is optional.

Different language versions of evaluation programs may require a different handling of the decimal point. Thus, you can define the decimal separator to be used (see ["Decimal Separator"](#) on page 200).

Table 11-4: ASCII file format for limit line files

File contents	Description
Header data	
sep=;	Separator for individual values (required by Microsoft Excel, for example)
Type ;RS_LimitLineDefinition;	Type of data
FileFormatVersion ;1.00;	File format version
Date;01.Oct 2006;	Date of data set storage
OptionID;SpectrumAnalyzer	Application the limit line was created for
Name ;RELFREQ1	Limit line name
Comment;Defines the upper limit line	Description of limit line
Mode;UPPER	Type of limit line (upper, lower)
ThresholdUnit;LEVEL_DBM	Unit of threshold value
ThresholdValue;-200	Threshold value
MarginValue;0	Margin value
XAxisScaling;LINEAR	Scaling of x-axis linear (LIN) or logarithmic (LOG)
XAxisUnit;FREQ_HZ	Unit of x values
XAxisScaleMode;ABSOLUTE	Scaling of x-axis (absolute or relative)
YAxisUnit;LEVEL_DB	Unit of y values
YAxisScaleMode;ABSOLUTE	Scaling of y-axis (absolute or relative)
NoOfPoints ;5	Number of points the line is defined by
Data section for individual data points	
-4500000000;-50	x- and y-values of each data point defining the line
-2000000000;-30	
-1000000000;0	
0;-30	
2500000000;-50	

12 Data management

The R&S EPL allows you to store and load instrument settings, as well as import and export measurement data for analysis later. Finally, you can store or print the measurement results displayed on the screen.

General storage and import/export functions are available via the toolbar. Some special storage functions are (also) available via softkeys or dialog boxes in the corresponding menus, for example trace data export.

- [Accessing, retrieving and handling data](#)..... 248
- [Restoring the default instrument configuration \(preset\)](#)..... 249
- [Storing and recalling instrument settings and measurement data](#)..... 250
- [Import/export functions](#)..... 260
- [Creating screenshots of current measurement results and settings](#)..... 261
- [Working with test reports](#)..... 275

12.1 Accessing, retrieving and handling data

Depending on their origin and content, this description distinguishes between the following data types:

- Operational data
- Non-operational data

Operational data (data for intended use)

Your instrument uses and creates this data because of its intended use and according to the settings and configuration you have made. Thus, this data makes up most of the data that the R&S EPL creates:

- System files contain the operating system, for example.
System files and the system directory are protected and only accessible to users with administration rights.
See [Section 5.12, "Logging on"](#), on page 35
- User files contain user-defined configurations or data, like instrument settings or measurement data.
You can access and retrieve user files, see [Section 12.3, "Storing and recalling instrument settings and measurement data"](#), on page 250 and [Section 12.4, "Import/export functions"](#), on page 260.

Non-operational data (usage data)

The R&S EPL creates this data during and through its use. Such data is collected e.g. for troubleshooting, to help our customer support center find solutions quickly.

The R&S EPL generates the following data continuously and in real-time:

- User and authentication data
- Network and communication data

- Diagnostic and troubleshooting data
- Environmental conditions

Only when you select the "Create R&S Support Information" option in the firmware, this data is stored in a ZIP file containing files in TXT format. The file size typically amounts to about 10 MB. You can access and retrieve this data, and store the data on a remote server, for example via a network connection. See:

[Section 16.6, "Collecting information for support"](#), on page 667

The Windows operating system generates the following data during its use:

- Software update data

You can access and retrieve this data if you log in with administration rights.

See [Section 5.12, "Logging on"](#), on page 35

For additional information on the different memory types of your product and on how to protect sensitive data, see:

- Instrument Security Procedures document. See https://www.rohde-schwarz.com/de/handbuch/r-s-epl1000-instrument-security-procedures-handbuecher_78701-1377408.html.

12.2 Restoring the default instrument configuration (preset)

When delivered, the R&S EPL has a default configuration. You can restore this defined initial state at any time as a known starting point for measurements. This is often recommendable as a first step in troubleshooting when unusual measurement results arise.



Factory default configuration

The factory default configuration is selected such that the RF input is always protected against overload, provided that the applied signal levels are in the allowed range for the instrument.

Alternatively to the factory default settings, you can define user-specific recall settings to be restored after a preset or reboot, see ["To recall settings automatically after preset or reboot"](#) on page 259.

To restore the default instrument configuration for all channel setups at once

- Press [PRESET].



After you use the [PRESET] function, the history of previous actions is deleted, i.e. any actions performed previously cannot be undone or redone using the [UNDO/REDO] keys.

Remote command:

*RST or SYSTem:PRESet

To restore the default configuration for a single channel setup

The default measurement settings can also be reset for an individual channel setup only, rather than resetting the entire instrument.

- In the "Overview", select "Preset Channel".

The factory default settings are restored to the current channel setup. Note that a user-defined recall settings file is **NOT** restored.

Remote command:

SYSTem:PRESet:CHANnel [:EXEC] on page 548

12.3 Storing and recalling instrument settings and measurement data



Access: "Save"/ "Open" icon in the toolbar



Or: [FILE]

Possibly you would like to restore or repeat a measurement you performed under specific conditions on the instrument. Or you want to evaluate imported data in another application on the R&S EPL and would like to restore the measurement settings applied during measurement. In these cases, you can store and recall instrument and measurement settings, and possibly other related measurement data.

Two different methods are available for managing instrument settings:

- Quick Save/Quick Recall - a defined set of instrument settings or channel setups are stored or recalled quickly in just one step
- Configurable Save/Recall - a user-defined set of instrument settings or channel setups are stored to a definable storage location

**Restrictions when recalling measurement settings**

When recalling a saved configuration file, the following restrictions apply:

- The R&S EPL must support the frequency range defined in the configuration file.
- Configuration files created on a R&S EPL with certain options in use do not work on an R&S EPL without these options.
- Files created with newer firmware versions may not work with a previous version.
- Files created on an instrument other than the R&S EPL do not work on the R&S EPL.



Saving and recalling transducer and limit line settings

If a transducer factors or limit lines file was in use when the save set was stored (with the save item "Current Settings" only) the R&S EPL assumes that these transducer factors or limit lines values should remain valid after every recall of that save set. Thus, even if the transducer factors or limit lines file is changed and the original save set file is recalled later, the *originally stored* transducer factors or limit lines values are recalled and applied to the measurement. In the "Edit" transducer factors or limit lines dialog box, however, the *changed* transducer factors or limit lines file values are displayed, as no updated transducer factors or limit lines file was loaded.

The same applies to limit line settings.

The same applies to integrated measurements' weighting filter.

If you want to apply the changed transducer values after recalling the save set, you must force the application to reload the transducer file. To do so, simply open the "Edit Transducer" dialog box (see [Section 13.7.2, "Working with transducers"](#), on page 313) and toggle the "X-Axis" option from "Lin" to "log" and back. Due to that change, the transducer file is automatically reloaded, and the changed transducer values are applied to the current measurement. Now you can create a new save set with the updated transducer values.

Similarly, if you want to apply the changed limit values after recalling the save set, you must force the application to reload the limit file. To do so, simply open the "Edit Limit Line" dialog box (see [Section 11.5.2.2, "Limit line settings and functions"](#), on page 236) and toggle the "Y-Axis" unit. Due to that change, the limit line file is automatically reloaded, and the changed limit values are applied to the current measurement. Now a new save set with the updated limit values can be created.

- [Quick save/quick recall](#)..... 251
- [Configurable storage and recall](#)..... 253
- [How to save and load instrument settings](#)..... 258

12.3.1 Quick save/quick recall

The "Quick Save" and "Quick Recall" functions allow you to store instrument settings or channel setups very easily and quickly in one step. Up to ten different sets of settings can be stored to or recalled from "save sets". Each save set is identified by its storage date and type (instrument or specific "Channel") in the display. The save sets are stored in the

C:\Users\Public\Documents\Rohde-Schwarz\Analyzer\QuickSave directory, in files named QuickSave1.dfl to QuickSave10.dfl. Only the current measurement settings are stored, not any additional data such as traces, limit line or transducer files (see [Section 12.3.2.1, "Stored data types"](#), on page 254).

Source calibration files for an optional internal generator, if available, are included.

During recall, save sets of type "Instrument" replace the settings of the entire instrument. All other save sets start a new channel setup with the stored settings.



If a channel setup with the same name as the "Channel" to be restored is already active, the name for the new channel setup is extended by a consecutive number:

Spectrum ! ✕ **Spectrum 2** ! ✕

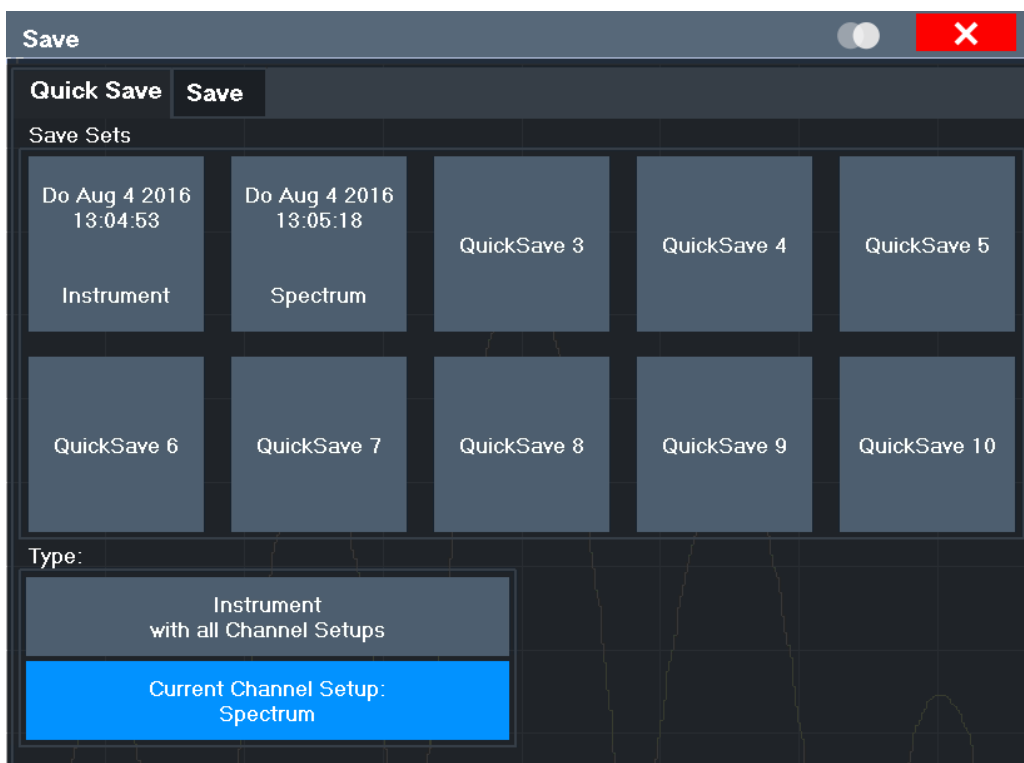
12.3.1.1 Quick save / quick recall settings



Access: "Save"/ "Open" icon in the toolbar > "Quick Save" / "Quick Recall"



Both dialog boxes are very similar and closely related.

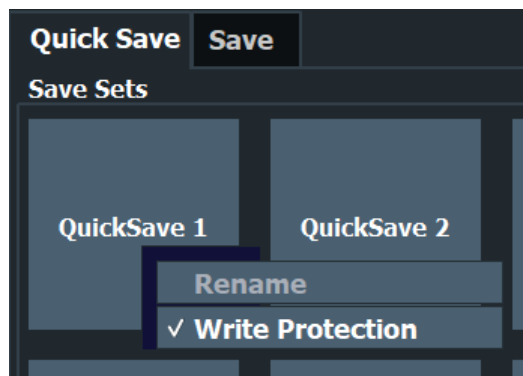


QuickSave 1 / ... / QuickSave 10.....	252
L Rename.....	253
L Write Protection.....	253
Storage Type (Save only).....	253
Recall.....	253

QuickSave 1 / ... / QuickSave 10

Selects one of the save sets to store the current settings in or to be recalled. At the time of storage, the "QuickSave 1 / ... / QuickSave 10" placeholder is replaced by a label indicating the storage date and time and the storage type.

Right-click on one of the QuickSave buttons to display a context menu with additional functions for the save set.



During recall, save sets of type "Instrument" replace the settings of the entire instrument. All other save sets start a new channel setup with the stored settings.

Rename ← QuickSave 1 / ... / QuickSave 10

Displays an input field to rename the save set, if write protection is disabled.

Write Protection ← QuickSave 1 / ... / QuickSave 10

Enables or disables write protection for the save set. If enabled, the save set cannot be renamed or overwritten.

Storage Type (Save only)

Defines which type of settings are stored in the save set.

"Instrument with all Channels" The instrument settings for all currently active "Channel"s are stored.

"Current Channel" Only the instrument settings for the currently selected measurement "Channel"s are stored.

Recall

Restores the instrument settings as saved in the selected settings file. If the settings file contains settings for a specific "Channel" only, a new channel setup with the stored settings is activated, otherwise all "Channel"s and instrument settings are overwritten with the stored settings.

Note: After you use the "Recall" function, the history of previous actions is deleted, i.e. any actions performed previously cannot be undone or redone using the [UNDO/REDO] keys.

Remote command:

[MMEMory:LOAD:STATe](#) on page 546

12.3.2 Configurable storage and recall

The more sophisticated storage and recall functions allow you to define which settings are stored, and where the settings file is stored to. Any settings file can be selected for recall.

Storing and recalling instrument settings and measurement data

• Stored data types	254
• Storage location and filename	254
• Save and recall dialog boxes	254
• Startup recall settings	257

12.3.2.1 Stored data types

The following types of data can be stored to and loaded from files via the "Save" dialog box on the R&S EPL:

Table 12-1: Items that can be stored to files

Item	Description
Current Settings	Current instrument and measurement settings.
All Transducers	All transducer factor <i>files</i> . (Note: Restoring a saveset overwrites transducer factor files on the hard disk that have the same name as those in the saveset. For more information, see "Saving and recalling transducer and limit line settings" on page 251.)
All Traces	All active traces.
All Limit Lines	All limit line <i>files</i> .
Spectrograms	Spectrogram trace data (only available if spectrogram display is currently active).
Peak List	Information of the peak list.

12.3.2.2 Storage location and filename

The data is stored on the internal flash disk or, if selected, on a memory stick or network drive. The operating system, firmware and stored instrument settings are located on drive C.

The storage location and filename are selected in a file selection dialog box which is displayed when you perform a storage function.

By default, the name of a settings file consists of a base name followed by an underscore and three numbers, e.g. `limit_lines_005`. In the example, the base name is `limit_lines`. The base name can contain characters, numbers and underscores. The file extension `df1` is added automatically. The default folder for settings files is `C:\Users\Public\Documents\Rohde-Schwarz\Analyzer\Save`.



File name restrictions

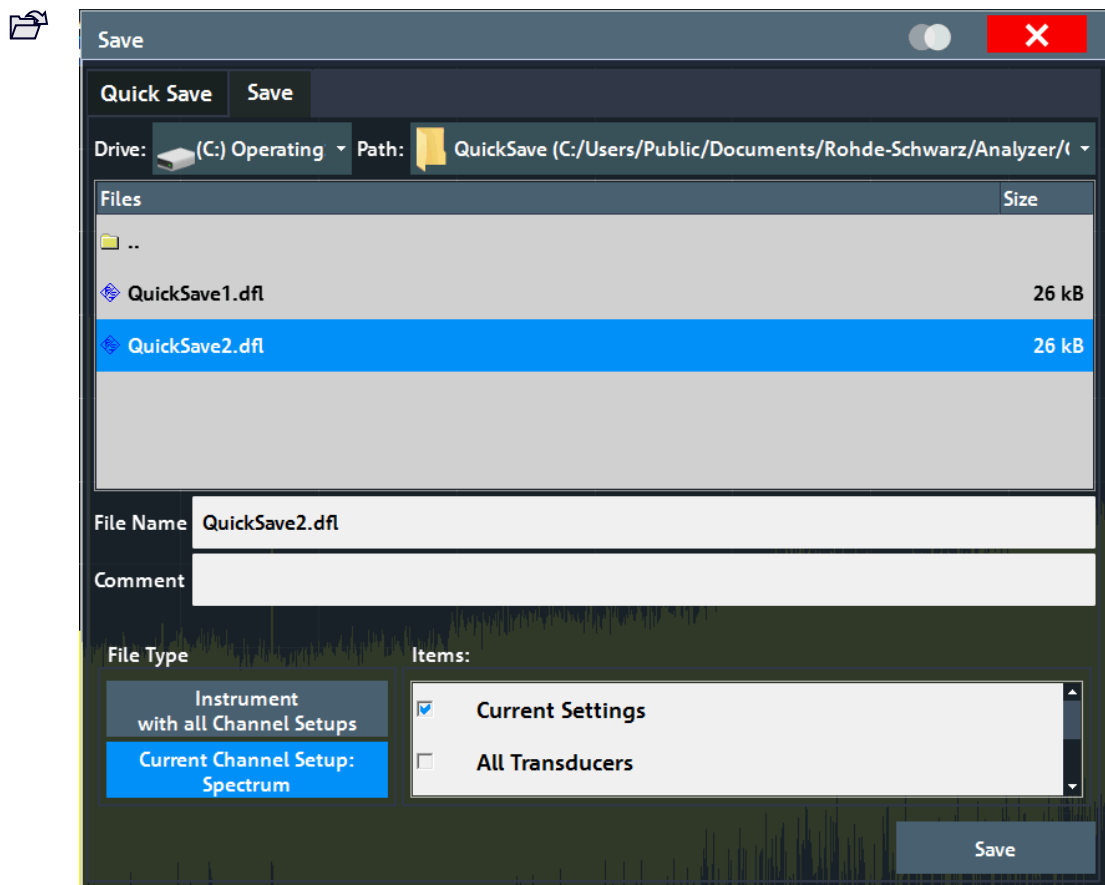
File names must be compatible with the Windows conventions for file names. In particular, they must not contain special characters such as `":", "*", "?"`.

12.3.2.3 Save and recall dialog boxes



Access: "Save"/ "Open" icon in the toolbar > "Save" / "Recall"

Both dialog boxes are very similar and closely related.



Selecting Storage Location - Drive/ Path/ Files.....	255
File Name.....	255
Comment.....	256
File Explorer.....	256
File Type.....	256
Items:.....	256
Save File.....	256
Recall in New Channel / Recall in Current Channel.....	256

Selecting Storage Location - Drive/ Path/ Files

Select the storage location of the file on the instrument or an external drive.

Remote command:

[MMEMory:CATalog](#) on page 537

File Name

Contains the name of the data file without the path or extension.

File names must be compatible with the Windows conventions for file names. In particular, they must not contain special characters such as ":", "*", "?".

For details on the filename and location, see [Section 12.3.2.2, "Storage location and filename"](#), on page 254.

Comment

An optional description for the data file. A maximum of 60 characters can be displayed.

Remote command:

[MMEMory:COMMeNt](#) on page 538

File Explorer

Opens the Microsoft Windows File Explorer.

Remote command:

not supported

File Type

Determines whether the global instrument settings with all "Channel"s are stored or recalled, or the current "Channel" settings only.

Items:

Defines which data and settings are stored or are recalled. Depending on the "File Type", either channel setups only, or global settings are available. Which items are available also depends on the installed options (see also [Section 12.3.2.1, "Stored data types"](#), on page 254).

Depending on the application, items may or may not be available. For example, saving spectrogram data is only possible in applications that feature a spectrogram.

Remote command:

[MMEMory:SELEct\[:ITEM\]:ALL](#) on page 542

[MMEMory:SELEct\[:ITEM\]:DEFault](#) on page 543

[MMEMory:SELEct\[:ITEM\]:NONE](#) on page 544

[MMEMory:SELEct\[:ITEM\]:HWSettings](#) on page 543

[MMEMory:SELEct\[:ITEM\]:LINEs:ALL](#) on page 543

[MMEMory:SELEct\[:ITEM\]:SGRam](#) on page 544

[MMEMory:SELEct\[:ITEM\]:TRACe<1...3>\[:ACTive\]](#) on page 544

[MMEMory:SELEct\[:ITEM\]:TRANsducer:ALL](#) on page 545

Save File

Saves the settings file with the defined filename.

Remote command:

[MMEMory:STORe<1|2>:STATe](#) on page 547

[MMEMory:STORe<1|2>:STATe:NEXT](#) on page 547

Recall in New Channel / Recall in Current Channel

Restores the instrument settings as saved in the selected settings file. If the settings file contains settings for a specific "Channel" only, select "Recall in New Channel" to activate a new channel setup with the stored settings. Select "Recall in Current Channel" to replace the current "Channel" settings.

Note: After you use the "Recall" function, the history of previous actions is deleted, i.e. any actions performed previously cannot be undone or redone using the [UNDO/REDO] keys.

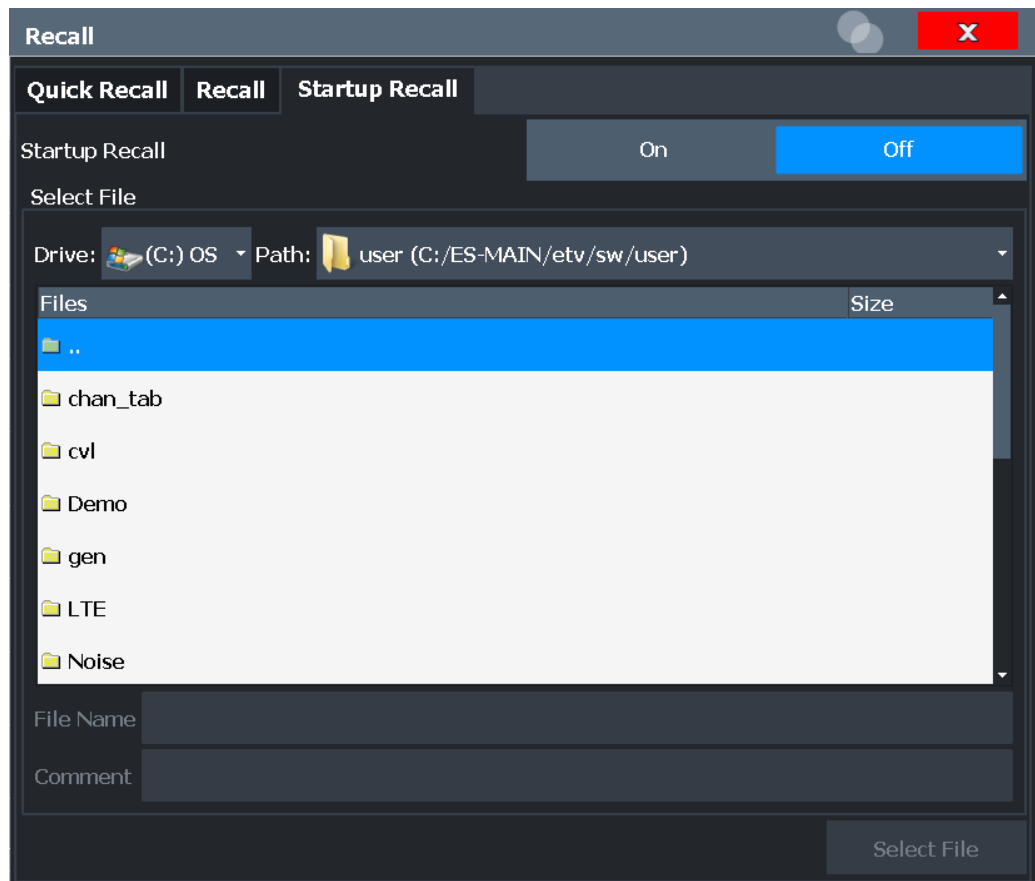
Remote command:

[MMEMory:LOAD:STATe](#) on page 546

12.3.2.4 Startup recall settings



Access: "Open" icon in the toolbar > "Startup Recall"



Startup Recall.....	257
Selecting Storage Location - Drive/ Path/ Files.....	257
File Name.....	258
Comment.....	258

Startup Recall

Activates or deactivates the startup recall function. If activated, the settings stored in the selected file are loaded each time the instrument is started or preset. If deactivated, the default settings are loaded.

Note that only *instrument* settings files can be selected for the startup recall function, not "Channel" files.

Remote command:

[MMEMory:LOAD:AUTO](#) on page 545

Selecting Storage Location - Drive/ Path/ Files

Select the storage location of the file on the instrument or an external drive.

Remote command:

[MMEMory:CATalog](#) on page 537

File Name

Contains the name of the data file without the path or extension.

File names must be compatible with the Windows conventions for file names. In particular, they must not contain special characters such as ":", "*", "?".

For details on the filename and location, see [Section 12.3.2.2, "Storage location and filename"](#), on page 254.

Comment

An optional description for the data file. A maximum of 60 characters can be displayed.

Remote command:

[MMEMory:COMMeNt](#) on page 538

12.3.3 How to save and load instrument settings

Instrument settings can be saved to a file and loaded again later, so that you can repeat the measurement with the same settings. Optionally, user-defined measurement settings can automatically be restored each time you start or preset the instrument.

To save and recall instrument settings using the Quick Save function

1. Select the "Save" icon from the toolbar.
2. Select whether the instrument settings for **all** "Channel"s are stored, or only those for the **current** "Channel".
3. Select one of the save sets in which the settings are stored ("QuickSaveX").

The selected settings are stored to the file

C:\Users\Public\Documents\Rohde-Schwarz\Analyzer\QuickSave\QuickSaveX.dfl.

Note: If you make any changes to the settings *after* storing the configuration file, remember to save the settings again. Otherwise those settings cannot be restored and will be overwritten by the stored values when the configuration file is recalled.



4. To restore the settings, select the "Open" icon from the toolbar.
5. Select the save set in which the settings were stored ("QuickSaveX").
The selected settings are restored to the instrument or channel setup.

To save configurable instrument settings

1. Select the "Save" icon from the toolbar.
2. In the "Save" dialog box, switch to the "Save" tab.
3. In the file selection dialog box, select a filename and storage location for the settings file.

4. Optionally, define a comment to describe the stored settings.
5. Select whether the instrument settings for **all** "Channel"s are stored, or only those for the **current** "Channel".
6. Select the items to be saved with the settings. Either the settings for the currently selected "Channel" only, or the settings for all "Channel"s can be stored. Various other items, such as lines or traces etc., can be stored as well (see [Section 12.3.2.1, "Stored data types"](#), on page 254).
7. Select "Save".

A file with the defined name and path and the extension `.df1` is created.



If you make any changes to the settings *after* storing the configuration file, remember to save the settings again. Otherwise those settings cannot be restored and will be overwritten by the stored values when the configuration file is recalled.

To recall configurable instrument settings



1. Select the "Open" icon from the toolbar.
2. In the "Recall" dialog box, switch to the "Recall" tab.
3. In the file selection dialog box, select the filename and storage location of the settings file.

Note: The "File Type" indicates whether the file contains instrument settings for **all** "Channel"s, or only those for the current "Channel".

4. If several items were saved, select which items are restored.
5. If a "Channel" was saved, select whether the settings will replace the settings in the current "Channel", or whether a new channel setup with the saved settings will be opened.
6. Select "Recall".

The settings and selected items from the saved measurement are restored and you can repeat the measurement with the same settings.

Note that any changes made to the settings *after* storing the configuration file will be overwritten by the stored values when the configuration file is recalled.

To recall settings automatically after preset or reboot

You can define the settings that are restored when you preset or reboot the instrument.

1. Configure the settings as required and save them as described in ["To save configurable instrument settings"](#) on page 258.
2. In the "Save/Recall" menu, select "Startup Recall".
3. From the file selection dialog box, select the recall settings to restore.
4. Select "Select File".

5. Set "Startup Recall" to "On".

Now when you press [PRESET] or reboot the instrument, the defined settings will be restored.

6. To restore the factory preset settings, set "Startup Recall" to "Off".

12.4 Import/export functions



Access: "Save"/ "Open" icon in the toolbar > "Import" / "Export"



The R&S EPL provides various evaluation methods for the results of the performed measurements. However, you may want to evaluate the data with further, external applications. In this case, you can export the measurement data to a standard format file (ASCII or XML). Some of the data stored in these formats can also be re-imported to the R&S EPL for further evaluation later, for example in other applications.

The following data types can be exported (depending on the application):

- Trace data
- Table results, such as result summaries, marker peak lists etc.
- I/Q data (in applications that process I/Q data)



I/Q data can only be imported and exported in applications that process I/Q data, such as the I/Q Analyzer or optional applications.

See the corresponding user manuals for those applications for details.



These functions are only available if no measurement is running.

In particular, if a continuous measurement is running, the import/export functions are not available.

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Export.....	260
L Export Configuration.....	261
L I/Q Export.....	261
L File Explorer.....	261



Import

Access: "Save/Recall" > Import



Provides functions to import data.

Currently, only I/Q data can be imported, and only by applications that process I/Q data.



Export

Access: "Save/Recall" > Export



Opens a submenu to configure data export.

Export Configuration ← Export

Opens the "Traces" dialog box to configure the trace and data export settings.

[Section 11.3.3, "Trace export"](#), on page 199

I/Q Export ← Export

Opens a file selection dialog box to define an export filename to which the I/Q data is stored. This function is only available in single sweep mode.

It is only available in applications that process I/Q data, such as the I/Q Analyzer or other optional applications.

For details, see the description in the R&S EPL I/Q Analyzer User Manual ("Importing and Exporting I/Q Data").

Note: Storing large amounts of I/Q data (several Gigabytes) can exceed the available (internal) storage space on the R&S EPL. In this case, it can be necessary to use an external storage medium.

File Explorer ← I/Q Export ← Export

Opens the Microsoft Windows File Explorer.

Remote command:

not supported

12.5 Creating screenshots of current measurement results and settings

To document the graphical results and the most important settings for the currently performed measurement, you can create a screenshot of the current display. Screenshots can either be printed or stored to a file.

- [Print and screenshot settings](#).....261
- [How to store or print screenshots of the display](#)..... 271
- [Example for storing multiple measurement results to a PDF file](#)..... 274

12.5.1 Print and screenshot settings

Access: [Print]

For step-by-step instructions, see [Section 12.5.2, "How to store or print screenshots of the display"](#), on page 271.

Remote commands for these settings are described in [Section 15.8.4, "Screenshots and printouts"](#), on page 549.



To print a screenshot of the current display with the current settings immediately, without switching to the "Print" menu, use [Print].

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12.5.1.1 Print content settings

Access: "Print" > "Print Config" > "Content" tab

The content settings determine which data is included in the printout.

Print Settings

Content **Printer** **Page Setup** **Color**

☒ Print Screenshot

☐ Print Multiple Windows

☒ Spectrum

 1 Frequency Sweep ☒

 2 Spectrogram ☒

Comment

☒ Print Logo ☐ Print Page Count

☒ Print Dialog ☒ Print Date and Time

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Print Screenshot

Selects all measurement results displayed on the screen for the current channel setup (or "MultiView"): diagrams, traces, markers, marker lists, limit lines, etc., including the channel bar and status bar, for printout on a single page. Displayed items belonging to the software user interface (e.g. softkeys) are not included. The position and size of the elements in the printout is identical to the display.

Remote command:

[HCOPY:CONTent](#) on page 550

Print Multiple Windows

Includes only the selected windows in the printout. All currently active windows for the current channel setup (or "MultiView") are available for selection. How many windows are printed on a single page of the printout is user-definable (see "[Windows Per Page](#)" on page 270).

This option is only available when printing on a printer or to a PDF file (see "[Destination](#)" on page 267). If the [Destination](#) is currently set to an image file or the clipboard, it is automatically changed to be a PDF file.

Remote command:

[HCOPY:CONTent](#) on page 550

[HCOPY:PAGE:WINDow:STATe](#) on page 557

[HCOPY:PAGE:WINDow:CHANnel:STATe](#) on page 556

Comment

Defines an optional comment to be included in the printout of the display. Maximum 120 characters are allowed. Up to 60 characters fit in one line. In the first line, a manual line-feed can be forced at any point by entering "@".

The comment is printed in the top left corner of each printout page. If a comment should not be printed, it must be deleted.

Tip: The current date and time can be inserted automatically, see "[Print Date and Time](#)" on page 264.

Remote command:

[HCOPY:ITEM:WINDow:TEXT](#) on page 554

Print Logo

Activates/deactivates the printout of the Rohde & Schwarz company logo in the upper right corner.

Remote command:

[DISPlay:LOGO](#) on page 549

Print Page Count

Includes the page number for printouts consisting of multiple windows ("[Print Multiple Windows](#)" on page 263).

Remote command:

[HCOPY:PAGE:COUNT:STATe](#) on page 554

Print Dialog

Includes any currently displayed dialog in the screenshot printout.

This setting is only available if [Print Screenshot](#) is selected.

Print Date and Time

Includes or removes the current date and time at the bottom of the printout.

Remote command:

[HCOPY:TDSTamp:STATe](#) on page 558

12.5.1.2 Print preview functions

Access: [Print]

The "Print Preview" of the printout according to the current configuration is available in all "Print Settings" dialog tabs.



Zoom In / Zoom Out.....	265
Fit Page.....	266
Zoom 1:1.....	266
Page Up / Page Down.....	266
Print.....	266

Zoom In / Zoom Out

Zooms into (enlarges) or zooms out of (decreases) the preview display. Note that the zoom functions affect only the preview, not the printout itself.

Fit Page

Adapts the preview display zoom factor so that one complete page is visible as large as possible in the available display space. Note that the zoom functions affect only the preview, not the printout itself.

Zoom 1:1

Displays the printout in its original size, as it will be printed.

Page Up / Page Down

Depending on the selected contents (see [Section 12.5.1.1, "Print content settings"](#), on page 262), the printout can consist of multiple pages. Use these functions to scroll within the preview to see the individual pages.

Print

Starts to print or store the selected screen contents to a file (see [Section 12.5.1.1, "Print content settings"](#), on page 262).

Whether the output is sent to the printer or stored in a file or the clipboard depends on the selected print settings (see [Section 12.5.1.3, "Printer settings"](#), on page 266).

If the output is stored to a file, a file selection dialog box is opened to select the file-name and location. The default path is C:\Users\Public\Documents\Rohde-Schwarz Analyzer\user.

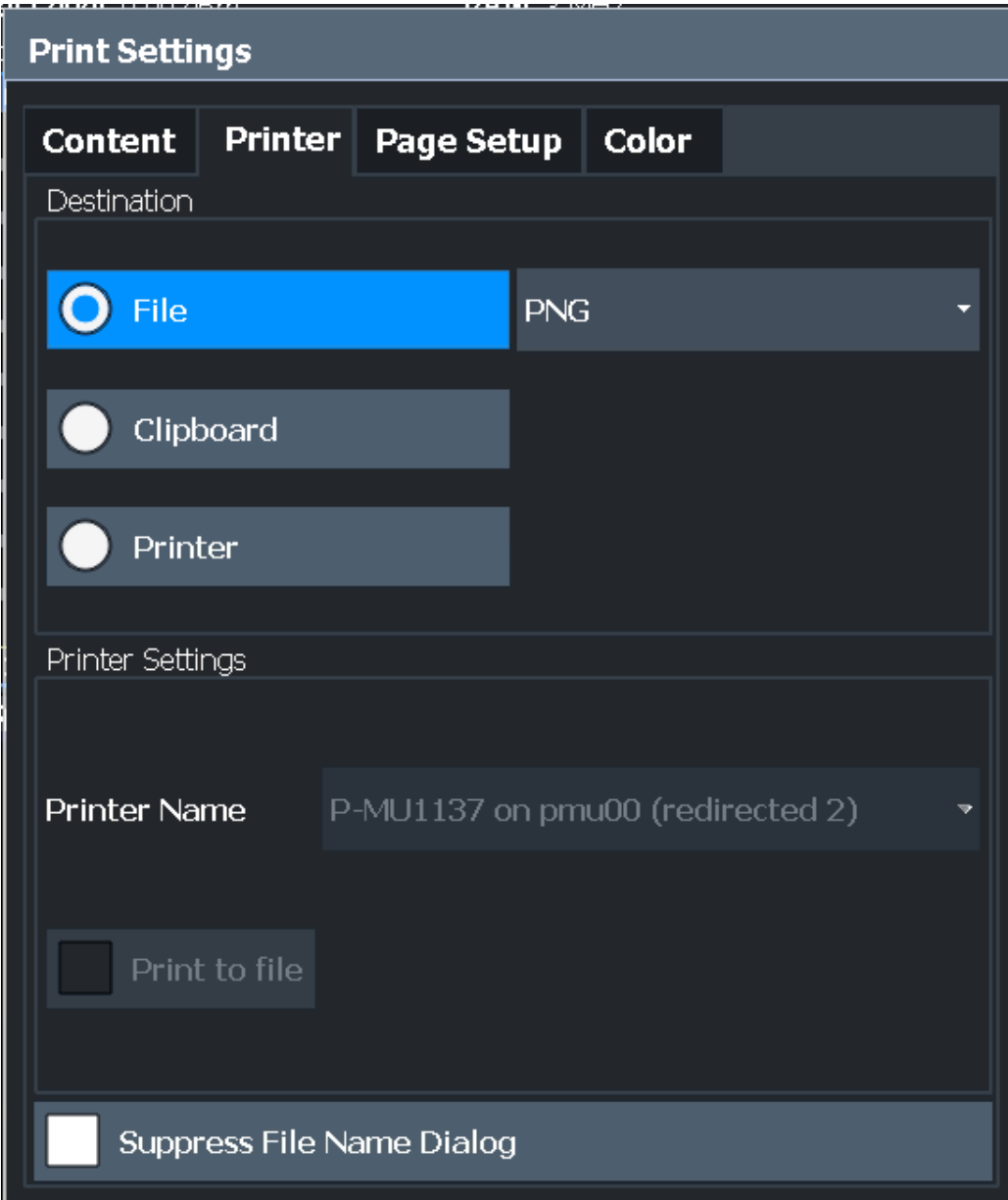
Remote command:

`HCOPY[:IMMEDIATE]` on page 553

`HCOPY[:IMMEDIATE]:NEXT` on page 554

12.5.1.3 Printer settings

Access: "Print" > "Print Config" > "Printer" tab



Destination.....	267
L Destination: File.....	268
L Destination: Clipboard.....	268
L Destination: Printer.....	268
Suppress File Name Dialog.....	268
Printer Name.....	268
Print to file.....	269
Install Printer.....	269

Destination
 Defines the medium to which the printout is output.

Destination: File ← Destination

Stores the printout to a file in the selected format. The filename is queried at the time of storage, or a default name is used (see [Suppress File Name Dialog](#)).

Multiple windows can only be printed to a file in PDF format. If you select an image file format, the content setting is automatically set to [Print Screenshot](#). Page settings are not available for image files; however, you can configure the colors used for the screenshot (see [Section 12.5.1.5, "Print color settings"](#), on page 270).

Remote command:

To save as a file:

```
HCOPY:DESTination<di> 'MMEM'
```

To save as a file in the specified format:

```
HCOPY:DEVIce:LANGuage on page 553
```

Destination: Clipboard ← Destination

Copies the printout to the clipboard. Since only single pages can be copied, only screenshots can be copied to this destination, not multiple windows (see [Section 12.5.1.1, "Print content settings"](#), on page 262). Page settings are not available; however, you can configure the colors used for the screenshot (see [Section 12.5.1.5, "Print color settings"](#), on page 270).

If you select the clipboard as the printing destination, the content setting is automatically set to [Print Screenshot](#).

Remote command:

```
HCOP:DEST1 'SYSTem:COMMUnicate:CLIPboard'
```

Destination: Printer ← Destination

Sends the printout to the printer selected from the [Printer Name](#) list.

Remote command:

```
HCOP:DEST1 'SYSTem:COMMUnicate:PRINter'
```

Suppress File Name Dialog

If the [Destination](#) is a file, the file selection dialog box is not displayed. Instead, the default storage location and filename are used.

```
(C:\Users\Public\Documents\Rohde-Schwarz\Analyzer\user  
\EPL_ScreenShot_<date and time>).
```

Printer Name

Defines the printer to print to if a printer is selected as the [Destination](#).

Any printers detected in the network are listed for selection.

Tip: the printout can also be stored in a print file using the selected printer driver, see ["Print to file"](#) on page 269.

Remote command:

```
SYSTem:COMMUnicate:PRINter:ENUMerate[:NEXT] on page 558
```

```
SYSTem:COMMUnicate:PRINter:ENUMerate:FIRSt on page 558
```

```
SYSTem:COMMUnicate:PRINter:SElect<di> on page 558
```

Print to file

If a printer is selected as the [Destination](#), use this option to store the data in a .prn file using the selected printer driver.

Remote command:

To enable: `HCOP:DEST1 'MMEM'`

To disable: `HCOP:DEST1 'SYSTEM:COMMunicate:PRINTER'`

Install Printer

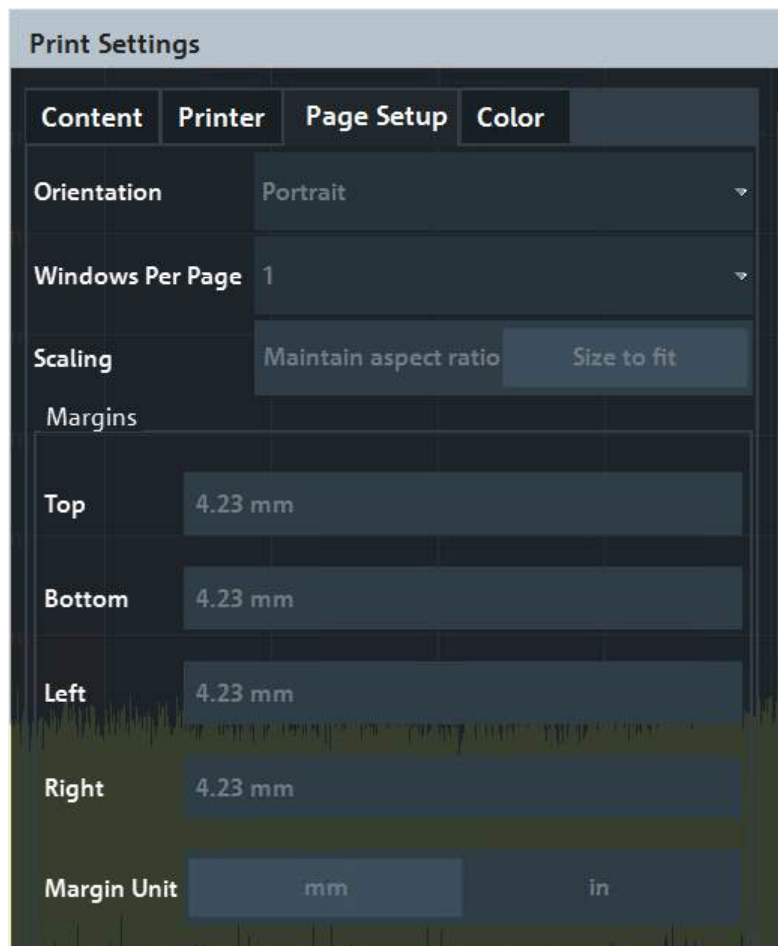
This softkey opens the standard Windows dialog box to install a new printer. All printers that are already installed are displayed.

Only user accounts with administrator rights can install a printer.

For further information, refer to the Microsoft Windows documentation.

12.5.1.4 Page setup

Access: "Print" > "Print Config" > "Page Setup" tab



Page settings are only available when printing on a printer or to a PDF file (see "[Destination](#)" on page 267).

Orientation.....	270
Windows Per Page.....	270
Scaling.....	270
Margins.....	270

Orientation

Selects the page orientation of the printout: portrait or landscape.

Remote command:

`HCOPY:PAGE:ORIENTATION` on page 556

Windows Per Page

Defines how many windows are displayed on a single page of the printout. This setting is only available if [Print Multiple Windows](#) is active (see [Section 12.5.1.1, "Print content settings"](#), on page 262).

If more than one window is printed on one page, each window is printed in equal size.

Remote command:

`HCOPY:PAGE:WINDOW:COUNT` on page 556

Scaling

Determines the scaling of the windows in the printout if [Print Multiple Windows](#) is active (see [Section 12.5.1.1, "Print content settings"](#), on page 262).

If more than one window is printed on one page (see [Windows Per Page](#)), each window is printed in equal size.

"Maintain aspect ratio" Each window is printed as large as possible while maintaining the aspect ratio of the original display.

"Size to fit" Each window is scaled to fit the page size optimally, not regarding the aspect ratio of the original display.

Remote command:

`HCOPY:PAGE:WINDOW:SCALE` on page 557

Margins

Defines margins for the printout page on which no elements are printed. The margins are defined according to the selected unit.

Remote command:

`HCOPY:PAGE:MARGIN:BOTTOM` on page 554

`HCOPY:PAGE:MARGIN:LEFT` on page 555

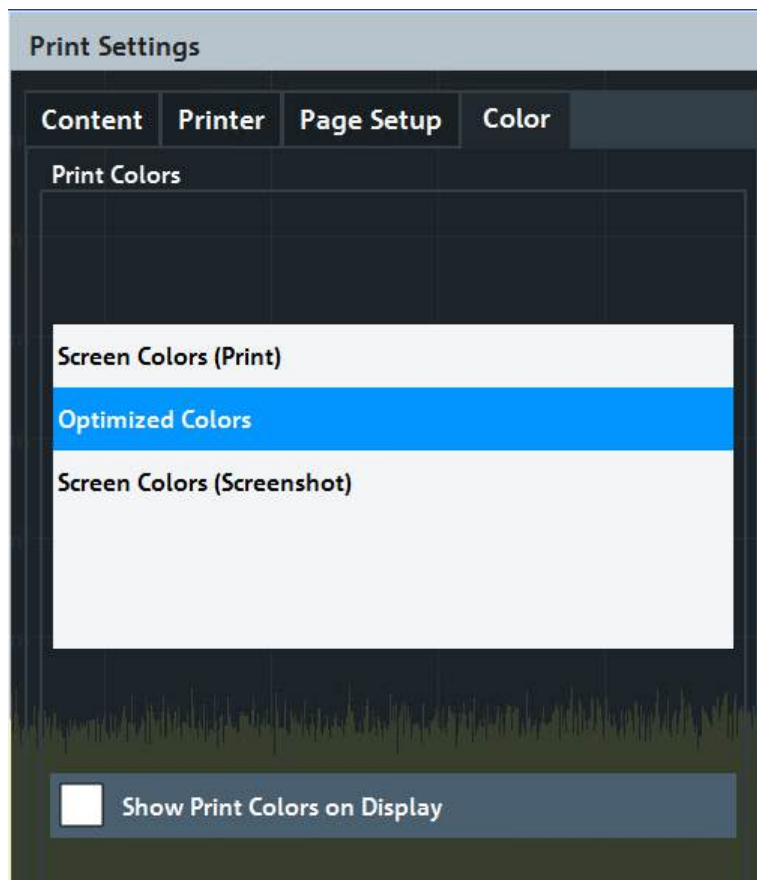
`HCOPY:PAGE:MARGIN:RIGHT` on page 555

`HCOPY:PAGE:MARGIN:TOP` on page 555

`HCOPY:PAGE:MARGIN:UNIT` on page 555

12.5.1.5 Print color settings

Access: "Print" > "Print Config" > "Color" tab



The settings provided here are identical to those in the "Print Colors" section of the "Display" > "Theme + Color" dialog box.

See ["Print Colors"](#) on page 292.

See the R&S EPL User Manual.

12.5.2 How to store or print screenshots of the display

The measurement results displayed on the screen can be printed or stored to a file very easily.



For a programming example, see [Section 15.8.8, "Examples: managing data"](#), on page 573.

To start printing or storing results to a file



- If the R&S EPL has already been set up according to your current requirements, simply select the "Print immediate" on the toolbar.

The current measurement display is printed or stored to a file, as configured.

To print a screenshot

This configuration assumes a printer has already been installed. To install a new printer, use the [Install Printer](#) function (common Microsoft Windows procedure).

1. Select [Print].

The "Print Settings" dialog box is displayed.

2. In the "Content" tab, define the elements of the screen and additional information to be included in the printout.
 - a) Select "Print Screenshot" to include all elements displayed on the screen in a single-page printout.
 - b) Optionally, add a comment to be printed at the top of the printout.
 - c) Optionally, activate the date and time or the logo so they are added to the printout.
 - d) Optionally, activate "Print Dialog" to include any dialog boxes currently displayed on the screen in the printout. This is useful, for example, to document the used settings for a particular result.
 - e) Check the "Print Preview" to make sure all relevant elements of the display are visible.
3. In the "Printer" tab, select "Printer" as the "Destination".
4. Select the "Printer Name" to print to from the list of installed printers.
5. In the "Page Setup" tab, configure the layout of the printout page.
 - a) Select the page orientation.
 - b) Define the page margins.
 - c) Check the "Print Preview" to make sure all relevant elements of the display are visible.
6. In the "Color" tab, define the colors to be used for the printout.
 - a) By default, "Optimized Colors" are used to improve the visibility of the colors. The background is always printed in white and the grid in black. For a printout that reflects exactly what you see on the screen, select "Screen Colors (Screenshot)".
 - b) Check the "Print Preview" to find out if the setting is appropriate.
7. Select "Print" to execute the print function.

The screenshot is printed on the printer as configured.

To store a printout containing multiple windows

1. Select [Print].

The "Print Settings" dialog box is displayed.

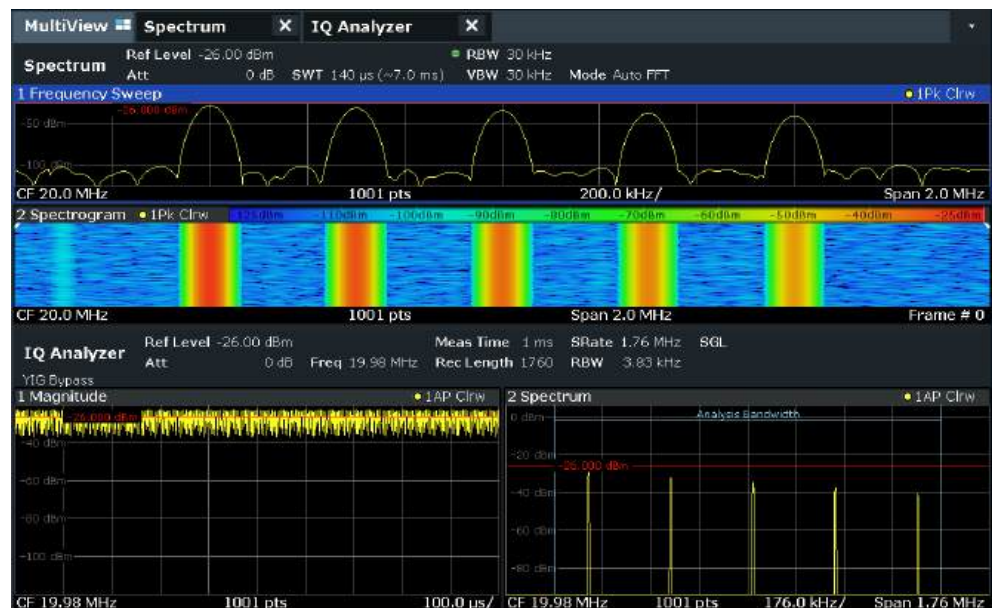
2. In the "Content" tab, define the elements of the screen and additional information to be included in the printout.
 - a) Select "Print Selected Windows" to include the selected windows in the printout, possibly on multiple pages.

- b) Select the result displays in the currently selected channel setup to be included in the printout.
Tip: Select the "MultiView" before configuring the printout to include result displays from any active channel setup.
 - c) Optionally, add a comment to be printed at the top of each page of the printout.
 - d) Optionally, activate the date and time or the logo so they are added to the print-out pages.
3. Check the "Print Preview" to make sure all required result displays are included.
 - a) Scroll through the individual pages of the printout using "Page Up" and "Page Down".
 - b) Use the zoom functions to make sure all relevant parts of the result display are visible.
4. In the "Printer" tab, select "File" as the "Destination".
5. Select the file format from the selection list.
6. By default, you define the filename individually for each print operation. To avoid having the "File Selection" dialog box being displayed for each print operation, select "Suppress File Name Dialog". In this case, the previously used or default storage location and filename are used.
 (C:\Users\Public\Documents\Rohde-Schwarz\Analyzer\user
 \EPL_ScreenShot_<date and time>).
7. In the "Page Setup" tab, configure the layout of the printout page.
 - a) Select the page orientation.
 - b) Define the page margins.
 - c) Check the "Print Preview" to make sure all relevant elements of the display are visible.
8. In the "Color" tab, define the colors to be used for the printout.
 - a) By default, "Optimized Colors" are used to improve the visibility of the colors. The background is always printed in white and the grid in black.
 For a printout that reflects the colors you see on the screen, but with a white background, select "Screen Colors (Print)".
 - b) Check the "Print Preview" to find out if the setting is appropriate.
9. Select "Print" to execute the print function.
10. If you did not select the option to suppress the dialog, enter a filename in the file selection dialog box.
 The selected data elements are stored to the file as configured.
-  11. To store another file using the same configuration any other time, simply select the "Print immediate" icon on the toolbar.

12.5.3 Example for storing multiple measurement results to a PDF file

The following example describes the procedure to store results from measurements in the Spectrum application and the I/Q Analyzer to a single PDF file.

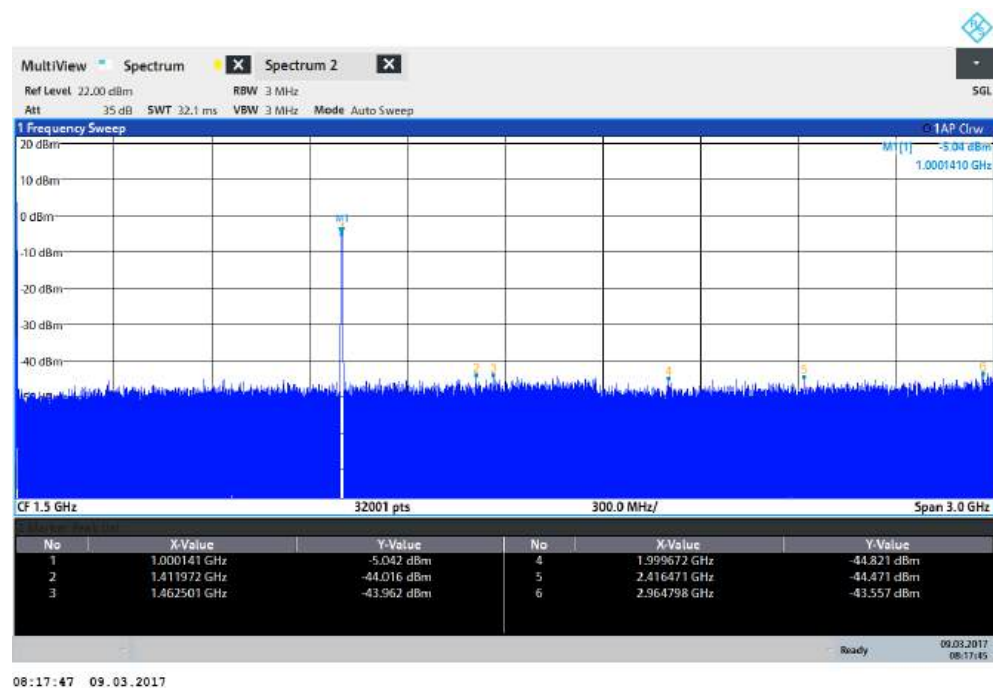
1. Configure and perform the measurements in the Spectrum application and I/Q Analyzer as required. Configure at least the following result displays:
 - Frequency Sweep, Spectrogram (Spectrum)
 - Magnitude, Spectrum (I/Q Analyzer)
2. Switch to the "MultiView" tab to display an overview of the result displays in all active channel setups.



3. Select [Print].
The "Print Settings" dialog box is displayed.
4. In the "Content" tab, select "Print Selected Windows".
5. Select the result displays listed in [step 1](#).
6. Enter the comment *Measurement Test Report* to be inserted at the top of each page.
7. Select "Print Page Count" and "Print Date and Time".
8. In the "Content" tab, select "Print Selected Windows".
9. In the "Printer" tab, select "File" as the "Destination".
10. Select "PDF" from the file format selection list.
11. Select "Suppress File Name Dialog".
12. In the "Page Setup" tab, select "Landscape" as the "Orientation".

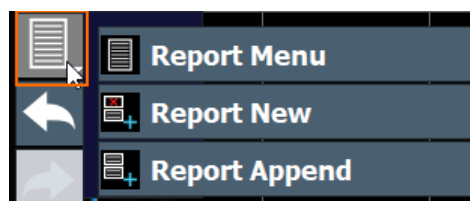
13. Select "Windows Per Page": 1 to print a single result display on each page.
14. Select the "Scaling" option "Size to fit" to maximize the result display on each page.
15. In the "Color" tab, select "Screen Colors (Print)" for a printout that reflects the colors you see on the screen, but with a white background.
16. Check the "Print Preview" to make sure all required result displays are included and all relevant data elements are visible.
 - a) Scroll through the individual pages of the printout using "Page Up" and "Page Down".
 - b) Use the zoom functions to make sure all relevant parts of the result display are visible.
17. Select "Print" to execute the print function.

The selected data elements are stored to the file as configured.



12.6 Working with test reports

Access: Toolbar:



The R&S EPL features a test report generator. A test report is a document that summarizes the results and configuration of measurements.

A test report is made up out of one or more datasets. Each dataset contains the results and configuration of one measurement.

- [Designing a test report template](#)..... 276
- [Creating a test report](#)..... 281

12.6.1 Designing a test report template

Access:  > "Report menu" > "Templates"

The R&S EPL allows you to create test report templates, for example if you handle different measurement tasks that require different information or a different layout in the test report. The following topics show you ways to customize your test reports and save those settings in a template.

Test report content selection	276
General properties of the test report document	277
Custom information about the measurement	278
Contents of the title page	279
Template management	280

Test report content selection

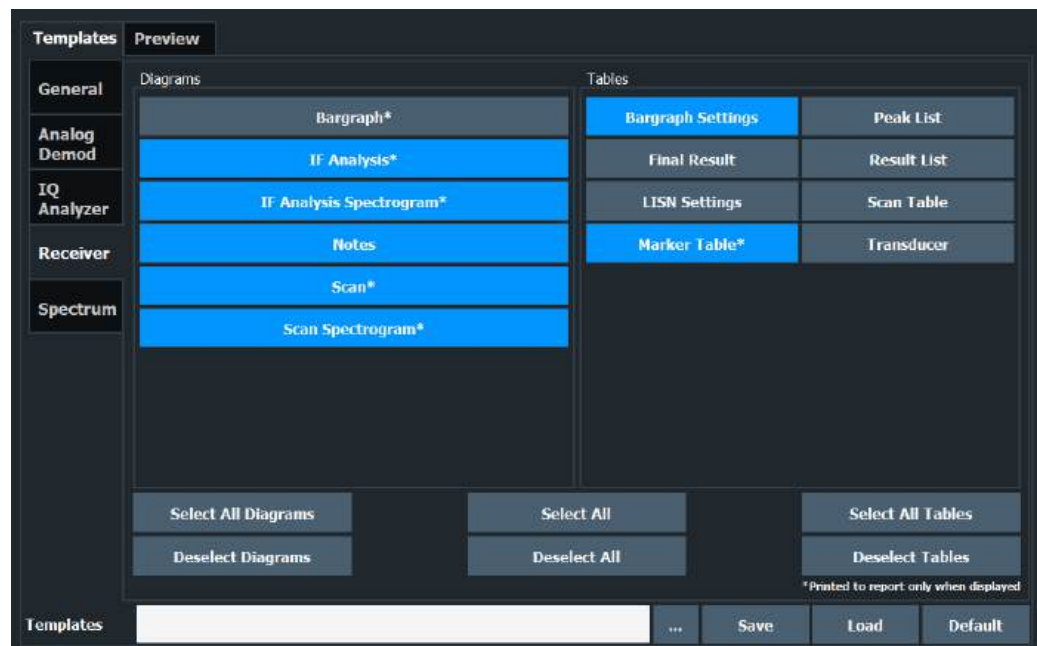
The properties available in the "Templates" tab define the information that each dataset in the test report should contain. You can add or remove the items as required.

The contents of the dialog box depend on the application (Receiver, Spectrum etc.).

In all applications, you can add different graphical results ("Diagrams" category), numerical results or information about the measurement setup or configuration ("Tables" category). Information that is to be included in the test report is represented by a blue button. Information not included is represented by a gray button.

Refer the individual dialog boxes for a comprehensive list of information that you can add to a test report.

For more information about the "General" tab of the dialog box, see "[Custom information about the measurement](#)" on page 278 and "[Contents of the title page](#)" on page 279.



Remote command:

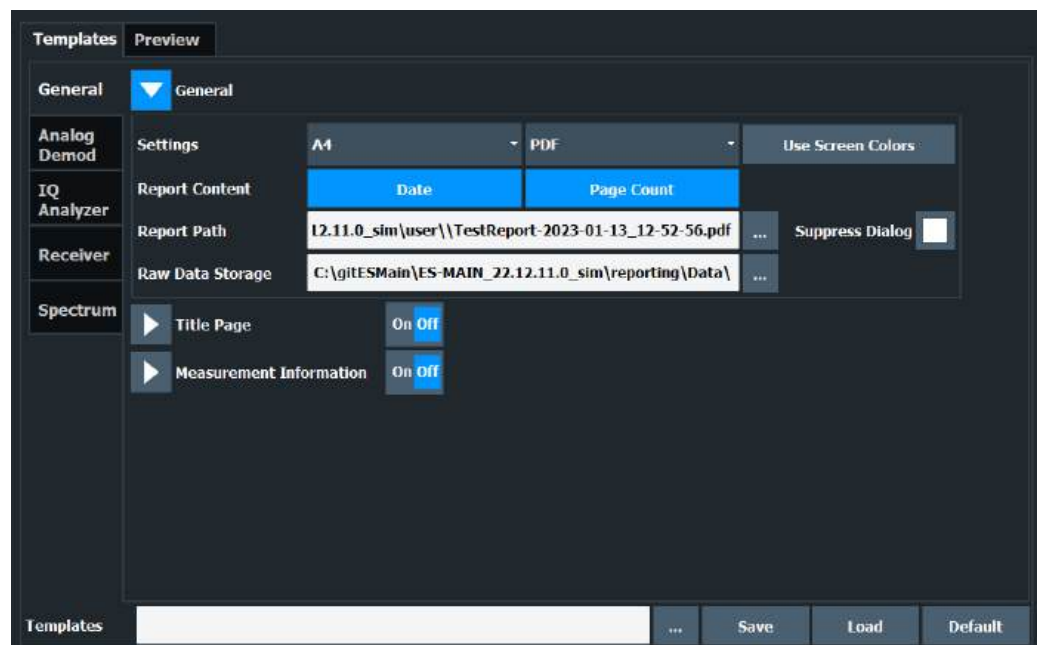
`HCOPY:TREPort:ITEM:SElect` on page 565

`HCOPY:TREPort:ITEM:DEFault` on page 561

General properties of the test report document

Access: > "Report menu" > "Templates" > "General" > "v" > "General"

The "General" category defines general properties of the report document.



The following document properties are supported.

- **Format**

Selects the format of the document (A4 or Letter format).

- **File type**
Selects the file type (.pdf or .doc)
- **Use Screen Colors**
Turns the use of printer friendly color schemes on and off.
- **Date**
Adds the current date to the report.
- **Page Count**
Adds page numbers to the report.
- **Report Path**
Defines the name of the report and the location where the report file is to be saved. You can specify the directory with the "..." button or by entering a path and filename into the input field.
When you omit the path, the report is saved in the default directory.
C:\Users\Public\Documents\Rohde-Schwarz\Analyzer
Note: This is the location of the actual test report. [Templates](#) are stored in a different location.
- **Suppress Dialog**
Turns a confirmation dialog box that is shown when you save the report on and off. When the confirmation dialog is suppressed, reports are saved to the default directory with a generic name.
- **Raw Data Storage**
Defines the location where the raw data used to create the report is stored. You can specify the directory with the "..." button or by entering a path into the input field.

Remote command:

Format: [HCOPY:TREPort:PAgeSize](#) on page 569

File type: [HCOPY:DEvice:LANGuage](#) on page 553

Page numbers: [HCOPY:TREPort:PAgecount:STATe](#) on page 568

Color: [HCOPY:TREPort:PCOLors:STATe](#) on page 569

Date and time: [HCOPY:TREPort:TDSTamp:STATe](#) on page 569

Custom information about the measurement

Access:  > "Report menu" > "Templates" > "General" > "▼" > "Measurement Information"

When you turn it on, the "Measurement Information" category allows you to add custom information about the measurement to the report. You can also define how often that information is added to the report.

You can add up to **six lines** to the report, plus **one picture** (for example a company logo). Each of the six lines consists of a **title** and a **value** (which is displayed next to the title). In addition, you can select how each line in the header is treated (the **visibility**).

The title and value are arbitrary strings. The application, however, comes with several predefined titles (except for the "Heading" title, you can change all others).

Title	Value	Visibility
Heading		Never
Meas Type		Never
Test Equipment		Never
Manufacturer		Never
OP Condition		Never
Test Spec		Never
Logo		Never

- **Title**
Defines a name for a variable that has different values depending on the measurement (for example the name of the EUT). The firmware comes with some predefined titles, but you can change and customize each title.
- **Value**
Defines the value of the variable defined by the title.
- **Visibility**
Selects if a line is displayed on every page in the header of the report ("Global"), below a main section title ("Subreport") or not at all ("Never").
By default, the information is not displayed at all.

Adding a logo

The page header can also contain a picture or logo. You can upload a picture with the "..." symbol. The "..." symbol opens a dialog box to select a file.

Reports support pictures in .bmp, .jpg, .png, .gif, .emf or .wmf format.

Similar to the alphanumeric lines in the header, you can select the visibility for the logo as well. By default, the logo is not displayed in the report.

Remote command:

State: `HCOPY:TREPort:ITEM:HEADer:STATe` on page 563

Title: `HCOPY:TREPort:ITEM:HEADer:LINE<li>:TITLe` on page 563

Value: `HCOPY:TREPort:ITEM:HEADer:LINE<li>:TEXT` on page 562

Visibility: `HCOPY:TREPort:ITEM:HEADer:LINE<li>:CONTrol` on page 561

Selection of logo: `HCOPY:TREPort:ITEM:LOGO` on page 564

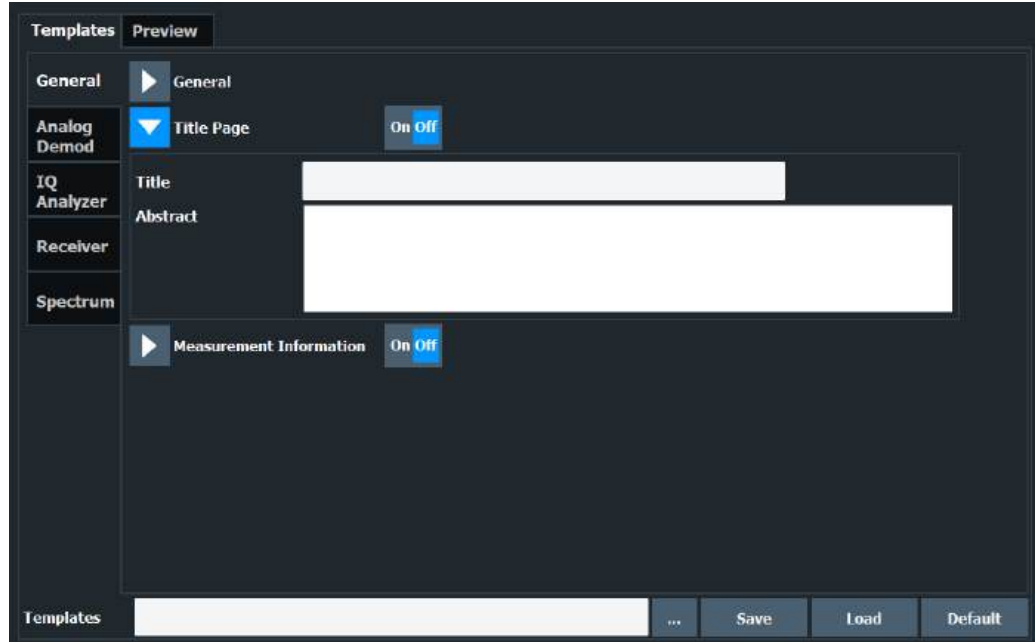
Visibility of logo: `HCOPY:TREPort:ITEM:LOGO:CONTrol` on page 564

Contents of the title page

Access: > "Report menu" > "Templates" > "General" > "▼" > "Title Page"

When you turn it on, the "Title" category defines the contents of the first page of the test report (title page).

You can define a title for the test report, which is printed in big and bold letters on the first page, and a short description of the contents of the test report (or the name of the author or something similar). This description is also part of the first test report page, but is printed in normal letters.



Remote command:

State: [HCOpy:TREPort:TITLe:STATe](#) on page 571

Title: [HCOpy:TREPort:TITLe](#) on page 571

Description: [HCOpy:TREPort:DESCRiption](#) on page 561

Template management

The "Templates" category contains functions to manage test report templates.

Test report management functions are always visible (at the bottom).



- Load
Restores the selected test report configuration.
- Save
Saves the current test report configuration. Before you save the configuration as a template, enter a name for the template in the corresponding field.
You can specify the directory with the "..." button or by entering a path and filename into the input field.
When you omit the path, the report is saved in the default directory.
- Default
Restores the default template configuration.

"File Explorer": Instead of using the file manager of the R&S EPL firmware, you can also use the Microsoft Windows File Explorer to manage files.

Remote command:

Query available templates: `HCOPY:TREPort:ITEM:TEMPlate:CATalog?`
on page 567

Save template: `HCOPY:TREPort:ITEM:TEMPlate:SAVE` on page 568

Load template: `HCOPY:TREPort:ITEM:TEMPlate:LOAD` on page 568

Default template: `HCOPY:TREPort:ITEM:DEFault` on page 561

12.6.2 Creating a test report

Access:  > "Report menu" > "Preview"

Generating report data

- Create a new dataset of the selected measurement channel from scratch: 
(Existing datasets will be deleted.)
- Append a new dataset of the selected measurement channel to an existing dataset: 

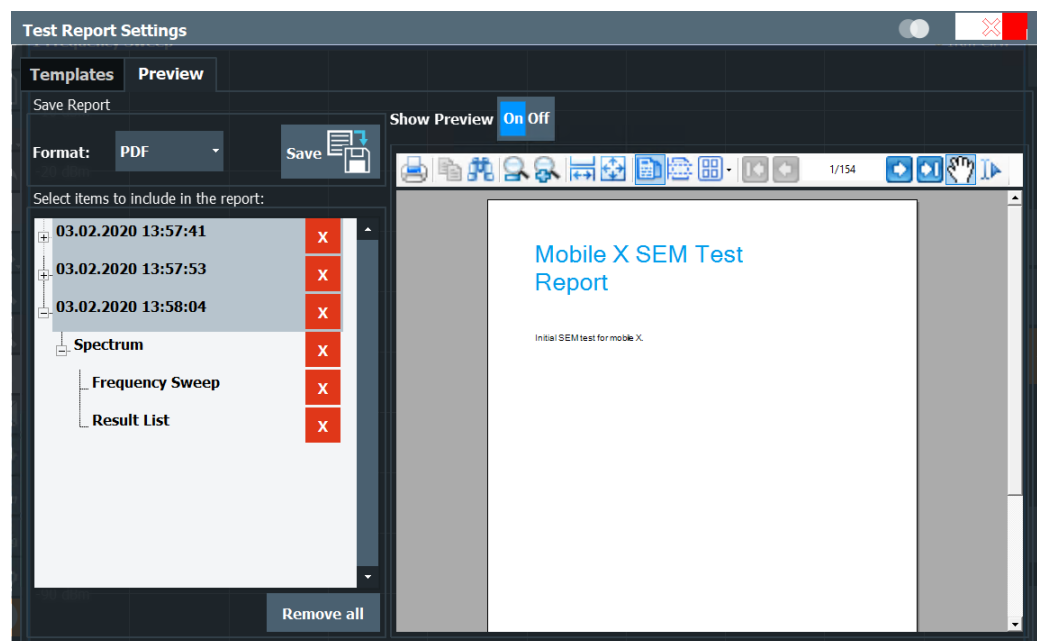


Test report limitations

The size of the test report is limited to 50.000 measurement points per trace.

If the number of measurement points is greater than that value, only the first 50.000 values are written to the report. The rest is dismissed.

Try to do an ASCII file export when you have more measurement points.



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Adding and removing datasets.....	282

Configuration and printout of the test report

You can save the test report either as a **pdf** document or an **doc** document in the corresponding dropdown menu in the "Report Content" dialog box.

The "Preview" feature, if it is turned on, opens a preview version of the test report in the corresponding pane of the dialog box. Note that it can take a short time until the preview has been created.

"Save" saves the test report. When you [suppress the file dialog](#), the report is saved to the directory you have specified in the [Report Path](#) input field.

Remote command:

Print mode: [HCOPY:MODE](#) on page 560

Print report: [HCOPY\[:IMMediate\]](#) on page 553

Report name and directory: [MMEMoRY:NAME](#) on page 540

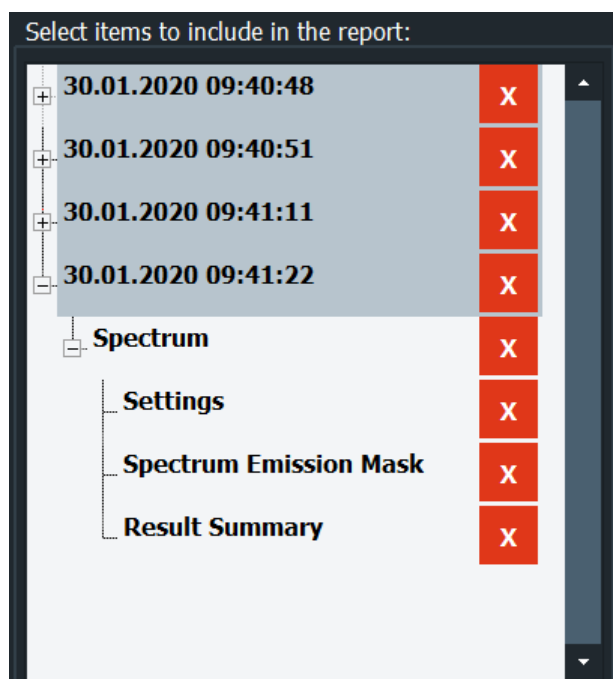
Adding and removing datasets

Before you can print a test report, you have to fill it with data.

Test report data is organized in datasets. Each dataset contains the results of one measurement or the settings of one measurement (which can result in several sub-sets):

You can generate datasets with the  (generate new dataset) or  (append data to the existing dataset).

After you have created a dataset, you can view the details in the "Select Items to Include in the Report" pane of the "Report Content" dialog box.



All datasets in the list are exported to the report. To delete a dataset, use the cross next to the dataset label.

The "Remove All" feature deletes all datasets.

Remote command:

New report: [HCOpy:TREPort:NEW](#) on page 568

Add dataset: [HCOpy:TREPort:APPend](#) on page 561

Remove dataset: [HCOpy:TREPort:TEST:REMove](#) on page 570

Remove all datasets: [HCOpy:TREPort:TEST:REMove:ALL](#) on page 571

13 General instrument setup

Access: [SETUP]

Some basic instrument settings can be configured independently of the selected operating mode or application. Usually, you configure most of these settings initially when you set up the instrument according to your personal preferences or requirements. Then you only adapt individual settings to special circumstances when necessary. Some special functions are provided for service and basic system configuration.



Network and remote settings

Settings for network and remote operation are described in [Section 14.5, "Network and remote control settings"](#), on page 350.

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13.1 Reference frequency

Access: [Setup] > "Reference Int/Ext"

The R&S EPL can use the internal reference source or an external reference source as the frequency standard for all internal oscillators. A 10 MHz crystal oscillator is used as the internal reference source. In the external reference setting, all internal oscillators of the R&S EPL are synchronized to the external reference frequency.

External references are connected to one of the [REF INPUT] connectors on the rear panel. For details see the R&S EPL "Getting Started" manual.

The default setting is the internal reference. When an external reference is used, "EXT REF" is displayed in the status bar.



OCXO option

The OCXO option generates a 10 MHz reference signal with a very precise frequency. If installed, and if no external signal is used, this signal is used as an internal reference. It can also be used to synchronize other connected devices via the Ref. Out 10 MHz connector.

The OCXO is available with option R&S FPL1-B4.

When the instrument is switched on, the OCXO requires an extended warm-up time.

Remote command:
[SENSe:]ROSCillator:SOURce on page 584

13.2 Display settings

13.2.1 Display settings

Access: [Setup] > "Display"

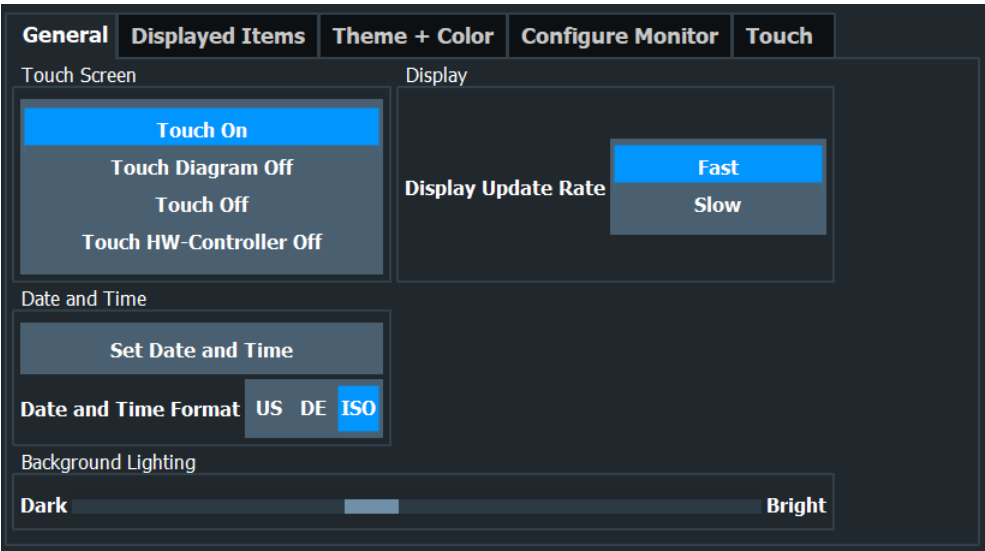
Some general display settings are available regardless of the current application or operating mode. For information on optimizing your display for measurement results, see [Section 11.1, "Result display configuration"](#), on page 177.

- [General display settings](#).....285
- [Displayed items](#).....287
- [Display theme and colors](#).....291
- [External monitor settings](#).....292
- [Touch\(screen\) settings](#).....293

13.2.1.1 General display settings

Access: [Setup] > "Display" > "General"

This section includes general screen display behavior and date and time display.



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Deactivating and Activating the Touchscreen

The touchscreen function can be deactivated, e.g. when the instrument is being used for demonstration purposes and tapping the screen must not provoke an action.

To reactivate the touchscreen, simply press [Setup] on the front panel. The "Display" dialog box is opened automatically and the "Touch Screen" option is set to "On".

"Touch On" Touchscreen function is active for the entire screen.

"Touch Off" Touchscreen is deactivated for the entire screen.

"Touch Diagram Off" Touchscreen is deactivated for the diagram area of the screen, but active for the surrounding softkeys, toolbars and menus.

"Touch HW Controller Off" Cuts off the touchscreen from the power supply to avoid interference during measurements.

Remote command:

[DISPlay:TOUCHscreen\[:STATe\]](#) on page 594

Display Update Rate

By default, a fast update rate ensures the most recent measurement results on the display. However, when performance is poor due to slow data transfer (for example during remote control), it can be helpful to decrease the frequency with which the screen display is updated.

Set Date and Time

Sets the current date and time for the internal real-time clock on the instrument. This function uses the standard Windows "Date and Time Properties" dialog box. Setting the clock requires administrator rights.

Select "Set Date and Time" in the "Display" dialog box, or select the date and time display in the status bar to open the Windows dialog box.

Remote command:

[SYSTem:DATE](#) on page 577

[SYSTem:TIME](#) on page 577

Date and Time Format

Switches the time and date display on the screen between US, ISO and German (DE) format.

"DE" dd.mm.yyyy hh:mm:ss
24 hour format.

"US" mm/dd/yyyy hh:mm:ss
12 hour format.

"ISO" yyyy-mm-dd hh:mm:ss
24 hour format.

Remote command:

[DISPlay\[:WINDow<n>\]:TIME:FORMat](#) on page 595

Background Lighting

Changes the brightness of the display in eight steps.

Remote command:

[DISPlay:BLIGHting](#) on page 596

13.2.1.2 Displayed items

Access: [Setup] > "Display" > "Displayed Items"

Several elements on the screen display can be hidden or shown as required, for example to enlarge the display area for the measurement results.

General	Displayed Items	Theme + Color	Configure Monitor	Touch	
Toolbar	On	Off	Status Bar	On	Off
Softkey Bar	On	Off	Channel Bar	On	Off
Annotation	On	Off	Date and Time	On	Off
Front Panel	On	Off	Mini Front Panel	On	Off
Disconnect RF	On	Off	Frequency Lock	On	Off

Toolbar.....	287
Status Bar.....	287
Softkey Bar.....	288
Channel Bar.....	288
Diagram Footer (Annotation).....	288
Date and Time.....	288
Front Panel.....	288
Mini Front Panel.....	289
Lock Frequency.....	290
Disconnect RF.....	291

Toolbar

The toolbar provides access to frequently used functions via icons at the top of the screen. Some functions, such as zooming, finding help, printing screenshots or storing and loading files are not accessible at all without the toolbar.

Remote command:

[DISPlay:TBAR\[:STATe\]](#) on page 593

Status Bar

The status bar beneath the diagram indicates the global instrument settings, the instrument status and any irregularities during measurement or display.

Some of the information displayed in the status bar can be queried from the status registry via remote commands.

We recommend displaying the status bar at all times. If you hide the status bar, you can miss important error messages.

Remote command:

`DISPlay:SBAR[:STATe]` on page 593

Softkey Bar

Softkeys are virtual keys provided by the software. Thus, more functions can be provided than can be accessed directly via the function keys on the device.

The functions provided by the softkeys are often also available via dialog boxes. However, some functions are not accessible at all without the softkey bar.

Note: The softkey bar is hidden while the SmartGrid is displayed and restored automatically when the SmartGrid is closed.

Remote command:

`DISPlay:SKEYs[:STATe]` on page 593

Channel Bar

The channel setup bar provides information on firmware and measurement settings for a specific channel setup.

Remote command:

`DISPlay:ANNotation:CBAR` on page 592

Diagram Footer (Annotation)

The diagram footer beneath the diagram contains information on the x-axis of the diagram display, such as:

- The current center frequency and span settings
- The displayed span per division
- The number of sweep points

Remote command:

`DISPlay:ANNotation:FREQuency` on page 592

Date and Time

The date and time display can be switched off independently of the status bar.

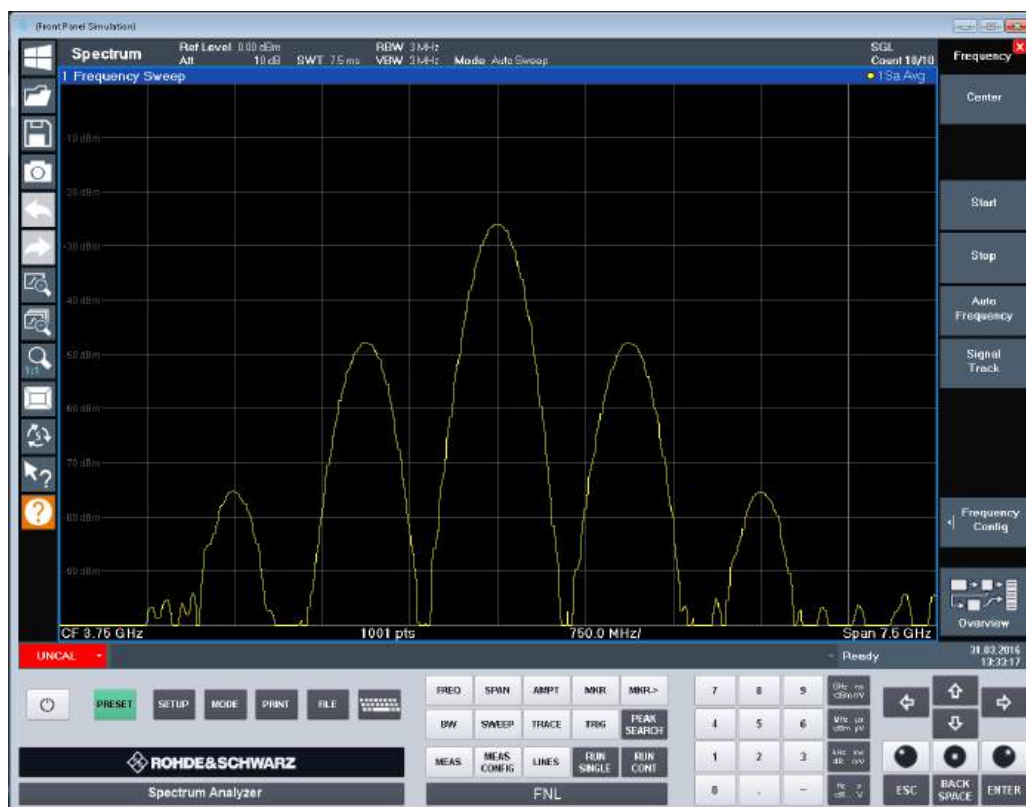
You can set the current date and time and configure the display format in the "General" tab of the "Display" dialog box.

