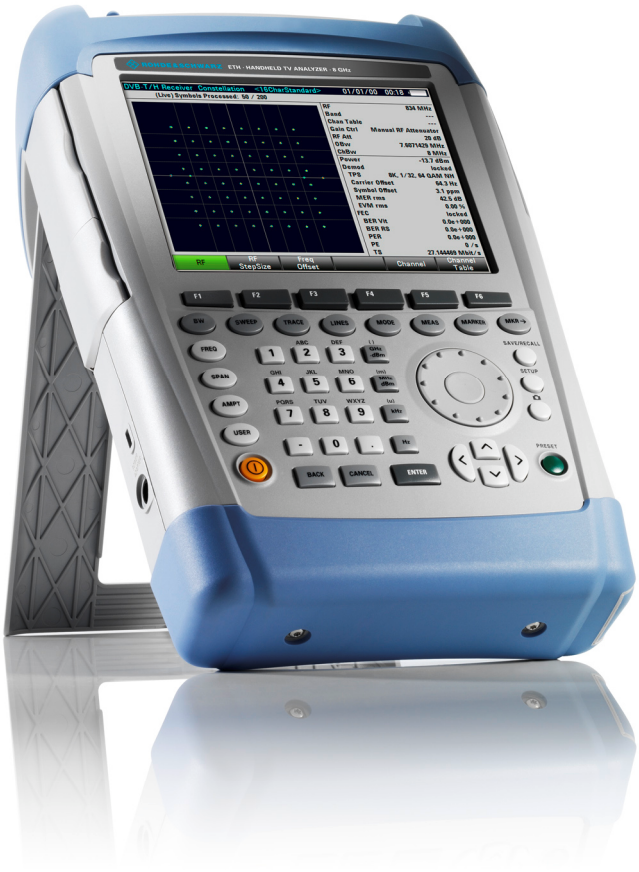
R&S®ETH-K40
Remote Control
Supplement



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Broadcasting

Supplement

ROHDE&SCHWARZ

The Supplement describes the following R&S® ETH-K40 option:

- 2114.1814.02

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Printed in the Netherlands – Subject to change – Data without tolerance limits is not binding.

The following abbreviations are used throughout this manual:
R&S® ETH is abbreviated as R&S ETH, R&S® ETL is abbreviated as R&S ETL
R&S® ETH-K40 is abbreviated as R&S ETH-K40

Table of Contents

1 Introduction

With the software application R&S ETH-K40 installed on the instrument, you can operate your R&S ETH using remote control. This manual provides all information necessary to remotely control the R&S ETH.

Enabling the Option

The Remote Control Option R&S ETH-K40 is enabled by entering a key code. The key code is based on the unique serial number of the instrument. To retrofit an option, enable it with a key code.

1. Press the SETUP key.
2. Press the INSTALLED OPTIONS softkey
3. Select INSTALL OPTION... under the OPTION ADMINISTRATION header.
4. Confirm with ENTER.

   An entry box in the lower right corner of the screen is displayed.
5. Type in the appropriate option key.
6. Confirm with ENTER.

If the correct key code is entered, the R&S ETH displays

Installation successful!

If an invalid key code is entered, the R&S ETH displays

Invalid key code!

2 Interfaces and Protocols

The R&S ETH supports two different interfaces for remote control.

- LAN Interface: The protocol is based on TCP/IP and supports the VXI-11 standard.
- USB Interface

The connectors are located at the side of the instrument and permit a connection to a controller for remote control via a local area network (LAN) or directly via USB.