Remote command:

`DISPlay[:WINDow<n>]:TIME` on page 594

Front Panel

The "Front Panel" display simulates the entire front panel of the device (except for the external connectors) on the screen. Thus, you can interact with the R&S EPL without the keypad and keys on the front panel of the device. That is useful, for example, when working with an external monitor or operating via remote control from a computer.



To hide or show the front panel temporarily, press [F6] on the external keyboard (if available) or the remote computer.

For more information, see [Section 13.2.2, "How to work with the soft front panels"](#), on page 294.

Remote command:

`SYSTem:DISPlay:FPANel[:STATe]` on page 596

Mini Front Panel

If you require a front panel display but do not want to lose too much space for results in the display area, a mini front panel is available. The mini version displays only the main function keys in a separate window in the display area.



For more information, see [Section 13.2.2, "How to work with the soft front panels"](#), on page 294.

Note:

You can also show the mini front panel using the key combination [ALT + m] (be aware of the keyboard language defined in the operating system!). That is useful when you are working from a remote PC and the front panel function is not active.

Remote command:

`SYSTem:DISPlay:FPANel[:STATe]` on page 596

Lock Frequency

Turns the display of the "Lock Frequency" icon in the toolbar on and off.

When the icon is part of the toolbar, you can turn the frequency lock on and off. When the lock is on, the frequency does not change when you turn the rotary knob.

Only applies to the frequency. You can still change other parameters with the rotary knob.

Remote command:
not supported

Disconnect RF
Turns the display of the "Disconnect RF" icon in the toolbar on and off.

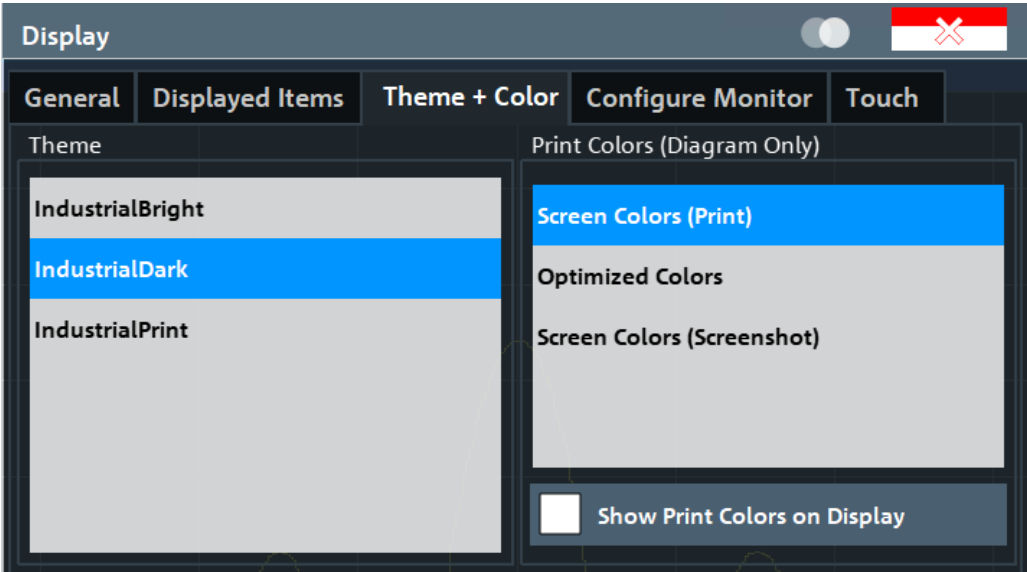
When the icon is part of the toolbar, you can cut off the (external) signal fed into the RF input quickly and easily.

Remote command:
[DISPlay:ITERm\[:STATe\]](#) on page 593
[INPut:TERMinator](#) on page 595

13.2.1.3 **Display theme and colors**

Access: [Setup] > "Display" > "Theme + Color"

You can configure the used colors and styles of display elements on the screen.



Theme.....	291
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Showing Print Colors on Display.....	292

Theme
The theme defines the colors and style used to display softkeys and other screen objects.

The default theme is "IndustrialDark".

Remote command:
[DISPlay:THEMe:SElect](#) on page 597

Print Colors

Defines the color settings used for printout.

If "Show Print Colors on Display" is activated, the currently selected print colors are displayed as a preview for your selection.

Gui setting	Description	Remote command
"Optimized Colors"	Selects an optimized color setting for the printout to improve the visibility of the colors (default setting). Trace 1 is blue, trace 2 black, trace 3 green, and the markers are turquoise. The background is always printed in white and the grid in black.	HCOP:CMAP:DEF2
"Screen Colors (Print)"	Selects the current screen colors for the printout. The background is always printed in white and the grid in black.	HCOP:CMAP:DEF1
"Screen Colors (Screenshot)"	Selects the current screen colors without any changes for a screenshot.	HCOP:CMAP:DEF4

Remote command:

HCOPY:CMAP<it>:DEFault<ci> on page 550

Showing Print Colors on Display

Temporarily shows the currently selected print colors on the screen display. This function can be used as a preview for printing.

13.2.1.4 External monitor settings

Access: [Setup] > "Display" > "Configure Monitor"

You can connect an external monitor (or projector) to the "DisplayPort" connector on the instrument's rear panel.

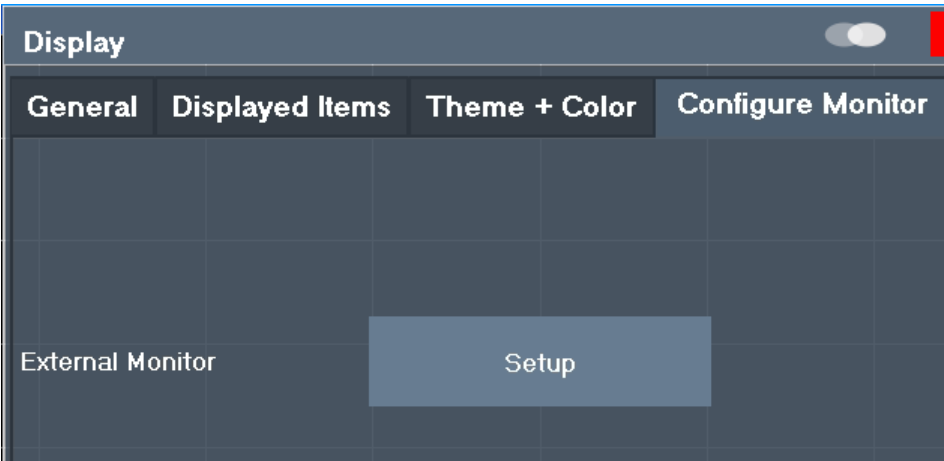


Screen resolution and format

The touchscreen of the R&S EPL is calibrated for a 16:10 format. If you connect a monitor or projector using a different format (e.g. 4:3), the calibration is not correct and the screen does not react to your touch actions properly.

The touchscreen has a screen resolution of 1280x800 pixels. Usually, the display of the external monitor is a duplicate of the instrument's monitor.

If you configure the external monitor to be used as the *only* display in the Windows configuration dialog box ("Show only on 2"), the maximum screen resolution of the monitor is used. In this case, you can maximize the R&S EPL application window and see even more details. You cannot change the monitor's screen resolution via the standard Windows configuration dialog box.



Display Switch.....	293

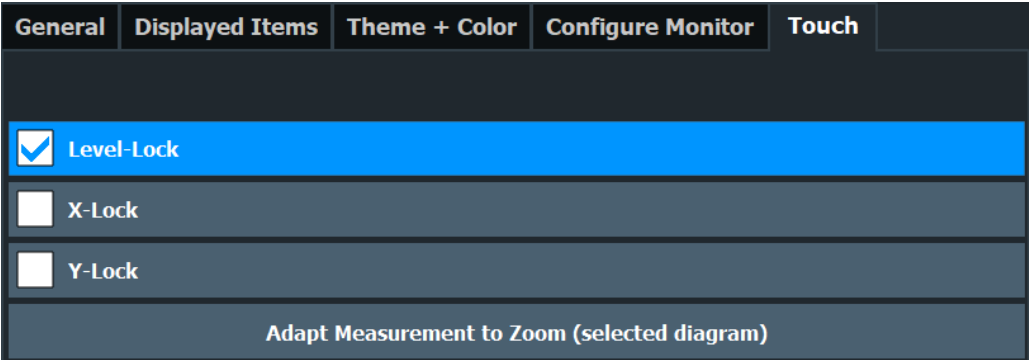
Display Switch
 Opens the standard Windows configuration dialog box to configure the used display devices.

13.2.1.5 Touch(screen) settings

Access: [Setup] > "Display" > "Touch"

These options concern the behavior of the firmware for touch gestures on the screen.

Note that these settings remain unchanged after a channel preset.



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Adapt Measurement to Zoom (selected diagram).....	294

Level Lock
 If activated (default), the reference level (and thus the attenuation) is locked, that is: remains unchanged during touch gestures on the screen.

X-Lock

If activated, the x-axis of the diagram is not changed during subsequent touch gestures.

Y-Lock

If activated, the y-axis of the diagram is not changed during subsequent touch gestures.

Adapt Measurement to Zoom (selected diagram)

If you already performed a graphical zoom using the "Single Zoom" on page 183 or "Multi-Zoom" on page 183 functions, this function automatically adapts the measurement settings to maintain the currently zoomed display.

13.2.2 How to work with the soft front panels

Basic operation with the soft front panels is identical to normal operation, except for the following aspects:

- To activate a key, select the key on the touchscreen.
- To simulate the use of the rotary knob, use the additional keys displayed between the keypad and the arrow keys:

Icon	Function
	Turn left
	Enter
	Turn right

Mini front panel

The mini front panel provides only the keys on the touchscreen, to operate the R&S EPL via an external monitor or remote desktop.

To display the soft front panel or mini front panel

1. Press [Setup] and select "Display".
2. Select the "Displayed Items" tab.
3. Select "Front Panel": "On" or "Mini Front Panel": "On".



To hide or show the front panel, press [F6] on the external keyboard (if available) or on the remote computer.

To hide or show the "Mini Front Panel", double-click the title of the softkey menu. As an alternative, press [ALT + m] (be aware of the keyboard language defined in the operating system!) on the external keyboard (if available) or on the remote computer.

If the softkey menu is visible, you can display the "Mini Front Panel" quickly and easily by double-clicking the title of the softkey menu.

To close the mini front panel

- Select the  "Close" icon at the top of the panel.

13.2.3 Reference: Keyboard shortcuts for the mini front panel

The mini front panel provides an alternative way to access the functionality of the hard-keys when you are operating the instrument remotely. You can access the keys either using a mouse or using keyboard shortcuts on the remote computer. The follow table provides an overview of the assigned keyboard shortcuts *for a German keyboard layout*. Be aware of the keyboard language defined in the operating system!



To hide or show the "Mini Front Panel", double-click the title of the softkey menu. As an alternative, press [ALT + m].

Hardkey on instrument	Keyboard shortcut
[Freq.]	[Alt+Shift+J]
[Span]	[Alt+Shift+K]
[Ampt./Scale]	[Alt+Shift+C]
[BW]	[Alt+Shift+L]
[Sweep]	[Alt+Shift+M]
[Trace]	[Alt+Shift+F]
[Trigger]	[Alt+Shift+S]
[Meas]	[Alt+Shift+A]
[Meas Config]	[Alt+Shift+W]
[Lines]	[Alt+Shift+B]
[Marker]	[Alt+Shift+G]
[Peak Search]	[Alt+Shift+R]
[Marker Function]	[Alt+Shift+Q]
[Marker ->]	[Alt+Shift+H]
[Run Single]	[Alt+Shift+D]
[Run Cont.]	[Alt+Shift+E]
[Setup]	[Alt+Shift+T]
[Print]	[Alt+CTRL+P]
[File]	[CTRL+S]
[Mode]	[Alt+Shift+P]
[GHz s -dBm V]	[CTRL+Shift+G]
[MHz ms dBm mV]	[CTRL+Shift+M]

Hardkey on instrument	Keyboard shortcut
[kHz μs dB μV]	[CTRL+Shift+K]
[Hz ns dB.. nV]	[CTRL+Shift+H]
	[ALT+CTRL+O]
[Preset]	[Alt+Shift+U]

13.3 Synchronizing measurement channel configuration

Access: [SETUP] > "Parameter Coupling"

Each of the applications of the R&S EPL is usually treated as an independent entity regarding their configuration: changing a setting in one measurement channel does not automatically change the corresponding setting in another channel.

For example, changing the frequency in the receiver application does not, by default, change the frequency in the spectrum application.

However, sharing settings can be convenient for certain measurement tasks. The R&S EPL provides a tool to couple (or synchronize) selected parameters across applications - the coupling manager.

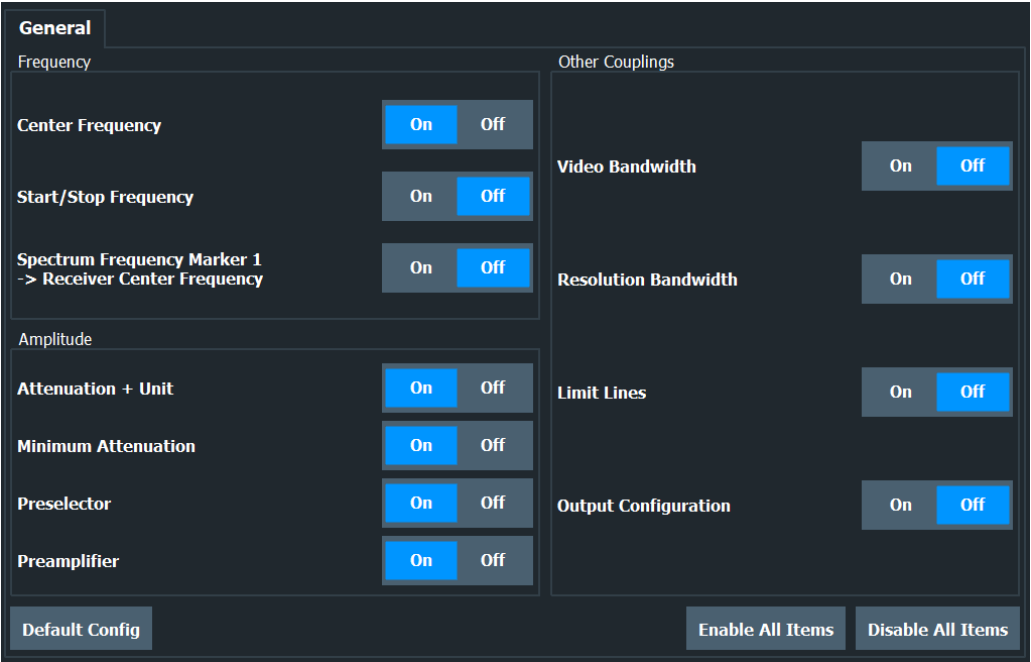
The coupling managers allows you not only to couple parameters, but also markers and lines accross applications.

- [General parameter coupling](#).....296

13.3.1 General parameter coupling

Access: [SETUP] > "Parameter Coupling" > "General"

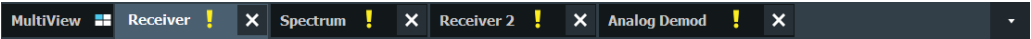
The "General" tab of the coupling manager contains several parameters that you can couple across all (active) measurement channels - if the channel supports the corresponding parameter.



When you couple a parameter across all active measurement channels, a change in the currently selected application is passed on to all other active measurement channels.

Example:

You have opened one instance of the spectrum application, two instances of the receiver application and one instance of the AM/FM/PM Analog Demod application. The currently selected channel is the first receiver channel (as shown in the picture).



When you turn the coupling of the frequency on, changing the frequency in the "Receiver" channel also changes the frequency in the "Spectrum", "Receiver 2" and "Analog Demod" channels.

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Synchronizing parameters across all measurement channels

To synchronize a specific parameter, turn on the corresponding function.

Synchronizing measurement channel configuration

Coupling	Effect when turned on
"Center Frequency"	Synchronizes the (center / receiver) frequency Remote command: <code>INSTrument:COUPle:CENTer</code> on page 598
"Start / Stop Frequency"	Synchronizes the start and stop frequencies for measurements in the frequency domain. Note: The start and stop frequencies can automatically change when you change another frequency parameter (like center frequency or span). Remote command: <code>INSTrument:COUPle:SPAN</code> on page 601
"Marker → Frequency"	Synchronizes the receiver frequency in the receiver application with the frequency of marker 1 in the spectrum application. Note: Simultaneous synchronization of center frequency, start and stop frequency and synchronization of marker and center frequency is not possible. Remote command: <code>INSTrument:COUPle:MARKer</code> on page 600
"Attenuation + Unit"	Synchronizes the attenuation and the unit of the level axis. Remote command: <code>INSTrument:COUPle:ATTen</code> on page 598
"Minimum Attenuation"	Synchronizes the 10 dB Minimum Attenuation feature. Remote command: <code>INSTrument:COUPle:PROT</code> on page 600
"Preamplifier"	Synchronizes the gain of the optional preamplifier. Note: If you have selected automatic selection of the ideal gain in a receiver application, only the calculated gain value is synchronized. Remote command: <code>INSTrument:COUPle:GAIN</code> on page 599
"Resolution Bandwidth"	Synchronizes the measurement bandwidth. Note: Simultaneous synchronization of the video bandwidth and the resolution bandwidth is not possible. Remote command: <code>INSTrument:COUPle:BWIDth</code> on page 598
"Video Bandwidth"	Synchronizes the video bandwidth. Note: Simultaneous synchronization of the video bandwidth and the resolution bandwidth is not possible. Remote command: <code>INSTrument:COUPle:VBW</code> on page 601
"Limit Lines"	Activates the limit line over all channels. Note: Limit lines are only synchronized over channels if the limit line is compatible to the channel configuration (especially units of the x- and y-axis). Remote command: <code>INSTrument:COUPle:LIMit</code> on page 599
"Output Configuration"	Synchronizes the settings for signal output . Remote command: <code>INSTrument:COUPle:DEMod</code> on page 599
"Preselector"	Synchronizes the preselector configuration . Note that the preselector is always on in the receiver application. Therefore, the coupling only has an effect on spectrum, I/Q analyzer and analog demodulation channels. Remote command: <code>INSTrument:COUPle:PRESel</code> on page 600

Note that you cannot synchronize all parameters at the same time, because some parameters are interdependent. For example, you cannot synchronize the resolution and video bandwidth simultaneously, because the video bandwidth depends on the resolution bandwidth and vice versa.

Selecting all or no coupling mechanisms

Select all items available in the general coupling manager using "Enable All Items".

Note that you cannot actually select all items, because some of them are mutually exclusive.

Deselect all items available in the coupling manager using "Disable All Items".

Remote command:

not supported

Restoring the default configuration

You can restore the default parameter coupling configuration any time with "Default Config".

Remote command:

not supported

13.4 System configuration settings

Access: [Setup] > "System Configuration"

- [Hardware information](#).....299
- [Information on versions and options](#).....300
- [System messages](#).....301
- [Firmware updates](#).....302
- [General configuration settings](#).....303
- [Additional interfaces](#).....304

13.4.1 Hardware information

Access: [Setup] > "System Configuration" > "Hardware Info"

An overview of the installed hardware in your R&S EPL is provided.

Every listed component is described by its serial number, part number, model information, hardware code, and hardware revision.

This information can be useful when problems occur with the instrument and you require support from Rohde & Schwarz.

Hardware Info	Versions + Options	System Messages	Firmware Update	Config	Add. Interfaces		
Component			Serial #	Part #	Model	HWC	Rev
Frontend EMI			999992	1329.9540	03	02	01.00
Motherboard			100000	1329.9370	03	00	01.00
Reference Board			100001	1323.0029	02	00	02.01
OCXO			000000	1300.3180	00	00	00.00
Internal Generator EMI			100000	1329.7602	03	00	01.00
Additional Interfaces			100000	1323.0212	02	00	00.00
DC Power Supply 12/24V			000000	1323.0193	00	00	00.00
Internal Li-Ion Battery			000000	1323.0170	02	00	00.00
GPIB Interface			000000	1323.1160	00	00	00.00
RF Input Board			100999	1329.8073	02	00	01.00
CPU Board - SIM			234561/234	1234.5678			
EPL1000 Device			900005	1350.4444	10		

Remote command:

`DIAGnostic:SERVICE:HWInfo?` on page 607

`DIAGnostic:SERVICE:BATtery:LEVel?` on page 583

13.4.2 Information on versions and options

Access: [Setup] > "System Configuration" > "Versions + Options"

Information on the firmware version and options installed on your instrument is provided. The unique Rohde & Schwarz device ID is also indicated here, as it is required for license and option administration.

You can also install new firmware options in this dialog box.

The table also contains:

- The open source acknowledgements (PDF file) for the firmware and other software packages used by the R&S EPL
- The European License Agreement (EULA) for LucasFonts RSCorpid



Expired option licenses

If an option is about to expire, a message box is displayed to inform you. You can then use the "Install Option" function to enter a new license key.

If an option has already expired, a message box appears for you to confirm. In this case, all instrument functions are unavailable (including remote control) until the R&S EPL is rebooted. You must then use the "Install Option" function to enter the new license key.

Hardware Info		Versions + Options	System Messages	Firmware Update	Config	Add. Interfaces
State	Item	Option	Version	License		
	Time Control Management			active		^

Remote commands:

[DIAGnostic:SERVICE:BIOSinfo?](#) on page 607

[DIAGnostic:SERVICE:VERSinfo?](#) on page 607

LucasFonts RsCorpid EULA: Open

Displays a PDF file containing copyright information on the RsCorpid font used by the R&S EPL firmware.

IVI Shared Components EULA: Open

Displays a PDF file containing copyright information on the IVI shared components used by the R&S EPL firmware.

Install Option

Opens an edit dialog box to enter the license key for the option that you want to install.

Install Option by XML

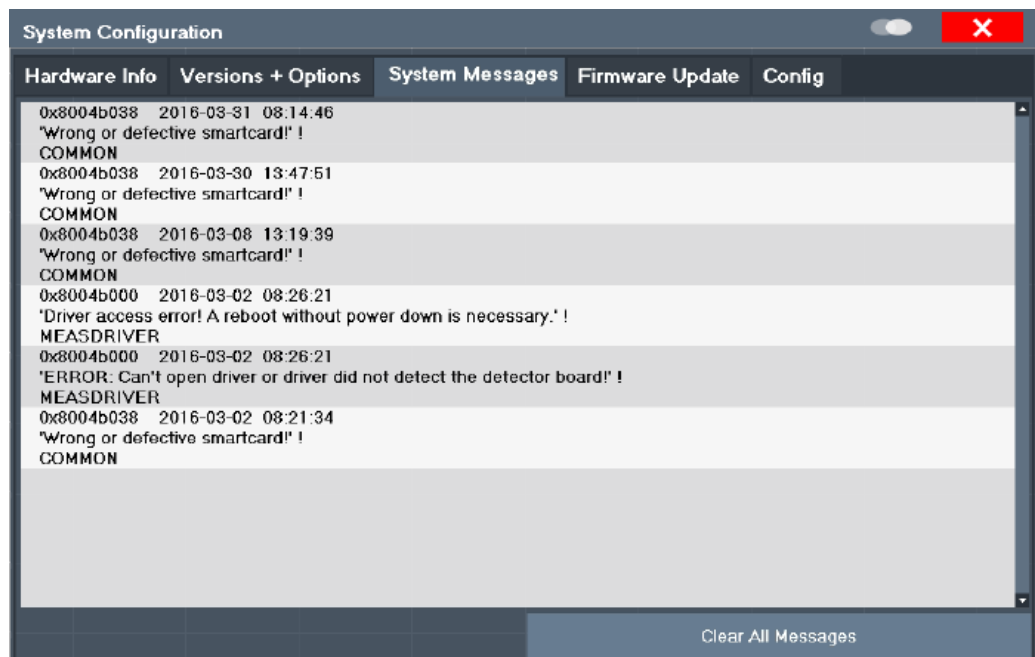
Opens a file selection dialog box to install an additional option to the R&S EPL using an XML file. Enter or browse for the name of an XML file that contains the option key and select "Select".

13.4.3 System messages

Access: [Setup] > "System Configuration" > "System Messages"

The system messages generated by the R&S EPL are displayed.

The messages are displayed in the order of their occurrence; the most recent messages are placed at the top of the list. Messages that have occurred since you last visited the system messages tab are marked with an asterisk '*'.



If the number of error messages exceeds the capacity of the error buffer, "Message Buffer Overflow" is displayed. To clear the message buffer, use "Clear All Messages".

The following information is available:

No	device-specific error code
Message	brief description of the message
Component	hardware messages: name of the affected module
	software messages: name of the affected software
Date/Time	date and time of the occurrence of the message

Remote command:

[SYSTem:ERRor:LIST?](#) on page 609

13.4.4 Firmware updates

Access: [Setup] > "System Configuration" > "Firmware Update"

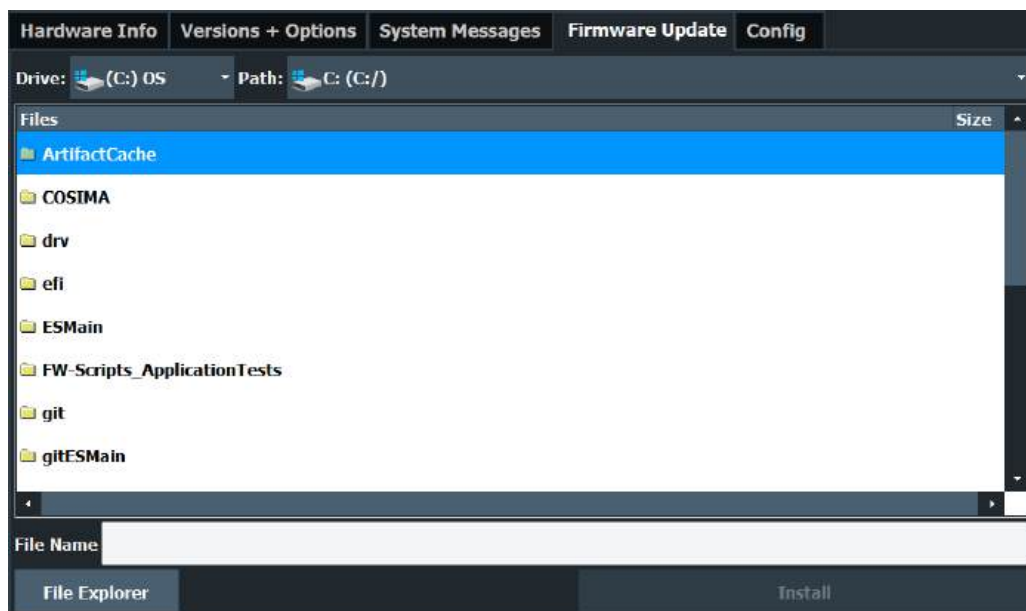
During instrument start, the R&S EPL checks the installed hardware against the current firmware version to ensure that the hardware is supported. If not, an error message is displayed ("Wrong Firmware Version") and you are asked to update the firmware. Until the firmware version is updated, self-alignment fails. To see which components are not supported, see the [System messages](#).

Possibly, you also have to update the firmware on your R&S EPL to enable additional new features or if reasons for improvement come up. Ask your sales representative or

check the Rohde & Schwarz website for availability of firmware updates. A firmware update package includes at least a setup file and release notes.



Before updating the firmware on your instrument, read the release notes delivered with the firmware version.



For detailed instructions on installing the firmware, see the product release notes.

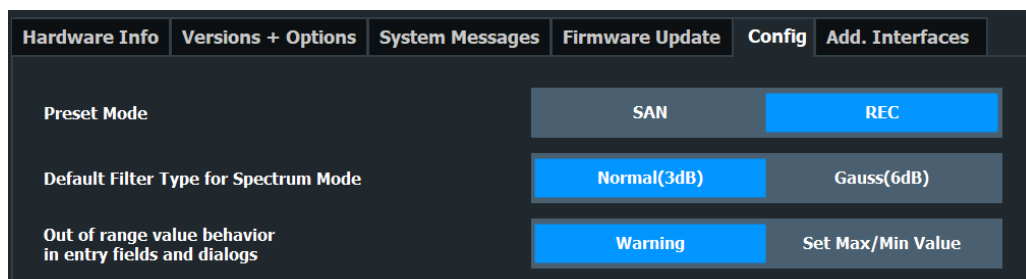
Remote command:

`SYSTem:FIRMware:UPDate` on page 610

13.4.5 General configuration settings

Access: [Setup] > "System Configuration" > "Config"

General system settings, for example concerning the initial behaviour of the R&S EPL after booting, can also be configured.



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Preset Mode

The preset mode selects the application that is started after an instrument preset.

The presettings can be defined in the "Config" tab of the "System Configuration" dialog box.

For details on operating modes see [Section 8, "Applications"](#), on page 76.

"SAN" Signal and Spectrum Analyzer mode

"REC" Receiver application

Remote command:

[SYSTem:PRESet:COMPAtible](#) on page 610

Default Filter Type for Spectrum Mode

Selects the type of resolution filter that is selected after a preset in the spectrum application.

"Normal (3 dB)" Selects 3 dB filter.

"Gauss (6 dB)" Selects 6 dB filter.
Note that in the receiver application, the default filter is always the 6 dB filter.

Remote command:

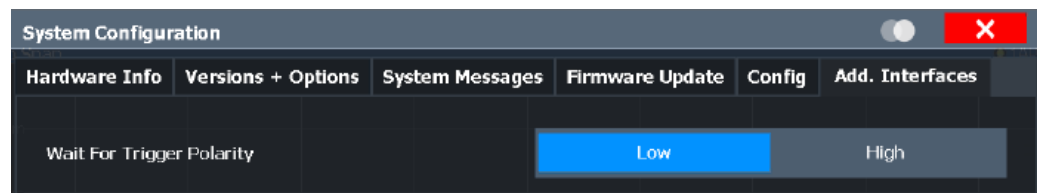
[SYSTem:PRESet:FILTer](#) on page 610

Out-of-range value behavior

By default, if you enter a value that is outside the valid range in an input field for a setting, a warning is displayed and the value is not accepted. Alternatively, entries below the minimum value can automatically be set to the minimum entry, and entries above the maximum value set to the maximum entry. This behavior avoids errors and facilitates setting correct values.

13.4.6 Additional interfaces

The following "Additional interfaces" are available on the R&S EPL.



Wait for Trigger Polarity

(For details on the connector see the R&S EPL Getting Started manual).

The signal polarity that indicates the trigger availability is configurable.

- "Low"

A low signal (= 0 V) indicates the instrument is ready to receive a trigger.
- "High"

A high signal (= 5 V) indicates the instrument is ready to receive a trigger.
- Remote command:

[OUTPut:UPORt:WTRigger:POLarity](#) on page 611

13.5 Service functions

- Access: [Setup] > "Service"

When unexpected problems arise with the R&S EPL some service functions may help you solve them.

For more helpful information for support, see also [Section 16.6, "Collecting information for support"](#), on page 667

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 - [Self-test settings and results](#).....306
 - [Calibration signal display](#).....307
 - [Service functions](#).....308
 - [Hardware diagnostics](#).....309

13.5.1 R&S support information

- Access: [Setup] > "Service" > "R&S Support"

In case of errors you can store useful information for troubleshooting and send it to your Rohde & Schwarz support center.

R&S Support

Selftest

Calibration Signal

Service Function

Hardware Diagnostics

Create R&S Support Information

Location: [C:/user/](#)

In case of problems, follow the customer support link, log in to GLORIS and navigate to the R&S Support Center area. Create a request, describe the problem and attach the Support Information file.

Save Device Footprint

Location: [C:/devicedata/xml/](#)

Contact Information

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



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[Save Device Footprint](#).....306
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Create R&S Support Information

Creates a *.zip file with important support information. The *.zip file contains the system configuration information ("Device Footprint"), the current eeprom data and a screenshot of the screen display.

This data is stored to the C:\Users\Public\Documents\Rohde-Schwarz\Analyzer directory on the instrument.

The file name consists of the unique device ID and the current date and time of the file creation.

If you contact the Rohde & Schwarz support to get help for a certain problem, send these files to the support in order to identify and solve the problem faster.

Remote command:

[DIAGnostic:SERVICE:SINfo?](#) on page 612

Save Device Footprint

Creates an *.xml file with information on installed hardware, software, image and FPGA versions. The *.xml file is stored under

C:\ProgramData\Rohde-Schwarz\ZNL-FPL\devicedata\xml\ on the instrument. It is also included in the service ZIP file (see ["Create R&S Support Information"](#) on page 306).

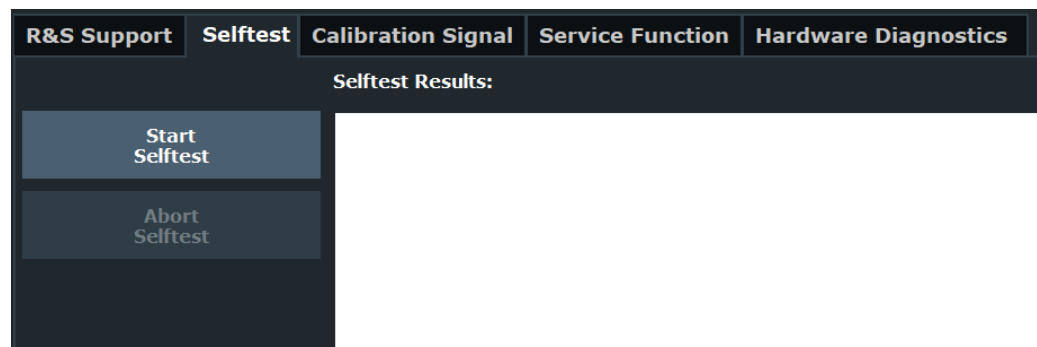
Remote command:

[SYSTEM:DFPrint](#) on page 613

13.5.2 Self-test settings and results

Access: [Setup] > "Service" > "Selftest"

If the R&S EPL fails you can perform a self-test of the instrument to identify any defective modules.



Once the self-test is started, all modules are checked consecutively and the test result is displayed. You can abort a running test.

In case of failure a short description of the failed test, the defective module, the associated value range and the corresponding test results are indicated.



A running Sequencer process is aborted when you start a self-test.
 If you start a self-test remotely, then select "Local" while the test is still running, the instrument only returns to the manual operation state after the test is completed. In this case, the self-test cannot be aborted.

Remote command:

[*TST?](#) on page 387

[DIAGnostic:SErvice:STEST:RESult?](#) on page 583

13.5.3 Calibration signal display

Access: [Setup] > "Service" > "Calibration Signal"

As an alternative to the RF input signal from the front panel connector, you can use the instrument's calibration signal as the input signal, for example to perform service functions on.



NONE.....	307
Calibration Frequency EMI.....	307
L Spectrum.....	307
L Frequency.....	308

NONE
 Uses the current RF signal at the input, i.e. no calibration signal (default).
 Remote command:
[DIAGnostic:SErvice:INPut\[:SElect\]](#) on page 582

Calibration Frequency EMI
 Uses the internal calibration signal as the RF input signal.
 Remote command:
[DIAGnostic:SErvice:INPut\[:SElect\]](#) on page 582

Spectrum ← Calibration Frequency EMI
 Defines whether a broadband or narrowband calibration signal is sent to the RF input.

"Narrowband"	Used to calibrate the absolute level of the frontend.
"Broadband"	Used to calibrate the IF filter.

Remote command:
`DIAGnostic:SERvice:INPut:RF[:SPECTrum]` on page 582

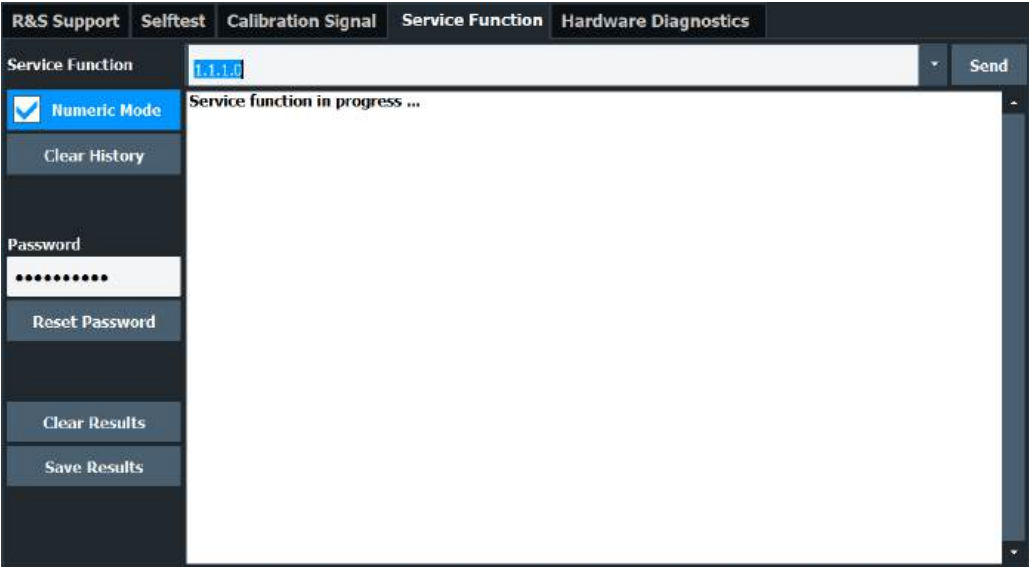
Frequency ← Calibration Frequency EMI
Defines the frequency of the internal broadband calibration signal to be used for IF filter calibration (max. 25 MHz).

13.5.4 Service functions

Access: [Setup] > "Service" > "Service Function"



Using service functions
The service functions are not necessary for normal measurement operation. Incorrect use can affect correct operation and/or data integrity of the R&S EPL.
Therefore, many of the functions can only be used after entering a password. These functions are described in the instrument service manual.



Service Function.....	308
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Password.....	309
Clear Results.....	309
Save Results.....	309
Result List.....	309

Service Function
Selects the service function by its numeric code or textual name.
The selection list includes all functions previously selected (since the last "Clear History" action).

Remote command:

[DIAGnostic:SErvice:SFUNction](#) on page 611

Send

Starts the selected service function.

Remote command:

[DIAGnostic:SErvice:SFUNction](#) on page 611

Clear History

Deletes the list of previously selected service functions.

Password

Most service functions require a special password as they may disrupt normal operation of the R&S EPL. There are different levels of service functions, depending on how restrictive their use is handled. Each service level has a different password.

"Reset Password" clears any previously entered password and returns to the most restrictive service level.

Remote command:

[SYSTem:PASSword\[:CENable\]](#) on page 613

[SYSTem:PASSword:RESet](#) on page 613

Clear Results

Clears the result display for all previously performed service functions.

Remote command:

[DIAGnostic:SErvice:SFUNction:RESults:DELeTe](#) on page 612

Save Results

Saves the results of all previously performed service functions to a file stored as C:\Users\Public\Documents\Rohde-Schwarz\Analyzer\results\ServiceLog.txt.

Remote command:

[DIAGnostic:SErvice:SFUNction:RESults:SAVE](#) on page 612

Result List

The Results List indicates the status and results of the executed service functions.

13.5.5 Hardware diagnostics

In case problems occur with the instrument hardware, some diagnostic tools provide information that may support troubleshooting.

The hardware diagnostics tools are available in the "Hardware Diagnostics" tab of the "Service" dialog box.

R&S Support		Selftest	Calibration Signal	Service Function	Hardware Diagnostics
Relays Cycle Counter					
Type					Counter
Signal Source Out					0
RF2 Mechanical Att. 10dB R1					82
RF2 Mechanical Att. 10dB R2					102
Calibration Source					70
RF1-RF2 Switch					77
SA-Bypass					50
EMI Mechanical Att. 10dB					5
Preselector AB: Bypass-R1					3
Preselector AB: Bypass-R2					3
Preselector AB: Switch-R1					6
Preselector AB: Switch-R2					6
Preselector AB: Preamplifier					2
LF Mechanical Att. 10dB					2

Relays Cycle Counter..... 310

Relays Cycle Counter

The hardware relays built into the R&S EPL may fail after a large number of switching cycles (see specifications document). The counter indicates how many switching cycles the individual relays have performed since they were installed.

Remote command:

[DIAGnostic:INFO:CCOunt?](#) on page 606

13.6 Toolbar configuration

If the list of available icons becomes longer than the height of the screen, an arrow at the bottom of the toolbar indicates that further icons are available.

However, you can configure which icons are displayed in the toolbar, and in which order.



Toolbar configuration is saved when you shut down or preset the R&S EPL. It is not included in save sets (see [Section 12.3, "Storing and recalling instrument settings and measurement data"](#), on page 250).

To configure the toolbar



- From the toolbar, select "More icons" > "Edit Toolbar".
The toolbar is highlighted red to indicate it is in edit mode.
- Drag and drop the icons in the toolbar to the required position. A blue line indicates the selected position.



Figure 13-1: Inserting the Windows icon in the toolbar

3. To add an icon that is currently not visible:
 - a) Select "More icons".
All hidden icons are displayed in a menu.
 - b) Drag the icon from the menu to the toolbar.
The added icon is displayed. If the toolbar contains too many icons to display, the icons from the bottom move to the menu.
4. To hide an icon from the toolbar, drag and drop it outside the toolbar.
The icon is moved to the menu of hidden icons ("More icons"). Empty spaces are indicated by a spacer.
5. To insert additional spaces between icons, for example to create groups of icons:
 - a) Select "More icons" > "Drag Spacer".
 - b) Drag and drop the "Drag Spacer" at the required position in the toolbar. Multiple spaces can be inserted.
6. To restore the default R&S EPL toolbar, select "More icons" > "Set to Default".
7. To exit the toolbar edit mode, select "More icons" > "Stop Editing".
The red highlighting is removed. Selecting an icon performs the assigned function as usual.



13.7 Transducers

13.7.1 Transducer

Many EMC test setups contain a transducer (for example antennas, cables, probes or current probes). A transducer is a device which generates a voltage signal that can be measured by the receiver. Therefore the level value is transformed into dBμV. This is

done for all transducer units except dBm and dB. In the latter case, the receiver displays the transducer unit and the level value shows the corresponding level in dB μ V.

For example, an input level of 0 dBm equates to 107 dB μ V (in case of an input impedance of 50 Ohms) if no transducer factor is active.

Because most transducers have a characteristic frequency response, it is necessary to correct the measurement results by the frequency characteristics of the transducer. These characteristics are defined in a transducer factor or transducer sets.

The visible effect of a transducer is therefore a vertical shift of the results by the amount defined in the transducer factor for each frequency point.

Transducer factors

A transducer factor takes the frequency response of a single transfer element into account. It consists of a series of reference values. Each reference value in turn consists of a frequency and the corresponding level (correction) value. The transducer factor can consist of up to 1001 reference values. Measurement points between the reference values are interpolated either linearly or logarithmically.

Note that the unit of the transducer overrides the unit you have selected for the measurement, because the R&S EPL is seen as the same device as the transducer itself. Measurement results are automatically converted into the unit of the transducer factor. Inputs are only possible in the unit of the transducer. If you want to have access to other units as well, the correction values must be defined in dB. When you turn off the transducer, the R&S EPL again uses the unit that was selected before.

Transducer factors are always applied to all active measurement windows.

Transducer sets

A transducer set consists of several transducer factors and thus takes the frequency response of several transducers into account. Using transducer sets is recommended if you are using different transducers in the measurement range or if cable attenuation or an amplifier have to be considered.

If you are using a transducer set, you can divide the complete frequency range defined for the transducer set into 20 smaller frequency ranges. Make sure, however, that the ranges have no gaps in between each other. The stop frequency of one range must always be the start frequency of the next one.

You can assign up to eight transducer factors to each subrange. Make sure that the frequency range of a particular (sub)range is covered completely by the frequency range defined for the transducer factor. In addition, the unit of all transducer factors that are part of a set has to be the same (or, alternatively, "dB"). Transducer factors that do not meet this condition will not be available for selection.

If necessary, you can configure the R&S EPL to interrupt the scan when it reaches a range boundary. This interruption is called transducer break. While the scan is interrupted, exchange the transducer and continue the scan with the transducer factor assigned to the new range or turn off transducer use and continue the measurement without a transducer factor.

If the scan reaches a frequency not covered by the currently active transducer factor, the R&S EPL shows a message in status bar ("No valid transducer for current receiver frequency").

Transducer management

The R&S EPL provides functionality to store and use the transducer factors during a measurement.

For more information on creating and managing transducer factors, see [Section 13.7.2, "Working with transducers"](#), on page 313.

Transducers in the receiver application

The transducer is calculated for a set scan. The transducer is uniquely calculated for each frequency point and added to the result of the level measurement as the measurement results are stored internally and can be zoomed later.

Transducers in the spectrum application

The R&S EPL calculates the correction values defined in the transducer factor for every displayed measurement point before you start the measurement. During the measurement, it adds the correction values to the measurement results. If you change the frequency range of the measurement, the R&S EPL calculates the correction values again.

13.7.2 Working with transducers

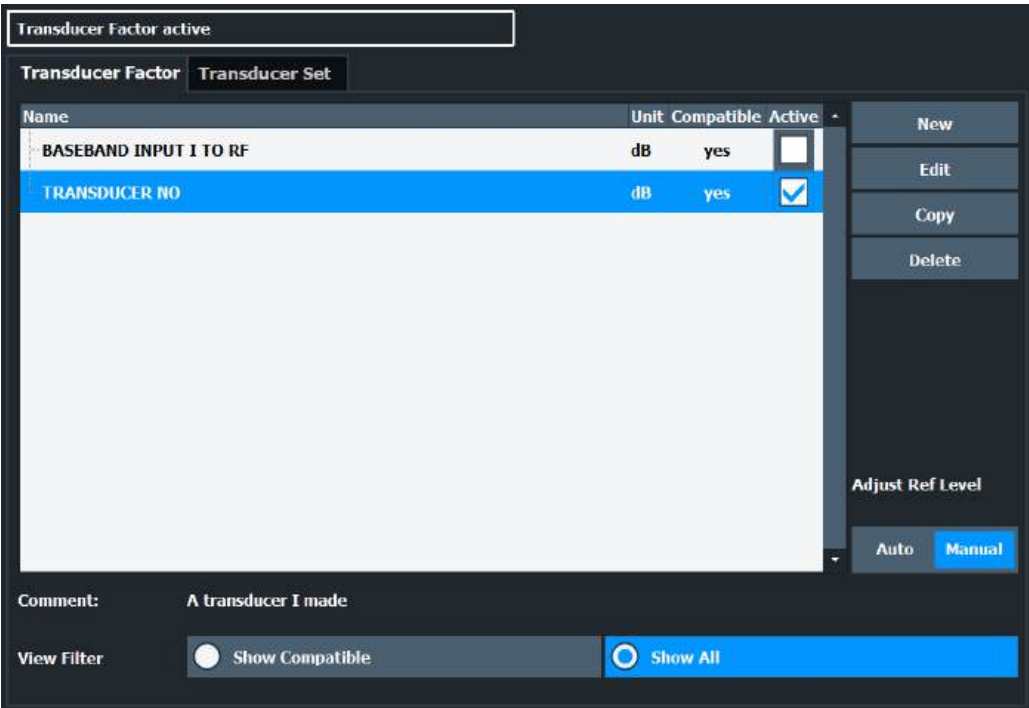
The R&S EPL allows you to create or edit transducer factors and transducer sets. The corresponding functions are combined in a dialog box.

For more information about transducer factors in general, see [Section 13.7.1, "Transducer"](#), on page 311.

- [Using transducers](#)..... 313

13.7.2.1 Using transducers

Access: [SETUP] > "Transducer"



The dialog box contains several tabs, including one to configure transducer factors and one to configure transducer sets.

Basically, both tabs contain the following elements.

- A list of available transducer factors or transducer sets.
The list shows the name of the transducer factor or set, its unit, if it is compatible with the current measurement configuration and its state.
- A button to filter the transducer factors that are displayed in the list (all factors or just the compatible ones).
The filter is available for transducer factor selection.
- A line that shows the comment of a transducer factor or set.
A comment is displayed only if one has been defined.
- Functions to create, edit and manage transducer factors and sets.



Displaying transducer characteristics

In the Receiver application, you can use the "Transducer" [trace mode](#). Selecting this trace mode draws a trace that shows the correction values of all active transducers in the displayed frequency range.

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Applying a transducer factor

The R&S EPL allows you to use either a transducer factor or a transducer set in a measurement. A combination of transducer factors and transducer sets is not possible.

A transducer factor or set becomes active when you check the box in the "Active" column.

When the transducer factor is active, all amplitude settings and outputs take on the unit of the transducer factor. It is no longer possible to select another unit. An exception is in case the transducer has the unit dB.

The name of the active transducer is displayed in the channel bar and in the "Transducer" dialog box.

Note that you can use up to eight transducer factors at the same time. If you want to use more transducer factors in the same measurement, you have to combine them in a transducer set.

Dynamic range with active transducers

The shift of the trace caused by the transducer factor by a certain amount deteriorates the dynamic range of the measurement results.

To restore the original dynamic range, you have to compensate for the transducer factor. You can do this by adjusting the reference level accordingly. If you turn on the automatic adjustment of the reference level (→"Adjust Ref Level"), the R&S EPL restores the original dynamic range as best as possible by changing the reference level by the maximum level shift defined in the active transducer factor.

Remote command:

See [Section 15.9.5, "Transducers"](#), on page 584.

Design and management of transducer factors

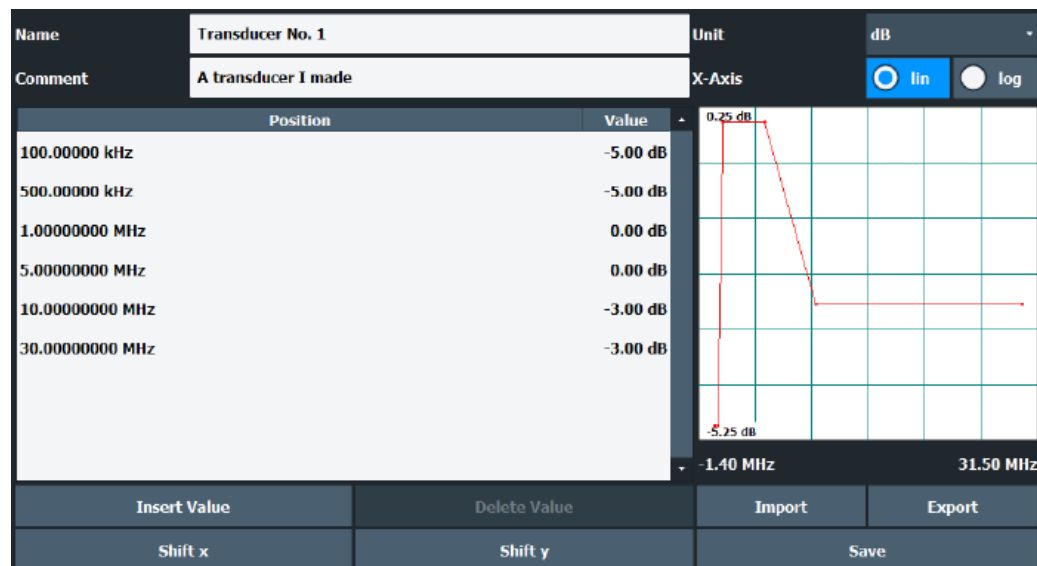
Before you define the characteristics of a transducer factor, make sure that you have actually selected the tab to configure transducer factors.

You can configure a transducer factor in several ways:

- Edit a transducer factor that already exists (→"Edit").
- Create a new transducer factor (→"New").
- Create a new transducer factor based on an existing one (→"Copy").

If necessary, you can delete the selected transducer factor at any time (→"Delete")

Each of the options opens the dialog box that contains the functionality to characterize a transducer factor.



- "Name" / "Comment"
Defines a name and / or comment of the transducer factor.
- "Unit"
Selects the unit of the transducer factor.
- "X-Axis"
Selects linear or logarithmic scaling of the x-axis.
- "Position" and "Value"
Define the data points of the transducer factor (including a graphical preview).
- "Insert Value"
Insert a transducer factor data point. Alternatively, you can click in the table itself to add a new data point.
- "Delete Value"
Deletes the currently selected data point. The currently selected data point is highlighted blue.
- "Shift x" / "Shift y"
Shifts all data points of the transducer factor horizontally or vertically by a certain amount.
- "Import" / "Export"
Imports or exports the information for a transducer factor to or from a csv file.
- "Save"
Saves and stores the transducer factor on the internal hard disk of the R&S EPL.

A transducer factor can consist of up to 1001 data points. Each data point is a pair of values: the first value describes the frequency, the second value describes the level for that frequency.

You have to enter frequencies in ascending order. They must not overlap.

When you save the transducer factor, the R&S EPL uses the name of the transducer factor as the file name. The file type is *.tdf. If a transducer factor of the same name already exists, the R&S EPL asks before it overwrites the existing file.

The transducer factors and sets are stored in separate but fix directories on the internal memory of the R&S EPL. You can create subdirectories for a more concise file structure and display their contents with "Show Directories" (you have to select the directory first, though).

"File Explorer": Instead of using the file manager of the R&S EPL firmware, you can also use the Microsoft Windows File Explorer to manage files.

Remote command:

See [Section 15.9.5, "Transducers"](#), on page 584.

Design and management of transducer sets

Before you define the characteristics of a transducer set, make sure that you have actually selected the tab to configure transducer sets.

You can configure transducer sets in several ways:

- Edit a transducer set that already exists (→"Edit").
- Create a new transducer set (→"New").
- Create a new transducer set based on an existing one (→"Copy").

If necessary, you can delete the selected transducer set at any time (→"Delete")

Each of the options opens the dialog box that contains the functionality to define a transducer set.

Range	Frequency	Factors
1	100.000 kHz 1.000 MHz	ANOTHER TRANSDUCER FACTOR
2	1.000 MHz 30.000 MHz	TRANSDUCER NO. 1

- "Name" / "Comment"
Defines a name and / or comment of the transducer set.
- "Unit"
Selects the unit of the transducer set.
- "Break"
Turns the transducer break on and off.
- "Insert Range"
Adds a new range to the transducer set. Each transducer set can consist of up to 20 ranges.
To select a range, select the corresponding range in the table, or select it with the buttons on the bottom of the dialog box.
- "Delete Range"

Deletes the currently selected transducer set range. The currently selected range is highlighted orange.

- "Start Frequency" / "Stop Frequency"
Defines the start and stop frequencies for the selected transducer set range.
- "Add Factor"
Opens a list of transducer factors that you can apply to the transducer set range. You can assign up to eight transducer factors to each range, but only those whose characteristics (frequency range, unit) are compatible to the characteristics of the selected range.
- "Change Factor"
Replaces the selected transducer factor with another one. The selected transducer factor is highlighted.
- "Remove Factor"
Removes the selected transducer factor from the transducer set range.
- "Save Sets"
Saves and stores the transducer set on the internal hard disk of the R&S EPL.

Remote command:

See [Section 15.9.5, "Transducers"](#), on page 584.

13.7.3 Reference: transducer factor file format

Transducer factor data can be exported to a file in ASCII (CSV) format for further evaluation in other applications. Transducer factors stored in the specified ASCII (CSV) format can also be imported to the R&S EPL for other measurements.

For more information about transducer factors, see ["Design and management of transducer factors"](#) on page 315.

This reference describes in detail the format of the export/import files for transducer factors. Note that the **bold** data is **mandatory**, all other data is optional.

Different language versions of evaluation programs may require a different handling of the decimal point. Thus, you can define the decimal separator to be used (see ["Decimal Separator"](#) on page 200).

Table 13-1: ASCII file format for transducer factor files

File contents	Description
Header data	
sep= ;	Separator for individual values (required by Microsoft Excel, for example)
Type ;RS_TransducerFactor;	Type of data
FileFormatVersion ;1.00;	File format version
Date;01.Oct 2006;	Date of data set storage
OptionID;SpectrumAnalyzer	Application the transducer factor was created for
Name ;TestTDF1	Transducer factor name
Comment;Transducer for device A	Description of transducer factor

File contents	Description
XAxisScaling;LINEAR	Scaling of x-axis linear (LIN) or logarithmic (LOG)
YAxisUnit;LEVEL_DB	Unit of y values
YAxisScaleMode;ABSOLUTE	Scaling of y-axis (absolute or relative)
NoOfPoints;5	Number of points the line is defined by
Data section for individual data points	
1000000000;-50.000000	x- and y-values of each data point defining the line
5000000000;-30.000000	
10000000000;0.000000	
15000000000;-30.000000	
25000000000;-50.000000	

13.7.4 How to configure the transducer

Configuring the transducer is very similar to configuring transducer factors.

The transducer settings are defined in the "Transducer" dialog box which is displayed when you press [Setup] and then select "Transducer".



Stored transducer settings

When storing and recalling transducer settings, consider the information provided in ["Saving and recalling transducer and limit line settings"](#) on page 251.

The following tasks are described:

- ["How to find compatible transducer lines"](#) on page 319
- ["How to activate and deactivate a transducer"](#) on page 319
- ["How to edit existing transducer lines"](#) on page 320
- ["How to copy an existing transducer line"](#) on page 320
- ["How to delete an existing transducer line"](#) on page 320
- ["How to configure a new transducer line"](#) on page 321
- ["How to move the transducer line vertically or horizontally"](#) on page 321

How to find compatible transducer lines

- In the "Transducer" dialog box, select the "View Filter" option: "Show Compatible".

All transducer lines stored on the instrument that are compatible to the current measurement settings are displayed in the overview.

How to activate and deactivate a transducer

1. To activate a transducer select a transducer line in the overview and select the "Active" setting for it.

The trace is automatically recalculated for the next sweep after a transducer line is activated.

2. To deactivate a transducer line, deactivate the "Active" setting for it.
After the next sweep, the originally measured values are displayed.

How to edit existing transducer lines

Existing transducer line configurations can be edited.

1. In the "Transducer" dialog box, select the transducer line.
2. Select "Edit".
3. Edit the line configuration as described in ["How to configure a new transducer line"](#) on page 321.
4. Save the new configuration by selecting "Save".

The trace is automatically recalculated for the next sweep if the transducer line is active.



In order to store the changes to the transducer lines in a settings file, select the  "Save" icon in the toolbar.

How to copy an existing transducer line

1. In the "Transducer" dialog box, select the transducer line.
2. Select "Copy".
The "Edit Transducer" dialog box is opened with the configuration of the selected transducer.
3. Define a new name to create a new transducer with the same configuration as the source line.
4. Edit the line configuration as described in ["How to configure a new transducer line"](#) on page 321.
5. Save the new configuration by selecting "Save".

The new transducer line is displayed in the overview and can be activated.

How to delete an existing transducer line

1. In the "Transducer" dialog box, select the transducer line.
2. Select "Delete".
3. Confirm the message.

The transducer line is deleted. After the next sweep, the originally measured values are displayed.

How to configure a new transducer line

1. In the "Transducer" dialog box, select "New".
The "Edit Transducer" dialog box is displayed. The current line configuration is displayed in the preview area of the dialog box. The preview is updated after each change to the configuration.
2. Define a "Name" and, optionally, a "Comment" for the new transducer line.
3. Define the scaling for the x-axis.
4. Define the data points: minimum 2, maximum 1001:
 - a) Select "Insert Value".
 - b) Define the x-value ("Position") and y-value ("Value") of the first data point.
 - c) Select "Insert Value" again and define the second data point.
 - d) Repeat this to insert all other data points.
To insert a data point before an existing one, select the data point and then "Insert Value".
To insert a new data point at the end of the list, move the focus to the line after the last entry and then select "Insert Value".
To delete a data point, select the entry and then "Delete Value".
5. Check the current line configuration in the preview area of the dialog box. If necessary, correct individual data points or add or delete some.
If necessary, shift the entire line vertically or horizontally by selecting "Shift x" or "Shift y" and defining the shift width.
6. Save the new configuration by selecting "Save".
The new transducer line is displayed in the overview and can be activated.

How to move the transducer line vertically or horizontally

A configured transducer line can easily be moved vertically or horizontally. Thus, a new transducer line can be easily generated based upon an existing transducer line which has been shifted.

1. In the "Line Config" dialog box, select the transducer line.
2. Select "Edit".
3. In the "Edit Transducer Line" dialog box, select "Shift x" or "Shift y" and define the shift width.
4. Save the shifted data points by selecting "Save".
If activated, the trace is recalculated after the next sweep.

13.8 Alignment

13.8.1 Basics on alignment

When you put the instrument into operation for the first time or when strong temperature changes occur, align the data to a reference source (see ["Temperature check"](#) on page 323).

The firmware determines the correction data and characteristics required for the alignment. It compares the results at different settings with the known characteristics of the high-precision calibration signal source.

Basic operation of the R&S EPL can be affected before or after a self-alignment in the following ways:

- Depending on the installation settings, an automatic self-alignment is performed directly after installation, and a dialog is displayed indicating how much warm-up time is still required before self-alignment can be performed.
- During instrument start, the firmware checks whether the installed hardware is supported. If not, an error message is displayed ("Wrong Firmware Version") and you are asked to update the firmware. Until the firmware version is updated, self-alignment fails.
- If you start a self-alignment remotely and then select "Local" while the alignment is still running, the instrument only returns to the manual operation state after the alignment is completed.
- During self-alignment, do not connect a signal to the RF input connector. Running a self-alignment with a signal connected to the RF input can lead to false measurement results.

Alignment results

The alignment results are displayed and contain the following information:

- Date and time of last correction data record
- Overall results of correction data record
- List of performed alignment steps

The results are classified as follows:

PASSED	Calibration successful without any restrictions
CHECK	Deviation of correction value larger than expected, correction could however be performed
FAILED	Deviations of correction value too large, no correction was possible. The found correction data is not applicable.

The results are available until the next self-alignment process is started or the instrument is switched off.

Temperature check

During self-alignment, the instrument's frontend temperature is measured (if activated, only after the instrument has warmed up completely, see ["Await Warm-Up Operation before Self Alignment"](#) on page 325). This temperature is used as a reference for a continuous temperature check during operation. If the current temperature deviates from the stored self-alignment temperature by a certain degree, a warning is displayed in the status bar. The warning indicates the resulting deviation in the measured power levels. A status bit in the `STATUS:QUESTIONABLE:TEMPERATURE` register indicates a possible deviation. The current temperature of the frontend can be queried using a remote command (see `SOURCE<si>:TEMPERATURE:FRONTend` on page 583).

Touchscreen alignment

When the device is delivered, the touchscreen is initially calibrated. However, to ensure that the touchscreen responds to the finger contact correctly, a touchscreen alignment is required.

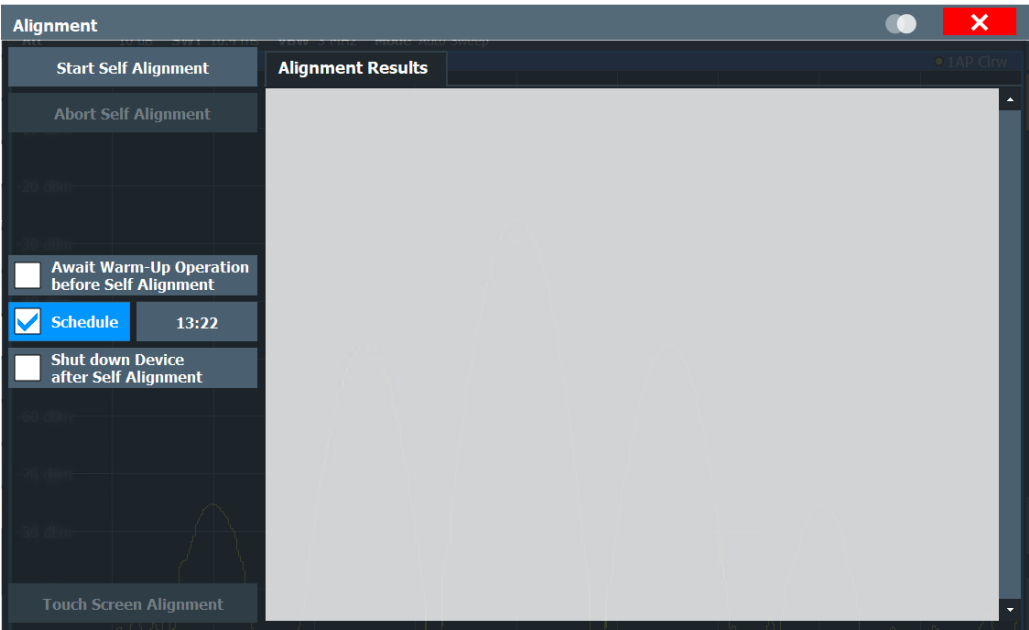
Alignment of the touchscreen is useful:

- At first use
- After an image update or after exchanging a hard disk
- If you notice that touching a specific point on the screen does not achieve the correct response
- If the position of the instrument has been changed and you cannot look straight on the screen
- If another person operates the instrument

13.8.2 Alignment settings

Access: [Setup] > "Alignment"

Both the instrument and the touchscreen can be aligned when necessary (see [Section 13.8.1, "Basics on alignment"](#), on page 322).



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Start Self Alignment

Starts recording correction data for the instrument. If the correction data acquisition fails or if the correction values are deactivated, a corresponding message is displayed in the status field.

For details, see [Section 13.8.1, "Basics on alignment"](#), on page 322.

Note:

A running Sequencer operation is aborted when you start a self-alignment.

During self-alignment, do not connect a signal to the RF input connector. Running a self-alignment with a signal connected to the RF input can lead to false measurement results.

Remote command:
[*CAL?](#) on page 384, see also [CALibration\[:ALL\]?](#) on page 578

Abort Self Alignment

As long as the self-alignment data is being collected, the procedure can be canceled using "Abort Self Alignment".

Note: If you start a self-alignment remotely, then select "Local" while the alignment is still running, the instrument only returns to the manual operation state after the alignment is completed. In this case, you cannot abort a self-alignment manually.

Await Warm-Up Operation before Self Alignment

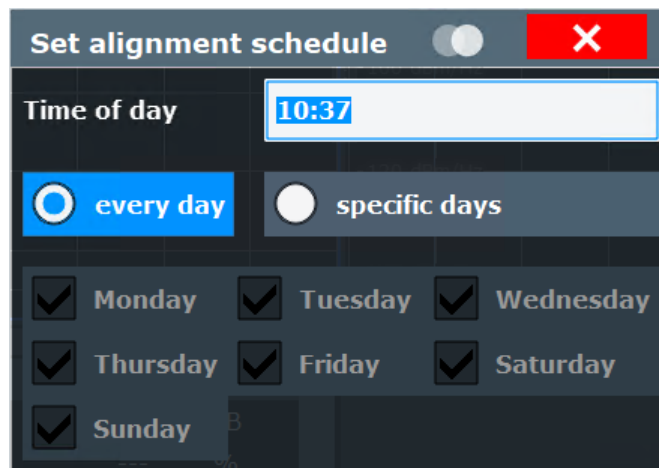
Displays a message indicating the remaining warmup time required before self-alignment is performed. After the warmup operation has completed, self-alignment is started automatically.

Remote command:

[CALibration:DUE:WARMup](#) on page 579

Schedule

If enabled, a self-alignment is performed regularly at specific days and time.



Remote command:

[CALibration:DUE:SCHeDule](#) on page 580

[CALibration:DUE:DAYs](#) on page 580

[CALibration:DUE:TIME](#) on page 581

Shut down Device after Self Alignment

If activated, the R&S EPL is automatically shut down after self-alignment is completed. Note that the instrument cannot be restarted via remote control.

Remote command:

[CALibration:DUE:SHUTdown](#) on page 581

Starting Touch Screen Alignment

Starts the touchscreen alignment.

Tap the 4 markers on the screen as you are asked to do. The touchscreen is aligned according to the executed pointing operations.

Alignment Results:

Information on whether the alignment was performed successfully and on the applied correction data is displayed. The results are available until the next self-alignment process is started or the instrument is switched off.

Remote command:

[CALibration:RESult?](#) on page 579

13.8.3 How to perform a self-test

You do not have to repeat the self-test every time you switch on the instrument. It is only necessary when instrument malfunction is suspected.



Operating temperature

Before performing this alignment, make sure that the instrument has reached its operating temperature.

For details, refer to the specifications document.

1. Select [SETUP].
2. Select "Service".
3. Select "Selftest".

Once the instrument modules have been checked successfully, a message is displayed.

13.8.4 How to align the instrument



Operating temperature

Before performing this alignment, make sure that the instrument has reached its operating temperature.

For details, refer to the specifications document.

To perform a self-alignment

Make sure no signal is connected to the RF input connector. Running a self-alignment with a signal connected to the RF input can lead to false measurement results.

1. Select [SETUP].
2. Select "Alignment".
3. Select "Start Self Alignment".
4. To abort the self-alignment process, select "Abort Self Alignment".

Once the system correction values have been calculated successfully, a message is displayed.

To display the alignment results again later

- Select [SETUP] > "Alignment".

13.8.5 How to align the touchscreen

To align the touchscreen

1. Press [Setup].
2. Select "Alignment".
3. Select "Touch Screen Alignment".
A blinking cross appears in the lower left corner of the screen.
4. Touch and hold the blinking cross until it stops blinking.
Repeat this action for the crosses in the other corners.

14 Network operation and remote control

In addition to working with the R&S EPL interactively, located directly at the instrument, it is also possible to operate and control it from a remote PC. Various methods for remote operation are supported:

- Connecting the instrument to a (LAN) network
- Using the web browser interface in a LAN network
- Using the Windows Remote Desktop application in a LAN network
- Connecting a PC via the GPIB interface (requires the "Additional Interfaces" hardware option R&S EPL1-B5)

Basic information on operating the R&S EPL via remote control is provided here. This information applies to all applications and operating modes on the R&S EPL.



For additional information on remote control of spectrum analyzers see the following documents available from the Rohde & Schwarz website:

- [Remote control via SCPI](#)
- [1EF62: Hints and Tricks for Remote Control of Spectrum and Network Analyzers](#)
- [1MA171: How to use Rohde & Schwarz Instruments in MATLAB](#)
- [1MA208: Fast Remote Instrument Control with HiSLIP](#)

How to configure the remote control interfaces is described in [Section 14.6, "How to set up a network and remote control"](#), on page 361.

- [Remote control interfaces and protocols](#).....328
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14.1 Remote control interfaces and protocols

The instrument supports different interfaces and protocols for remote control. The following table gives an overview.



For a description of the protocols refer to [Remote control via SCPI](#).

Table 14-1: Remote control interfaces and protocols

Inter- face	Protocols, VISA ^{*)} address string	Port ^{**)}	Remarks
Local Area Net- work (LAN)	HiSLIP High-Speed LAN Instrument Protocol (IVI-6.1) TCPIP::host address::hislip0[::INSTR]	TCP port: 4880	A LAN connector is located on the rear panel of the instrument.
	VXI-11 TCPIP::host address::inst0[::INSTR] Library: VISA	TCP or UDP port: 111 TCP port: well-known ports (600 - 1023) for Linux or registered ports (1024 - 49151) for Windows	
	socket communication (Raw Ethernet, simple Telnet) TCPIP::host address[::LAN device name]::<port>::SOCKET Library: VISA or socket controller	SCPI raw, TCP port: 5025, 5125 SCPI telnet, TCP port: 5024, 5124	
	VNC	via VNC client: 5800/5900 Device web: 5850	
	Device web / web control	80	
GPIB (IEC/ IEEE Bus Inter- face)	VISA ^{*)} address string: GPIB::primary address[::INSTR] (no secondary address)		
^{*)} VISA is a standardized software interface library providing input and output functions to communicate with instruments. A VISA installation on the controller is a prerequisite for remote control using the indicated interfaces. ^{**)} By default, R&S EPL use these ports for communication via LAN control interface. If necessary, adapt your firewall to allow for use of these ports.			



Within this interface description, the term GPIB is used as a synonym for the IEC/IEEE bus interface.

14.1.1 LAN interface

To be integrated in a LAN, the instrument is equipped with a LAN interface, consisting of a connector, a network interface card and protocols. The network card can be operated with the following interfaces:

- 10 Mbit/s Ethernet IEEE 802.3
- 100 Mbit/s Ethernet IEEE 802.3u
- 1Gbit/s Ethernet IEEE 802.3ab

For remote control via a network, the PC and the instrument must be connected via the LAN interface to a common network with TCP/IP network protocol. They are connected using a commercial RJ45 cable (shielded or unshielded twisted pair category 5). The TCP/IP network protocol and the associated network services are preconfigured on the instrument. Software for instrument control and the VISA program library must be installed on the controller.

IP address

Only the IP address or a valid DNS host name is required to set up the connection. The host address is part of the "VISA resource string" used by the programs to identify and control the instrument.

The VISA resource string has the form:

```
TCPIP::host address[::LAN device name][::INSTR]
```

or

```
TCPIP::host address::port::SOCKET
```

where:

- **TCPIP** designates the network protocol used
- **host address** is the IP address or host name of the device
- **LAN device name** defines the protocol and the instance number of a subinstrument;
 - `inst0` selects the VXI-11 protocol (default)
 - `hislip0` selects the HiSLIP protocol
- **INSTR** indicates the instrument resource class (optional)
- **port** determines the used port number
- **SOCKET** indicates the raw network socket resource class

Example:

- Instrument has the IP address *192.1.2.3*; the valid resource string using VXI-11 protocol is:

```
TCPIP::192.1.2.3::INSTR
```
- The DNS host name is *EPL1000-123456*; the valid resource string using HiSLIP is:

```
TCPIP::EPL1000-123456::hislip0
```
- A raw socket connection can be established using:

```
TCPIP::192.1.2.3::5025::SOCKET
```



Identifying instruments in a network

If several instruments are connected to the network, each instrument has its own IP address and associated resource string. The controller identifies these instruments by the resource string.

For details on configuring the LAN connection, see [Section 14.6, "How to set up a network and remote control"](#), on page 361.

- [LAN web browser interface](#).....330

14.1.1.1 LAN web browser interface

The LAN web browser interface allows for easy configuration of the LAN and remote control of the R&S EPL without additional installation requirements.

The instrument's LAN web browser interface works correctly with all W3C compliant browsers.

Via the web browser interface to the R&S EPL you can control the instrument remotely from another PC. Manual instrument controls are available via the front panel simulation. File upload and download between the instrument and the remote PC is also available. Using this feature, several users can access *and operate* the R&S EPL simultaneously. This is useful for troubleshooting or training purposes.

For details, see [Section 14.6.1.4, "How to configure the LAN using the web browser interface"](#), on page 365 and [Section 14.6.5, "How to control the R&S EPL via the web browser interface"](#), on page 371.



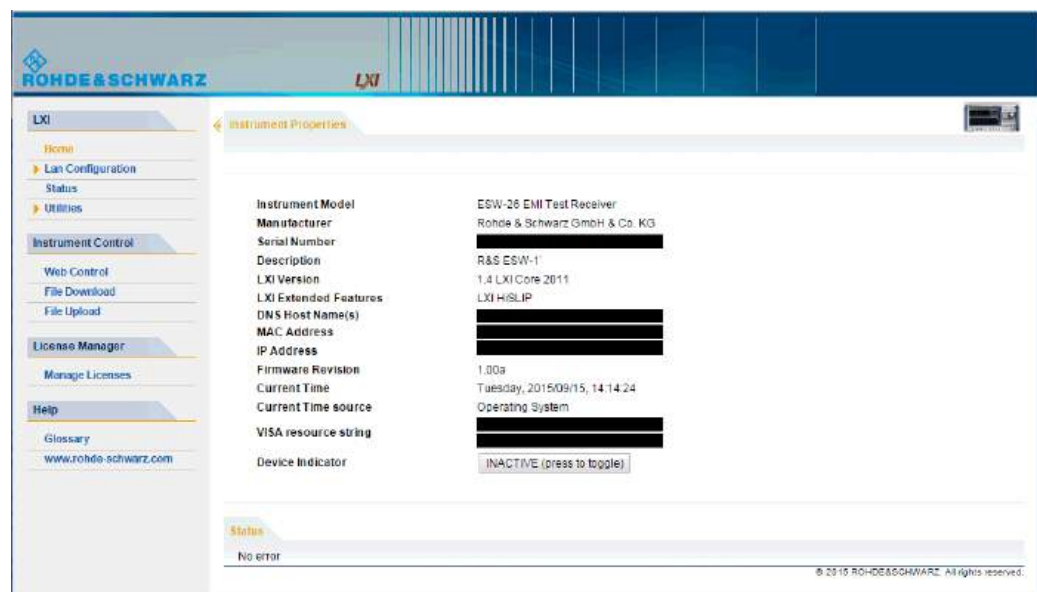
If you do not want other users in the LAN to be able to access and operate the R&S EPL you can deactivate this function.

See [Section 14.6.6, "How to deactivate the web browser interface"](#), on page 372.

To display the LAN web browser interface

- In the address field of the browser on your PC, type the host name or IP address of the instrument, for example: `http://10.113.10.203`.

The instrument home page (welcome page) opens.



The navigation pane of the browser interface contains the following elements:

- "LAN"
 - "Home" opens the instrument home page.
The home page displays device information, including the VISA resource string in read-only format.
 - "Device Indicator" allows you to physically identify the instrument. This is useful if you have several instruments and want to know which instrument the LAN

home page belongs to. To identify the instrument, activate the "Device Indicator". Then check the "LAN Status" indicator of the instruments.

- "LAN Configuration" allows you to configure LAN parameters and to initiate a ping.
(See ["LAN configuration"](#) on page 366.)
- "Utilities" provides access to an event log.
- "Instrument Control"
 - "Web Control" provides remote access to the instrument via VNC (no installation required). Manual instrument controls are available via the front panel simulation.
 - "File Download" downloads files from the instrument.
 - "File Upload" uploads files to the instrument.
 (See [step 4](#).)
- "License Manager"
 - "License Manager" allows you to install or uninstall license keys and to activate, register or unregister licenses.
- "Help"
 - "www.rohde-schwarz.com" opens the Rohde & Schwarz home page.

14.1.2 GPIB interface (IEC 625/IEEE 418 bus interface)

By connecting a PC to the R&S EPL via the GPIB connection you can send remote commands to control and operate the instrument.

To be able to control the instrument via the GPIB bus, the instrument and the controller must be linked by a GPIB bus cable. A GPIB bus card, the card drivers and the program libraries for the programming language used must be provided in the controller. The controller must address the instrument with the GPIB bus address (see [Section 14.6.1.5, "How to change the GPIB instrument address"](#), on page 367). You can set the GPIB address and the ID response string. The GPIB language is set as SCPI by default and cannot be changed for the R&S EPL.

Notes and Conditions

In connection with the GPIB interface, note the following:

- Up to 15 instruments can be connected
- The total cable length is restricted to a maximum of 15 m or 2 m times the number of devices, whichever is less; the cable length between two instruments should not exceed 2 m.
- A wired "OR"-connection is used if several instruments are connected in parallel.
- Any connected IEC-bus cables should be terminated by an instrument or controller.

14.2 Status reporting system

The status reporting system stores all information on the current operating state of the instrument, and on errors which have occurred. This information is stored in the status registers and in the error queue. Both can be queried via GPIB bus or LAN interface using the `STATus...` commands.

(See [Section 15.9.11, "Using the status register"](#), on page 614).

For details on the status reporting system, see [Remote control via SCPI](#).

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14.2.1 Hierarchy of status registers

As shown in the following figure, the status information is of hierarchical structure.

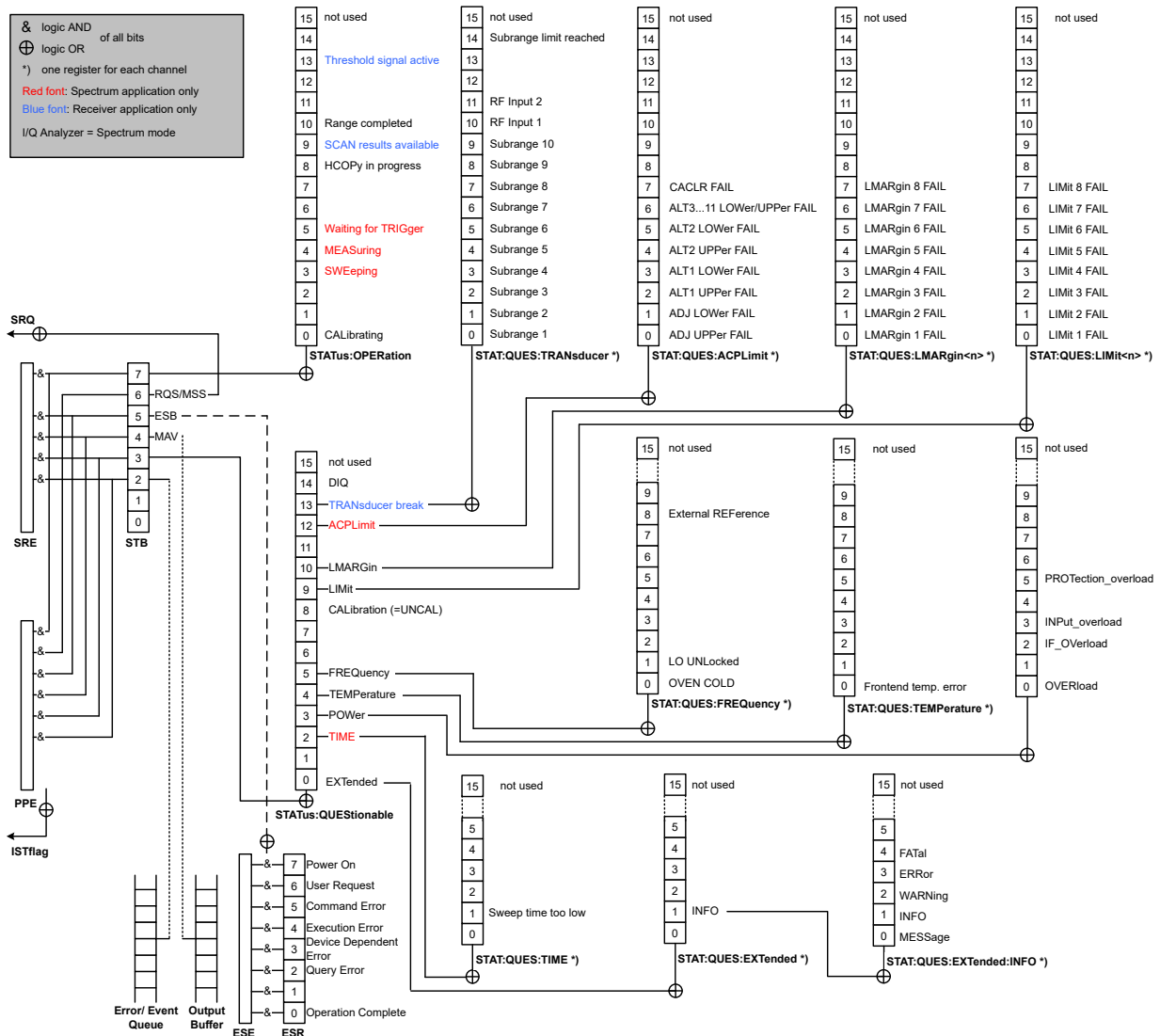


Figure 14-1: Graphical overview of the R&S EPL status registers hierarchy

All status registers have the same internal structure.

14.2.2 Contents of the status registers

In the following sections, the contents of the status registers are described in more detail.



STATUS:QUESTIONable:SYNC register

The STATUS:QUESTIONable:SYNC register is used by the R&S EPL applications and is described in the individual sections (manuals) for each application.

• Status byte (STB) and service request enable register (SRE).....	335
• IST flag and parallel poll enable register (PPE).....	336
• Event status register (ESR) and event status enable register (ESE).....	336
• STATus:OPERation register.....	337
• STATus:QUEStionable register.....	338
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• STATus:QUEStionable:FREQuency register.....	341
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• STATus:QUEStionable:TEMPerature register.....	344
• STATus:QUEStionable:TIME register.....	344
• STATus:QUEStionable:TRANsducer register.....	345

14.2.2.1 Status byte (STB) and service request enable register (SRE)

The `STatus Byte` (STB) is already defined in IEEE 488.2. It provides a rough overview of the instrument status by collecting the pieces of information of the lower registers. A special feature is that bit 6 acts as the sum bit of the remaining bits of the status byte.

The STB can thus be compared with the `CONDition` part of an SCPI register and assumes the highest level within the SCPI hierarchy.

The STB is read using the command `*STB?` or a serial poll.

The `STatus Byte` (STB) is linked to the `Service Request Enable` (SRE) register. Each bit of the STB is assigned a bit in the SRE. Bit 6 of the SRE is ignored. If a bit is set in the SRE and the associated bit in the STB changes from 0 to 1, a service request (SRQ) is generated. The SRE can be set using the command `*SRE` and read using the command `*SRE?`.

Table 14-2: Meaning of the bits used in the status byte

Bit No.	Meaning
0...1	Not used
2	Error Queue not empty The bit is set when an entry is made in the error queue. If this bit is enabled by the SRE, each entry of the error queue generates a service request. Thus an error can be recognized and specified in greater detail by polling the error queue. The poll provides an informative error message. This procedure is to be recommended since it considerably reduces the problems involved with remote control.
3	QUEStionable status register summary bit The bit is set if an <code>EVENT</code> bit is set in the <code>QUEStionable</code> status register and the associated <code>ENABLe</code> bit is set to 1. A set bit indicates a questionable instrument status, which can be specified in greater detail by querying the <code>STATus:QUEStionable</code> status register.
4	MAV bit (message available) The bit is set if a message is available in the output queue which can be read. This bit can be used to enable data to be automatically read from the instrument to the controller.

Bit No.	Meaning
5	ESB bit Sum bit of the event status register. It is set if one of the bits in the event status register is set and enabled in the event status enable register. Setting of this bit indicates a serious error which can be specified in greater detail by polling the event status register.
6	MSS bit (main status summary bit) The bit is set if the instrument triggers a service request. This is the case if one of the other bits of this registers is set together with its mask bit in the service request enable register SRE.
7	STATUS:OPERation status register summary bit The bit is set if an EVENT bit is set in the OPERATION status register and the associated ENABLE bit is set to 1. A set bit indicates that the instrument is just performing an action. The type of action can be determined by querying the STATUS:OPERation status register.

14.2.2.2 IST flag and parallel poll enable register (PPE)

As with the SRQ, the IST flag combines the entire status information in a single bit. It can be read by means of a parallel poll or using the command `*IST?`.

The parallel poll enable register (PPE) determines which bits of the STB contribute to the IST flag. The bits of the STB are "ANDed" with the corresponding bits of the PPE, with bit 6 being used as well in contrast to the SRE. The IST flag results from the "ORing" of all results. The PPE can be set using commands `*PRE` and read using command `*PRE?`.

14.2.2.3 Event status register (ESR) and event status enable register (ESE)

The ESR is defined in IEEE 488.2. It can be compared with the EVENT part of a SCPI register. The event status register can be read out using command `*ESR?`.

The ESE corresponds to the ENABLE part of a SCPI register. If a bit is set in the ESE and the associated bit in the ESR changes from 0 to 1, the ESB bit in the STB is set. The ESE register can be set using the command `*ESE` and read using the command `*ESE?`.

Table 14-3: Meaning of the bits used in the event status register

Bit No.	Meaning
0	Operation Complete This bit is set on receipt of the command <code>*OPC</code> exactly when all previous commands have been executed.
1	Not used
2	Query Error This bit is set if either the controller wants to read data from the instrument without having sent a query, or if it does not fetch requested data and sends new instructions to the instrument instead. The cause is often a query which is faulty and hence cannot be executed.

Bit No.	Meaning
3	Device-dependent Error This bit is set if a device-dependent error occurs. An error message with a number between -300 and -399 or a positive error number, which denotes the error in greater detail, is entered into the error queue.
4	Execution Error This bit is set if a received command is syntactically correct but cannot be performed for other reasons. An error message with a number between -200 and -300, which denotes the error in greater detail, is entered into the error queue.
5	Command Error This bit is set if a command is received, which is undefined or syntactically incorrect. An error message with a number between -100 and -200, which denotes the error in greater detail, is entered into the error queue.
6	User Request This bit is set when the instrument is switched over to manual control.
7	Power On (supply voltage on) This bit is set on switching on the instrument.

14.2.2.4 STATus:OPERation register

The `STATus:OPERation` register contains information on current activities of the R&S EPL. It also contains information on activities that have been executed since the last read out.

Table 14-4: Meaning of the bits used in the `STATus:OPERation` register

Bit No.	Meaning
0	CALibrating This bit is set as long as the instrument is performing a calibration.
1-2	Not used
3	SWEEping Sweep is being performed in base unit (applications are not considered); identical to bit 4 Available in the Spectrum application.
4	MEASuring Measurement is being performed in base unit (applications are not considered); identical to bit 3 Available in the Spectrum application.
5	Waiting for TRigger Instrument is ready to trigger and waiting for trigger signal. Available in the Spectrum application and Multi CISPR APD application.
6-7	Not used
8	HardCOpy in progress This bit is set while the instrument is printing a hardcopy.

Bit No.	Meaning
9	SCAN results available This bit is set when a block of scan results is available. Must be enabled by <code>TRAC:FEED:CONTALWAYS</code>. Available in the Receiver application.
10	Range completed In the Spectrum application, this bit is set when a range in the sweep list has been completed if "Stop after Range" has been activated. In the Receiver application, this bit is set when the end of a scan range has been reached. To resume the scan, use <code>INITiate:CONMeas</code>.
11-12	Not used
13	Threshold signal active Available for the Receiver application.
14	Not used
15	This bit is always 0.

14.2.2.5 STATUS:QUESTIONable register

The STATUS:QUESTIONable register contains information on instrument states that do not meet the specifications.

You can read out the register with `STAT:QUES:COND` or `STAT:QUES:EVEN`.



The STATUS:QUESTIONable register "sums up" the information from all subregisters (e.g. bit 2 sums up the information for all STATUS:QUESTIONable:TIME registers). For some subregisters, there may be separate registers for each active channel. Thus, if a status bit in the STATUS:QUESTIONable register indicates an error, the error may have occurred in any of the channel-specific subregisters. In this case, you must check the subregister of each channel to determine which channel caused the error. By default, querying the status of a subregister always returns the result for the currently selected channel.

Table 14-5: Meaning of the bits used in the STATUS:QUESTIONable register

Bit No.	Meaning
0 - 1	Unused
2	TIME This bit is set if a time error occurs in any of the active channels. The STATUS:QUESTIONable:TIME register provides more information on the error type. Available in the Spectrum application.
3	POWER This bit is set if the measured power level in any of the active channels is questionable. The STATUS:QUESTIONable:POWER register provides more information on the error type.

Bit No.	Meaning
4	TEMPerature This bit is set if the temperature is questionable.
5	FREQuency This bit is set if there is anything wrong with the frequency of the local oscillator or the reference frequency in any of the active channels. The STATUS:QUESTionable:FREQuency register provides more information on the error type.
6 - 7	Unused
8	CALibration This bit is set if the R&S EPL is unaligned ("UNCAL" display)
9	LIMit This bit is set if a limit value is violated in any of the active channels in any window. The STATUS:QUESTionable:LIMit register provides more information on the error type.
10	LMARgin This bit is set if a margin is violated in any of the active channels in any window. The STATUS:QUESTionable:LMARgin register provides more information on the error type.
11	SYNC (device-specific) This bit is set if the R&S EPL is not synchronized to the signal that is applied. The R&S EPL is not synchronized if the results deviate too much from the expected value during premeasurements
12	ACPLimit This bit is set if a limit during ACLR measurements is violated in any of the active channels. The STATUS:QUESTionable:ACPLimit register provides more information on the error type. Available in the Spectrum application.
13	TRANsducer break This bit is set if a transducer break occurs and indicates the next range. The Section 14.2.2.15, "STATUS:QUESTionable:TRANsducer register" , on page 345 provides more information on the error type.
14	Unused
15	This bit is always 0.

14.2.2.6 STATUS:QUESTionable:ACPLimit register

Available for the Spectrum application.

The STATUS:QUESTionable:ACPLimit register contains information about the results of a limit check during ACLR measurements. A separate ACPLimit register exists for each active channel.

You can read out the register with [STATUS:QUESTionable:ACPLimit:CONDition?](#) or [STATUS:QUESTionable:ACPLimit\[:EVENT\]?](#)

Table 14-6: Meaning of the bits used in the `STATUS:QUESTIONable:ACPLimit` register

Bit No.	Meaning
0	ADJ UPPer FAIL This bit is set if the limit is exceeded in the upper adjacent channel.
1	ADJ LOWer FAIL This bit is set if the limit is exceeded in the lower adjacent channel.
2	ALT1 UPPer FAIL This bit is set if the limit is exceeded in the upper 1st alternate channel.
3	ALT1 LOWer FAIL This bit is set if the limit is exceeded in the lower 1st alternate channel.
4	ALT2 UPPer FAIL This bit is set if the limit is exceeded in the upper 2nd alternate channel.
5	ALT2 LOWer FAIL This bit is set if the limit is exceeded in the lower 2nd alternate channel.
6	ALT3 ... 11 LOWer/UPPer FAIL This bit is set if the limit is exceeded in one of the lower or upper alternate channels 3 ... 11.
7	CACLR FAIL This bit is set if the CACLR limit is exceeded in one of the gap channels.
8-14	Unused
15	This bit is always 0.

14.2.2.7 `STATUS:QUESTIONable:EXTended` register

The `STATUS:QUESTIONable:EXTended` register contains further status information not covered by the other status registers of the R&S EPL. A separate `EXTended` register exists for each active channel.

You can read out the register with `STATUS:QUESTIONable:EXTended:CONDition?` or `STATUS:QUESTIONable:EXTended[:EVENT]?`

Table 14-7: Meaning of the bits used in the `STATUS:QUESTIONable:EXTended` register

Bit No.	Meaning
0	not used
1	INFO This bit is set if a status message is available for the application. Which type of message occurred is indicated in the STATUS:QUESTIONable:EXTended:INFO register.
2 to 14	Unused
15	This bit is always 0.

14.2.2.8 STATUS:QUESTIONable:EXTended:INFO register

The STATUS:QUESTIONable:EXTended:INFO register contains information on the type of messages that occur during operation of the R&S EPL. A separate INFO register exists for each active channel.

You can read out the register with STATUS:QUESTIONable:EXTended:INFO:CONDition? or STATUS:QUESTIONable:EXTended:INFO[:EVENT]?. You can query all messages that occur for a specific channel using the command SYSTEM:ERRor:EXTended? on page 608.

Table 14-8: Meaning of the bits used in the STATUS:QUESTIONable:EXTended:INFO register

Bit No.	Meaning
0	MESSage This bit is set if event or state has occurred that may lead to an error during further operation.
1	INFO This bit is set if an informational status message is available for the application.
2	WARNing This bit is set if an irregular situation occurs during measurement, e.g. the settings no longer match the displayed results, or the connection to an external device was interrupted temporarily.
3	ERRor This bit is set if an error occurs during a measurement, e.g. due to missing data or wrong settings, so that the measurement cannot be completed correctly.
4	FATal This bit is set if a serious error occurs in the application and regular operation is no longer possible.
5 to 14	Unused
15	This bit is always 0.

14.2.2.9 STATUS:QUESTIONable:FREQuency register

The STATUS:QUESTIONable:FREQuency register contains information about the condition of the local oscillator and the reference frequency. A separate frequency register exists for each active channel.

You can read out the register with STATUS:QUESTIONable:FREQuency:CONDition? or STATUS:QUESTIONable:FREQuency[:EVENT]?

Table 14-9: Meaning of the bits used in the STATUS:QUESTIONable:FREQuency register

Bit No.	Meaning
0	OVEN COLD This bit is set if the reference oscillator has not yet attained its operating temperature. "OCXO" is displayed.
1	LO UNLocked This bit is set if the local oscillator no longer locks. "LOUNL" is displayed.
2 to 7	Not used

Bit No.	Meaning
8	EXTernalREFerence This bit is set if you have selected an external reference oscillator but did not connect a useable external reference source. In that case the synthesizer can not lock. The frequency in all probability is not accurate.
9 to 14	Not used
15	This bit is always 0.

14.2.2.10 STATUS:QUESTIONable:LIMit register

The STATUS:QUESTIONable:LIMit register contains information about the results of a limit check when you are working with limit lines.

A separate LIMit register exists for each active channel and for each window.

Table 14-10: Meaning of the bits used in the STATUS:QUESTIONable:LIMit register

Bit No.	Meaning
0	LIMit 1 FAIL This bit is set if limit line 1 is violated.
1	LIMit 2 FAIL This bit is set if limit line 2 is violated.
2	LIMit 3 FAIL This bit is set if limit line 3 is violated.
3	LIMit 4 FAIL This bit is set if limit line 4 is violated.
4	LIMit 5 FAIL This bit is set if limit line 5 is violated.
5	LIMit 6 FAIL This bit is set if limit line 6 is violated.
6	LIMit 7 FAIL This bit is set if limit line 7 is violated.
7	LIMit 8 FAIL This bit is set if limit line 8 is violated.
8 to 14	Unused
15	This bit is always 0.

14.2.2.11 STATUS:QUESTIONable:LMARgin register

This register contains information about the observance of limit margins.

A separate LMARgin register exists for each active channel and for each window.

It can be read using the commands

`STATUS:QUESTIONable:LMARgin:CONDition?` and
`STATUS:QUESTIONable:LMARgin[:EVENT]?`.

Table 14-11: Meaning of the bits used in the STATUS:QUESTIONable:LMARgin register

Bit No.	Meaning
0	LMARgin 1 FAIL This bit is set if limit margin 1 is violated.
1	LMARgin 2 FAIL This bit is set if limit margin 2 is violated.
2	LMARgin 3 FAIL This bit is set if limit margin 3 is violated.
3	LMARgin 4 FAIL This bit is set if limit margin 4 is violated.
4	LMARgin 5 FAIL This bit is set if limit margin 5 is violated.
5	LMARgin 6 FAIL This bit is set if limit margin 6 is violated.
6	LMARgin 7 FAIL This bit is set if limit margin 7 is violated.
7	LMARgin 8 FAIL This bit is set if limit margin 8 is violated.
8 to 14	Not used
15	This bit is always 0.

14.2.2.12 STATUS:QUESTIONable:POWer register

The `STATUS:QUESTIONable:POWer` register contains information about possible overload situations that may occur during operation of the R&S EPL. A separate power register exists for each active channel.

You can read out the register with `STATUS:QUESTIONable:POWer:CONDition?` or `STATUS:QUESTIONable:POWer[:EVENT]?`

Table 14-12: Meaning of the bits used in the STATUS:QUESTIONable:POWer register

Bit No.	Meaning
0	OVERload This bit is set if an overload occurs at the RF input, causing signal distortion but not yet causing damage to the device. The R&S EPL displays the keyword "RF OVLD".
1	Unused

Bit No.	Meaning
2	IF_Overload This bit is set if an overload occurs in the IF path. The R&S EPL displays the keyword "IF OVLD".
3	INPut_overload This bit is set if an overload occurs at the RF input connector. If the input overload occurs, an additional 10dB is switched into the signal path and the user has to confirm a note in the GUI. The R&S EPL displays the keyword "INPUT OVLD".
5	PROTection_overload This bit is set if the signal level at the RF input connector exceeds the maximum. The RF input is disconnected from the input mixer to protect the device. In order to re-enable measurement, decrease the level at the RF input connector and reconnect the RF input to the mixer input. The R&S EPL displays the keyword "PROT OVLD".
4 to 14	Unused
15	This bit is always 0.

14.2.2.13 STATUS:QUESTIONable:TEMPerature register

The STATUS:QUESTIONable:TEMPerature register contains information about possible temperature deviations that may occur during operation of the R&S EPL. A separate temperature register exists for each active channel.

You can read out the register with `STATUS:QUESTIONable:TEMPerature:CONDition?` or `STATUS:QUESTIONable:TEMPerature[:EVENT]?`

Table 14-13: Meaning of the bits used in the STATUS:QUESTIONable:TEMPerature register

Bit No.	Meaning
0	This bit is set if the frontend temperature sensor deviates by a certain degree from the self-alignment temperature. During warmup, this bit is always 1. For details see " Temperature check " on page 323.
1 to 14	Unused
15	This bit is always 0.

14.2.2.14 STATUS:QUESTIONable:TIME register

Available for the Spectrum application.

The STATUS:QUESTIONable:TIME register contains information about possible time errors that may occur during operation of the R&S EPL. A separate time register exists for each active channel.

Table 14-14: Meaning of the bits used in the STATUS:QUESTIONable:TIME register

Bit No.	Meaning
0	not used
1	Sweep time too low This bit is set if the sweep time is too low.
2 to 14	Unused
15	This bit is always 0.

14.2.2.15 STATUS:QUESTIONable:TRANsdUcer register

Available for the Receiver application.

The STATUS:QUESTIONable:TRANsdUcer register contains information about the state and condition of measurements with transducer sets. A separate TRANsdUcer register exists for each active channel.

It indicates that a transducer break has been reached. It also indicates the next range that is to be swept. You can continue the sweep with `INITiate<mt>:CONMeas` on page 393.

You can read out the register with `STATUS:QUESTIONable:TRANsdUcer:CONDition?` or `STATUS:QUESTIONable:TRANsdUcer[:EVENT]?` on page 616.

Table 14-15: Meaning of the bits used in the STATUS:QUESTIONable:ACPLimit register

Bit No.	Meaning
0	Range 1 This bit is set if subrange 1 has been reached.
1	Range 2 This bit is set if subrange 2 has been reached.
2	Range 3 This bit is set if subrange 3 has been reached.
3	Range 4 This bit is set if subrange 4 has been reached.
4	Range 5 This bit is set if subrange 5 has been reached.
5	Range 6 This bit is set if subrange 6 has been reached.
6	Range 7 This bit is set if subrange 7 has been reached.
7	Range 8 This bit is set if subrange 8 has been reached.
8	Range 9 This bit is set if subrange 9 has been reached.

Bit No.	Meaning
9	Range 10 This bit is set if subrange 10 has been reached.
10	RF Input 1 This bit is set if the transducer has been assigned to RF input 1.
11	RF Input 2 This bit is set if the transducer has been assigned to RF input 2.
12 to 13	Unused
14	Subrange limit This bit is set when the transducer is at the point of changeover from one subrange to another.
15	This bit is always 0.

14.2.3 Reset values of the status reporting system

The following table contains the different commands and events causing the status reporting system to be reset. None of the commands, except *RST and SYSTem:PRESet, influence the functional instrument settings. In particular, DCL does not change the instrument settings.

Table 14-16: Resetting the status reporting system

Event	Switching on supply voltage Power-On-Status-Clear		DCL, SDC (Device Clear, Selected Device Clear)	*RST or SYSTem:PRE Set	STA-Tus:PRE-Set	*CLS
	0	1				
Clear STB, ESR	-	yes	-	-	-	yes
Clear SRE, ESE	-	yes	-	-	-	-
Clear PPE	-	yes	-	-	-	-
Clear EVENT parts of the registers	-	yes	-	-	-	yes
Clear ENABLE parts of all OPERation and QUESTIONable registers; Fill ENABLE parts of all other registers with "1".	-	yes	-	-	yes	-
Fill PTRansition parts with "1"; Clear NTRansition parts	-	yes	-	-	yes	-
Clear error queue	yes	yes	-	-	-	yes
Clear output buffer	yes	yes	yes	1)	1)	1)

Event	Switching on supply voltage Power-On-Status-Clear		DCL, SDC (Device Clear, Selected Device Clear)	*RST or SYS-Tem:PRE Set	STA-Tus:PRE-Set	*CLS
Effect	0	1				
Clear command processing and input buffer	yes	yes	yes	-	-	-
1) The first command in a command line that immediately follows a <PROGRAM MESSAGE TERMINATOR> clears the output buffer.						

14.3 GPIB languages

The R&S EPL analyzer family supports a subset of the GPIB commands used by other devices. Thus it can emulate other devices in order to use existing remote control programs.

Supported languages

Language	Comment
SCPI	
71100C	Compatible to 8566A/B
71200C	Compatible to 8566A/B
71209A	Compatible to 8566A/B
8560E	
8561E	
8562E	
8563E	
8564E	
8565E	
8566A	Command sets A and B are available. Command sets A and B differ in the rules regarding the command structure.
8566B	
8568A	Command sets A and B are available. Command sets A and B differ in the rules regarding the command structure.
8568A_DC	Uses DC input coupling by default if supported by the instrument
8568B	Command sets A and B are available. Command sets A and B differ in the rules regarding the command structure.
8568B_DC	Uses DC input coupling by default if supported by the instrument
8591E	Compatible to 8594E

Language	Comment
8594E	Command sets A and B are available. Command sets A and B differ in the rules regarding the command structure.
CXA	
EXA	
R&S FSL	
R&S FSV	

Notes:

- If you select a language other than "SCPI", the GPIB address is set to 18 if it was 20 before.
- The Start/stop frequency, reference level and number of sweep points are adapted to the selected instrument model.
- When you switch between remote control languages, the following settings or changes are made:

SCPI:

- The instrument performs a PRESET.

8566A/B, 8568A/B, 8594E; FSEA, FSEB, FSEM; FSEK:

- The instrument performs a PRESET.
- The following instrument settings are changed:

Table 14-17: Instrument settings for emulation of 8566A/B, 8568A/B, 8594E; FSEA, FSEB, FSEM; FSEK instruments

Model	# of Trace Points	Start Freq.	Stop Freq.	Ref Level	Input Coupling
8566A/B	1001	2 GHz	22 GHz	0 dBm	AC
8568A/B	1001	0 Hz	1.5 GHz	0 dBm	AC
8560E	601	0 Hz	2.9 GHz	0 dBm	AC
8561E	601	0 Hz	6.5 GHz	0 dBm	AC
8562E	601	0 Hz	13.2 GHz	0 dBm	AC
8563E	601	0 Hz	26.5 GHz	0 dBm	AC
8564E	601	0 Hz	40 GHz	0 dBm	AC
8565E	601	0 Hz	50 GHz	0 dBm	AC
8594E	401	0 Hz	3 GHz	0 dBm	AC

Note: The stop frequency indicated in the table may be limited to the corresponding frequency of the R&S EPL, if required.

14.4 The IECWIN tool

The R&S EPL is delivered with *IECWIN* installed, an auxiliary tool provided free of charge by R&S. IECWIN is a program to send SCPI commands to a measuring instrument either interactively or from a command script.



The R&S IECWIN32 tool is provided free of charge. The functionality may change in a future version without notice.

IECWIN offers the following features:

- Connection to instrument via several interfaces/protocols (GPIB, VISA, named pipe (if IECWIN is run on the instrument itself), RSIB)
- Interactive command entry
- Browsing available commands on the instrument
- Error checking following every command
- Execution of command scripts
- Storing binary data to a file
- Reading binary data from a file
- Generation of a log file

For command scripts, IECWIN offers the following features:

- Synchronization with the instrument on every command
- Checking expected result for query commands (as string or numeric value)
- Checking for expected errors codes
- Optional pause on error
- Nested command scripts
- Single step mode
- Conditional execution, based on the *IDN and *OPT strings



You can use the IECWIN to try out the programming examples provided in the R&S EPL User Manuals.

Starting IECWIN

IECWIN is available from the Windows "Start" menu on the R&S EPL, or by executing the following file:

```
C:\ProgramData\Rohde-Schwarz\ZNL-FPL\iecwin32.exe
```

You can also copy the program to any Windows PC or laptop. Simply copy the *iecwin32.exe*, *iecwin.chm* and *rsib32.dll* files from the location above to the same folder on the target computer.

When the tool is started, a "Connection settings" dialog box is displayed. Define the connection from the computer the IECWIN tool is installed on to the R&S EPL you want to control. If you are using the tool directly on the R&S EPL, you can use an NT

Pipe (COM Parser) connection, which requires no further configuration. For help on setting up other connection types, check the tool's online help (by clicking the "Help" button in the dialog box).



The IECWIN offers an online help with extensive information on how to work with the tool.

14.5 Network and remote control settings

Access: [SETUP] > "Network + Remote"

The remote commands required to define these settings are described in [Section 15.9.8, "Network and remote control configuration"](#), on page 601.

Step-by-step instructions are provided in [Section 14.6, "How to set up a network and remote control"](#), on page 361.



The content of the dialog box varies depending on the instrument model.

• General network settings	350
• Remote settings	352
• Compatibility settings	355
• LAN settings	357
• Remote errors	358
• Returning to manual mode ("local")	360

14.5.1 General network settings

Access: [SETUP] > "Network + Remote" > "Network" tab

The R&S EPL can be operated in a local area network (LAN), for example to control the instrument from a remote PC or use a network printer.



Network settings can only be edited in the firmware if a LAN cable is connected to the R&S EPL.



Risk of network problems

All parameters can be edited here; however, beware that changing the computer name has major effects in a network.

For details, see [Section 14.6, "How to set up a network and remote control"](#), on page 361.

Network
 GPIB
 Compatibility
 LAN
 Remote Errors

Computer Name

LAN1(1GBit)

IP Address

Subnet Mask

255.255.252.0

DHCP

On

Off

Open Dialog "Network Configuration"

Computer Name.....	351
IP Address.....	352
Subnet Mask.....	352
DHCP.....	352
Network Configuration.....	352

Computer Name

Each instrument is delivered with an assigned computer name, but this name can be changed. The naming conventions of Windows apply. If too many characters and/or numbers are entered, an error message is displayed in the status line.

The default instrument name is a non-case-sensitive string with the following syntax:

<Type><variant>-<serial_number>

For example EPL1000-123456

The serial number can be found on the rear panel of the instrument. It is the third part of the device ID printed on the bar code sticker:



IP Address

Defines the IP address. The TCP/IP protocol is preinstalled with the IP address 10.0.0.10. If the DHCP server is available ("DHCP On"), the setting is read-only.

The IP address consists of four number blocks separated by dots. Each block contains 3 numbers in maximum (e.g. 100.100.100.100), but also one or two numbers are allowed in a block (as an example see the preinstalled address).

Subnet Mask

Defines the subnet mask. The TCP/IP protocol is preinstalled with the subnet mask 255.255.255.0. If the DHCP server is available ("DHCP On"), this setting is read-only.

The subnet mask consists of four number blocks separated by dots. Each block contains 3 numbers in maximum (e.g. 100.100.100.100), but also one or two numbers are allowed in a block (as an example see the preinstalled address).

DHCP

Switches between DHCP server available (On) or not available (Off). If a DHCP server is available in the network, the IP address and subnet mask of the instrument are obtained automatically from the DHCP server.

Network Configuration

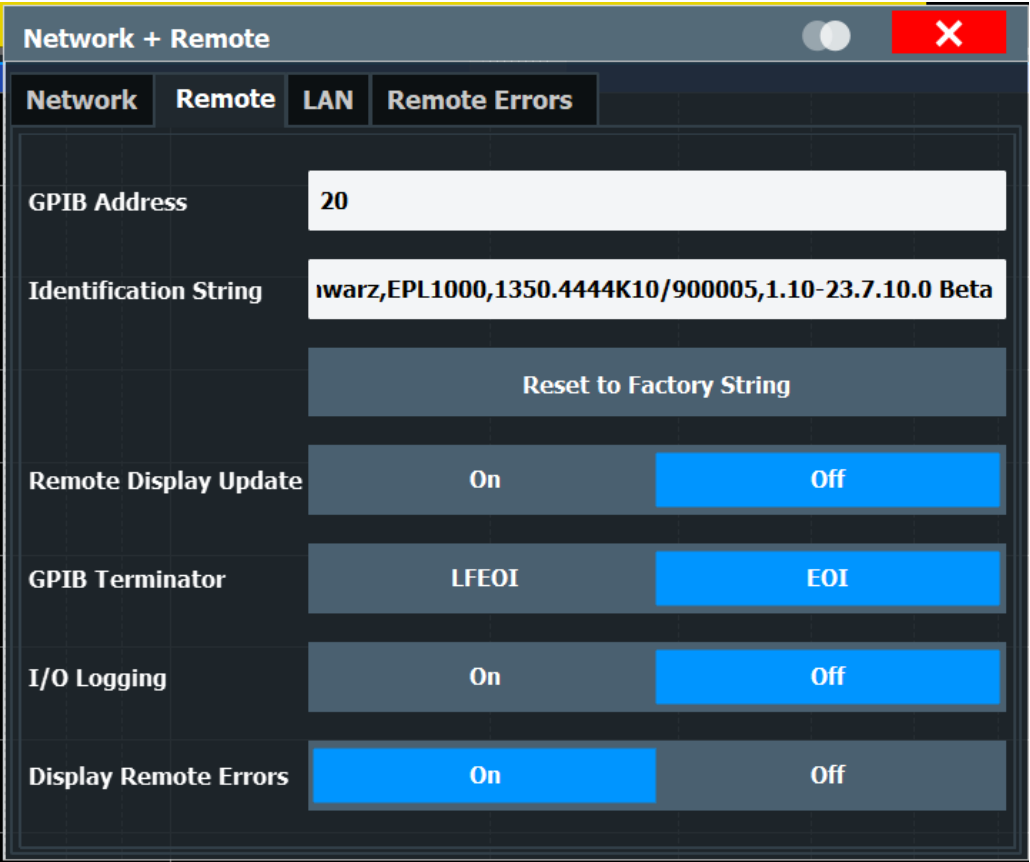
Opens the standard Windows "Network Configuration" dialog box for further configuration.

14.5.2 Remote settings

Access: [Setup] > "Network + Remote" > "Remote" tab



GPIB-specific settings are only available if option R&S FPL1-B10 is installed on the R&S EPL.



GPIB Address.....	353
Identification String.....	353
Reset to Factory String.....	353
Remote Display Update.....	354
GPIB Terminator.....	354
I/O Logging.....	354
Display Remote Errors.....	354

GPIB Address
 Defines the GPIB address. Values from 0 to 30 are allowed. The default address is 20.
 Remote command:
[SYSTem:COMMunicate:GPIB\[:SELF\]:ADDress](#) on page 602

Identification String
 Defines the identification string for the R&S EPL which is provided as a response to the *IDN? query. Maximum 36 characters are allowed.
 Remote command:
[SYSTem:IDENtify\[:STRing\]](#) on page 605

Reset to Factory String
 Restores the default identification string. Each R&S EPL has a unique ID according to the following syntax:
 Rohde&Schwarz,EPL,<Unique number>,1.00

Remote command:

`SYSTem:IDENtify:FACTory` on page 605

Remote Display Update

Defines whether the display of the R&S EPL is updated when changing from manual operation to remote control.

Turning off the display update function improves performance during remote control.

Note: Usually, this function remains available on the display during remote operation. However, it can be disabled remotely. In this case, the display is not updated during remote operation, and cannot be turned on again locally until local operation is resumed.

Remote command:

`SYSTem:DISPlay:UPDate` on page 604

`SYSTem:DISPlay:LOCK` on page 603

GPIO Terminator

Changes the GPIO receive terminator.

"LFEOI" According to the standard, the terminator in ASCII is <LF> and/or <EOI>.

"EOI" For binary data transfers (e.g. trace data) from the control computer to the instrument, the binary code used for <LF> might be included in the binary data block, and therefore should not be interpreted as a terminator in this particular case. This can be avoided by using only the receive terminator `EOI`.

Remote command:

`SYSTem:COMMunicate:GPIO[:SELF]:RTERminator` on page 602

I/O Logging

Activates or deactivates the SCPI error log function. All remote control commands received by the R&S EPL are recorded in a log file. The files are named according to the following syntax:

C:

`\Users\Public\Documents\Rohde-Schwarz\Analyzer\ScpiLogging\ScpiLog.<no.>`

where <no.> is a sequential number

A new log file is started each time logging was stopped and is restarted.

Logging the commands may be extremely useful for debug purposes, e.g. in order to find misspelled keywords in control programs.

Remote command:

`SYSTem:CLOGging` on page 577

Display Remote Errors

Activates and deactivates the display of errors that occur during remote operation of the R&S EPL. If activated, the R&S EPL displays a message box at the bottom of the screen that contains the type of error and the command that caused the error.



The error message remains in place when you switch to "Local" mode. To close the message box, select the  "Close" icon.

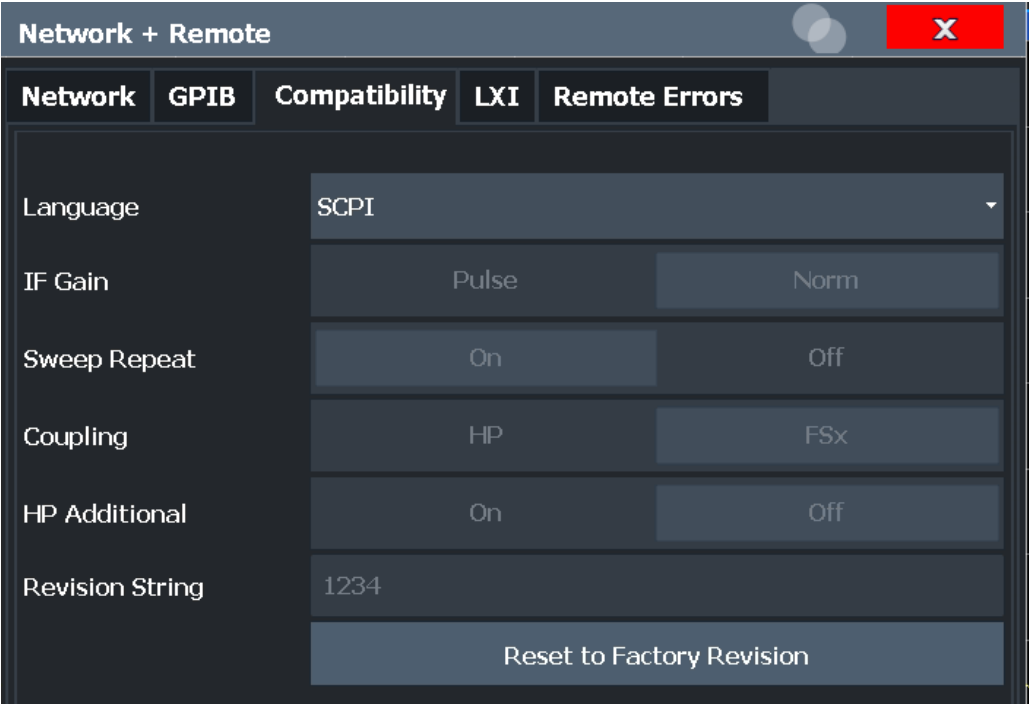
Only the most recent error is displayed in remote mode. However, in local mode, all errors that occurred during remote operation are listed in a separate tab of the "Network + Remote" dialog box (see [Section 14.5.5, "Remote errors"](#), on page 358).

Remote command:
[SYSTem:ERRor:DISPlay](#) on page 604
[SYSTem:ERRor:CLEar:REMOte](#) on page 604

14.5.3 Compatibility settings

The R&S EPL can emulate the GPIB interface of other signal and spectrum analyzers, e.g. in order to use existing control applications.

The required settings are configured in the "Compatibility" tab of the "Network + Remote" dialog box.



Language	355
IF Gain	356
Sweep Repeat	356
Coupling	356
Revision String	356
Resetting the Factory Revision	357

Language
 Defines the system language used to control the instrument.

For details on the available GPIB languages, see [Section 14.3, "GPIB languages"](#), on page 347.

Remote command:

[SYSTem:LANGuage](#) on page 623

IF Gain

Configures the internal IF gain settings in HP emulation mode due to the application needs. This setting is only taken into account for resolution bandwidth < 300 kHz.

NORM	Optimized for high dynamic range, overload limit is close to reference level.
PULS	Optimized for pulsed signals, overload limit up to 10 dB above reference level.

This setting is only available if an HP language is selected (see ["Language"](#) on page 355).

Remote command:

[SYSTem:IFGain:MODE](#) on page 623

Sweep Repeat

Controls a repeated sweep of the E1 and MKPK HI HP model commands (for details on the commands refer to [Section 15.11.2, "Reference: GPIB commands of emulated HP models"](#), on page 624). If the repeated sweep is OFF, the marker is set without sweeping before.

Note: In single sweep mode, switch off this setting before you set the marker via the E1 and MKPK HI commands in order to avoid sweeping again.

This setting is only available if a HP language is selected (see ["Language"](#) on page 355).

Remote command:

[SYSTem:RSweep](#) on page 624

Coupling

Controls the default coupling ratios in the HP emulation mode for:

- span and resolution bandwidth (Span/RBW)
- resolution bandwidth and video bandwidth (RBW/VBW)

For FSx, the standard parameter coupling of the instrument is used. As a result, in most cases a shorter sweep time is used than in case of HP.

This setting is only available if a HP language is selected (see ["Language"](#) on page 355).

Remote command:

[SYSTem:HPCoupling](#) on page 622

Revision String

Defines the response to the `REV?` query for the revision number.

(HP emulation only, see ["Language"](#) on page 355).

Max. 36 characters are allowed.

Remote command:

`SYSTem:REVision[:STRing]` on page 624

Resetting the Factory Revision

Resets the response to the `REV?` query for the revision number to the factory default (HP emulation only, see ["Language"](#) on page 355).

Remote command:

`SYSTem:REVision:FACTory` on page 602

14.5.4 LAN settings

Access: [SETUP] > "Network + Remote" > "LAN" tab

In a LAN network, the R&S EPL can be accessed via any web browser (e.g. the Microsoft Internet Explorer) to perform the following tasks:

- Modifying network configurations
- Modifying device configurations
- Monitoring connections from the device to other devices

The "LAN" tab of the "Network + Remote" dialog box provides basic LAN configuration functions and information for the R&S EPL.

Alternatively, you can change the LAN settings using the web browser interface.

For details see ["LAN configuration"](#) on page 366.

Only user accounts with administrator rights are able to use LAN configuration and web browser functionality.

Network	GPIB	Compatibility	LAN	Remote Errors
Current LAN Configuration:				
Computer Name				
MAC Address				
IP Address				
LAN Password				
		LAN Reset		

Current LAN Configuration	358
LAN Password	358
LAN Reset	358

Current LAN Configuration

Displays the current LAN information from the R&S EPL (read-only).

"Computer name"	Name of the R&S EPL as defined in the operating system (see also "Computer Name" on page 351)
"MAC address"	Media Access Control address (MAC address), a unique identifier for the network card in the R&S EPL
"IP address"	IP address of the R&S EPL as defined in the operating system (see also "IP Address" on page 352).

LAN Password

Password for LAN configuration. The default password is *LxiWebIfc*.

Remote command:

[SYSTem:LXI:PASSword](#) on page 606

LAN Reset

Resets the "LAN" configuration to its default settings (LCI function).

Parameter	Value
TCP/IP Mode	DHCP + Auto IP Address
Dynamic DNS	Enabled
ICMP Ping	Enabled
Password for "LAN" configuration	LxiWebIfc

The LAN settings are configured in the "Network" tab of the "Network + Remote" dialog box or using the instrument's "LAN" web browser interface.

Remote command:

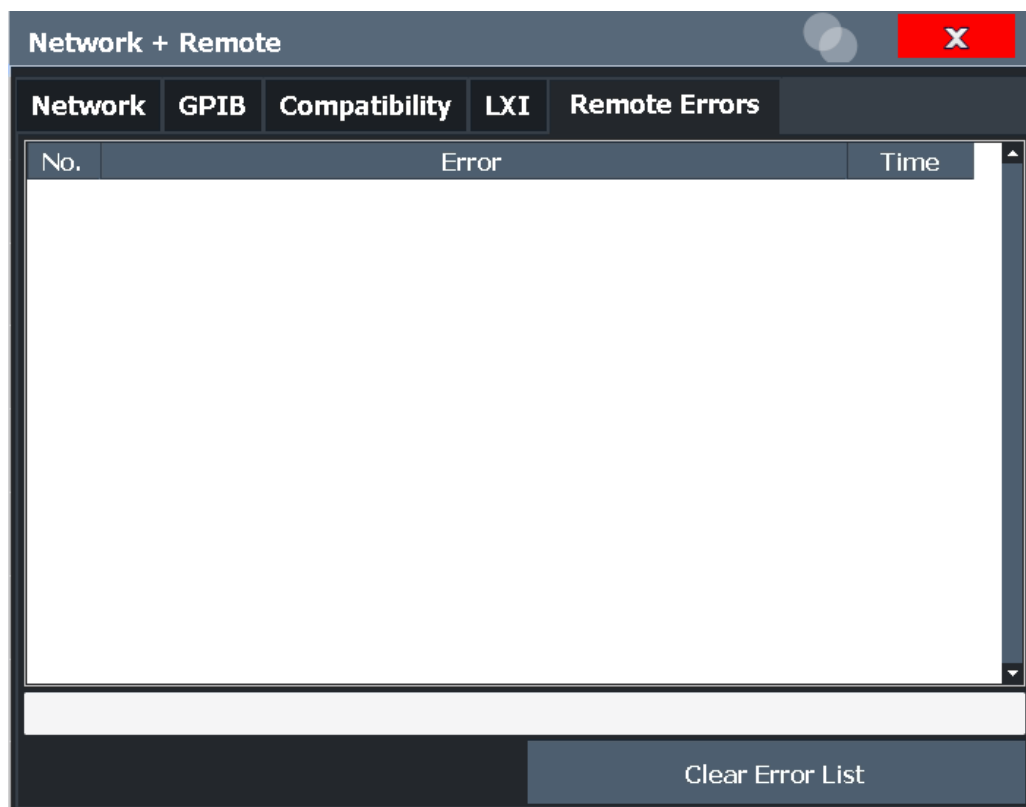
[SYSTem:LXI:LANReset](#) on page 605

14.5.5 Remote errors

Access: [SETUP] > "Network + Remote" > "Remote Errors" tab

The error messages generated by the R&S EPL during remote operation are displayed here.

The messages are displayed in the order of their occurrence; the most recent messages are placed at the top of the list.



The most recent error message during remote operation can be displayed on the screen, see ["Display Remote Errors"](#) on page 354.

If the number of error messages exceeds the capacity of the error buffer, the oldest error message is removed before the newest one is inserted. To clear the message buffer use "Clear Error List". It is automatically cleared when the R&S EPL is shut down.

The following information is available:

No	Device-specific error code
Error	Brief description of the error
Date/Time	Time the message occurred

For details on remote control error messages, see [Section 16.2, "Error messages in remote control mode"](#), on page 662.

Remote command:

`SYSTem:ERRor:LIST?` on page 609

Clear Error List

Deletes the error message buffer for remote operation.

Note: The remote error list is automatically cleared when the R&S EPL is shut down.

Remote command:

`SYSTem:ERRor:CLEar:REMOte` on page 604

14.5.6 Returning to manual mode ("local")

When switched on, the instrument is always in the manual measurement mode and can be operated via the front panel. As soon as the instrument receives a remote command, it is switched to the remote control mode.

In remote control mode, all keys of the instrument are disabled. The "LOCAL" softkey and the [Remote Display Update](#) softkey are displayed.

Local

The instrument switches from remote to manual operation.

Note:

- If the local lockout function (`LLO` or `SYST:KLOC ON`) is activated in the remote control mode, manual operation is no longer available until `GTL` (or `SYST:KLOC OFF`) is executed.
- Before you switch back to manual operation, all remote command processing must be completed. Otherwise, the instrument will switch back to remote control immediately.
- If you select "Local" while a self-alignment or a self-test is still running (which was started remotely), the instrument only returns to the manual operation state when the alignment or test is completed.

Furthermore, when you return to manual operation, the following happens:

- All front panel keys are enabled.
- The main softkey menu of the current mode is displayed.
- The measurement diagrams, traces and display fields are displayed again.
- If, at the time of pressing "LOCAL", the synchronization mechanism via `*OPC?`, `*WAI` is active, the currently running measurement procedure is aborted and synchronization is achieved by setting the corresponding bits in the registers of the status reporting system.
- Bit 6 (`User Request`) of the `Event` status register is set.
If the status reporting system is configured accordingly, this bit immediately causes the generation of a service request (SRQ) to inform the control software that the user wishes to return to front panel control. For example, this can be used to interrupt the control program and to correct instrument settings manually. This bit is set each time you select "LOCAL".

Remote command:

`SYST:COMM:INT:REM OFF`, see `SYSTem:COMMunicate:INTernal:REMOte` on page 602

14.6 How to set up a network and remote control

Remote operation

You can operate the instrument remotely from a connected computer using SCPI commands. Before you send remote commands, configure the instrument in a LAN network or connect it to a PC via the GPIB interface as described in [Section 14.6.1, "How to configure a network"](#), on page 361.

Remote Desktop

In production test and measurement, a common requirement is central monitoring of the T&M instruments for remote maintenance and remote diagnostics. Equipped with the Remote Desktop software of Windows, the R&S EPL ideally meets requirements for use in production. The computer that is used for remote operation is called "controller" here.

The following tasks can be performed using Remote Desktop:

- Access to the control functions via a virtual front panel (soft front panel)
- Printout of measurement results directly from the controller
- Storage of measured data on the controller's hard disk

This documentation provides basic instructions on setting up the Remote Desktop for the R&S EPL. For details refer to the Windows operating system documentation.

14.6.1 How to configure a network

A precondition for operating or monitoring the instrument remotely is that it is connected to a LAN network or a PC connected to the GPIB interface. Setup is described here.



Windows Firewall Settings

A firewall protects an instrument by preventing unauthorized users from gaining access to it through a network. We highly recommend using the firewall on your instrument. Rohde & Schwarz instruments are shipped with the Windows firewall enabled and pre-configured in such a way that all ports and connections for remote control are enabled.

For more details on firewall configuration, see the Windows help system and the Rohde & Schwarz white paper (available from the Rohde & Schwarz website):

[1EF96: Malware Protection Windows 10](#)

14.6.1.1 How to connect the instrument to the network

There are two methods to establish a LAN connection to the instrument:

- A non-dedicated network (Ethernet) connection from the instrument to an existing network made with an ordinary RJ-45 network cable. The instrument is assigned

an IP address and can coexist with a computer and with other hosts on the same network.

- A dedicated network connection (Point-to-point connection) between the instrument and a single computer made with a (crossover) RJ-45 network cable. The computer must be equipped with a network adapter and be directly connected to the instrument. The use of hubs, switches, or gateways is not required, however, data transfer is still performed using the TCP/IP protocol. You have to assign an IP address to the instrument and the computer, see [Section 14.6.1.2, "How to assign the IP address"](#), on page 362.

Note: As the R&S EPL uses a 1 GBit LAN, a crossover cable is not necessary (due to Auto-MDI(X) functionality).

► **NOTICE!** Network environment.

Before connecting the product to a local area network (LAN), consider the following:

- Install the latest firmware to reduce security risks.
- For internet or remote access, use secured connections, if applicable.
- Ensure that the network settings comply with the security policies of your company. Contact your local system administrator or IT department before connecting your product to your company LAN.
- When connected to the LAN, the product may potentially be accessed from the internet, which may be a security risk. For example, attackers might misuse or damage the product.

To establish a non-dedicated network connection, connect a commercial RJ-45 cable to one of the LAN ports.

To establish a dedicated connection, connect a (crossover) RJ-45 cable between the instrument and a single PC.

If the instrument is connected to the LAN, Windows automatically detects the network connection and activates the required drivers.

The network card can be operated with a 1 GBit Ethernet IEEE 802.3u interface.

14.6.1.2 How to assign the IP address

Depending on the network capacities, the TCP/IP address information for the instrument can be obtained in different ways.

- If the network supports dynamic TCP/IP configuration using the Dynamic Host Configuration Protocol (DHCP), all address information can be assigned automatically.
- If the network does not support DHCP, or if the instrument is set to use alternate TCP/IP configuration, the addresses must be set manually.

By default, the instrument is configured to use dynamic TCP/IP configuration and obtain all address information automatically. Thus, it is safe to establish a physical connection to the LAN without any previous instrument configuration.



When a DHCP server is used, a new IP address can be assigned each time the PC is restarted. You have to determine this address on the PC itself. Thus, when using a DHCP server, we recommend using the permanent computer name, which determines the address via the DNS server (see ["Using a DNS server to determine the IP address"](#) on page 364).

Assigning the IP address on the instrument

Note: Risk of network errors. Connection errors can affect the entire network. Contact your network administrator to obtain a valid IP address.

1. Press [SETUP].
2. Press "Network + Remote".
3. Select the "Network" tab.
4. In the "Network + Remote" dialog, toggle the "DHCP On/Off" setting to the required mode.

If DHCP is "Off", you must enter the IP address manually, as described in the following steps.

Note: When you switch DHCP from "On" to "Off", the previously set IP address and subnet mask are retrieved.

If DHCP is "On", the instrument obtains the IP address of the DHCP server automatically. The configuration is saved, and the R&S EPL prompts you to restart the instrument. You can skip the remaining steps.

Note: When a DHCP server is used, a new IP address can be assigned each time you restart the instrument. You have to determine this address on the instrument itself. Thus, when using a DHCP server, we recommend using the permanent computer name. Then the address is determined via the DNS server.

(See ["Using a DNS server to determine the IP address"](#) on page 364 and [Section 14.6.1.3, "How to change the instrument name"](#), on page 364).

5. Enter the "IP Address", for example 192.0.2.0. The IP address consists of four number blocks separated by dots. Every block contains a maximum of 3 numbers.
6. Enter the "Subnet Mask", for example 255.255.255.0. The subnet mask consists of four number blocks separated by dots. Every block contains a maximum of 3 numbers.
7. Close the dialog box.

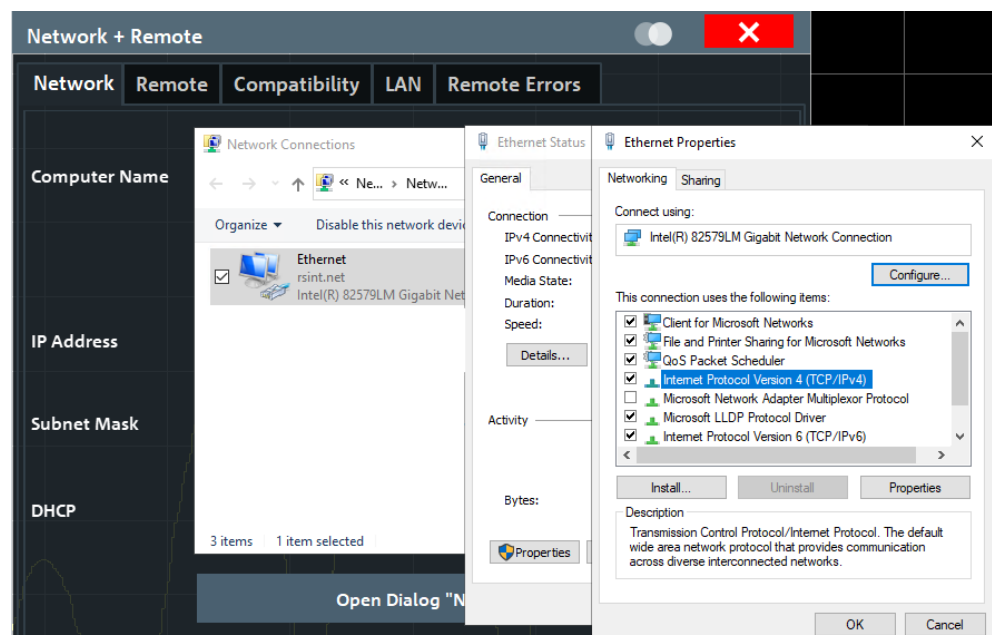
If you have entered an invalid IP address or subnet mask, the message "out of range" is displayed in the status line. If the settings are correct, the configuration is saved, and you are prompted to restart the instrument.

8. Confirm the displayed message to restart the instrument.

Using a DNS server to determine the IP address

If a DNS server is configured on the R&S EPL, the server can determine the current IP address for the connection using the permanent computer name.

1. Obtain the name of your DNS domain and the IP addresses of the DNS and WINS servers on your network (see [Section 14.6.1.3, "How to change the instrument name"](#), on page 364).
2. Select [Setup] > "Network + Remote".
3. In the "Network" tab, select "Open Dialog 'Network Connections'".
4. Double-tap "Ethernet".
5. In the "Ethernet Status" dialog box, select "Properties".
The items used by the Ethernet connection are displayed.
6. Tap the entry named "Internet Protocol Version 4 (TCP/IPv4)" to highlight it.



7. Select "Properties".
8. On the "General" tab, select "Use the following DNS server addresses".
9. Enter your own DNS addresses.

For more information, refer to the Windows operating system Help.

14.6.1.3 How to change the instrument name

In a LAN that uses a DNS server, each PC or instrument connected in the LAN can be accessed via an unambiguous computer name instead of the IP address. The DNS server translates the host name to the IP address. Using the computer name is espe-

cially useful when a DHCP server is used, as a new IP address can be assigned each time the instrument is restarted.

Each instrument is delivered with an assigned computer name, but you can change this name.

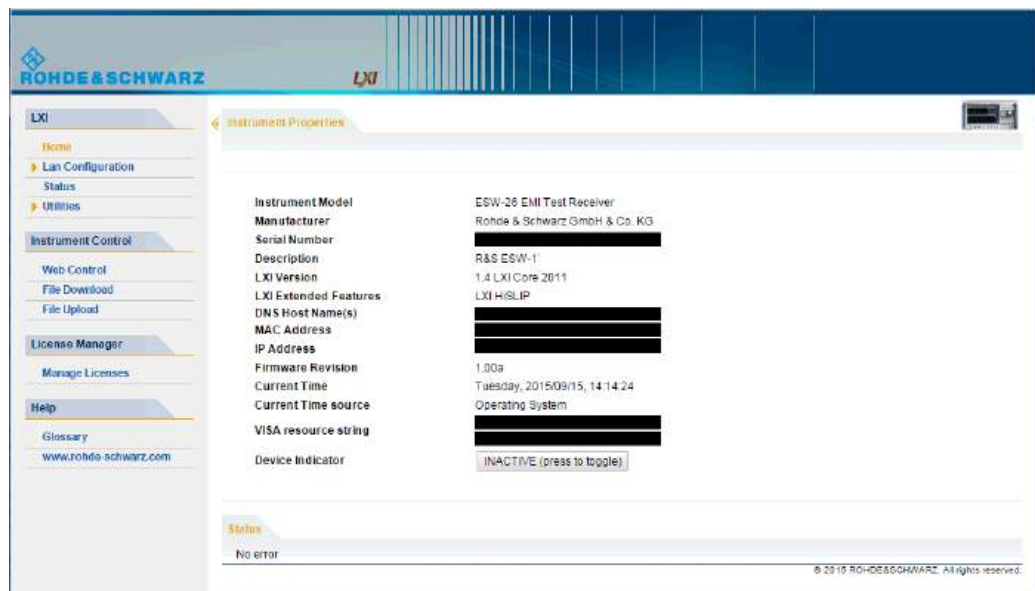
To change the instrument's computer name

1. Press [Setup] and then "Network + Remote".
The current "Computer Name" is displayed in the "Network" tab.
2. Enter the new computer name.
3. Close the dialog box.
The configuration is saved, and you are prompted to restart the instrument.
4. Confirm the displayed message to restart the instrument.

14.6.1.4 How to configure the LAN using the web browser interface

The instrument's "LAN" web browser interface works correctly with all W3C compliant browsers.

- In the web browser, open the `http://<instrument-hostname>` or `http://<instrument-ip-address>` page, e.g. `http://10.113.10.203`.
The default password to change "LAN" configurations is *LxiWebIfc*.
The "Instrument Home Page" (welcome page) opens.



The instrument home page displays device information, including the VISA resource string, in read-only format.

- ▶ On the "Instrument Home Page", select "Device Indicator" to activate or deactivate the "LAN" status LED to the right of the button. The "Device Indicator" setting is not password-protected.

A green "LAN" status LED indicates that a LAN connection is established.

A red status LED indicates an error, for example, that no LAN cable is connected.

When a device is connecting to the instrument, the "LAN" status LED blinks.

The most important control elements in the navigation pane of the browser interface are the following:

- "LAN Configuration" opens the menu with configuration pages.
- "Status" displays information about the "LAN" status of the instrument.

LAN configuration

The LAN configuration consists of three parts:

- "IP configuration" provides all mandatory LAN parameters.
- "Advanced LAN Configuration" provides further LAN settings.
- "Ping Client" provides the ping utility to verify the connection between the instrument and other devices.

IP configuration

The "LAN Configuration > IP configuration" web page displays all mandatory LAN parameters and allows their modification.

The "TCP/IP Mode" configuration field controls how the IP address for the instrument gets assigned (see also [Section 14.6.1.2, "How to assign the IP address"](#), on page 362).

For the manual configuration mode, the static IP address, subnet mask, and default gateway are used to configure the LAN. The automatic configuration mode uses DHCP server or Dynamic Link Local Addressing (Automatic IP) to obtain the instrument IP address.



Changing the LAN configuration is password-protected. The default password is *Lxi-WebIfc* (notice upper and lower case characters).

You can change the LAN password in the "Network + Remote" dialog box, see [Section 14.5.4, "LAN settings"](#), on page 357.

Advanced LAN configuration

The "LAN Configuration > Advanced LAN Configuration" parameters are used as follows:

- "mDNS and DNS-SD" are two additional protocols: Multicast DNS and DNS Service Discovery. They are used for device communication in zero configuration networks working without DNS and DHCP
- "ICMP Ping" must be enabled to use the ping utility.
- "VXI-11" is the protocol that is used to detect the instrument in the LAN.

Ping client

Ping is a utility that verifies the connection between the instrument and another device. The ping command uses the ICMP echo request and echo reply packets to determine whether the LAN connection is functional. Ping is useful for diagnosing IP network or router failures. The ping utility is not password-protected.

To initiate a ping between the instrument and a second connected device:

To initiate a ping between the instrument and a second connected device

1. Enable "ICMP Ping" on the "Advanced LAN Configuration" page (enabled after an LCI).
2. Enter the IP address of the second device **without the ping command and without any further parameters** into the "Destination Address" field (e.g. 10.113.10.203).
3. Select "Submit".

14.6.1.5 How to change the GPIB instrument address

To operate the instrument via remote control, it must be addressed using the GPIB address. The remote control address is factory-set to 20, but it can be changed if it does not fit in the network environment. For remote control, addresses 0 through 30 are allowed. The GPIB address is maintained after a reset of the instrument settings.

Setting the GPIB address

1. On the R&S EPL, press [SETUP].
2. Press "Network + Remote".
3. In the "Network + Remote" dialog box, select the "GPIB" tab.
4. In the "GPIB Address" field, enter a value between 0 and 30.

Remote command:

```
SYST:COMM:GPIB:ADDR 18
```

14.6.2 How to operate the instrument without a network

To operate the instrument without a network connection either temporarily or permanently, no special measures are necessary. Windows automatically detects the interruption of the network connection and does not set up the connection when the instrument is switched on.

If you are not prompted to enter the user name and password, proceed as described in [Section 14.6.3.3, "How to configure the automatic login mechanism"](#), on page 369.

14.6.3 How to log on to the network

Windows requires that users identify themselves by entering a user name and password in a login window. You can set up two types of user accounts, either an administrator account with unrestricted access to the computer/domain or a standard user account with limited access.

The instrument provides an auto-login function for the standard account, i.e. login with unrestricted access is carried out automatically in the background. By default, the user name for the standard account is "Instrument", and the user name for the administrator user account is "Admin".

In both cases the initial password is "894129". You can change the password in Windows for any user at any time. Some administrative tasks require administrator rights (e.g. firmware updates or the configuration of a LAN network). If so, it is mentioned in the function descriptions.

At the same time you log on to the operating system, you are automatically logged on to the network. As a prerequisite, the user name and the password must be identical on the instrument and on the network.

14.6.3.1 How to create users

After the software for the network has been installed, the instrument issues an error message the next time it is switched on because there is no user named "instrument" (= default user ID for Windows auto-login) in the network. Thus, a matching user must be created in the R&S EPL and in the network, the password must be adapted to the network password, and the auto-login mechanism must then be deactivated.

The network administrator is responsible for creating new users in the network.



Select the "Windows" icon in the toolbar to access the operating system.

2. Select "Start > Settings > Accounts > Other users".
3. Select "Add someone else to this PC".
4. In the "Microsoft account" dialog box, enter the new user name and password.
5. Select "OK".
6. Select "Finish".
The new user is created.

14.6.3.2 How to change the user password

After the new user has been created on the instrument, the password must be adapted to the network password.



Select the "Windows" icon in the toolbar to access the operating system.

2. Press [Ctrl + Alt + Delete], then select "Change a password".
3. Enter the user account name.
4. Enter the old password.
5. Enter the new password twice.
6. Press [Enter].
The new password is now active.

14.6.3.3 How to configure the automatic login mechanism

Adapting the auto-login function to a new password

If you change the password that is used during auto-login, this function no longer works. Adapt the settings for the auto-login function first.



Changing the password for auto-login requires administrator rights.



1. Select the "Windows" icon in the toolbar to access the operating system of the R&S EPL (see also ["To access the \"Start\" menu\"](#) on page 34).
2. Open the
`C:\Users\Public\Documents\Rohde-Schwarz\Analyzer\user\AUTOLOGIN.REG` file in any text editor (e.g. Notepad).
3. In the line `"DefaultPassword"="894129"`, replace the default password (894129) by the new password for automatic login.
4. Save the changes to the file.
5. In the Windows "Start" menu, select "Run".
The "Run" dialog box is displayed.
6. Enter the command
`C:\Users\Public\Documents\Rohde-Schwarz\Analyzer\user\AUTOLOGIN.REG`.
7. Press [ENTER] to confirm.

The auto-login function is reactivated with the changed password. It is applied the next time you switch on the instrument.

Switching users when using the auto-login function

Which user account is used is defined during login. If auto-login is active, the login window is not displayed. However, you can switch the user account to be used even when the auto-login function is active.



1. Select the "Windows" icon in the toolbar to access the operating system of the R&S EPL (see also ["To access the "Start" menu"](#) on page 34).

2. Press [CTRL] + [ALT] + [DEL], then select "Sign out".

The "Login" dialog box is displayed, in which you can enter the different user account name and password.

Deactivating the auto-login function

When shipped, the instrument is already configured to log on the "instrument" user automatically under Windows. To deactivate the auto-login function, perform the following steps:

1. In the "Start" menu, select "Run".
The "Run" dialog box is displayed.

2. Enter the command
`C:\Users\Public\Documents\Rohde-Schwarz\Analyzer\user\NO_AUTOLOGIN.REG.`

3. Press [ENTER] to confirm.
The auto-login function is deactivated. The next time you switch on the instrument, the R&S EPL prompts you to enter your user name and password before the firmware is started.

Reactivating the auto-login function

To reactivate the auto-login function after manually deactivating it, perform the following steps:

1. In the "Start" menu, select "Run".
The "Run" dialog box is displayed.

2. Enter the command
`C:\Users\Public\Documents\Rohde-Schwarz\Analyzer\user\AUTOLOGIN.REG.`

3. Press [ENTER] to confirm.
The auto-login function is reactivated. It is applied the next time you switch on the instrument.

14.6.4 How to share directories (only with Microsoft networks)

Sharing directories makes data available for other users. Sharing directories is only possible in Microsoft networks. Sharing is a property of a file or directory.

1. In the "Start" menu, select "Programs" > "Accessories" > "Windows Explorer".
2. Right-click the desired folder.
3. In the context menu, select "Sharing with" > "Specific people".
The dialog box for sharing a directory is displayed.
4. Select a user from the list or add a new name.
5. Select "Add".
6. Select "Share".
7. Select "Done" to close the dialog box.
The drive is shared and the selected users can access it.

14.6.5 How to control the R&S EPL via the web browser interface

Via the LAN web browser interface to the R&S EPL, one or more users can control the instrument remotely from another PC without additional installation. Most instrument controls are available via the front panel simulation. File upload and download between the instrument and the remote PC is also available.

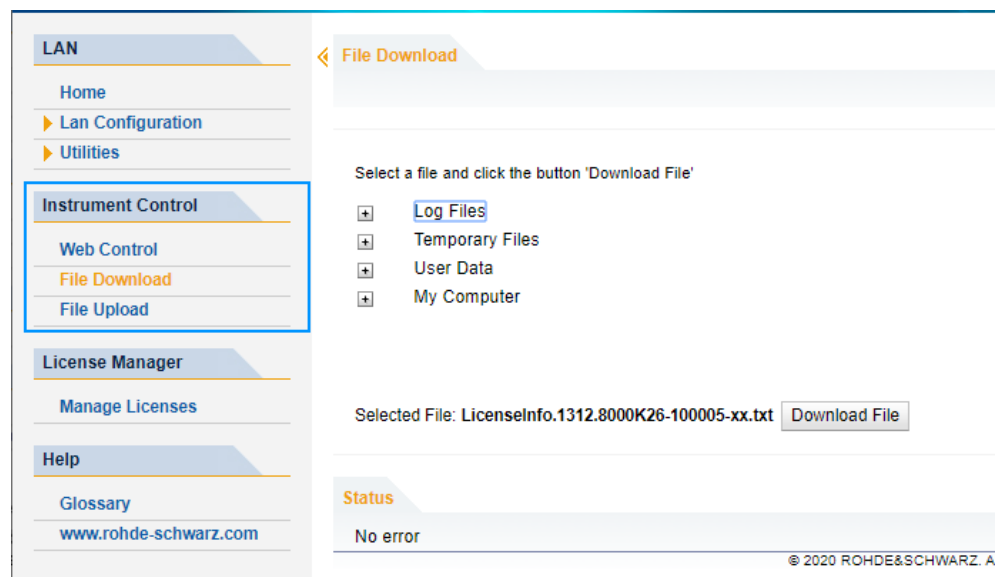
To access the R&S EPL via the web browser interface

1. Start a web browser that supports html5 (W3C compliant).
2. Enter the IP address of the R&S EPL in the browser's address bar.
The R&S EPL's Welcome page is displayed.
3. In the navigation pane, select "Instrument Control > Web Control".
The instrument's display is shown in a new browser window, with a software front panel displayed beside or below it.
4. Use the mouse cursor to access the functionality in the software front panel or in the display as you would directly on the instrument's front panel.

To exchange files with the R&S EPL

You can download files, for example stored measurement data, from the R&S EPL to the remote PC, or upload files, for example limit line definitions, from the PC to the R&S EPL.

1. In the web browser, select the Welcome page window.
2. In the navigation pane, select "Instrument Control" > "File Upload" or "File Download".



The most commonly used folders on the instrument are displayed. For example, folders that contain user data. From the top-most folder, *My Computer*, you can access all other folders on the instrument.

3. To download a file from the R&S EPL:
 - a) Select the file from the displayed folders.
 - b) Select "Download File".
4. To upload a file to the R&S EPL:
 - a) From the displayed folders in the web browser window, select the folder on the R&S EPL to which you want to copy a file.
 - b) Under "File to Upload", select "Browse".
 - c) From the file selection dialog box, select the required file on the PC.
 - d) Select "Upload" to copy the file from the PC to the defined folder on the R&S EPL.

14.6.6 How to deactivate the web browser interface

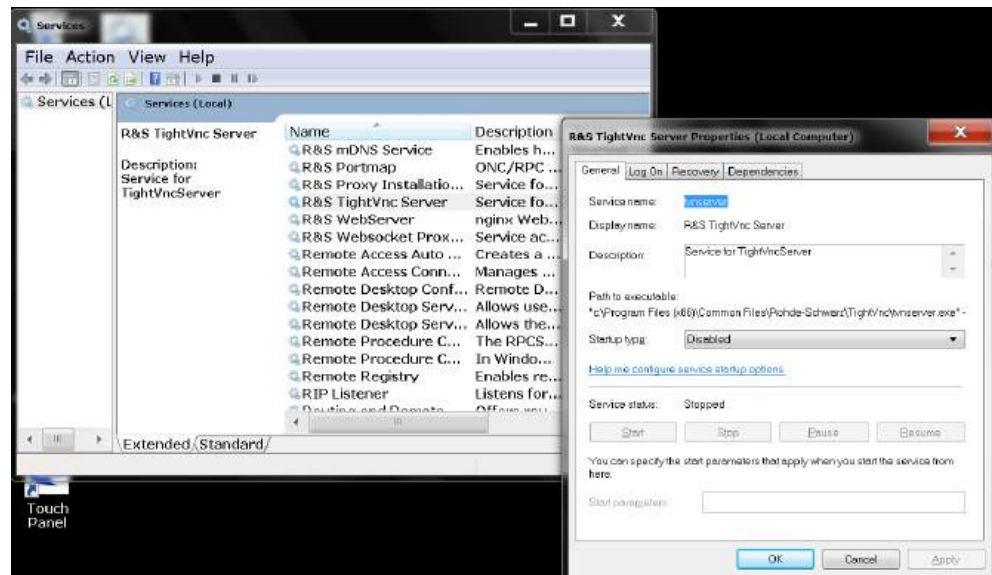
If you want to prevent other users in the LAN from accessing or operating the R&S EPL via its LAN web browser interface, you must deactivate this function. Note that **after a firmware update** the function is **automatically active** again until you deactivate it manually.

To deactivate the LAN web browser interface

1. 


Select the "Windows" icon in the toolbar to access the operating system.

2. In the "Start" menu, select "Control Panel".
3. Select "System and Security" > "Administrative Tools".
4. From the list on the right, select "Services".
5. From the list of local services, select "R&S TightVNC Server".



6. Set "Startup type" to "Disabled".
7. Select "Stop".
8. Select "Apply".

The next time a user enters the IP address of the instrument in a web browser, an error message is displayed:

Failed to connect to server (code. 1006)

14.6.7 How to set up remote desktop

Remote Desktop is a Windows application which can be used to access and control the instrument from a remote computer through a LAN connection. While the instrument is in operation, the instrument screen contents are displayed on the remote computer, and Remote Desktop provides access to all of the applications, files, and network resources of the instrument. Thus, remote operation of the R&S EPL is possible.

With Windows, Remote Desktop Client is part of the operating system. For other versions of Windows, Microsoft offers the Remote Desktop Client as an add-on. For details refer to the Windows operating system documentation.

With the factory settings, the default "instrument" user can connect to the R&S EPL with the Remote Desktop program of the controller immediately. No further configura-

tion is required. However, if the connection fails or other users need to connect, this section provides basic instructions on setting up the Remote Desktop for the R&S EPL.

14.6.7.1 How to configure the R&S EPL for remote operation via remote desktop

1. Create a fixed IP address for the TCP/IP protocol as described in [Section 14.6.1.2, "How to assign the IP address"](#), on page 362.

Note: To avoid problems, use a fixed IP address.

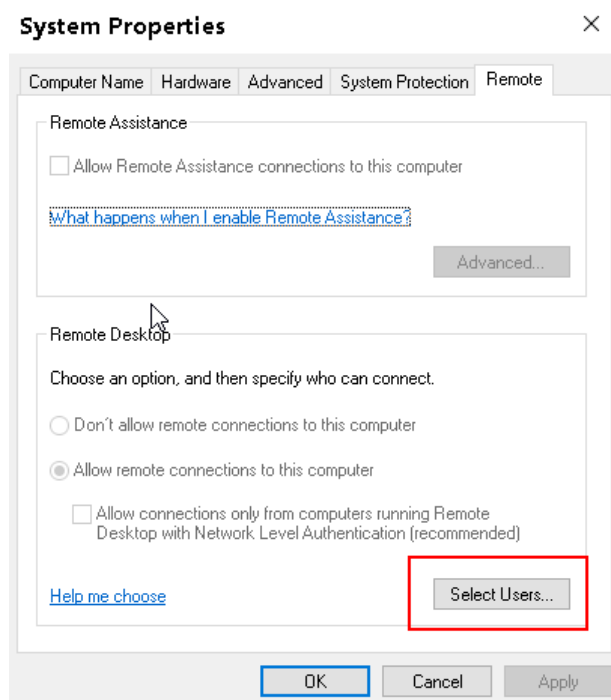
When a DHCP server is used, a new IP address is assigned each time the instrument is restarted. This address must first be determined on the instrument itself. Thus, using a DHCP server is not suitable for remote operation of the R&S EPL via Remote Desktop.



Select the "Windows" icon in the toolbar to access the operating system.

3. In the Windows "Start" menu, select "Settings > System".
4. Search for "remote access".
5. Select "Allow remote access to your computer".
6. Define which users can access the R&S EPL via Remote Desktop.

Note: The currently used user account is automatically enabled for Remote Desktop.



- a) Select "Select Users".
 - b) Select the users or create new user accounts as described in [Section 14.6.3.1, "How to create users"](#), on page 368.
 - c) Select "OK" to confirm the settings.
7. The R&S EPL is now ready for connection setup with the Remote Desktop program of the controller.

14.6.7.2 How to configure the controller



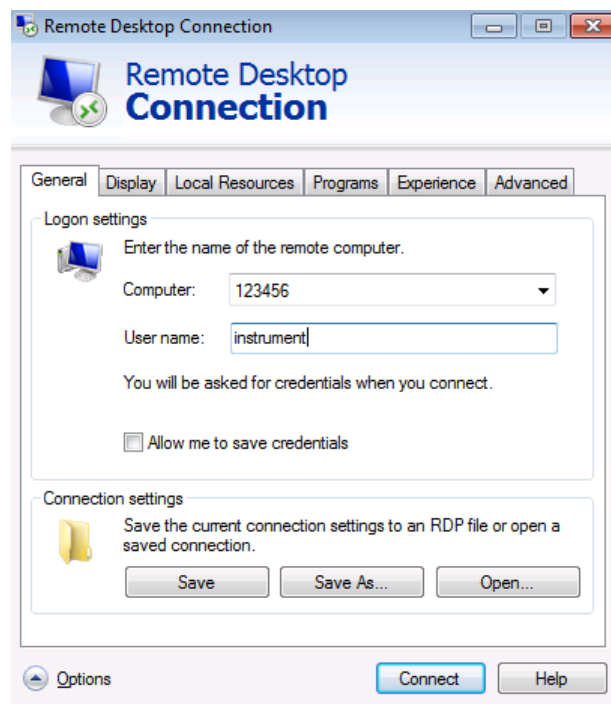
Remote Desktop Client

With Windows, Remote Desktop Client is part of the operating system and can be accessed via "Start > Programs > Accessories > Remote Desktop Connection".

For other versions of Windows, Microsoft offers the Remote Desktop Client as an add-on.

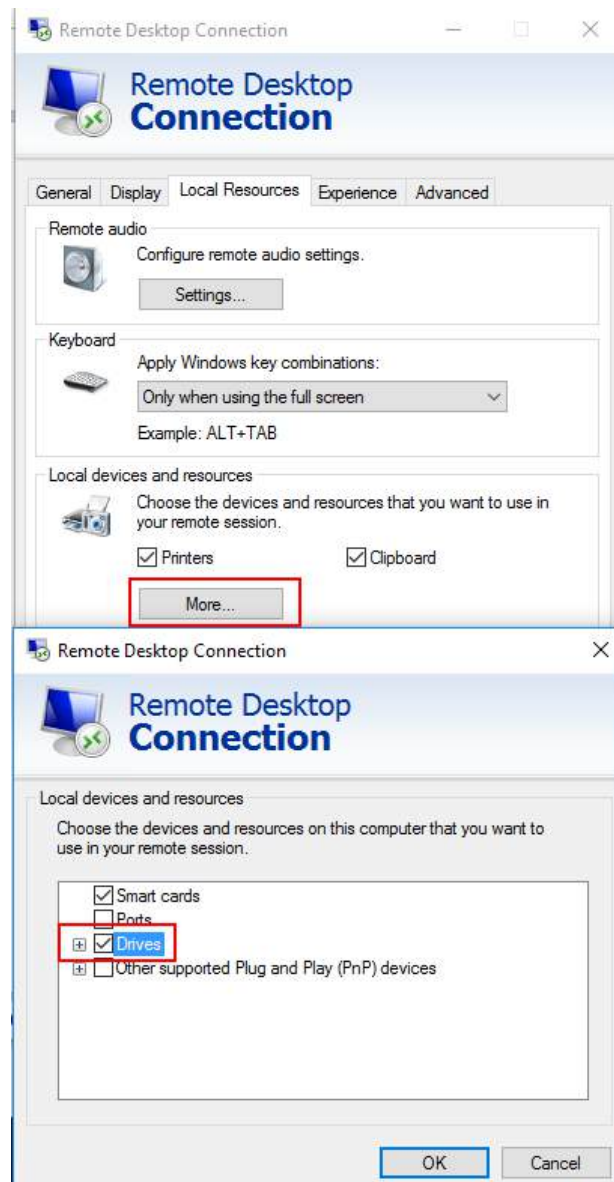


1. 
Select the "Windows" icon in the toolbar to access the operating system.
2. From the "Start" menu, select "All Programs" > "Accessories" > "Remote Desktop Connection".
The "Remote Desktop Connection" dialog box is displayed.
3. Select "Options >>".
The dialog box is expanded to display the configuration data.



4. Open the "Experience" tab.
The settings on this tab select and optimize the connection speed.
5. In the list, select the appropriate connection (for example: "LAN (10 Mbps or higher)").
Depending on your selection (and how powerful the connection is), the options are activated or deactivated.
6. To improve the performance, you can deactivate the "Desktop background", "Show contents of window while dragging" and "Menu and window animation" options.
7. Open the "Local Resources" tab to enable printers, local drives and serial interfaces.
8. To access drives of the controller from the R&S EPL, e.g. to store settings or to copy files from the controller to the R&S EPL:

a) Select "More".



b) Enable the "Drives" option.

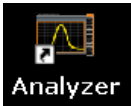
Windows maps drives of the controller to the corresponding network drives.

9. To use printers connected to the controller while accessing them from the R&S EPL, activate the "Printers" option. Do not change the remaining settings.
10. Open the "Display" tab.
The options for configuring the R&S EPL screen display are displayed.
11. Under "Remote desktop size", you can set the size of the R&S EPL window on the desktop of the controller.
12. Under "Colors", do not change the settings.
13. Set the "Display the connection bar when I use the full screen" option:

- If activated, a bar showing the network address of the R&S EPL appears at the top edge of the screen. You can use this bar to reduce, minimize or close the window.
- If deactivated, the only way you can return to the controller desktop from the R&S EPL screen in full screen mode is to select "Disconnect" from the "Start" menu.

14.6.7.3 How to start and close the remote desktop

To set up a connection to the R&S EPL

1. In the "Remote Desktop Connection" dialog box (see [Section 14.6.7.2, "How to configure the controller"](#), on page 375), open the "General" tab.
2. In the "Computer" field, enter the IP address of the R&S EPL.
In the "User name" field, enter *instrument* to log in as an administrator, or *Normal User* to log in as a standard user.
In the "Password" field, enter *894129*.
3. To save the connection configuration for later use:
 - a) Select "Save As".
The "Save As" dialog box is displayed.
 - b) Enter the name for the connection information (*.rdp).
4. To load an existing connection configuration:
 - a) Select "Open".
The "Open" dialog box is displayed.
 - b) Select the *.rdp file.
5. Select "Connect".
The connection is set up.
6. If the "Disk drives" option is enabled on the "Local Resources" tab, a warning is displayed indicating that the drives are enabled for access from the R&S EPL.
Select "OK" to confirm the warning.
After a few moments, the R&S EPL screen is displayed.
7. If a dark screen appears or a dark square appears in the upper left-hand corner of the screen, restart the R&S EPL to see the modified screen resolution.
 - a) Press the key combination [ALT] + [F4].
The R&S EPL firmware is shut down, which can take a few seconds.
 - b) The icon shows a yellow waveform on a black background with a small white square in the bottom left corner. Below the icon is the word "Analyzer" in white text.

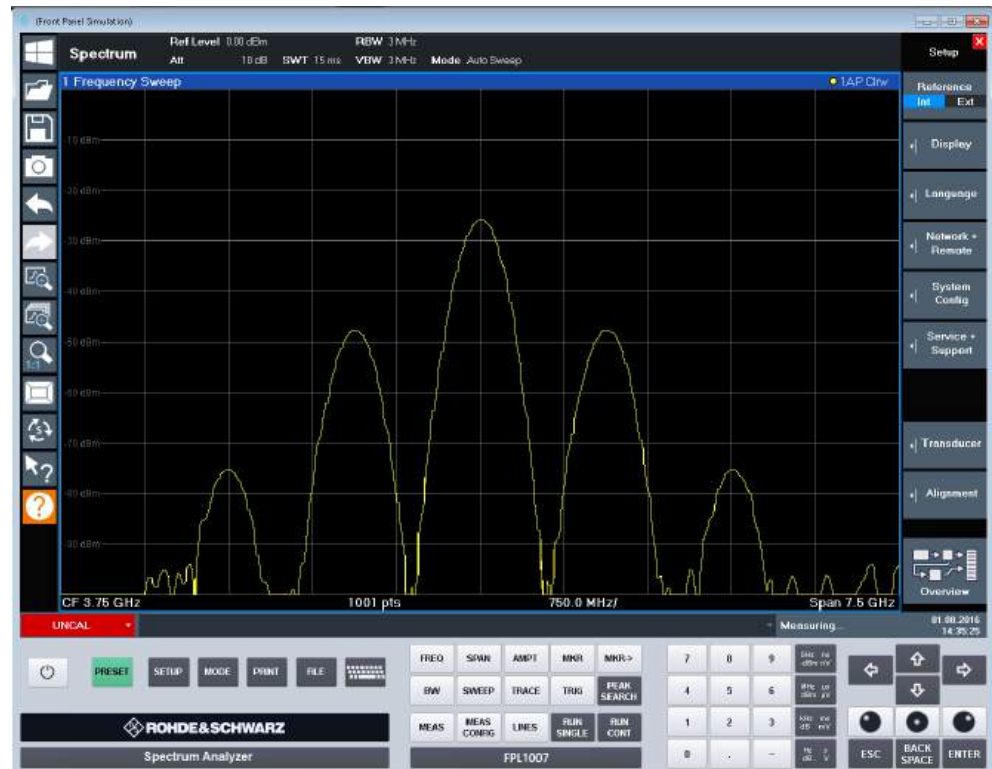
On the desktop, double-tap the "Analyzer" icon.

The firmware restarts and then automatically opens the "Softfrontpanel", i.e. the user interface on which all front panel controls and the rotary knob are mapped to buttons.

For more information, see [Section 13.2.2, "How to work with the soft front panels"](#), on page 294.

8. To deactivate or activate the "Softfrontpanel", press [F6].

After the connection is established, the R&S EPL screen is displayed in the "Remote Desktop" application window.



To access the Windows "Start" menu, expand the "Remote Desktop" window to full size.

During the connection with the controller, the login dialog box is displayed on the R&S EPL screen.

To terminate Remote Desktop control

The controller or a user at the R&S EPL can terminate the remote connection:

- ▶ ● On the controller, close the "Remote Desktop" window at any time.
The connection to the R&S EPL is terminated.
- On the R&S EPL, log on.
The connection to the controller is terminated. A message is displayed on the controller display indicating that another user has assumed control of the instrument.

Restoring the connection to the R&S EPL

Follow the instructions above to set up a connection to the R&S EPL. If the connection is terminated and then restored, the R&S EPL remains in the same state.

14.6.7.4 How to shut down the R&S EPL via remote operation

1. Select the R&S EPL softfrontpanel.
2. Close the application with the key combination [ALT] + [F4].
3. Select the desktop.
4. Press the key combination [ALT] + [F4].
A safety query is displayed to warn you that the instrument cannot be reactivated via remote operation and asks you whether you want to continue the shutdown process.
5. Respond to the safety query with "Yes".
The connection with the controller is terminated and the R&S EPL is shut down.

14.6.8 How to start a remote control session from a PC

When you switch on the R&S EPL, it is always in manual operation state ("local" state) and can be operated via the front panel.

To start remote control

1. Send an addressed command (`GTR` - Go to Remote) from a controller to the instrument.
The instrument is switched to remote control ("remote" state). Operation via the front panel is disabled. Only the "Local" softkey is displayed to return to manual operation. The instrument remains in the remote state until it is reset to the manual state via the instrument or via remote control interfaces. Switching from manual operation to remote control and vice versa does not affect the other instrument settings.
2. During program execution, send the `SYSTem:DISPlay:UPDate ON` command to activate the display of results (see [SYSTem:DISPlay:UPDate](#) on page 604).
The changes in the device settings and the recorded measurement values are displayed on the instrument screen.
3. To obtain optimum performance during remote control, send the `SYSTem:DISPlay:UPDate OFF` command to hide the display of results and diagrams again (default setting in remote control).
4. To prevent unintentional return to manual operation, disable the keys of the instrument using the universal command `LLO`.

Switching to manual mode is only possible via remote control then. This function is only available for the GPIB interface.

5. To enable the keys of the R&S EPL again, switch the instrument to local mode (GTL - Go to Local), i.e. deactivate the REN line of the remote control interface.



If the instrument is operated exclusively in remote control, it is recommended that you switch off the display. For details see ["Remote Display Update"](#) on page 354.

14.6.9 How to return to manual operation

Before you switch back to manual operation, all remote command processing must be completed. Otherwise, the instrument switches back to remote control immediately.

- ● Manual operation: Select "Local".
- Remote operation: Use the following GPIB command:

```
status = viGpibControlREN(vi, VI_GPIB_REN_ADDRESS_GTL)
```



If you select "Local" while a self-alignment or a self-test is still running (which was started remotely), the instrument only returns to the manual operation state when the alignment or test is completed.