SCPI

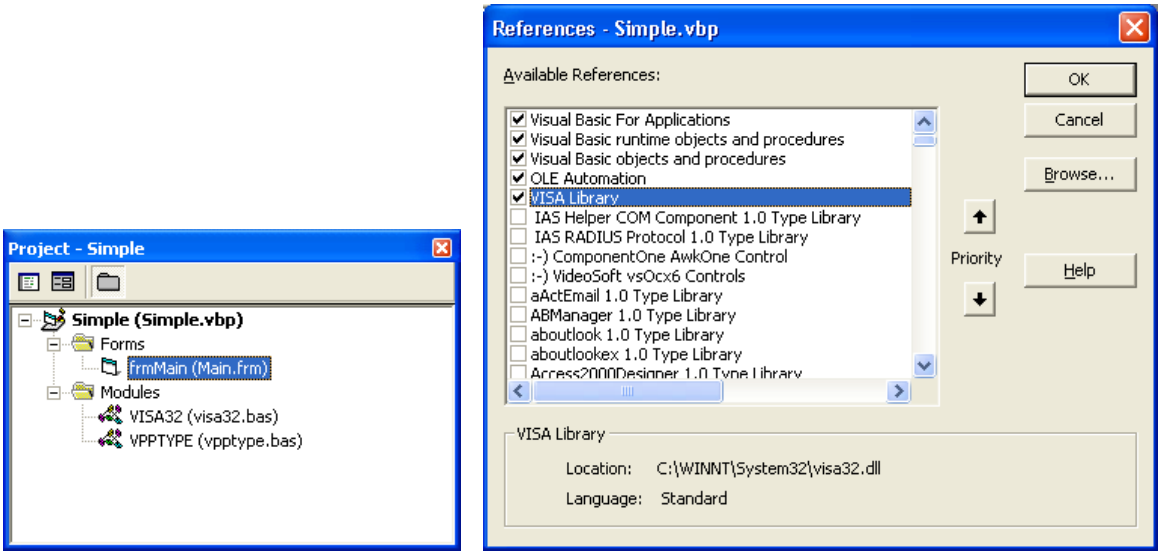
SCPI (Standard Commands for Programmable Instruments) commands - messages - are used for remote control. Commands that are not taken from the SCPI standard follow the SCPI syntax rules. The instrument supports the SCPI version 1999. The SCPI standard is based on standard IEEE 488.2 and aims at the standardization of device-specific commands, error handling and the status registers. The tutorial "Automatic Measurement Control - A tutorial on SCPI and IEEE 488.2" from John M. Pieper (R&S order number 0002.3536.00) offers detailed information on concepts and definitions of SCPI.

The requirements that the SCPI standard places on command syntax, error handling and configuration of the status registers are explained in detail in the following sections. Tables provide a fast overview of the bit assignment in the status registers. The tables are supplemented by a comprehensive description of the status registers.

VISA

VISA is a standardized software interface library providing input and output functions to communicate with instruments. The I/O channel (LAN or USB) is selected at initialization time by means of a channel-specific resource string. For more information about VISA refer to its user documentation.

The programming examples for remote control are all written in Microsoft® VISUAL BASIC®. Access to the VISA functions require the declaration of the functions and constants prior to their use in the project. This can be accomplished either by adding the modules VISA32.BAS and VPPTYPE.BAS or a reference to the VISA32.DLL to the project.



The modules visa32.bas and vpptype.bas can be found in the <VXIpnpPath>\WinNT\include (typically C:\VXIpnp\WinNt\include).

Manual operation is designed for maximum possible operating convenience. In contrast, the priority of remote control is the "predictability" of the device status. Therefore, control programs should always define an initial device status (e.g. with the `*RST` command) and then implement the required settings.

2.1 LAN Interface

To be integrated in a LAN, the instrument is equipped with a standard LAN interface, consisting of a connector, a network interface and protocols (VXI-11).

Instrument access via VXI-11 is usually achieved from high level programming platforms by using VISA as an intermediate abstraction layer. VISA encapsulates the low level VXI-11 (LAN) or USB function calls and thus makes the transport interface transparent for the user. The necessary VISA library is available as a separate product. For details contact your local R&S sales representative.

2.2 USB Interface

For remote control via the USB connection, the PC and the instrument must be connected via the USB interface. A USB connection requires the VISA library to be installed. VISA detects and configures the instrument automatically when the USB connection is established. You do not have to enter an address string or install a separate driver.

2.3 Protocols - VXI-11 Basics

The VXI-11 standard is based on the ONC-RPC protocol which in turn relies on TCP/IP as the network/transport layer. The TCP/IP network protocol and the associated network services are preconfigured. TCP/IP ensures connection-oriented communication, where the order of the exchanged messages is adhered to and interrupted links are identified. With this protocol, messages cannot be lost.

Remote control of an instrument via a network is based on standardized protocols which follow the OSI reference model (see Fig. below).