15 Remote commands in the receiver application

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15.1 Conventions used in SCPI command descriptions

The following conventions are used in the remote command descriptions:

- *Command usage*
If not specified otherwise, commands can be used both for setting and for querying parameters.
If a command can be used for setting or querying only, or if it initiates an event, the usage is stated explicitly.
- *Parameter usage*
If not specified otherwise, a parameter can be used to set a value, and it is the result of a query.
Parameters required only for setting are indicated as "Setting parameters".
Parameters required only to refine a query are indicated as "Query parameters".
Parameters that are only returned as the result of a query are indicated as "Return values".
- *Conformity*
Commands that are taken from the SCPI standard are indicated as "SCPI confirmed". All commands used by the R&S EPL follow the SCPI syntax rules.
- *Asynchronous commands*
A command which does not automatically finish executing before the next command starts executing (overlapping command) is indicated as an "Asynchronous command".
- *Reset values (*RST)*
Default parameter values that are used directly after resetting the instrument (*RST command) are indicated as "*RST" values, if available.
- *Default unit*
The default unit is used for numeric values if no other unit is provided with the parameter.

- *Manual operation*

If the result of a remote command can also be achieved in manual operation, a link to the description is inserted.

15.2 Common suffixes

In the Receiver application, the following common suffixes are used in remote commands:

Table 15-1: Common suffixes used in remote commands in the Receiver application

Suffix	Value range	Description
<m>	1..16	Marker
<n>	1..16	Window (in the currently selected channel setup)
<t>	1..6	Trace
	1 to 8	Limit line
<k>	1..8 (Limit line) 1 2 (Display line)	Selects a limit or display line.
<pk>	1..3000	Selects a peak.
<ou>	irrelevant	



Selecting windows in multiple channel setups

Note that the suffix <n> always refers to a window in the currently selected channel setup.

15.3 Common commands

Common commands are described in the IEEE 488.2 (IEC 625-2) standard. These commands have the same effect and are employed in the same way on different devices. The headers of these commands consist of "*" followed by three letters. Many common commands are related to the Status Reporting System.

Available common commands:

*CAL?	384
*CLS	384
*ESE	384
*ESR?	384
*IDN?	385
*IST?	385
*OPC	385
*OPT?	385
*PCB	386
*PRE	386

*PSC.....	386
*RST.....	386
*SRE.....	386
*STB?.....	387
*TRG.....	387
*TST?.....	387
*WAI.....	387

*CAL?

Calibration query

Initiates a calibration of the instrument and then queries the calibration status. Responses > 0 indicate errors.

Note: If you start a self-alignment remotely, then select the "Local" softkey while the alignment is still running, the instrument only returns to the manual operation state after the alignment is completed.

Usage: Query only

Manual operation: See ["Start Self Alignment"](#) on page 324

*CLS

Clear status

Sets the status byte (STB), the standard event register (ESR) and the `EVENT` part of the `QUESTIONABLE` and the `OPERATION` registers to zero. The command does not alter the mask and transition parts of the registers. It clears the output buffer.

Usage: Setting only

*ESE <Value>

Event status enable

Sets the event status enable register to the specified value. The query returns the contents of the event status enable register in decimal form.

Parameters:

<Value> Range: 0 to 255

*ESR?

Event status read

Returns the contents of the event status register in decimal form and then sets the register to zero.

Return values:

<Contents> Range: 0 to 255

Usage: Query only

***IDN?**

Identification

Returns the instrument identification.

Return values:

<ID> "Rohde&Schwarz,<device type>,<part number>/<serial number>,<firmware version>"

Example: Rohde&Schwarz,EPL1000,1350.4444K10/100005,1.50

Usage: Query only

***IST?**

Individual status query

Returns the contents of the IST flag in decimal form. The IST flag is the status bit which is sent during a parallel poll.

Return values:

<ISTflag> 0 | 1

Usage: Query only

***OPC**

Operation complete

Sets bit 0 in the event status register when all preceding commands have been executed. This bit can be used to initiate a service request. The query writes a "1" into the output buffer when all preceding commands have been executed, which is useful for command synchronization.

***OPT?**

Option identification query

Queries the options included in the instrument. For a list of all available options and their description, refer to the specifications document.

Return values:

<Options> The query returns a list of all installed and activated options, separated by commas, where:
 B<number> describes hardware options.
 K<number> describes software options.
 Note that K9 (Power Meter), K14 (Spectrograms), and K54 (EMI measurement) are displayed for compatibility reasons only; in fact, they are standard functionality of the R&S EPL base unit and do not require additional ordering.

Usage: Query only

***PCB <Address>**

Pass control back

Indicates the controller address to which remote control is returned after termination of the triggered action.

Setting parameters:

<Address> Range: 0 to 30

Usage: Setting only

***PRE <Value>**

Parallel poll register enable

Sets parallel poll enable register to the indicated value. The query returns the contents of the parallel poll enable register in decimal form.

Parameters:

<Value> Range: 0 to 255

***PSC <Action>**

Power on status clear

Determines whether the contents of the `ENABLE` registers are preserved or reset when the instrument is switched on. Thus a service request can be triggered when the instrument is switched on, if the status registers ESE and SRE are suitably configured. The query reads out the contents of the "power-on-status-clear" flag.

Parameters:

<Action> 0 | 1

0

The contents of the status registers are preserved.

1

Resets the status registers.

***RST**

Reset

Sets the instrument to a defined default status. The default settings are indicated in the description of commands.

The command is equivalent to `SYSTEM:PRESet`.

Usage: Setting only

***SRE <Contents>**

Service request enable

Sets the service request enable register to the indicated value. This command determines under which conditions a service request is triggered.

Parameters:

<Contents> Contents of the service request enable register in decimal form.
 Bit 6 (MSS mask bit) is always 0.
 Range: 0 to 255

***STB?**

Status byte query

Reads the contents of the status byte in decimal form.

Usage: Query only

***TRG**

Trigger

Triggers all actions waiting for a trigger event. In particular, *TRG generates a manual trigger signal. This common command complements the commands of the TRIGger subsystem.

*TRG corresponds to the INITiate:IMMediate command.

Usage: Event

***TST?**

Self-test query

Initiates self-tests of the instrument and returns an error code.

Note: If you start a self-test remotely, then select the "Local" softkey while the test is still running, the instrument only returns to the manual operation state after the test is completed. In this case, you cannot abort the self-test.

Return values:

<ErrorCode> **integer > 0 (in decimal format)**
 An error occurred.
 0
 No errors occurred.

Usage: Query only

***WAI**

Wait to continue

Prevents servicing of the subsequent commands until all preceding commands have been executed and all signals have settled (see also command synchronization and *OPC).

Usage: Event

15.4 Application selection

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INSTrument:CREate:DUPLicate.....	388
INSTrument:CREate[:NEW].....	388
INSTrument:CREate:REPLace.....	389
INSTrument:DELeTe.....	389
INSTrument:LIST?.....	390
INSTrument:REName.....	390
INSTrument[:SELeCt].....	391
CALCulate:STATistics:CAPD[:STATe].....	391

DISPlay:ATAB <State>

This command switches between the MultiView tab and the most recently displayed channel setup. If only one channel setup is active, this command has no effect.

Parameters:

<State> ON | OFF | 0 | 1
 OFF | 0
 Switches off the function.
 ON | 1
 Switches on the function.

INSTrument:CREate:DUPLicate

Duplicates the currently selected channel setup, i.e creates a new channel setup of the same type and with the identical measurement settings. The name of the new channel setup is the same as the copied channel setup, extended by a consecutive number (e.g. "IQAnalyzer" -> "IQAnalyzer 2").

The channel setup to be duplicated must be selected first using the `INST:SEL` command.

Example: `INST:SEL 'Receiver'`
 `INST:CRE:DUPL`
 Duplicates the channel setup named 'Receiver' and creates a new channel setup named 'Receiver 2'.

Usage: Event

Manual operation: See ["Duplicate Current Channel"](#) on page 79

INSTrument:CREate[:NEW] <ChannelType>, <ChannelName>

Adds a measurement channel. You can configure up to 10 measurement channels at the same time (depending on available memory).

See also

- [INSTrument\[:SElect\]](#) on page 391
- [INSTrument:DElete](#) on page 389

Parameters:

- <ChannelType> Channel type of the new channel.
For a list of available channel types, see [INSTrument:LIST?](#) on page 390.
- <ChannelName> String containing the name of the channel.
Note that you cannot assign an existing channel name to a new channel. If you do, an error occurs.

Example: `INST:CRE SAN, 'Spectrum 2'`
Adds a spectrum display named "Spectrum 2".

Manual operation: See ["New Channel setup"](#) on page 79

INSTrument:CREate:REPLace <ChannelName1>, <ChannelType>,
<ChannelName2>

Replaces a channel setup with another one.

Setting parameters:

- <ChannelName1> String containing the name of the channel setup you want to replace.
- <ChannelType> Channel type of the new channel setup.
For a list of available channel setup types, see [INSTrument:LIST?](#) on page 390.
- <ChannelName2> String containing the name of the new channel setup.
Note: If the specified name for a new channel setup already exists, the default name, extended by a sequential number, is used for the new channel setup (see [INSTrument:LIST?](#) on page 390).
Channel names can have a maximum of 31 characters, and must be compatible with the Windows conventions for file names. In particular, they must not contain special characters such as ":", "*", "?".

Example: `INST:CRE:REPL 'Receiver', REC, 'REC2'`
Replaces the channel setup named "Receiver" by a new channel setup of type "Receiver" named "REC2".

Usage: Setting only

Manual operation: See ["Replace Current Channel setup"](#) on page 79

INSTrument:DELeTe <ChannelName>

Deletes a channel setup.

If you delete the last channel setup, the default "Receiver" channel setup is activated.

Setting parameters:

<ChannelName> String containing the name of the channel setup you want to delete.
A channel setup must exist to delete it.

Example:

```
INST:DEL 'Receiver'
```

Deletes the channel setup with the name 'Receiver'.

Usage:

Setting only

INSTrument:LIST?

Queries all active channel setups. The query is useful to obtain the names of the existing channel setups, which are required to replace or delete the channel setups.

Return values:

<ChannelType>, For each channel setup, the command returns the channel setup type and channel setup name (see tables below).
<ChannelName>

Tip: to change the channel setup name, use the [INSTrument:REName](#) command.

Example:

```
INST:LIST?
```

Result for 2 channel setups:

```
'REC', 'Receiver', 'REC', 'Receiver 2'
```

Usage:

Query only

Table 15-2: Available channel setup types and default channel setup names

Application	<ChannelType> Parameter	Default Channel setup Name*)
Analog Modulation Analysis	ADEMod	Analog Demod
Click Rate Analyzer	CRANalyzer	Click Rate Analyzer
I/Q Analyzer	IQ	IQ Analyzer
Real-Time Spectrogram	RTSGram	Real-Time Spectrogram
Receiver	RECeiver	Receiver
Spectrum	SANalyzer	Spectrum
Note: the default channel setup name is also listed in the table. If the specified name for a new channel setup already exists, the default name, extended by a sequential number, is used for the new channel setup.		

INSTrument:REName <ChannelName1>, <ChannelName2>

Renames a channel setup.

Setting parameters:

<ChannelName1> String containing the name of the channel setup you want to rename.

<ChannelName2> String containing the new channel setup name.
 Note that you cannot assign an existing channel setup name to a new channel setup. If you do, an error occurs.
 Channel names can have a maximum of 31 characters, and must be compatible with the Windows conventions for file names. In particular, they must not contain special characters such as ":", "*", "?".

Example: `INST:REN 'Receiver', 'REC'`
 Renames the channel setup with the name 'Receiver' to 'REC'.

Usage: Setting only

INSTrument[:SElect] <ChannelType> | <ChannelName>

Activates a new channel setup with the defined channel setup type, or selects an existing channel setup with the specified name.

Also see

- [INSTrument:CREate\[:NEW\]](#) on page 388

Parameters:

<ChannelType> Channel type of the new channel setup.
 For a list of available channel setup types see [INSTrument:LIST?](#) on page 390.

<ChannelName> String containing the name of the channel setup.

Example: `INST IQ`
 Activates a channel setup for the I/Q Analyzer application (evaluation mode).
`INST 'MyIQSpectrum'`
 Selects the channel setup named 'MyIQSpectrum' (for example before executing further commands for that channel setup).

Manual operation: See ["Receiver"](#) on page 76
 See ["Spectrum"](#) on page 77
 See ["AM/FM/PM analog demod"](#) on page 77
 See ["CISPR APD"](#) on page 77
 See ["Click Rate Analyzer"](#) on page 77
 See ["I/Q analyzer"](#) on page 77
 See ["Real-Time Spectrogram"](#) on page 77
 See ["New Channel setup"](#) on page 79

CALCulate:STATistics:CAPD[:STATe] <State>

This command creates a new measurement channel for the CISPR APD measurement.

Note that this is only possible from within a selected spectrum channel.

Parameters:

<State> ON | OFF
 OFF returns to the spectrum application.
 *RST: OFF

Example:

```
INST:CRE SAN, 'Spectrum'
INST 'Spectrum'
Creates and selects the Spectrum channel.
CALC:STAT:CAPD ON
Opens a CISPR APD channel.
```

15.5 Measurements and result displays

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15.5.1 Measurement control

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INITiate<mt>[:IMMediate]	395

ABORT

This command aborts the measurement in the current measurement channel and resets the trigger system.

To prevent overlapping execution of the subsequent command before the measurement has been aborted successfully, use the *OPC or *WAI command after ABORT and before the next command.

To abort a sequence of measurements by the Sequencer, use the `INITiate:SEQuencer:ABORt` command.

Note on blocked remote control programs:

If a sequential command cannot be completed, for example because a triggered sweep never receives a trigger, the remote control program will never finish. The remote channel to the R&S EPL is blocked for further commands. In this case, you must interrupt processing on the remote channel first to abort the measurement.

To do so, send a "Device Clear" command from the control instrument to the R&S EPL on a parallel channel to clear all currently active remote channels. Depending on the used interface and protocol, send the following commands:

- **Visa:** `viClear()`
- **GPIB:** `ibclr()`
- **RSIB:** `RSDLLibclr()`

Now you can send the `ABORt` command on the remote channel that runs the measurement.

Example: `ABOR;INIT:IMM`
Aborts the measurement and restarts it.

Usage: Event

HOLD

Interrupts (holds) a scan.

To resume the scan, use `INITiate<mt>[:IMMediate]` on page 395.

Example: `HOLD`
Interrupts the scan.

Usage: Event

INITiate<mt>:CONMeas

This command resumes a scan that was interrupted by a transducer stop at the current receiver frequency.

If the scan was interrupted by the `HOLD` command, you have to resume it with `INITiate<mt>[:IMMediate]`.

Suffix:
`<mt>` `INITiate1` is irrelevant.
`INITiate2` resumes the scan.

Example: //Configure a single measurement that is averaged over 20 measurements
 INIT2:CONT OFF
 SWE:COUN 20
 //Start the measurement and wait for the end of the 20 scans
 INIT2;*WAI
 //Continue the measurement (next 20 sequences) and wait for the end
 INIT2:CONM;*WAI

Usage: Event

INITiate<n>:CONTinuous <State>

Controls the measurement mode for an individual channel setup.

Note that in single measurement mode, you can synchronize to the end of the measurement with *OPC, *OPC? or *WAI. In continuous measurement mode, synchronization to the end of the measurement is not possible. Thus, it is not recommended that you use continuous measurement mode in remote control, as results like trace data or markers are only valid after a single measurement end synchronization.

For details on synchronization see [Remote control via SCPI](#).

If the measurement mode is changed for a channel setup while the Sequencer is active (see [INITiate:SEQuencer:IMMediate](#) on page 397), the mode is only considered the next time the measurement in that channel setup is activated by the Sequencer.

Suffix:

<n> irrelevant

Parameters:

<State> ON | OFF | 0 | 1
 ON | 1
 Continuous measurement
 OFF | 0
 Single measurement
 *RST: 0

Example: INIT:CONT OFF
 Switches the measurement mode to single measurement.
 INIT:CONT ON
 Switches the measurement mode to continuous measurement.

Manual operation: See ["Performing continuous measurements"](#) on page 84
 See ["Performing single measurements"](#) on page 85

INITiate<mt>:EMITest

This command initiates an automated test sequence.

The sequence consists of a scan, a peak search and a final measurement.

When you are running a continuous measurement, you have to stop the scan deliberately (with [ABORT](#) on page 392) before the peak search is performed. For a single measurement, the R&S EPL automatically performs the peak search after number of scans defined by the scan count has been performed.

Suffix:

<mt> irrelevant

Example:

```
//Start the test sequence
INIT2:EMIT
```

Usage:

Event

Manual operation: See ["Performing single measurements"](#) on page 85

INITiate<mt>:FMEasurement

This command initiates a final measurement based on the peak list.

Suffix:

<mt> irrelevant

Example:

```
//Start the final measurement
INIT2:FME
```

Usage:

Event

Manual operation: See ["Performing single measurements"](#) on page 85

INITiate<mt>[:IMMediate]

The command initiates a new measurement.

For a single measurement, the R&S EPL stops measuring when it has reached the end frequency. When you start a continuous measurement, it stops only if you abort it deliberately.

If you are using trace modes MAXHold, MINHold and AVERage, previous results are reset when you restart the measurement.

- **Single measurements**

Synchronization to the end of the measurement is possible with *OPC, *OPC? or *WAI.

- **Continuous measurements**

Synchronization to the end of the measurement is not possible.

It is thus recommended to use a single measurement for remote controlled measurements, because results like trace data or markers are only valid after synchronization.

Suffix:

<mt> INITiate1 initiates a bargraph measurement.
INITiate2 initiates a scan.

Example: //Start a single scan (with a scan count = 20), and wait until the measurement is done
 INIT2:CONT OFF
 SWE:COUN 20
 INIT2;*WAI

Usage: Event

Manual operation: See "Performing continuous measurements" on page 84
 See "Performing single measurements" on page 85

15.5.2 Measurement sequences

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CONFigure:RECeiver:MEASurement[:DEFAult] <Measurement>

This command selects the measurement performed in a receiver channel during measurement sequences.

[More information](#)

Parameters:

<Measurement> **BARGraph**
 Performs a bargraph measurement.

NONE
 Performs no measurement.

SCAN
 Performs a scan.

 *RST: SCAN

Example: //Perform a bargraph measurement in a measurement sequence
 CONF:REC:MEAS BARG

INITiate:SEQuencer:ABORt

Stops the currently active sequence of measurements.

You can start a new sequence any time using [INITiate:SEQuencer:IMMediate](#) on page 397.

Usage: Event

Manual operation: See "[Sequencer State](#)" on page 82

INITiate:SEQuencer:IMMediate

Starts a new sequence of measurements by the Sequencer.

Before this command can be executed, the Sequencer must be activated (see [SYSTem:SEQuencer](#) on page 397).

Example:

```
SYST:SEQ ON
```

Activates the Sequencer.

```
INIT:SEQ:MODE SING
```

Sets single sequence mode so each active measurement is performed once.

```
INIT:SEQ:IMM
```

Starts the sequential measurements.

Manual operation: See ["Sequencer State"](#) on page 82

INITiate:SEQuencer:MODE <Mode>

Defines the capture mode for the entire measurement sequence and all measurement groups and channels it contains.

Note: To synchronize to the end of a measurement sequence using *OPC, *OPC? or *WAI, use `SINGLE` Sequencer mode.

Parameters:

<Mode>

SINGLE

Each measurement group is started one after the other in the order of definition. All measurement channels in a group are started simultaneously and performed once. After *all* measurements are completed, the next group is started. After the last group, the measurement sequence is finished.

CONTInuous

Each measurement group is started one after the other in the order of definition. All measurement channels in a group are started simultaneously and performed once. After *all* measurements are completed, the next group is started. After the last group, the measurement sequence restarts with the first one and continues until it is stopped explicitly.

*RST: CONTInuous

Manual operation: See ["Sequencer Mode"](#) on page 82

SYSTem:SEQuencer <State>

Turns the Sequencer on and off. The Sequencer must be active before any other Sequencer commands (`INIT:SEQ. . .`) are executed, otherwise an error occurs.

A detailed programming example is provided in [Section 15.5.14, "Programming example: performing a sequence of measurements"](#), on page 436.

Parameters:

<State> ON | OFF | 0 | 1

ON | 1
The Sequencer is activated and a sequential measurement is started immediately.

OFF | 0
The Sequencer is deactivated. Any running sequential measurements are stopped. Further Sequencer commands (INIT:SEQ...) are not available.

*RST: 0

Example:

```
SYST:SEQ ON
Activates the Sequencer.
INIT:SEQ:MODE SING
Sets single Sequencer mode so each active measurement is
performed once.
INIT:SEQ:IMM
Starts the sequential measurements.
SYST:SEQ OFF
```

Manual operation: See ["Sequencer State"](#) on page 82

15.5.3 Result retrieval

- [Trace data and result query](#)..... 398

15.5.3.1 Trace data and result query

This section contains information on the TRACe:DATA command and a detailed description of the characteristics of that command. Basically, the command queries the results of the current measurement. The command supports various SCPI parameters in combination with the query. Each SCPI parameter returns a different aspect of the measurement.

The format of the return values is either in ASCII or binary characters and depends on the format you have set with [FORMat \[:DATA\]](#) on page 536.

Querying trace data

The SCPI parameters TRACE1 | ... | TRACE6 return the trace data for the corresponding trace.

Example:

```
TRAC? TRACE1
```

The number of results depends on the currently selected number of sweep points. For each sweep point, the command returns one level value. The unit depends on the measurement and on the unit you have currently set.

The trace has to be active for the command to work.

When you have selected `trace modeTRD`, only the `TRACE1` parameter is available. It returns the characteristics of the transducer's correction values over the currently selected frequency range.

Querying bargraph results

The SCPI parameters `SINGLE` and `PHOLD` return the results of the bargraph measurement.

`SINGLE` returns the current bargraph results for each active bargraph detector.

The order of detectors is the following:

1. Max Peak
2. Min Peak
3. Quasi-Peak
4. Average
5. RMS
6. CISPR AV
7. RMS Average

Example:

```
TRAC? SINGLE
```

`PHOLD` returns the bargraph maxhold results for each active bargraph detector.

Each result is made up out of two values:

- Absolute level
- Frequency

The order of detectors is as shown in the user interface. Inactive detectors are ignored.

Example:

```
TRAC? PHOLD
```

Querying scan characteristics

The SCPI parameter `SCAN` returns the scan characteristics while the scan is running.



In order to use this command, it is first necessary to enable the block data transfer. This is done by `TRACe<n>:FEED:CONTrol ALWays`.

The number of returned results depends on the scan settings.

The type of returned data is as follows:

- 4 byte, trace status:
 - bit 0 to 9 represent the number of the scan range
 - bit 10 represents the last block of a scan range
 - bit 11 represents the last block of the last scan range
 - bit 12 represents the last of all blocks (for multiple scans after the last scan)
- When number of scan ranges greater than 10:
 - bit 16 to 31 represent a value that has to be added to the bit coded range number (bit 0 to bit 9) to get the number of scan ranges. Example: bit 16 to 31 represent the value "20", bit 0 to 9 represent the value "5"; in that case, the complete number of scan ranges is "25".
- 4 byte, number n of measurement results contained in one trace
- 4 byte, bit 0 represents the state of trace 1 (0/1)
- 4 byte, bit 0 represents the state of trace 2 (0/1)
- 4 byte, bit 0 represents the state of trace 3 (0/1)
- 4 byte, bit 0 represents the state of trace 4 (0/1)
- **Note:**
If more than 4 traces are active, the state of trace 5 and 6 is indicated by an additional bit (bit 8) in the UINT32 field of trace 1 and 2.
- $n \times 4$ byte, measurement results for trace 1; only if trace 1 is active
- $n \times 4$ byte, measurement results for trace 2; only if trace 2 is active
- $n \times 4$ byte, measurement results for trace 3; only if trace 3 is active
- $n \times 4$ byte, measurement results for trace 4; only if trace 4 is active
- $n \times 4$ byte, measurement results for trace 5; only if trace 5 is active
- $n \times 4$ byte, measurement results for trace 6; only if trace 6 is active
- $n \times 1$ byte, status information for each measurement result
 - bit 2 represents overrange for trace 1 to trace 6

The data is always returned in binary format ([FORM REAL, 32](#)).

Note that the `SCAN` parameter only works while the scan is actually running.

Note:

To ensure proper execution of the command, the following commands must be executed in a specific order.

1. `TRAC:FEED:CONT ALW`
2. `INIT2:IMM`
3. `TRAC? SCAN`

Example:

`TRAC? SCAN`

Querying results for a peak search

The SCPI parameters `PLIST1` | ... | `PLIST6` returns the results of a peak search for a particular trace or detector (1 to 6).

Each result is made up out of three values:

- 4 byte, frequency
- 4 byte, absolute level
- 4 byte, Delta between absolute level and limit line value at corresponding frequency
If no limit line is active, the delta value is set to 0.0

The trace has to be active for the command to work.

Example:

```
TRAC? PLIST3
```

Querying results for the final measurement

The SCPI parameters `FINAL1` | ... | `FINAL6` return the results of the final measurement for a particular trace or detector (1 to 6).

Each result is made up out of three values:

- 4 byte, frequency
- 4 byte, absolute level
- 4 byte, Delta between absolute level and limit line value at corresponding frequency
If no limit line is active, the delta value is set to 0.0

The trace has to be active for the command to work.

Querying the status of the measurement results

The SCPI parameter `STATUS` returns the status information for each measurement result. Thus, the number of returned values depends on the number of measurement results n . For each measurement result, the parameter queries 1 byte of status information.

→ bit 2 represents overrange for trace 1 to trace 6.

Note that the `SCAN` parameter only works while the scan is actually running.

Example:

```
TRAC? STATUS
```

Querying spectrogram data

The SCPI parameter `SGRam` returns the contents of the spectrogram.

For every frame (horizontal line) in the spectrogram, the command returns the power levels that have been measured, one for each sweep or measurement point. The number of frames depends on the size of the history depth. The power level depends on the unit that you have currently set.

Querying LISN settings

The SCPI parameters PHASe1 to PHASe6 return the LISN settings for each phase.

If trace mode "Max Hold" is selected, the R&S EPL combines the maximum values for the measurements run on each phase into a single trace containing all phases.

TRACe<n>[:DATA]? <ResultType>

This command queries current trace data and measurement results.

The data format depends on FORMat[:DATA].

Reading out trace data in IF analysis is possible with TRACe<n>:IF[:DATA].

Suffix:

<n> [Window](#)

Query parameters:

<ResultType>

TRACE1 | ... | TRACE6

See ["Querying trace data"](#) on page 398.

FINAL1 | ... | FINAL6

See ["Querying results for the final measurement"](#) on page 401.

PLIST1 | ... | PLIST6

See ["Querying results for a peak search"](#) on page 401.

PHASe1 | ... | PHASe6

See ["Querying LISN settings"](#) on page 402.

PHOLD

See ["Querying bargraph results"](#) on page 399.

SCAN

See ["Querying scan characteristics"](#) on page 399.

SGRam | SPECTrogram

See ["Querying spectrogram data"](#) on page 401.

SINGLE

See ["Querying bargraph results"](#) on page 399.

STATus

See ["Querying scan characteristics"](#) on page 399.

Return values:

<Result>

Example:

//Query level for each trace point of trace 1.

TRAC? TRACE1

Usage:

Query only

TRACe<n>:FEED:CONTrol <Occasion>

This command turns block data transmission during a scan on and off.

The availability of data is reported in the STATus:OPERation register.

The block size depends on scan time and the upper limit defined by `TRACe<n>:POINTs` on page 403.

Suffix:

<n> irrelevant

Parameters:

<Occasion>

ALWays

Block data transmission is on.

NEVer

Block data transmission is off.

*RST: NEVer

Example:

//Select block data transmission

TRAC:FEED:CONT ALW

TRACe<n>:IF[:DATA] <ResultType>

This command queries current trace data and measurement results for IF analysis.

The data format depends on `FORMat[:DATA]`.

Suffix:

<n> 1..n
irrelevant

Parameters:

<ResultType>

TRACE1 | ... | TRACE3

Returns the level values displayed on the corresponding trace.

Example:

//Query the level for each trace point of trace 1

TRAC:IF? TRACE1

TRACe<n>:POINTs <LiMit>, <Points>

This command defines the maximum number of measurement points that are transferred in one block after using `TRAC? SCAN`.

The total number of bytes which is transferred depends on the number of active traces.

Suffix:

<n> irrelevant

Parameters:

<LiMit>

<Points>

Range: 1 to 10000

*RST: 1000

Example:

//Transfer a maximum of 8000 measurement values per trace with a single query

TRAC:POIN LIM, 8000

15.5.4 Bargraph configuration

DISPlay:BARGraph:LEVel:LOWer?	404
DISPlay:BARGraph:LEVel:UPPer?	404
DISPlay:BARGraph:PHOLd:RESet	404
DISPlay:BARGraph:PHOLd[:STATe]	405
DISPlay:BARGraph:TCOupling[:STATe]	405
[SENSe:]DETEctor<t>:RECEiver[:FUNCTion]	405
[SENSe:]SWEep:TIME	406

DISPlay:BARGraph:LEVel:LOWer?

This command queries the level range of the bargraph.

Return values:

<Level> Lowest level displayed on the bargraph scale.
 Default unit: depends on the selected unit

Example:

//Query bargraph minimum level
 DISP: BARG: LEV: LOW?
 would return, e.g.
 10

Usage: Query only

DISPlay:BARGraph:LEVel:UPPer?

This command queries the level range of the bargraph.

Return values:

<Level> Highest level displayed on the bargraph scale.
 Default unit: depends on the selected unit

Example:

//Query bargraph peak level
 DISP: BARG: LEV: UPP?
 would return, e.g.
 110

Usage: Query only

DISPlay:BARGraph:PHOLd:RESet

This command resets the bargraph max hold.

Example:

//Reset the max hold value
 DISP: BARG: PHOL: RES

Usage: Event

Manual operation: See ["Bargraph Max Hold"](#) on page 89

DISPlay:BARGraph:PHOLd[:STATe] <State>

This command turns the bargraph max hold function on and off.

Parameters:

<State> ON | OFF | 1 | 0
*RST: OFF

Example: //Turn on the bargraph max hold
 DISP:BARG:PHOL ON

Manual operation: See ["Bargraph Max Hold"](#) on page 89

DISPlay:BARGraph:TCOupling[:STATe] <State>

This command couples or decouples the bargraph detector and trace detector used for the scan.

Parameters:

<State> ON | OFF | 1 | 0
*RST: OFF

Example: //Couple the type and color of bargraph and scan trace
 DISP:BARG:TCO ON

Manual operation: See ["Couple to Scan Trace"](#) on page 89

[SENSe:]DETEctor<t>:RECEiver[:FUNCTion] <Detector>...

This command selects the detector for the bargraph measurement.

Suffix:

<t> [Trace](#)

Parameters:

<Detector> You can select up to four detectors, one for each active bargraph:
 <Detector>, [<Detector>, <Detector>, <Detector>]

AVERage

Selects the Average detector.

CAVerage

Selects the CISPR Average detector.

CRMS

Selects the CISPR RMS detector.

NEGative

Selects the Min Peak detector.

POSitive

Selects the Max Peak detector.

QPEak

Selects the Quasipeak detector.

RMS

Selects the RMS detector.

*RST: AVERAge

Example: //Select bargraph detector
DET:REC POS, AVER, RMS

Manual operation: See ["Detector"](#) on page 121

[SENSe:]SWEep:TIME <Time>

This command defines the measurement or acquisition time for bargraph measurements.

For scans not based on a scan table, the command also defines the measurement time for the scan.

Example: //Define measurement time
SWE:TIME 10s

Manual operation: See ["Measurement Time"](#) on page 89

15.5.5 Scan configuration

Commands to configure scans described elsewhere.

- See [Section 15.5.6, "Scan table configuration"](#), on page 407.

[SENSe:]FREQuency:MODE.....	406
[SENSe:]SCAN<sr>:TDOMain.....	407

[SENSe:]FREQuency:MODE <Mode>

This command selects the scan mode.

Parameters:

<Mode>

SCAN | SWEep

Selects stepped scans in the frequency domain.

Define the frequency range with:

- [\[SENSe:\]FREQuency:START](#)
- [\[SENSe:\]FREQuency:STOP](#)
- [\[SENSe:\]SCAN<sr>:START](#)
- [\[SENSe:\]SCAN<sr>:STOP](#)

TDOMain

Selects the time domain scans in the frequency domain.

Define the frequency range with the commands for stepped scans.

Example: //Select stepped scan
FREQ:MODE SCAN

Manual operation: See ["Selecting the scan type"](#) on page 101

[SENSe:]SCAN<sr>:TDOMain <Time>

This command defines the measurement time for fixed frequency scans.

Suffix:

<sr> 1..n
 irrelevant

Parameters:

<Time> <numeric value>
 Measurement time in seconds.
 The range indicated below is the maximum range. The actual
 range depends on the measurement time defined with [\[SENSe:\]SWEep:TIME](#) on page 406.
 Range: 10 ms to 10000 s
 Default unit: s

Example:

```
//Define measurement time
SCAN:TDOM 100 s
```

15.5.6 Scan table configuration

[SENSe:]DETEctor<t>[:FUNcTion].....	407
[SENSe:]FREQuency:STARt.....	408
[SENSe:]FREQuency:STOP.....	408
[SENSe:]SCAN<sr>:BANDwidth:RESolution.....	409
[SENSe:]SCAN<sr>:BARS.....	409
[SENSe:]SCAN<sr>:INPut:ATTenuation:AUTO.....	409
[SENSe:]SCAN<sr>:INPut:ATTenuation[:VALue].....	410
[SENSe:]SCAN<sr>:INPut:GAIN:AUTO.....	410
[SENSe:]SCAN<sr>:INPut:GAIN:STATe.....	410
[SENSe:]SCAN<sr>:NAME.....	411
[SENSe:]SCAN<sr>:RANGes[:COUNT].....	411
[SENSe:]SCAN<sr>:STARt.....	412
[SENSe:]SCAN<sr>:STEP.....	412
[SENSe:]SCAN<sr>:STOP.....	412
[SENSe:]SCAN<sr>:TIME.....	413
[SENSe:]SWEep:COUNT.....	413
[SENSe:]SWEep:SPACing.....	414
[SENSe:]SCAN<sr>:INPut:TYPE.....	414

[SENSe:]DETEctor<t>[:FUNcTion] <Detector>

This command selects the detector for the scan.

In the Spectrum application, it selects the detector in general.

Suffix:

<t> 1..n
Trace

Parameters:

<Detector> **AVERage**
Selects the Average detector.

CAVerage
Selects the CISPR Average detector.

CRMS
Selects the CISPR RMS detector.

NEGative
Selects the Min Peak detector.

POSitive
Selects the Max Peak detector.

QPEak
Selects the Quasipeak detector.

RMS
Selects the RMS detector.

*RST: POSitive

Example: //Select scan detector
DET RMS

Manual operation: See "Detector" on page 121

[SENSe:]FREQuency:STARt <Frequency>

This command defines the start frequency of a scan.

In the spectrum application, the command defines the start frequency of a measurement.

Parameters:

<Frequency> <numeric value>

Range: Refer to the datasheet

*RST: depends on application

Default unit: Hz

Example: //Define start frequency
FREQ:STAR 30 kHz

Manual operation: See "Defining a frequency range for the scan" on page 106
See "Start / Stop Frequency" on page 168

[SENSe:]FREQuency:STOP <Frequency>

This command defines the stop frequency of a scan.

In the Spectrum application, the command defines the stop frequency of a measurement.

Parameters:

<Frequency> <numeric value>
 Range: Refer to the datasheet
 *RST: depends on application
 Default unit: Hz

Example:

```
//Define stop frequency
FREQ:STOP 100MHz
```

Manual operation:

See ["Defining a frequency range for the scan"](#) on page 106
 See ["Start / Stop Frequency"](#) on page 168

[SENSe:]SCAN<sr>:BANDwidth:RESolution <Bandwidth>

This command defines the resolution bandwidth applied in the selected scan range.

Suffix:

<sr> Selects the scan range.

Parameters:

<Bandwidth> <numeric value>
 If you enter a resolution bandwidth that is not supported, the R&S EPL uses the next available bandwidth instead.
 Range: Refer to datasheet
 Default unit: Hz

Example:

```
//Define a measurement bandwidth for the 4th scan range
SCAN4:BAND:RES 1MHz
```

Manual operation:

See ["Measurement Bandwidth"](#) on page 90

[SENSe:]SCAN<sr>:BARS <State>

This command turns the display of the bars indicating the size of a scan range on and off.

Suffix:

<sr> irrelevant

Parameters:

<State> ON | OFF | 1 | 0
 *RST: ON

Example:

```
//Turn on range bars
SCAN:BARS ON
```

Manual operation:

See ["Displaying range bars"](#) on page 107

[SENSe:]SCAN<sr>:INPut:ATTenuation:AUTO <State>

This command turns auto ranging in a scan range on and off.

Suffix:<sr> [Scan range](#)**Parameters:**<State> ON | OFF | 1 | 0
*RST: OFF**Example:** //Turn off auto ranging in the 4th scan range
SCAN4:INP:ATT:AUTO OFF**Manual operation:** See ["Auto Range"](#) on page 109**[SENSe:]SCAN<sr>:INPut:ATTenuation[:VALue] <Attenuation>**

This command defines the attenuation level applied in the selected scan range.

Suffix:

<sr> Selects the scan range.

Parameters:<Attenuation> <numeric value> (integer only)
Range: 0 dB to 55 dB
Increment: 1 dB
*RST: 10 dB
Default unit: dB**Example:** //Define attenuation for the 4th scan range.
SCAN4:INP:ATT 30dB**Manual operation:** See ["Attenuation"](#) on page 110**[SENSe:]SCAN<sr>:INPut:GAIN:AUTO <State>**

This command includes and excludes the preamplifier from the auto ranging feature.

Suffix:

<sr> Selects the scan range.

Parameters:<State> ON | OFF | 1 | 0
*RST: OFF**Example:** //Automatically determine if the preamplifier is used or not
SCAN1:INP:GAIN:AUTO ON**Manual operation:** See ["Preamplifier"](#) on page 110**[SENSe:]SCAN<sr>:INPut:GAIN:STATe <State>**

This command turns the preamplifier in a scan range on and off.

The command is available with the optional preamplifier.

Suffix:

<sr> Selects the scan range.

Parameters:

<State> **ON | 1**
Turns on the preamplifier.
OFF | 0
Turns off the preamplifier.
***RST: OFF**

Example:

//Turn on preamplifier for 4th scan range.
SCAN4:INP:GAIN:STAT ON

Manual operation: See ["Preamplifier"](#) on page 110

[SENSe:]SCAN<sr>:NAME <Name>

This command changes the name of a scan range.

Suffix:

<sr> Selects the scan range.

Parameters:

<Name> String containing the name of the scan range.

Example:

//Change name of scan range 4
SCAN4:NAME 'Fourth Range'

Manual operation: See ["Configuring scan ranges"](#) on page 107

[SENSe:]SCAN<sr>:RANGes[:COUNT] <Range>

This command defines the number of scan ranges.

Suffix:

<sr> irrelevant

Parameters:

<Range> <numeric value> (integer only)
Number of ranges in the scan table.
If you enter the value "0", the R&S EPL ignores the configuration of the scan table. Instead, it performs the measurement based on the current receiver configuration.
Range: 0 to 100
***RST: 1**

Example:

//Define number of scan ranges
SCAN:RANG:COUN 4

Manual operation: See ["Adding and removing scan ranges"](#) on page 106

[SENSe:]SCAN<sr>:STARt <Frequency>

This command defines the start frequency of a scan range.

Suffix:

<sr> Selects the scan range.

Parameters:

<Frequency> <numeric value>
Range: Refer to the datasheet
*RST: Depends on the scan range.
Default unit: Hz

Example: //Define start frequency for 4th scan range
 SCAN4:STAR 30MHz

Manual operation: See ["Range Start and Range Stop"](#) on page 108

[SENSe:]SCAN<sr>:STEP <Frequency>

This command defines the frequency stepsize applied in the selected scan range

Available for linear and logarithmic step mode ([\[SENSe:\]SWEep:SPACing](#)).

Suffix:

<sr> Selects the scan range.

Parameters:

<Frequency> <numeric value>
Linear step mode: numeric value in %.
Logarithmic step mode: numeric value in Hz.
*RST: Depends on the scan and frequency range.
Default unit: HZ

Example: //Define step size for 4th scan range
 SWE:SPAC LIN
 SCAN4:STEP 100KHZ

Manual operation: See ["Step Size"](#) on page 108

[SENSe:]SCAN<sr>:STOP <Frequency>

This command defines the stop frequency of a scan range.

Suffix:

<sr> Selects the scan range.

Parameters:

<Frequency> <numeric value>
Range: Refer to the datasheet
*RST: Depends on the scan range.
Default unit: Hz

Example: //Define stop frequency for 4th scan range
 SCAN4:STOP 500MHz

Manual operation: See ["Range Start and Range Stop"](#) on page 108

[SENSe:]SCAN<sr>:TIME <Time>

This command defines the measurement time applied in the selected scan range.

Suffix:

<sr> Selects the scan range.

Parameters:

<Time> <numeric value>
 Range: 100 μ s to 100 s
 *RST: depends on the range
 Default unit: s

Example: //Define measurement time for 4th scan range
 SCAN4:TIME 1 ms

Manual operation: See ["Measurement Time"](#) on page 89

[SENSe:]SWEep:COUNT <Measurements>

This command defines the number of measurements that the application uses to average traces.

For continuous measurements, the application calculates the moving average over the average count.

For single measurements, the application stops the measurement and calculates the average after the average count has been reached.

Parameters:

<Measurements> <numeric value> (integer only)
 Number of measurements considered in calculating an average trace.
 When you set a count of 1, the R&S EPL performs a single measurement over the selected scan range.
 Range: 0 to 32767
 *RST: 0

Example: //Define 10 measurements in single measurement mode
 SWE:COUN 10
 INIT:CONT OFF
 //Start sweep and wait for its end
 INIT;*WAI

Manual operation: See ["Scan Count"](#) on page 102

[SENSe:]SWEep:SPACing <StepMode>

This command selects the frequency step mode.

Note that the command has no effect on the scale and display of the frequency axis.

Parameters:

<StepMode>

LINEar

Linear frequency steps with a fix stepsize.

AUTO

The stepsize is coupled to the resolution bandwidth to get the best measurement results.

*RST: AUTO

Example:

```
//Select logarithmic frequency steps
SWE:SPAC LIN
```

Manual operation: See ["Selecting the frequency step mode"](#) on page 107

[SENSe:]SCAN<sr>:INPut:TYPE <Input>

This command selects the RF input used for a scan range.

Suffix:

<sr>

Selects the scan range.

Parameters:

<Input>

INPUT1

Selects RF input 1.

INPUT2

Selects RF input 2.

*RST: INPUT1

Example:

```
//Select RF input path for the 4th scan range
SCAN4:INP:TYPE INPUT2
```

Manual operation: See ["Input Selection"](#) on page 110

15.5.7 Peak search

Commands to configure the peak search described elsewhere.

- [FORMat:DEXPort:DSEPARATOR](#) on page 537

CALCulate<n>:MARKer<m>:PEXCursion	415
CALCulate<n>:PSEarch:ADD	415
CALCulate<n>:PEAKsearch:ADD	415
CALCulate<n>:PSEarch:AUTO	416
CALCulate<n>:PEAKsearch:AUTO	416
CALCulate<n>:PSEarch:CLEar[:IMMediate]	416
CALCulate<n>:PEAKsearch:CLEar[:IMMediate]	416
CALCulate<n>:PSEarch[:IMMediate]	416
CALCulate<n>:PEAKsearch[:IMMediate]	416

CALCulate<n>:PSEarch:MARGin.....	417
CALCulate<n>:PEAKsearch:MARGin.....	417
CALCulate<n>:PSEarch:METHod.....	417
CALCulate<n>:PEAKsearch:METHod.....	417
CALCulate<n>:PSEarch:SUBRanges:PCOunt.....	417
CALCulate<n>:PEAKsearch:SUBRanges:PCOunt.....	417
CALCulate<n>:PSEarch:SUBRanges.....	418
CALCulate<n>:PEAKsearch:SUBRanges[:VALue].....	418
DISPlay[:WINDow<n>]:TRACe<t>:SYMBOL.....	418
MMEMory:STORe:FINAl.....	419
MMEMory:STORe:PLISt.....	419

CALCulate<n>:MARKer<m>:PEXCursion <Excursion>

Defines the peak excursion (for *all* markers in *all* windows).

The peak excursion sets the requirements for a peak to be detected during a peak search.

The unit depends on the measurement.

Suffix:

<n>	irrelevant
<m>	irrelevant

Parameters:

<Excursion>	The excursion is the distance to a trace maximum that must be attained before a new maximum is recognized, or the distance to a trace minimum that must be attained before a new minimum is recognized
*RST:	6 dB

Example:

CALC:MARK:PEXC 10dB
Defines peak excursion as 10 dB.

Manual operation: See ["Defining peak characteristics"](#) on page 114
See ["Peak Excursion"](#) on page 226

CALCulate<n>:PSEarch:ADD <Frequency>

CALCulate<n>:PEAKsearch:ADD <Frequency>

This command manually adds a particular frequency to the peak list, regardless if the level threshold conditions have been fulfilled for that frequency.

Note that the frequency has to be in the displayed frequency range.

Suffix:

<n>	irrelevant

Setting parameters:

<Frequency>

Example:

//Add a frequency to the peak list
CALC:PEAK:ADD 93MHz

Usage: Setting only

Manual operation: See ["Editing a peak list"](#) on page 116
See ["Adding the current frequency to the peak list"](#) on page 116

CALCulate<n>:PSEarch:AUTO <State>
CALCulate<n>:PEAKsearch:AUTO <State>

This command turns an automatic test sequence on and off.

An automated test sequence includes a scan and a peak search, but no final measurement.

Suffix:
 <n> irrelevant

Parameters:
 <State> ON | OFF | 1 | 0
 *RST: OFF

Example: //Turn on the automated peak search
 CALC:PEAK:AUTO ON

CALCulate<n>:PSEarch:CLEAr[:IMMediate]
CALCulate<n>:PEAKsearch:CLEAr[:IMMediate]

This command deletes the contents of a peak list.

Suffix:
 <n> irrelevant

Example: //Clear the peak list
 CALC:PEAK:CLE

Usage: Event

Manual operation: See ["Editing a peak list"](#) on page 116

CALCulate<n>:PSEarch[:IMMediate]
CALCulate<n>:PEAKsearch[:IMMediate]

This command initiates a peak search.

Suffix:
 <n> irrelevant

Example: //Initiate a peak search
 CALC:PEAK

Usage: Event

CALCulate<n>:PSEarch:MARGin <Margin>

CALCulate<n>:PEAKsearch:MARGin <Margin>

This command defines the limit line margin that is considered during a peak search.

Suffix:

<n> irrelevant

Parameters:

<Margin> Default unit: dB

Example:

//Define a limit line margin
 CALC:PEAK:MARG 2

Manual operation: See ["Defining peak characteristics"](#) on page 114

CALCulate<n>:PSEarch:METHod <Method>

CALCulate<n>:PEAKsearch:METHod <Method>

This command selects the way the R&S EPL creates a peak list.

Suffix:

<n> irrelevant

Parameters:

<Method>

SUBRange

Divides the scan range into smaller subranges and looks for a particular number of peaks in each subrange.

PEAK

Looks for a particular number of peaks over the complete scan range.

*RST: PEAK

Example:

//Divide the scan range into smaller subranges for the peak search
 CALC:PEAK:METH SUBR

Manual operation: See ["Selecting the peak search method"](#) on page 113

CALCulate<n>:PSEarch:SUBRanges:PCOunt <Peaks>

CALCulate<n>:PEAKsearch:SUBRanges:PCOunt <Peaks>

This command defines the number of peaks to be found in each subrange.

Prerequisites for this command

- Select subrange peak search mode ([CALCulate<n>:PEAKsearch:METHod](#)).
- Define number of subranges ([CALCulate<n>:PEAKsearch:SUBRanges\[:VALue\]](#)).

Suffix:

<n> irrelevant

Parameters:

<Peaks>

Number of peaks in one subrange.

Note that the maximum number of peaks is 500. Thus, the maximum number of peaks per subrange depends on the number of subranges you have defined.

*RST: 1

Example:

CALC:PEAK:METH SUBR

CALC:PEAK:SUBR 20

CALC:PEAK:SUBR:PCO 5

Looks for 5 peaks in each of 20 subranges.

Manual operation: See ["Controlling the size of the peak list"](#) on page 113

CALCulate<n>:PSEarch:SUBRanges <Peaks> | <Subranges>

CALCulate<n>:PEAKsearch:SUBRanges[VALue] <Peaks | Subranges>

The effects of this command depend on the peak search mode that you have selected.

Suffix:

<n>

irrelevant

Parameters:

<Peaks | Subranges> If you have selected the "Peaks" search mode, the command defines the number of peaks to look for during the peak search.

Range: 1 to 500

*RST: 50

Example:

//Select subrange search and define 25 subranges

CALC:PEAK:METH SUBR

CALC:PEAK:SUBR 25

Manual operation: See ["Controlling the size of the peak list"](#) on page 113

DISPlay[:WINDow<n>]:TRACe<t>:SYMBol <Symbol>

This command turns the peak labels in the diagram on and off.

Suffix:

<n>

irrelevant

<t>

irrelevant

Parameters:

<Symbol>

CROSSs

Each peak is labeled by a symbol. The symbol and its color depend on the trace the peak is on.

OFF

Peak labels are off.

*RST: CROSSs

Example:

//Turn on peak labels

DISP:TRAC:SYMB CROS

Manual operation: See ["Displaying peaks as symbols"](#) on page 117

MMEMory:STORe:FINal <FileName>

This command exports the contents of the final measurement peak list to a file in ASCII format.

Setting parameters:

<FileName> String containing the file name. The extension of the file is *.dat.

Example: //Export the peak list
MMEM:STOR:FIN 'A:\TEST.DAT'

Usage: Setting only

Manual operation: See ["Exporting a peak list"](#) on page 117

MMEMory:STORe:PLISt <FileName>

This command exports the contents of the final measurement peak list to a file in ASCII format.

Setting parameters:

<FileName> String containing the file name. The extension of the file is *.dat.

Example: //Export the peak list
MMEM:STOR:PLIS 'A:\TEST.DAT'

Usage: Setting only

Manual operation: See ["Exporting a peak list"](#) on page 117

15.5.8 Peak list

CALCulate<n>:PSEarch:PLISt<peak>:ALL?	420
CALCulate<n>:PEAKsearch:PLISt<pi>:ALL?	420
CALCulate<n>:PSEarch:PLISt<peak>:COMMeNt	420
CALCulate<n>:PEAKsearch:PLISt<pi>:COMMeNt	420
CALCulate<n>:PSEarch:PLISt<peak>:DELeTe	421
CALCulate<n>:PEAKsearch:PLISt<pi>:DELeTe	421
CALCulate<n>:PSEarch:PLISt<peak>:DELTA?	421
CALCulate<n>:PEAKsearch:PLISt<pi>:DELTA?	421
CALCulate<n>:PSEarch:PLISt<peak>:DETector?	421
CALCulate<n>:PEAKsearch:PLISt<pi>:DETector?	421
CALCulate<n>:PSEarch:PLISt<peak>:FREQUency?	422
CALCulate<n>:PEAKsearch:PLISt<pi>:FREQUency?	422
CALCulate<n>:PSEarch:PLISt<peak>:LEVeL?	422
CALCulate<n>:PEAKsearch:PLISt<pi>:LEVeL	422
CALCulate<n>:PSEarch:PLISt<peak>:SIZE?	422
CALCulate<n>:PEAKsearch:PLISt<pi>:SIZE?	422

CALCulate<n>:PSEarch:PLISt<peak>:TRACe?	423
CALCulate<n>:PEAKsearch:PLISt<pi>:TRACe?	423
CALCulate<n>:PSEarch:PLISt<peak>[:DATA]?	423
CALCulate<n>:PEAKsearch:PLISt<pi>[:DATA]?	423

CALCulate<n>:PSEarch:PLISt<peak>:ALL?**CALCulate<n>:PEAKsearch:PLISt<pi>:ALL?**

This command queries the information for all peaks found in the peak search.

Suffix:

<n> irrelevant

<pi> irrelevant

Return values:

<Peaks> List of values representing all measured peaks. The size of the list depends on the number of peaks found in the peak search. For each peak, the command returns the following information.
 <TraceNumber>, <Detector>, <Frequency>, <Level>, <DeltaLimit>, <Comment>, ...
 <DeltaLimit> is '0' if you use no limit line.
 <comment> is empty if you have not entered one for the corresponding peak.

Example:

```
//Query peak information
CALC:PEAK:PLIS:ALL?
would return, e.g.
' TRACE1,Quasi-Peak,
4.5e+07,53.99,0,yahoo,TRACE2,Average,
4.5e+07,53.07,0,,TRACE3,RMS,
4.5e+07,50.89,0,,TRACE4,Quasi-Peak,
4.5e+07,53.99,0,, [...] '
```

Usage: Query only

CALCulate<n>:PSEarch:PLISt<peak>:COMMENT <Comment>**CALCulate<n>:PEAKsearch:PLISt<pi>:COMMENT <Comment>**

This command assigns a comment to a peak found in the peak search.

Suffix:

<n> irrelevant

<pi> 1..n
Peak

Parameters:

<Comment> String that contains the comment.

Example:

```
//Define a comment for a peak
CALC:PEAK:PLIS4:COMM 'Woohoo'
```

CALCulate<n>:PSEarch:PLISt<peak>:DELeTe
CALCulate<n>:PEAKsearch:PLISt<pi>:DELeTe

This command deletes a peak from the peak list.

Suffix:

<n> irrelevant

<pi> [Peak](#)

Example: //Deletes a peak from the peak list

CALC:PEAK:PLIS4:DEL

Usage: Event

CALCulate<n>:PSEarch:PLISt<peak>:DELTa?
CALCulate<n>:PEAKsearch:PLISt<pi>:DELTa?

This command queries the distance of a peak to the nearest limit line in the peak search.

Suffix:

<n> irrelevant

<pi> [Peak](#)

Return values:

<Level> If you are using no limit line, the return value is '0'.

Example: //Query distance to limit line

CALC:PEAK:PLIS4:DELT?

//would return, e.g.

3.23

Usage: Query only

CALCulate<n>:PSEarch:PLISt<peak>:DETector?
CALCulate<n>:PEAKsearch:PLISt<pi>:DETector?

This command queries the detector with which a peak was found in the peak search.

Suffix:

<n> irrelevant

<pi> [Peak](#)

Return values:

<Detector> String that contains the name of the detector.

Example: //Query detector the peak was measured with

CALC:PEAK:PLIS4:DET?

//would return, e.g.

'Average'

Usage: Query only

CALCulate<n>:PSEarch:PLISt<peak>:FREQuency?**CALCulate<n>:PEAKsearch:PLISt<pi>:FREQuency?**

This command queries the frequency of a peak found in the peak search.

Suffix:

<n> irrelevant

<pi> **Peak**

Return values:

<Frequency>

Example:

```
//Query frequency of a peak
CALC:PEAK:PLIS4:FREQ?
//would return, e.g.
69420000
```

Usage:

Query only

CALCulate<n>:PSEarch:PLISt<peak>:LEVel?**CALCulate<n>:PEAKsearch:PLISt<pi>:LEVel <Level>**

This command queries the level of a peak found in the peak search.

Suffix:

<n> irrelevant

<pi> **Peak**

Parameters:

<Level> <numeric value>

The unit depends on your selection (**CALCulate<n>:UNIT:POWer**).

Example:

```
//Query level of the fourth peak
CALC:PEAK:PLIS4:LEV?
//would return, e.g.
-53.99
```

CALCulate<n>:PSEarch:PLISt<peak>:SIZE?**CALCulate<n>:PEAKsearch:PLISt<pi>:SIZE?**

This command queries the number of peaks found in the peak search.

Suffix:

<n> irrelevant

<pi> irrelevant

Return values:

<Peaks>

Example: //Query size of peak list
 CALC:PEAK:PLIS:SIZE
 //would return, e.g.
 100

Usage: Query only

CALCulate<n>:PSEarch:PLIS<peak>:TRACe?
CALCulate<n>:PEAKsearch:PLIS<pi>:TRACe?

This command queries the trace that a peak found in the peak search is located on.

Suffix:
 <n> irrelevant
 <pi> Peak

Return values:
 <Trace> String that contains the trace number.

Example: //Query trace the peak is on
 CALC:PEAK:PLIS4:TRAC
 //would return, e.g.
 'TRACE1'

Usage: Query only

CALCulate<n>:PSEarch:PLIS<peak>[:DATA]?
CALCulate<n>:PEAKsearch:PLIS<pi>[:DATA]?

This command queries the information for a peak found in the peak search.

Suffix:
 <n> irrelevant
 <pi> Peak

Return values:
 <PeakResults> String that contains a list of values for the selected peak.
 The command returns the following information.
 <TraceNumber>, <Detector>, <Frequency>, <Level>,
 <DeltaLimit>, <Comment>, ...
 <DeltaLimit> is '0' if you use no limit line.
 <comment> is empty if you have not entered one for the corre-
 sponding peak.

Example: //Query the information for a peak
 CALC:PEAK:PLIS4?
 //would return, e.g.
 'TRACE2,Average,4.5e+07,53.07,0,Woohoo'

Usage: Query only

15.5.9 Final measurement (and trace) configuration

CALCulate<n>:FMEasurement[:AUTO].....	424
[SENSe:]CORRection:TRANsducer:VIEW.....	424
[SENSe:]DETEctor<t>:FMEasurement.....	425
[SENSe:]FMEasurement:AUTO.....	425
[SENSe:]FMEasurement:TIME.....	425
DISPlay[:WINDow<n>]:TRACe<t>:MODE.....	426
DISPlay[:WINDow<n>][:SUBWIndow<w>]:TRACe<t>[:STATe].....	427
[SENSe:]JAVERage<n>:TYPE.....	427

CALCulate<n>:FMEasurement[:AUTO] <State>

This command turns a full automated test sequence on and off.

A full automated test sequence includes a scan, a peak search and a final measurement.

Suffix:

<n> irrelevant

Parameters:

<State> ON | OFF | 1 | 0
*RST: OFF

Example: //Turn on automated test sequence.
CALC:FME ON

[SENSe:]CORRection:TRANsducer:VIEW <State>

This command turns the "Transducer" trace mode on and off.

Also possible with [DISPlay\[:WINDow<n>\]:TRACe<t>:MODE](#) on page 426.

Parameters:

<State> **ON | 1**
Turns on the transducer trace.
The transducer trace represents the correction values of all active transducers over the currently selected frequency range. When you turn on the transducer trace, all other traces are temporarily removed.
OFF | 0
Turns off the transducer trace, and restores the original scan traces.
*RST: 0

Example: CORR:TRAN:VIEW ON
TRAC? TRACE1
Turns on the transducer trace and queries the correction values.

Manual operation: See ["Trace Mode"](#) on page 120

[SENSe:]DETEctor<t>:FMEasurement <Detector>

This command selects the detector for the final measurement.

Suffix:

<t> [Trace](#)

Parameters:

<Detector>

AVERage

Selects the Average detector.

CAVerage

Selects the CISPR Average detector.

CRMS

Selects the CISPR RMS detector.

NEGative

Selects the Min Peak detector.

NONE

Ignores the corresponding trace during the final measurement.

POSitive

Selects the Max Peak detector.

QPEak

Selects the Quasipeak detector.

RMS

Selects the RMS detector.

*RST: QPEak

Example:

```
//Select final measurement detector
DET:FME POS
```

Manual operation: See ["Detector"](#) on page 121

[SENSe:]FMEasurement:AUTO <State>

This command turns a full automated test sequence on and off.

A full automated test sequence includes a scan, a peak search and a final measurement.

Parameters:

<State> ON | OFF | 1 | 0

*RST: ON

Example:

```
//Turn on automated test sequence.
FME:AUTO ON
```

Manual operation: See ["Interactive"](#) on page 122

[SENSe:]FMEasurement:TIME <Time>

This command defines the time each frequency in the peak list is measured during the final measurement.

Parameters:

<Time> <numeric value>

*RST: 1 s

Default unit: s

Example:

//Define final measurement time

FME:TIME 1us

Manual operation: See "[Measurement Time](#)" on page 89

DISPlay[:WINDow<n>]:TRACe<t>:MODE <DisplayMode>

This command selects the trace mode.

To turn on the transducer trace mode, use [\[SENSe:\]CORRection:TRANsdUCer:VIEW](#) on page 424.

Suffix:

<n> irrelevant

<t> [Trace](#)

Parameters:

<DisplayMode>

AVERage

Draws a trace based on the average over several measurements.

You can define the number of measurements considered in the averaging process with [\[SENSe:\]SWEep:COUNT](#).

BLANK

Removes the trace from the display.

MAXHold

Draws a trace based on the highest values that have been measured over several measurements.

You can define the number of measurements with [\[SENSe:\]SWEep:COUNT](#).

MINHold

Draws a trace based on the lowest values that have been measured over several measurements.

You can define the number of measurements with [\[SENSe:\]SWEep:COUNT](#).

TRD

Draws a trace that shows the correction values of all active transducer factors in the currently selected frequency range.

See also [\[SENSe:\]CORRection:TRANsdUCer:VIEW](#) on page 424.

VIEW

Freezes the trace.

Even if you continue the measurement, the trace remains as it is.

WRITe

Overwrites the trace when a new measurement begins.

*RST: Depends on the trace number.

Example:

//Select trace mode and display the highest value obtained over 5 measurements

DISP:TRAC2:MODE MAXH

SENS:SWE:COUN 5

Manual operation: See "Trace Mode" on page 120

DISPlay[:WINDow<n>][:SUBWindow<w>]:TRACe<t>[:STATe] <State>

Turns a trace on and off.

The measurement continues in the background.

Suffix:

<n> [Window](#)
Irrelevant in the Receiver application.

<w> subwindow
Not supported by all applications

<t> [Trace](#)

Parameters:

<State> ON | OFF | 0 | 1
OFF | 0
Switches the function off
ON | 1
Switches the function on

Example: DISP:TRAC3 ON

[SENSe:]AVERAge<n>:TYPE <Mode>

Selects the trace averaging mode.

Suffix:

<n> 1..n
[Window](#)

Parameters:

<Mode> **LOGarithmic**
The logarithmic power values are averaged.
LINear
The power values are averaged before they are converted to logarithmic values.
POWER
The power level values are converted into unit Watt prior to averaging. After the averaging, the data is converted back into its original unit.

Example: AVER:TYPE LIN
Switches to linear average calculation.

Manual operation: See ["Average Mode"](#) on page 122

15.5.10 Final results

CALCulate<n>:FMEasurement:PLISt<pi>:ALL?	428
CALCulate<n>:FMEasurement:PLISt<pi>:COMMeNt	429
CALCulate<n>:FMEasurement:PLISt<pi>:DELTA?	429
CALCulate<n>:FMEasurement:PLISt<pi>:DETector	429
CALCulate<n>:FMEasurement:PLISt<pi>:FREQuency?	430
CALCulate<n>:FMEasurement:PLISt<pi>:LEVel	430
CALCulate<n>:FMEasurement:PLISt<pi>:SIZE?	430
CALCulate<n>:FMEasurement:PLISt<pi>:TRACe?	431
CALCulate<n>:FMEasurement:PLISt<pi>[:DATA]?	431

CALCulate<n>:FMEasurement:PLISt<pi>:ALL?

This command queries the information for all peaks measured in the final measurement.

Suffix:

<n> irrelevant
<pi> irrelevant

Return values:

<FinalResults> List of values representing all measured peaks. The size of the list depends on the number of peaks measured in the final measurement.
For each peak, the command returns the following information.
<TraceNumber>, <Detector>, <Frequency>, <Level>, <DeltaLimit>, <Comment>, ...
<DeltaLimit> is '0' if you use no limit line.
<comment> is empty if you have not entered one for the corresponding peak.

Example: //Query peak information
CALC:FME:PLIS?
would return, e.g.
'TRACE1,Quasi-Peak,
4.5e+07,53.99,0,yahoo,TRACE2,Average,
4.5e+07,53.07,0,,TRACE3,RMS,
4.5e+07,50.89,0,,TRACE4,Quasi-Peak,
4.5e+07,53.99,0,,[...]'

Usage: Query only

CALCulate<n>:FMEasurement:PLIS<pi>:COMMent <Comment>

This command defines a comment for a peak measured in the final measurement.

Suffix:

<n> irrelevant

<pi> [Peak](#)

Parameters:

<Comment> String that contains the comment.

Example: //Define a comment for the fourth peak in the peak list
CALC:FME:PLIS4:COMM 'Woohoo'

CALCulate<n>:FMEasurement:PLIS<pi>:DELTa?

This command queries the distance of a peak to the nearest limit line in the final measurement.

Suffix:

<n> irrelevant

<pi> [Peak](#)

Return values:

<Level> <numeric value>

If you are using no limit line, the return value is '0'.

Default unit: dB

Example: //Query distance of a peak to a limit line
CALC:FME:PLIS4:DELT?
//would return, e.g.
3.23

Usage: Query only

CALCulate<n>:FMEasurement:PLIS<pi>:DETector <Detector>

This command queries the detector with which a peak was measured in the final measurement.

Suffix:

<n> irrelevant

<pi> [Peak](#)

Parameters:

<Detector> String that contains the name of the detector.

Example: //Query detector the peak was measured with
CALC:FME:PLIS4:DET?
//would return, e.g.
'Average'

CALCulate<n>:FMEasurement:PLIS<pi>:FREQuency?

This command queries the frequency of a peak measured in the final measurement.

Suffix:

<n> irrelevant

<pi> **Peak**

Return values:

<Frequency> <numeric value>

Default unit: Hz

Example:

//Query frequency of a peak

CALC:FME:PLIS4:FREQ?

//would return, e.g.

69420000

Usage:

Query only

CALCulate<n>:FMEasurement:PLIS<pi>:LEVel <Level>

This command queries the level of a peak measured in the final measurement.

Suffix:

<n> irrelevant

<pi> **Peak**

Parameters:

<Level> <numeric value>

The unit depends on your selection (**CALCulate<n>:UNIT:POWer**).

Example:

//Query level of the fourth peak

CALC:FME:PLIS4:LEV?

//Return value example:

-53.99

CALCulate<n>:FMEasurement:PLIS<pi>:SIZE?

This command queries the number of peaks measured in the final measurement.

Suffix:

<n> irrelevant

<pi> irrelevant

Return values:

<Peaks>

Example:

//Query size of peak list

CALC:FME:PLIS:SIZE

Return value example:

100

Usage: Query only

CALCulate<n>:FMEasurement:PLIS<pi>:TRACe?

This command queries the trace that a peak measured in the final measurement is located on.

Suffix:

<n> irrelevant

<pi> **Peak**

Return values:

<Trace> String that contains the trace number.

Example:

```
//Query trace of the peak
CALC:FME:PLIS4:TRAC
//would return, e.g.
' TRACE1 '
```

Usage: Query only

CALCulate<n>:FMEasurement:PLIS<pi>[:DATA]?

This command queries the information for a peak measured in the final measurement.

Suffix:

<n> irrelevant

<pi> **Peak**

Return values:

<PeakResults> List of values for the selected peak.
The command returns the following information.
<TraceNumber>, <Detector>, <Frequency>, <Level>,
<DeltaLimit>, <Comment>, ...
<DeltaLimit> is '0' if you use no limit line.
<comment> is empty if you have not entered one for the corresponding peak.

Example:

```
//Query peak information
CALC:FME:PLIS4?
//Return value example:
' TRACE2,Average,4.5e+07,53.07,0,Woohoo '
```

Usage: Query only

15.5.11 LISN configuration

[SENSe:]FMEasurement:LISN:PHASe.....	432
[SENSe:]SCAN<sr>:LISN:PHASe.....	432
INPut:LISN:FILTeR:HPASs[:STATe].....	433
INPut:LISN:PHASe.....	433
INPut:LISN[:TYPE].....	434

[SENSe:]FMEasurement:LISN:PHASe <Phase>...

This command selects the LISN phases to be measured in a final measurement.

Parameters:

<Phase> You can select several phases for the final measurement:
<Phase>,[<Phase>,<Phase>,<Phase>]

L1

L2

Available for networks with four phases (R&S ESH2Z5, R&S ENV4200 and R&S ENV432)

L3

Available for networks with four phases (R&S ESH2Z5, R&S ENV4200 and R&S ENV432)

N

*RST: L1

Example: //Select phases for the final measurement
FME:LISN:PHAS L1,N

Manual operation: See "Phase" on page 125

[SENSe:]SCAN<sr>:LISN:PHASe <Phase>...

This command selects the LISN phases to be measured in a scan.

Suffix:

<sr> irrelevant

Parameters:

<Phase> You can select several phases for the scan:
<Phase>,[<Phase>,<Phase>,<Phase>]

L1

L2

Available for networks with four phases (R&S ESH2Z5, R&S ENV4200 and R&S ENV432)

L3

Available for networks with four phases (R&S ESH2Z5, R&S ENV4200 and R&S ENV432)

N

*RST: L1

Example: //Select phases to be measured in the scan
 SCAN:LISN:PHAS L1,N

Manual operation: See ["Phase"](#) on page 125

INPut:LISN:FILTer:HPASs[:STATe] <State>

This command turns the 150 kHz highpass filter of the ENV216 network on and off.

Prerequisites for this command

- Select ENV216 network ([INPut:LISN\[:TYPE\]](#)).

Parameters:

<State> ON | OFF | 1 | 0
 *RST: OFF

Example: //Turn on high pass filter
 INP:LISN:TYPE ENV216
 INP:LISN:FILT:HPAS ON

Manual operation: See ["High-Pass Filter 150 kHz"](#) on page 126

INPut:LISN:PHASe <Phase>

This command selects one LISN phase to be measured.

The command is available in all applications (spectrum, receiver, I/Q analyzer and analog demodulator).

Parameters:

<Phase> **L1**
L2
 Available for networks with four phases (R&S ESH2Z5, R&S ENV4200 and R&S ENV432)
L3
 Available for networks with four phases (R&S ESH2Z5, R&S ENV4200 and R&S ENV432)
N
 *RST: L1

Example: //Select phase L1
 INP:LISN:PHAS L1

Manual operation: See ["Phase"](#) on page 125

INPut:LISN[:TYPE] <Type>

This command turns automatic control of a LISN on and off. It also selects the type of network.

Parameters:

<Type>

ENV216

R&S ENV 216: two phases and highpass are controllable.

AMN6500

R&S AMN6500: two phases and highpass are controllable

ENV432

R&S ENV 432: four phases are controllable.

ENV4200

R&S ENV 4200: four phases are controllable.

ESH2Z5

R&S ESH2-Z5: four phases (incl. protective earth) are controllable.

ESH3Z5

R&S ESH3-Z5: two phases (incl. protective earth) are controllable.

FOURphase

R&S ESH2-Z5: four phases (incl. protective earth) are controllable.

OFF

Turns off control of the LISN.

TWOPhase

R&S ESH3-Z5: two phases (incl. protective earth) are controllable.

*RST: OFF

Example:

```
//Select LISN
INP:LISN:TYPE TWOP
```

Manual operation: See "LISN type" on page 125

15.5.12 CISPR APD measurement configuration

The remote commands to configure CISPR APD measurements are similar to those available for the APD measurement in the Spectrum application.

For a comprehensive description, refer to the user manual of the Spectrum application.

[CALCulate<n>:MARKer<m>:Y:PERCent](#)..... 434

CALCulate<n>:MARKer<m>:Y:PERCent <Probability>

Sets a marker to a particular probability value. You can query the corresponding level with [CALCulate<n>:MARKer<m>:X](#).

Using the command turns delta markers into normal markers.

Is available for CCDF measurements.

Suffix:

<n> [Window](#)

<m> [Marker](#)

Parameters:

<Probability> Range: 0 % to 100 %
Default unit: %

Example: CALC1:MARK:Y:PERC 95PCT
Positions marker 1 to a probability of 95 %.

Manual operation: See "[Percent Marker](#)" on page 129

15.5.13 Preventing overlapping execution

To prevent an overlapping execution of commands, one of the commands *OPC, *OPC? or *WAI can be used. All three commands cause a certain action only to be carried out after the hardware has been set. The controller can be forced to wait for the corresponding action to occur.

Table 15-3: Synchronization using *OPC, *OPC? and *WAI

Com- mand	Action	Programming the controller
*OPC	Sets the Operation Complete bit in the Standard Event Status Register (ESR) after all previous commands have been executed.	- Setting bit 0 in the ESE - Setting bit 5 in the SRE - Waiting for service request (SRQ)
*OPC?	Stops command processing until 1 is returned. The 1 is returned when all pending operations are completed.	Send *OPC? directly after the command whose processing must be terminated before other commands can be executed.
*WAI	Stops further command processing until all commands sent before Wait-to-Continue Command (WAI) have been executed.	Send *WAI directly after the command whose processing must be terminated before other commands are executed.

Command synchronization using *WAI or *OPC? is a good choice if the overlapped command takes only a little time to process. The two synchronization commands simply block overlapping execution of the command. Append the synchronization command to the overlapped command, for example:

SINGLE; *OPC?

For time-consuming overlapped commands, you can allow the controller or the instrument to do other useful work while waiting for command execution. Use one of the following methods:

***OPC with a service request**

1. Execute *ESE 1

Sets the OPC mask bit (bit No. 0) of the Standard Event Status Register (ESR) to 1

2. Execute *SRE 32

Sets the Event Status Bit (ESB - bit No. 5) of the Service Request Enable Register (SRE) to 1 to enable ESB service request.

3. Send the overlapped command with *OPC

Example: INIT; *OPC

4. Wait for an ESB service request.

The service request indicates that the overlapped command has finished.

***OPC? with a service request**

1. Execute *SRE 16

Sets the Message Available bit (MAV - bit No. 4) of the Service Request Enable Register (SRE) to 1 to enable MAV service request.

2. Send the overlapped command with *OPC?

Example: INIT; *OPC?

3. Wait for an MAV service request.

The service request indicates that the overlapped command has finished.

Event status enable register (ESE)

1. Execute *ESE 1

Sets the OPC mask bit (bit No. 0) of the Standard Event Status Register (ESR) to 1

2. Send the overlapped command without *OPC, *OPC? or *WAI.

Example: INIT; *OPC?

3. Poll the operation complete state periodically (with a timer) using the sequence:

*OPC; *ESR?

A return value (LSB) of 1 indicates that the overlapped command has finished.

15.5.14 Programming example: performing a sequence of measurements

This example demonstrates how to perform several measurements in a sequence in a remote environment.

```
//2xSpectrumAnalyzer + 2xIQ, start Sequencer at the end, test OPC?
// -----

//-----Preparing the instrument and first and second channel -----
*RST
//Activate new IQ channel
INSTRUMENT:CREate:NEW IQ,'IQ 1'
//Set sweep count for new IQ channel
SENS:SWEEP:COUNT 6
```

```

//Change trace modes for IQ channel
DISP:TRAC1:MODE BLANK
DISP:TRAC2:MODE MAXH
DISP:TRAC3:MODE MINH
//Switch to single sweep mode
INIT:CONT OFF
//switch back to first (default) analyzer channel
INST:SEL 'Spectrum';*WAI
//Switch into SEM
SENSe:SWEep:MODE ESpectrum
//Load Sem standard file for W-CDMA
SENSe:ESpectrum:PRESet:STANdard 'WCDMA\3GPP\DL\3GPP_DL.xml'
//Set sweep count in Spectrum channel
SENS:SWEEP:COUNT 5

//-----Creating a third measurement channel -----

//Create second IQ channel
INSTrument:CREate:NEW IQ,'IQ 2'
//Set sweep count
SENS:SWEEP:COUNT 2
//Change trace modes
DISP:TRAC1:MODE MAXH
DISP:TRAC2:MODE MINH
//Create new analyzer channel
INSTrument:CREate:NEW SANalyzer,'Spectrum 2'
//Activate ACLR measurement in channel 'Spectrum 2'
CALCulate:MARKer:FUNCTion:POWer:SElect ACPower
//Load W-CDMA Standard
CALCulate:MARKer:FUNCTion:POWer:PRESet FW3Gppcdma
//Change trace modes
DISP:TRAC2:MODE MAXH
DISP:TRAC1:MODE MINH

//-----Performing a sweep and retrieving results-----

//Change sweep count
SENS:SWEEP:COUNT 7
//Single Sweep mode
INIT:CONT OFF
//Switch back to first IQ channel
INST:SEL 'IQ 1';*WAI
//Perform a measurement
INIT:IMM;*OPC?
//Retrieve results
CALC:MARK:Y?
//Activate Multiview
DISPlay:ATAB ON

//-----Performing a sequence of measurements with the Sequencer-----

```

```

//Activate Sequencer
SYSTem:SEQuencer ON
//Start sweep in Sequencer
INITiate:SEQuencer:IMMediate;*OPC?
//Switch into first IQ channel to get results
INST:SEL 'IQ 1';*WAI
CALCulate:MARKer:MAXimum
CALC:MARK:Y?
//Change sweep time in IQ
SENS:SWE:TIME 300us
//Switch to single Sequencer mode
INITiate:SEQuencer:MODE SINGLE
//Sweep all channels once, taking the sweep count in each channel into account
INITiate:SEQuencer:IMMediate;*OPC?
//Set marker to maximum in IQ1 and query result
CALCulate:MARKer:MAXimum
CALC:MARK:Y?
//Switch to second IQ channel and retrieve results
INST:SEL 'IQ 2';*WAI
CALCulate:MARKer:MIN
CALC:MARK:Y?
//Switch to first Spectrum channel
INST:SEL 'Spectrum';*WAI
//Query one of the SEM results
CALCulate:MARKer:FUNCTION:POWER:RESult? CPower
//Switch to second Spectrum channel
INST:SEL 'Spectrum 2';*WAI
//Query channel power result
CALCulate:MARKer:FUNCTION:POWER:RESult? ACPower

```

15.6 Configuration

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15.6.1 Input configuration

• RF input configuration	439
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15.6.1.1 RF input configuration

INPut:IMPedance.....	439
INPut:ATTenuation:PROTection:RESet.....	439
INPut:TYPE.....	439

INPut:IMPedance <Impedance>

Selects the nominal input impedance of the RF input. In some applications, only 50 Ω are supported.

Parameters:

<Impedance> 50 | 75
 *RST: 50 Ω
 Default unit: OHM

Example: INP:IMP 75

Manual operation: See "[Impedance](#)" on page 137

INPut:ATTenuation:PROTection:RESet

Resets the attenuator and reconnects the RF input with the input mixer for the R&S EPL after an overload condition occurred and the protection mechanism intervened. The error status bit (bit 3 in the STAT:QUES:POW status register) and the INPUT OVLD message in the status bar are cleared.

The command works only if the overload condition has been eliminated first.

For more information, see [Section 10.6.1, "Increasing measurement sensitivity \(or avoiding an input mixer overload\)"](#), on page 158.

Example: INP:ATT:PROT:RES

INPut:TYPE <Input>

The command selects the input path.

Parameters:

<Input> **INPUT1**
 Selects RF input 1.
 INPUT2
 Selects RF input 2.
 *RST: INPUT1

Example: //Select input path
 INP:TYPE INPUT1

Manual operation: See "[Input Selection](#)" on page 110

15.6.1.2 Preselector configuration

INPut:PRESelection[:STATe]	440
INPut:PRESelection:BYPass	440
INPut:PRESelection:SABYpass	440

INPut:PRESelection[:STATe] <State>

This command turns the preselector on and off.

The preselector is always on in the receiver application.

Parameters:

<State> ON | OFF | 1 | 0
 *RST: Depends on application.

Example: //Turn on preselector
 INP:PREs ON

Manual operation: See "[Preselection filter](#)" on page 139

INPut:PRESelection:BYPass <State>

This command turns the preselector on and off.

It basically has the same effect as [INPut:PRESelection\[:STATe\]](#).

Parameters:

<State> **ON | 1**
 Turns off (bypasses) the preselector.
 Unavailable in the receiver application.
 OFF | 0
 Turns on the preselector.
 *RST: OFF

Example: //Bypass preselector
 INP:PREs:BYP ON

Manual operation: See "[Bypass](#)" on page 139

INPut:PRESelection:SABYpass <State>

This command turns the SA-Pass preselector on and off.

Parameters:

<State> **ON | 1**
 Turns off (bypasses) the preselector.
 Unavailable in the receiver application.
 OFF | 0
 Turns on the SA-Pass preselector.
 *RST: OFF

Example: //Turn on SA-Pass
 INP: PRES: SAbY ON

15.6.1.3 User port configuration (AUX port)

INPut:UPORt:STATe.....	441
INPut:UPORt[:VALue].....	441
OUTPut:UPORt[:VALue].....	441
OUTPut:UPORt:STATe.....	442

INPut:UPORt:STATe <State>

Toggles the control lines of the user ports for the **AUX PORT** connector. This SUB-D male connector is located on the rear panel of the R&S EPL.

See the R&S EPL Getting Started manual for details.

Parameters:

<State> **ON | 1**
 User port is switched to INPut
 OFF | 0
 User port is switched to OUTPut
 *RST: 1

Manual operation: See ["User port configuration"](#) on page 132

INPut:UPORt[:VALue]

Queries the control lines of the user ports.

For details see [OUTPut:UPORt\[:VALue\]](#) on page 441.

Return values:

<Level> bit values in hexadecimal format
 TTL type voltage levels (max. 5V)
 Range: #B00000000 to #B00111111

Example: INP:UPOR?
 //Result: #B00100100
 Pins 5 and 7 are active.

Manual operation: See ["User port configuration"](#) on page 132

OUTPut:UPORt[:VALue] <Value>

Sets the control lines of the user ports.

The assignment of the pin numbers to the bits is as follows:

Bit	7	6	5	4	3	2	1	0
Pin	N/A	N/A	5	3	4	7	6	2

Bits 7 and 6 are not assigned to pins and must always be 0.

The user port is written to with the given binary pattern.

If the user port is programmed to input instead of output (see [INPut:UPORt:StAtE](#) on page 441), the output value is temporarily stored.

Parameters:

<Value> bit values in hexadecimal format
TTL type voltage levels (max. 5V)
Range: #B00000000 to #B00111111

Example:

OUTP:UPOR #B00100100
Sets pins 5 and 7 to 5 V.

Manual operation: See "[User port configuration](#)" on page 132

OUTPut:UPORt:StAtE <State>

Toggles the control lines of the user ports for the **AUX PORT** connector. This 9-pole SUB-D male connector is located on the rear panel of the R&S EPL.

Parameters:

<State> ON | OFF | 0 | 1
OFF | 0
User port is switched to INPut
ON | 1
User port is switched to OUTPut

Example:

OUTP:UPOR:STAT ON

Manual operation: See "[User port configuration](#)" on page 132

15.6.2 Output configuration

- [IF / video / demodulation](#).....442
- [Additional output](#).....447

15.6.2.1 IF / video / demodulation

OUTPut<ou>:IF:LPASs:FREQuency:MANual	443
OUTPut<ou>:IF:LPASs[:StAtE]	443
OUTPut<ou>:IF:SCALe[:VALue]	443
OUTPut<ou>:IF[:SOURce]	444
[SENSe:]DEMod:SQUelch:LEVel	444
[SENSe:]DEMod:SQUelch:LEVel:ABSolute	445
[SENSe:]DEMod:SQUelch[:StAtE]	445
SYSTem:SPEaker:MAXVolume	446
SYSTem:SPEaker:MUTE	446
SYSTem:SPEaker:VOLume	446

OUTPut<ou>:IF:LPASs:FREQuency:MANual <Frequency>

This command defines the cutoff frequency of the low pass filter available for signal output.

Available for the following output types:

- Video
- AM
- FM
- PM

This command is available after you have turned on the low pass filter with `OUTPut<ou>:IF:LPASs[:STATe]`.

Suffix:

<ou> [Output](#)

Parameters:

<Frequency> Default unit: Hz

Example:

```
//Turn on low pass filter with a cutoff frequency of 100 kHz
OUTP:IF:LPAS ON
OUTP:IF:LPAS:FREQ:MAN 100KHZ
```

Manual operation: See ["Low Pass"](#) on page 141

OUTPut<ou>:IF:LPASs[:STATe] <State>

This command turns a low pass filter to control the output on and off.

Available for the following output types:

- Video
- AM
- FM
- PM

Suffix:

<ou> [Output](#)

Parameters:

<State> ON | OFF | 1 | 0

Example:

```
//Turn on low pass filter with a cutoff frequency of 100 kHz
OUTP:IF:LPAS ON
OUTP:IF:LPAS:FREQ:MAN 100KHZ
```

Manual operation: See ["Low Pass"](#) on page 141

OUTPut<ou>:IF:SCALE[:VALue] <Scale>

This command defines the scale of the transferred signal.