Application	SCPI
Presentation	XDR (VXI-11)
Session	ONC-RPC
Transport	TCP / UDP
Network	IP
Data Link	Ethernet/802.3
Physical	802.3/10BASE-T

Figure 1: Example for LAN remote control based on the OSI reference model

Based on TCP/UDP, messages between the controller and the instrument are exchanged via open network computing (ONC) - remote procedure calls (RPC). With XDR (VXI-11), legal RPC messages are known as VXI-11 standard. Based on this standard, messages are exchanged between the controller and the instrument. The messages are identical with SCPI commands. They can be organized in four groups:

- Program messages (control command to the instrument)
- Response messages (values returned by the instrument)
- Service request (spontaneous queries of the instrument)
- Low-level control messages (interface messages).

A VXI-11 link between a controller and an instrument uses three channels: core, abort and interrupt channel. Instrument control is mainly performed on the core channel (program, response and low-level control messages). The abort channel is used for immediate abort of the core channel; the interrupt channel transmits spontaneous service requests of the instrument. Link setup itself is very complex. For more details refer to the VXI-11 specification.

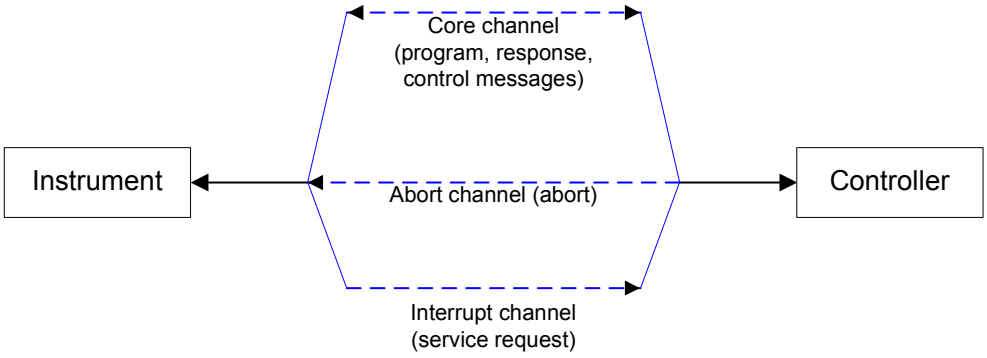


Figure 2: VXI-11 channels between instrument and controller

The number of controllers that can address an instrument is practically unlimited in the network. In the instrument, the individual controllers are clearly distinguished. This distinction continues up to the application level in the controller, i.e. two applications on a computer are identified by the instrument as two different controllers.

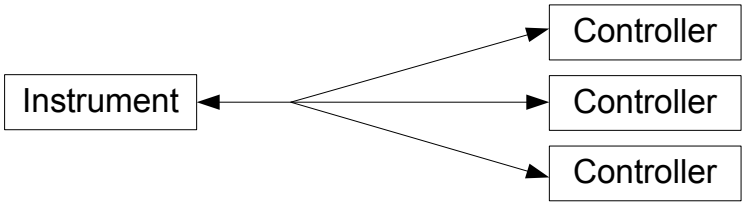


Figure 3: Remote control via LAN from several controllers

The controllers can lock and unlock the instrument for exclusive access. This regulates access to the instrument of several controllers.

3 Setting Up the Remote Control Connection

Preparing for Remote Control

The short and simple operating sequence below shows how to put the instrument into operation and quickly set its basic functions. The current IP address for LAN operation is shown in the SETUP – Instrument Setup Menu. In case of USB connection the IP address is fixed to 172.16.10.10..

For instructions on how to change the IP address, refer to the Quick Reference Guide.