Available for the following output types:

- AM
- FM

Suffix:

<ou> [Output](#)

Parameters:

<Scale> Numeric value whose unit depends on the output type:

- % for AM output
- Hz for FM output

Example: //Select a scale of 100 kHz for FM output on output 1
 OUTP:IF FM
 OUTP:IF:SCAL 100KHZ

Manual operation: See ["Scale"](#) on page 142

OUTPut<ou>:IF[:SOURce] <Type>

This command selects the type of signal data that is output.

Suffix:

<ou> [Output](#)

Parameters:

<Type>

AM
Outputs the AM signal.

FM
Outputs the FM signal.

FOCUS
Outputs the data of the currently selected measurement window.
Available for Analog Modulation Analysis.

IF
Outputs the IF signal.
Unavailable for audio output.

OFF
Turns off the output.

VIDEO
Outputs the video signal.
Unavailable for audio output.

Example: //Select output of AM signal data
 OUTP:IF:SOUR AM

Manual operation: See ["Selecting the output type"](#) on page 140

[SENSe:]DEMod:SQUelch:LEVel <Level>

This command defines the relative squelch level for audio output, below which the output is not demodulated.

To define an absolute squelch level, use `[SENSe:]DEMod:SQUelch:LEVel:ABSolute`.

If you are using the "Marker Demodulation" marker function in the spectrum application, the command instead selects the level below which the signal at the marker position is not demodulated.

Parameters:

<Level> <numeric value>
 Default unit: PCT

Example: //Configure squelch for audio output
 DEM:SQU ON
 DEM:SQU:LEV 10

Manual operation: See "Squelch" on page 141

[SENSe:]DEMod:SQUelch:LEVel:ABSolute <Level>

This command defines the absolute squelch level for audio output, below which the output is not demodulated.

To define a relative squelch level, use `[SENSe:]DEMod:SQUelch:LEVel`.

Parameters:

<Level> <numeric value>
 The unit depends on `CALCulate<n>:UNIT:POWer`.

Example: //Configure squelch in dBmV for audio output
 CALC:UNIT:POW DBMV
 DEM:SQU ON
 DEM:SQU:LEV:ABS 10

Manual operation: See "Squelch" on page 141

[SENSe:]DEMod:SQUelch[:STATe] <State>

This command turns a squelch for the audio output on and off.

The squelch is available for the following outputs.

- AM
- FM

If you are using the "Marker Demodulation" marker function in the spectrum application, the command instead turns selective demodulation at the marker position on and off. For selective demodulation, the R&S EPL turns on a video trigger whose level corresponds to the squelch level. Therefore it turns off other triggers or gates.

In both cases, you can define the squelch level with `[SENSe:]DEMod:SQUelch:LEVel`.

Parameters:

<State> ON | OFF | 1 | 0
 *RST: OFF

Example:

//Configure squelch for audio output
 DEM:SQU ON
 DEM:SQU:LEV 10

Manual operation: See ["Squelch"](#) on page 141

SYSTem:SPEaker:MAXVolume <Volume>

This command defines the maximum volume level for audio output (for example over headphones).

Parameters:

<Volume> Numeric value between 0 and 1, with 1 being the loudest.

Example:

//Define a maximum volume of 60 %
 SYST:SPE:MAXV 0.6

Manual operation: See ["Controlling the volume"](#) on page 142

SYSTem:SPEaker:MUTE

This command turns off audio output.

To turn the volume back on again, use [SYSTem:SPEaker:VOLume](#).

Example:

//Turn off audio output
 SYST:SPE:MUTE
 //Turn audio output back on
 SYST:SPE:VOL 25

Usage:

Event

Manual operation: See ["Controlling the volume"](#) on page 142

SYSTem:SPEaker:VOLume <Volume>

This command defines the volume with which audio signals are output.

Parameters:

<Volume> Numeric value between 0 and 1, with 1 being the loudest.
 Note that if you have defined a maximum volume level with [SYSTem:SPEaker:MAXVolume](#), the value range is limited by the maximum volume.

Example:

//Define a volume of 25 %.
 SYST:SPE:VOL 0.25

Manual operation: See ["Controlling the volume"](#) on page 142

15.6.2.2 Additional output

DIAGnostic:SERVice:NSource.....	447

DIAGnostic:SERVice:NSource <State>

Turns the 28 V supply of the BNC connector labeled [noise source control] on the R&S EPL on and off.

Parameters:

<State> ON | OFF | 0 | 1
 OFF | 0
 Switches the function off
 ON | 1
 Switches the function on

Example: DIAG:SERV:NSO ON

Manual operation: See "Noise Source Control" on page 143

15.6.3 Generator configuration

[SENSe:]CORRection[:STATe].....	447
[SENSe:]CORRection:COLLect[:ACQuire].....	448
[SENSe:]CORRection:METHod.....	448
[SENSe:]CORRection:RECall.....	449
[SENSe:]CORRection:TRANsduder:GENerate.....	449
DISPlay[:WINDow<n>][:SUBWindow<w>]:TRACe<t>:Y[:SCALe]:RPOSition.....	449
DISPlay[:WINDow<n>][:SUBWindow<w>]:TRACe<t>:Y[:SCALe]:RVALue.....	450
OUTPut[:STATe].....	450
SOURce<si>:INTernal:FREQuency.....	450
SOURce<si>:POWer[:LEVel][:IMMediate][:AMPLitude].....	451
SOURce<si>:POWer[:LEVel][:IMMediate]:OFFSet.....	451
SOURce<si>:FREQuency:COUPling[:STATe].....	451
SOURce<si>:INTernal:FREQuency:OFFSet.....	452
SOURce<si>:POWer:MODE.....	452
SOURce<si>:POWer:START.....	452
SOURce<si>:POWer:STOP.....	453

[SENSe:]CORRection[:STATe] <State>

Turns correction of measurement results (normalization) on and off.

The command is available after you have created a reference trace for the selected measurement type with [SENSe:]CORRection:COLLect[:ACQuire] on page 448.

Parameters:

<State> ON | OFF | 0 | 1
 OFF | 0
 Switches the function off

ON | 1

Switches the function on

***RST:** 1**Example:**

CORR ON

Activates normalization.

Manual operation: See ["Normalization state"](#) on page 154**[SENSe:]CORRection:COLLect[:ACQuire] <MeasType>**

Initiates a reference measurement (calibration). The reference measurement is the basis for the measurement normalization. The result depends on whether a reflection measurement or transmission measurement is performed (see [\[SENSe:\]CORRection:METHod](#) on page 448).

To obtain a correct reference measurement, a complete sweep with synchronization to the end of the sweep must have been carried out. This is only possible in the single sweep mode.

Setting parameters:

<MeasType> THROugh | OPEN

THROugh

"TRANsmission" mode: calibration with direct connection between generator and device input

"REFLection" mode: calibration with short circuit at the input

OPEN

only allowed in "REFLection" mode: calibration with open input

Example:

INIT:CONT OFF

Selects single sweep operation

CORR:METH TRAN

Selects a transmission measurement.

CORR:COLL THR;*WAI

Starts the measurement of reference data using direct connection between generator and device input and waits for the sweep end.

Usage:

Setting only

Manual operation: See ["Calibrate Reflection Short"](#) on page 153See ["Calibrate Reflection Open"](#) on page 153**[SENSe:]CORRection:METHod <Type>**

Selects the type of measurement to be performed with the generator.

Parameters:

<Type>

REFLection

Selects reflection measurements.

TRANsmission

Selects transmission measurements.

*RST: TRANsmission

Example: CORR:METH TRAN
Sets the type of measurement to "transmission".

Manual operation: See ["Calibrate Transmission"](#) on page 153
See ["Calibrate Reflection Short"](#) on page 153
See ["Calibrate Reflection Open"](#) on page 153

[SENSe:]CORRection:RECall

Restores the measurement configuration used for calibration.

Example: CORR:REC

Manual operation: See ["Recall Cal. Settings"](#) on page 154

[SENSe:]CORRection:TRANsducer:GENerate <Name>

Uses the normalized measurement data to generate a transducer factor with up to 1001 points. The trace data is converted to a transducer with unit dB and stored in a file with the specified name and the suffix .trd under

C:\ProgramData\Rohde-Schwarz\ZNL-FPL\trd. The frequency points are allocated in equidistant steps between start and stop frequency.

Parameters:

<Name> '<name>'

Example: CORR:TRAN:GEN 'MyGenerator'
Creates the transducer file
C:\r_s\instr\trd\MyGenerator.trd.

Manual operation: See ["Save as Trd Factor"](#) on page 155

DISPlay[:WINDow<n>][:SUBWindow<w>]:TRACe<t>:Y[:SCALE]:RPOSition <Position>

Defines the vertical position of the reference level on the display grid (for all traces).

The R&S EPL adjusts the scaling of the y-axis accordingly.

Suffix:

<n> [Window](#)

<w> subwindow
Not supported by all applications

<t> irrelevant

Parameters:

<Position> 0 PCT corresponds to the lower display border, 100 percent corresponds to the upper display border.

*RST: frequency display: 90 PCT; time display: 50 PCT;
AF spectrum display (K7): 100 PCT;
Default unit: PCT

Example:

DISP:TRAC:Y:RPOS 50PCT

Manual operation: See ["Reference Position"](#) on page 154

DISPlay[:WINDow<n>][:SUBWindow<w>]:TRACe<t>:Y[:SCALE]:RVALue <Value>

Defines the reference value assigned to the reference position in the specified window. Separate reference values are maintained for the various displays.

Suffix:

<n> [Window](#)
<w> subwindow
<t> irrelevant

Parameters:

<Value> Default unit: DB

Example:

DISP:TRAC:Y:RVAL 0
Sets the value assigned to the reference position to 0 Hz

Manual operation: See ["Reference Value"](#) on page 154

OUTPut[:STATe] <State>

Enables or disables the internal generator. The generator signal is output at the GEN Output 50 Ω connector on the front panel.

Parameters:

<State> ON | OFF | 0 | 1
OFF | 0
Switches the function off
ON | 1
Switches the function on
*RST: 0

Example:

OUTP ON

Manual operation: See ["Generator"](#) on page 138
See ["State"](#) on page 151

SOURce<si>:INTernal:FREQuency <Frequency>

Suffix:

<si> irrelevant

Parameters:

<Frequency> Range: 5 kHz to 3 GHz
 Increment: 0.1 Hz
 *RST: 1 GHz
 Default unit: HZ

Example: SOUR:INT:FREQ 2 GHz

Manual operation: See "CW Frequency" on page 152

SOURce<si>:POWer[:LEVel][:IMMediate][:AMPLitude] <Amplitude>

Suffix:

<si> irrelevant

Example: SOUR:POW -30dBm

Manual operation: See "Level" on page 151

SOURce<si>:POWer[:LEVel][:IMMediate]:OFFSet <Offset>

Suffix:

<si> irrelevant

Parameters:

<Offset> Range: -200 dB to +200 dB
 *RST: 0dB
 Default unit: DB

Example: SOUR:POW:OFFS -10dB

Manual operation: See "Level Offset" on page 151

SOURce<si>:FREQuency:COUPling[:STATe] <State>

Enables or disables the usage of the internal generator as a tracking generator. The tracking generator is only available for frequency sweeps in the Spectrum application.

Suffix:

<si> 1..n

Parameters:

<State> ON | OFF | 0 | 1
 OFF | 0
 Switches the tracking generator off
 ON | 1
 Switches the tracking generator on
 *RST: 0

Example: SOUR:FREQ:COUP:STAT ON

SOURce<si>:INTernal:FREQuency:OFFSet <FreqOffset>

Defines an offset of the tracking generator signal to the analyzer frequency.

Suffix:

<si> 1..n

Parameters:

<FreqOffset> Default unit: HZ

Example: SOUR:INT:FREQ:OFFS 10kHz

Manual operation: See ["Frequency Offset"](#) on page 153

SOURce<si>:POWer:MODE <Mode>

Enables or disables a power sweep.

Suffix:

<si> irrelevant

Parameters:

<Mode> FIXed | SWEep

FIXed

Fixed power level. Required for tracking generator.

SWEep

Increasing power level. Required for power sweep.

*RST: FIXed

Example:
SOUR:POW:MODE:SWE
SOUR:POW:STAR -50
SOUR:POW:STOP -10

SOURce<si>:POWer:STARt <StartLevel>

Defines the start power level of the internal generator signal for power sweeps. This value must be lower than the stop level (see [SOURce<si>:POWer:STOP](#) on page 453).

Suffix:

<si> irrelevant

Parameters:

<StartLevel> Range: -60 to +10
*RST: -30
Default unit: DBM

Example:
SOUR:POW:MODE:SWE
SOUR:POW:STAR -50
SOUR:POW:STOP -10

Manual operation: See ["Level Start / Level Stop"](#) on page 156

SOURce<si>:POWer:STOP <StopLevel>

Defines the end power level of the internal generator signal for power sweeps. This value must be higher than the start level (see [SOURce<si>:POWer:START](#) on page 452).

Suffix:

<si> irrelevant

Parameters:

<StopLevel> Range: -60 to +10
 *RST: -20
 Default unit: DBM

Example:

SOUR:POW:MODE:SWE
 SOUR:POW:STAR -50
 SOUR:POW:STOP -10

Manual operation: See ["Level Start / Level Stop"](#) on page 156

15.6.4 Frequency configuration

CALCulate<n>:MARKer<m>:FUNCTION:CENTer	453
CALCulate<n>:MARKer<m>:FUNCTION:STRack[:STATe]	454
CALCulate<n>:MARKer<m>:FUNCTION:STRack:BANDwidth	454
CALCulate<n>:MARKer<m>:FUNCTION:STRack:THReshold	454
CALCulate<n>:MARKer<m>:FUNCTION:STRack:TRACe	455
CALCulate<n>:MARKer<m>:FUNCTION:POWer<sb>:RESTore	455
DISPlay[:WINDow<n>]:TRACe<t>:X:SPACing	455
[SENSe:]FREQuency:CENTer	456
[SENSe:]FREQuency:CENTer:STEP	456
[SENSe:]FREQuency:SCOupled	457
[SENSe:]FREQuency:SPAN	457
[SENSe:]FREQuency:SPAN:FULL	457

CALCulate<n>:MARKer<m>:FUNCTION:CENTer

This command matches the receiver frequency to the frequency of a marker.

Suffix:

<n> [Window](#)

<m> [Marker](#)

Example:

CALC:MARK2:FUNC:CENT
 Sets the receiver frequency to the frequency of marker 2.

Usage:

Event

Manual operation: See ["Synchronizing the receiver frequency to the marker frequency"](#) on page 167

CALCulate<n>:MARKer<m>:FUNCTION:STRack[:STATe] <State>

Turns signal tracking on and off.

Suffix:

<n> irrelevant
<m> irrelevant

Parameters:

<State> ON | OFF | 0 | 1
OFF | 0
Switches the function off
ON | 1
Switches the function on

Example:

```
//Activate signal tracking to keep the center frequency on the signal peak
//After each sweep the maximum on trace 1 is searched within a range of 20 MHz
//around the center frequency. It must have a minimum power of -90dBm.
CALC:MARK:FUNC:STR ON
CALC:MARK:FUNC:STR:BAND 20MHz
CALC:MARK:FUNC:STR:THR -90dBm
CALC:MARK:FUNC:STR:TRAC 1
```

Manual operation: See ["Signal Tracking"](#) on page 166
See ["IF Signal Tracking"](#) on page 170

CALCulate<n>:MARKer<m>:FUNCTION:STRack:BANDwidth <Bandwidth>

Defines the bandwidth around the center frequency that is included in the signal tracking process.

Note that you have to turn on signal tracking before you can use the command.

Suffix:

<n> irrelevant
<m> irrelevant

Parameters:

<Bandwidth> Range: 10 Hz to Max span
*RST: (= span/10 on activating the function)
Default unit: Hz

Manual operation: See ["Signal Tracking"](#) on page 166
See ["IF Signal Tracking"](#) on page 170

CALCulate<n>:MARKer<m>:FUNCTION:STRack:THReshold <Level>

Defines the threshold level for the signal tracking process.

Note that you have to turn on signal tracking before you can use the command.

Suffix:

<n> irrelevant

<m> irrelevant

Parameters:<Level> The unit depends on `CALCulate<n>:UNIT:POWer`.

Range: -130 dBm to 30 dBm

*RST: -120 dBm

Default unit: DBM

Manual operation: See ["Signal Tracking"](#) on page 166
 See ["IF Signal Tracking"](#) on page 170

CALCulate<n>:MARKer<m>:FUNCTION:STRack:TRACe <TraceNumber>

Selects the trace on which the largest signal is searched for.

Suffix:

<n> irrelevant

<m> irrelevant

Parameters:

<TraceNumber> 1 to 6

Range: 1 to 6

*RST: 1

Manual operation: See ["Signal Tracking"](#) on page 166
 See ["IF Signal Tracking"](#) on page 170

CALCulate<n>:MARKer<m>:FUNCTION:POWer<sb>:RESTore

Restores ACLR user standards.

Suffix:

<n> irrelevant

<m> irrelevant

<sb> irrelevant

Usage: Event**DISPlay[:WINDow<n>]:TRACe<t>:X:SPACing <Scale>**

This command selects the scale of the x-axis.

Suffix:

<n> irrelevant

<t> irrelevant

Parameters:

<Scale>

LINear

Linear scale of the frequency axis.

LOGarithmic

Logarithmic scale of the frequency axis.

*RST: LOGarithmic

Example:

```
//Select a linear scale for the x-axis
DISP:TRAC:X:SPAC LIN
```

Manual operation: See ["Frequency Axis Scale"](#) on page 168

[SENSe:]FREQuency:CENTer <Frequency>

This command defines the measurement frequency for measurements in the frequency or time domain.

Parameters:

<Frequency>

<numeric value>

Numeric value in Hz.

Range: Refer to the datasheet

*RST: $f_{\max} / 2$

Default unit: Hz

Example:

```
//Define receiver frequency
FREQ:CENT 100MHz
```

Manual operation: See ["PS Frequency"](#) on page 155
See ["Receiver Frequency"](#) on page 167

[SENSe:]FREQuency:CENTer:STEP <StepSize>

This command defines the center frequency step size.

Parameters:

<StepSize>

<numeric value>

Numeric value in Hz.

Example:

```
//Define frequency step size
FREQ:CENT:STEP 4KHZ
```

Manual operation: See ["Frequency Stepsize"](#) on page 168

[SENSe:]FREQuency:SCOUpled <State>

This command couples or decouples the bargraph settings to the scan settings.

Parameters:

<State>

LSC

Couples the bargraph settings to the settings of the last scan that has been performed.

OFF

Decouples the bargraph settings from the scan settings.

SCAN

Couples the bargraph settings to the current scan settings or the settings of the current scan range.

*RST: OFF

Example:

```
//Couple bargraph settings to settings of last scan
FREQ:SCO LSC
```

Manual operation: See ["Couple Bargraph Settings"](#) on page 169

**[SENSe:]FREQuency:SPAN **

Defines the frequency span.

Parameters:

Available for IF analysis in the receiver application.

Default unit: Hz

Manual operation: See ["IF Analysis"](#) on page 169

[SENSe:]FREQuency:SPAN:FULL

Restores the full span.

The full span depends on the current receiver frequency.

Manual operation: See ["IF Analysis"](#) on page 169

15.6.5 Amplitude configuration

CALCulate<n>:UNIT:POWer	457
INPut:ATTenuation[:VALue]	458
INPut:ATTenuation:AMODE	458
INPut:ATTenuation:AUTO	458
INPut:ATTenuation:PROTection[:STATe]	459
INPut:GAIN:AUTO	459
INPut:GAIN:STATe	459

CALCulate<n>:UNIT:POWer <Unit>

This command selects the unit for the y-axis.

Suffix:

<n> irrelevant

Parameters:

<Unit> DBM | V | A | W | DBPW | DBPW_MHZ | DBUV | DBUV_MHZ |
 DBMV | DBMV_MHZ | DBUA | DBUA_MHZ | DBPT |
 DBPT_MHZ | DBUV_M | DBUV_MMHZ | DBUA_M |
 DBUA_MMHZ
 *RST: dB μ V

Example:

```
//Select unit
CALC:UNIT:POW DBM
```

Manual operation: See ["Unit"](#) on page 162
 See ["dBx/MHz"](#) on page 162

INPut:ATTenuation[:VALue] <Attenuation>

This command defines the attenuation at the RF input.

To protect the input mixer, attenuation levels of 10 dB or less are possible only if you have turned off the input protection with [INPut:ATTenuation:PROtection\[:STATe\]](#) on page 459.

Parameters:

<Attenuation> Range: 0 dB to 55 dB
 *RST: 10 dB
 Default unit: dB

Example:

```
//Define attenuation
INP:ATT 40dB
```

Manual operation: See ["Attenuation"](#) on page 110

INPut:ATTenuation:AMODE <State>

This command selects the auto ranging mode.

Parameters:

<State> **LOWNoise**
 Selects the low noise mode.
NORMAL
 Selects the normal mode.
 *RST: NORMAL

Example:

```
//Select low noise auto ranging mode
INP:ATT:AMOD LOWN
```

Manual operation: See ["Auto Range"](#) on page 109

INPut:ATTenuation:AUTO <State>

This command turns automatic determination of the attenuation level on and off.

When you turn it on, the R&S EPL selects an attenuation that results in a good signal-to-noise ratio without overloading the RF input.

Parameters:

<State> ON | OFF
ON
 Turns on the auto ranging feature.
OFF
 Turns off the auto ranging feature.
 *RST: ON

Example: //Turn on auto ranging
 INP:ATT:AUTO ON

Manual operation: See ["Auto Range"](#) on page 109
 See ["Attenuation"](#) on page 110

INPut:ATTenuation:PROTection[:STATe] <State>

This command turns the availability of attenuation levels of 10 dB or less on and off.

Parameters:

<State> ON | OFF | 1 | 0
 *RST: 1

Example: //Turn on input protection
 INP:ATT:PROT ON

Manual operation: See ["10 dB Minimum Attenuation"](#) on page 162

INPut:GAIN:AUTO <State>

This command includes and excludes the preamplifier from the auto ranging feature.

Parameters:

<State> ON | OFF | 1 | 0
 *RST: OFF

Example: //Consider preamplifier for auto ranging
 INP:GAIN:AUTO ON

Manual operation: See ["Preamplifier"](#) on page 110

INPut:GAIN:STATe <State>

This command turns the preamplifier on and off.

Parameters:

<State> ON | OFF | 1 | 0
 *RST: OFF

Example: //Turn on preamplifier
INP:GAIN:STAT ON

Manual operation: See ["Preamplifier"](#) on page 110

15.6.6 Diagram scale

DISPlay[:WINDow<n>][:SUBWindow<w>]:TRACe<t>:Y[:SCALe]..... 460
DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:BOTTom.....460

DISPlay[:WINDow<n>][:SUBWindow<w>]:TRACe<t>:Y[:SCALe] <Range>

Defines the display range of the y-axis (for all traces).

Suffix:

<n>	Window
<w>	subwindow Not supported by all applications
<t>	irrelevant

Parameters:

<Range>	Range: 1 dB to 200 dB *RST: 100 dB Default unit: HZ

Example: DISP:TRAC:Y 110dB

Manual operation: See ["Grid Range / Minimum Level"](#) on page 163

DISPlay[:WINDow<n>]:TRACe<t>:Y[:SCALe]:BOTTom <Level>

This command defines the minimum level displayed on the vertical diagram axis.

Suffix:

<n>	Window
<t>	irrelevant

Parameters:

<Level>	Minimum displayed level. The unit and value range depend on the unit you have selected. *RST: 0 dBµV

Example: //Define a minimum grid level
DISP:TRAC:Y:BOTT -20

Manual operation: See ["Grid Range / Minimum Level"](#) on page 163

15.6.7 Bandwidth and filter configuration

[SENSe:]BWIDth:IF.....	461
[SENSe:]BANDwidth:IF.....	461
[SENSe:]BWIDth[:RESolution].....	461
[SENSe:]BANDwidth[:RESolution][:VALue].....	461
[SENSe:]BWIDth:SCPL.....	461
[SENSe:]BANDwidth:SCPL.....	461
[SENSe:]BWIDth[:RESolution]:AUTO.....	462
[SENSe:]BANDwidth[:RESolution]:AUTO.....	462
[SENSe:]BWIDth[:RESolution]:TYPE.....	462
[SENSe:]BANDwidth[:RESolution]:TYPE.....	462

[SENSe:]BWIDth:IF <Bandwidth>

[SENSe:]BANDwidth:IF <Bandwidth>

This command defines the resolution bandwidth for IF analysis.

Parameters:

<Bandwidth> <numeric value>
 The available bandwidths depend on the span.
 Default unit: Hz

Example: //Define resolution bandwidth for IF analysis
 BAND:IF 10KHZ

Manual operation: See ["IF Analysis"](#) on page 169

[SENSe:]BWIDth[:RESolution] <Bandwidth>

[SENSe:]BANDwidth[:RESolution][:VALue] <Bandwidth>

This command defines the measurement (or resolution) bandwidth.

The available bandwidths depend on the selected filter type.

A change of the resolution bandwidth automatically turns the coupling to the frequency off.

Parameters:

<Bandwidth> <numeric value>
 Refer to the datasheet for available bandwidths.
 Default unit: Hz

Example: //Select measurement bandwidth
 BAND 3MHZ

Manual operation: See ["Measurement Bandwidth"](#) on page 90

[SENSe:]BWIDth:SCPL <State>

[SENSe:]BANDwidth:SCPL <State>

This command couples or decouples the IF span to the measurement bandwidth used for the bargraph.

Parameters:

<State> ON | OFF | 1 | 0
 *RST: ON

Example: //Decouple span from the measurement bandwidth.
 BAND:SCPL OFF

Manual operation: See ["IF Analysis"](#) on page 169

[SENSe:]BWIDth[:RESolution]:AUTO <State>

[SENSe:]BANDwidth[:RESolution]:AUTO <State>

This command couples or decouples the resolution bandwidth to the selected frequency.

The resolution bandwidth is coupled to the frequency only if you have selected the Quasipeak, CISPR Average or CISPR RMS detector.

Parameters:

<State> ON | OFF | 1 | 0
 *RST: ON

Example: //Decouple measurement bandwidth from frequency range
 BAND:AUTO OFF

Manual operation: See ["CISPR RBW Uncoupled"](#) on page 171

[SENSe:]BWIDth[:RESolution]:TYPE <FilterType>

[SENSe:]BANDwidth[:RESolution]:TYPE <FilterType>

This command selects the resolution filter type.

When you change the filter type, the command selects the next larger filter bandwidth if the same bandwidth is unavailable for that filter.

Parameters:

<FilterType> **CFILter**
 Channel filters
 Available in the spectrum application.
NORMal
 Gaussian filters
CISPr | PULSe
 CISPR (6 dB)
 Return value for query is always **PULS**.
MIL
 MIL Std (6 dB)
 *RST: NORMal

Example: BAND:TYPE NORM

Manual operation: See ["Filter Type"](#) on page 90

15.6.8 Trigger and gate configuration

[SENSe:]SWEep:EGATe:HOLDoff.....	463
[SENSe:]SWEep:EGATe:LENGth.....	463
[SENSe:]SWEep:EGATe:POLarity.....	463
[SENSe:]SWEep:EGATe.....	464
[SENSe:]SWEep:EGATe:TYPE.....	464
TRIGger[:SEQuence]:HOLDoff[:TIME].....	464
TRIGger[:SEQuence]:SLOPe.....	465
TRIGger[:SEQuence]:SOURce.....	465
[SENSe:]SWEep:EGATe:SOURce.....	466

[SENSe:]SWEep:EGATe:HOLDoff <DelayTime>

Defines the delay time between the gate signal and the continuation of the measurement.

Parameters:

<DelayTime> Range: 0 s to 30 s
 *RST: 0 s
 Default unit: S

Example: SWE:EGAT:HOLD 100us

Manual operation: See ["Gate Delay"](#) on page 176

[SENSe:]SWEep:EGATe:LENGth <GateLength>

Defines the gate length.

Parameters:

<GateLength> Range: 125 ns to 30 s
 *RST: 400µs
 Default unit: S

Example: SWE:EGAT:LENG 10ms

Manual operation: See ["Gate Length"](#) on page 176

[SENSe:]SWEep:EGATe:POLarity <Polarity>

Selects the polarity of an external gate signal.

The setting applies both to the edge of an edge-triggered signal and the level of a level-triggered signal.

Parameters:

<Polarity> POSitive | NEGative
 *RST: POSitive

Example: SWE:EGAT:POL POS

[SENSe:]SWEep:EGATe <State>

Turns gated measurements on and off.

Parameters:

<State> ON | OFF | 0 | 1
 OFF | 0
 Switches the function off
 ON | 1
 Switches the function on

Example:

SWE:EGAT ON
 Switches on the gate mode.
 SWE:EGAT:TYPE EDGE
 Switches on the edge-triggered mode.
 SWE:EGAT:HOLD 100US
 Sets the gate delay to 100 µs.
 SWE:EGAT:LEN 500US
 Sets the gate opening time to 500 µs.
 INIT;*WAI
 Starts a sweep and waits for its end.

Manual operation: See ["Gated Trigger"](#) on page 176

[SENSe:]SWEep:EGATe:TYPE <Type>

Selects the way gated measurements are triggered.

Parameters:

<Type> **LEVeL**
 The trigger event for the gate to open is a particular power level.
 After the gate signal has been detected, the gate remains open
 until the signal disappears.
 EDGE
 The trigger event for the gate to open is the detection of the sig-
 nal edge.
 After the gate signal has been detected, the gate remains open
 until the gate length is over.
 *RST: EDGE

Example:

SWE:EGAT:TYPE EDGE

Manual operation: See ["Gate Mode"](#) on page 176

TRIGger[:SEquence]:HOLDoff[:TIME] <Offset>

Defines the time offset between the trigger event and the start of the measurement (data capturing).

A negative offset is possible for time domain measurements.

For the trigger sources "External" or "IF Power", a common input signal is used for both trigger and gate. Therefore, changes to the gate delay affect the trigger offset as well.

Parameters:

<Offset> Range for measurements in the frequency domain:
 0 s to 10 s
 Range for measurements in the time domain:
 negative sweep time to 10 s
 *RST: 0 s
 Default unit: s

Example: //Define a trigger offset
 TRIG:HOLD 500us

Manual operation: See ["Trigger Offset"](#) on page 175

TRIGger[:SEquence]:SLOPe <Type>

Selects the trigger slope.

Parameters:

<Type> **POSitive**
 Triggers when the signal rises to the trigger level (rising edge).
 NEGative
 Triggers when the signal drops to the trigger level (falling edge).
 *RST: POSitive

Example: //Select trigger slope
 TRIG:SLOP NEG

Manual operation: See ["Trigger Slope"](#) on page 175

TRIGger[:SEquence]:SOURce <Source>

Selects the trigger source.

Note on external triggers:

If a measurement is configured to wait for an external trigger signal in a remote control program, remote control is blocked until the trigger is received and the program can continue. Make sure that this situation is avoided in your remote control programs.

For troubleshooting tips, see ["Incompleted sequential commands - blocked remote channels"](#) on page 663.

Parameters:

<Source> See table below.
 *RST: IMMEDIATE

Example: //Select external trigger input as source of the trigger signal
 TRIG:SOUR EXT

Manual operation: See ["Trigger Source"](#) on page 175
 See ["Free Run"](#) on page 175
 See ["External Trigger 1"](#) on page 175

Table 15-4: Available trigger sources

SCPI parameter	Trigger source
EXTernal	Trigger signal from the [Trigger Input] connector.

[SENSe:]SWEep:EGATe:SOURce <Source>

Selects the signal source for gated measurements.

If an IF power signal is used, the gate is opened as soon as a signal at > -20 dBm is detected within the IF path bandwidth (10 MHz).

For more information see ["Trigger Source"](#) on page 175.

Parameters:

<Source> EXTernal | IFPower | TIME

*RST: IFPower

Example:

SWE:EGAT:SOUR IFP

Switches the gate source to IF power.

15.6.9 Programming example for a tracking generator

The following example demonstrates how to work with a tracking generator in a remote environment. It requires the Tracking Generator option (R&S EPL1-B9) to be installed on the R&S EPL.

```
//-----Preparing the instrument -----

//Reset the instrument
*RST

//Set the frequency span.
SENS:FREQ:STAR 10HZ
SENS:FREQ:STOP 1MHZ

//-----Configuring the use of the internal generator -----
OUTP ON
SOUR:FREQ:COUP ON
//Set the generator output level to -10 dBm.
SOUR:POW -10DBM
//Define a frequency offset of 100kHz
SOUR:INT:FREQ:OFFS 100KHZ

//-----Performing the calibration measurement -----

//Perform a transmission measurement with direct connection between the generator
```

```

//and the analyzer and wait till the end
SENS:CORR:METH TRAN
SENS:CORR:COLL:ACQ THR; *WAI

//-----Retrieving the calibration trace results -----

//Retrieve the measured frequencies (10 Hz - 10 MHz)
TRAC:DATA:X? TRACE1

//Retrieve the measured power levels;
TRAC:DATA? TRACE1

//-----Normalizing the calibration trace results -----

//Retrieve the normalized power levels (= power offsets from calibration results)
//Should be 0 for all sweep points directly after calibration
SENS:CORR:STAT ON
TRAC:DATA? TRACE1

//-----Changing the display of the calibration results -----
//Shift the reference line so the -5 dB level is displayed in the center
DISP:TRAC:Y:SCAL:RVAL -5DB
DISP:TRAC:Y:SCAL:RPOS 50PCT

```

15.7 Analysis

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15.7.1 Result display configuration

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15.7.1.1 General window commands

Note that the suffix <n> always refers to the window in the currently selected measurement channel.

DISPlay:FORMat	468
DISPlay[:WINDow<n>]:SIZE	468

DISPlay:FORMat <Format>

Determines which tab is displayed.

Parameters:

<Format>

SPLit

Displays the MultiView tab with an overview of all active channels

SINGle

Displays the measurement channel that was previously focused.

*RST: SING

Example:

DISP:FORM SPL

DISPlay[:WINDow<n>]:SIZE <Size>

Maximizes the size of the selected result display window *temporarily*. To change the size of several windows on the screen permanently, use the `LAY:SPL` command (see [LAYout:SPLitter](#) on page 472).

Suffix:

<n>

[Window](#)**Parameters:**

<Size>

LARGE

Maximizes the selected window to full screen.
Other windows are still active in the background.

SMALI

Reduces the size of the selected window to its original size.
If more than one measurement window was displayed originally, these are visible again.

*RST: SMALI

Example:

DISP:WIND2:SIZE LARG

15.7.1.2 Screen layout

The following commands are required to change the evaluation type and rearrange the screen layout for a measurement channel as you do using the SmartGrid in manual operation. Since the available evaluation types depend on the selected application, some parameters for the following commands also depend on the selected measurement channel.

Note that the suffix <n> always refers to the window in the currently selected measurement channel.

LAYout:ADD[:WINDow]?	469
LAYout:CATalog[:WINDow]?	470
LAYout:IDENtify[:WINDow]?	470
LAYout:MOVE[:WINDow]	471
LAYout:REMOve[:WINDow]	471

LAYout:REPLace[:WINDow].....	471
LAYout:SPLitter.....	472
LAYout:WINDow<n>:ADD?.....	473
LAYout:WINDow<n>:IDENTify?.....	474
LAYout:WINDow<n>:REMove.....	474
LAYout:WINDow<n>:REPLace.....	474

LAYout:ADD[:WINDow]? <WindowName>, <Direction>, <WindowType>

Adds a window to the display in the active channel setup.

Is always used as a query so that you immediately obtain the name of the new window as a result.

To replace an existing window, use the `LAYout:REPLace[:WINDow]` command.

Query parameters:

<WindowName>	String containing the name of the existing window the new window is inserted next to. By default, the name of a window is the same as its index. To determine the name and index of all active windows, use the <code>LAYout:CATalog[:WINDow]?</code> query.
<Direction>	LEFT RIGHT ABOVE BELOW Direction the new window is added relative to the existing window.
<WindowType>	text value Type of result display (evaluation method) you want to add. See the table below for available parameter values.

Return values:

<NewWindowName>	When adding a new window, the command returns its name (by default the same as its number) as a result.

Usage: Query only

Table 15-5: <WindowType> parameter values for the receiver application

Parameter value	Window type
BGRaph	Bargraph
DIAGram	Scan diagram
FACCess	Fast access panel
FMEas	Final measurement
IFANalysis	IF analysis diagram
IFSGram	IF analysis spectrogram
MTABle	Marker table
NOTes	Notes display
PLISt	Marker peak list

Parameter value	Window type
PRESelection	"Preselector" configuration
SCAN	Scan diagram
SCSGram	Scan spectrogram

LAYout:CATalog[:WINDow]?

Queries the name and index of all active windows in the active channel setup from top left to bottom right. The result is a comma-separated list of values for each window, with the syntax:

<WindowName_1>,<WindowIndex_1>..

Return values:

<WindowName> string
 Name of the window.
 In the default state, the name of the window is its index.

<WindowIndex> **numeric value**
 Index of the window.

Example:

LAY:CAT?

Result:

'2',2,'1',1

Two windows are displayed, named '2' (at the top or left), and '1' (at the bottom or right).

Usage: Query only

LAYout:IDENTify[:WINDow]? <WindowName>

Queries the **index** of a particular display window in the active channel setup.

Query parameters:

<WindowName> String containing the name of a window.

Return values:

<WindowIndex> Index number of the window.

Example:

LAY:IDEN:WIND? '2'

Queries the index of the result display named '2'.

Response:

2

Usage: Query only

LAYout:MOVE[:WINDow] <WindowName>, <WindowName>, <Direction>**Setting parameters:**

<WindowName>	String containing the name of an existing window that is to be moved. By default, the name of a window is the same as its index. To determine the name and index of all active windows in the active channel setup, use the LAYout:CATalog[:WINDow]? query.
<WindowName>	String containing the name of an existing window the selected window is placed next to or replaces. By default, the name of a window is the same as its index. To determine the name and index of all active windows in the active channel setup, use the LAYout:CATalog[:WINDow]? query.
<Direction>	LEFT RIGHT ABOVE BELOW REPLACE Destination the selected window is moved to, relative to the reference window.

Example: `LAY:MOVE '4','1',LEFT`
Moves the window named '4' to the left of window 1.

Example: `LAY:MOVE '1','3',REPL`
Replaces the window named '3' by window 1. Window 3 is deleted.

Usage: Setting only

LAYout:REMove[:WINDow] <WindowName>

Removes a window from the display in the active channel.

Setting parameters:

<WindowName>	String containing the name of the window. In the default state, the name of the window is its index.

Example: `LAY:REM '2'`
Removes the result display in the window named '2'.

Usage: Setting only

LAYout:REPLace[:WINDow] <WindowName>, <WindowType>

Replaces the window type (for example from "Diagram" to "Result Summary") of an already existing window in the active channel setup while keeping its position, index and window name.

To add a new window, use the [LAYout:ADD\[:WINDow\]?](#) command.

Setting parameters:

<WindowName>	String containing the name of the existing window. By default, the name of a window is the same as its index. To determine the name and index of all active windows in the active channel setup, use the LAYout:CATalog[:WINDow]? query.

<WindowType> Type of result display you want to use in the existing window. See [LAYout:ADD\[:WINDow\]?](#) on page 469 for a list of available window types.

Example: `LAY:REPL:WIND '1',MTAB`
Replaces the result display in window 1 with a marker table.

Usage: Setting only

LAYout:SPLitter <Index1>, <Index2>, <Position>

Changes the position of a splitter and thus controls the size of the windows on each side of the splitter.

Note that windows must have a certain minimum size. If the position you define conflicts with the minimum size of any of the affected windows, the command does not work, but does not return an error.

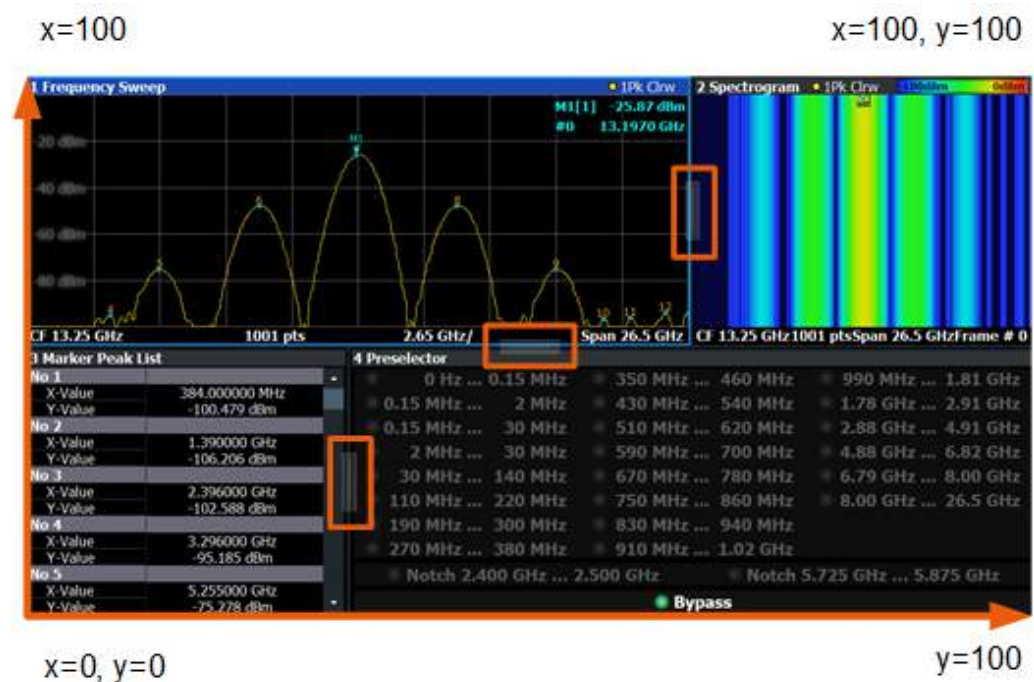


Figure 15-1: SmartGrid coordinates for remote control of the splitters

Setting parameters:

<Index1> The index of one window the splitter controls.
<Index2> The index of a window on the other side of the splitter.

<Position>	New vertical or horizontal position of the splitter as a fraction of the screen area (without channel and status bar and softkey menu). The point of origin (x = 0, y = 0) is in the lower left corner of the screen. The end point (x = 100, y = 100) is in the upper right corner of the screen. (See Figure 15-1.) The direction in which the splitter is moved depends on the screen layout. If the windows are positioned horizontally, the splitter also moves horizontally. If the windows are positioned vertically, the splitter also moves vertically. Range: 0 to 100
Example:	LAY:SPL 1,3,50 Moves the splitter between window 1 ('Frequency Sweep') and 3 ('Marker Table') to the center (50%) of the screen, i.e. in the figure above, to the left.
Example:	LAY:SPL 1,4,70 Moves the splitter between window 1 ('Frequency Sweep') and 3 ('Marker Peak List') towards the top (70%) of the screen. The following commands have the exact same effect, as any combination of windows above and below the splitter moves the splitter vertically. LAY:SPL 3,2,70 LAY:SPL 4,1,70 LAY:SPL 2,1,70
Usage:	Setting only

LAYout:WINDow<n>:ADD? <Direction>,<WindowType>

Adds a measurement window to the display. Note that with this command, the suffix <n> determines the existing window next to which the new window is added. Unlike [LAYout:ADD\[:WINDow\]?](#), for which the existing window is defined by a parameter.

To replace an existing window, use the [LAYout:WINDow<n>:REPLace](#) command.

Is always used as a query so that you immediately obtain the name of the new window as a result.

Suffix:

<n> [Window](#)

Query parameters:

<Direction> LEFT | RIGHT | ABOVE | BELOW

<WindowType> Type of measurement window you want to add.
See [LAYout:ADD\[:WINDow\]?](#) on page 469 for a list of available window types.

Return values:

<NewWindowName> When adding a new window, the command returns its name (by default the same as its number) as a result.

Example: `LAY:WIND1:ADD? LEFT,MTAB`
Result:
 '2'
 Adds a new window named '2' with a marker table to the left of window 1.

Usage: Query only

LAYout:WINDow<n>:IDENtify?

Queries the **name** of a particular display window (indicated by the <n> suffix) in the active channel setup.

Note: to query the **index** of a particular window, use the `LAYout:IDENtify[:WINDow]?` command.

Suffix:
 <n> [Window](#)

Return values:
 <WindowName> String containing the name of a window.
 In the default state, the name of the window is its index.

Example: `LAY:WIND2:IDEN?`
 Queries the name of the result display in window 2.
Response:
 '2'

Usage: Query only

LAYout:WINDow<n>:REMOve

Removes the window specified by the suffix <n> from the display in the active channel setup.

The result of this command is identical to the `LAYout:REMOve[:WINDow]` command.

Suffix:
 <n> [Window](#)

Example: `LAY:WIND2:REM`
 Removes the result display in window 2.

Usage: Event

LAYout:WINDow<n>:REPLace <WindowType>

Changes the window type of an existing window (specified by the suffix <n>) in the active channel setup.

The effect of this command is identical to the `LAYout:REPLace[:WINDow]` command.

To add a new window, use the `LAYout:WINDow<n>:ADD?` command.

Suffix:

<n>

Window

Setting parameters:

<WindowType>

Type of measurement window you want to replace another one with.

See [LAYout:ADD\[:WINDow\]?](#) on page 469 for a list of available window types.

Example:

LAY:WIND2:REPL MTAB

Replaces the result display in window 2 with a marker table.

Usage:

Setting only

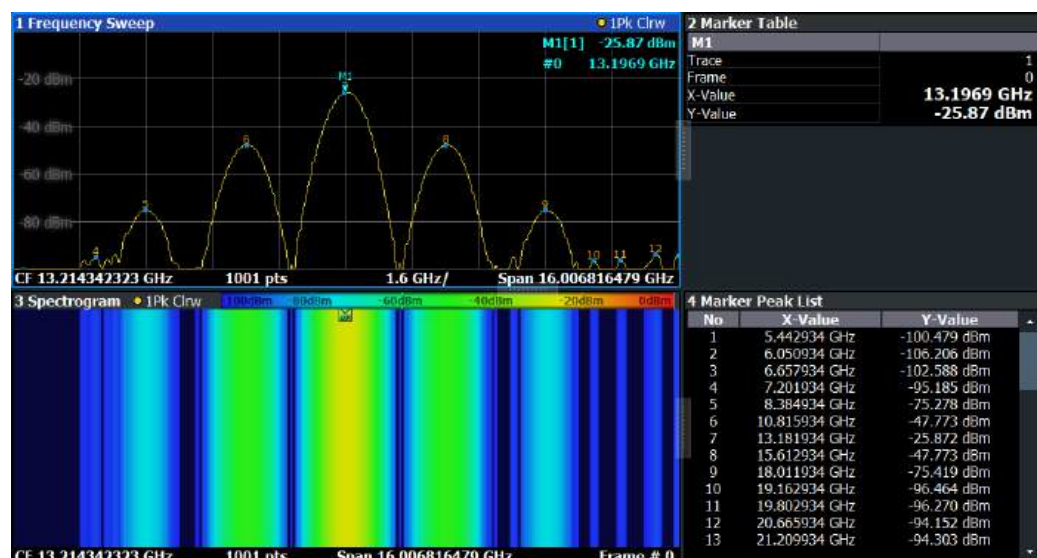
15.7.1.3 Examples: configuring the result display

The following example demonstrates how to configure result displays in a remote environment.

Example 1: adding and arranging windows

Starting from the default initial display in the Spectrum application (Frequency Sweep), we will configure the following result displays:

1 Frequency Sweep	3 "Marker Table"
2 Spectrogram	4 "Marker Peak List"



```
//-----Resetting the instrument -----
*RST

//----- Adding new windows -----
//Add a Spectrogram window beneath the Frequency Sweep window
LAY:ADD? '1',BEL,SGR
//Result: window number: '2'
//Add a Marker Table window to the right of the Frequency Sweep window
```

```

LAY:ADD? '1',RIGH,MTAB
//Result: window number: '3'
//Add a Marker Peak List window to the right of the Spectrogram window
LAY:WIND2:ADD? RIGH,PEAK
//Result: window number: '4'

//----- Changing the size of individual windows -----
//Move the splitter between the Frequency Sweep window and the Marker Table
//window to enlarge the spectrum display to 60% of the entire width.
LAY:SPL 1,3,60
//Move the splitter between the Spectrogram window and the Marker Peak List
//window to enlarge the Spectrogram display to 60% of the entire width.
LAY:SPL 2,4,60

//----- Querying all displayed windows -----
//Query the name and number of all displayed windows
//(from top left to bottom right)
LAY:CAT?
//Result : '1',1,'2',2,'3',3,'4',4

//----- Maximizing a Window -----
//Maximize the window "2 Spectrogram"
DISP:WIND2:SIZE LARG

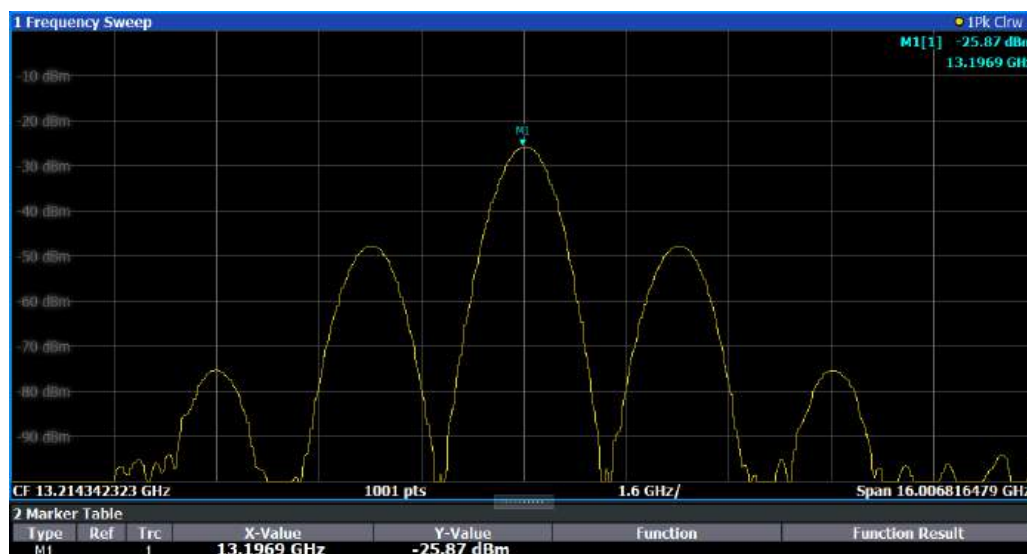
//-----Restore multiple window display -----
DISP:WIND2:SIZE SMAL

```

Example 2: replacing and removing windows

Starting from the display configured in [Example 1: adding and arranging windows](#), we will remove and replace result displays to obtain the following configuration:

1 Frequency Sweep
4 "Marker Table"



```
//----- Preparing the configuration from example 1 -----
*RST
LAY:ADD? '1',BEL,SGR
LAY:ADD? '1',RIGH,MTAB
LAY:WIND2:ADD? RIGH,PEAK
LAY:CAT?
//Result : '1',1,'2',2,'3',3,'4',4
//Remove Spectrogram
LAY:WIND2:REM //Remove Marker Table window
LAY:REM '3'
//Replace Marker Peak List window by Marker Table
LAY:REPL '4',MTAB

//----- Querying all displayed windows -----
//Query the name and number of all displayed windows (from top left to bottom right)
LAY:CAT?
//Result : '1',1,'4',4

//----- Changing the size of individual windows -----
//Move the splitter between the Frequency Sweep window and the Marker Table window
//to enlarge the spectrum display to 80% of the entire height.
LAY:SPL 1,4,80
```

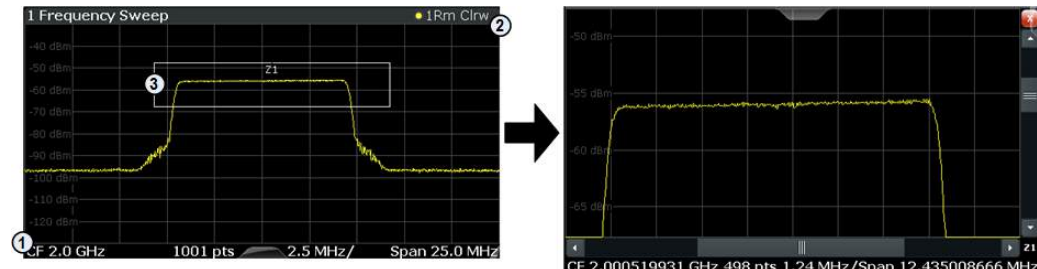
15.7.2 Zoomed displays

DISPlay[:WINDow<n>][:SUBWindow<w>]:ZOOM:AREA..... 478
 DISPlay[:WINDow<n>][:SUBWindow<w>]:ZOOM[:STATE]..... 479
 DISPlay[:WINDow<n>][:SUBWindow<w>]:ZOOM:MULTiple<zn>[:STATE]..... 479
 DISPlay[:WINDow<n>][:SUBWindow<w>]:ZOOM:MULTiple<zn>:AREA..... 479

DISPlay[:WINDow<n>][:SUBWindow<w>]:ZOOM:AREA <x1>,<y1>,<x2>,<y2>

Defines the zoom area.

To define a zoom area, you first have to turn the zoom on.



1 = origin of coordinate system (x1 = 0, y1 = 0)

2 = end point of system (x2 = 100, y2 = 100)

3 = zoom area (e.g. x1 = 60, y1 = 30, x2 = 80, y2 = 75)

Suffix:

<n>

Window

<w>

subwindow

Not supported by all applications

Parameters:

<x1>

Diagram coordinates in % of the complete diagram that define the zoom area.

The lower left corner is the origin of coordinate system. The upper right corner is the end point of the system.

Range: 0 to 100

Default unit: PCT

<y1>

Diagram coordinates in % of the complete diagram that define the zoom area.

The lower left corner is the origin of coordinate system. The upper right corner is the end point of the system.

Range: 0 to 100

Default unit: PCT

<x2>

Diagram coordinates in % of the complete diagram that define the zoom area.

The lower left corner is the origin of coordinate system. The upper right corner is the end point of the system.

Range: 0 to 100

Default unit: PCT

<y2>

Diagram coordinates in % of the complete diagram that define the zoom area.

The lower left corner is the origin of coordinate system. The upper right corner is the end point of the system.

Range: 0 to 100

Default unit: PCT

Manual operation: See ["Single Zoom"](#) on page 183

DISPlay[:WINDow<n>][:SUBWindow<w>]:ZOOM[:STATe] <State>

Turns the zoom on and off.

Suffix:

<n> [Window](#)

<w> subwindow
Not supported by all applications

Parameters:

<State> ON | OFF | 0 | 1
OFF | 0
Switches the function off
ON | 1
Switches the function on

Example: DISP:ZOOM ON
Activates the zoom mode.

Manual operation: See ["Single Zoom"](#) on page 183
See ["Restore Original Display"](#) on page 184

DISPlay[:WINDow<n>][:SUBWindow<w>]:ZOOM:MULTiple<zn>[:STATe] <State>

Turns the multiple zoom on and off.

Suffix:

<n> [Window](#)

<w> subwindow
Not supported by all applications

<zn> Selects the zoom window.
If you turn off one of the zoom windows, all subsequent zoom windows move up one position.

Parameters:

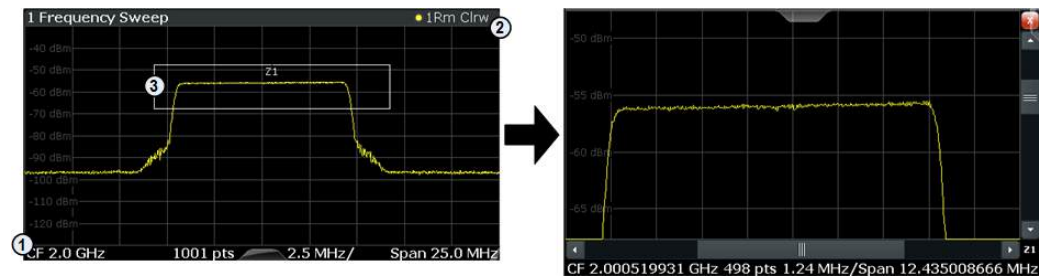
<State> ON | OFF | 0 | 1
OFF | 0
Switches the function off
ON | 1
Switches the function on

Manual operation: See ["Multi-Zoom"](#) on page 183

DISPlay[:WINDow<n>][:SUBWindow<w>]:ZOOM:MULTiple<zn>:AREA <x1>,<y1>,<x2>,<y2>

Defines the zoom area for a multiple zoom.

To define a zoom area, you first have to turn the zoom on.



1 = origin of coordinate system (x1 = 0, y1 = 0)

2 = end point of system (x2 = 100, y2 = 100)

3 = zoom area (e.g. x1 = 60, y1 = 30, x2 = 80, y2 = 75)

Suffix:

<n>	Window
<w>	subwindow Not supported by all applications
<zn>	Selects the zoom window.

Parameters:

<x1>	Diagram coordinates in % of the complete diagram that define the zoom area. The lower left corner is the origin of coordinate system. The upper right corner is the end point of the system. Range: 0 to 100 Default unit: PCT
<y1>	Diagram coordinates in % of the complete diagram that define the zoom area. The lower left corner is the origin of coordinate system. The upper right corner is the end point of the system. Range: 0 to 100 Default unit: PCT
<x2>	Diagram coordinates in % of the complete diagram that define the zoom area. The lower left corner is the origin of coordinate system. The upper right corner is the end point of the system. Range: 0 to 100 Default unit: PCT
<y2>	Diagram coordinates in % of the complete diagram that define the zoom area. The lower left corner is the origin of coordinate system. The upper right corner is the end point of the system. Range: 0 to 100 Default unit: PCT

Manual operation: See ["Multi-Zoom"](#) on page 183

15.7.3 Trace configuration

15.7.3.1 Trace export

Commands to export traces described elsewhere.

- [FORMat:DEXPort:DSEPARATOR](#) on page 537

FORMat:DEXPort:CSEPARATOR	481
FORMat:DEXPort:HEADr	481
FORMat:DEXPort:TRACes	481
FORMat:DEXPort:FORMat	482

FORMat:DEXPort:CSEPARATOR <Separator>

Selects the column separator for exported trace data.

The selected value is not affected by a preset. The command therefore has no reset value.

Parameters:

<Separator>

COMMa

Selects a comma as a separator.

SEMicolon

Selects a semicolon as a separator.

TAB

Selects a tabulator as a separator.

*RST: n/a

Example:

```
//Select column separator
FORM:DEXP:CSEP TAB
```

Manual operation: See ["Column Separator"](#) on page 202

FORMat:DEXPort:HEADr <State>

If enabled, additional instrument and measurement settings are included in the header of the export file for result data. If disabled, only the pure result data from the selected traces and tables is exported.

Parameters:

<State>

ON | OFF | 0 | 1

*RST: 1

Manual operation: See ["Include Instrument & Measurement Settings"](#) on page 200

FORMat:DEXPort:TRACes <Selection>

Selects the data to be included in a data export file (see [MMEMory:STORe<n>:TRACe](#) on page 572).

For details on exporting data, see [Section 11.3.3, "Trace export"](#), on page 199.

Parameters:

<Selection> SINGLE | ALL

SINGLE

Only a single trace is selected for export, namely the one specified by the `MMEMory:STORe<n>:TRACe` command.

ALL

Selects all active traces and result tables (e.g. "Result Summary", marker peak list etc.) in the current application for export to an ASCII file.

The <trace> parameter for the `MMEMory:STORe<n>:TRACe` command is ignored.

*RST: SINGLE

Manual operation: See ["Export all Traces and all Table Results"](#) on page 199

FORMAT:DEXPort:FORMat <FileFormat>

Determines the format of the ASCII file to be imported or exported. Depending on the external program that creates the data file or evaluates it, a comma-separated list (CSV) or a plain data format (DAT) file is required.

Parameters:

<FileFormat> CSV | DAT

*RST: DAT

Example: `FORM:DEXP:FORM CSV`

Manual operation: See ["File Type"](#) on page 201

15.7.3.2 Traces copy

[TRACe<n>:COPY](#) 482

TRACe<n>:COPY <TraceNumber>, <TraceNumber>

Copies data from one trace to another.

Suffix:

<n> [Window](#)

Parameters:

<TraceNumber> **TRACE1 | TRACE2 | TRACE3 | TRACE4 | TRACE5 | TRACE6**

The first parameter is the destination trace, the second parameter is the source.

(Note the 'e' in the parameter is required!)

Example: `TRAC:COPY TRACE1,TRACE2`

Copies the data from trace 2 to trace 1.

Manual operation: See ["Copy Trace"](#) on page 203

15.7.3.3 Trace mathematics

CALCulate<n>:MATH<t>:EXPRession[:DEFine].....	483
CALCulate<n>:MATH<t>:MODE.....	483
CALCulate<n>:MATH<t>:POSition.....	484
CALCulate<n>:MATH<t>:STATe.....	484

CALCulate<n>:MATH<t>:EXPRession[:DEFine] <Expression>

This command selects the mathematical expression for trace mathematics.

Prerequisites for this command

- Turn on trace mathematics (CALCulate<n>:MATH<t>:STATe).

Suffix:

<n> [Window](#)

<t> Trace that the result of the trace mathematics is written to.

Parameters:

<Expression> (TRACE<x> - TRACE<y>)

The expression selects the two traces that are subtracted from each other. You can select any trace you like as the two operands.

The result is shown in the trace defined by the suffix <t> at the MATH syntax element of the command.

Example:

```
//Subtract trace 2 from trace 3 and write the result to trace 4
CALC:MATH:STAT ON
CALC:MATH4:EXPR (TRACE3-TRACE2)
```

Manual operation: See ["Trace Math Function"](#) on page 203

CALCulate<n>:MATH<t>:MODE <Mode>

Selects the way the R&S EPL calculates trace mathematics.

Suffix:

<n> [Window](#)

<t> irrelevant

Parameters:

<Mode> For more information on the way each mode works see [Trace Math Mode](#).

LINEar

Linear calculation.

LOGarithmic

Logarithmic calculation.

POWER

Linear power calculation.

*RST: LOGarithmic

Example: `CALC:MATH:MODE LIN`
Selects linear calculation.

Manual operation: See ["Trace Math Mode"](#) on page 204

CALCulate<n>:MATH<t>:POSition <Position>

Defines the position of the trace resulting from the mathematical operation.

Suffix:

<n> [Window](#)

<t> irrelevant

Parameters:

<Position> Vertical position of the trace in % of the height of the diagram area.

100 PCT corresponds to the upper diagram border.

Range: -100 to 200

*RST: 50

Default unit: PCT

Example: `CALC:MATH:POS 100`
Moves the trace to the top of the diagram area.

Manual operation: See ["Trace Math Position"](#) on page 203

CALCulate<n>:MATH<t>:STATe <State>

This command turns the trace mathematics on and off.

Suffix:

<n> [Window](#)

<t> irrelevant

Parameters:

<State> ON | OFF | 1 | 0

*RST: OFF

Example: `//Turn on trace mathematics`
`CALC:MATH:STAT ON`

Manual operation: See ["Trace Math Function"](#) on page 203

15.7.3.4 Trace labels

DISPlay[:WINDow<n>]:TRACe<t>:LABel[:STATe]	484
DISPlay[:WINDow<n>]:TRACe<t>:LABel:TEXT	485

DISPlay[:WINDow<n>]:TRACe<t>:LABel[:STATe] <State>

This command turns the display of the trace label for a specific trace on and off.

The command can only be applied to active traces.

Suffix:

<n> 1..n
Window

<t> 1..n
Trace

Parameters:

<State> ON | OFF | 1 | 0
*RST: OFF

Example: //Turn on the label for trace 2
DISP:TRAC2:LAB ON

DISPlay[:WINDow<n>]:TRACe<t>:LABel:TEXT <Label>

This command defines the contents of a trace label.

Suffix:

<n> 1..n
Window

<t> 1..n
Trace

Parameters:

<Label> String containing the trace label.

Example: //Assign a label to trace 2.
DISP:TRAC2:LAB:TEXT 'A YELLOW TRACE'

15.7.3.5 Spectrogram configuration

Commands to configure spectrograms described elsewhere.

- [Section 15.7.4.6, "Spectrogram markers"](#), on page 507
- [Spectrogram settings](#).....485
- [Color map configuration](#).....490

Spectrogram settings

CALCulate<n>:SGRam:CLEar[:IMMediate].....	486
CALCulate<n>:SPECtrogram:CLEar[:IMMediate].....	486
CALCulate<n>:SGRam:FRAMe:SElect.....	486
CALCulate<n>:SPECtrogram:FRAMe:SElect.....	486
CALCulate<n>:SGRam:HDEPth.....	486
CALCulate<n>:SPECtrogram:HDEPth.....	486
CALCulate<n>:SGRam:TRACe.....	487
CALCulate<n>:SPECtrogram:TRACe.....	487
CALCulate<n>:SGRam:TSTamp:DATA?.....	487
CALCulate<n>:SPECtrogram:TSTamp:DATA?.....	487

CALCulate<n>:SGRam:TSTamp[:STATe].....	488
CALCulate<n>:SPECtrogram:TSTamp[:STATe].....	488
CALCulate<n>:SGRam[:STATe].....	489
CALCulate<n>:SPECtrogram[:STATe].....	489
CALCulate<n>:SGRam:FRAME:RINTerval.....	489
CALCulate<n>:SPECtrogram:FRAME:RINTerval.....	489
CALCulate<n>:SPECtrogram:THReedim[:STATe].....	489

CALCulate<n>:SGRam:CLEar[:IMMediate]
CALCulate<n>:SPECtrogram:CLEar[:IMMediate]

Resets the spectrogram and clears the history buffer.

Suffix:

<n> [Window](#)

Example: //Reset the result display and clear the memory

CALC:SGR:CLE

Manual operation: See ["Clear Spectrogram"](#) on page 208

CALCulate<n>:SGRam:FRAME:SElect <Frame> | <Time>
CALCulate<n>:SPECtrogram:FRAME:SElect <Frame> | <Time>

Selects a specific frame for further analysis.

The command is available if no measurement is running or after a single sweep has ended.

Suffix:

<n> [Window](#)

Parameters:

<Frame> Selects a frame directly by the frame number. Valid if the time stamp is off.
The range depends on the history depth.
Default unit: S

<Time> Selects a frame via its time stamp. Valid if the time stamp is on.
The number is the distance to frame 0 in seconds. The range depends on the history depth.

Example: INIT:CONT OFF
Stop the continuous sweep.
CALC:SGR:FRAM:SEL -25
Selects frame number -25.

Manual operation: See ["Select Frame"](#) on page 207

CALCulate<n>:SGRam:HDEPth <History>
CALCulate<n>:SPECtrogram:HDEPth <History>

Defines the number of frames to be stored in the R&S EPL memory.

Suffix:<n> [Window](#)**Parameters:**

<History> The maximum number of frames depends on the number of sweep points.

Range: 781 to 20000

Increment: 1

*RST: 3000

Example:

//Set the history depth to 1500

CALC:SGR:SPEC 1500

Manual operation: See ["History Depth"](#) on page 207**CALCulate<n>:SGRam:TRACe****CALCulate<n>:SPECTrogram:TRACe <Trace>**

This command selects the trace the spectrogram is based on.

Suffix:<n> Receiver application: [Window](#)
I/Q Analyzer: [Window](#)
Spectrum application: irrelevant**Parameters:**<Trace> Number of the trace. The range depends on the result display:
Scans support six traces, IF Analysis supports three traces.**Example:**

//Assign trace two to the spectrogram result display

CALC:SPEC:TRAC 2

Manual operation: See ["Trace"](#) on page 207**CALCulate<n>:SGRam:TSTamp:DATA? <Frames>****CALCulate<n>:SPECTrogram:TSTamp:DATA? <Frames>**

Queries the starting time of the frames.

The return values consist of four values for each frame. If the "Spectrogram" is empty, the command returns '0,0,0,0'. The times are given as delta values, which simplifies evaluating relative results; however, you can also calculate the absolute date and time as displayed on the screen.

The frame results themselves are returned with TRAC:DATA? SGR

Suffix:<n> [Window](#)**Query parameters:**<Frames> **CURRENT**
Returns the starting time of the current frame.

ALL

Returns the starting time for all frames. The results are sorted in descending order, beginning with the current frame.

Return values:

<Seconds>	Number of seconds that have passed since 01.01.1970 until the frame start
<Nanoseconds>	Number of nanoseconds that have passed <i>in addition to the</i> <Seconds> since 01.01.1970 until the frame start.
<Reserved>	The third value is reserved for future uses.
<Reserved>	The fourth value is reserved for future uses.

Example:

CALC:SGR:TST:DATA? ALL

Returns the starting times of all frames sorted in a descending order.

Usage:

Query only

Manual operation: See ["Time Stamp"](#) on page 207

CALCulate<n>:SGRam:TSTamp[:STATe] <State>

CALCulate<n>:SPECTrogram:TSTamp[:STATe] <State>

Activates and deactivates the time stamp.

If the time stamp is active, some commands do not address frames as numbers, but as (relative) time values:

- [CALCulate<n>:DELTaMarker<m>:SPECTrogram:FRAMe](#) on page 512
- [CALCulate<n>:MARKer<m>:SPECTrogram:FRAMe](#) on page 508
- [CALCulate<n>:SPECTrogram:FRAMe:SELection](#) on page 486

Suffix:

<n> 1..n
[Window](#)

Parameters:

<State> ON | OFF | 0 | 1
OFF | 0
Switches the function off
ON | 1
Switches the function on

Example:

//Activates the time stamp
CALC:SGR:TST ON

Manual operation: See ["Time Stamp"](#) on page 207

CALCulate<n>:SGRam[:STATe] <State>
CALCulate<n>:SPECtrogram[:STATe] <State>

Turns the spectrogram on and off.

Parameters:

<State> ON | OFF | 0 | 1
 OFF | 0
 Switches the function off
 ON | 1
 Switches the function on

Example:

CALC:SGR ON
 Activates the Spectrogram result display.

Manual operation: See ["State"](#) on page 206

CALCulate<n>:SGRam:FRAME:RINTerval
CALCulate<n>:SPECtrogram:FRAME:RINTerval <Interval>

Defines a recording interval for the IF spectrogram result display. For example if the recording interval is set to 5, only every fifth scan is taken from the IF analysis diagram and displayed in the IF spectrogram. This prevents the IF spectrogram from getting filled up too fast.

Suffix:

<n> irrelevant

Parameters:

<Interval> Recording interval

Example:

CALC:SGR:FRAM:RINT 5

Manual operation: See ["Recording Interval"](#) on page 208

CALCulate<n>:SPECtrogram:THReedim[:STATe] <State>

Activates or deactivates a 3-dimensional spectrogram for the selected result display.

Suffix:

<n> [Window](#)

Parameters:

<State> ON | OFF | 0 | 1
 OFF | 0
 Switches the function off
 ON | 1
 Switches the function on
 *RST: 0

Example:

CALC:SPEC:THR:STAT ON

Manual operation: See ["3D Spectrogram State"](#) on page 207

Color map configuration

DISPlay[:WINDow<n>]:SGRam:COLor:DEFAult.....	490
DISPlay[:WINDow<n>]:SPECTrogram:COLor:DEFAult.....	490
DISPlay[:WINDow<n>]:SGRam:COLor:LOWer.....	490
DISPlay[:WINDow<n>]:SPECTrogram:COLor:LOWer.....	490
DISPlay[:WINDow<n>]:SGRam:COLor:SHAPE.....	490
DISPlay[:WINDow<n>]:SPECTrogram:COLor:SHAPE.....	490
DISPlay[:WINDow<n>]:SGRam:COLor:UPPer.....	491
DISPlay[:WINDow<n>]:SPECTrogram:COLor:UPPer.....	491
DISPlay[:WINDow<n>]:SGRam:COLor[:STYLe].....	491
DISPlay[:WINDow<n>]:SPECTrogram:COLor[:STYLe].....	491

DISPlay[:WINDow<n>]:SGRam:COLor:DEFAult

DISPlay[:WINDow<n>]:SPECTrogram:COLor:DEFAult

Restores the original color map.

Suffix:

<n> [Window](#)

Manual operation: See ["Set to Default"](#) on page 209

DISPlay[:WINDow<n>]:SGRam:COLor:LOWer <Percentage>

DISPlay[:WINDow<n>]:SPECTrogram:COLor:LOWer <Percentage>

Defines the starting point of the color map.

Suffix:

<n> [Window](#)

Parameters:

<Percentage> Statistical frequency percentage.

Range: 0 to 66

*RST: 0

Default unit: %

Example:

DISP:WIND:SGR:COL:LOW 10

Sets the start of the color map to 10%.

Manual operation: See ["Start / Stop"](#) on page 209

DISPlay[:WINDow<n>]:SGRam:COLor:SHAPE <Shape>

DISPlay[:WINDow<n>]:SPECTrogram:COLor:SHAPE <Shape>

Defines the shape and focus of the color curve for the spectrogram result display.

Suffix:

<n> [Window](#)

Parameters:

<Shape> Shape of the color curve.

Range: -1 to 1

*RST: 0

Manual operation: See ["Shape"](#) on page 209

DISPlay[:WINDow<n>]:SGRam:COLor:UPPer <Percentage>
DISPlay[:WINDow<n>]:SPECtrogram:COLor:UPPer <Percentage>

Defines the end point of the color map.

Suffix:

<n> [Window](#)

Parameters:

<Percentage> Statistical frequency percentage.
 Range: 0 to 66
 *RST: 0
 Default unit: %

Example: `DISP:WIND:SGR:COL:UPP 95`
 Sets the start of the color map to 95%.

Manual operation: See ["Start / Stop"](#) on page 209

DISPlay[:WINDow<n>]:SGRam:COLor[:STYLE] <ColorScheme>
DISPlay[:WINDow<n>]:SPECtrogram:COLor[:STYLE] <ColorScheme>

Selects the color scheme.

Parameters:

<ColorScheme> **HOT**
 Uses a color range from blue to red. Blue colors indicate low levels, red colors indicate high ones.

COLD
 Uses a color range from red to blue. Red colors indicate low levels, blue colors indicate high ones.

RADar
 Uses a color range from black over green to light turquoise with shades of green in between.

GRAYscale
 Shows the results in shades of gray.
 *RST: HOT

Example: `DISP:WIND:SPEC:COL GRAY`
 Changes the color scheme of the spectrogram to black and white.

Manual operation: See ["Hot/Cold/Radar/Grayscale"](#) on page 209

15.7.3.6 Formats for returned values: ASCII format and binary format

When trace data is retrieved using the `TRAC:DATA` or `TRAC:IQ:DATA` command, the data is returned in the format defined using the [FORMat\[:DATA\]](#) on page 536. The possible formats are described here.

- **ASCII Format (FORMat ASCII):**
The data is stored as a list of comma-separated values (CSV) of the measured values in floating point format.
- **Binary Format (FORMat REAL,16/32/64):**
The data is stored as binary data (definite length block data according to IEEE 488.2), each measurement value being formatted in 16-bit/32-bit/64-bit IEEE 754 floating-point-format.
The schema of the result string is as follows:
#<Length of length><Length of data><value1><value2>...<value n>
with:

<Length of length>	Number of digits of the following number of data bytes
<Length of data>	Number of following data bytes
<Value>	2-byte/4-byte/8-byte floating point value

Example: #41024<Data>... contains 1024 data bytes

Data blocks larger than 999,999,999 bytes

According to SCPI, the header of the block data format allows for a maximum of 9 characters to describe the data length. Thus, the maximum REAL 32 data that can be represented is 999,999,999 bytes. However, the R&S EPL is able to send larger data blocks. In this case, the length of the data block is placed in brackets, e.g.

(1234567890) <value1><value2>...



Reading out data in binary format is quicker than in ASCII format. Thus, binary format is recommended for large amounts of data.

15.7.4 Markers

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- [General marker configuration](#).....496
- [Marker search](#).....498
- [Marker positioning](#).....501
- [Marker results](#).....506
- [Spectrogram markers](#).....507

15.7.4.1 Individual marker configuration

- [CALCulate<n>:DELTaMarker<m>:AOFF](#).....493
- [CALCulate<n>:DELTaMarker<m>:MODE](#).....493
- [CALCulate<n>:DELTaMarker<m>:MREference](#).....493
- [CALCulate<n>:DELTaMarker<m>\[:STATe\]](#).....494
- [CALCulate<n>:DELTaMarker<m>:TRACe](#).....494
- [CALCulate<n>:DELTaMarker<m>:X](#).....494
- [CALCulate<n>:MARKer<m>:AOFF](#).....495

CALCulate<n>:MARKer<m>[:STATe].....	495
CALCulate<n>:MARKer<m>:TRACe.....	495
CALCulate<n>:MARKer<m>:X.....	496

CALCulate<n>:DELTamarker<m>:AOFF

Turns off *all* delta markers.

Suffix:

<n> [Window](#)

<m> irrelevant

Example:

CALC:DELT:AOFF

Turns off all delta markers.

CALCulate<n>:DELTamarker<m>:MODE <Mode>

Defines whether the position of a delta marker is provided as an absolute value or relative to a reference marker. Note that this setting applies to *all* windows.

Note that when the position of a delta marker is *queried*, the result is always an absolute value (see [CALCulate<n>:DELTamarker<m>:X](#) on page 494)!

Suffix:

<n> irrelevant

<m> irrelevant

Parameters:

<Mode>

ABSolute

Delta marker position in absolute terms.

RELative

Delta marker position in relation to a reference marker.

*RST: RELative

Example:

CALC:DELT:MODE ABS

Absolute delta marker position.

CALCulate<n>:DELTamarker<m>:MREFerence <Reference>

Selects a reference marker for a delta marker other than marker 1.

Suffix:

<n> [Window](#)

<m> [Marker](#)

Parameters:

<Reference>

Example:

CALC:DELT3:MREF 2

Specifies that the values of delta marker 3 are relative to marker 2.

Manual operation: See ["Reference Marker"](#) on page 223

CALCulate<n>:DELTamarker<m>[:STATe] <State>

Turns delta markers on and off.

If necessary, the command activates the delta marker first.

No suffix at DELTmarker turns on delta marker 1.

Suffix:

<n> [Window](#)

<m> [Marker](#)

Parameters:

<State> ON | OFF | 0 | 1

OFF | 0

Switches the function off

ON | 1

Switches the function on

Example:

CALC:DELT2 ON

Turns on delta marker 2.

Manual operation: See ["Marker State"](#) on page 222
 See ["Marker Type"](#) on page 222
 See ["Select Marker"](#) on page 223

CALCulate<n>:DELTamarker<m>:TRACe <Trace>

Selects the trace a delta marker is positioned on.

Note that the corresponding trace must have a trace mode other than "Blank".

If necessary, the command activates the marker first.

Suffix:

<n> [Window](#)

<m> [Marker](#)

Parameters:

<Trace> Trace number the marker is assigned to.

Example:

CALC:DELT2:TRAC 2

Positions delta marker 2 on trace 2.

CALCulate<n>:DELTamarker<m>:X <Position>

Moves a delta marker to a particular coordinate on the x-axis.

If necessary, the command activates the delta marker and positions a reference marker to the peak power.

Suffix:<n> [Window](#)<m> [Marker](#)**Example:**

CALC:DELT:X?

Outputs the absolute x-value of delta marker 1.

Manual operation: See ["Marker Position X-value"](#) on page 222**CALCulate<n>:MARKer<m>:AOFF**

Turns off all markers.

Suffix:<n> [Window](#)<m> [Marker](#)**Example:**

CALC:MARK:AOFF

Switches off all markers.

Manual operation: See ["All Markers Off"](#) on page 223**CALCulate<n>:MARKer<m>[:STATe] <State>**

Turns markers on and off. If the corresponding marker number is currently active as a delta marker, it is turned into a normal marker.

Suffix:<n> [Window](#)<m> [Marker](#)**Parameters:**

<State> ON | OFF | 0 | 1

OFF | 0

Switches the function off

ON | 1

Switches the function on

Example:

CALC:MARK3 ON

Switches on marker 3.

Manual operation: See ["Marker State"](#) on page 222
See ["Marker Type"](#) on page 222
See ["Select Marker"](#) on page 223**CALCulate<n>:MARKer<m>:TRACe <Trace>**

Selects the trace the marker is positioned on.

Note that the corresponding trace must have a trace mode other than "Blank".

If necessary, the command activates the marker first.

Suffix:<n> [Window](#)<m> [Marker](#)**Parameters:**

<Trace>

Example: //Assign marker to trace 1
 CALC:MARK3:TRAC 2

Manual operation: See ["Assigning the Marker to a Trace"](#) on page 223

CALCulate<n>:MARKer<m>:X <Position>

Moves a marker to a specific coordinate on the x-axis.

If necessary, the command activates the marker.

If the marker has been used as a delta marker, the command turns it into a normal marker.

Suffix:<n> [Window](#)<m> [Marker](#)**Parameters:**

<Position> Numeric value that defines the marker position on the x-axis.
 The unit depends on the result display.
 Range: The range depends on the current x-axis range.
 Default unit: Hz

Example: CALC:MARK2:X 1.7MHz
 Positions marker 2 to frequency 1.7 MHz.

Manual operation: See ["Marker Position X-value"](#) on page 222

15.7.4.2 General marker configuration

CALCulate<n>:MARKer<m>:SCOUpled:LSCan	496
CALCulate<n>:MARKer<m>:SCOUpled[:STATe]	497
DISPlay[:WINDow<n>]:MINFo[:STATe]	497
DISPlay[:WINDow<n>]:MTABLe	498

CALCulate<n>:MARKer<m>:SCOUpled:LSCan <State>

This command selects the measurement configuration to be applied when you couple receiver settings to scan range settings.

Prerequisites for this command

- Couple receiver settings to scan range settings ([CALCulate<n>:MARKer<m>:COUPlEd\[:STATe\]](#)).

Suffix:

<n> irrelevant

<m> irrelevant

Parameters:

<State>

ON | 1

Applies the configuration used during the last scan.

OFF | 0

Applies the current configuration.

This has an effect only if you have changed anything since the last scan.

***RST:** OFF**Example:**

//Couple receiver settings to the scan range settings

CALC:MARK:COUP ON

CALC:MARK:SCO:LSC ON

Manual operation: See ["Settings Coupled"](#) on page 225**CALCulate<n>:MARKer<m>:SCOUpled[:STATe] <State>**

This command couples or decouples the marker frequency to the scan range settings.

Suffix:<n> [Marker](#)

<m> irrelevant

Parameters:

<State>

ON | OFF | 1 | 0

***RST:** ON**Example:**

//Couple scan range settings to the marker frequency

CALC:MARK:SCO ON

Manual operation: See ["Settings Coupled"](#) on page 225**DISPlay[:WINDow<n>]:MINFo[:STATe] <State>**

Turns the marker information in all diagrams on and off.

Suffix:

<n> irrelevant

Parameters:

<State>

ON | 1

Displays the marker information in the diagrams.

OFF | 0

Hides the marker information in the diagrams.

***RST:** 1**Example:**

DISP:MINF OFF

Hides the marker information.

Manual operation: See ["Marker Info"](#) on page 224

DISPlay[:WINDow<n>]:MTABle <DisplayMode>

Turns the marker table on and off.

Suffix:

<n> irrelevant

Parameters:

<DisplayMode> **ON | 1**
Turns on the marker table.
OFF | 0
Turns off the marker table.
***RST: AUTO**

Example: DISP:MTAB ON
Activates the marker table.

Manual operation: See ["Marker Table Display"](#) on page 224

15.7.4.3 Marker search

Commands to configure a marker search described elsewhere.

- [CALCulate<n>:MARKer<m>:PEXCursion](#) on page 415

CALCulate<n>:MARKer<m>:COUPled[:STATe]	498
CALCulate<n>:MARKer<m>:X:SLIMits[:STATe]	499
CALCulate<n>:MARKer<m>:X:SLIMits:LEFT	499
CALCulate<n>:MARKer<m>:X:SLIMits:RIGHT	499
CALCulate<n>:THReshold	500
CALCulate<n>:THReshold:STATe	500

CALCulate<n>:MARKer<m>:COUPled[:STATe] <State>

This command couples or decouples the receiver frequency to the current marker frequency.

Suffix:

<n> [Marker](#)

<m> irrelevant

Parameters:

<State> ON | OFF | 1 | 0
***RST: OFF**

Example: //Couples receiver frequency to marker frequency
CALC:MARK:COUP ON

Manual operation: See ["Synchronizing the receiver frequency to the marker frequency"](#) on page 167

CALCulate<n>:MARKer<m>:X:SLIMits[:STATe] <State>

Turns marker search limits on and off for *all* markers in *all* windows.

Suffix:

<n> irrelevant
<m> irrelevant

Parameters:

<State> ON | OFF | 0 | 1
OFF | 0
Switches the function off
ON | 1
Switches the function on

Example:

CALC:MARK:X:SLIM ON
Switches on search limitation.

Manual operation: See ["Search Limits \(Left / Right\)"](#) on page 226
See ["Search Limits Off"](#) on page 227

CALCulate<n>:MARKer<m>:X:SLIMits:LEFT <SearchLimit>

Defines the left limit of the marker search range for *all* markers in *all* windows.

Suffix:

<n> irrelevant
<m> irrelevant

Parameters:

<SearchLimit> The value range depends on the frequency range or measurement time.
The unit is Hz for frequency domain measurements and s for time domain measurements.
*RST: left diagram border
Default unit: HZ

Example:

CALC:MARK:X:SLIM ON
Switches the search limit function on.
CALC:MARK:X:SLIM:LEFT 10MHz
Sets the left limit of the search range to 10 MHz.

Manual operation: See ["Search Limits \(Left / Right\)"](#) on page 226

CALCulate<n>:MARKer<m>:X:SLIMits:RIGHT <SearchLimit>

Defines the right limit of the marker search range for *all* markers in *all* windows.

Suffix:

<n> irrelevant
<m> irrelevant

Example: `CALC:MARK:X:SLIM ON`
Switches the search limit function on.
`CALC:MARK:X:SLIM:RIGH 20MHz`
Sets the right limit of the search range to 20 MHz.

Manual operation: See ["Search Limits \(Left / Right\)"](#) on page 226

CALCulate<n>:THReshold <Level>

Defines a threshold level for the marker peak search (for *all* markers in *all* windows).

Note that you must enable the use of the threshold using [CALCulate<n>:THReshold:STATe](#) on page 500.

Suffix:
<n> irrelevant

Parameters:
<Level> Numeric value. The value range and unit are variable.
*RST: -120 dBm
Default unit: DBM

Example: `CALC:THR:STAT ON`

Example: `CALC:THR -82DBM`
Enables the search threshold and sets the threshold value to -82 dBm.

Manual operation: See ["Search Threshold"](#) on page 226

CALCulate<n>:THReshold:STATe <State>

Turns a threshold for the marker peak search on and off (for *all* markers in *all* windows).

Suffix:
<n> irrelevant

Parameters:
<State> ON | OFF | 0 | 1
OFF | 0
Switches the function off
ON | 1
Switches the function on

Example: `CALC:THR:STAT ON`
Switches on the threshold line.

Manual operation: See ["Search Threshold"](#) on page 226
See ["Search Limits Off"](#) on page 227

15.7.4.4 Marker positioning

- [Markers](#)..... 501
- [Delta markers](#)..... 503

Markers

CALCulate<n>:MARKer<m>:MAXimum:LEFT	501
CALCulate<n>:MARKer<m>:MAXimum:NEXT	501
CALCulate<n>:MARKer<m>:MAXimum[:PEAK]	501
CALCulate<n>:MARKer<m>:MAXimum:RIGHT	502
CALCulate<n>:MARKer<m>:MINimum:LEFT	502
CALCulate<n>:MARKer<m>:MINimum:NEXT	502
CALCulate<n>:MARKer<m>:MINimum[:PEAK]	503
CALCulate<n>:MARKer<m>:MINimum:RIGHT	503

CALCulate<n>:MARKer<m>:MAXimum:LEFT

Moves a marker to the next positive peak.

The search includes only measurement values to the left of the current marker position.

In the spectrogram, the command moves a marker horizontally to the maximum level in the currently selected frame. The vertical marker position remains the same.

Suffix:

<n> [Window](#)

<m> [Marker](#)

Manual operation: See ["Search Next Peak"](#) on page 229

CALCulate<n>:MARKer<m>:MAXimum:NEXT

Moves a marker to the next positive peak.

In the spectrogram, the command moves a marker horizontally to the maximum level in the currently selected frame. The vertical marker position remains the same.

Suffix:

<n> [Window](#)

<m> [Marker](#)

Manual operation: See ["Search Next Peak"](#) on page 229

CALCulate<n>:MARKer<m>:MAXimum[:PEAK]

Moves a marker to the highest level.

In the spectrogram, the command moves a marker horizontally to the maximum level in the currently selected frame. The vertical marker position remains the same.

If the marker is not yet active, the command first activates the marker.

Suffix:<n> [Window](#)<m> [Marker](#)**Manual operation:** See "[Peak Search](#)" on page 229

CALCulate<n>:MARKer<m>:MAXimum:RIGHT

Moves a marker to the next positive peak.

The search includes only measurement values to the right of the current marker position.

In the spectrogram, the command moves a marker horizontally to the maximum level in the currently selected frame. The vertical marker position remains the same.

Suffix:<n> [Window](#)<m> [Marker](#)**Manual operation:** See "[Search Next Peak](#)" on page 229

CALCulate<n>:MARKer<m>:MINimum:LEFT

Moves a marker to the next minimum peak value.

The search includes only measurement values to the right of the current marker position.

In the spectrogram, the command moves a marker horizontally to the minimum level in the currently selected frame. The vertical marker position remains the same.

Suffix:<n> [Window](#)<m> [Marker](#)**Manual operation:** See "[Search Next Minimum](#)" on page 229

CALCulate<n>:MARKer<m>:MINimum:NEXT

Moves a marker to the next minimum peak value.

In the spectrogram, the command moves a marker horizontally to the minimum level in the currently selected frame. The vertical marker position remains the same.

Suffix:<n> [Window](#)<m> [Marker](#)**Manual operation:** See "[Search Next Minimum](#)" on page 229

CALCulate<n>:MARKer<m>:MINimum[:PEAK]

Moves a marker to the minimum level.

In the spectrogram, the command moves a marker horizontally to the minimum level in the currently selected frame. The vertical marker position remains the same.

If the marker is not yet active, the command first activates the marker.

Suffix:

<n> [Window](#)

<m> [Marker](#)

Manual operation: See ["Search Minimum"](#) on page 229

CALCulate<n>:MARKer<m>:MINimum:RIGHT

Moves a marker to the next minimum peak value.

The search includes only measurement values to the right of the current marker position.

In the spectrogram, the command moves a marker horizontally to the minimum level in the currently selected frame. The vertical marker position remains the same.

Suffix:

<n> [Window](#)

<m> [Marker](#)

Manual operation: See ["Search Next Minimum"](#) on page 229

Delta markers

CALCulate<n>:DELTamarker<m>:MAXimum:LEFT	503
CALCulate<n>:DELTamarker<m>:MAXimum:NEXT	504
CALCulate<n>:DELTamarker<m>:MAXimum[:PEAK]	504
CALCulate<n>:DELTamarker<m>:MAXimum:RIGHT	504
CALCulate<n>:DELTamarker<m>:MINimum:LEFT	505
CALCulate<n>:DELTamarker<m>:MINimum:NEXT	505
CALCulate<n>:DELTamarker<m>:MINimum[:PEAK]	505
CALCulate<n>:DELTamarker<m>:MINimum:RIGHT	505

CALCulate<n>:DELTamarker<m>:MAXimum:LEFT

Moves a delta marker to the next positive peak value.

The search includes only measurement values to the left of the current marker position.

In the spectrogram, the command moves a marker horizontally to the maximum level in the currently selected frame. The vertical marker position remains the same.

Suffix:

<n> [Window](#)

<m> [Marker](#)

Manual operation: See ["Search Next Peak"](#) on page 229

CALCulate<n>:DELTaMarker<m>:MAXimum:NEXT

Moves a marker to the next positive peak value.

In the spectrogram, the command moves a marker horizontally to the maximum level in the currently selected frame. The vertical marker position remains the same.

Suffix:

<n> 1..n
[Window](#)

<m> 1..n
[Marker](#)

Manual operation: See ["Search Next Peak"](#) on page 229

CALCulate<n>:DELTaMarker<m>:MAXimum[:PEAK]

Moves a delta marker to the highest level.

In the spectrogram, the command moves a marker horizontally to the maximum level in the currently selected frame. The vertical marker position remains the same.

If the marker is not yet active, the command first activates the marker.

Suffix:

<n> [Window](#)

<m> [Marker](#)

Manual operation: See ["Peak Search"](#) on page 229

CALCulate<n>:DELTaMarker<m>:MAXimum:RIGHT

Moves a delta marker to the next positive peak value on the trace.

The search includes only measurement values to the right of the current marker position.

In the spectrogram, the command moves a marker horizontally to the maximum level in the currently selected frame. The vertical marker position remains the same.

Suffix:

<n> [Window](#)

<m> [Marker](#)

Manual operation: See ["Search Next Peak"](#) on page 229

CALCulate<n>:DELTamarker<m>:MINimum:LEFT

Moves a delta marker to the next minimum peak value.

The search includes only measurement values to the right of the current marker position.

In the spectrogram, the command moves a marker horizontally to the minimum level in the currently selected frame. The vertical marker position remains the same.

Suffix:

<n> [Window](#)

<m> [Marker](#)

Manual operation: See ["Search Next Minimum"](#) on page 229

CALCulate<n>:DELTamarker<m>:MINimum:NEXT

Moves a marker to the next minimum peak value.

In the spectrogram, the command moves a marker horizontally to the minimum level in the currently selected frame. The vertical marker position remains the same.

Suffix:

<n> [Window](#)

<m> [Marker](#)

Manual operation: See ["Search Next Minimum"](#) on page 229

CALCulate<n>:DELTamarker<m>:MINimum[:PEAK]

Moves a delta marker to the minimum level.

In the spectrogram, the command moves a marker horizontally to the minimum level in the currently selected frame. The vertical marker position remains the same.

If the marker is not yet active, the command first activates the marker.

Suffix:

<n> [Window](#)

<m> [Marker](#)

Manual operation: See ["Search Minimum"](#) on page 229

CALCulate<n>:DELTamarker<m>:MINimum:RIGHT

Moves a delta marker to the next minimum peak value.

The search includes only measurement values to the right of the current marker position.

In the spectrogram, the command moves a marker horizontally to the minimum level in the currently selected frame. The vertical marker position remains the same.

Suffix:<n> [Window](#)<m> [Marker](#)**Manual operation:** See ["Search Next Minimum"](#) on page 229**15.7.4.5 Marker results**

Commands to retrieve the marker position described elsewhere.

- [CALCulate<n>:DELTamarker<m>:X](#) on page 494
- [CALCulate<n>:MARKer<m>:X](#) on page 496

CALCulate<n>:DELTamarker<m>:X:RELative?	506
CALCulate<n>:DELTamarker<m>:Y?	506
CALCulate<n>:MARKer<m>:Y?	507

CALCulate<n>:DELTamarker<m>:X:RELative?

Queries the relative position of a delta marker on the x-axis.

If necessary, the command activates the delta marker first.

Suffix:<n> [Window](#)<m> [Marker](#)**Return values:**

<Position> Position of the delta marker in relation to the reference marker.

Example:

```
CALC:DELT3:X:REL?
```

Outputs the frequency of delta marker 3 relative to marker 1 or relative to the reference position.

Usage: Query only**CALCulate<n>:DELTamarker<m>:Y?**

Queries the result at the position of the specified delta marker.

Suffix:

<n> 1..n

<m> 1..n

Return values:<Result> Result at the position of the delta marker.
The unit is variable and depends on the one you have currently set.

Default unit: DBM

Usage: Query only

CALCulate<n>:MARKer<m>:Y?

Queries the result at the position of the specified marker.

Suffix:

<n> 1..n
<m> 1..n

Return values:

<Result> Default unit: DBM

Usage: Query only

15.7.4.6 Spectrogram markers**Marker configuration**

Commands to configure markers in spectrograms described elsewhere.

- [CALCulate<n>:MARKer<m>:MAXimum:LEFT](#) on page 501
- [CALCulate<n>:MARKer<m>:MAXimum:NEXT](#) on page 501
- [CALCulate<n>:MARKer<m>:MAXimum\[:PEAK\]](#) on page 501
- [CALCulate<n>:MARKer<m>:MAXimum:RIGHT](#) on page 502
- [CALCulate<n>:MARKer<m>:MINimum:LEFT](#) on page 502
- [CALCulate<n>:MARKer<m>:MINimum:NEXT](#) on page 502
- [CALCulate<n>:MARKer<m>:MINimum\[:PEAK\]](#) on page 503
- [CALCulate<n>:MARKer<m>:MINimum:RIGHT](#) on page 503

CALCulate<n>:MARKer<m>:SGRam:FRAME	508
CALCulate<n>:MARKer<m>:SPECtrogram:FRAME	508
CALCulate<n>:MARKer<m>:SGRam:SARea	508
CALCulate<n>:MARKer<m>:SPECtrogram:SARea	508
CALCulate<n>:MARKer<m>:SGRam:XY:MAXimum[:PEAK]	509
CALCulate<n>:MARKer<m>:SPECtrogram:XY:MAXimum[:PEAK]	509
CALCulate<n>:MARKer<m>:SGRam:XY:MINimum[:PEAK]	509
CALCulate<n>:MARKer<m>:SPECtrogram:XY:MINimum[:PEAK]	509
CALCulate<n>:MARKer<m>:SGRam:Y:MAXimum:ABOVe	509
CALCulate<n>:MARKer<m>:SPECtrogram:Y:MAXimum:ABOVe	509
CALCulate<n>:MARKer<m>:SGRam:Y:MAXimum:BELOW	509
CALCulate<n>:MARKer<m>:SPECtrogram:Y:MAXimum:BELOW	509
CALCulate<n>:MARKer<m>:SGRam:Y:MAXimum:NEXT	509
CALCulate<n>:MARKer<m>:SPECtrogram:Y:MAXimum:NEXT	509
CALCulate<n>:MARKer<m>:SGRam:Y:MAXimum[:PEAK]	510
CALCulate<n>:MARKer<m>:SPECtrogram:Y:MAXimum[:PEAK]	510
CALCulate<n>:MARKer<m>:SGRam:Y:MINimum:ABOVe	510
CALCulate<n>:MARKer<m>:SPECtrogram:Y:MINimum:ABOVe	510
CALCulate<n>:MARKer<m>:SGRam:Y:MINimum:BELOW	510
CALCulate<n>:MARKer<m>:SPECtrogram:Y:MINimum:BELOW	510
CALCulate<n>:MARKer<m>:SGRam:Y:MINimum:NEXT	510

CALCulate<n>:MARKer<m>:SPECtrogram:Y:MINimum:NEXT.....	510
CALCulate<n>:MARKer<m>:SGRam:Y:MINimum[:PEAK].....	511
CALCulate<n>:MARKer<m>:SPECtrogram:Y:MINimum[:PEAK].....	511

CALCulate<n>:MARKer<m>:SGRam:FRAME <Frame> | <Time>

CALCulate<n>:MARKer<m>:SPECtrogram:FRAME <Frame> | <Time>

Positions a marker on a particular frame.

Suffix:

<n> [Window](#)

<m> [Marker](#)

Parameters:

<Frame> Selects a frame directly by the frame number. Valid if the time stamp is off.

The range depends on the history depth.

Default unit: S

<Time> Selects a frame via its time stamp. Valid if the time stamp is on. The number is the (negative) distance to frame 0 in seconds. The range depends on the history depth.

Example:

CALC:MARK:SGR:FRAM -20

Sets the marker on the 20th frame before the present.

CALC:MARK2:SGR:FRAM -2s

Sets second marker on the frame 2 seconds ago.

Manual operation: See "[Frame \(Spectrogram only\)](#)" on page 222

CALCulate<n>:MARKer<m>:SGRam:SAREa <SearchArea>

CALCulate<n>:MARKer<m>:SPECtrogram:SAREa <SearchArea>

Defines the marker search area for all spectrogram markers in the channel setup.

Suffix:

<n> irrelevant

<m> irrelevant

Parameters:

<SearchArea>

VISible

Performs a search within the visible frames.

Note that the command does not work if the spectrogram is not visible for any reason (e.g. if the display update is off).

MEMory

Performs a search within all frames in the memory.

*RST: VISible

Manual operation: See "[Marker Search Area](#)" on page 228

CALCulate<n>:MARKer<m>:SGRam:XY:MAXimum[:PEAK]

CALCulate<n>:MARKer<m>:SPECTrogram:XY:MAXimum[:PEAK]

Moves a marker to the highest level of the spectrogram.

Suffix:

<n> [Window](#)

<m> [Marker](#)

CALCulate<n>:MARKer<m>:SGRam:XY:MINimum[:PEAK]

CALCulate<n>:MARKer<m>:SPECTrogram:XY:MINimum[:PEAK]

Moves a marker to the minimum level of the spectrogram.

Suffix:

<n> [Window](#)

<m> [Marker](#)

CALCulate<n>:MARKer<m>:SGRam:Y:MAXimum:ABOVE

CALCulate<n>:MARKer<m>:SPECTrogram:Y:MAXimum:ABOVE

Moves a marker vertically to the next lower peak level for the current frequency.

The search includes only frames above the current marker position. It does not change the horizontal position of the marker.

Suffix:

<n> [Window](#)

<m> [Marker](#)

CALCulate<n>:MARKer<m>:SGRam:Y:MAXimum:BELOW

CALCulate<n>:MARKer<m>:SPECTrogram:Y:MAXimum:BELOW

Moves a marker vertically to the next lower peak level for the current frequency.

The search includes only frames below the current marker position. It does not change the horizontal position of the marker.

Suffix:

<n> [Window](#)

<m> [Marker](#)

CALCulate<n>:MARKer<m>:SGRam:Y:MAXimum:NEXT

CALCulate<n>:MARKer<m>:SPECTrogram:Y:MAXimum:NEXT

Moves a marker vertically to the next lower peak level for the current frequency.

The search includes all frames. It does not change the horizontal position of the marker.

Suffix:<n> [Window](#)<m> [Marker](#)**CALCulate<n>:MARKer<m>:SGRam:Y:MAXimum[:PEAK]****CALCulate<n>:MARKer<m>:SPECTrogram:Y:MAXimum[:PEAK]**

Moves a marker vertically to the highest level for the current frequency.

The search includes all frames. It does not change the horizontal position of the marker.

If the marker hasn't been active yet, the command looks for the peak level in the whole spectrogram.

Suffix:<n> [Window](#)<m> [Marker](#)**CALCulate<n>:MARKer<m>:SGRam:Y:MINimum:ABOVE****CALCulate<n>:MARKer<m>:SPECTrogram:Y:MINimum:ABOVE**

Moves a marker vertically to the next higher minimum level for the current frequency.

The search includes only frames above the current marker position. It does not change the horizontal position of the marker.

Suffix:<n> [Window](#)<m> [Marker](#)**CALCulate<n>:MARKer<m>:SGRam:Y:MINimum:BELOW****CALCulate<n>:MARKer<m>:SPECTrogram:Y:MINimum:BELOW**

Moves a marker vertically to the next higher minimum level for the current frequency.

The search includes only frames below the current marker position. It does not change the horizontal position of the marker.

Suffix:<n> [Window](#)<m> [Marker](#)**CALCulate<n>:MARKer<m>:SGRam:Y:MINimum:NEXT****CALCulate<n>:MARKer<m>:SPECTrogram:Y:MINimum:NEXT**

Moves a marker vertically to the next higher minimum level for the current frequency.

The search includes all frames. It does not change the horizontal position of the marker.

Suffix:<n> [Window](#)<m> [Marker](#)**CALCulate<n>:MARKer<m>:SGRam:Y:MINimum[:PEAK]****CALCulate<n>:MARKer<m>:SPECTrogram:Y:MINimum[:PEAK]**

Moves a marker vertically to the minimum level for the current frequency.

The search includes all frames. It does not change the horizontal position of the marker.

If the marker hasn't been active yet, the command first looks for the peak level for all frequencies and moves the marker vertically to the minimum level.

Suffix:<n> [Window](#)<m> [Marker](#)**Delta marker configuration**

Commands to configure delta markers in spectrograms described elsewhere.

- [CALCulate<n>:DELTamarker<m>:MAXimum:LEFT](#) on page 503
- [CALCulate<n>:DELTamarker<m>:MAXimum:NEXT](#) on page 504
- [CALCulate<n>:DELTamarker<m>:MAXimum\[:PEAK\]](#) on page 504
- [CALCulate<n>:DELTamarker<m>:MAXimum:RIGHT](#) on page 504
- [CALCulate<n>:DELTamarker<m>:MINimum:LEFT](#) on page 505
- [CALCulate<n>:DELTamarker<m>:MINimum:NEXT](#) on page 505
- [CALCulate<n>:DELTamarker<m>:MINimum\[:PEAK\]](#) on page 505
- [CALCulate<n>:DELTamarker<m>:MINimum:RIGHT](#) on page 505

CALCulate<n>:DELTamarker<m>:SGRam:FRAMe	512
CALCulate<n>:DELTamarker<m>:SPECTrogram:FRAMe	512
CALCulate<n>:DELTamarker<m>:SGRam:SARea	512
CALCulate<n>:DELTamarker<m>:SPECTrogram:SARea	512
CALCulate<n>:DELTamarker<m>:SGRam:XY:MAXimum[:PEAK]	513
CALCulate<n>:DELTamarker<m>:SPECTrogram:XY:MAXimum[:PEAK]	513
CALCulate<n>:DELTamarker<m>:SGRam:XY:MINimum[:PEAK]	513
CALCulate<n>:DELTamarker<m>:SPECTrogram:XY:MINimum[:PEAK]	513
CALCulate<n>:DELTamarker<m>:SGRam:Y:MAXimum:ABOVe	513
CALCulate<n>:DELTamarker<m>:SPECTrogram:Y:MAXimum:ABOVe	513
CALCulate<n>:DELTamarker<m>:SGRam:Y:MAXimum:BELOW	513
CALCulate<n>:DELTamarker<m>:SPECTrogram:Y:MAXimum:BELOW	513
CALCulate<n>:DELTamarker<m>:SGRam:Y:MAXimum:NEXT	514
CALCulate<n>:DELTamarker<m>:SPECTrogram:Y:MAXimum:NEXT	514
CALCulate<n>:DELTamarker<m>:SGRam:Y:MAXimum[:PEAK]	514
CALCulate<n>:DELTamarker<m>:SPECTrogram:Y:MAXimum[:PEAK]	514
CALCulate<n>:DELTamarker<m>:SGRam:Y:MINimum:ABOVe	514

CALCulate<n>:DELTamarker<m>:SPECTrogram:Y:MINimum:ABOVE.....	514
CALCulate<n>:DELTamarker<m>:SGRam:Y:MINimum:BELOW.....	514
CALCulate<n>:DELTamarker<m>:SPECTrogram:Y:MINimum:BELOW.....	514
CALCulate<n>:DELTamarker<m>:SGRam:Y:MINimum:NEXT.....	515
CALCulate<n>:DELTamarker<m>:SPECTrogram:Y:MINimum:NEXT.....	515
CALCulate<n>:DELTamarker<m>:SGRam:Y:MINimum[:PEAK].....	515
CALCulate<n>:DELTamarker<m>:SPECTrogram:Y:MINimum[:PEAK].....	515

CALCulate<n>:DELTamarker<m>:SGRam:FRAME <Frame> | <Time>

CALCulate<n>:DELTamarker<m>:SPECTrogram:FRAME <Frame>

Positions a delta marker on a particular frame. The frame is relative to the position of marker 1.

The command is available for the spectrogram.

Suffix:

<n> [Window](#)

<m> [Marker](#)

Parameters:

<Frame> Selects a frame either by its frame number or time stamp.
 The frame number is available if the time stamp is off. The range depends on the history depth.
 The time stamp is available if the time stamp is on. The number is the distance to frame 0 in seconds. The range depends on the history depth.
 Default unit: S

Example:

CALC:DELT4:SGR:FRAM -20

Sets fourth deltamarker 20 frames below marker 1.

CALC:DELT4:SGR:FRAM 2 s

Sets fourth deltamarker 2 seconds above the position of marker 1.

Manual operation: See ["Frame \(Spectrogram only\)"](#) on page 222

CALCulate<n>:DELTamarker<m>:SGRam:SAREa <SearchArea>

CALCulate<n>:DELTamarker<m>:SPECTrogram:SAREa <SearchArea>

Defines the marker search area for *all* spectrogram markers in the channel setup.

Suffix:

<n> irrelevant

<m> irrelevant

Parameters:

<SearchArea> **VISible**

Performs a search within the visible frames.

Note that the command does not work if the spectrogram is not visible for any reason (e.g. if the display update is off).

MEMory

Performs a search within all frames in the memory.

*RST: VISible

Manual operation: See "[Marker Search Area](#)" on page 228

CALCulate<n>:DELTamarker<m>:SGRam:XY:MAXimum[:PEAK]

CALCulate<n>:DELTamarker<m>:SPECTrogram:XY:MAXimum[:PEAK]

Moves a marker to the highest level of the spectrogram over all frequencies.

Suffix:

<n> [Window](#)

<m> [Marker](#)

CALCulate<n>:DELTamarker<m>:SGRam:XY:MINimum[:PEAK]

CALCulate<n>:DELTamarker<m>:SPECTrogram:XY:MINimum[:PEAK]

Moves a delta marker to the minimum level of the spectrogram over all frequencies.

Suffix:

<n> [Window](#)

<m> [Marker](#)

CALCulate<n>:DELTamarker<m>:SGRam:Y:MAXimum:ABOVE

CALCulate<n>:DELTamarker<m>:SPECTrogram:Y:MAXimum:ABOVE

Moves a marker vertically to the next higher level for the current frequency.

The search includes only frames above the current marker position. It does not change the horizontal position of the marker.

Suffix:

<n> [Window](#)

<m> [Marker](#)

CALCulate<n>:DELTamarker<m>:SGRam:Y:MAXimum:BELOW

CALCulate<n>:DELTamarker<m>:SPECTrogram:Y:MAXimum:BELOW

Moves a marker vertically to the next higher level for the current frequency.

The search includes only frames below the current marker position. It does not change the horizontal position of the marker.

Suffix:

<n> [Window](#)

<m> [Marker](#)

CALCulate<n>:DELTamarker<m>:SGRam:Y:MAXimum:NEXT**CALCulate<n>:DELTamarker<m>:SPECTrogram:Y:MAXimum:NEXT**

Moves a delta marker vertically to the next higher level for the current frequency.

The search includes all frames. It does not change the horizontal position of the marker.

Suffix:<n> [Window](#)<m> [Marker](#)

CALCulate<n>:DELTamarker<m>:SGRam:Y:MAXimum[:PEAK]**CALCulate<n>:DELTamarker<m>:SPECTrogram:Y:MAXimum[:PEAK]**

Moves a delta marker vertically to the highest level for the current frequency.

The search includes all frames. It does not change the horizontal position of the marker.

If the marker hasn't been active yet, the command looks for the peak level in the whole spectrogram.

Suffix:<n> [Window](#)<m> [Marker](#)

CALCulate<n>:DELTamarker<m>:SGRam:Y:MINimum:ABOVE**CALCulate<n>:DELTamarker<m>:SPECTrogram:Y:MINimum:ABOVE**

Moves a delta marker vertically to the next minimum level for the current frequency.

The search includes only frames above the current marker position. It does not change the horizontal position of the marker.

Suffix:<n> [Window](#)<m> [Marker](#)

CALCulate<n>:DELTamarker<m>:SGRam:Y:MINimum:BELOW**CALCulate<n>:DELTamarker<m>:SPECTrogram:Y:MINimum:BELOW**

Moves a delta marker vertically to the next minimum level for the current frequency.

The search includes only frames below the current marker position. It does not change the horizontal position of the marker.

Suffix:<n> [Window](#)<m> [Marker](#)

CALCulate<n>:DELTamarker<m>:SGRam:Y:MINimum:NEXT
CALCulate<n>:DELTamarker<m>:SPECtrogram:Y:MINimum:NEXT

Moves a delta marker vertically to the next minimum level for the current frequency.

The search includes all frames. It does not change the horizontal position of the marker.

Suffix:

<n> [Window](#)

<m> [Marker](#)

CALCulate<n>:DELTamarker<m>:SGRam:Y:MINimum[:PEAK]
CALCulate<n>:DELTamarker<m>:SPECtrogram:Y:MINimum[:PEAK]

Moves a delta marker vertically to the minimum level for the current frequency.

The search includes all frames. It does not change the horizontal position of the marker.

If the marker hasn't been active yet, the command first looks for the peak level in the whole spectrogram and moves the marker vertically to the minimum level.

Suffix:

<n> [Window](#)

<m> [Marker](#)

15.7.5 Display and limit line configuration

- [Display lines](#).....515
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15.7.5.1 Display lines

CALCulate<n>:DLINe<dl>	515
CALCulate<n>:DLINe<dl>:STATe	516
CALCulate<n>:FLINe<dl>	516
CALCulate<n>:FLINe<dl>:STATe	517
CALCulate<n>:TFLIne:STATe	517
CALCulate<n>:TLINe<dl>	517
CALCulate<n>:TLINe<dl>:STATe	518

CALCulate<n>:DLINe<dl> <Position>

Defines the (horizontal) position of a display line.

Suffix:

<n> [Window](#)

<dl> 1 | 2

Parameters:

<Position>

The value range is variable.

You can use any unit you want, the R&S EPL then converts the unit to the currently selected unit. If you omit a unit, the R&S EPL uses the currently selected unit.

*RST: (state is OFF)

Default unit: DBM

Example:

CALC:DLIN2 -20dBm

Positions the second display line at -20 dBm.

Manual operation: See "[Horizontal Line 1/ Horizontal Line 2](#)" on page 231**CALCulate<n>:DLINe<dl>:STATe <State>**

Turns a display line on and off

Suffix:

<n>

[Window](#)

<dl>

1 | 2

Parameters:

<State>

ON | OFF | 0 | 1

OFF | 0

Switches the function off

ON | 1

Switches the function on

Example:

CALC:DLIN2:STAT ON

Turns on display line 2.

CALCulate<n>:FLINe<dl> <Frequency>

Defines the position of a frequency line.

Suffix:

<n>

[Window](#)

<dl>

1 to 4

frequency line

Parameters:

<Frequency>

Note that you can not set a frequency line to a position that is outside the current span.

Range: 0 Hz to Fmax

*RST: (STATe to OFF)

Default unit: HZ

Example:

CALC:FLIN2 120MHz

Sets frequency line 2 to a frequency of 120 MHz.

Manual operation: See "[Vertical Line <x>](#)" on page 231

CALCulate<n>:FLINe<dl>:STATe <State>

Turns a frequency line on and off

Suffix:

<n> [Window](#)
 <dl> 1 | 2
 frequency line

Parameters:

<State> ON | OFF | 0 | 1
OFF | 0
 Switches the function off
ON | 1
 Switches the function on

Example:

CALC:FLIN2:STAT ON
 Turns frequency line 2 on.

CALCulate<n>:TFLine:STATe <State>

This command turns the frequency line representing the current receiver frequency on and off.

Suffix:

<n> irrelevant

Parameters:

<State> ON | OFF | 1 | 0
 *RST: ON

Example:

//Turn on the frequency line
 CALC:TFL:STAT ON

Manual operation: See ["Tuned Frequency"](#) on page 231

CALCulate<n>:TLINe<dl> <Time>

Defines the position of a time line.

Suffix:

<n> [Window](#)
 <dl> 1 to 4
 time line

Parameters:

<Time> Note that you can not set a time line to a position that is higher than the current sweep time.
 Range: 0 s to 1600 s
 *RST: (STATe to OFF)
 Default unit: S

Example: `CALC:TLIN 10ms`
Sets the first time line to 10 ms.

Manual operation: See "[Vertical Line <x>](#)" on page 231

CALCulate<n>:TLINe<dl>:STATe <State>

Turns a time line on and off

Suffix:

<n> [Window](#)

<dl> 1 | 2
time line

Parameters:

<State> ON | OFF | 0 | 1

OFF | 0

Switches the function off

ON | 1

Switches the function on

Example: `CALC:TLIN:STAT ON`
Turns the first time line on.

15.7.5.2 Limit lines

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- [Limit check](#).....531
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Limit line management

CALCulate<n>:LIMit:ACTive?	518
CALCulate<n>:LIMit:CONTRol:OFFSet	519
CALCulate<n>:LIMit:COPY	519
CALCulate<n>:LIMit:DELeTe	520
CALCulate<n>:LIMit:LOWer:OFFSet	520
CALCulate<n>:LIMit:LOWer:STATe	520
CALCulate<n>:LIMit:STATe	521
CALCulate<n>:LIMit:TRACe<t>	521
CALCulate<n>:LIMit:TRACe<t>:CHECK	521
CALCulate<n>:LIMit:UPPer:OFFSet	522
CALCulate<n>:LIMit:UPPer:STATe	522
MMEMory:LOAD<n>:LIMit	523
MMEMory:STORe<n>:LIMit	523

CALCulate<n>:LIMit:ACTive?

Queries the names of *all* active limit lines.

Suffix:

<n> irrelevant

 irrelevant

Return values:

<LimitLines> String containing the names of all active limit lines in alphabetical order.

Example:

CALC:LIM:ACT?

Queries the names of all active limit lines.

Usage:

Query only

Manual operation: See "[Visibility](#)" on page 238**CALCulate<n>:LIMit:CONTrol:OFFSet <Offset>**

Defines an offset for a complete limit line.

Compared to shifting the limit line, an offset does not actually change the limit line definition points.

Suffix:

<n> irrelevant

 [Limit line](#)**Parameters:**

<Offset> Numeric value.
 The unit depends on the scale of the x-axis.
 *RST: 0
 Default unit: HZ

Manual operation: See "[X-Offset](#)" on page 238**CALCulate<n>:LIMit:COPY <Line>**

Copies a limit line.

Suffix:<n> [Window](#) [Limit line](#)**Parameters:**

<Line> **1 to 8**
 number of the new limit line
<name>
 String containing the name of the limit line.

Example:

CALC:LIM1:COPY 2

Copies limit line 1 to line 2.

CALC:LIM1:COPY 'FM2'

Copies limit line 1 to a new line named FM2.

Manual operation: See ["Copy Line"](#) on page 239

CALCulate<n>:LIMit:DELete

Deletes a limit line.

Suffix:

<n> [Window](#)

 [Limit line](#)

Manual operation: See ["Delete Line"](#) on page 239

CALCulate<n>:LIMit:LOWer:OFFSet <Offset>

Defines an offset for a complete lower limit line.

Compared to shifting the limit line, an offset does not actually change the limit line definition points.

Suffix:

<n> [Window](#)

 [Limit line](#)

Parameters:

<Offset> Numeric value.

*RST: 0

Default unit: dB

Manual operation: See ["Y-Offset"](#) on page 238

CALCulate<n>:LIMit:LOWer:STATe <State>

Turns a lower limit line on and off.

Before you can use the command, you have to select a limit line with [CALCulate<n>:LIMit:NAME](#) on page 528.

Suffix:

<n> irrelevant

 [Limit line](#)

Parameters:

<State> ON | OFF | 0 | 1

OFF | 0

Switches the function off

ON | 1

Switches the function on

Manual operation: See ["Visibility"](#) on page 238

CALCulate<n>:LIMit:STATe <State>

Turns the limit check for a specific limit line on and off.

To query the limit check result, use `CALCulate<n>:LIMit<li>:FAIL?`.

Note that a new command exists to activate the limit check and define the trace to be checked in one step (see `CALCulate<n>:LIMit<li>:TRACe<t>:CHECK` on page 521).

Suffix:

<n> irrelevant

 [Limit line](#)

Parameters:

<State> ON | OFF | 0 | 1

OFF | 0

Switches the function off

ON | 1

Switches the function on

Example:

`CALC:LIM:STAT ON`

Switches on the limit check for limit line 1.

Manual operation: See ["Disable All Lines"](#) on page 239

CALCulate<n>:LIMit:TRACe<t> <TraceNumber>

Links a limit line to one or more traces.

Note that this command is maintained for compatibility reasons only. Limit lines no longer need to be assigned to a trace explicitly. The trace to be checked can be defined directly (as a suffix) in the new command to activate the limit check (see `CALCulate<n>:LIMit<li>:TRACe<t>:CHECK` on page 521).

Suffix:

<n> [Window](#)

 [Limit line](#)

<t> irrelevant

Example:

`CALC:LIM2:TRAC 3`

Assigns limit line 2 to trace 3.

CALCulate<n>:LIMit:TRACe<t>:CHECK <State>

Turns the limit check for a specific trace on and off.

To query the limit check result, use `CALCulate<n>:LIMit<li>:FAIL?`.

Note that this command replaces the two commands from previous signal and spectrum analyzers (which are still supported, however):

- `CALCulate<n>:LIMit<li>:TRACe<t>` on page 521

- [CALCulate<n>:LIMit:STATe](#) on page 521

Suffix:

<n>	Window
	Limit line
<t>	Trace

Parameters:

<State>	ON OFF 0 1
	OFF 0
	Switches the function off
	ON 1
	Switches the function on

Example:

CALC:LIM3:TRAC2:CHEC ON
Switches on the limit check for limit line 3 on trace 2.

Manual operation: See ["Traces to be Checked"](#) on page 238

CALCulate<n>:LIMit:UPPer:OFFSet <Offset>

Defines an offset for a complete upper limit line.

Compared to shifting the limit line, an offset does not actually change the limit line definition points.

Suffix:

<n>	irrelevant
	Limit line

Parameters:

<Offset>	Numeric value.
	*RST: 0
	Default unit: dB

Manual operation: See ["Y-Offset"](#) on page 238

CALCulate<n>:LIMit:UPPer:STATe <State>

Turns an upper limit line on and off.

Before you can use the command, you have to select a limit line with [CALCulate<n>:LIMit:NAME](#) on page 528.

Suffix:

<n>	irrelevant
	Limit line

Parameters:

<State>	ON OFF 0 1

OFF | 0

Switches the function off

ON | 1

Switches the function on

Manual operation: See ["Visibility"](#) on page 238**MMEMory:LOAD<n>:LIMit <FileName>**

Loads the limit line from the selected file in .CSV format.

Suffix:

<n> irrelevant

Parameters:

<FileName> String containing the path and name of the CSV import file.

Example:

MMEM:LOAD:LIM 'C:\TEST.CSV'

Manual operation: See ["Import"](#) on page 242**MMEMory:STORe<n>:LIMit <FileName>, <LimitLineName>**

Exports limit line data to an ASCII (CSV) file.

Suffix:

<n> irrelevant

Parameters:

<FileName> String containing the path and name of the target file.

<LimitLineName> Name of the limit line to be exported.

Example:

```
MMEM:STOR:LIM 'C:\TEST', 'UpperLimitLine'
Stores the limit line named "UpperLimitLine" in the file
TEST.CSV.
```

Manual operation: See ["Export"](#) on page 242**Limit line design**

CALCulate<n>:LIMit :COMMeNt.....	524
CALCulate<n>:LIMit :CONTRol[:DATA].....	524
CALCulate<n>:LIMit :CONTRol:DOMain.....	524
CALCulate<n>:LIMit :CONTRol:MODE.....	525
CALCulate<n>:LIMit :CONTRol:SHIFt.....	525
CALCulate<n>:LIMit :CONTRol:SPACing.....	526
CALCulate<n>:LIMit :LOWer[:DATA].....	526
CALCulate<n>:LIMit :LOWer:MARGin.....	526
CALCulate<n>:LIMit :LOWer:MODE.....	527
CALCulate<n>:LIMit :LOWer:SHIFt.....	527
CALCulate<n>:LIMit :LOWer:SPACing.....	527
CALCulate<n>:LIMit :LOWer:THReshold.....	528
CALCulate<n>:LIMit :NAME.....	528

CALCulate<n>:LIMit :UNIT.....	528
CALCulate<n>:LIMit :UPPer[:DATA].....	529
CALCulate<n>:LIMit :UPPer:MARGin.....	529
CALCulate<n>:LIMit :UPPer:MODE.....	529
CALCulate<n>:LIMit :UPPer:SHIFt.....	530
CALCulate<n>:LIMit :UPPer:SPACing.....	530
CALCulate<n>:LIMit :UPPer:THReshold.....	530

CALCulate<n>:LIMit:COMMeNt <Comment>

Defines a comment for a limit line.

Suffix:

<n>	irrelevant
	Limit line

Parameters:

<Comment>	String containing the description of the limit line.

Manual operation: See "Comment" on page 240

CALCulate<n>:LIMit:CONTRol[:DATA] <LimitLinePoints>...

Defines the horizontal definition points of a limit line.

Suffix:

<n>	irrelevant
	Limit line

Parameters:

<LimitLinePoints>	Variable number of x-axis values. Note that the number of horizontal values has to be the same as the number of vertical values set with CALCulate<n>:LIMit :LOWer[:DATA] or CALCulate<n>:LIMit :UPPer[:DATA]. If not, the R&S EPL either adds missing values or ignores surplus values. *RST: - Default unit: HZ

Manual operation: See "Data Points" on page 241

CALCulate<n>:LIMit:CONTRol:DOMain <SpanSetting>

Selects the domain of the limit line.

Suffix:

<n>	irrelevant
	Limit line

Parameters:

<SpanSetting>	FREQuency TIME

FREQuency

For limit lines that apply to a range of frequencies.

TIME

For limit lines that apply to a period of time.

*RST: FREQuency

Example:

CALC:LIM:CONT:DOM FREQ

Select a limit line in the frequency domain.

Manual operation: See ["X-Axis"](#) on page 241

CALCulate<n>:LIMit:CONTrol:MODE <Mode>

Selects the horizontal limit line scaling.

Suffix:

<n> irrelevant

 [Limit line](#)

Parameters:

<Mode>

ABSolute

Limit line is defined by absolute physical values (Hz or s).

RELative

Limit line is defined by relative values related to the center frequency (frequency domain) or the left diagram border (time domain).

*RST: ABSolute

Manual operation: See ["X-Axis"](#) on page 241

CALCulate<n>:LIMit:CONTrol:SHIFt <Distance>

Moves a complete limit line horizontally.

Compared to defining an offset, this command actually changes the limit line definition points by the value you define.

Suffix:

<n> irrelevant

 [Limit line](#)

Parameters:

<Distance>

Numeric value.

The unit depends on the scale of the x-axis.

Default unit: HZ

Manual operation: See ["Shift x"](#) on page 242

CALCulate<n>:LIMit:CONTrol:SPACing <InterpolMode>

Selects linear or logarithmic interpolation for the calculation of limit lines from one horizontal point to the next.

Suffix:

<n> [Window](#)

 [Limit line](#)

Parameters:

<InterpolMode> LINear | LOGarithmic

*RST: LIN

Example: CALC:LIM:CONT:SPAC LIN

Manual operation: See ["X-Axis"](#) on page 241

CALCulate<n>:LIMit:LOWer[:DATA] <LimitLinePoints>...

Defines the vertical definition points of a lower limit line.

Suffix:

<n> irrelevant

 [Limit line](#)

Parameters:

<LimitLinePoints> Variable number of level values.
Note that the number of vertical values has to be the same as the number of horizontal values set with [CALCulate<n>:LIMit:CONTrol\[:DATA\]](#). If not, the R&S EPL either adds missing values or ignores surplus values.

*RST: Limit line state is OFF

Default unit: DBM

Manual operation: See ["Data Points"](#) on page 241

CALCulate<n>:LIMit:LOWer:MARGin <Margin>

Defines an area around a lower limit line where limit check violations are still tolerated.

Suffix:

<n> irrelevant

 [Limit line](#)

Parameters:

<Margin> **numeric value**

*RST: 0

Default unit: dB

Manual operation: See ["Margin"](#) on page 241

CALCulate<n>:LIMit:LOWer:MODE <Mode>

Selects the vertical limit line scaling.

Suffix:

<n> [Window](#)

 [Limit line](#)

Parameters:

<Mode>

ABSolute

Limit line is defined by absolute physical values.
The unit is variable.

RELative

Limit line is defined by relative values related to the reference level (dB).

*RST: ABSolute

Manual operation: See ["Y-Axis"](#) on page 241

CALCulate<n>:LIMit:LOWer:SHIFt <Distance>

Moves a complete lower limit line vertically.

Compared to defining an offset, this command actually changes the limit line definition points by the value you define.

Suffix:

<n> [Window](#)

 [Limit line](#)

Parameters:

<Distance>

Defines the distance that the limit line moves.

Default unit: DB

Manual operation: See ["Shift y"](#) on page 242

CALCulate<n>:LIMit:LOWer:SPACing <InterpolType>

Selects linear or logarithmic interpolation for the calculation of a lower limit line from one horizontal point to the next.

Suffix:

<n> [Window](#)

 [Limit line](#)

Parameters:

<InterpolType>

LINear | LOGarithmic

*RST: LIN

Manual operation: See ["Y-Axis"](#) on page 241

CALCulate<n>:LIMit:LOWer:THReshold <Threshold>

Defines a threshold for relative limit lines.

The R&S EPL uses the threshold for the limit check, if the limit line violates the threshold.

Suffix:

<n> irrelevant

 [Limit line](#)

Parameters:

<Threshold> Numeric value.
The unit depends on [CALCulate<n>:LIMit:UNIT](#) on page 528.

*RST: -200 dBm

Default unit: DBM

Manual operation: See ["Threshold"](#) on page 240

CALCulate<n>:LIMit:NAME <Name>

Selects a limit line that already exists or defines a name for a new limit line.

Suffix:

<n> [Window](#)

 [Limit line](#)

Parameters:

<Name> String containing the limit line name.

*RST: REM1 to REM8 for lines 1 to 8

Manual operation: See ["Name"](#) on page 240

CALCulate<n>:LIMit:UNIT <Unit>

Defines the unit of a limit line.

Suffix:

<n> irrelevant

 [Limit line](#)

Parameters:

<Unit> DBM | DBPW | WATT | DBUV | DBMV | VOLT | DBUA | A | DB | DBM_mhz | DBM_hz | DBUV_mhz | DBMV_mhz | DBUa_mhz | DBUV_m | DBUa_m | DBUV_mmhz | DBUa_mmhz | DBPW_mhz | DBPT_mhz | DBPT | DEG | RAD | S | HZ | UNITless

If you select a dB-based unit for the limit line, the command automatically turns the limit line into a relative limit line.

*RST: DBM

Manual operation: See "Y-Axis" on page 241

CALCulate<n>:LIMit:UPPer[:DATA] <LimitLinePoints>...

Defines the vertical definition points of an upper limit line.

Suffix:

<n> irrelevant

 [Limit line](#)

Parameters:

<LimitLinePoints> Variable number of level values.
 Note that the number of vertical values has to be the same as the number of horizontal values set with [CALCulate<n>:LIMit:CONTRol\[:DATA\]](#). If not, the R&S EPL either adds missing values or ignores surplus values.

*RST: Limit line state is OFF

Default unit: DBM

Manual operation: See "Data Points" on page 241

CALCulate<n>:LIMit:UPPer:MARGin <Margin>

Defines an area around an upper limit line where limit check violations are still tolerated.

Suffix:

<n> irrelevant

 [Limit line](#)

Parameters:

<Margin> **numeric value**

*RST: 0

Default unit: dB

Manual operation: See "Margin" on page 241

CALCulate<n>:LIMit:UPPer:MODE <Mode>

Selects the vertical limit line scaling.

Suffix:

<n> [Window](#)

 [Limit line](#)

Parameters:

<Mode> **ABSolute**

Limit line is defined by absolute physical values.
 The unit is variable.

RELative

Limit line is defined by relative values related to the reference level (dB).

*RST: ABSolute

Manual operation: See ["Y-Axis"](#) on page 241

CALCulate<n>:LIMit:UPPer:SHIFt <Distance>

Moves a complete upper limit line vertically.

Compared to defining an offset, this command actually changes the limit line definition points by the value you define.

Suffix:

<n> irrelevant

 [Limit line](#)

Parameters:

<Distance> Defines the distance that the limit line moves.

Manual operation: See ["Shift y"](#) on page 242

CALCulate<n>:LIMit:UPPer:SPACing <InterpolType>

Selects linear or logarithmic interpolation for the calculation of an upper limit line from one horizontal point to the next.

Suffix:

<n> [Window](#)

 [Limit line](#)

Parameters:

<InterpolType> LINear | LOGarithmic

*RST: LIN

Manual operation: See ["Y-Axis"](#) on page 241

CALCulate<n>:LIMit:UPPer:THReshold <Limit>

Defines an absolute limit for limit lines with a relative scale.

The R&S EPL uses the threshold for the limit check, if the limit line violates the threshold.

Suffix:

<n> irrelevant

 [Limit line](#)

Parameters:

<Limit> Numeric value.
 The unit depends on `CALCulate<n>:LIMit<li>:UNIT`
 on page 528.
 *RST: -200
 Default unit: dBm

Manual operation: See "[Threshold](#)" on page 240

Limit check

<code>CALCulate<n>:LIMit:CLEar[:IMMediate]</code>	531
<code>CALCulate<n>:LIMit:FAIL?</code>	531
<code>CALCulate<n>:LIMit:CHECK</code>	532

CALCulate<n>:LIMit:CLEar[:IMMediate]

Deletes the result of the current limit check.

The command works on *all* limit lines in *all* measurement windows at the same time.

Suffix:

<n> [Window](#)
 irrelevant

Example:

`CALC:LIM:CLE`
 Deletes the result of the limit check.

CALCulate<n>:LIMit:FAIL?

Queries the result of a limit check in the specified window.

To get a valid result, you have to perform a complete measurement with synchronization to the end of the measurement before reading out the result. This is only possible for single measurement mode.

See also `INITiate<n>:CONTInuous` on page 394.

Suffix:

<n> [Window](#)
 [Limit line](#)

Return values:

<Result> **0**
 PASS
 1
 FAIL

Example:

`INIT;*WAI`
 Starts a new sweep and waits for its end.
`CALC2:LIM3:FAIL?`
 Queries the result of the check for limit line 3 in window 2.

Usage: Query only

CALCulate<n>:LIMit:CHECK <State>

Checks the limits of all limit lines in pre-measurement.

Suffix:

<n> 1..n
Window

 1..n
Limit line

Parameters:

<State> ON | OFF | 0 | 1
OFF | 0
Switches the function off.
ON | 1
Switches the function on.

Example: //Switch on the limit check
CALC:LIMIT:CHECK ON

Manual operation: See "Limit Check" on page 239

Programming example: using limit lines

The following examples demonstrate how to work with limit lines in a remote environment.

- [Example: configuring limit lines](#).....532
- [Example: performing a limit check](#).....533

Example: configuring limit lines

This example demonstrates how to configure 2 limit lines - an upper and a lower limit - for a measurement in a remote environment.

```
//----- Configuring the limit lines -----
CALC:LIM1:NAME 'FM1'
//Names limit line 1 'FM1'.

CALC:LIM1:CONT:MODE ABS
//Selects absolute scaling for the horizontal axis.
CALC:LIM1:CONT 1 MHz,50MHz,100 MHz,150MHz,200MHz
//Defines 5 horizontal definition points for limit line 1.
CALC:LIM1:UPP:MODE ABS
//Selects an absolute vertical scale for limit line 1.
CALC:LIM1:UNIT DBM
//Selects the unit dBm for limit line 1.
CALC:LIM1:UPP -10,-5,0,-5,-10
//Defines 5 definition points for limit line 1.
```

```

CALC:LIM1:UPP:MARG 5dB
//Defines an area of 5 dB around limit line 1 where limit check violations
//are still tolerated.

CALC:LIM1:UPP:SHIF -10DB
//Shifts the limit line 1 by -10 dB.
CALC:LIM1:UPP:OFFS -3dB
//Defines an additional -3 dB offset for limit line 1.

CALC:LIM3:NAME 'FM3'
//Names limit line 3 'FM3'.

CALC:LIM3:LOW:MODE REL
//Selects a relative vertical scale for limit line 3.
CALC:LIM3:UNIT DB

CALC:LIM3:CONT 1 MHz,50MHz,100 MHz,150MHz,200MHz
//Defines 5 horizontal definition points for limit line 3.
CALC:LIM3:LOW -90,-60,-40,-60,-90
//Defines 5 definition points relative to the reference level for limit line 3.

CALC:LIM3:LOW:SHIF 2
//Shifts the limit line 3 by 2dB.
CALC:LIM3:LOW:OFFS 3
//Defines an additional 3 dB offset for limit line 3.

CALC:LIM3:LOW:THR -200DBM
//Defines a power threshold of -200dBm that must be exceeded for limit to be checked

CALC:LIM3:LOW:MARG 5dB
//Defines an area of 5dB around limit line 3 where limit check violations
//are still tolerated.

//----- Storing the limit lines -----
MMEM:SEL:CHAN:LIN:ALL ON
MMEM:STOR:TYPE CHAN
MMEM:STOR:STAT 1,'LimitLines_FM1_FM3'

```

Example: performing a limit check

This example demonstrates how to perform a limit check during a basic frequency sweep measurement in a remote environment. The limit lines configured in ["Example: configuring limit lines"](#) on page 532 are assumed to exist and be active.

```

//-----Preparing the instrument -----
*RST
//Resets the instrument
INIT:CONT OFF
//Selects single sweep mode.

//-----Configuring the measurement -----

```

```

FREQ:CENT 100MHz
//Defines the center frequency
FREQ:SPAN 200MHz
//Sets the span to 100 MHz on either side of the center frequency.
SENS:SWE:COUN 10
//Defines 10 sweeps to be performed in each measurement.
DISP:TRAC1:Y:RLEV 0dBm
//Sets the reference level to 0 dBm.
TRIG:SOUR IFP
TRIG:LEV:IFP -10dBm
//Defines triggering when the second intermediate frequency rises to a level
//of -10 dBm.

//-----Configuring the Trace-----
DISP:TRAC2 ON
DISP:TRAC2:MODE AVER
DISP:TRAC3 ON
DISP:TRAC3:MODE MAXH
//Configures 3 traces: 1 (default): clear/write; 2: average; 3: max hold

//----- Configuring the limit check -----
MMEM:LOAD:TYPE REPL
MMEM:LOAD:STAT 1,'LimitLines_FM1_FM3'
//Loads the limit lines stored in 'LimitLines_FM1_FM3'
CALC:LIM1:NAME 'FM1'
CALC:LIM1:UPP:STAT ON
//Activates upper limit FM1 as line 1.
CALC:LIM3:NAME 'FM3'
CALC:LIM3:LOW:STAT ON
//Activates lower limit line FM3 as line 3.
CALC:LIM:ACT?
//Queries the names of all active limit lines
//Result: 'FM1,FM3'
CALC:LIM1:TRAC3:CHEC ON
//Activates the upper limit to be checked against trace3 (maxhold trace)
CALC:LIM3:TRAC2:CHEC ON
//Activates the upper limit to be checked against trace2 (average trace)
CALC:LIM:CLE
//Clears the previous limit check results

//----- Performing the measurement-----
INIT;*WAI
//Initiates a new measurement and waits until the last sweep has finished.

//----- Retrieving limit check results-----

CALC:LIM1:FAIL?
//Queries the result of the upper limit line check

```

```
CALC:LIM3:FAIL?
//Queries the result of the lower limit line check
```

15.8 Data management

The commands required to store and load instrument settings and import and export measurement results in a remote environment are described here. The tasks for manual operation are described in [Section 12, "Data management"](#), on page 248.

Addressing drives

The various drives can be addressed via the "mass storage instrument specifier" <msis> using the conventional Windows syntax. The internal hard disk is addressed by "C:". For details on storage locations refer to [Section 12.3.2.2, "Storage location and filename"](#), on page 254.

The file names (<FileName> parameter) are given as string parameters enclosed in quotation marks. They also comply with Windows conventions. Windows file names do not distinguish between uppercase and lowercase notation.

Wildcards

The two characters "*" and "?" can be used as "wildcards". Wildcards are variables for a selection of several files. The question mark "?" replaces exactly one character, the asterisk replaces any of the remaining characters in the file name. "*. *" thus means all files in a directory.

Path names

Storage locations can be specified either as absolute (including the entire path) or relative paths (including only subfolders of the current folder). Use the `MMEM:CDIR?` query to determine the current folder.

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15.8.1 File management

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FORMat[:DATA] <Format>[, <BitLength>]

Selects the data format that is used for transmission of trace data from the R&S EPL to the controlling computer.

Note that the command has no effect for data that you send to the R&S EPL. The R&S EPL automatically recognizes the data it receives, regardless of the format.

For details on data formats, see [Section 15.7.3.6, "Formats for returned values: ASCII format and binary format"](#), on page 491.

Parameters:

<Format>

AScii

AScii format, separated by commas.

This format is almost always suitable, regardless of the actual data format. However, the data is not as compact as other formats can be.

REAL

Floating-point numbers (according to IEEE 754) in the "definite length block format".

The format setting **REAL** is used for the binary transmission of trace data.

<BitLength>

Length in bits for floating-point results

16

16-bit floating-point numbers.

Compared to **REAL**, 32 format, half as many numbers are returned.

32

32-bit floating-point numbers

For I/Q data, 8 bytes per sample are returned for this format setting.

64

64-bit floating-point numbers

Compared to **REAL**, 32 format, twice as many numbers are returned.

Example: `FORM REAL, 32`

FORMat:DEXPort:DSEParator <Separator>

Selects the decimal separator for data exported in ASCII format.

Parameters:

<Separator>

POINT | COMMa

COMMa

Uses a comma as decimal separator, e.g. 4,05.

POINT

Uses a point as decimal separator, e.g. 4.05.

*RST: *RST has no effect on the decimal separator.
Default is POINT.

Example: `FORM:DEXP:DSEP POIN`
Sets the decimal point as separator.

Manual operation: See ["Exporting a peak list"](#) on page 117
See ["Decimal Separator"](#) on page 200

MMEMory:CATalog <FileName>

This command returns the contents of a particular directory.

Parameters:

<FileName>

String containing the path and directory

If you leave out the path, the command returns the contents of the directory selected with [MMEMory:CDIRectory](#) on page 538.

The path may be relative or absolute. Using wildcards (*) is possible to query a certain type of files only.

If you use a specific file as a parameter, the command returns the name of the file if the file is found in the specified directory, or an error if the file is not found ("-256, "File name not found").

Example: `MMEM:CAT? 'C:\Data\SPOOL?.PNG'`
Returns all files in C:\Data\ whose names start with SPOOL, have 6 characters and the extension .PNG, e.g.:
SPOOL1.PNG, SPOOL2.PNG, SPOOL3.PNG

Example: `MMEM:CAT? 'C:\Data\SPOOL6.PNG'`
Query whether the file 'SPOOL6.PNG' also exists in the directory;
Result:
-256,"File name not found::MMEMory:CATalog?
'C:\Data\SPOOL6.PNG'

Manual operation: See ["Selecting Storage Location - Drive/ Path/ Files"](#) on page 255

MMEMory:CATalog:LONG <Directory>

This command returns the contents of a particular directory with additional information about the files.

Parameters:

<Directory> String containing the path and directory.
 If you leave out the path, the command returns the contents of the directory selected with [MMEMory:CDIRectory](#) on page 538.
 The path may be relative or absolute. Using wildcards (*) is possible to query a certain type of files only.

MMEMory:CDIRectory <Directory>

This command changes the current directory.

Parameters:

<Directory> String containing the path to another directory.
 The path may be relative or absolute.

MMEMory:COMMeNt <Comment>

Defines a comment for the stored settings.

Parameters:

<Comment> String containing the comment.

Example:

```
MMEMory:COMMeNt "ACP measurement with Standard Tetra from 23.05."
MMEMory::MMEMory:STORE1:STATE 1, "ACP_T"
As a result, in the selection list for recall settings, the comment "ACP measurement with Standard Tetra from 23.05." is added to the ACP entry.
```

Manual operation: See ["Comment"](#) on page 256

MMEMory:COpy <FileName>, <FileName>

This command copies one or more files to another directory.

Parameters:

<FileName> String containing the path and file name of the source file.
 <FileName> String containing the path and name of the target file.
 The path may be relative or absolute.

MMEMory:DATA <FileName>[, <Data>]

MMEMory:DATA? <FileName>

This command writes block data into a file. The delimiter must be set to EOI to obtain error-free data transfer.

When you query the contents of a file, you can save them in a file on the remote control computer.

The command is useful for reading stored settings files or trace data from the instrument or for transferring them to the instrument

Parameters:

<Data>	<block_data> Data block with the following structure. # Hash sign. <number> Length of the length information. <number> Length information of the binary data (number of bytes). <data> Binary data with the indicated <number> of bytes.

Parameters for setting and query:

<FileName>

Example:

```
MMEM:NAME '\Public\User\Testfile.txt'
```

Creates a new file called 'testfile.txt'.

```
MMEM:DATA 'Testfile.txt',#220Contents of the
file
```

The parameter means:

#2: hash sign and length of the length information (20 bytes = 2 digits)

20: indicates the number of subsequent binary data bytes.

Contents of the file: store 20 binary bytes (characters) to the file.

```
MMEM:DATA? 'Testfile.txt'
```

Returns the contents of the file.

MMEMory:DELeTe:IMMediate <FileName>

This command deletes a file.

Parameters:

<FileName>	String containing the path and file name of the file to delete. The path may be relative or absolute.

MMEMory:MDIRectory <Directory>

This command creates a new directory.

Parameters:

<Directory> String containing the path and new directory name
The path may be relative or absolute.

MMEMory:MOVE <FileName>, <FileName>

This command moves a file to another directory.

The command also renames the file if you define a new name in the target directory.

If you do not include a path for <NewFileName>, the command just renames the file.

Parameters:

<FileName> String containing the path and file name of the source file.

<FileName> String containing the path and name of the target file.

Example:

```
MMEM:MOVE 'C:\TEST01.CFG', 'SETUP.CFG'
```

Renames TEST01.CFG in SETUP.CFG in directory C:\.

MMEMory:MSIS <Drive>

This command selects the default storage device used by all MMEMory commands.

Parameters:

<Drive> 'A:' | 'C:' | ... | 'Z:'

String containing the device drive name

*RST: n.a.

MMEMory:NAME <FileName>

This command has several purposes, depending on the context it is used in.

- It creates a new and empty file.
- It defines the file name for screenshots taken with `HCOPY[:IMMediate]`. Note that you have to route the printer output to a file.
- It defines the name and directory of a test report.

Parameters:

<FileName> String containing the path and name of the target file.

Example:

```
MMEM:NAME 'C:\Data\PRINT1.BMP'
```

Selects the file name.

Manual operation: See ["Configuration and printout of the test report"](#) on page 282

MMEMory:NETWork:DISConnect <Drive>[, <State>]

This command disconnects a network drive.

Parameters:

<Drive>	String containing the drive name.
<State>	1 0 ON OFF Optional: determines whether disconnection is forced or not 1 ON Disconnection is forced. 0 OFF Disconnect only if not in use. *RST: 0

MMEMory:NETWork:MAP <FilePath>, <IP>[, <UserName>, <Password>, <State>]

This command maps a drive to a server or server directory of the network.

Note that you have to allow sharing for a server or folder in Microsoft networks first.

Parameters:

<FilePath>	String containing the drive name or path of the directory you want to map.
<IP>	String containing the host name of the computer or the IP address and the share name of the drive. '<host name or IP address>\share name'
<UserName>	String containing a user name in the network. The user name is optional.
<Password>	String containing the password corresponding to the <User-Name>. The password is optional.
<State>	ON OFF 1 0 ON 1 Reconnects at logon with the same user name. OFF 0 Does not reconnect at logon.

MMEMory:NETWork:UNUSeddrives

This command returns a list of unused network drives.

MMEMory:NETWork:USEDdrives [<State>]

This command returns a list of all network drives in use.

Parameters:

<State>	You do not have to use the parameter. If you do not include the parameter, the command returns a list of all drives in use. This is the same behavior as if you were using the parameter OFF.

ON | 1

Returns a list of all drives in use including the folder information.

OFF | 0

Returns a list of all drives in use.

MMEMory:RDIrectory <Directory>

This command deletes the indicated directory.

Parameters:

<Directory> String containing the path of the directory to delete.
Note that the directory you want to remove must be empty.

15.8.2 Items to store

The following commands select the items to be included in the configuration file.

Depending on the used command, either the items from the entire instrument (MMEMory:SElect[:ITEM]...), or only those from the currently selected channel (MMEM:SElect:CHANnel[:ITEM]...) are stored.

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MMEMory:SElect[:ITEM]:ALL.....	542
MMEMory:SElect:CHANnel[:ITEM]:DEFault.....	543
MMEMory:SElect[:ITEM]:DEFault.....	543
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MMEMory:SElect[:ITEM]:HWSettings.....	543
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MMEMory:SElect[:ITEM]:LINes:ALL.....	543
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MMEMory:SElect[:ITEM]:NONE.....	544
MMEMory:SElect:CHANnel[:ITEM]:SGRam.....	544
MMEMory:SElect[:ITEM]:SGRam.....	544
MMEMory:SElect:CHANnel[:ITEM]:TRACe[:ACTive].....	544
MMEMory:SElect[:ITEM]:TRACe<1...3>[:ACTive].....	544
MMEMory:SElect:CHANnel[:ITEM]:TRANsducer:ALL.....	545
MMEMory:SElect[:ITEM]:TRANsducer:ALL.....	545

MMEMory:SElect:CHANnel[:ITEM]:ALL**MMEMory:SElect[:ITEM]:ALL**

This command includes all items when storing or loading a configuration file.

The items are:

- Hardware configuration: [MMEMory:SElect\[:ITEM\]:HWSettings](#) on page 543
- Limit lines: [MMEMory:SElect\[:ITEM\]:LINes:ALL](#) on page 543
- Spectrogram data: [MMEMory:SElect\[:ITEM\]:SGRam](#) on page 544
- Trace data: [MMEMory:SElect\[:ITEM\]:TRACe<1...3>\[:ACTive\]](#) on page 544

- Transducers: `MMEMory:SElect[:ITEM]:TRANsducer:ALL` on page 545

Example: `MMEM:SEL:ALL`

Manual operation: See "[Items:](#)" on page 256

MMEMory:SElect:CHANnel[:ITEM]:DEFault

MMEMory:SElect[:ITEM]:DEFault

This command selects the current settings as the only item to store to and load from a configuration file.

Manual operation: See "[Items:](#)" on page 256

MMEMory:SElect:CHANnel[:ITEM]:HWSettings <State>

MMEMory:SElect[:ITEM]:HWSettings <State>

This command includes or excludes measurement (hardware) settings when storing or loading a configuration file.

Measurement settings include:

- general channel configuration
- measurement hardware configuration including markers
- limit lines
Note that a configuration may include no more than 8 limit lines. This number includes active limit lines as well as inactive limit lines that were used last. Therefore the combination of inactivate limit lines depends on the sequence of use with `MMEMory:LOAD:STATe` on page 546.
- color settings
- configuration for the hardcopy output

Parameters:

<State> `ON | OFF | 0 | 1`
 *RST: `1`

Example: `MMEM:SEL:HWS ON`

Manual operation: See "[Items:](#)" on page 256

MMEMory:SElect:CHANnel[:ITEM]:LINes:ALL <State>

MMEMory:SElect[:ITEM]:LINes:ALL <State>

This command includes or excludes all limit lines (active and inactive) when storing or loading a configuration file.

Parameters:

<State> `ON | OFF | 1 | 0`
 *RST: `0`

Example: `MMEM:SEL:LIN:ALL ON`

Manual operation: See "[Items:](#)" on page 256

MMEMory:SElect:CHANnel[:ITEM]:NONE**MMEMory:SElect[:ITEM]:NONE**

This command does not include any of the following items when storing or loading a configuration file.

- Hardware configuration: [MMEMory:SElect\[:ITEM\]:HWSettings](#) on page 543
- Limit lines: [MMEMory:SElect\[:ITEM\]:LINes:ALL](#) on page 543
- Spectrogram data: [MMEMory:SElect\[:ITEM\]:SGRam](#) on page 544
- Trace data: [MMEMory:SElect\[:ITEM\]:TRACe<1...3>\[:ACTive\]](#) on page 544
- Transducers: [MMEMory:SElect\[:ITEM\]:TRANsducer:ALL](#) on page 545

Example: `MMEM:SEL:NONE`

Manual operation: See ["Items:"](#) on page 256

MMEMory:SElect:CHANnel[:ITEM]:SGRam <State>**MMEMory:SElect[:ITEM]:SGRam <State>**

This command includes or excludes spectrogram data when storing or loading a configuration file.

Parameters:

<State> ON | OFF | 1 | 0
*RST: 0

Example: `MMEM:SEL:SGR ON`
Adds the spectrogram data to the list of data subsets.

Manual operation: See ["Items:"](#) on page 256

MMEMory:SElect:CHANnel[:ITEM]:TRACe[:ACTive] <State>**MMEMory:SElect[:ITEM]:TRACe<1...3>[:ACTive] <State>**

This command includes or excludes trace data when storing or loading a configuration file.

Suffix:

<1...3> irrelevant

Parameters:

<State> ON | OFF | 1 | 0
*RST: 0, i.e. no traces are stored

Example: `MMEM:SEL:TRAC ON`

Manual operation: See ["Items:"](#) on page 256

MMEMory:SElect:CHANnel[:ITEM]:TRANsducer:ALL <State>
MMEMory:SElect[:ITEM]:TRANsducer:ALL <State>

This command includes or excludes transducer factors when storing or loading a configuration file.

Parameters:

<State> ON | OFF | 1 | 0
 *RST: 0

Example: MMEM:SEL:TRAN:ALL ON

Manual operation: See "Items:" on page 256

15.8.3 Instrument setting management

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SYSTem:PRESet.....	548
SYSTem:PRESet:CHANnel[:EXEC].....	548

MMEMory:CLEar:ALL

This command deletes all instrument configuration files in the current directory.

You can select the directory with [MMEMory:CDIRectory](#) on page 538.

Example: MMEM:CLE:ALL

MMEMory:CLEar:STATe <1>, <FileName>

This command deletes an instrument configuration file.

Parameters:

<1>
 <FileName> String containing the path and name of the file to delete.
 The string may or may not contain the file's extension.

Example: MMEM:CLE:STAT 1, 'TEST'

MMEMory:LOAD:AUTO <1>, <FileName>

This command restores an instrument configuration and defines that configuration as the default state.

The default state is restored after a preset ([*RST](#)) or after you turn on the R&S EPL.

Parameters:

<1>

<FileName>

'Factory'

Restores the factory settings as the default state.

'<file_name>'

String containing the path and name of the configuration file.

Note that only *instrument* settings files can be selected for the startup recall function; channel setup files cause an error.**Example:**

```
MMEM:LOAD:AUTO 1, 'C:\Users\Public\Documents\Rohde-Schwarz\Analyzer\user\TEST'
```

Manual operation: See ["Startup Recall"](#) on page 257**MMEMory:LOAD:STATe <1>, <FileName>**

This command restores and activates the instrument configuration stored in a *.dfl file.

Note that files with other formats cannot be loaded with this command.

The contents that are reloaded from the file are defined by the last selection made either in the "Save/Recall" dialogs (manual operation) or through the `MMEMory:SElect[:ITEM]` commands (remote operation; the settings are identical in both cases).

By default, the selection is limited to the user settings ("User Settings" selection in the dialogs, `HWSettings` in SCPI). The selection is not reset by `[Preset]` or `*RST`.

As a consequence, the results of a SCPI script using the `MMEMory:LOAD:STATe` command without a previous `MMEMory:SElect[:ITEM]` command may vary, depending on previous actions in the GUI or in previous scripts, even if the script starts with the `*RST` command.

It is therefore recommended that you use the appropriate `MMEMory:SElect[:ITEM]` command before using `MMEMory:LOAD:STATe`.

Parameters:

<1>

<FileName>

String containing the path and name of the file to load.
The string may or may not include the file's extension.

Example:

```

MMEM:SEL:ALL
//Save all items (User Settings, All Traces, All Limit Lines) from
the R&S EPL.
MMEM:LOAD:STAT 1, 'C:
\Users\Public\Documents\Rohde-Schwarz\Analyzer\user\TEST01
//Reloads all items
In the "Recall" dialog, select only "User Settings" and "All Limit
Lines".
MMEM:LOAD:STAT 1, 'C:
\Users\Public\Documents\Rohde-Schwarz\Analyzer\user\TEST01
//Reloads user settings and all limit lines.
*RST
//Reset instrument.
MMEM:LOAD:STAT 1, 'C:
\Users\Public\Documents\Rohde-Schwarz\Analyzer\user\TEST01
//Selected items are retained. Reloads user settings and all limit
lines.
Restart the instrument.
(Switch the [ON/OFF] key off and on).
MMEM:LOAD:STAT 1, 'C:
\Users\Public\Documents\Rohde-Schwarz\Analyzer\user\TEST01
// Selected items are set to default. Reloads only the user set-
tings.

```

Manual operation: See ["Recall"](#) on page 253
 See ["Recall in New Channel / Recall in Current Channel"](#)
 on page 256

MMEMory:STORe<1|2>:STATe <1>, <FileName>

This command saves the current instrument configuration in a *.dfl file.

Suffix:

<1|2> irrelevant

Parameters:

<1>

<FileName> String containing the path and name of the target file.
 The file extension is .dfl.

Example:

```

MMEM:STOR:STAT 1, 'Save '
Saves the current instrument settings in the file Save.dfl.

```

Manual operation: See ["Save File"](#) on page 256

MMEMory:STORe<1|2>:STATe:NEXT

This command saves the current instrument configuration in a *.dfl file.

The file name depends on the one you have set with [MMEMory:STORe<1|2>:STATe](#)
 on page 547. This command adds a consecutive number to the file name.

Suffix:

<1|2> irrelevant

Example:

MMEM:STOR:STAT 1, 'Save'

Saves the current instrument settings in the file Save.dfl.

MMEM:STOR:STAT:NEXT

Saves the current instrument settings in the file Save_001.dfl

MMEM:STOR:STAT:NEXT

Saves the current instrument settings in the file Save_002.dfl

Manual operation: See ["Save File"](#) on page 256

MMEMory:STORe<1|2>:TYPE <Type>

This command defines whether the data from the entire instrument or only from the current channel setup is stored with the subsequent MMEM:STOR... command.

Suffix:

<1|2> irrelevant

Parameters:

<Type> INSTrument | CHANnel

INSTrument

Stores data from the entire instrument.

CHANnel

Stores data from an individual channel setup.

*RST: INST

Example:

INST:SEL 'SPECTRUM2'

Selects channel setup 'SPECTRUM2'.

MMEM:STOR:TYPE CHAN

Specifies that channel setup data is to be stored.

SYSTem:PRESet

This command presets the R&S EPL. It is identical to [*RST](#).

Example:

SYST:PRES

Usage:

Event

SYSTem:PRESet:CHANnel[:EXEC]

Restores the default instrument settings in the current channel setup.

Use INST:SEL to select the channel setup.

Example:

INST:SEL 'Spectrum2'

Selects the channel setup for "Spectrum2".

SYST:PRES:CHAN:EXEC

Restores the factory default settings to the "Spectrum2" channel setup.

Usage: Event

Manual operation: See "Preset Channel setup" on page 135

15.8.4 Screenshots and printouts

Commands to take and store screenshots described elsewhere.

- [MMEMory:NAME](#) on page 540

DISPlay:LOGO	549
HCOPy:ABORT	550
HCOPy:CMAP<it>:DEFault<ci>	550
HCOPy:CONTeNt	550
HCOPy:DESTination<di>	551
HCOPy:DEVice:COLor	552
HCOPy:DEVice:LANGuage	553
HCOPy[:IMMediate]	553
HCOPy[:IMMediate]:NEXT	554
HCOPy:ITEM:WINDow:TEXT	554
HCOPy:PAGE:COUNt:STATe	554
HCOPy:PAGE:MARGin:BOTTom	554
HCOPy:PAGE:MARGin:LEFT	555
HCOPy:PAGE:MARGin:RIGHT	555
HCOPy:PAGE:MARGin:TOP	555
HCOPy:PAGE:MARGin:UNIT	555
HCOPy:PAGE:ORientation	556
HCOPy:PAGE:WINDow:CHANnel:STATe	556
HCOPy:PAGE:WINDow:COUNt	556
HCOPy:PAGE:WINDow:SCALE	557
HCOPy:PAGE:WINDow:STATe	557
HCOPy:TDSTamp:STATe	558
SYSTem:COMMunicate:PRINter:ENUMerate:FIRSt	558
SYSTem:COMMunicate:PRINter:ENUMerate[:NEXT]	558
SYSTem:COMMunicate:PRINter:SELect<di>	558

DISPlay:LOGO <State>

Activates/deactivates the printout of the Rohde & Schwarz company logo at the top of each page.

Parameters:

<State> 1 | 0 | ON | OFF
 1 | ON
 Logo is printed.
 0 | OFF
 Logo is not printed.
 *RST: 1

Example: DISP:LOGO OFF

Manual operation: See ["Print Logo"](#) on page 263

HCOPy:ABORt

This command aborts a running hardcopy output.

Example: HCOP:ABOR

HCOPy:CMAP<it>:DEFault<ci>

This command defines the color scheme for print jobs.

Suffix:

<it> Irrelevant.

<ci> See table below

Example: HCOP:CMAP:DEF2
Selects the optimized color set for the color settings of a print-out.

Manual operation: See ["Print Colors"](#) on page 292

Gui setting	Description	Remote command
"Screen Colors (Print)"	Selects the current screen colors for the printout. The background is always printed in white and the grid in black.	HCOP:CMAP:DEF1
"Optimized Colors"	Selects an optimized color setting for the printout to improve the visibility of the colors (default setting). Trace 1 is blue, trace 2 black, trace 3 green, and the markers are turquoise. The background is always printed in white and the grid in black.	HCOP:CMAP:DEF2
"Screen Colors (Screenshot)"	Selects the current screen colors without any changes for a screenshot.	HCOP:CMAP:DEF4

HCOPy:CONTent <Content>

This command determines the type of content included in the printout.

Parameters:

<Content> WINDows | HCOPy

WINDows

Includes only the selected windows in the printout. All currently active windows for the current channel setup (or "MultiView") are available for selection. How many windows are printed on a each page of the printout is defined by [HCOPY:PAGE:WINDow:COUNT](#) on page 556.

This option is not available when copying to the clipboard ([HCOP:DEST 'SYST:COMM:CLIP'](#) or an image file (see [HCOPY:DEVIce:LANGuage](#) on page 553).

If the destination is currently set to an image file or the clipboard, it is automatically changed to be a PDF file.

HCOPY

Selects all measurement results displayed on the screen for the current channel setup (or "MultiView"): diagrams, traces, markers, marker lists, limit lines, etc., including the channel setup bar and status bar, for printout on a single page. Displayed items belonging to the software user interface (e.g. softkeys) are not included. The size and position of the elements in the printout is identical to the screen display.

*RST: HCOpy

Example:

```
HCOP:DEST1 'SYST:COMM:CLIP'
HCOP:CONT WIND
HCOP:DEST1?
//Result: 'MMEM'
HCOP:DEV:LANG1?
//Result: 'PDF'
```

"Print to clipboard" is automatically switched to "print to PDF file" when the contents are switched to "multiple windows".

Manual operation: See ["Print Screenshot"](#) on page 263
 See ["Print Multiple Windows"](#) on page 263

HCOPY:DESTination<di> <Destination>

This command selects the destination of a print job.

Note: To print a screenshot to a file, see [HCOPY:DEVIce:LANGuage](#) on page 553.

Suffix:

<di> Irrelevant.

Parameters:

<Destination>

'MMEM'

Activates "Print to file". Thus, if the destination of the print function is set to "printer" (see [HCOP:DEST1 'SYSTEM:COMMunicate:PRINter'](#) or [HCOP:DEV:LANG GDI](#)), the output is redirected to a .PRN file using the selected printer driver.

Select the file name with [MMEMory:NAME](#).

Note: To save a screenshot to a file, see [HCOPY:DEVIce:LANGuage](#) on page 553.

'SYSTem:COMMunicate:PRINter'

Sends the hardcopy to a printer and deactivates "print to file".

Select the printer with `SYSTem:COMMunicate:PRINter:SElect<di>`.

'SYSTem:COMMunicate:CLIPboard'

Sends the hardcopy to the clipboard.

*RST: 'SYST:COMM:CLIP'

Example:

To print on a printer:

```
//Destination: printer, deactivate "print to file"
HCOP:DEST1 'SYSTem:COMMunicate:PRINter'
//Define the printer name
SYST:COMM:PRIN:SEL 'myFavoritePrinter'
//Print
HCOP:IMM
```

Example:

To print to a *PRN file:

```
//Destination: printer
HCOP:DEV:LANG GDI
//Define the printer name
SYST:COMM:PRIN:SEL 'myFavoritePrinter'
//Redirect the printer output to a file
HCOP:DEST1 'MMEM'
//Define file name
MMEM:NAME 'C:\R_S\instr\user\MeasurementTestReport.png'
//Print
HCOP:IMM
```

Manual operation:

See ["Destination: File"](#) on page 268

See ["Destination: Clipboard"](#) on page 268

See ["Destination: Printer"](#) on page 268

See ["Print to file"](#) on page 269

HCOPy:DEvice:COLor <State>

This command turns color printing on and off.

Parameters:

<State> ON | OFF | 0 | 1
 ON | 1
 Color printing
 OFF | 0
 Black and white printing
 *RST: 1

Example:

```
HCOP:DEV:COL ON
```


HCOPy:DEVice:LANGuage <Language>

This command selects the file format for a print job or to store a screenshot to a file.

Parameters:

<Language>

GDI

Graphics Device Interface

Default format for output to a printer configured under Windows. Must be selected for output to the printer interface.

Can be used for output to a file. The printer driver configured under Windows is used to generate a printer-specific file format.

BMP | JPG | PNG | PDF | SVG

Data format for output to files

DOC | PDF

File type for test reports

Available for [HCOP:MODE REPort](#)

Example:

To print a screenshot to a PNG file:

```
//Destination: PNG file
HCOP:DEV:LANG PNG
//Define file name
MMEM:NAME 'C:\R_S\instr\user\MeasurementTestReport.png'
//Print
HCOP:IMM
```

Manual operation:

See ["Destination: File"](#) on page 268

See ["General properties of the test report document"](#) on page 277

HCOPy[:IMMEDIATE]

This command initiates a print job.

If you are printing to a file, the file name depends on [MMEMory:NAME](#).

The command also generates a measurement report when you have selected [HCOPy:MODE REPort](#). Note that you have to add at least one dataset to the report with [HCOPy:TREPort:NEW](#) or [HCOPy:TREPort:APPend](#). Otherwise creating the report results in an error. If no specific file name is defined using [MMEMory:NAME](#), the current date and time is used as file name of the report.

Example:

```
HCOP:MODE REPort
MMEM:NAME 'C:\WooHoo.pdf'
HCOP:DEV:LANG PDF
HCOP:TREP:NEW
HCOP
Creates a measurement report (in pdf format).
```

Manual operation:

See ["Print"](#) on page 266

See ["Configuration and printout of the test report"](#) on page 282

HCOPy[:IMMediate]:NEXT

This command initiates a print job.

If you are printing to a file, the file name depends on [MMEMoRy:NAME](#). This command adds a consecutive number to the file name.

Manual operation: See ["Print"](#) on page 266

HCOPy:ITEM:WINDow:TEXT <Comment>

This command defines a comment to be added to the printout.

Parameters:

<Comment> String containing the comment.

Manual operation: See ["Comment"](#) on page 263

HCOPy:PAGE:COUNt:STATe <State>

This command includes or excludes the page number for printouts consisting of multiple pages ([HCOPy:CONTent](#) on page 550).

Parameters:

<State> 1 | 0 | ON | OFF
1 | ON
The page number is printed.
0 | OFF
The page number is not printed.
*RST: 1

Example: HCOP:PAGE:COUN:STAT ON

Manual operation: See ["Print Page Count"](#) on page 264

HCOPy:PAGE:MARGIn:BOTTom <Bottom>

This command defines the margin at the bottom of the printout page on which no elements are printed. The margins are defined according to [HCOPy:PAGE:MARGIn:UNIT](#) on page 555.

Parameters:

<Bottom> *RST: 4.23 mm

Example: HCOP:PAGE:MARG2:BOTT 2

Manual operation: See ["Margins"](#) on page 270

HCOPy:PAGE:MARGIn:LEFT <Left>

This command defines the margin at the left side of the printout page on which no elements are printed. The margins are defined according to [HCOPy:PAGE:MARGIn:UNIT](#) on page 555.

Parameters:

<Left> *RST: 4.23 mm

Example:

HCOP:PAGE:MARG2:LEFT 2

Manual operation: See "[Margins](#)" on page 270

HCOPy:PAGE:MARGIn:RIGHT <Right>

This command defines the margin at the right side of the printout page on which no elements are printed. The margins are defined according to [HCOPy:PAGE:MARGIn:UNIT](#) on page 555.

Parameters:

<Right> *RST: 4.23 mm

Example:

HCOP:PAGE:MARG2:RIGHT 2

Manual operation: See "[Margins](#)" on page 270

HCOPy:PAGE:MARGIn:TOP <Top>

This command defines the margin at the top of the printout page on which no elements are printed. The margins are defined according to [HCOPy:PAGE:MARGIn:UNIT](#) on page 555.

Parameters:

<Top> *RST: 4.23 mm

Example:

HCOP:PAGE:MARG2:TOP 2

Manual operation: See "[Margins](#)" on page 270

HCOPy:PAGE:MARGIn:UNIT <Unit>

This command defines the unit in which the margins for the printout page are configured.

Parameters:

<Unit> MM | IN
 MM
 millimeters
 IN
 inches
 *RST: MM

Example:

HCOP:PAGE:MARG2:BOTT 2

Manual operation: See ["Margins"](#) on page 270

HCOPy:PAGE:ORientation <Orientation>

The command selects the page orientation of the printout.