1. Connect the instrument to the LAN or directly to the controller via USB.
2. Switch on the instruments.
3. Write and start the following program on the controller:

```
status = viOpenDefaultRM(defaultRM)          ' Open default resource manager
status = viOpen(DefaultRM,                   ' in case of USB connection
"TCPIP::172.16.10.10", 0, 0, vi)
Status = viopen(DefaultRM,                   'in case of a LAN connection, with
"TCPIP::xxx.xxx.xxx.xxx", 0, 0, vi)          xxx.xxx.xxx.xxx = IP address
Cmd = "*RST;*CLS"                            ' Reset instrument and clear status registers
status = viWrite(vi, Cmd, Len(Cmd),
retCount)
Cmd = "FREQ:CENT 100MHz"                     ' Set center frequency to 100 MHz
status = viWrite(vi, Cmd, Len(Cmd),
retCount)
Cmd = "FREQ:SPAN 10MHz"                      ' Set span to 10 MHz
status = viWrite(vi, Cmd, Len(Cmd),
retCount)
Cmd = "DISP:TRAC:Y:RLEV -10dBm"              ' Set reference level to -10 dBm
status = viWrite(vi, Cmd, Len(Cmd),
retCount)
viclose vi
viclose default RM
```

The instrument now performs a sweep in the frequency range of 95 MHz to 105 MHz.

Changing the IP Address

In order to operate the instrument via remote control, it must be accessed via LAN (IP address) or USB. If the factory-set remote control address does not fit in the network environment, it can be changed. For instructions on how to change the IP address, refer to the Quick Reference Guide.

4 Instrument Model and Command Processing

The block diagram in Fig. 1-2 shows how SCPI commands are serviced in the instrument. The individual components work independently and simultaneously. They communicate with each other by means of so-called "messages".

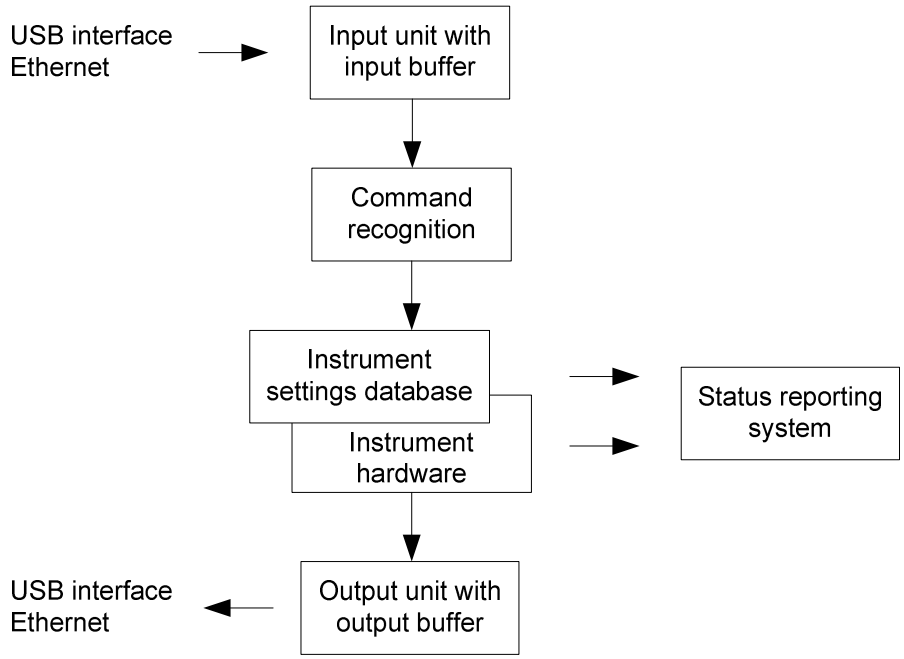


Figure 1: Instrument model in the case of remote control

Input unit

The input unit receives commands character by character from the controller and collects them in the input buffer. The input unit sends a message to the command recognition as soon as the input buffer is full or as soon as it receives a delimiter, <PROGRAM MESSAGE TERMINATOR>, as defined in IEEE 488.2, or the interface message DCL.

If the input buffer is full, the traffic is stopped and the data received up to then are processed. Subsequently the traffic is continued. If, however, the buffer is not yet full when receiving the delimiter, the input unit can already receive the next command during command recognition and execution. The receipt of DCL clears the input buffer and immediately resets the command recognition.

Command recognition

The command recognition analyses the data received from the input unit. It proceeds in the order in which it receives the data. Only DCL is serviced with priority, for example GET (Group Execute Trigger) is only executed after the commands received before. Each recognized command is immediately transferred to the internal instrument settings data base but not executed immediately.

The command recognition detects syntax errors in the commands and transfers them to the status reporting system. The rest of a program message after a syntax error is analyzed further if possible and serviced. After the syntax test, the value range of the parameter is checked, if required.

If the command recognition detects a delimiter, it passes the command to an execution unit that performs the instrument settings. In the meantime, the command recognition is ready to process new commands (overlapping execution). A DCL command is processed in the same way.

Data base and instrument hardware

Here the expression "instrument hardware" denotes the part of the instrument fulfilling the actual instrument function - signal generation, measurement etc. The controller is not included. The term "data base" denotes a database that manages all the parameters and associated settings required for setting the instrument hardware.

Setting commands lead to an alteration in the data set. The data set management enters the new values (e.g. frequency) into the data set, however, only passes them on to the hardware when requested by the command recognition. This only takes place at the end of a program message.

The data are checked for compatibility with the current instrument settings before they are transmitted to the instrument hardware. If the execution is not possible, an "execution error" is signaled to the status reporting system. The corresponding settings are discarded.

Before passing on the data to the hardware, the settling bit in the STATus:OPERation register is set (refer to section "STATus:OPERation Register"). The hardware executes the settings and resets the bit again as soon as the new state has settled. This fact can be used to synchronize command servicing.

Queries induce the data set management to send the desired data to the output unit.

Status reporting system

For detailed information refer to section "Status Reporting System".

Output unit

The output unit collects the information requested by the controller, which it receives from the data base management. It processes it according to the SCPI rules and makes it available in the output buffer.

If the instrument is addressed as a talker without the output buffer containing data or awaiting data from the data base management, the output unit sends error message "Query UNTERMINATED" to the status reporting system. No data are sent to the controller, the controller waits until it has reached its time limit. This behavior is defined by IEEE 488.2 and SCPI.

5 SCPI Command Structure and Syntax

SCPI (Standard Commands for Programmable Instruments) describes a standard command set for programming instruments, irrespective of the type of instrument or manufacturer. The goal of the SCPI consortium is to standardize the device-specific commands to a large extent. For this purpose, a model was developed which defines the same functions inside a device or for different devices. Command systems were generated which are assigned to these functions. Thus it is possible to address the same functions with identical commands. The command systems are of a hierarchical structure.

SCPI is based on standard IEEE 488.2, i.e. it uses the same syntactic basic elements as well as the common commands defined in this standard. Part of the syntax of the device responses is defined with greater restrictions than in standard IEEE 488.2 (see section "Responses to Queries").

Not all commands used in the following examples are implemented in the instrument.

5.1.1 Structure of a Command

The commands consist of a so-called header and, in most cases, one or more parameters. Header and parameter are separated by a "white space" (ASCII code 0 to 9, 11 to 32 decimal, e.g. blank). The headers may consist of several key words. Queries are formed by directly appending a question mark to the header.

5.1.1.1 Common commands

Common commands consist of a header preceded by an asterisk "*" and one or several parameters, if any.

Examples:

`*RST`	RESET, resets the device
`*ESE 253`	EVENT STATUS ENABLE, sets the bits of the event status enable register
`*ESR?`	EVENT STATUS QUERY, queries the contents of the event status register.

5.1.1.2 Device-Specific Commands

Hierarchy

Device-specific commands are of hierarchical structure (see Figure 1). The different levels are represented by combined headers. Headers of the highest level (root level) have only one key word. This key word denotes a complete command system.

Example

`SENSe`

This key word denotes the SENSe command system.

For commands of lower levels, the complete path has to be specified, starting on the left with the highest level, the individual key words being separated by a colon ":".

Example

`SENSe:FREQuency:SPAN 10MHZ`

This command lies in the third level of the SENSe system. It sets the frequency span.