The command is only available if the output device is a printer or a PDF file.

Parameters:

<Orientation> LANDscape | PORTrait
*RST: PORTrait

Example:
HCOP:DEV:LANG1 PDF
HCOP:PAGE:ORI2 LAND

Manual operation: See ["Orientation"](#) on page 270

HCOPy:PAGE:WINDow:CHANnel:STATe <Channel>, <State>

This command selects all windows of the specified channel setup to be included in the printout for [HCOPy:CONTent](#) on page 550.

Parameters:

<Channel> String containing the name of the channel setup.
For a list of available channel setup types use [INSTrument:LIST?](#) on page 390.

<State> 1 | 0 | ON | OFF
1 | ON
The channel setup windows are included in the printout.
0 | OFF
The channel setup windows are not included in the printout.
*RST: 1

Example:
HCOP:CONT WIND
HCOP:PAGE:WIND2:CHAN 'IQ Analyzer',0
HCOP:PAGE:WIND2:STAT 'IQ Analyzer','1',1
Prints only window 1 in the IQ Analyzer channel setup.

Manual operation: See ["Print Multiple Windows"](#) on page 263

HCOPy:PAGE:WINDow:COUNt <Count>

This command defines how many windows are displayed on a single page of the printout for [HCOPy:CONTent](#) on page 550.

Parameters:

<Count> integer
*RST: 1

Example:
HCOP:PAGE:WIND2:COUN 2

Manual operation: See ["Windows Per Page"](#) on page 270

HCOPY:PAGE:WINDow:SCALE <Scale>

This command determines the scaling of the windows in the printout for [HCOPY:CONTent](#) on page 550.

Parameters:

<Scale> 1 | 0 | ON | OFF

1 | ON
Each window is scaled to fit the page size optimally, not regarding the aspect ratio of the original display. If more than one window is printed on one page (see [HCOPY:PAGE:WINDow:COUNT](#) on page 556), each window is printed in equal size.
("Size to fit")

0 | OFF
Each window is printed as large as possible while maintaining the aspect ratio of the original display.
("Maintain aspect ratio")

*RST: 1

Example: HCOPI:PAGE:WIND2:SCALE 0

Manual operation: See ["Scaling"](#) on page 270

HCOPY:PAGE:WINDow:STATe <Channel>, <Window>, <State>

This command selects the windows to be included in the printout for [HCOPY:CONTent](#) on page 550.

Parameters:

<Channel> String containing the name of the channel setup.
For a list of available channel setup types use [INSTrument:LIST?](#) on page 390.

<Window> String containing the name of the existing window.
By default, the name of a window is the same as its index.
To determine the name and index of all active windows in the active channel setup, use the [LAYout:CATalog\[:WINDow\]?](#) query.

<State> 1 | 0 | ON | OFF

1 | ON
The window is included in the printout.

0 | OFF
The window is not included in the printout.

*RST: 1

Example: HCOPI:PAGE:WIND2:STAT 'IQ Analyzer','1',1

Manual operation: See ["Print Multiple Windows"](#) on page 263

HCOPY:TDSTamp:STATe <State>

This command includes or excludes the time and date in the printout.

Parameters:

<State> 1 | 0 | ON | OFF
 1 | ON
 The time and date are printed.
 0 | OFF
 The time and date are not printed.
 *RST: 1

Manual operation: See "Print Date and Time" on page 264

SYSTem:COMMunicate:PRINter:ENUMerate:FIRSt

This command queries the name of the first available printer.

To query the name of other installed printers, use `SYSTem:COMMunicate:PRINter:ENUMerate[:NEXT]` on page 558.

Manual operation: See "Printer Name" on page 268

SYSTem:COMMunicate:PRINter:ENUMerate[:NEXT]

This command queries the name of available printers.

You have to use `SYSTem:COMMunicate:PRINter:ENUMerate:FIRSt` on page 558 for this command to work properly.

Manual operation: See "Printer Name" on page 268

SYSTem:COMMunicate:PRINter:SELEct<di> <Printer>

This command selects the printer that processes jobs sent by the R&S EPL.

Use `HCOPY:DESTination<di>` to select another output destination.

Suffix:

<di> 1..n
 Irrelevant.

Parameters:

<Printer> String containing the printer name.
 Use
 • `SYSTem:COMMunicate:PRINter:ENUMerate:FIRSt`
 on page 558 and
 • `SYSTem:COMMunicate:PRINter:ENUMerate[:NEXT]`
 on page 558
 to query all available printers.
 *RST: NONE

Manual operation: See "Printer Name" on page 268

15.8.5 Notes display

Commands to configure the "Notes" display described elsewhere:

- `LAYout:ADD[:WINDow] ?`

<code>DISPlay[:WINDow<n>][:SUBWindow<w>]:NOTes:APPend:TEXT</code>	559
<code>DISPlay[:WINDow<n>][:SUBWindow<w>]:NOTes:CLEar</code>	559
<code>DISPlay[:WINDow<n>][:SUBWindow<w>]:NOTes:TEXT</code>	559

DISPlay[:WINDow<n>][:SUBWindow<w>]:NOTes:APPend:TEXT <Text>

This command is used to append content to the notes display.

Suffix:

<n>	Window
<w>	subwindow

Setting parameters:

<Text>

Example: `DISPlay:NOTes:APPend:TEXT 'Measurement configuration'`
 'Measurement configuration' is added to the existing content of the notes display.

Usage: Setting only

DISPlay[:WINDow<n>][:SUBWindow<w>]:NOTes:CLEar

This command is used to clear the notes display.

Suffix:

<n>	Window
<w>	subwindow

Example: `DISPlay:NOTes:CLEar`
 The notes display is cleared.

Usage: Event

DISPlay[:WINDow<n>][:SUBWindow<w>]:NOTes:TEXT <Text>

This command is used to set and query the content of the notes display.

Suffix:

<n>	Window
<w>	subwindow

Parameters:

<Text>

Example:

DISPlay:NOTes:TEXT 'Measurement configuration'
 'Measurement configuration' is added to the notes display. The
 existing content is replaced.

15.8.6 Test reports

Commands to create test reports described elsewhere.

- [HCOpy:DEvIce:LANGuage](#) on page 553
- [HCOpy\[:IMMediate\]](#) on page 553
- [MMEMoRY:NAME](#) on page 540

HCOpy:MODE	560
HCOpy:TREPort:APPend	561
HCOpy:TREPort:DESCRiption	561
HCOpy:TREPort:ITEM:DEFault	561
HCOpy:TREPort:ITEM:HEADer:LINE:CONTRol	561
HCOpy:TREPort:ITEM:HEADer:LINE:TEXT	562
HCOpy:TREPort:ITEM:HEADer:LINE:TITLe	563
HCOpy:TREPort:ITEM:HEADer:STATe	563
HCOpy:TREPort:ITEM:LIST	564
HCOpy:TREPort:ITEM:LOGO	564
HCOpy:TREPort:ITEM:LOGO:CONTRol	564
HCOpy:TREPort:ITEM:SElect	565
HCOpy:TREPort:ITEM:TEMPlate:CATalog?	567
HCOpy:TREPort:ITEM:TEMPlate:DELeTe	567
HCOpy:TREPort:ITEM:TEMPlate:LOAD	568
HCOpy:TREPort:ITEM:TEMPlate:SAVE	568
HCOpy:TREPort:NEW	568
HCOpy:TREPort:PAGecount:STATe	568
HCOpy:TREPort:PAGesize	569
HCOpy:TREPort:PCOLors:STATe	569
HCOpy:TREPort:TDSamp:STATe	569
HCOpy:TREPort:TEST:REMove	570
HCOpy:TREPort:TEST:REMove:ALL	571
HCOpy:TREPort:TITLe	571
HCOpy:TREPort:TITLe:STATe	571
MMEMoRY:RAW	571

HCOpy:MODE <Mode>

Parameters:

<Mode> SCReen | REPort

Manual operation: See "[Configuration and printout of the test report](#)" on page 282

HCOPy:TREPort:APPend

This command adds the current measurement results to the test report.

The saved data depends on the items you have selected with [HCOPy:TREPort:ITEM:SElect](#) on page 565.

Example: Perform a measurement, then:
`HCOP:TREP:NEW`
Creates a new test report with the results of the first measurement.
Perform another measurement, then:
`HCOP:TREP:APP`
Adds the results of the second measurement to the test report.

Usage: Event

Manual operation: See ["Adding and removing datasets"](#) on page 282

HCOPy:TREPort:DESCription <Description>

This command defines the description of the test report as shown on its title page.

Parameters:
<Description> String containing the description of the test report.

Example: `HCOP:TREP:DESC 'A short summary of the test report.'`
Adds a description to the test report.

Manual operation: See ["Contents of the title page"](#) on page 279

HCOPy:TREPort:ITEM:DEFault

This command restores the default configuration of the test report regarding the information that is part of the report.

It also restores the default names of the measurement information titles.

Usage: Event

Manual operation: See ["Test report content selection"](#) on page 276
See ["Template management"](#) on page 280

HCOPy:TREPort:ITEM:HEADer:LINE:CONTrol <Repetition>

This command selects how often the items in the report header are displayed in the document.

Suffix:

 1..n
Selects the header line.

Parameters:

<Repetition>

GLOBAL

The selected header line is displayed at the top of every page of the report.

NEVer

The selected header line is displayed on no page of the report. Note that a line that does not contain anything is still displayed in the report as a blank line. If you select NEVer, the line is not displayed at all.

SECTION

The selected header line is displayed after the title of every sub-report.

*RST: NEVer

Example:

HCOP:TREP:ITEM:HEAD:LINE4:TITL ''

HCOP:TREP:ITEM:HEAD:LINE4:TEXT ''

Defines an empty string for line 4 of the report header.

HCOP:TREP:ITEM:HEAD:LINE4:CONT NEV

Removes line 4 from the header of the test report.

Manual operation: See ["Custom information about the measurement"](#) on page 278

HCOPy:TREPort:ITEM:HEADer:LINE:TEXT <Description>

This command defines a descriptive text for one of the items part of the report header.

You can define up to 6 items in the header.

Use [HCOPy:TREPort:ITEM:HEADer:LINE:TITLe](#) on page 563 to define custom titles for each item.

Use [HCOPy:TREPort:ITEM:HEADer:LINE:CONTrol](#) to select the condition under which each item is shown.

Suffix:

 1..n
Selects the header line.

Parameters:

<Description>

String containing the description of one of the value fields. By default, the value fields of the items are empty.

Example:

HCOP:TREP:ITEM:HEAD:LINE3:TITL 'Device under Test'

Renames the third title into "Device under Test".

HCOP:TREP:ITEM:HEAD:LINE3:TEXT 'Some Device'

Labels the third title as "Some Device".

Manual operation: See ["Custom information about the measurement"](#) on page 278

HCOPy:TREPort:ITEM:HEADer:LINE:TITLe <Title>

This command defines a custom name for one of the items part of the report header.

You can define up to 6 items in the header.

Use `HCOPy:TREPort:ITEM:HEADer:LINE<li>:TEXT` on page 562 to add a value to each item.

Use `HCOPy:TREPort:ITEM:HEADer:LINE<li>:CONTrol` to select the condition under which each item is shown.

Suffix:

 1..n
Selects the header line.

Parameters:

<Title> String containing the title of the item.
The default titles are as follows:

- Line 1: "Heading"
- Line 2: "Meas Type"
- Line 3: "Equipment under Test"
- Line 4: "Manufacturer"
- Line 5: "OP Condition"
- Line 6: "Test Spec"

Make sure that the title string is not too long, because strings that are too long could mess up the layout of the report.

Example: `HCOP:TREP:ITEM:HEAD:LINE3:TITL 'Device under Test'`
Renames the third title into "Device under Test".

Manual operation: See ["Custom information about the measurement"](#) on page 278

HCOPy:TREPort:ITEM:HEADer:STATe <State>

This command includes or excludes the complete set of measurement information from the test report.

Parameters:

<State> ON | OFF | 0 | 1
OFF | 0
Switches the function off
ON | 1
Switches the function on
*RST: 1

Example: `HCOP:TREP:ITEM:HEAD:STAT ON`
Includes the measurement information in the test report.

Manual operation: See ["Custom information about the measurement"](#) on page 278

HCOPy:TREPort:ITEM:LIST [<ChannelType>]

This command queries the selected information to be included in the test report for a specific channel type.

Parameters:

<ChannelType> <char_data>

Selects the channel type that you want to query the test report configuration for.

When you omit the parameter, the command returns the configuration of the currently selected channel.

Example:

HCOP:TREP:ITEM:LIST? SAN

Queries the items that are included in the test reports of the Spectrum application.

Table 15-6: Available <ChannelTypes>

<ChannelType>	
ADEM	Analog Demodulator
IQ	I/Q Analyzer
REC	Receiver
SAN	Spectrum

HCOPy:TREPort:ITEM:LOGO <FileName>**Parameters:**

<FileName> String containing the location and name of the picture.
You can use the following file types: bmp, jpg, png, gif, emf or wmf format.

Example:

HCOP:TREP:ITEM:LOGO 'C:\aPicture.jpg'

Includes a picture at the top of each page of the report.

Manual operation: See ["Custom information about the measurement"](#) on page 278

HCOPy:TREPort:ITEM:LOGO:CONTrol <Repetition>

This command selects how often the logo is displayed in the document.

Parameters:

<Repetition>

ALWays

The logo is displayed at the top of every page of the report.

NEVer

The logo is displayed on no page of the report.

ONCE

The logo is displayed on the first page of each dataset.

*RST: NEVer

Example: `HCOP:TREP:ITEM:LOGO 'c:\logo.png'`
 Selects a picture to be displayed in the report document.
`HCOP:TREP:ITEM:LOGO:CONT GLOB`
 Displays the logo on each page.

Manual operation: See ["Custom information about the measurement"](#) on page 278

HCOPy:TREPort:ITEM:SElect [<ChannelType>], '<Item>,<Item>,<Item>,...'

This command defines the type of information that a test report consists of.

Setting parameters:

<ChannelType> Optional parameter to define the channel type that the selection applies to.
 When you omit the <ChannelType> parameter, the selection applies to the currently active channel.

<Item> String containing the information you want to include in the test report.
 Note that the items, separated by commas, have to be written into one string (see example below).
 The available items depend on the application you are using. See the tables below for a short description of each item.
 By default, some items are selected (see tables below).

Example: `HCOP:TREP:ITEM:SEL 'SETT,MARK,SRES,DIAG'`
 Each dataset consists of the measurement settings, marker information, the scan results and a screenshot of the scan trace (for Receiver channels).

Example: `HCOP:TREP:ITEM:SEL REC, 'BARG,LISN'`
 A dataset in the Receiver application consists of the bargraph and the LISN settings.

Usage: Setting only

Manual operation: See ["Test report content selection"](#) on page 276

Table 15-7: Available <ChannelTypes>

<ChannelType>	Description
ADEM	Analog demodulator
IQ	I/Q analyzer
REC	Receiver
SAN	Spectrum

Table 15-8: Available <items> in receiver application

<Item>	Description	Default
BARGraph	Screenshot of the bargraph.	
DIAGram	Screenshot of the scan results.	x

<Item>	Description	Default
FRESults	Numerical results for the final measurement.	
IF	Screenshot of the results for IF analysis.	x
IFSPectrogram	Screenshot of the IF spectrogram.	x
LISN	Information about LISNs.	
MARKers	Contents of the marker table.	x
PREResults	Contents of the peak list.	
SCANtable	Measurement configuration as defined in the scan table.	
SETTings	Settings that have been used during a measurement.	x
SPECtrogram	Screenshot of the spectrogram.	x
SRESults	Numerical results for the scan.	
TRANsducer	Characteristics of the transducer.	

Table 15-9: Available <items> in spectrum application

<Item>	Description	Default
DIAGram	Screenshot of the scan results.	x
MARKers	Contents of the marker table.	x
PEAKlist	Contents of the peak list.	x
RESultlist	Numerical measurement results.	
RSUMmary	Contents of the result summary.	x
SETTings	Settings that have been used during a measurement.	x
SPECtrogram	Screenshot of the spectrogram.	x
TRANsducer	Characteristics of the transducer.	

Table 15-10: Available <items> in I/Q analyzer

<Item>	Description	Default
DIAGram	Screenshot of the result diagram.	x
FREQuency	Screenshot of the Spectrum results.	x
MAGNitude	Screenshot of the Magnitude results.	x
PEAKlist	Contents of the peak list.	x
RESultlist	Numerical measurement results.	x
RIMag	Screenshot of the Real / Imaginary results.	x
SETTings	Settings that have been used during a measurement.	x
TRANsducer	Characteristics of the transducer.	
VECTor	Screenshot of the I/Q Vector results.	x

Table 15-11: Available <items> in analog demodulation application

<Item>	Description	Default
AMSpectrum	Screenshot of the AM Spectrum.	
AMTDomain	Screenshot of the AM Time Domain.	
FMSpectrum	Screenshot of the FM Spectrum.	
FMTDomain	Screenshot of the FM Time Domain.	
MARKers	Contents of the marker table.	
PEAKlist	Contents of the peak list.	
PMSpectrum	Screenshot of the PM Spectrum.	
PMTDomain	Screenshot of the PM Time Domain.	
RFSpectrum	Screenshot of the RF Spectrum.	
RFTDomain	Screenshot of the RF Time Domain.	
RSUMmary	Contents of the result summary.	
SETTings	Settings that have been used during a measurement.	
TRANsducer	Characteristics of the transducer.	

HCOPy:TREPort:ITEM:TEMPlate:CATalog?

This command queries the test report templates available in the default report directory (and its subdirectories).

Return values:

<Templates> String containing the name of the templates as a comma-separated list.

Example:

HCOP:TREP:ITEM:TEMP:CAT?

Returns, e.g.:

'TemplateX, TemplateY, TemplateZ'

Usage:

Query only

Manual operation: See ["Template management"](#) on page 280

HCOPy:TREPort:ITEM:TEMPlate:DELeTe <Template>

This command deletes a test report template.

Setting parameters:

<Template> String containing the name of the template.

Example:

HCOP:TREP:ITEM:TEMP:DEL 'myTemplate'

Deletes a test report template.

Usage:

Setting only

HCOPy:TREPort:ITEM:TEMPlate:LOAD <Template>

This command loads a test report template.

Setting parameters:

<Template> String containing the name of the template.

Example: HCOP:TREP:ITEM:TEMP:LOAD 'myTemplate'
Loads a test report template.

Usage: Setting only

Manual operation: See ["Template management"](#) on page 280

HCOPy:TREPort:ITEM:TEMPlate:SAVE <Template>

This command saves a test report template in XML format.

Setting parameters:

<Template> String containing the name of the template. The .xml file extension is added automatically.

Example: HCOP:TREP:ITEM:TEMP:SAVE 'myTemplate'
Saves a test report template.

Usage: Setting only

Manual operation: See ["Template management"](#) on page 280

HCOPy:TREPort:NEW

This command creates a new dataset for a new test report.

Creating a new test report deletes all previously saved datasets. The current measurement results are added as the first dataset to the new report.

The R&S EPL saves the data selected with [HCOPy:TREPort:ITEM:SElect](#) on page 565.

To save the report, use [HCOPy\[:IMMediate\]](#) on page 553.

Example: HCOP:TREP:NEW
Creates a dataset for a new test report.

Usage: Event

Manual operation: See ["Adding and removing datasets"](#) on page 282

HCOPy:TREPort:PAGeCount:STATe <State>

This command includes or excludes page number from the test report.

Parameters:

<State> ON | OFF | 0 | 1
OFF | 0
Switches the function off

ON | 1

Switches the function on

***RST:** 0**Example:**`HCOP:TREP:PAG:STAT OFF`

Removes page numbers from the test report.

Manual operation:See ["General properties of the test report document"](#) on page 277**HCOPy:TREPort:PAGeSize <Size>**

This command selects the size of the test report document.

Parameters:

<Size>

A4 | US

A4

Document pages have an A4 size.

US

Document pages have a US letter size.

***RST:** A4**Example:**`HCOP:TREP:PAG A4`

Selects the A4 size for the document.

Manual operation:See ["General properties of the test report document"](#) on page 277**HCOPy:TREPort:PCOLors:STATe <State>**

This command turns the use of printer friendly colors on and off.

Parameters:

<State>

ON | OFF | 0 | 1

OFF | 0

Switches the function off

ON | 1

Switches the function on

***RST:** 0**Manual operation:**See ["General properties of the test report document"](#) on page 277**HCOPy:TREPort:TDSTamp:STATe <State>**

This command includes or excludes date and time from the test report.

Parameters:

<State>

ON | OFF | 0 | 1

OFF | 0

Switches the function off

ON | 1

Switches the function on

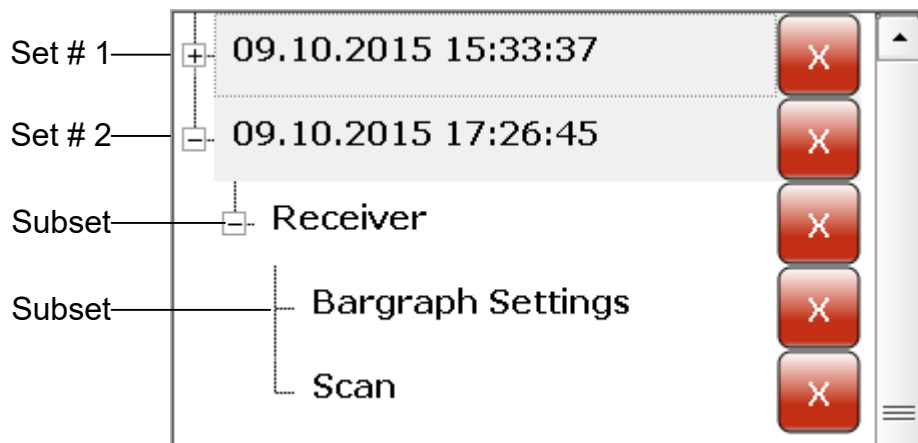
***RST:** 0**Example:**`HCOP:TREP:TDST OFF`

Does not show any time or date information in the test report.

Manual operation:See ["General properties of the test report document"](#) on page 277**HCOPy:TREPort:TEST:REMOve <Dataset>**

This command deletes one of the datasets that are currently part of a test report.

Note that the command only deletes datasets as a whole (= complete chapters). Deleting individual items of a dataset is not possible.



Set # 1 = Number of the dataset would be "1".

Set # 2 = Number of the dataset would be "2".

Subset = Cannot be removed.

Setting parameters:

<Dataset>

Index number of the dataset as shown in the "Test Report Content Selection" dialog box.

If the index number is greater than the number of available datasets, the command returns an error.

Example:`HCOP:TREP:TEST:REM 2`

Deletes the second dataset from the current test report.

Usage:

Setting only

Manual operation:See ["Adding and removing datasets"](#) on page 282

HCOPy:TREPort:TEST:REMove:ALL

This command removes all existing datasets from the test report.

Example: `HCOP:TREP:TEST:REM:ALL`
Deletes all datasets that are currently in the test report.

Usage: Event

Manual operation: See ["Adding and removing datasets"](#) on page 282

HCOPy:TREPort:TITLe <Title>

This command defines the title for the test report as shown on its title page.

Parameters:
<Title> String containing the title.

Example: `HCOP:TREP:TITL 'My first test report'`
Defines a title for a test report.

Manual operation: See ["Contents of the title page"](#) on page 279

HCOPy:TREPort:TITLe:STATe <State>

This command includes or excludes the title page from the test report.

Parameters:
<State> ON | OFF | 0 | 1
OFF | 0
Switches the function off
ON | 1
Switches the function on
***RST:** 0

Example: `HCOP:TREP:TITL:STAT OFF`
Removes the title page from the test report.

Manual operation: See ["Contents of the title page"](#) on page 279

MMEMory:RAW <Path>

Defines the location where the measurement data sets for the report are stored until the report is created.

Parameters:
<Path> String containing the path of the preliminary data

15.8.7 Measurement result export

Commands to export measurement results described elsewhere.

- [FORMat \[: DATA \]](#) on page 536

MMEMory:STORe<n>:SGRam	572
MMEMory:STORe<n>:SPECtrogram	572
MMEMory:STORe<n>:TRACe	572

MMEMory:STORe<n>:SGRam <FileName>

MMEMory:STORe<n>:SPECtrogram <FileName>

Exports spectrogram data to an ASCII file.

The file contains the data for every frame in the history buffer. The data corresponding to a particular frame begins with information about the frame number and the time that frame was recorded.

Note that, depending on the size of the history buffer, the process of exporting the data can take a while.

Suffix:

<n> [Window](#)

Parameters:

<FileName> String containing the path and name of the target file.

Example:

MMEM:STOR:SGR 'Spectrogram'
Copies the spectrogram data to a file.

Manual operation: See ["Export Trace to ASCII File"](#) on page 200

MMEMory:STORe<n>:TRACe <Trace>, <FileName>

Exports trace data from the specified window to an ASCII file.

For details on the file format, see [Section 11.3.9.1, "Reference: ASCII file export format"](#), on page 214.

Suffix:

<n> [Window](#)

Parameters:

<Trace> Number of the trace to be stored

<FileName> String containing the path and name of the target file.

Example:

MMEM:STOR1:TRAC 1, 'C:\TEST.ASC'
Stores trace 1 from window 1 in the file TEST.ASC.

Manual operation: See ["Export Trace to ASCII File"](#) on page 200

15.8.8 Examples: managing data

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15.8.8.1 Storing data

```

MMEM:MSIS 'C:'
//Selects drive C: as the default storage device.

//-----Connecting a network drive-----
MMEM:NETW:USED?
//Returns a list of all drives in use in the network.
MMEM:NETW:UNUS?
//Returns a list of free drive names in the network.
MMEM:NETW:MAP 'Q:', 'Server\ACLRTest'
//Maps drive Q: to the directory 'Server\ACLRTest'

//-----Saving data on the instrument-----
MMEM:MDIR 'C:\R_S\INSTR\USER\Results'
//Creates a directory called 'Results' on drive C:
MMEM:NAME 'C:\R_S\INSTR\USER\Results\Test001.txt'
//Defines a file called 'Test001.txt'
MMEM:COMM 'ACLR test results'
//Creates a comment for the settings to be displayed in gui.
MMEM:DATA 'Test001.txt', #212FileContents
//Creates the file 'Test001.txt' and writes 12 characters to it

//-----Copying the data to another location---
MMEM:COPY 'C:\R_S\INSTR\USER\Results\Test001.txt', 'Q:'
//Copies the specified file to network drive Q:.
MMEM:DEL 'C:\R_S\INSTR\USER\Results\Test001.txt'
//Deletes the specified file from the instrument hard disk.
//or
//MMEM:MOVE 'C:\R_S\INSTR\USER\Results\Test001.xml', 'Q:\TestResults.txt'//
//Moves the file 'Test001.txt' to drive Q:, renames it to 'Testresults.txt'
//and removes it from the instrument hard disk.
MMEM:RDIR 'C:\R_S\INSTR\USER\Results'
//Deletes the directory called 'Results' from drive C:, unless it still
//contains any content.

//-----Disconnecting the network drive---
MMEM:NETW:DISC 'Q:'
//Disconnect drive Q:.

```

15.8.8.2 Loading data

```
MMEM:CDIR?
//Returns the path of the current directory.
//e.g.
C:\R_S\Instr\user\
MMEM:CDIR 'C:\R_S\INSTR\USER\Results'
//Changes the current directory.
MMEM:CAT? 'C:\R_S\INSTR\USER\Results\*.xml'
//or
MMEM:CAT? '*.xml'
//Returns a list of all xml files in the directory 'C:\R_S\INSTR\USER\Results'.
MMEM:CAT:LONG? '*.xml'
//Returns additional information about the xml files in the directory
// 'C:\R_S\INSTR\USER\Results'.
```

15.8.8.3 Storing instrument settings

In this example we will store the instrument settings for the "Spectrum" channel setup.

```
INST:SEL 'SPECTRUM'
//Selects measurement channel 'SPECTRUM'.
MEMM:STOR:TYPE CHAN
//Specifies that channel-specific data is to be stored.
MMEM:STOR:STAT 1, 'C:\R_S\Instr\user\Spectrum'
//Stores the channel settings from the 'Spectrum' channel
// to the file 'Spectrum.dfl'.
```

15.8.8.4 Loading instrument settings

In this example we will load the hardware settings from the configuration file Spectrum.dfl to a new "Spectrum2" channel setup.

```
MEMM:LOAD:TYPE NEW
//Specifies that settings will be loaded to a new channel besides the existing
//'Spectrum' channel.
MMEM:SEL:CHAN:HWS ON
//Selects only hardware settings to be loaded.
MMEM:LOAD:STAT 1, 'C:\R_S\Instr\user\Spectrum'
//Loads the channel-specific settings from the file 'C:\R_S\Instr\user\Spectrum.dfl'
//to a new channel. The new channel is named 'Spectrum2' to avoid a naming conflict
//with the existing 'Spectrum' channel.
INST:REN 'Spectrum2','Spectrum3'
//Renames the loaded channel to 'Spectrum3'.
```

15.8.8.5 Printing to a file

```
//Select bmp as the file format.
HCOP:DEV:LANG BMP
```

```
//Select the file name for the printout.
MMEM:NAME 'C:\R_S\INSTR\USER\Screenshot.bmp'
//Select all screen elements for printing
HCOP:ITEM:ALL
//Add a comment to the printout.
HCOP:ITEM:WIND:TEXT 'ACLRResults'
//Store the printout in a file called 'Screenshot.bmp'.
HCOP
//Store another printout in a file called 'Screenshot_001.bmp'.
HCOP:NEXT
```

15.8.8.6 Printing on a printer

```
HCOP:DEST2 'SYST:COMM:PRIN'
//Prints the data on a printer.
SYST:COMM:PRIN:ENUM:FIRS?
SYST:COMM:PRIN:ENUM?
//Returns the available printers, e.g.
//'LASER on LPT1'
//''
//Means that one printer is available.
SYST:COMM:PRIN:SEL2 'LASER on LPT1'
//Selects the printer for the print job on device 2.
HCOP:PAGE:ORI2 LAND
//Selects the landscape format for the printout.
HCOP:TDST:STAT2 ON
//Includes date and time on the printout.
HCOP:ITEM:ALL
//Prints all screen elements
HCOP
//Initiates the printout.
```

15.8.8.7 Storing multiple graphical measurement results to a PDF file

This example demonstrates how to store graphical results from measurements in the Spectrum application and the I/Q Analyzer to a single PDF file. It assumes the Spectrum and I/Q Analyzer measurements have already been configured and performed, with the following screen layout:

'Spectrum': 1 Frequency Sweep

'Spectrum': 2 Spectrogram

'IQ Analyzer': 1 Magnitude

'IQ Analyzer': 2 Spectrum

```
//Switch to MultiView tab
DISP:ATAB ON
```

```
//Select windows to be stored to file
```

```

HCOP:CONT WIND
HCOP:PAGE:WIND:STAT 'Spectrum','1',ON
HCOP:PAGE:WIND:STAT 'Spectrum','2',ON
HCOP:PAGE:WIND:STAT 'IQ Analyzer','1',ON
HCOP:PAGE:WIND:STAT 'IQ Analyzer','2',ON

//Define contents to be printed on each page (logo, timestamp, page count)
DISP:LOGO ON
HCOP:TDST:STAT ON
HCOP:PAGE:COUN:STAT ON
//Define comment to be printed on each page
HCOP:ITEM:WIND:TEXT 'Measurement Test Report'

//Configure page layout (landscape, 1 display per page, margins 2cm on each side)
HCOP:PAGE:ORI1 LAND
HCOP:PAGE:WIND1:COUN 1
HCOP:PAGE:WIND1:SCAL 1
HCOP:PAGE:MARG1:BOTT 20
HCOP:PAGE:MARG1:LEFT 20
HCOP:PAGE:MARG1:RIGH 20
HCOP:PAGE:MARG1:TOP 20

//Configure the use of optimized colors for printout
HCOP:CMAP:DEF2

//Set format of printout to PDF.
HCOP:DEV:LANG1 PDF
//Define file name of printout
MMEM:NAME 'C:\R_S\instr\user\MeasurementTestReport.pdf'

//Store pdf of printout to file
HCOP:IMM

```

15.9 General instrument setup

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15.9.1 Basic instrument setup

SYSTem:CLOGging.....	577
SYSTem:REBoot.....	577
SYSTem:DATE.....	577
SYSTem:TIME.....	577

SYSTem:CLOGging <State>

This command turns logging of remote commands on and off.

Parameters:

<State> ON | OFF | 1 | 0

ON | 1

Writes all remote commands that have been sent to a file.

The destination is C:

\Users\Public\Documents\Rohde-Schwarz\Analyzer\ScpiLogging
ScpiLog.<no.>.

where <no.> is a sequential number

A new log file is started each time logging was stopped and is restarted.

OFF | 0

*RST: 0

Manual operation: See "[I/O Logging](#)" on page 354

SYSTem:REBoot

This command reboots the instrument, including the operating system.

SYSTem:DATE <Year>, <Month>, <Day>

Configures the date on the instrument.

Parameters:

<Year>

<Month>

<Day>

Example: SYST:DATE 2020,04,23

Manual operation: See "[Set Date and Time](#)" on page 286

SYSTem:TIME <Hour>, <Minutes>, <Seconds>

Configures the time on the internal real-time clock on the instrument.

Parameters:

<Hour> Range: 0 to 23

<Minutes> Range: 0 to 59

<Seconds> Range: 0 to 59

Example: SYST:TIME 10,52,33

Manual operation: See "Set Date and Time" on page 286

15.9.2 Calibration and temperature check

CALibration[:ALL]?	578
CALibration:RESult?	579
CALibration:DUE:WARMup	579
CALibration:DUE:SCHeDule	580
CALibration:DUE:DAYS	580
CALibration:DUE:TIME	581
CALibration:DUE:SHUTdown	581
DIAGnostic:SERVice:INPut:EMI:CFRequency	582
DIAGnostic:SERVice:INPut:EMI[:SPECtrum]	582
DIAGnostic:SERVice:INPut[:SELect]	582
DIAGnostic:SERVice:INPut:RF[:SPECtrum]	582
DIAGnostic:SERVice:STESt:RESult?	583
SOURce<si>:TEMPerature:FRONtend	583

CALibration[:ALL]?

This command initiates a calibration (self-alignment) routine and queries if calibration was successful.

During the acquisition of correction data the instrument does not accept any remote control commands.

In order to recognize when the acquisition of correction data is completed, the MAV bit in the status byte can be used. If the associated bit is set in the Service Request Enable (SRE) register, the instrument generates a service request after the acquisition of correction data has been completed.

Return values:

<CalibrationFailed> ON | OFF | 0 | 1

OFF | 0

Calibration was successful.

ON | 1

Calibration was not successful.

Example:

*CLS

Resets the status management.

*SRE 16

Enables MAV bit in the Service Request Enable register.

*CAL?

Starts the correction data recording, and then a service request is generated.

Usage: Query only

Manual operation: See ["Start Self Alignment"](#) on page 324

CALibration:RESult?

This command returns the results collected during calibration.

Return values:

<CalibrationData> String containing the calibration data.

Example:

```
CAL:RES?
would return, e.g.
[...]
Total Calibration Status:
PASSED, Date (dd/mm/yyyy): 12/07/2004,
Time: 16:24:54, Runtime: 00.06
```

Usage: Query only

Manual operation: See ["Alignment Results:"](#) on page 325

CALibration:DUE:WARMup <State>

If enabled, self-alignment is started automatically after the warmup operation has completed.

Parameters:

<State> ON | OFF | 0 | 1

OFF | 0
Switches the function off

ON | 1
Switches the function on

*RST: 0

Example: //Schedule a self-alignment every Sunday at 2 AM after a warmup period, then shut down instrument.

```
CAL:DUE:WARM
CAL:DUE:SCH ON
CAL:DUE:DAYS SUND
CAL:DUE:TIME '2:00'
CAL:DUE:SHUT
```

Manual operation: See ["Await Warm-Up Operation before Self Alignment"](#) on page 325

CALibration:DUE:SCHEdule <State>

If enabled, a self-alignment is performed regularly at specific days and time. Specify the date and time using the [CALibration:DUE:DAYS](#) and [CALibration:DUE:TIME](#) commands.

Parameters:

<State> ON | OFF | 0 | 1
 OFF | 0
 Switches the function off
 ON | 1
 Switches the function on
 *RST: 0

Example: //Schedule a self-alignment every Sunday at 2 AM after a warmup period, then shut down instrument.

```
CAL:DUE:WARM
CAL:DUE:SCH ON
CAL:DUE:DAYS SUND
CAL:DUE:TIME '2:00'
CAL:DUE:SHUT
```

Manual operation: See "[Schedule](#)" on page 325

CALibration:DUE:DAYS <Day1>[, <Day2>, <Day3>, <Day4>, <Day5>, <Day6>, <Day7>]

Defines the days on which a self-alignment is scheduled for [CALibration:DUE:SCHEdule](#) ON. Up to 7 different days can be scheduled.

Parameters:

<Day1> ALL | MONDay | TUESday | WEDNesday | THURsday |
 FRIDay | SATurday | SUNDay
 <Day2> ALL | MONDay | TUESday | WEDNesday | THURsday |
 FRIDay | SATurday | SUNDay
 <Day3> ALL | MONDay | TUESday | WEDNesday | THURsday |
 FRIDay | SATurday | SUNDay
 <Day4> ALL | MONDay | TUESday | WEDNesday | THURsday |
 FRIDay | SATurday | SUNDay
 <Day5> ALL | MONDay | TUESday | WEDNesday | THURsday |
 FRIDay | SATurday | SUNDay
 <Day6> ALL | MONDay | TUESday | WEDNesday | THURsday |
 FRIDay | SATurday | SUNDay
 <Day7> ALL | MONDay | TUESday | WEDNesday | THURsday |
 FRIDay | SATurday | SUNDay

Example: //Schedule a self-alignment every Monday and Friday
 CAL:DUE:DAYS MOND,FRID

Example: //Schedule a self-alignment every Sunday at 2 AM after a warmup period, then shut down instrument.

```
CAL:DUE:WARM
CAL:DUE:SCH ON
CAL:DUE:DAYS SUND
CAL:DUE:TIME '2:00'
CAL:DUE:SHUT
```

Manual operation: See ["Schedule"](#) on page 325

CALibration:DUE:TIME <Time>

Defines the time at which a self-alignment is scheduled for the days specified by [CALibration:DUE:DAYS](#), if [CALibration:DUE:SCHedule](#) ON.

Parameters:

<Time> string with format 'hh:mm' (24 hours)

Example: //Schedule a self-alignment every Sunday at 2 AM after a warmup period, then shut down instrument.

```
CAL:DUE:WARM
CAL:DUE:SCH ON
CAL:DUE:DAYS SUND
CAL:DUE:TIME '2:00'
CAL:DUE:SHUT
```

Manual operation: See ["Schedule"](#) on page 325

CALibration:DUE:SHUTdown <State>

If activated, the R&S EPL is automatically shut down after self-alignment is completed. Note that the instrument cannot be restarted via remote control.

Parameters:

<State> ON | OFF | 0 | 1
OFF | 0
 Switches the function off
ON | 1
 Switches the function on
 *RST: 0

Example: //Schedule a self-alignment every Sunday at 2 AM after a warmup period, then shut down instrument.

```
CAL:DUE:WARM
CAL:DUE:SCH ON
CAL:DUE:DAYS SUND
CAL:DUE:TIME '2:00'
CAL:DUE:SHUT
```

Manual operation: See ["Shut down Device after Self Alignment"](#) on page 325

DIAGnostic:SERVice:INPut:EMI:CFRequency <Frequency>

This command defines the frequency of the calibration signal.

Before you can use the command, you have to feed in a calibration signal with [DIAGnostic:SERVice:INPut\[:SElect\]](#) on page 582.

Parameters:

<Frequency>

Possible frequencies of the calibration signal are fix.
If you define a frequency that is not available, the R&S EPL uses the next available frequency. Example: a frequency of 20 MHz is rounded up to the next available frequency (25 MHz).

*RST: 16.66667 MHz

Default unit: Hz

DIAGnostic:SERVice:INPut:EMI[:SPEctrum] <Spectrum>

This command selects the bandwidth of the EMI calibration signal.

Parameters:

<Spectrum>

NARRowband

Narrowband signal for power calibration of the frontend.

BROadband

Broadband signal for calibration of the IF filter.

DIAGnostic:SERVice:INPut[:SElect] <Signal>

This command activates or deactivates the use of an internal calibration signal as input for the R&S EPL.

Parameters:

<Signal>

EMI

Uses the internal calibration signal in the EMI frequency range.

RF

Uses the signal from the RF input.

*RST: RF

Example:

//Select calibration signal source

DIAG:SERV:INP RF

Manual operation:

See ["NONE"](#) on page 307

See ["Calibration Frequency EMI"](#) on page 307

DIAGnostic:SERVice:INPut:RF[:SPEctrum] <Bandwidth>

This command selects the bandwidth of the calibration signal.

Parameters:

<Bandwidth>

NARRowband | BROadband

NARRowband

Narrowband signal for power calibration of the frontend.

BROadband

Broadband signal for calibration of the IF filter.

Manual operation: See "Spectrum" on page 307

DIAGnostic:SERVice:STES:RESult?

This command queries the self-test results.

Return values:

<Results> String of data containing the results.
The rows of the self-test result table are separated by commas.

Example:

DIAG:SERV:STES:RES?
would return, e.g.
"Total Selftest Status:
PASSED", "Date (dd/mm/yyyy): 09/07/2004 TIME:
16:24:54", "Runtime: 00:06", "..."

Usage: Query only

SOURce<si>:TEMPerature:FRONTend

This command queries the current frontend temperature of the R&S EPL.

During self-alignment, the instrument's (frontend) temperature is also measured (as soon as the instrument has warmed up completely). This temperature is used as a reference for a continuous temperature check during operation. If the current temperature deviates from the stored self-alignment temperature by a certain degree, a warning is displayed in the status bar indicating the resulting deviation in the measured power levels. A status bit in the STATUS:QUESTIONable:TEMPerature register indicates a possible deviation.

Suffix:

<si> irrelevant

Return values:

<Temperature> Temperature in degrees Celsius.

Example:

SOUR:TEMP:FRON?
Queries the temperature of the frontend sensor.

15.9.3 Battery level check

DIAGnostic:SERVice:BATTery:LEVel?.....583

DIAGnostic:SERVice:BATTery:LEVel?

Queries the joint charge state of the internal batteries (with internal battery pack option R&S EPL1-B31).

Return values:

<ChargeState> numeric value
 Charge state in percent
 Range: 0 to 100

Example:

DIAG:SERV:BATT:LEV?

Usage:

Query only

15.9.4 External reference configuration

[SENSe:]ROSCillator:SOURce..... 584

[SENSe:]ROSCillator:SOURce <Source>

This command selects the reference oscillator.

If you want to select the external reference, it must be connected to the R&S EPL.

Parameters:

<Source>

INTernal

The internal reference is used (10 MHz).

EXTernal

The external reference from the "REF INPUT 10 MHZ" connector is used; if none is available, an error flag is displayed in the status bar.

Example:

ROSC:SOUR EXT

15.9.5 Transducers



Before making any changes to a transducer factor or set, you have to select one by name with [SENSe:]CORRection:TSET:SElect.

Compared to manual configuration of transducers, any changes made to a transducer factor or set via remote control are saved after the corresponding command has been sent.

Designing a transducer factor

```
//Select a transducer factor
CORR:TRAN:SEL 'Transducer1'
//Define a comment for the transducer factor
CORR:TRAN:COMM 'Correction values for device x'
//Define the transducer factor unit
CORR:TRAN:UNIT 'DB'
//Select the scale of the frequency axis
CORR:TRAN:SCAL LOG
//Define the data points of the transducer factor
```



```

CORR:TRAN:DATA 1MHZ,-10,10MHZ,-10,100MHZ,-15,1GHZ,-15
//Turn on the transducer
CORR:TRAN ON
//Automatically adjust the reference level
CORR:TRAN:ADJ:RLEV ON

```

Managing a transducer set

```

//Select or create a transducer set
CORR:TSET:SEL 'Transducer Set'
//Define a comment for the transducer set
CORR:TSET:COMM 'Transducer set example'
//Define a unit for the transducer set
CORR:TSET:UNIT 'DB'
//Turn the transducer break on
CORR:TSET:BRE ON
//Define the first transducer range
CORR:TSET:RANG1 150KHZ,1MHZ,'Transducer 1','Transducer 3'
CORR:TSET:RANG2 1MHZ,10MHZ,'Transducer 3','Transducer 4'
CORR:TSET:RANG3 10MHZ,30MHZ,'Transducer 3'
//Turn on the transducer set
CORR:TSET ON

```

Commands to configure transducers described elsewhere.

- [MMEMory:SElect\[:ITEM\]:TRANsducer:ALL](#) on page 545

MMEMory:LOAD<n>:TFACtor	585
MMEMory:STORe<n>:TFACtor	586
[SENSe:]CORRection:TRANsducer:ACTive	586
[SENSe:]CORRection:TRANsducer:ADJust:RLEVel[:STATe]	586
[SENSe:]CORRection:TRANsducer:CATalog?	586
[SENSe:]CORRection:TRANsducer:COMMeNt	587
[SENSe:]CORRection:TRANsducer:DATA	587
[SENSe:]CORRection:TRANsducer:DELeTe	588
[SENSe:]CORRection:TRANsducer:SCALing	588
[SENSe:]CORRection:TRANsducer:SELeCt	588
[SENSe:]CORRection:TRANsducer[:STATe]	588
[SENSe:]CORRection:TRANsducer:UNIT	589
[SENSe:]CORRection:TSET:BREak	589
[SENSe:]CORRection:TSET:CATalog	589
[SENSe:]CORRection:TSET:COMMeNt	590
[SENSe:]CORRection:TSET:DELeTe	590
[SENSe:]CORRection:TSET:RANGe<range>	590
[SENSe:]CORRection:TSET:SELeCt	591
[SENSe:]CORRection:TSET:UNIT	591
[SENSe:]CORRection:TSET[:STATe]	591

MMEMory:LOAD<n>:TFACtor <FileName>

Loads the transducer factor from the selected file in .CSV format.

Suffix:

<n> irrelevant

Parameters:

<FileName> String containing the path and name of the CSV import file.

Example:

MMEM:LOAD:TFAC 'C:\TEST.CSV'

MMEMory:STORe<n>:TFACtor <FileName>, <TransdName>

Exports transducer factor data to an ASCII (CSV) file.

For details on the file format see [Section 13.7.3, "Reference: transducer factor file format"](#), on page 318.**Suffix:**

<n> irrelevant

Parameters:

<FileName> Name of the transducer factor to be exported.

<TransdName> Name of the transducer factor to be exported.

Example:

```
MMEM:STOR:TFAC 'C:\TEST', 'Transducer1'
Stores the transducer factor named "Transducer1" in the file
TEST.CSV.
```

[SENSe:]CORRection:TRANsducer:ACTive

This command queries the currently active transducer factor.

Return values:<TransducerFactor> String containing the name of the transducer factor.
If no transducer factor is active, the string is empty.**Example:**

```
CORR:TRAN:ACT?
Queries the active transducer factor.
```

[SENSe:]CORRection:TRANsducer:ADJust:RLEVel[:STATe] <State>

This command turns an automatic adjustment of the reference level to the transducer on and off.

Before you can use the command, you have to select and turn on a transducer.

Parameters:

```
<State>      ON | OFF | 1 | 0
*RST:        0
```

[SENSe:]CORRection:TRANsducer:CATalog?

This command queries all transducer factors stored on the R&S EPL.

After general data for the transducer storage directory, data for the individual files is listed.

The result is a comma-separated list of values with the following syntax:

<UsedMem>,<FreeMem>,<FileSize>,<FileName>[,<FileSize>,<FileName>]

[More information](#)

Return values:

<UsedDiskSpace>	numeric value in bytes Amount of storage space required by all transducers files in the C:\ProgramData\Rohde-Schwarz\ZNL-FPL\trd directory (= sum of all individual <FileSize> values)
<FreeDiskSpace>	numeric value in bytes Amount of free storage space on the R&S EPL
<FileSize>	numeric value in bytes Size of a single transducer file
<FileName>	string Name of a single transducer file

Example:

```
SENSE:CORR:TRAN:CAT?
//Result: 2743,2312620544,720,'FactorGSM.TDF',2023,'FactorBTS.TDF'
```

Usage: Query only

[SENSe:]CORRection:TRANsducer:COMMeNt <Comment>

This command defines the comment for the selected transducer factor.

Before you can use the command, you have to select and turn on a transducer.

Parameters:

<Comment> *RST: (empty comment)

[SENSe:]CORRection:TRANsducer:DATA {<Frequency>, <Level>}...

This command configures transducer factors for specific trace points. A set of transducer factors defines an interpolated transducer line and can be stored on the instrument. You can define up to 1001 points.

[More information](#)

Parameters:

<Frequency>	The unit for <Frequency> is Hz, which may or may not be omitted. Frequencies have to be sorted in ascending order. Default unit: Hz
<Level>	The unit for <Level> depends on [SENSe:]CORRection:TRANsducer:UNIT .

Example:

```
SENSe1:CORRection:TRANsdUcer:UNIT 'DB'
// Frequency Span 0 Hz to 4 Ghz
SENSe1:CORRection:TRANsdUcer:DATA 0,8,2GHz,5,4GHz,3
```

Table 15-12: Created transducer points in example

Frequency	Level
0 Hz	8 dB
2 GHz	5 dB
4 GHz	3 dB

[SENSe:]CORRection:TRANsdUcer:DELeTe

This command deletes the currently selected transducer factor.

Before you can use the command, you have to select a transducer.

Example:

```
CORR:TRAN:DEL
```

[SENSe:]CORRection:TRANsdUcer:SCALing <ScalingType>

This command selects the frequency scaling of the transducer factor.

Parameters:

<ScalingType> LINear | LOGarithmic
*RST: LINear

[SENSe:]CORRection:TRANsdUcer:SELEct <Name>

This command selects a transducer factor.

Parameters:

<Name> String containing the name of the transducer factor.
If the name does not exist yet, the R&S EPL creates a transducer factor by that name.

Example:

```
CORR:TRAN:SEL 'FACTOR1'
```

[SENSe:]CORRection:TRANsdUcer[:STATe] <State>

This command turns the selected transducer factor on or off.

Before you can use the command, you have to select a transducer.

Parameters:

<State> ON | OFF | 1 | 0
*RST: 0

[SENSe:]CORRection:TRANsducer:UNIT <Unit>

This command selects the unit of the transducer factor.

Before you can use the command, you have to select and turn on a transducer.

Parameters:

<Unit> string as defined in table below

*RST: DB

Example:

CORR:TRAN:UNIT 'DBUV'

String	Unit
'DB'	dB
'DBM'	dBm
'DBMV'	dBmV
'DBUV'	dB μ V
'DBUV/M'	dB μ V/m
'DBUA'	dB μ A
'DBUA/M'	dB μ A/m
'DBPW'	dBpW
'DBPT'	dBpT

[SENSe:]CORRection:TSET:BRaK <State>

This command turns a transducer break on and off.

Before you can use the command, you have to select a transducer set with [\[SENSe:\]CORRection:TSET:SElect](#).

Parameters:

<State> ON | OFF

*RST: OFF

Example:

See [Section 15.9.5, "Transducers"](#), on page 584.

[SENSe:]CORRection:TSET:CATalog

This command queries all transducer sets stored on the R&S EPL.

Return values:

<UsedDiskSpace> Size of all available files containing transducer factors in byte.

<FreeDiskSpace> Remaining disk space in bytes.

<FileInfo> String containing the file information.
'<NameFileN>,<SizeFileN>'

<NameFileN>

Name of the file.

<SizeFileN>

Size of the file in bytes.

Example:

CORR:TSET:CAT?
 would return, e.g.
 3298,34482896896,'SET1,1520','SET2,1756'

[SENSe:]CORRection:TSET:COMMeNt <Comment>

This command defines a comment for a transducer set.

Before you can use the command, you have to select a transducer set with [\[SENSe:\]CORRection:TSET:SELeCt](#).

Parameters:

<Comment> String containing the comment.

Example: See [Section 15.9.5, "Transducers"](#), on page 584.

[SENSe:]CORRection:TSET:DELeTe

This command deletes a transducer set.

Before you can use the command, you have to select a transducer set with [\[SENSe:\]CORRection:TSET:SELeCt](#).

Example:

CORR:TSET:SEL 'Transducer Set'
 CORR:TSET:DEL
 Deletes the transducer set.

[SENSe:]CORRection:TSET:RANGe<range> <Frequency>, <Frequency>, <FileName>...

This command selects a set of transducer factors used for a particular frequency range.

Ranges 1 to 10 must be sent in ascending order.

Before you can use the command, you have to select a transducer set with [\[SENSe:\]CORRection:TSET:SELeCt](#).

Suffix:

<range> 1...10
 Selects the range.

Parameters:

<Frequency> Defines the start frequency of the frequency range.

<Frequency> Defines the stop frequency of the frequency range.

<FileName> String containing the name of the transducer factor.
Note that you can assign up to eight transducer factors to a particular frequency range. In that case, add additional strings containing the file name after the first one separated by comma.

Example: See [Section 15.9.5, "Transducers"](#), on page 584.

[SENSe:]CORRection:TSET:SElect <FileName>

This command creates or selects a transducer set.

Parameters:

<FileName> String containing the name of the transducer set.
If the name does not exist yet, the R&S EPL creates a transducer set by that name.

Example: `CORR:TSET:SEL 'TSET1'`

Example: See [Section 15.9.5, "Transducers"](#), on page 584.

[SENSe:]CORRection:TSET:UNIT <Unit>

This command selects the unit of a transducer set.

Note that the unit of all transducer factors in a transducer set must be the same or in relative terms (dB).

Before you can use the command, you have to select a transducer set with [\[SENSe:\]CORRection:TSET:SElect](#).

Parameters:

<Unit> String containing one of the following units:
DB | DBM | DBUV | DBUV_M | DBUA | DBUA_M | DBPW | DBPT

*RST: DB

Example: See [Section 15.9.5, "Transducers"](#), on page 584.

[SENSe:]CORRection:TSET[:STATe] <State>

This command turns a transducer set on and off.

Before you can use the command, you have to select a transducer set with [\[SENSe:\]CORRection:TSET:SElect](#).

Parameters:

<State> ON | OFF

*RST: OFF

Example: See [Section 15.9.5, "Transducers"](#), on page 584.

15.9.6 Display layout and elements

- [Screen element selection](#).....592
- [Colors and schemes](#).....596

15.9.6.1 Screen element selection

Commands to configure screen elements described elsewhere.

- [DISPlay\[:WINDow<n>\]:MTABle](#) on page 498
- [DISPlay:FORMat](#) on page 468

DISPlay:ANNotation:CBAR	592
DISPlay:ANNotation:FREQuency	592
DISPlay:ITERm[:STATe]	593
DISPlay:SBAR[:STATe]	593
DISPlay:SKEYs[:STATe]	593
DISPlay:TBAR[:STATe]	593
DISPlay:TOUChscreen[:STATe]	594
DISPlay:SCReen[:STATe]	594
DISPlay[:WINDow<n>]:TIME	594
DISPlay[:WINDow<n>]:TIME:FORMat	595
INPut:TERMinator	595
SYSTem:DISPlay:FPANel[:STATe]	596
DISPlay:BLIGHting	596

DISPlay:ANNotation:CBAR <State>

This command hides or displays the channel bar information.

Parameters:

<State> ON | OFF | 0 | 1
 *RST: 1

Example: DISP:ANN:CBAR OFF

Manual operation: See ["Channel Bar"](#) on page 288

DISPlay:ANNotation:FREQuency <State>

This command turns the label of the x-axis on and off.

Parameters:

<State> ON | OFF | 0 | 1
 *RST: 1

Example: DISP:ANN:FREQ OFF

Manual operation: See ["Diagram Footer \(Annotation\)"](#) on page 288

DISPlay:ITERm[:STATe] <State>

This command turns the display of the "Disconnect RF" icon on the toolbar on and off.

Note: This setting is maintained even after using the [PRESET] function.

Parameters:

<State> ON | OFF
*RST: ON

Example:

DISP:ITER ON
Displays the icon in the toolbar.

Manual operation: See ["Disconnect RF"](#) on page 291

DISPlay:SBAR[:STATe] <State>

This command turns the status bar on and off.

Parameters:

<State> ON | OFF | 0 | 1
*RST: 1

Example:

DISP:SBAR:OFF

Manual operation: See ["Status Bar"](#) on page 287

DISPlay:SKEYs[:STATe] <State>

This command turns the softkey bar on and off.

Parameters:

<State> ON | OFF | 0 | 1
*RST: 1

Example:

DISP:SKEY:OFF

Manual operation: See ["Softkey Bar"](#) on page 288

DISPlay:TBAR[:STATe] <State>

This command turns the toolbar on or off.

Parameters:

<State> ON | OFF | 1 | 0
*RST: 0

Example:

DISP:TBAR ON

Manual operation: See ["Toolbar"](#) on page 287

DISPlay:TOUCHscreen[:STATe] <State>

This command controls the touch screen functionality.

Parameters:

<State>	ON FRAMe OFF TCOFF
	ON 1
	Touch screen is active for entire screen
	OFF 0
	Touch screen is inactive for entire screen
	FRAMe
	Touch screen is inactivate for the diagram area of the screen, but active for softkeys, toolbars and menus.
	TCOFF
	Cuts off the touch screen from the power supply.
*RST:	1

Example: DISP:TOUC:STAT ON

Manual operation: See ["Deactivating and Activating the Touchscreen"](#) on page 286

DISPlay:SCReen[:STATe] <State>

This command turns the display of the R&S EPL on and off completely.

Parameters:

<State>	OFF
	Turns off the display until you turn it on again deliberately.
	ON
	Turns on the display.
	SINGLE
	Turns off the display during a single measurement. This only works for single measurements.
*RST:	ON

Example: //Turn off display
DISP:SCR OFF

DISPlay[:WINDow<n>]:TIME <State>

This command adds or removes the date and time from the display.

Suffix:

<n>	irrelevant

Parameters:

<State>	ON OFF 1 0
*RST:	0

Example: DISP:TIME ON

Manual operation: See ["Date and Time"](#) on page 288

DISPlay[:WINDow<n>]:TIME:FORMat <Format>

This command selects the time and date format.

Suffix:

<n> irrelevant

Parameters:

<Format> US | DE | ISO

DE
dd.mm.yyyy hh:mm:ss
24 hour format.

US
mm/dd/yyyy hh:mm:ss
12 hour format.

ISO
yyyy-mm-dd hh:mm:ss
24 hour format.

*RST: ISO

Example:

```
DISP:TIME ON
Switches the screen display of date and time on.
DISP:TIME:FORM US
Switches the date and time format to US.
```

Manual operation: See ["Date and Time Format"](#) on page 286

INPut:TERMinator <State>

This command turns the RF input on and off.

Note that the command works regardless of the state of `DISPlay:ITERm[:STATe]`. Only for usage via the user interface is it necessary to turn on the display of the toolbar icon.

Note: This setting is maintained even after using the [PRESET] function.

Parameters:

<State> ON | OFF

ON | 1
Cuts off the RF input.

OFF | 0
Turns on the RF input.

*RST: OFF

Example:

```
INP:TERM ON
```

Manual operation: See ["Disconnect RF"](#) on page 291

SYSTem:DISPlay:FPANel[:STATe] <State>

This command includes or excludes the front panel keys when working with the remote desktop.

Parameters:

<State> ON | OFF | 0 | 1
*RST: 1

Manual operation: See ["Front Panel"](#) on page 288
See ["Mini Front Panel"](#) on page 289

DISPlay:BLIGhting <Brightness>

Changes the brightness of the display in eight steps.

Parameters:

<Brightness> integer
Range: 0 to 7
*RST: 3

Example: DISP:BLIG 3
Reduces the brightness of the display.

Manual operation: See ["Background Lighting"](#) on page 286

15.9.6.2 Colors and schemes

DISPlay:CMAP<it>:DEFault<ci>	596
DISPlay:THEMe:CATalog?	597
DISPlay:THEMe:SElect	597

DISPlay:CMAP<it>:DEFault<ci>

This command selects the color scheme for the display. The query returns the default color scheme.

Suffix:

<it> Irrelevant.
<ci> 1
Default color set 1 with a black background and white grid.
2
Default color set 2 with a white background and a black grid.
Suffix irrelevant for query

Return values:

<DefScheme> 1 | 2 | 3
The default color scheme used for the screen, as specified by the <ci> suffix.

Example: `DISP:CMAP:DEF2`
 Selects default setting 2 (white background and a black grid) for
 screen colors.
 `DISP:CMAP:DEF?`
 `//Result: 2`

DISPlay:THEMe:CATalog?

This command queries all available display themes.

Return values:

<Themes> String containing all available display themes.

Example: `DISP:THEMe:CAT?`

Usage: Query only

DISPlay:THEMe:SElect <Theme>

This command selects the display theme.

Parameters:

<Theme> String containing the name of the theme.
 *RST: SPL

Example: `DISP:THEM:SEL "BlueOcean"`

Manual operation: See ["Theme"](#) on page 291

15.9.7 Measurement channel synchronization

- [General coupling manager](#).....597

15.9.7.1 General coupling manager

INSTrument:COUPle:ATTen	598
INSTrument:COUPle:BANDwidth	598
INSTrument:COUPle:BWIDth	598
INSTrument:COUPle:CENTer	598
INSTrument:COUPle:DEMod	599
INSTrument:COUPle:GAIN	599
INSTrument:COUPle:LLINes	599
INSTrument:COUPle:LIMit	599
INSTrument:COUPle:MARKer	600
INSTrument:COUPle:PRESel	600
INSTrument:COUPle:PROT	600
INSTrument:COUPle:SPAN	601
INSTrument:COUPle:VBW	601

INSTRument:COUPle:ATTen <State>

This command turns synchronization of the attenuation and unit between measurement channels on and off.

Parameters:

<State> ALL | NONE
ALL
Turns on synchronization.
NONE
Turns off synchronization.

*RST: ALL

Example:

INST:COUP:ATT ALL
Synchronizes the attenuation.

INSTRument:COUPle:BANDwidth <State>**INSTRument:COUPle:BWIDth <State>**

This command turns synchronization of the resolution bandwidth (and filter type) between measurement channels on and off.

Parameters:

<State> ALL | NONE
ALL
Turns on synchronization.
NONE
Turns on synchronization.

*RST: NONE

Example:

INST:COUP:BWID ALL
Synchronizes the resolution bandwidth.

INSTRument:COUPle:CENTer <State>

This command turns synchronization of the frequency between measurement channels on and off.

Parameters:

<State> ALL | NONE
ALL
Turns on synchronization.
NONE
Turns off synchronization.

*RST: ALL

Example:

INST:COUP:CENT ALL
Synchronizes the center frequency.

INSTrument:COUPle:DEMod <State>

This command turns synchronization of the audio demodulator configuration between measurement channels on and off.

Parameters:

<State> ALL | NONE
ALL
 Turns on synchronization.
NONE
 Turns off synchronization.
 *RST: NONE

Example:

INST:COUP:DEM ALL
 Synchronizes the audio demodulator configuration.

INSTrument:COUPle:GAIN <State>

This command turns synchronization of the preamplifier configuration between measurement channels on and off.

Parameters:

<State> ALL | NONE
ALL
 Turns on synchronization.
NONE
 Turns off synchronization.
 *RST: NONE

Example:

INST:COUP:GAIN ALL
 Synchronizes the preamplifier configuration.

INSTrument:COUPle:LLINes <State>**INSTrument:COUPle:LIMit <State>**

This command turns synchronization of limit results between measurement channels on and off.

Parameters:

<State> ALL | NONE
ALL
 Turns on synchronization.
 Limit lines have to be compatible to the x-axis and y-axis configuration for successful synchronization.
NONE
 Turns off synchronization.
 *RST: ALL

Example:

INST:COUP:LIM ALL
 Synchronizes the limit values.

INSTrument:COUPle:MARKer <State>

This command turns synchronization of the marker frequency in the spectrum application and the receiver frequency on and off.

Parameters:

<State> ALL | NONE
ALL
Turns on synchronization.
NONE
Turns off synchronization.

*RST: NONE

Example:

INST:COUP:MARK ALL
Synchronizes the receiver frequency and the marker frequency.

INSTrument:COUPle:PRESel <State>

This command turns synchronization of the preselector state between measurement channels on and off.

Parameters:

<State> ALL | NONE
ALL
Turns on synchronization.
NONE
Turns off synchronization.

*RST: ALL

Example:

INST:COUP:PRES ALL
Synchronizes the preselector configuration.

INSTrument:COUPle:PROT <State>

This command turns synchronization of the input protection between measurement channels on and off.

Parameters:

<State> ALL | NONE
ALL
Turns on synchronization.
NONE
Turns off synchronization.

*RST: NONE

Example:

INST:COUP:PROT ALL
Synchronizes the "10 dB Min" parameter.

INSTrument:COUPle:SPAN <State>

This command turns synchronization of the start and stop frequency between measurement channels on and off.

Parameters:

<State> ALL | NONE
ALL
 Turns on synchronization.
NONE
 Turns off synchronization.
 *RST: NONE

Example:

INST:COUP:SPAN ALL
 Synchronizes the start and stop frequency.

INSTrument:COUPle:VBW <State>

This command turns synchronization of the video bandwidth between measurement channels on and off.

Parameters:

<State> ALL | NONE
ALL
 Turns on synchronization.
NONE
 Turns off synchronization.
 *RST: NONE

Example:

INST:COUP:VBW ALL
 Synchronizes the video bandwidth.

15.9.8 Network and remote control configuration

SYSTem:COMMunicate:INTernal:REMOte.....	602
SYSTem:COMMunicate:GPIB[:SELF]:ADDRess.....	602
SYSTem:REVisIon:FACTory.....	602
SYSTem:COMMunicate:GPIB[:SELF]:RTERminator.....	602
SYSTem:DISPlay:LOCK.....	603
SYSTem:DISPlay:MESSAge[:TEXT].....	603
SYSTem:DISPlay:MESSAge:STATe.....	603
SYSTem:DISPlay:UPDate.....	604
SYSTem:ERRor:CLEar:REMOte.....	604
SYSTem:ERRor:DISPlay.....	604
SYSTem:IDENtify:FACTory.....	605
SYSTem:IDENtify[:STRing].....	605
SYSTem:KLOCK.....	605

SYSTem:LXI:LANReset	605
SYSTem:LXI:MDEscription	605
SYSTem:LXI:PASSword	606

SYSTem:COMMunicate:INTernal:REMOte <GoToRemote>

The instrument switches between manual and remote operation.

Note: If the local lockout function (`LLO` or `SYST:KLOC ON`) has been activated in the remote control mode, manual operation is no longer available until `GTL` (or `SYST:KLOC OFF`) is executed.

For details, see [Section 14.5.6, "Returning to manual mode \("local"\)"](#), on page 360.

Parameters:

<GoToRemote> `ON | OFF | 0 | 1`

OFF | 0
The instrument switches from remote to manual operation. You can operate the instrument locally.

ON | 1
The instrument switches from manual to remote operation.

*RST: 0

Example:

`SYST:COMM:INT:REM OFF`

The instrument switches from remote to manual operation (corresponds to `@LOC` or selecting the "Local" softkey).

Manual operation: See ["Local"](#) on page 360

SYSTem:COMMunicate:GPIB[:SELF]:ADDRess <Address>

This command sets the GPIB address of the R&S EPL.

Parameters:

<Address> Range: 0 to 30

*RST: (no influence on this parameter, factory default 20)

Example:

`SYST:COMM:GPIB:ADDR 18`

Manual operation: See ["GPIB Address"](#) on page 353

SYSTem:REVision:FACTory

Resets the response to the `REV?` query to the factory default value.

Usage: Event

Manual operation: See ["Resetting the Factory Revision"](#) on page 357

SYSTem:COMMunicate:GPIB[:SELF]:RTERminator <Terminator>

This command selects the GPIB receive terminator.

Output of binary data from the instrument to the control computer does not require such a terminator change.

Parameters:

<Terminator> LFEOI | EOI

LFEOI

According to the standard, the terminator in ASCII is <LF> and/or <EOI>.

EOI

For binary data transfers (e.g. trace data) from the control computer to the instrument, the binary code used for <LF> might be included in the binary data block, and therefore should not be interpreted as a terminator in this particular case. This can be avoided by using only the receive terminator EOI.

*RST: LFEOI

Example:

SYST:COMM:GPIB:RTER EOI

Manual operation: See ["GPIB Terminator"](#) on page 354

SYSTem:DISPlay:LOCK <State>

Defines whether the "Display Update" function remains available in remote operation or not.

Parameters:

<State> ON | OFF | 0 | 1

OFF | 0

The function remains available.

ON | 1

The function is not available and the display is not updated during remote operation.

*RST: 0

Manual operation: See ["Remote Display Update"](#) on page 354

SYSTem:DISPlay:MESSage[:TEXT] <Message>

Defines an additional text that is displayed during remote control operation.

To enable the text display, use [SYSTem:DISPlay:MESSage:STATe](#) on page 603.

Parameters:

<Message> String that contains the text.

Example:

SYST:DISP:MESS ON

SYST:DISP:MESS 'CONTROLLED BY DEVICE X'

SYSTem:DISPlay:MESSage:STATe <State>

Enables and disables the display of an additional text in remote control.

To define the text, use `SYSTem:DISPlay:MESSage[:TEXT]` on page 603.

Parameters:

<State> ON | OFF | 0 | 1
 OFF | 0
 Switches the function off
 ON | 1
 Switches the function on
 *RST: 0

Example:

```
SYST:DISP:MESS ON
SYST:DISP:MESS 'CONTROLLED BY DEVICE X'
```

SYSTem:DISPlay:UPDate <State>

This command turns the display during remote operation on and off.

If on, the R&S EPL updates the diagrams, traces and display fields only.

The best performance is obtained if the display is off during remote control operation.

Parameters:

<State> ON | OFF | 1 | 0
 *RST: 0

Example:

```
SYST:DISP:UPD ON
```

Manual operation: See ["Remote Display Update"](#) on page 354

SYSTem:ERRor:CLEar:REMOte

This command deletes all contents of the "Remote Errors" table.

Note: The remote error list is automatically cleared when the R&S EPL is shut down.

Example:

```
SYST:ERR:CLE:REM
```

Manual operation: See ["Display Remote Errors"](#) on page 354
 See ["Clear Error List"](#) on page 359

SYSTem:ERRor:DISPlay <State>

This command switches the error display during remote operation on and off.

If activated, the R&S EPL displays a message box at the bottom of the screen that contains the most recent type of error and the command that caused the error.

Parameters:

<State> ON | OFF | 1 | 0
 *RST: 1

Example:

```
SYST:ERR:DISP ON
```

Manual operation: See ["Display Remote Errors"](#) on page 354

SYSTem:IDENtify:FACTory

This command resets the query to `*IDN?` to its default value.

Usage: Event

Manual operation: See ["Reset to Factory String"](#) on page 353

SYSTem:IDENtify[:STRing] <String>

This command defines the response to `*IDN?`.

Parameters:

<String> String containing the description of the instrument.

Manual operation: See ["Identification String"](#) on page 353

SYSTem:KLOCK <State>

This command locks or unlocks manual operation.

Parameters:

<State>

ON
LLO (local lockout). The instrument can only be operated remotely, not locally.

OFF
Unlocks the manual operation mode. To operate the instrument locally again, you must execute `SYST:COMM:INT:REM OFF` or select the "Local" softkey first.

*RST: state not affected by *RST

Example: `SYST:KLOC ON`
Activates LLO (remote control only)

Example: `SYST:KLOC OFF`
`SYST:COMM:INT:REM OFF`
You can operate the instrument locally.

SYSTem:LXI:LANReset

This command resets the LAN configuration, as well as the "LAN" password and instrument description.

Manual operation: See ["LAN Reset"](#) on page 358

SYSTem:LXI:MDEscription <Description>

This command defines the "LAN" instrument description.

Parameters:

<Description> String containing the instrument description.

SYSTem:LXI:PASSword <Password>

This command defines the "LAN" password.

Parameters:

<Password> String containing the password.

Return values:

<Password>

Manual operation: See ["LAN Password"](#) on page 358

15.9.9 System configuration check

Commands to check the system configuration described elsewhere.

- [DIAGnostic:SERvice:SINFO?](#) on page 612

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DIAGnostic:SERvice:BIOSinfo?	607
DIAGnostic:SERvice:HWInfo?	607
DIAGnostic:SERvice:VERSinfo?	607
SYSTem:ERRor:CLEar:ALL	608
SYSTem:ERRor:EXTended?	608
SYSTem:ERRor:LIST?	609
SYSTem:ERRor[:NEXT]?	609
SYSTem:FIRMware:UPDate	610
SYSTem:PRESet:COMPAtible	610
SYSTem:PRESet:FILTer	610
OUTPut:UPORt:WTRigger:POLarity	611

DIAGnostic:INFO:CCOunt? <Relay>

This command queries how many switching cycles the individual relays have performed since they were installed.

Query parameters:

<Relay> See table below for an overview of supported parameters.

Return values:

<Cycles> Number of switching cycles.

Example:

DIAG:INFO:CCO? CAL

Usage:

Query only

Manual operation: See ["Relays Cycle Counter"](#) on page 310

SCPI parameter	Hardware component
INP2matt10r1	RF2 mechanical att. 10dB R1
INP2matt10r2	RF2 mechanical att. 10dB R2
CAL	Calibration source

SCPI parameter	Hardware component
EMIMatt10	EMI mechanical att. 10dB
PRESab_bypr1	Preselector AB: bypass-R1
PRESab_bypr2	Preselector AB: bypass-R2
PRESab_swir1	Preselector AB: switch-R1
PRESab_swir2	Preselector AB: switch-R2
PREamp	Preselector AB: Preamplifier
LFMatt10	Direct path mechanical att. 10dB

DIAGnostic:SERVice:BIOSinfo?

This command queries the BIOS version of the CPU board.

Return values:

<BiosInformation> String containing the BIOS version.

Example:

```
DIAG:SERV:BIOS?
Returns the BIOS version.
```

Usage:

Query only

DIAGnostic:SERVice:HWInfo?

This command queries hardware information.

Return values:

<Hardware> String containing the following information for every hardware component.
 <component>: name of the hardware component
 <serial#>: serial number of the component
 <order#>: order number of the component
 <model>: model of the component
 <code>: code of the component
 <revision>: revision of the component
 <subrevision>: subrevision of the component

Example:

```
DIAG:SERV:HWIN?
Queries the hardware information.
"FRONTEND|100001/003|1300.3009|03|01|00|00",
"MOTHERBOARD|123456/002|1300.3080|02|00|00|00",
...
```

Usage:

Query only

DIAGnostic:SERVice:VERSinfo?

This command queries information about the hardware and software components.

Return values:

<Information>

String containing the version of hardware and software components including the types of licenses for installed options.

Example:

```
DIAG:SERV:VERS?
```

Queries the version information.

Response:

```
Instrument Firmware |1.00,
R&S Device ID |1350.4444K10-900005-Be,
Operating System |Windows 10 Enterprise (Build: 19044),
BIOS |47.11, Image Version |0.0.0,
Device Installation Version |0.0.0,
PCIE-FPGA |1.11.0,
FE-FPGA (SPA) |1.0.0,
AUX-FPGA |1.0.3,
TG-FPGA |0.0.1,
Data Sheet Version |01.00,
Time Control Management ||active,
Smart Card Service ||installed,
OCXO Precision Frequency Reference B4||,
Additional Interfaces B5||
```

Usage:

Query only

SYSTem:ERRor:CLEar:ALL

This command deletes all contents of the "System Messages" table.

Example:

```
SYST:ERR:CLE:ALL
```

SYSTem:ERRor:EXTended? <MessageType>[, <ChannelName>]

This command queries all system messages, or all messages of a defined type, displayed in the status bar for a specific channel setup (application).

Note: This command queries the strings displayed for manual operation. For remote programs, do not define processing steps depending on these results. Instead, query the results of the `STATus:QUESTionable:EXTended:INFO` status register, which indicates whether messages of a certain type have occurred (see [Section 14.2.2.8, "STATus:QUESTionable:EXTended:INFO register"](#), on page 341).

Parameters:

<MessageType>

ALL | INFO | WARNing | FATAI | ERRor | MESSage

<ChannelName>

String containing the name of the channel setup.

The parameter is optional. If you omit it, the command works for the currently active channel setup.

Return values:

<Messages> String containing all messages of the selected type for the specified channel setup. Each message is separated by a comma and inserted in parentheses. If no messages are available, empty parentheses are returned.

Example:

SYST:ERR:EXT? ALL

Returns all messages for the currently active application, e.g. "Message 1", "Message 2".

Example:

SYST:ERR:EXT? FAT, 'Spectrum2'

Queries fatal errors in the 'Spectrum2' application. If none have occurred, the result is: " ".

Usage:

Query only

SYSTem:ERRor:LIST? [<MessType>]

This command queries the error messages that occur during R&S EPL operation.

Query parameters:

<MessType> SMSG | REMote

SMSG

(default) Queries the system messages which occurred during manual operation.

REMote

Queries the error messages that occurred during remote operation.

Note: The remote error list is automatically cleared when the R&S EPL is shut down.

Return values:

<SystemMessages> String containing all messages in the "System Messages" table.

<RemoteErrors> <Error_no> | <Description> | <Command> | <Date> | <Time>
Comma-separated list of errors from the "Remote Errors" table, where:
<Error_no>: device-specific error code
<Description>: brief description of the error
<Command>: remote command causing the error
<Date> | <Time>: date and time the error occurred

Usage:

Query only

SYSTem:ERRor[:NEXT]?

This command queries the most recent error queue entry and deletes it.

Positive error numbers indicate device-specific errors, negative error numbers are error messages defined by SCPI. If the error queue is empty, the error number 0, "No error", is returned.

For details on error queues see [Section 14.2, "Status reporting system"](#), on page 333.

Usage: Query only

SYSTem:FIRMware:UPDate <Directory>

This command starts a firmware update using the *.msi files in the selected directory. The default path is D:\FW_UPDATE. The path is changed via the [MMEMory:COMMeNt](#) command. To store the update files the [MMEMory:DATA](#) command is used.

Only user accounts with administrator rights can perform a firmware update.

Setting parameters:

<Directory>

Example: `SYST:FIRM:UPD 'D:\FW_UPDATE'`
Starts the firmware update from directory "D:\FW_UPDATE".

SYSTem:PRESet:COMPAtible <OpMode>

Defines the operating mode that is activated when you switch on the R&S EPL or press [PRESET].

Parameters:

<OpMode>

SAAnalyzer

Defines Signal and Spectrum Analyzer operating mode as the presetting.

RECeiver

Selects the receiver application as the default application (default value).

Manual operation: See ["Preset Mode"](#) on page 304

SYSTem:PRESet:FILTer <FilterType>

This command selects the resolution filter type that is selected after a preset in the Spectrum application.

Parameters:

<FilterType>

NORMal

Selects 3 dB filter.

NOISe

Selects 3 dB filter.
(NORMal and NOISe have the same effect.)

PULSe

Selects 6 dB filter.

*RST: NORMal

Example: //Select the 6 dB filters as the default filter type
`SYST:PRESet:FILT PULS`

Manual operation: See ["Default Filter Type for Spectrum Mode"](#) on page 304

OUTPut:UPORt:WTRigger:POLarity <State>

Defines the signal polarity that indicates the trigger availability at the optional [AUX PORT] connector of the R&S EPL.

Parameters:

<State> HIGH | LOW

LOW

A low signal (= 0 V) indicates the instrument is ready to receive a trigger.

HIGH

A high signal (= 5 V) indicates the instrument is ready to receive a trigger.

Example:

OUTP:UPOR:WTR:POL HIGH

The R&S EPL waits for a 5-V-signal at the AUX PORT connector before accepting a trigger signal.

Manual operation: See ["Wait for Trigger Polarity"](#) on page 304

15.9.10 Service functions

DIAGnostic:SERvice:SFUNction.....	611
DIAGnostic:SERvice:SFUNction:LASTresult?.....	612
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SYSTem:DFPPrint.....	613
SYSTem:PASSword:RESet.....	613
SYSTem:PASSword[:CENable].....	613

DIAGnostic:SERvice:SFUNction <ServiceFunction>**DIAGnostic:SERvice:SFUNction? <ServiceFunction>**

This command starts a service function.

The service functions are available after you have entered the level 1 or level 2 system password.

Parameters for setting and query:

<ServiceFunction> String containing the ID of the service function.
 The ID of the service function is made up out of five numbers, separated by a point.

- function group number
- board number
- function number
- parameter 1 (see the Service Manual)
- parameter 2 (see the Service Manual)

Return values:

<Result>

Example: DIAG:SERV:SFUN 'Function1'
 DIAG:SERV:SFUN? 'Function2'

Manual operation: See ["Service Function"](#) on page 308
 See ["Send"](#) on page 309

DIAGnostic:SERvice:SFUNction:LASTresult?

This command queries the results of the most recent service function you have used.

Return values:

<Result>

Usage: Query only

DIAGnostic:SERvice:SFUNction:RESults:DELeTe

This command deletes the results in the output buffer for service functions you have used.

Usage: Event

Manual operation: See ["Clear Results"](#) on page 309

DIAGnostic:SERvice:SFUNction:RESults:SAVE [<FileName>]

This command saves the results in the output buffer for service functions you have used to a file.

If no <FileName> parameter is provided, the results are stored to
C:\Users\Public\Documents\Rohde-Schwarz\Analyzer\results\
Servicelog.txt.

Note that if the buffer is empty, the function returns an error.

Parameters:

<FileName> String containing the path and file name.

Manual operation: See ["Save Results"](#) on page 309

DIAGnostic:SERvice:SINFo?

This command creates a *.zip file with important support information. The *.zip file contains the system configuration information ("device footprint"), the current eeprom data and a screenshot of the screen display (if available).

This data is stored to the

C:\Users\Public\Documents\Rohde-Schwarz\Analyzer\user directory on
the instrument.

As a result of this command, the created file name (including the drive and path) is returned.

If you contact the Rohde & Schwarz support to get help for a certain problem, send this file to the support in order to identify and solve the problem faster.

Return values:

<FileName> C:\Users\Public\Documents\Rohde-Schwarz\Analyzer\user
 \<R&S Device ID>_<CurrentDate>_<CurrentTime>
 String containing the drive, path and file name of the created support file, where the file name consists of the following elements:
<R&S Device ID>: The unique R&S device ID indicated in the "Versions + Options" information
<CurrentDate>: The date on which the file is created (<YYYYMMDD>)
<CurrentTime>: The time at which the file is created (<HHMMSS>)

Usage: Query only

Manual operation: See ["Create R&S Support Information"](#) on page 306

Example:

DIAG:SERV:SINF?

Result:

"C:
 \ProgramData\Rohde-Schwarz\ZNL-FPL\user\EPL1000__20220103_145113.zip"

SYSTem:DFPRint

Creates an *.xml file with information on installed hardware, software, image and FPGA versions. The *.xml file is stored under C:\Users\Public\Documents\Rohde-Schwarz\Analyzer\devicedata\xml\DeviceFootprint_* on the instrument. It is also output to the remote interface as binary data.

Return values:

<xxx> Contents of the xml file in binary format.

Example: SYST:DFPR?

Manual operation: See ["Save Device Footprint"](#) on page 306

SYSTem:PASSword:RESet

Clears any previously provided password and returns to the most restrictive service level.

Manual operation: See ["Password"](#) on page 309

SYSTem:PASSword[:CENable] <arg0>

Provides a password for subsequent service functions.

Parameters:**<arg0>** string**Example:**

SYST:PASS:CEN '894129'

Manual operation: See "Password" on page 309

15.9.11 Using the status register

For more information on the contents of the status registers see:

- [Remote control via SCPI](#)
- [Section 14.2.2.4, "STATus:OPERation register", on page 337](#)
- [Section 14.2.2.6, "STATus:QUEStionable:ACPLimit register", on page 339](#)
- [Section 14.2.2.7, "STATus:QUEStionable:EXTended register", on page 340](#)
- [Section 14.2.2.9, "STATus:QUEStionable:FREQuency register", on page 341](#)
- [Section 14.2.2.10, "STATus:QUEStionable:LIMit register", on page 342](#)
- [Section 14.2.2.11, "STATus:QUEStionable:LMARgin register", on page 342](#)
- [Section 14.2.2.12, "STATus:QUEStionable:POWEr register", on page 343](#)
- [Section 14.2.2.13, "STATus:QUEStionable:TEMPerature register", on page 344](#)
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15.9.11.1 General status register commands

STATus:PRESet.....	614
STATus:QUEue[:NEXT]?.....	614

STATus:PRESet

Resets the edge detectors and **ENABLE** parts of all registers to a defined value. All **PTRansition** parts are set to **FFFFh**, i.e. all transitions from 0 to 1 are detected. All **NTRansition** parts are set to 0, i.e. a transition from 1 to 0 in a **CONDition** bit is not detected. The **ENABLE** part of the **STATus:OPERation** and **STATus:QUEStionable** registers are set to 0, i.e. all events in these registers are not passed on.