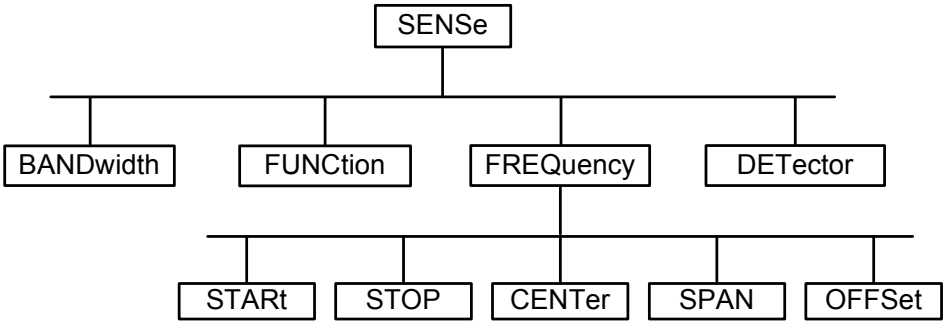


Figure 1: Tree structure the SCPI command systems using the SENSe system as example

Multiple key words

Some key words occur in several levels within one command system. Their effect depends on the structure of the command, i.e. at which position in the header of a command they are inserted.

Example

`SOURce:FM:POLarity NORMal`

This command contains key word POLarity in the third command level. It defines the polarity between modulator and modulation signal.

Example

`SOURce:FM:EXTernal:POLarity NORMal`

This command contains key word POLarity in the fourth command level. It defines the polarity between modulation voltage and the resulting direction of the modulation only for the external signal source indicated.

Optional key words

Some command systems permit certain key words to be inserted into the header or omitted. These key words are marked by square brackets in the description. The full command length must be recognized by the instrument for reasons of compatibility with the SCPI standard. Some commands are considerably shortened by these optional key words.

Example

`[SENSe]:BANDwidth[:RESolution]:AUTO`

This command couples the resolution bandwidth of the instrument to other parameters. The following command has the same effect:

`BANDwidth:AUTO`

Optional keywords with numeric suffixes

Do not omit an optional keyword if it includes a numeric suffix that is relevant for the effect of the command.

Example

`DISPlay[:WINDow<1...4>]:MAXimize <Boolean>`

Command `DISP:MAX ON` refers to window 1.

In order to refer to a window other than 1, you must include the optional `WINDow` parameter with the suffix for the required window.

`DISP:WIND2:MAX ON` refers to window 2.

Long and short form

The key words feature a long form and a short form. Either the short form or the long form can be entered, other abbreviations are not permitted.

Example

`STATus:QUEStionable:ENABle 1` is equivalent to `STAT:QUES:ENAB 1`

Upper-case and lower-case notation only serves to distinguish the two forms in the manual, the instrument itself does not distinguish upper-case and lower-case letters.

Parameter

The parameter must be separated from the header by a "white space". If several parameters are specified in a command, they are separated by a comma ",". A few queries permit the parameters MINimum, MAXimum and DEFault to be entered. Refer to "Parameters" for a detailed description of the various parameters.

Example

`SENSe:FREQuency:STOP? MAXimum`, Response: `3.5E9`

This query requests the maximal value for the stop frequency.

Special Characters

|	A vertical stroke in parameter definitions indicates alternative possibilities in the sense of "or". The effect of the command differs, depending on which parameter is used.
	Example
	`DISPlay:FORMat SINGle | SPLit`
	If parameter SINGle is selected, full screen is displayed, in the case of SPLit, split screen is displayed.
	A selection of key words with an identical effect exists for several commands. These keywords are indicated in the same line; they are separated by a vertical stroke. Only one of these keywords needs to be included in the header of the command. The effect of the command is independent of which of the keywords is used.
	Example
	`SENSe:BANDwidth|BWIDth[:RESolution]`
	The two following commands with identical meaning can be created. They set the frequency of the fixed frequency signal to 1 kHz:
	`SENSe:BAND 1`
	`SENSe:BWID 1`

[ ]	Key words in square brackets can be omitted when composing the header. The full command length must be accepted by the instrument for reasons of compatibility with the SCPI standards.
	Example
	`[SENSe:]BANDwidth|BWIDth[:RESolution]`
	`SENS:BAND:RES` is equivalent to `BAND`
	Parameters in square brackets can be incorporated optionally in the command or omitted as well.
	Example
	`MMEMory:NETWork:MAP <string>,<string>[,string>,<string>,<boolean>]`
	Entries in square brackets are optional or can be omitted.

{ }	Parameters in curly brackets are optional and can be inserted once or several times, or omitted.
	Example
	`SENSe:LIST:FREQuency <numeric_value>{,<numeric_value>}`
	The following are available commands:
	`SENS:LIST:FREQ 10`
	`SENS:LIST:FREQ 10,20`
	`SENS:LIST:FREQ 10,20,30,40`

Numeric suffix

If a device features several functions or features of the same kind, e.g. inputs, the desired function can be selected by a suffix added to the command. Entries without suffix are interpreted like entries with the suffix 1. Optional keywords must be specified if they select a function with the suffix.

Example

`SYSTem:COMMunicate:SERial2:BAUD 9600`

This command sets the baud rate of a second serial interface.

In case of remote control, suffix counting may differ from the numbers of the corresponding selection used in manual operation. SCPI prescribes that suffix counting starts with 1. Suffix 1 is the default state and used when no specific suffix is specified.

Some standards define a fixed numbering, starting with 0. With GSM, for instance, slots are counted from 0 to 7. In the case of remote control, the slots are selected with the suffixes 1 to 8. If the numbering differs in manual operation and remote control, it is indicated with the respective command.

5.1.2 Overview of Syntax Elements

The following table offers an overview of the syntax elements.

:	The colon separates the key words of a command. In a program message the separating semicolon marks the uppermost command level.
;	The semicolon separates two commands within a program message. It does not alter the path.
,	The comma separates several parameters of a command.
?	The question mark forms a query.
*	The asterisk marks a common command.
"	Quotation marks introduce a string and terminate it.
#	The hash symbol # introduces binary, octal, hexadecimal and block data. Binary: #B10110 Octal: #O7612 Hexa: #HF3A7 Block: #21312
	A "white space" (ASCII-Code 0 to 9, 11 to 32 decimal, e.g. blank) separates header and parameter.

5.1.3 Parameters

For most commands a parameter needs to be supplemented. The parameter has to be separated from the header by a "white space". Possible parameters are:

- Numeric values
- Special numeric values
- Boolean parameters
- Text
- Character strings
- Block data

The type of parameter required for each command and the allowed range of values are specified in the command description.

5.1.3.1 Numeric Values

Numeric values can be entered in any form, i.e. with sign, decimal point and exponent. Values exceeding the resolution of the instrument are rounded up or down. The mantissa may comprise up to 255 characters, the exponent must lie inside the value range -32000 to 32000. The exponent is introduced by an "E" or "e". Entry of the exponent alone is not permissible. In the case of physical quantities, the unit can be entered. Permissible unit prefixes are G (giga), MA (mega), (MOHM and MHZ are also possible), K (kilo), M (milli), U (micro) and N (nano). If the unit is missing, the basic unit is used.

Example

```
SENSe:FREQuency:STOP 1.5GHz = SENSe:FREQuency:STOP 1.5E9
```

5.1.3.2 Special Numeric Values

The texts MINimum, MAXimum, DEFault, UP and DOWN are interpreted as special numeric values. In case of a query, the numeric value is returned.

- MIN/MAX

  MINimum and MAXimum denote the minimum and maximum value.

- UP/DOWN

  UP, DOWN increases or reduces the numerical value by one step. The step width can be specified via an allocated step command for each parameter which can be set via UP, DOWN.

- INF/NINF

  INFinity, Negative INFinity (NINF) Negative INFinity (NINF) represent the numerical values -9.9E37 or 9.9E37, respectively. INF and NINF are only sent as device responses.

- NAN

  Not A Number (NAN) represents the value 9.91E37. NAN is only sent as device response. This value is not defined. Possible causes are the division of zero by zero, the subtraction of infinite from infinite and the representation of missing values.

  Example:

  Setting command: `SENSe:FREQuency:STOP MAXimum`

  `Query: SENSe:FREQuency:STOP?, Response: 3.6E9`

5.1.3.3 Boolean Parameters

Boolean parameters represent two states. The ON state (logically true) is represented by ON or a numerical value unequal to 0. The OFF state (logically untrue) is represented by OFF or the numerical value 0. The numerical values are provided as response for query.

Example

Setting command: `DISPlay:WINDow:STATe ON`

Query: `DISPlay:WINDow:STATe?, Response: 1`

5.1.3.4 Text

Text parameters observe the syntactic rules for key words, i.e. they can be entered using a short or long form. Like any parameter, they have to be separated from the header by a white space. In the case of a query, the short form of the text is provided.