Usage: Event

STATus:QUEue[:NEXT]?

Queries the most recent error queue entry and deletes it.

Positive error numbers indicate device-specific errors, negative error numbers are error messages defined by SCPI. If the error queue is empty, the error number 0, "No error", is returned.

Is identical to the `SYSTem:ERRor[:NEXT]?` command.

Usage: Query only

15.9.11.2 Reading out the CONDition part

STATus:OPERation:CONDition?
STATus:QUESTionable:CONDition?
STATus:QUESTionable:ACPLimit:CONDition? <ChannelName>
STATus:QUESTionable:EXTended:CONDition? <ChannelName>
STATus:QUESTionable:EXTended:INFO:CONDition? <ChannelName>
STATus:QUESTionable:FREQuency:CONDition? <ChannelName>
STATus:QUESTionable:LIMit<n>:CONDition? <ChannelName>
STATus:QUESTionable:LMARgin<n>:CONDition? <ChannelName>
STATus:QUESTionable:POWer:CONDition? <ChannelName>
STATus:QUESTionable:TEMPerature:CONDition? <ChannelName>
STATus:QUESTionable:TRANsducer:CONDition? <ChannelName>
STATus:QUESTionable:TIME:CONDition? <ChannelName>

These commands read out the CONDition section of the status register.

The commands do not delete the contents of the CONDition section.

Suffix:

<n> [Window](#)

Query parameters:

<ChannelName> String containing the name of the channel.
 The parameter is optional. If you omit it, the command works for the currently active channel.

Usage: Query only

15.9.11.3 Reading out the EVENT part

STATus:OPERation[:EVENT]?
STATus:QUESTionable[:EVENT]?
STATus:QUESTionable:ACPLimit[:EVENT]? <ChannelName>
STATus:QUESTionable:EXTended[:EVENT]? <ChannelName>
STATus:QUESTionable:EXTended:INFO[:EVENT]? <ChannelName>
STATus:QUESTionable:FREQuency[:EVENT]? <ChannelName>
STATus:QUESTionable:LIMit<n>[:EVENT]? <ChannelName>
STATus:QUESTionable:LMARgin<n>[:EVENT]? <ChannelName>
STATus:QUESTionable:POWer[:EVENT]? <ChannelName>
STATus:QUESTionable:TEMPerature[:EVENT]? <ChannelName>

STATus:QUESTIONable:TRANSDUCER[:EVENT]? <ChannelName>

STATus:QUESTIONable:TIME[:EVENT]? <ChannelName>

These commands read out the EVENT section of the status register.

At the same time, the commands delete the contents of the EVENT section.

Suffix:

<n> [Window](#)

Query parameters:

<ChannelName> String containing the name of the channel.
The parameter is optional. If you omit it, the command works for the currently active channel.

Usage: Query only

15.9.11.4 Controlling the ENABLE part

STATus:OPERation:ENABLE <SumBit>

STATus:QUESTIONable:ENABLE <SumBit>

STATus:QUESTIONable:ACPLimit:ENABLE <SumBit>,<ChannelName>

STATus:QUESTIONable:EXTended:ENABLE <SumBit>,<ChannelName>

STATus:QUESTIONable:EXTended:INFO:ENABLE <SumBit>,<ChannelName>

STATus:QUESTIONable:FREQuency:ENABLE <SumBit>,<ChannelName>

STATus:QUESTIONable:LIMit<n>:ENABLE <SumBit>,<ChannelName>

STATus:QUESTIONable:LMARgin<n>:ENABLE <SumBit>,<ChannelName>

STATus:QUESTIONable:POWer:ENABLE <SumBit>,<ChannelName>

STATus:QUESTIONable:TEMPerature:ENABLE <SumBit>,<ChannelName>

STATus:QUESTIONable:TRANSDUCER:ENABLE? <SumBit>,<ChannelName>

STATus:QUESTIONable:TIME:ENABLE <SumBit>,<ChannelName>

These commands control the ENABLE part of a register.

The ENABLE part allows true conditions in the EVENT part of the status register to be reported in the summary bit. If a bit is 1 in the enable register and its associated event bit transitions to true, a positive transition will occur in the summary bit reported to the next higher level.

Suffix:

<n> [Window](#)

Parameters:

<SumBit> Range: 0 to 65535

<ChannelName> String containing the name of the channel.
The parameter is optional. If you omit it, the command works for the currently active channel.

15.9.11.5 Controlling the negative transition part

STATus:OPERation:NTRansition <SumBit>

STATus:QUESTIONable:NTRansition <SumBit>

STATus:QUESTionable:ACPLimit:NTRansition <SumBit>,<ChannelName>
STATus:QUESTionable:EXTended:NTRansition <SumBit>,<ChannelName>
STATus:QUESTionable:EXTended:INFO:NTRansition <SumBit>,<ChannelName>
STATus:QUESTionable:FREQuency:NTRansition <SumBit>,<ChannelName>
STATus:QUESTionable:LIMit<n>:NTRansition <SumBit>,<ChannelName>
STATus:QUESTionable:LMARgin<n>:NTRansition <SumBit>,<ChannelName>
STATus:QUESTionable:POWer:NTRansition <SumBit>,<ChannelName>
STATus:QUESTionable:TEMPerature:NTRansition <SumBit>,<ChannelName>
STATus:QUESTionable:TRANsducer:NTRansition? <SumBit>,<ChannelName>
STATus:QUESTionable:TIME:NTRansition <SumBit>,<ChannelName>

These commands control the Negative TRansition part of a register.

Setting a bit causes a 1 to 0 transition in the corresponding bit of the associated register. The transition also writes a 1 into the associated bit of the corresponding EVENT register.

Suffix:

<n> [Window](#)

Parameters:

<SumBit> Range: 0 to 65535
 <ChannelName> String containing the name of the channel.
 The parameter is optional. If you omit it, the command works for the currently active channel.

15.9.11.6 Controlling the positive transition part

STATus:OPERation:PTRansition <SumBit>
STATus:QUESTionable:PTRansition <SumBit>
STATus:QUESTionable:ACPLimit:PTRansition <SumBit>,<ChannelName>
STATus:QUESTionable:EXTended:PTRansition <SumBit>,<ChannelName>
STATus:QUESTionable:EXTended:INFO:PTRansition <SumBit>,<ChannelName>
STATus:QUESTionable:FREQuency:PTRansition <SumBit>,<ChannelName>
STATus:QUESTionable:LIMit<n>:PTRansition <SumBit>,<ChannelName>
STATus:QUESTionable:LMARgin<n>:PTRansition <SumBit>,<ChannelName>
STATus:QUESTionable:POWer:PTRansition <SumBit>,<ChannelName>
STATus:QUESTionable:TEMPerature:PTRansition <SumBit>,<ChannelName>
STATus:QUESTionable:TRANsducer:PTRansition? <SumBit>,<ChannelName>
STATus:QUESTionable:TIME:PTRansition <SumBit>,<ChannelName>

These commands control the Positive TRansition part of a register.

Setting a bit causes a 0 to 1 transition in the corresponding bit of the associated register. The transition also writes a 1 into the associated bit of the corresponding EVENT register.

Suffix:

<n> [Window](#)

Parameters:

<SumBit> Range: 0 to 65535

<ChannelName> String containing the name of the channel.
The parameter is optional. If you omit it, the command works for the currently active channel.

15.10 Using the status register

For more information on the contents of the status registers see:

- [Remote control via SCPI](#)
- [Section 14.2.2.4, "STATus:OPERation register", on page 337](#)
- [Section 14.2.2.6, "STATus:QUESTionable:ACPLimit register", on page 339](#)
- [Section 14.2.2.7, "STATus:QUESTionable:EXTended register", on page 340](#)
- [Section 14.2.2.9, "STATus:QUESTionable:FREQuency register", on page 341](#)
- [Section 14.2.2.10, "STATus:QUESTionable:LIMit register", on page 342](#)
- [Section 14.2.2.11, "STATus:QUESTionable:LMARgin register", on page 342](#)
- [Section 14.2.2.12, "STATus:QUESTionable:POWEr register", on page 343](#)
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15.10.1 General status register commands

STATus:PRESet.....	618
STATus:QUEue[:NEXT]?.....	618

STATus:PRESet

Resets the edge detectors and ENABle parts of all registers to a defined value. All PTRansition parts are set to FFFFh, i.e. all transitions from 0 to 1 are detected. All NTRansition parts are set to 0, i.e. a transition from 1 to 0 in a CONDition bit is not detected. The ENABle part of the STATus:OPERation and STATus:QUESTionable registers are set to 0, i.e. all events in these registers are not passed on.

Usage: Event

STATus:QUEue[:NEXT]?

Queries the most recent error queue entry and deletes it.

Positive error numbers indicate device-specific errors, negative error numbers are error messages defined by SCPI. If the error queue is empty, the error number 0, "No error", is returned.

Is identical to the `SYSTem:ERRor[:NEXT]?` command.

Usage: Query only

15.10.2 Reading out the CONDition part

STATus:OPERation:CONDition?
STATus:QUESTionable:CONDition?
STATus:QUESTionable:ACPLimit:CONDition? <ChannelName>
STATus:QUESTionable:EXTended:CONDition? <ChannelName>
STATus:QUESTionable:EXTended:INFO:CONDition? <ChannelName>
STATus:QUESTionable:FREQuency:CONDition? <ChannelName>
STATus:QUESTionable:LIMit<n>:CONDition? <ChannelName>
STATus:QUESTionable:LMARgin<n>:CONDition? <ChannelName>
STATus:QUESTionable:POWer:CONDition? <ChannelName>
STATus:QUESTionable:TEMPerature:CONDition? <ChannelName>
STATus:QUESTionable:TRANsducer:CONDition? <ChannelName>
STATus:QUESTionable:TIME:CONDition? <ChannelName>

These commands read out the CONDition section of the status register.

The commands do not delete the contents of the CONDition section.

Suffix:

<n> [Window](#)

Query parameters:

<ChannelName> String containing the name of the channel.
 The parameter is optional. If you omit it, the command works for the currently active channel.

Usage: Query only

15.10.3 Reading out the EVENT part

STATus:OPERation[:EVENT]?
STATus:QUESTionable[:EVENT]?
STATus:QUESTionable:ACPLimit[:EVENT]? <ChannelName>
STATus:QUESTionable:EXTended[:EVENT]? <ChannelName>
STATus:QUESTionable:EXTended:INFO[:EVENT]? <ChannelName>
STATus:QUESTionable:FREQuency[:EVENT]? <ChannelName>
STATus:QUESTionable:LIMit<n>[:EVENT]? <ChannelName>
STATus:QUESTionable:LMARgin<n>[:EVENT]? <ChannelName>
STATus:QUESTionable:POWer[:EVENT]? <ChannelName>
STATus:QUESTionable:TEMPerature[:EVENT]? <ChannelName>

STATus:QUESTIONable:TRANSDUCER[:EVENT]? <ChannelName>

STATus:QUESTIONable:TIME[:EVENT]? <ChannelName>

These commands read out the EVENT section of the status register.

At the same time, the commands delete the contents of the EVENT section.

Suffix:

<n> [Window](#)

Query parameters:

<ChannelName> String containing the name of the channel.
The parameter is optional. If you omit it, the command works for the currently active channel.

Usage: Query only

15.10.4 Controlling the ENABLE part

STATus:OPERation:ENABLE <SumBit>

STATus:QUESTIONable:ENABLE <SumBit>

STATus:QUESTIONable:ACPLimit:ENABLE <SumBit>,<ChannelName>

STATus:QUESTIONable:EXTended:ENABLE <SumBit>,<ChannelName>

STATus:QUESTIONable:EXTended:INFO:ENABLE <SumBit>,<ChannelName>

STATus:QUESTIONable:FREQuency:ENABLE <SumBit>,<ChannelName>

STATus:QUESTIONable:LIMit<n>:ENABLE <SumBit>,<ChannelName>

STATus:QUESTIONable:LMARgin<n>:ENABLE <SumBit>,<ChannelName>

STATus:QUESTIONable:POWer:ENABLE <SumBit>,<ChannelName>

STATus:QUESTIONable:TEMPerature:ENABLE <SumBit>,<ChannelName>

STATus:QUESTIONable:TRANSDUCER:ENABLE? <SumBit>,<ChannelName>

STATus:QUESTIONable:TIME:ENABLE <SumBit>,<ChannelName>

These commands control the ENABLE part of a register.

The ENABLE part allows true conditions in the EVENT part of the status register to be reported in the summary bit. If a bit is 1 in the enable register and its associated event bit transitions to true, a positive transition will occur in the summary bit reported to the next higher level.

Suffix:

<n> [Window](#)

Parameters:

<SumBit> Range: 0 to 65535

<ChannelName> String containing the name of the channel.
The parameter is optional. If you omit it, the command works for the currently active channel.

15.10.5 Controlling the negative transition part

```

STATus:OPERation:NTRansition <SumBit>
STATus:QUESTionable:NTRansition <SumBit>
STATus:QUESTionable:ACPLimit:NTRansition <SumBit>,<ChannelName>
STATus:QUESTionable:EXTended:NTRansition <SumBit>,<ChannelName>
STATus:QUESTionable:EXTended:INFO:NTRansition <SumBit>,<ChannelName>
STATus:QUESTionable:FREQuency:NTRansition <SumBit>,<ChannelName>
STATus:QUESTionable:LIMit<n>:NTRansition <SumBit>,<ChannelName>
STATus:QUESTionable:LMARgin<n>:NTRansition <SumBit>,<ChannelName>
STATus:QUESTionable:POWer:NTRansition <SumBit>,<ChannelName>
STATus:QUESTionable:TEMPerature:NTRansition <SumBit>,<ChannelName>
STATus:QUESTionable:TRANsducer:NTRansition? <SumBit>,<ChannelName>
STATus:QUESTionable:TIME:NTRansition <SumBit>,<ChannelName>

```

These commands control the Negative TRansition part of a register.

Setting a bit causes a 1 to 0 transition in the corresponding bit of the associated register. The transition also writes a 1 into the associated bit of the corresponding EVENT register.

Suffix:

<n> [Window](#)

Parameters:

<SumBit>	Range: 0 to 65535
<ChannelName>	String containing the name of the channel. The parameter is optional. If you omit it, the command works for the currently active channel.

15.10.6 Controlling the positive transition part

```

STATus:OPERation:PTRansition <SumBit>
STATus:QUESTionable:PTRansition <SumBit>
STATus:QUESTionable:ACPLimit:PTRansition <SumBit>,<ChannelName>
STATus:QUESTionable:EXTended:PTRansition <SumBit>,<ChannelName>
STATus:QUESTionable:EXTended:INFO:PTRansition <SumBit>,<ChannelName>
STATus:QUESTionable:FREQuency:PTRansition <SumBit>,<ChannelName>
STATus:QUESTionable:LIMit<n>:PTRansition <SumBit>,<ChannelName>
STATus:QUESTionable:LMARgin<n>:PTRansition <SumBit>,<ChannelName>
STATus:QUESTionable:POWer:PTRansition <SumBit>,<ChannelName>
STATus:QUESTionable:TEMPerature:PTRansition <SumBit>,<ChannelName>
STATus:QUESTionable:TRANsducer:PTRansition? <SumBit>,<ChannelName>
STATus:QUESTionable:TIME:PTRansition <SumBit>,<ChannelName>

```

These commands control the Positive TRansition part of a register.

Setting a bit causes a 0 to 1 transition in the corresponding bit of the associated register. The transition also writes a 1 into the associated bit of the corresponding EVENT register.

Suffix:<n> [Window](#)**Parameters:**

<SumBit> Range: 0 to 65535

<ChannelName> String containing the name of the channel.
 The parameter is optional. If you omit it, the command works for the currently active channel.

15.11 Emulating other instruments' commands

The R&S EPL analyzer family supports a subset of the GPIB commands of several HP and PSA instruments.

For details see [Section 14.3, "GPIB languages"](#), on page 347.

- [Setting up instrument emulation](#).....622
- [Reference: GPIB commands of emulated HP models](#).....624

15.11.1 Setting up instrument emulation

The following commands are required to set up the use of commands to emulate other instruments.

Useful commands for emulating other instruments described elsewhere:

- [SYSTem:REVision:FACTory](#) on page 602

Remote commands exclusive to emulating other instruments:

SYSTem:HPCoupling	622
SYSTem:IFGain:MODE	623
SYSTem:LANGuage	623
SYSTem:PSA:WIDeband	623
SYSTem:REVision[:STRing]	624
SYSTem:RSWeep	624

SYSTem:HPCoupling <CouplingType>

Controls the default coupling ratios in the HP emulation mode for:

- span and resolution bandwidth (Span/RBW) and
- resolution bandwidth and video bandwidth (RBW/VBW)

This command is only available if a HP language is selected using [SYSTem:LANGuage](#) on page 623.

Parameters:

<CouplingType> HP | FSP
 *RST: FSP

Example: `SYSTem:HPC HP`

Manual operation: See ["Coupling"](#) on page 356

SYSTem:IFGain:MODE <Mode>

Configures the internal IF gain settings in HP emulation mode due to the application needs. This setting is only taken into account for resolution bandwidth < 300 kHz and is only available if a HP language is selected using [SYSTem:LANGuage](#) on page 623.

Parameters:

<Mode> NORMal | PULSe

NORMal

Optimized for high dynamic range, overload limit is close to reference level.

PULSe

Optimized for pulsed signals, overload limit up to 10 dB above reference level.

*RST: NORM

Example: `SYST:IFG:MODE PULS`

Manual operation: See ["IF Gain"](#) on page 356

SYSTem:LANGuage <Language>

This command selects the system language.

Example: `SYST:LANG 'PSA'`
Emulates the PSA.

Manual operation: See ["Language"](#) on page 355

SYSTem:PSA:WIDeband <State>

This command defines which option is returned when the *OPT? query is executed, depending on the state of the wideband option.

It is only available for PSA89600 emulation.

Parameters:

<State> ON | OFF | HIGH

OFF

The option is indicated as "B7J"

ON

The 40 MHz wideband is used.

The option is indicated as "B7J, 140".

HIGH

The 80 MHz wideband is used.

The option is indicated as "B7J, 122".

*RST: OFF

SYSTem:REVision[:STRing] <Name>

Sets the response to the `REV?` query to the defined string (HP emulation only, see [SYSTem:LANGuage](#) on page 623).

Parameters:

<Name>

Example:

Define the system language:

```
SYST:LANG '8563E'
```

Query the revision:

```
REV?
```

Response:

```
920528
```

Set the response to 'NewRevision':

```
SYST:REV:STR 'NewRevision'
```

Query the response:

```
SYST:REV:STR?
```

Response:

```
NewRevision
```

Manual operation: See ["Revision String"](#) on page 356

SYSTem:RSWeep <State>

Controls a repeated sweep of the E1 and MKPK HI HP model commands (for details on the commands refer to [Section 15.11.2, "Reference: GPIB commands of emulated HP models"](#), on page 624). If the repeated sweep is OFF, the marker is set without sweeping before.

This command is only available if a HP language is selected using [SYSTem:LANGuage](#) on page 623

Parameters:

<State> ON | OFF | 1 | 0
*RST: 0

Example:

```
SYSTem:RSW ON
```

Manual operation: See ["Sweep Repeat"](#) on page 356

15.11.2 Reference: GPIB commands of emulated HP models

The R&S EPL analyzer family supports a subset of the GPIB commands of HP models 8560E, 8561E, 8562E, 8563E, 8564E, 8565E, 8566A, 8566B, 8568A, 8568B and 8594E.

Despite the differences in system architecture and device features, the supported commands have been implemented in a way to ensure a sufficiently high degree of correspondence with the original.

This includes the support of syntax rules for not only newer device families (B and E models) but for the previous A family as well.

In many cases the selection of commands supported by the R&S EPL is sufficient to run an existing GPIB program without adaptation.

After the introduction, this section includes the following topics:

- [Command set of models 8560E, 8561E, 8562E, 8563E, 8564E, 8565E, 8566A/B, 8568A/B, 8591E, 8594E, 71100C, 71200C, and 71209A](#)..... 625
- [Special features of the syntax parsing algorithms for 8566A and 8568A models](#)..... 648
- [Special behavior of commands](#)..... 649
- [Model-dependent default settings](#)..... 650
- [Data output formats](#)..... 651
- [Trace data output formats](#)..... 651
- [Trace data input formats](#)..... 652
- [GPIB status reporting](#)..... 652

15.11.2.1 Command set of models 8560E, 8561E, 8562E, 8563E, 8564E, 8565E, 8566A/B, 8568A/B, 8591E, 8594E, 71100C, 71200C, and 71209A

As with the original units, the R&S EPL includes the command set of the A models in the command set of the B models.



The HP model 8591E is compatible to HP model 8594E, the HP models 71100C, 71200C, and 71209A are compatible to HP models 8566A/B.

Command	Supported subset	Function	Corresp. HP-Models	Status
A1	A1	Clear/Write A	HP 8566A/ HP 8568A	available
A2	A2	Max Hold A	HP 8566A/ HP 8568A	available
A3	A3	View A	HP 8566A/ HP 8568A	available
A4	A4	Blank A	HP 8566A/ HP 8568A	available
ABORT ¹⁾	ABORT	Stop previous function	HP 856xE/ HP 8566B/HP 8568B/HP 8594E	available
ADD		Add	HP 8566B/ HP 8568B/ HP 8594E	available

Command	Supported subset	Function	Corresp. HP-Models	Status
ADJALL	ADJALL	Adjust all	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
ADJCRT ²⁾	ADJCRT	Adjust CRT	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
ADJIF ²⁾	ADJIF	Auto adjust IF	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
AMB	AMB ON OFF AMB 1 0 AMB?	Trace A – B -> Trace A	HP 856xE/ HP 8594E	available
AMBPL	AMBPL ON OFF AMBPL 1 0 AMBPL?		HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
ANNOT	ANNOT ON OFF ANNOT 1 0 ANNOT?	Annotation	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
APB	APB	Trace A + B -> Trace A	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
AT	AT <numeric_value> DB DM AT DN AT UP AT AUTO AT?	Attenuation	HP 8566A/ HP 8568A/ HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
AUNITS	AUNITS DBM DBMV DBUV AUNITS?	Amplitude Units	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available

Command	Supported subset	Function	Corresp. HP-Models	Status
AUTOCP	AUTOCP	Coupling default	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
AXB	AXB	Exchange trace A and B	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
B1	B1	Clear/Write B	HP 8566A/ HP 8568A	available
B2	B2	Max Hold B	HP 8566A/ HP 8568A	available
B3	B3	View B	HP 8566A/ HP 8568A	available
B4	B4	Blank B	HP 8566A/ HP 8568A	available
BL	BL	Trace B – Display Line - > Trace B	HP 8566A/ HP 8568A	available
BML	BML	Trace B – Display Line - > Trace B	HP 856xE/ HP8594E	available
BTC	BTC	Transfer Trace B -> C	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
BXC	BXC	Exchange Trace B and C	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
BLANK	BLANK TRA TRB TRC	Blank Trace	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
C1	C1	A-B off	HP 8566A/ HP 8568A	available
C2	C2	A-B -> A	HP 8566A/ HP 8568A	available
CA	CA	Couple Attenuation	HP 8566A/ HP 8568A	available

Command	Supported subset	Function	Corresp. HP-Models	Status
CAL ¹⁾	CAL ALL CAL ON CAL OFF	Start analyzer self alignment	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
CF	CF <numeric_value> HZ KHZ MHZ GHZ CF UP CF DN CF?	Center Frequency	HP 8566A/ HP 8568A/ HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
CHANPWR	CHANPWR TRA TRB, <numeric_value>,<?>	Channel Power Measurement	HP 856xE/ HP 8594E	available
CHPWRBW	CHPWRBW <numeric_value> HZ KHZ MHZ GHZ	Channel Power Bandwidth	HP 856xE/ HP 8594E	available
CLRW	CLRW TRA TRB TRC	Clear/Write Trace	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
CLS ¹⁾	CLS	Clear all status bits	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
CONTS	CONTS		HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
COUPLE	COUPLE AC DC	Input coupling	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
CR	CR	Couple RBW	HP 8566A/ HP 8568A	available
CS	CS	Couple Step Size	HP 8566A/ HP 8568A	available
CT	CT	Couple SWT	HP 8566A/ HP 8568A	available
CTA		Convert to absolute units	HP 8566B/ HP 8568B/ HP 8594E	available

Command	Supported subset	Function	Corresp. HP-Models	Status
CV	CV	Couple VBW	HP 8566A/ HP 8568A	available
D1 ²⁾	D1	Display Size normal	HP 8566A/ HP 8568A	available
DA ²⁾	DA	Display address		available
DEMOMD ¹⁾	DEMOMD ON OFF AM FM	AF Demodulator	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
DEMOMDAGC ²⁾	DEMOMDAGC ON OFF 1 0 DEMOMDAGC?	Demodulation AGC	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
DEMOMDT	DEMOMDT <numeric_value> S MS US SC DEMOMDT UP DN DEMOMDT?	Demodulation time	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
DET	DET POS SMP NEG DET?	Detector	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
DISPOSE ²⁾	ONEOS TRMATH ONSWP ALL <numeric_value>			available
DIV		Divide	HP 8566B/ HP 8568B/ HP 8594E	available
DL	DL <numeric_value> DB DM DL DN DL UP DL ON DL OFF DL?	Display Line	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
DLE	DLE ON OFF	Display Line enable	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available

Command	Supported subset	Function	Corresp. HP-Models	Status
DONE	DONE DONE?	Done query	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
DW ²⁾	DW	Write to display and increment address		available
E1	E1	Peak Search	HP 8566A/ HP 8568A	available
E2	E2	Marker to Center Freq.	HP 8566A/ HP 8568A	available
E3	E3	Deltamarker Step Size	HP 8566A/ HP 8568A	available
E4	E4	Marker to Ref. Level	available	available
EDITDONE		limit line edit done	HP 856xE	available
EDITLIML		edit limit line	HP 856xE	available
ERR	ERR 250 cal level error ERR 300 LO unlock ERR 472 cal error digital filter ERR 473 cal error analog filter ERR 552 cal error log amp ERR 902 unscale tracking generator ERR 906 oven cold ERR 117 numeric unit error ERR 112 Unrecognized Command	Now some FSx errors are mapped to HP errors.	HP8568A HP856xE	not yet available
ERR?	ERR?	Error queue query	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	not yet available
EX	EX	Exchange trace A and B	HP 8566A/ HP 8568A	available
FA	FA <numeric_value> HZ KHZ MHZ GHZ FA UP FA DN FA?	Start Frequency	HP 8566A/ HP 8568A/ HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available

Command	Supported subset	Function	Corresp. HP-Models	Status
FB	FB <numeric_value> HZ KHZ MHZ GHZ FB UP FB DN FB?	Stop Frequency	HP 8566A/ HP 8568A/ HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
FDSP		Frequency display off	8560E 8561E 8562E 8563E 8564E 8565E	available
FOFFSET ¹⁾	FOFFSET <numeric_value> HZ KHZ MHZ GHZ FOFFSET?	Frequency Offset	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
FREF	FREF INT EXT	Reference Frequency	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
FS	FS	Full Span	HP 8566A/ HP 8568A	available
FUNCDEF		Define Function Function must be in one line between delimiters @	HP 8594E/ HP 856xE/ HP 8566B	available
GATE ¹⁾	GATE ON OFF GATE 1 0		HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
GATECTL ¹⁾	GATECTL EDGE LEVEL GATECTL?		HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
GD ¹⁾	GD <numeric_value> US MS SC GD DN GD UP GD?		HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available

Command	Supported subset	Function	Corresp. HP-Models	Status
GL ¹⁾	GL <numeric_value> US MS SC GL DN GL UP GL?		HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
GP ¹⁾	GP POS NEG GP?		HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
GRAT ²⁾	GRAT ON OFF	Graticule	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
I1	I1		HP 8566A/ HP 8568A	available
I2	I2		HP 8566A/ HP 8568A	available
ID	ID ID?	Identify	HP 8566A/ HP 8568A/ HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
INZ ¹⁾	INZ 75 INZ 50 INZ?	Input Impedance	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
IP	IP	Instrument preset	HP 8566A/ HP 8568A	available
KEYDEF	KEYDEF	Key definition	HP 8566B/ HP 856xE/ HP 859xE	available
KEYEXEC	KEYEXEC	Key execute	HP 8566B	available
KS=	KS= <numeric_value> HZ KHZ MHZ GHZ KS= DN KS= UP KS=?	Marker Frequency Counter Resolution	HP 8566A/ HP 8568A	available
KS/	KS/	Manual Peaking	HP 8566A/ HP 8568A	available

Command	Supported subset	Function	Corresp. HP-Models	Status
KS(	KS(	Lock register	HP 8566A/ HP 8568A	available
KS)	KS)	Unlock register	HP 8566A/ HP 8568A	available
KS91	KS91	Read Amplitude Error	HP 8566A/ HP 8568A	available
KSA	KSA	Amplitude Units in dBm	HP 8566A/ HP 8568A	available
KSB	KSB	Amplitude Units in dBmV	HP 8566A/ HP 8568A	available
KSC	KSC	Amplitude Units in dBuV	HP 8566A/ HP 8568A	available
KSD	KSD	Amplitude Units in V	HP 8566A/ HP 8568A	available
KSE	KSE <numeric_value> <char data>@	Title mode	HP 8566A/ HP 8568A	available
KSG	KSG KSG ON KSG <numeric_value>	Video Averaging on	HP 8566A/ HP 8568A	available
KSH	KSH	Video Averaging Off	HP 8566A/ HP 8568A	available
KSK		Marker to Next Peak	HP 8566A/ HP 8568A	available
KSL		Marker Noise off	HP 8566A/ HP 8568A	available
KSM		Marker Noise on	HP 8566A/ HP 8568A	available
KSO	KSO	Deltamarker to span	HP 8566A/ HP 8568A	available
KSP	KSP <numeric_value>	HPIB address	HP 8566A/ HP 8568A	available
KSQ ²⁾	KSQ	Band lock off	HP 8566A/ HP 8568A	available
KST	KST	Fast Preset	HP 8566A/ HP 8568A	available
KSV	KSV <numeric_value> HZ KHZ MHZ GHZ KSV?	Frequency Offset	HP 8566A/ HP 8568A	available

Command	Supported subset	Function	Corresp. HP-Models	Status
KSW	KSW	Error Correction Routine	HP 8566A/ HP 8568A	available
KSX	KSX	Correction Values On	HP 8566A/ HP 8568A	available
KSY	KSY	Correction Values Off	HP 8566A/ HP 8568A	available
KSZ	KSZ <numeric_value> DB KSZ?	Reference Value Offset	HP 8566A/ HP 8568A	available
KSa	KSa	Normal Detection	HP 8566A/ HP 8568A	available
KSb	KSb	Pos Peak Detection	HP 8566A/ HP 8568A	available
KSd	KSd	Neg Peak Detection	HP 8566A/ HP 8568A	available
KSe	KSe	Sample Detection	HP 8566A/ HP 8568A	available
KSg		CRT beam off		available
KSh		CRT beam on		available
KSj	KSj	View Trace C	HP 8566A/ HP 8568A	available
KSk	KSk	Blank Trace C	HP 8566A/ HP 8568A	available
KSl	KSl	Transfer B to C	HP 8566A/ HP 8568A	available
KSm	KSm	Graticule off	HP 8566A/ HP 8568A	available
KSn ²⁾	KSn	Grid on	HP 8566A/ HP 8568A	available
KSo	KSn	Character display off	HP 8566A/ HP 8568A	available
KSp	KSp	Character display on	HP 8566A/ HP 8568A	available
KSr	KSr	Create service request	HP 8566A/ HP 8568A	available
KSt ²⁾	KSt	Band lock on	HP 8566A/ HP 8568A	available

Command	Supported subset	Function	Corresp. HP-Models	Status
KSv ²⁾	KSv	Signal ident on	HP 8566A/ HP 8568A	available
L0	L0	Display line off	HP 8566A/ HP 8568A	available
LB	LB <numeric_value> <char data>@	Label	HP 8566A/ HP 8568A	available
LF	LF	Low frequency band pre-set	HP 8566A/ HP 8568A	available
LIMD		limit line delta	HP 856xE	available
LIMF		limit line frequency	HP 856xE	available
LIMIFAIL		limit fail query	HP 856xE	available
LIMIPURGE		purge limit line	HP 856xE	available
LIMIRCL		recall limit line	HP 856xE	available
LIMIREL		relative limit line	HP 856xE	available
LIMISAV		save limit line	HP 856xE	available
LIMITEST		limit line test	HP 856xE	available
LIML		lower limit line value	HP 856xE	available
LIMM		middle limit line value	HP 856xE	available
LIMTFL		flat limit line segment	HP 856xE	available
LIMTSL		slope limit line segment	HP 856xE	available
LIMU		upper limit line value	HP 856xE	available
LG	LG <numeric_value> DB DM LG?	Amplitude Scale Log	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
LL ²⁾	LL	Plot command	HP 8566A/ HP 8568A	available
LN	LN	Amplitude Scale Lin	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
M1	M1	Marker Off	HP 8566A/ HP 8568A	available

Command	Supported subset	Function	Corresp. HP-Models	Status
M2	M2 M2 <numeric_value> HZ KHZ MHZ GHZ M2 DN M2 UP M2?	Marker Normal	HP 8566A/ HP 8568A	available
M3	M3 M3 <numeric_value> HZ KHZ MHZ GHZ M3 DN M3 UP M3?	Delta Marker	HP 8566A/ HP 8568A	available
M4	M4 <numeric_value> HZ KHZ MHZ GHZ	Marker Zoom	HP 8566A/ HP 8568A	available
MA	MA	Marker Amplitude	HP 8566A/ HP 8568A	available
MC0	MC0	Marker Count off	HP 8566A/ HP 8568A	available
MC1	MC1	Marker Count on	HP 8566A/ HP 8568A	available
MDS	MDS	Measurement data size	HP 8566B	available
MEAS		Measurement status	HP 856xE	available
MF	MF MF?	Marker Frequency	HP 8566A/ HP 8568A/ HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MINH ¹⁾	MINH TRC	Minimum Hold	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKA	MKA <numeric_value> MKA?	Marker Amplitude	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKACT	MKACT 1 MKACT?	Select the active marker	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	not available

Command	Supported subset	Function	Corresp. HP-Models	Status
MKBW ¹⁾	MKBW <numeric_value> MKBW ON MKBW OFF	N dB Down	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKD	MKD MKD <numeric_value> HZ KHZ MHZ GHZ MKD DN MKD UP MKD ON MKD OFF MKD?	Delta Marker	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKDR	MKDR <numeric_value> HZ KHZ MHZ GHZ S SC MS MSEC USMKDR?	Delta Marker reverse	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKDR?		Delta Marker reverse query		available
MKF	MKF <numeric_value> HZ KHZ MHZ GHZ MKF?	Set Marker Frequency	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKFC	MKFC ON OFF	Frequency Counter on/off	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKFCR ¹⁾	MKFCR <numeric_value> HZ KHZ MHZ GHZ MKFCR DN MKFCR UP MKFCR?	Frequency Counter Resolution	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKMIN	MKMIN	Marker -> Min	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available

Command	Supported subset	Function	Corresp. HP-Models	Status
MKN	MKN MKN <numeric_value> HZ KHZ MHZ GHZ MKN DN MKN UP MKN ON MKN OFF MKN?	Normal Marker	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKNOISE	MKNOISE ON OFF MKNOISE 1 0 MKNOISE?	Noise Measurement	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKOFF	MKOFF MKOFF ALL	Marker off	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKP	MKP <numeric_value> MKP?	Marker position	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKPK	MKPK MKPK HI MKPK NH MKPK NR MKPK NL	Marker Search	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKPT	MKPT MKPT HI MKPT NH MKPT NR MKPT NL	Marker Peak Threshold	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKPX	MKPX <numeric_value> DB MKPX DN MKPX UP MKPX?	Peak Excursion	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKRL	MKRL	Ref Level = Marker Level	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available

Command	Supported subset	Function	Corresp. HP-Models	Status
MKSP	MKSP	Deltamarker to span	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKSS	MKSS	CF Stepsize = Marker Freq	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKT	MKT <numeric_value> S MS US SC MKT?	MKF = fstart + MKT/ SWT*Span	HP 856xE/ HP 8594E	available
MKTRACE	MKTRACE TRA TRB TRC	Marker to Trace	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKTRACK	MKTRACK ON OFF MKTRACK 1 0 MKTRACK?	Signal Track	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKTYPE	MKTYPE AMP MK TYPE?	Marker type	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
ML		Mixer level	HP 856xE	available
MOV	MOV TRA TRB TRC, TRA TRB T RC	Move Trace Contents	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MPY		Multiply	HP 8566B/ HP 8568B/ HP 8594E	available
MT0	MT0	Marker Track Off	HP 8566A/ HP 8568A	available
MT1	MT1	Marker Track On	HP 8566A/ HP 8568A	available
MXMH	MXMH TRA TRB	Maximum Hold	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available

Command	Supported subset	Function	Corresp. HP-Models	Status
NORMALIZE	NORMALIZE	Normalize trace	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	not available available
NRL ¹⁾	NRL <numeric_value> DB DM NRL?	Normalized Reference Level	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
NRPOS	NRPOS <numeric_value> NRL?	Normalize position	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
O1	O1	Format ASCII, Values 0 to 4095	HP 8566A/ HP 8568A	available
O2	O2	Format Binary, Values 0 to 4095	HP 8566A/ HP 8568A	available
O3	O3	Format ASCII	HP 8566A/ HP 8568A	available
OA	OA	Output All	HP 8566A/ HP 8568A	available
OL	OL <80 characters> OL?	Output Learn String	HP 8566A/ HP 8568A	available
OT	OT	Output Trace Annotations	HP 8566A/ HP 8568A	available
PA	PA <numeric_value>, <numeric_value	Plot command	HP 8566A/ HP 8568A	available
PD	PD <numeric_value>, <numeric_value	Plot command	HP 8566A/ HP 8568A	available
PH_MKF		Spot frequency in Hz	HP 856xE	available
PH_FMIN		Min offset frequency to be measured	HP 856xE	available
PH_FMAX		Max offset frequency to be measured	HP 856xE	available
PH_MKA		Queries amplitude at the spot frequency	HP 856xE	available
PH_DRIFT		0: for stable signals, 1: for drift	HP 856xE	available
PH_RLVL		Reference level for the log plot	HP 856xE	available

Command	Supported subset	Function	Corresp. HP-Models	Status
PH_SMTHV		Trace smoothing	HP 856xE	available
PH_VBR		Filtering	HP 856xE	available
PH_RMSPT		Amount of data points to skip when doing the integration	HP 856xE	available
PH_RMSFL		Lower integration frequency in Hz	HP 856xE	available
PH_RMSFU		Upper integration frequency in Hz	HP 856xE	available
PH_EXIT		Quits phase noise	HP 856xE	available
PH_F_UDT		Updates internal frequency variables	HP 856xE	available
PH_LMT_L		Apply limits to PH_FMIN and PH_FMAX	HP 856xE	available
PH_MEAS		Generates log frequency plot	HP 856xE	available
PH_MKF_D		Updates the spot frequency	HP 856xE	available
PH_RMS		Requests the rms phase noise	HP 856xE	available
PH_RMSFT		Updates internal frequency variables	HP 856xE	available
PH_RMSX		Calculates the rms phase noise	HP 856xE	available
PH_SPOTF		Executes the spot frequency measurement	HP 856xE	available
PLOTORG ²⁾	PLOTORG DSP GRT	Plot command	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
PLOTSRC ²⁾	PLOTSRC ANNT GRT TRB TRA ALLDSP GRT	Plot command	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
PP	PP	Preselector Peaking	HP 8566A/ HP 8568A	available
PRINT ¹⁾	PRINT PRINT 1 0	Hardcopy	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available

Command	Supported subset	Function	Corresp. HP-Models	Status
PSDAC ²⁾	PSDAC <numeric_value> PSDAC UP DN	Preselector DAC value	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
PSTATE ²⁾	PSTATE ON OFF 1 0	Protect State	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
PU	PU	Pen Up	HP 8566A/ HP 8568A	available
PWRBW	PWRBW	Power Bandwidth	HP 8566B/ HP 859x/ HP 856xE	available
R1	R1	Set Status Bit Enable	HP 8566A/ HP 8568A	available
R2	R2	Set Status Bit Enable	HP 8566A/ HP 8568A	available
R3	R3	Set Status Bit Enable	HP 8566A/ HP 8568A	available
R4	R4	Set Status Bit Enable	HP 8566A/ HP 8568A	available
RB	RB <numeric_value> HZ KHZ MHZ GHZ RB DN RB UP RB AUTO RB?	Resolution Bandwidth	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
RBR	RBR <numeric_value> RBR DN RBR UP RBR?	Resolution Bandwidth Ratio	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
RC1...6	RC1...6	Recall Last State	HP 8566A/ HP 8568A	available
RCLS	RCLS <numeric_value>	Recall State Register	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
RCLT	RCLT TRA TRB, <number>	Recall Trace	HP856xE/ HP8594E	available

Command	Supported subset	Function	Corresp. HP-Models	Status
RESET	RESET	Instrument preset	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
REV	REV REV?	Firmware revision	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
RL	RL <numeric_value> DB DM RL DN RL UP RL?	Reference Level	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
RLCAL	RLCAL <numeric_value> RL?	Reference Level Calibration	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
RCLOSCAL	RCLOSCAL	Recall Open/Short Average	HP 856xE/ HP 8594E	not available
RCLTHRU	RCLTHRU	Recall Thru	HP 856xE/ HP 8594E	not available
RLPOS ¹⁾	RLPOS <numeric_value> RLPOS DN RLPOS UP RLPOS?	Reference Level Position	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
ROFFSET	ROFFSET <numeric_value> DB DM ROFFSET?	Reference Level Offset	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
RQS	RQS	Service Request Bit mask	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
S1	S1	Continuous Sweep	HP 8566A/ HP 8568A	available
S2	S2	Single Sweep	HP 8566A/ HP 8568A	available
SADD		add a limit line segment	HP 856xE	available

Command	Supported subset	Function	Corresp. HP-Models	Status
SAVES	SAVES <numeric_value>	Save State Register	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
SAVET	SAVET TRA TRB,<number>	Save Trace	HP856xE/ HP8594E	available
SDEL		delete limit line segment	HP 856xE	available
SDON		limit line segment done	HP 856xE	available
SEDI		edit limit line segment	HP 856xE	available
SMOOTH	SMOOTH TRA TRB TRC, <number of points>	Smooth Trace	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
SNGLS	SNGLS	Single Sweep	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
SQUELCH ²⁾	SQUELCH <numeric_value> DM DB SQUELCH UP DN SQUELCH ON OFF	Squelch	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
SP	SP <numeric_value> HZ KHZ MHZ GHZ SP DN SP UP SP?	Span	HP 8566A/ HP 8568A/ HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
SRCNORM ¹⁾	SRCNORM ON OFF SRCNORM 1 0	Source Normalization	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	not available
SRCPOFS ¹⁾	SRCPOFS <numeric_value> DB DM SRCPOFS DN SRCPOFS UP SRCPOFS?	Source Power Offset	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	not available

Command	Supported subset	Function	Corresp. HP-Models	Status
SRCPWR ¹⁾	SRCPWR <numeric_value> DB DM SRCPWR DN SRCPWR UP SRCPWR ON SRCPWR OFF SRCPWR?	Source Power	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	not available
SS	SS <numeric_value> HZ KHZ MHZ GHZ SS DN SS UP SS AUTO SS?	CF Step Size	HP 8566A/ HP 8568A/ HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
ST	ST <numeric_value> US MS SC ST DN ST UP ST AUTO ST?	Sweep Time	HP 8566A/ HP 8568A/ HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
STB	STB	Status byte query	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
STOREOPEN	STOREOPEN	Store Open	HP 856xE/ HP 8594E	not available
STORESHORT	STORESHORT	Store Short	HP 856xE/ HP 8594E	not available
STORETHRU	STORETHRU	Store Thru	HP 856xE/ HP 8594E	not available
SUB		Subtract	HP 8566B/ HP 8568B/ HP 8594E	available
SUM		sum of trace amplitudes	HP 8566B/ HP 8568B/ HP 8594E	available
SV1...6	SV1...6	Save State	HP 8566A/ HP 8568A	available

Command	Supported subset	Function	Corresp. HP-Models	Status
SWPCPL ²⁾	SWPCPL SA SR SWPCPL?	Sweep Couple	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
SWPOUT ²⁾	SWPOUT FAV FAVA RAMP SWPOUT?	Sweep Output	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
T0	T0	Threshold off	HP 8566A/ HP 8568A	available
T1	T1	Free Run Trigger	HP 8566A/ HP 8568A	available
T2 ²⁾	T2	Line Trigger	HP 8566A/ HP 8568A	available
T3	T3	External Trigger	HP 8566A/ HP 8568A	available
T4	T4	Video Trigger	HP 8566A/ HP 8568A	available
TA	TA	Transfer A	HP 8566A/ HP 8568A	available
TACL	TACL?	Returns instantaneous measurement results. See TRACe<trace #>:IMMediate:LEVel? for full description.		not available
TBCL	TBCL?			
TCCL	TCCL?			
TACR	TACR?	Returns instantaneous measurement results. See TRACe<trace #>:IMMediate:LEVel? for full description.		not available
TBCR	TBCR?			
TCCR	TCCR?			
TB	TB	Transfer B	HP 8566A/ HP 8568A	available
TDF	TDF P TDF M TDF B TDF A TDF I	Trace Data Format	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available

Command	Supported subset	Function	Corresp. HP-Models	Status
TH	TH <numeric_value> DB DM TH DN TH UP TH ON TH OFF TH AUTO TH?	Threshold	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
THE	THE ON OFF	Threshold Line enable	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
TIMEDSP ¹⁾	TIMEDSP ON OFF TIMEDSP 1 0 TIMEDSP?	Time Display	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
TM	TM FREE VID EXT LINE ²⁾ TM?	Trigger Mode	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
TM LINE ²⁾	TM LINE	Trigger Line	HP 8566B	available
TRA	TRA B TRA A TRA I	Transfer A	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
TRB	TRB B TRB A TRB I	Transfer B	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
TRSTAT	TRSTAT?	Trace State Query	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
TS	TS	Take Sweep	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
UR ²⁾	UR	Plot Command	HP 8566A/ HP 8568A	available

Command	Supported subset	Function	Corresp. HP-Models	Status
VARDEF	VARDEF	Variable definition, arrays are not supported	HP 8566B/ HP 8568B/ HP 8594E	available
VAVG	VAVG VAVG TRA TRB TRC	Video Averaging	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
VB	VB <numeric_value> HZ KHZ MHZ GHZ VB DN VB UP VB AUTO VB?	Video Bandwidth	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
VBR ¹⁾	VBR <numeric_value> VBR DN VBR UP VBR?	Video Bandwidth Ratio	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
VIEW	VIEW TRA TRB TRC		HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
VTL	VTL <numeric_value> DB DM VTL DN VTL UP VTL?	Video Trigger Level	HP 856xE/ HP 8594E	not available
1) HP 8594E only				
2) Command is accepted without error message, but is ignored				

15.11.2.2 Special features of the syntax parsing algorithms for 8566A and 8568A models

The command syntax is very different for models A and B. Different names are assigned to identical instrument functions, and the command structure likewise differs considerably between models A and models B.

The command structure for models A is as follows:

```
<command> ::= <command
code> [<SPC>] [<data>|<step>] [<SPC>] [<delimiter>] [<command
code>]...<delimiter>
```

```
<data> ::= <Value> [<SPC>] [<units
code>] [<SPC>] [<delimiter>] [<SPC>] [<data>]...
```


$\langle \text{step} \rangle ::= \text{UP} | \text{DN}$

where

$\langle \text{command code} \rangle$ = see Table "Supported Commands"

$\langle \text{Value} \rangle$ = integer or floating-point numerical value

$\langle \text{units code} \rangle$ = DM | -DM | DB | HZ | KZ | MZ | GZ | MV | UV | SC | MS | US

$\langle \text{delimiter} \rangle$ = $\langle \text{CR} \rangle$ | $\langle \text{LF} \rangle$ | $\langle , \rangle$ | $\langle ; \rangle$ | $\langle \text{ETX} \rangle$

$\langle \text{SPC} \rangle$ = 32_{10}

$\langle \text{ETX} \rangle$ = 3_{10}

Command sections given in [] are optional.

The R&S EPL GPIB hardware differs from that used in the HP analyzers. Therefore, the following constraint exists:

$\langle \text{LF} \rangle$ | $\langle \text{EOI} \rangle$ are still used as delimiters since the GPIB hardware is able to identify them. The other delimiters are identified and evaluated during syntax analysis.

15.11.2.3 Special behavior of commands

Command	Known Differences
ABORT	Does not automatically set the command complete bit (bit 4) in the status byte. An additional DONE is required for that purpose.
ANNOT	Only frequency axis annotation is affected.
AT	AT DN/UP: Step size
CAL	The CAL commands do not automatically set the command complete bit (bit 4) in the status byte. An additional DONE command is required for that purpose.
CF	Default value, range, step size
CR	Default ratio Span/RBW
CT	Formula for coupled sweep time
CV	Default ratio RBW/VBW
DET	DET? returns SAMP instead of SMP on the R&S EPL. DET not automatically set the command complete bit (bit 4) in the status byte. An additional DONE is required for that purpose.
ERR?	Deletes the error bit in the status register but always returns a '0' in response.
FA	Default value, range, step size
FB	Default value, range, step size
ID	
M2	Default value, range, step size
M3	Default value, range, step size
MKACT	Only marker 1 is supported as the active marker.

Command	Known Differences
MKBW	Default value
MKPT	Step size
MKPX	Step size
OL?	Storage of instrument settings: 80 characters are returned as information on the instrument settings. The contents of the 80 characters returned does not correspond to the original data contents of the 8566A/8568A family.
OL	Readout of instrument settings: The 80 characters read by means of OL? are accepted as information on the corresponding instrument settings. The contents of the 80 characters read does not correspond to the original data contents of the 8566A/8568A family.
RB	Default value, range, step size
RL	Default value, step size
RLPOS	Adapts the position of the reference level even if the tracking generator normalization is not active.
RQS	Supported bits: 1 (Units key pressed) 2 (End of Sweep) 3 (Device error) 4 (Command complete) 5 (Illegal command)

15.11.2.4 Model-dependent default settings

If the GPIB language is switched over to an 85xx model, the GPIB address is automatically switched over to 18 provided that the default address of the R&S EPL (20) is still set. If a different value is set, this value is maintained. Upon return to SCPI, this address remains unchanged.

The following table shows the default settings obtained after a change of the GPIB language and for the commands IP, KST and RESET:

Model	# of Trace Points	Start Freq.	Stop Freq.	Ref Level	Input Coupling
8566A/B	1001	2 GHz	22 GHz	0 dBm	AC
8568A/B	1001	0 Hz	1.5 GHz	0 dBm	AC
8560E	601	0 Hz	2.9 GHz	0 dBm	AC
8561E	601	0 Hz	6.5 GHz	0 dBm	AC
8562E	601	0 Hz	13.2 GHz	0 dBm	AC
8563E	601	0 Hz	26.5 GHz	0 dBm	AC

Model	# of Trace Points	Start Freq.	Stop Freq.	Ref Level	Input Coupling
8564E	601	0 Hz	40 GHz	0 dBm	AC
8565E	601	0 Hz	50 GHz	0 dBm	AC
8594E	401	0 Hz	3 GHz	0 dBm	AC



Stop frequency

The stop frequency given in the table may be limited to the corresponding frequency range of the R&S EPL.

Command LF sets the stop frequency for 8566A/B to a maximum value of 2 GHz.

Test points (trace points)

The number of trace points is switched over only upon transition to the REMOTE state.

15.11.2.5 Data output formats

In the case of the SCPI and IEEE488.2 standards, the output formats for numerical data are flexible to a large extent. The output format for the HP units, by contrast, is accurately defined with respect to the number of digits. The memory areas for reading instrument data have therefore been adapted accordingly in the remote-control programs for instruments of this series.

Therefore, in response to a query, the R&S EPL returns data of the same structure as that used by the original instruments; this applies in particular to the number of characters returned.

Two formats are currently supported when trace data is output: Display Units (command O1) and physical values (command O2, O3 or TDF P). As to the "Display Units" format, the level data of the R&S EPL is converted to match the value range and the resolution of the 8566/8568 series. Upon transition to the **REMOTE** state, the R&S EPL is reconfigured such that the number of test points (trace points) corresponds to that of the 85xx families (1001 for 8566A/B and 8568A/B, 601 for 8560E to 8565E, 401 for 8594E).

15.11.2.6 Trace data output formats

All formats are supported for trace data output: display units (command O1), display units in two byte binary data (command O2 or TDF B and MDS W), display units in one byte binary data (command O4 or TDF B and MDS B) and physical values (commands O3 or TDF P). With format "display units" the level data is converted into value range and resolution of the 8566/8568 models. On transition to REMOTE state the number of trace points are reconfigured in order to be conform to the selected instrument model (1001 for 8566A/B and 8568 A/B, 601 for 8560E to 8565E, 401 for 8594E).

15.11.2.7 Trace data input formats

Trace data input is only supported for binary date (TDF B, TDF A, TDF I, MDS W, MDS B).

15.11.2.8 GPIB status reporting

The assignment of status bits by commands R1, R2, R3, R4, RQS is supported.

The STB command and the serial poll respond with an 8-bit value with the following assignment:

Bit enabled by RQS	Description
0	not used (value 0)
1	Units key pressed
2	End of Sweep
3	Device Error
4	Command Complete
5	Illegal Command
6	Service Request
7	not used (value 0)

Bits 0 and 7 are not used and always have the value 0.

Please note that the R&S EPL reports any key pressed on the front panel rather than only the unit keys if bit 1 was enabled.

Another difference is the behavior of bit 6 when using the STB? query. On the HP analyzers this bit monitors the state of the SRQ line on the bus. On the R&S EPL this is not possible. Therefore this bit is set, as soon as one of the bits 1 to 5 is set. It won't be reset by performing a serial poll.

15.12 Service request

The service request routine requires an extended initialization of the instrument in which the relevant bits of the transition and enable registers are set. In addition the service request event must be enabled in the VISA session.

15.12.1 Initiate service request

```
REM ---- Example of initialization of the SRQ in the case
' of errors -----
PUBLIC SUB SetupSRQ()
CALL InstrWrite (analyzer, "*CLS") 'Reset status reporting system
```

```

CALL InstrWrite (analyzer, "*SRE 168") 'Enable service request for
'STAT:OPER, STAT:QUES and ESR
'register
CALL InstrWrite (analyzer, "*ESE 60") 'Set event enable bit for
'command, execution, device-
'dependent and query error
CALL InstrWrite (analyzer, "STAT:OPER:ENAB 32767")
'Set OPERation enable bit for
'all events
CALL InstrWrite (analyzer, "STAT:OPER:PTR 32767")
'Set appropriate OPERation
'Ptransition bits
CALL InstrWrite (analyzer, "STAT:QUES:ENAB 32767")
'Set questionable enable bits
'for all events
CALL InstrWrite (analyzer, "STAT:QUES:PTR 32767")
'Set appropriate questionable
'Ptransition bits
CALL viEnableEvent(analyzer, VI_EVENT_SERVICE_REQ, VI_QUEUE, 0)
'Enable the event for service
'request
Status = viWaitOnEvent(analyzer, VI_EVENT_SERVICE_REQ, SRQWaitTimeout, VI_NULL,
VI_NULL)
IF (status = VI_SUCCESS) THEN CALL Srq
'If SRQ is recognized =>
'subroutine for evaluation
END SUB
REM *****

Private mbSession As MessageBasedSession

Sub Main()
    Console.WriteLine("Example of initialization      _
                        of the SRQ in the case of errors.")
    Dim SRQWaitTimeout = 4000 ' Timeout As Integer for WaitOnEvent
    'Opening session
    Try
        'Analyzer is alias, instead of using resource string.
        'For example on TCP use TCPIP0::192.168.1.2::inst0::INSTR
        mbSession = CType(ResourceManager.GetLocalManager().Open("Analyzer"), _
                        MessageBasedSession)
        mbSession.TerminationCharacterEnabled = True
    Try
        mbSession.Write("*CLS") 'Reset status reporting system
        mbSession.Write("*SRE 168") 'Enable service request for
        'STAT:OPER, STAT:QUES and ESR register
        mbSession.Write("*ESE 60") 'Set event enable bit for
        'command, execution, device-dependent and query error
        mbSession.Write("STAT:OPER:ENAB 32767")
        'Set OPERation enable bit for all events

```

```

mbSession.Write("STAT:OPER:PTR 32767")
' Set appropriate OPERATION Ptransition bits
mbSession.Write("STAT:QUES:ENAB 32767")
' Set questionable enable bits for all events
mbSession.Write("STAT:QUES:PTR 32767")
' Set appropriate questionable Ptransition bits
Console.WriteLine("Wait on event - Blocking")
mbSession.EnableEvent(MessageBasedSessionEventType.ServiceRequest, _
                        EventMechanism.Queue)

' Enable the event for service request

' -----
' Your command please use here
' mbSession.Write("Your command")
' -----

Dim Status = mbSession.WaitOnEvent( _
    MessageBasedSessionEventType.ServiceRequest, SRQWaitTimeout)
If (Status.EventType() = _
    MessageBasedSessionEventType.ServiceRequest) Then
    Console.WriteLine("SRQ is recognized")
    ' If SRQ is recognized => subroutine for evaluation
    Srq()
End If
Catch exp As Exception
    Console.WriteLine(exp.Message)
End Try
Catch exp As InvalidCastException
    Console.WriteLine("Resource selected must be a message-based session")
Catch exp As Exception
    Console.WriteLine(exp.Message)
End Try

' Close session
mbSession.Dispose()
' Wait for end
Console.WriteLine("Press any key to end")
Console.ReadKey()
End Sub

```

15.12.2 Waiting for the arrival of a service request

There are basically two methods of waiting for the arrival of a service request:

Blocking (user inputs not possible):

This method is appropriate if the waiting time until the event to be signaled by an SRQ is short (shorter than the selected timeout), if no response to user inputs is required

during the waiting time, and if – as the main criterion – the event is absolutely certain to occur.

Reason:

From the time the `viWaitOnEvent()` function is called until the occurrence of the expected event, it does not allow the program to respond to mouse clicks or key entries during the waiting time. Moreover, it returns an error if the SRQ event does not occur within the predefined timeout period.

The method is, therefore, in many cases not suitable for waiting for measurement results, especially when using triggered measurements.

The following function calls are required:

```
Status = viWaitOnEvent(analyzer, VI_EVENT_SERVICE_REQ, SRQWaitTimeout, VI_NULL,
    VI_NULL)
'Wait for service request user
'inputs are not possible during
'the waiting time!
IF (status = VI_SUCCESS) THEN CALL Srq
'If SRQ is recognized =>
'subroutine for evaluation

'----- Sweep in first Spectrum Tab and query marker -----
Dim Status = mbSession.WaitOnEvent( _
    MessageBasedSessionEventType.ServiceRequest, SRQWaitTimeout)
'Wait for service request user inputs are not possible
'during the waiting time!
If (Status.EventType() = MessageBasedSessionEventType.ServiceRequest) Then
'If SRQ is recognized => subroutine for evaluation
    Srq()
End If
```

Non-blocking (user inputs possible):

This method is recommended if the waiting time until the event to be signaled by an SRQ is long (longer than the selected timeout), and user inputs should be possible during the waiting time, or if the event is not certain to occur. This method is, therefore, the preferable choice for waiting for the end of measurements, i.e. the output of results, especially in the case of triggered measurements.

The method necessitates a waiting loop that checks the status of the SRQ line at regular intervals and returns control to the operating system during the time the expected event has not yet occurred. In this way, the system can respond to user inputs (mouse clicks, key entries) during the waiting time.

It is advisable to employ the `Hold()` auxiliary function, which returns control to the operating system for a selectable waiting time (see section [Waiting without blocking the keyboard and mouse](#)), so enabling user inputs during the waiting time.

```
result% = 0
For i = 1 To 10 'Abort after max. 10 loop
'iterations
```

```

Status = viWaitOnEvent(analyzer, VI_EVENT_SERVICE_REQ, VI_TMO_IMMEDIATE, VI_NULL,
    VI_NULL)
'Check event queue
If (status = VI_SUCCESS) Then
    result% = 1
    CALL Srq 'If SRQ is recognized =>
    'subroutine for evaluation
Else
    CALL Hold(20) 'Call hold function with
    '20 ms 'waiting time. User inputs
    'are possible.
Endif
Next i
If result% = 0 Then
    Debug.Print "Timeout Error; Program aborted" 'Output error message
    STOP 'Stop software
Endif

```

15.12.3 Waiting without blocking the keyboard and mouse

A frequent problem with remote control programs using Visual Basic is to insert waiting times without blocking the keyboard and the mouse.

If the program is to respond to user inputs also during a waiting time, control over the program events during this time must be returned to the operating system. In Visual Basic, this is done by calling the `DoEvents` function. This function causes keyboard-or mouse-triggered events to be executed by the associated elements. For example, it allows the operation of buttons and input fields while the user waits for an instrument setting to be completed.

The following programming example describes the `Hold()` function, which returns control to the operating system for the period of the waiting time selectable in milliseconds.

```

Rem *****
Rem The waiting function below expects the transfer of the desired
Rem waiting time in milliseconds. The keyboard and the mouse remain
Rem operative during the waiting period, thus allowing desired elements
Rem to be controlled
Rem *****
Public Sub Hold(delayTime As Single)
    Start = Timer 'Save timer count on calling the
    'function
    Do While Timer < Start + delayTime/1000 'Check timer count
    DoEvents 'Return control to operating
    'system to enable control of
    'desired elements as long as
    'timer has not elapsed
    Loop

```


End Sub

Rem *****

The waiting procedure is activated simply by calling Hold(<Waiting time in milliseconds>).

15.12.4 Service request routine

A service request is processed in the service request routine.



The variables userN% and userM% must be pre-assigned usefully!

```
REM ----- Service request routine -----
Public SUB Srq()
ON ERROR GOTO noDevice 'No user existing
CALL viReadSTB(analyzer, STB%) 'Serial poll, read status byte
IF STB% > 0 THEN 'This instrument has bits set in
'the STB
SRQFOUND% = 1
IF (STB% AND 16) > 0 THEN CALL Outputqueue
IF (STB% AND 4) > 0 THEN CALL ErrorQueueHandler
IF (STB% AND 8) > 0 THEN CALL Questionablestatus
IF (STB% AND 128) > 0 THEN CALL Operationstatus
IF (STB% AND 32) > 0 THEN CALL Esrread
END IF
noDevice:
END SUB 'End of SRQ routine
REM *****

REM ----- Subroutine for evaluation Service Request Routine -----

Public Sub Srq()
Try
Dim mySTB As Short = mbSession.ReadStatusByte()
'Serial poll, read status byte
Console.WriteLine("Reading Service Request Routine:" + mySTB.ToString())
If mySTB > 0 Then 'This instrument has bits set in the STB
If (mySTB And 16) > 0 Then Call Outputqueue()
If (mySTB And 4) > 0 Then Call ErrorQueueHandler()
If (mySTB And 8) > 0 Then Call Questionablestatus()
If (mySTB And 128) > 0 Then Call Operationstatus()
If (mySTB And 32) > 0 Then Call Esrread()
End If
Catch exp As Exception
Console.WriteLine(exp.Message)
End Try
End Sub 'End of SRQ routine
```

Reading out the status event registers, the output buffer and the error/event queue is effected in subroutines.

15.12.5 Reading out the output buffer

```
REM ----- Subroutine for the individual STB bits -----
Public SUB Outputqueue() 'Reading the output buffer
result$ = SPACE$(100) 'Make space for response
CALL InstrRead(analyzer, result$)
Debug.Print "Contents of Output Queue: "; result$
END SUB
REM *****

REM ----- Subroutine for the output queue -----
Public Sub Outputqueue() 'Reading the output buffer
    Try
        Dim result As String = mbSession.ReadString()
        Console.WriteLine("Contents of Output Queue:" + result)
    Catch exp As Exception
        Console.WriteLine(exp.Message)
    End Try
End Sub
```

15.12.6 Reading error messages

```
REM ----- Subroutine for reading the error queue -----
Public SUB ErrorQueueHandler()
ERROR$ = SPACE$(100) 'Make space for error variable
CALL InstrWrite (analyzer, "SYSTEM:ERROR?")
CALL InstrRead(analyzer, ERROR$)
Debug.Print "Error Description: "; ERROR$
END SUB
REM *****

REM ----- Subroutine for reading the error queue -----
Sub ErrorQueueHandler()
    Dim result As String
    Dim hasErr As Boolean = True
    Do
        mbSession.Write("SYST:ERR?")
        result = mbSession.ReadString()
        Dim parts As String() = result.Split(",")
        If parts(0) = 0 Then
            hasErr = False
            Console.WriteLine(result)
        Else
            Console.WriteLine(result)
        End If
    Loop
```

```

        Loop While hasErr
    End Sub

```

15.12.7 Evaluation of SCPI status registers

```

REM ----- Subroutine for evaluating Questionable Status Register -----
Public SUB Questionablestatus()
Ques$ = SPACE$(20)
'Preallocate blanks to text
'variable
CALL InstrWrite (analyzer, "STATus:QUESTionable:EVENT?")
CALL InstrRead(analyzer, Ques$)
Debug.Print "Questionable Status: "; Ques$
END SUB
REM *****
REM ----- Subroutine for evaluating Operation Status Register -----
Public SUB Operationstatus()
Oper$ = SPACE$(20) 'Preallocate blanks to text
'variable
CALL InstrWrite (analyzer, "STATus:OPERation:EVENT?")
CALL InstrRead(analyzer, Oper$)
Debug.Print "Operation Status: "; Oper$
END SUB
REM *****

REM ----- Subroutine for evaluating Questionable Status Register -----
Public Sub Questionablestatus()
    Dim myQSR As String = Nothing
    Try
        myQSR = mbSession.Query("STATus:QUESTionable:EVENT?") 'Read QSR
        Console.WriteLine("Questionable Status:" + myQSR)
    Catch exp As Exception
        Console.WriteLine(exp.Message)
    End Try
End Sub

REM ----- Subroutine for evaluating Operation Status Register -----
Public Sub Operationstatus()
    Dim myOSR As String = Nothing
    Try
        myOSR = mbSession.Query("STATus:OPERation:EVENT?") 'Read OSR
        Console.WriteLine("Operation Status:" + myOSR)
    Catch exp As Exception
        Console.WriteLine(exp.Message)
    End Try
End Sub

```

15.12.8 Evaluation of event status register

```

REM ----- Subroutine for evaluating the Event Status Register -----
Public SUB Esrread()
Esr$ = SPACE$(20) 'Preallocate blanks to text
'variable
CALL InstrWrite (analyzer, "*ESR?") 'Read ESR
CALL InstrRead(analyzer, Esr$)
IF (VAL(Esr$) AND 1) > 0 THEN Debug.Print "Operation complete"
IF (VAL(Esr$) AND 2) > 0 THEN Debug.Print "Request Control"
IF (VAL(Esr$) AND 4) > 0
THEN Debug.Print "Query Error"
IF (VAL(Esr$) AND 8) > 0
THEN Debug.Print "Device dependent error"
IF (VAL(Esr$) AND 16) > 0
THEN Debug.Print "Execution Error; Program aborted" 'Output error message
STOP 'Stop software
END IF
IF (VAL(Esr$) AND 32) > 0
THEN Debug.Print "Command Error; Program aborted" 'Output error message
STOP 'Stop software
END IF
IF (VAL(Esr$) AND 64) > 0 THEN Debug.Print "User request"
IF (VAL(Esr$) AND 128) > 0 THEN Debug.Print "Power on"END SUB
REM *****

REM ----- Subroutine for evaluating the Event Status Register -----
Public Sub Esrread()
    Try
        Dim myESR As Short = mbSession.Query("*ESR?") 'Read ESR
        If (myESR And 1) > 0 Then Console.WriteLine("Operation complete")
        If (myESR And 2) > 0 Then Console.WriteLine("Request Control")
        If (myESR And 4) > 0 Then Console.WriteLine("Query Error")
        If (myESR And 8) > 0 Then Console.WriteLine("Device dependent error")
        If (myESR And 16) > 0 Then
            Console.WriteLine("Execution Error; Program aborted") 'Output error message
            Stop 'Stop software
        End If
        If (myESR And 32) > 0 Then
            Console.WriteLine("Command Error; Program aborted") 'Output error message
            Stop 'Stop software
        End If
        If (myESR And 64) > 0 Then Console.WriteLine("User request")
        If (myESR And 128) > 0 Then Console.WriteLine("Power on")
    Catch exp As Exception
        Console.WriteLine(exp.Message)
    End Try
End Sub

```

16 Troubleshooting

If the results do not meet your expectations, the following sections may contain helpful hints and information.

- [Error information](#)..... 661
- [Error messages in remote control mode](#)..... 662
- [Troubleshooting remote operation](#)..... 663
- [Miscellaneous troubleshooting hints](#)..... 665
- [System recovery](#)..... 666
- [Collecting information for support](#)..... 667
- [Contacting customer support](#)..... 668

16.1 Error information

If errors or irregularities are detected, a keyword and an error message, if available, are displayed in the status bar.



Depending on the type of message, the status message is indicated in varying colors.

Table 16-1: Status bar information - color coding

Color	Type	Description
Red	Error	An error occurred at the start or during a measurement, e.g. due to missing data or wrong settings, so that the measurement cannot be started or completed correctly.
Orange	Warning	An irregular situation occurred during measurement, e.g. the settings no longer match the displayed results, or the connection to an external device was interrupted temporarily.
Gray	Information	Information on the status of individual processing steps.
No color	No errors	No message displayed - normal operation.
Green	Measurement successful	Some applications visualize that the measurement was successful by showing a message.



If any error information is available for a channel setup, an exclamation mark is displayed next to the channel setup name (■). This is particularly useful when the MultiView tab is displayed, as the status bar in the MultiView tab always displays the information for the currently selected measurement only.

Table 16-2: List of keywords

Keyword	Description	Bit in status register
"INPUT OVLD"	The signal level at the RF input connector exceeds the maximum. An additional 10dB is switched into the signal path. Opens a message box for the user to confirm.	STATUS:QUESTIONABLE:POWER, bit 3
"PROT OVLD"	The signal level at the RF input connector exceeds the maximum. The RF input is disconnected from the input mixer to protect the device. To re-enable measurement, decrease the level at the RF input connector and reconnect the RF input to the mixer input.	STATUS:QUESTIONABLE:POWER, bit 5
"RF OVLD"	Overload of the input mixer or of the analog IF path. • Increase the RF attenuation (for RF input). • Reduce the input level (for digital input)	STATUS:QUESTIONABLE:POWER, bit 0
"LO UNL"	Error in the instrument's frequency processing hardware was detected.	STAT:QUES:FREQUENCY, bit 1
"NO REF"	Instrument was set to an external reference but no signal was detected on the reference input.	STAT:QUES:FREQUENCY, bit 8
"UNCAL"	One of the following conditions applies: • Correction data has been switched off. • No correction values are available, for example after a firmware update. • Record the correction data by performing a self alignment	STATUS:QUESTIONABLE, bit 8
"WRONG_FW"	The firmware version is out-of-date and does not support the currently installed hardware. Until the firmware version is updated, this error message is displayed and self-alignment fails.	

16.2 Error messages in remote control mode

In remote control mode error messages are entered in the error/event queue of the status reporting system and can be queried with the command `SYSTEM:ERROR?`. The answer format of R&S EPL to the command is as follows:

```
<error code>, "<error text with queue query>; <remote control command concerned>"
```

The indication of the remote control command with prefixed semicolon is optional.

Example:

The command `TEST:COMMAND` generates the following answer to the query `SYSTEM:ERROR?`

```
-113, "Undefined header;TEST:COMMAND"
```

There are two types of error messages:

- Error messages defined by SCPI are marked by negative error codes. These messages are defined and described in the SCPI standard and not listed here.
- Device-specific error messages use positive error codes. These messages are described below.

Table 16-3: Device-specific error messages

Error code	Error text in the case of queue poll Error explanation
1052	Frontend LO is Unlocked This message is displayed when the phase regulation of the local oscillator fails in the RF front-end.
1060	Trigger-Block Gate Delay Error- gate length < Gate Delay This message is displayed when the gate signal length is not sufficient for the pull-in delay with a predefined gate delay.
1064	Tracking LO is Unlocked This message is displayed when the phase regulation of the local oscillator fails on the internal generator module.
2028	Hardcopy not possible during measurement sequence This message is displayed when a printout is started during scan sequences that cannot be interrupted. Such sequences are for example: • Recording the system error correction data (alignment) • Instrument self-test In such cases synchronization to the end of the scan sequence should be performed prior to starting the printout.
2033	Printer Not Available This message is displayed when the selected printer is not included in the list of available output devices. A possible cause is that the required printer driver is missing or incorrectly installed.
2034	CPU Temperature is too high This message is displayed when the temperature of the processor exceeds 70 °C.

16.3 Troubleshooting remote operation

If problems arise during measurement in remote operation, try the following methods to solve them.

Incompleted sequential commands - blocked remote channels

If a sequential command cannot be completed, for example because a triggered sweep never receives a trigger, the remote control program will never finish and the remote channel to the R&S EPL is blocked for further commands. In this case, you must interrupt processing on the remote channel in order to abort the measurement.

To regain control over a blocked remote channel

Usually, if you wait a minute for the VISA connection to detect the lost connection and clear the control channel by itself, you can then re-establish the connection again. If this fails, try the following:

1. Press "Local" on the front panel of the R&S EPL to return to manual operation (if not disabled). Then re-establish the connection.
2. Send a "Device Clear" command from the control instrument to the R&S EPL to clear all currently active remote channels. Depending on the used interface and protocol, send the following commands:
 - **Visa:** `viClear()`The remote channel currently processing the incompleted command is then ready to receive further commands again.
3. On the remote channel performing the measurement, send the SCPI command `ABORT` to abort the current measurement and reset the trigger system.
4. If the R&S EPL still does not react to the remote commands, switch it off and back on.

Ignored commands

When a remote command attempts to define incompatible settings, the command is ignored and the instrument status remains unchanged, i.e. other settings are not automatically adapted. Therefore, control programs should always define an initial instrument status (e.g. using the `*RST` command) and then implement the required settings.

Detecting false commands - log file

If a remote program does not provide the expected results and you are using a GPIB connection, you can log the commands and any errors that may occur. To activate the SCPI error log function, in the "Network + Remote" dialog box, in the "GPIB" tab, select "I/O Logging".

All remote control commands received by the R&S EPL are recorded in log files with the following syntax:

```
C:\Users\Public\Documents\Rohde-Schwarz\Analyzer\ScpiLogging\ScpiLog.<xx>
```

where <xx> is a consecutive number, starting with 00;

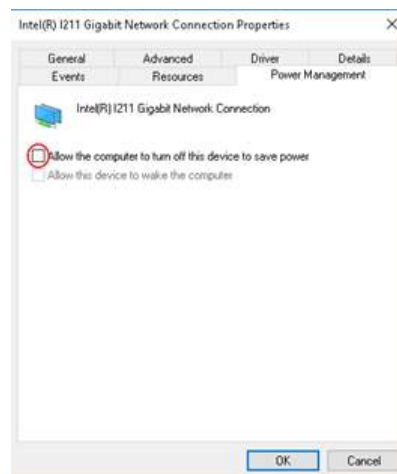
A new file is created each time you stop and restart the logging function. The lowest available number is used for the <xx> extension.

Logging the commands may be extremely useful for debug purposes, e.g. in order to find misspelled keywords in control programs. However, remember to turn off the logging function after debugging to avoid unnecessary access to the hard drive and use of storage space.

Interrupted VISA connection to R&S EPL

Sometimes, in combination with a certain LAN-switch (SMC Switch 210), the VISA remote connection to the R&S EPL is interrupted. In this case, disable the power save mode for the network controller on the R&S EPL.

1. On the R&S EPL, open the Windows "Start" menu.
2. Search for the network connection properties.
3. On the "Power Management" tab, disable the power save option.



16.4 Miscellaneous troubleshooting hints

Invalid trace display.....	665
Multiple user access to one instrument.....	665
Web browser access to instrument fails.....	666
The transducer factors/limit lines applied to my measurement are different to those displayed in the Transducer/Lines dialog box.....	666

Invalid trace display

If output to the [IF 2 GHz OUT] connector is activated, the measured values are no longer sent to the display; thus, the trace data currently displayed on the R&S EPL becomes invalid. A message in the status bar indicates this situation.

Multiple user access to one instrument

Using the R&S EPL's web browser interface, several users can access *and operate* the same instrument simultaneously. This is useful for troubleshooting or training purposes.

Type the instrument's host name or IP address in the address field of the browser on your PC, for example "http://10.113.10.203". The instrument home page (welcome page) opens.

Note: This function can be deactivated for the instrument. After a firmware update, it is automatically activated again.

Web browser access to instrument fails

If an error message ("Failed to connect to server (code. 1006)") is displayed in the web browser instead of the instrument's user interface then the LAN web browser interface was probably deactivated.

The transducer factors/limit lines applied to my measurement are different to those displayed in the Transducer/Lines dialog box

If a transducer file was in use when the save set was stored (with the save item "Current Settings" only) it is anticipated that these transducer values should remain valid after every recall of that save set. Thus, even if the transducer file is changed and the original save set file is recalled later, the *originally stored* transducer values are recalled and applied to the measurement. In the "Transducer" dialog box, however, the *changed* transducer file values are displayed as no updated transducer file was loaded.

The same applies to limit line settings.

If you want to apply the changed transducer values after recalling the save set you must force the application to reload the transducer file. To do so, simply open the "Edit Transducer" dialog box and toggle the "X-Axis" option from "Lin" to "Log" and back. Due to that change, the transducer file is automatically reloaded, and the changed transducer values are applied to the current measurement. Now you can create a new save set with the updated transducer values.

Similarly, if you want to apply the changed limit values after recalling the save set you must force the application to reload the limit file. To do so, simply open the "Edit Limit Line" dialog box (see [Section 11.5.2.2, "Limit line settings and functions"](#), on page 236) and toggle the "Y-Axis" unit. Due to that change, the limit line file is automatically reloaded, and the changed limit values are applied to the current measurement. Now a new save set with the updated limit values can be created.

16.5 System recovery

The system drive of the R&S EPL is delivered with a recovery partition that allows you to restore the original operating system image and firmware.

To restore the original operating system image and firmware

1. Press the "Windows" key on the front panel, or press the "Windows" key or the [CTRL] + [ESC] key combination on the (external) keyboard.



2. Open the Windows "Settings".
3. Select "Update & Security" > "Recovery".
4. In the "Advanced Startup" section, select "Restart Now".

The "R&S Recovery Environment" starts.

5. In the "R&S Recovery Environment", select "Factory Default Restore".

The default image is restored.

6. Reboot the instrument.

After the default image is restored, upgrade to the desired firmware version (see [Section 13.4.4, "Firmware updates"](#), on page 302).

16.6 Collecting information for support

If problems occur, the instrument generates error messages which in most cases will be sufficient for you to detect the cause of an error and find a remedy.

In addition, our customer support centers are there to assist you in solving any problems that you may encounter with your R&S EPL. We will find solutions more quickly and efficiently if you provide us with the information listed below.

- **Windows Event Log Files**

Windows records important actions of applications and the operating system in event logs. You can create event log files to summarize and save the existing event logs (see ["To create windows event log files"](#) on page 668).

- **System Configuration:** The "System Configuration" dialog box (in the "Setup" menu) provides information on:

- **Hardware Info:** hardware assemblies
- **Versions and Options:** the status of all software and hardware options installed on your instrument
- **System Messages:** messages on any errors that may have occurred

An .xml file with information on the system configuration ("Device Footprint") can be created automatically (using the `DIAGnostic:SERVICE:SINfo` command or as described in ["To collect the support information"](#) on page 667).

- **Error Log:** The `RSError.log` file (in the `C:\ProgramData\Rohde-Schwarz\ZNL-FPL\log` directory) contains a chronological record of errors.

- **Support file:** a *.zip file with important support information can be created automatically (in the `C:\ProgramData\Rohde-Schwarz\ZNL-FPL\user` directory). The *.zip file contains the system configuration information ("Device Footprint"), the current eeprom data and a screenshot of the screen display.

See also [Section 13.5.1, "R&S support information"](#), on page 305.

To collect the support information

1. Press [Setup].
2. Select "Service" > "R&S Support" and then "Create R&S Support Information".

The file is stored as

```
C:\Users\Public\Documents\Rohde-Schwarz\Analyzer\user\
<inst_model>_<serial-no>_<date_and_time>.zip
```

For example

```
C:\ProgramData\Rohde-Schwarz\ZNL-FPL\user\EPL1000__20220103_145113.zip
```

To create windows event log files



1. Select the "Windows Start Button" in the bottom left corner.
2. Enter *Event Viewer* and select "Enter".
3. Select and expand "Windows Logs" in the "Console Tree".
4. Right-click on each subsection and select "Save All Events As..."

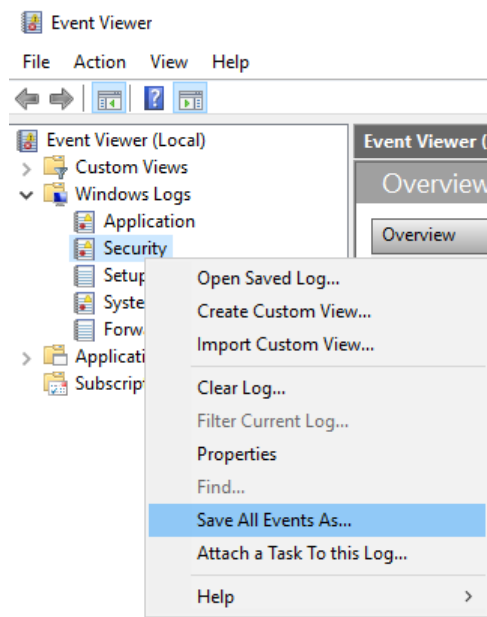


Figure 16-1: Event Viewer

5. Enter a file name and select "Save"

Collect the error information and log files and attach them to an email in which you describe the problem. Send the email to the customer support address for your region as described in [Section 16.7, "Contacting customer support"](#), on page 668.



Packing and transporting the instrument

If the instrument needs to be transported or shipped, observe the notes described in [Section 17.5, "Transporting"](#), on page 672.

16.7 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 16-2: QR code to the Rohde & Schwarz support page

17 Maintenance, storage, transport and disposal

We advise to check the nominal data from time to time.

Avoiding electrical and mechanical damage to the instrument

In addition to the recommendations provided in this section, also consider the information provided here:

- Instrument Health Guide, available from the product page on the Rohde & Schwarz website.
- Environmental conditions described in the instrument's Specifications document
- [Switching on or off on page 28](#)
- [Placing the R&S EPL on a bench top on page 23](#)
- [Considerations for test setup on page 37](#)
- [Connecting to RF coaxial connectors on page 29](#)
- [Basics on RF input on page 135](#)

17.1 Cleaning

How to clean the product is described in "[Cleaning the product](#)" on page 15.

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

17.2 Changing fuses

If the R&S EPL does not start, it is possible that a blown fuse is the cause. The fuse is located in the socket of the power supply.



1. **WARNING!** The fuse is part of the AC power supply. Handling the fuse while the power is on can lead to electric shock.

Before changing the fuse:

- a) Set the switch on the power supply to position [0].
- b) Disconnect the R&S EPL from the power source.

2. Pull out the fuse holder.
3. Check the condition of the fuse.
4. Replace the blown fuse. Only use a fuse of the specified type.
The fuse type and its characteristics are indicated next to the fuse holder.
5. Insert the fuse holder into the mains power inlet.

17.3 Handling batteries

Safe handling of batteries is described in ["Handling batteries safely"](#) on page 15. Maintenance information is provided here.

Keep the batteries clean and dry. If the terminals become soiled, clean them with a dry, clean cloth.

Charging batteries

Charge the battery before using it for the first time. Following a long storage period, it can be necessary to charge and discharge the battery several times to reach full capacity.

For details on charging batteries, see ["Charging batteries"](#) on page 27.

Storing batteries

Ideally, store the battery in the product and follow the instructions in [Section 17.4, "Storage"](#), on page 671. Otherwise, observe the following rules:

- Prevent short-circuiting of the batteries, which can happen if batteries touch each other or come into contact with metallic objects in the storage container. As storage container, you can use the product packaging.
- Do not expose to direct sunlight.
- Store the battery at room temperature.
- Store the battery at a state of charge between 50 % and 70 %.

17.4 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 document.

17.5 Transporting

Lifting and carrying

See:

- "Lifting and carrying the product" on page 13
- Section 5.1, "Lifting and carrying", on page 22.

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

The maximum transport altitude without pressure compensation is 4600 m above sea level.

17.6 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 17-1: 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 of 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 17-2: 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 15.

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