Example

Setting command: `INPut:COUPling GROund`

Query: `INPut:COUPling?, Response: GRO`

5.1.3.5 Strings

Strings must always be entered in quotation marks (' or ").

Example

```
SYSTem:LANGuage "SCPI" or SYSTem:LANGuage 'SCPI'
```

5.1.3.6 Block data

Block data are a transmission format which is suitable for the transmission of large amounts of data. A command using a block data parameter has the following structure:

Example

```
HEADer:HEADer #45168xxxxxxxx
```

ASCII character # introduces the data block. The next number indicates how many of the following digits describe the length of the data block. In the example the 4 following digits indicate the length to be 5168 bytes. The data bytes follow. During the transmission of these data bytes all end or other control signs are ignored until all bytes are transmitted.

5.1.4 Structure of a Program Message

A program message may consist of one or several commands. It is terminated by the program message terminator which is the NL (New Line) character for LAN and USB connections.

Several commands in a program message must be separated by a semicolon ";". If the next command belongs to a different command system, the semicolon is followed by a colon. A colon ":" at the beginning of a command marks the root node of the command tree.

Example:

```
CALL InstrWrite(analyzer, "SENSe:FREQuency:CENTer
100MHz;:INPut:ATTenuation 10")
```

This program message contains two commands. The first one is part of the SENSe command system and is used to determine the center frequency of the instrument. The second one is part of the INPut command system and sets the input signal attenuation.

If the successive commands belong to the same system, having one or several levels in common, the program message can be abbreviated. For that purpose, the second command after the semicolon starts with the level that lies below the common levels (see also Fig. 1-1). The colon following the semicolon must be omitted in this case.

Example:

```
CALL InstrWrite(analyzer, "SENSe:FREQuency:STARt
1E6;:SENSe:FREQuency:STOP 1E9")
```

This program message is represented in its full length and contains two commands separated from each other by the semicolon. Both commands are part of the SENSe command system, subsystem FREQuency, i.e. they have two common levels.

When abbreviating the program message, the second command begins with the level below SENSe:FREQuency. The colon after the semicolon is omitted. The abbreviated form of the program message reads as follows:

```
CALL InstrWrite(analyzer, "SENSe:FREQuency:STARt 1E6;STOP 1E9")
```

However, a new program message always begins with the complete path.

Example:

```
CALL InstrWrite(analyzer, "SENSe:FREQuency:STARt 1E6")
CALL InstrWrite(analyzer, "SENSe:FREQuency:STOP 1E9")
```

5.1.5 Responses to Queries

A query is defined for each setting command unless explicitly specified otherwise. It is formed by adding a question mark to the associated setting command. According to SCPI, the responses to queries are partly subject to stricter rules than in standard IEEE 488.2.

- The requested parameter is transmitted without header.

  Example

  `INPut:COUPling?`, Response: DC

- Maximum values, minimum values and all further quantities, which are requested via a special text parameter are returned as numerical values.

  Example

  `SENSe:FREQuency:STOP? MAX`, Response: 3.5E9

- Numerical values are output without a unit. Physical quantities are referred to the basic units or to the units set using the Unit command.

  Example

  `SENSe:FREQuency:CENTer?`, Response: 1E6 (for 1 MHz)

- Truth values <Boolean values> are returned as 0 (for OFF) and 1 (for ON).

  Example

  `SENSe:BANDwidth:AUTO?`, Response: 1 (for ON)

- Text (character data) is returned in a short form.

  Example

  `SYSTem:COMMunicate:SERial:CONTrol:RTS?`, Response `STAN` (for standard)

6 Command Sequence and Command Synchronization

What has been said above makes clear that all commands can potentially be carried out overlapping. In order to prevent an overlapping execution of commands, one of the commands *OPC, *OPC? or *WAI must be used. All three commands cause a certain action only to be carried out after the hardware has been set. By suitable programming, the controller can be forced to wait for the respective action to occur (refer to Table 1).

Table 1: Synchronization using *OPC, *OPC? and *WAI

Command	Action	Programming the controller
*OPC	Sets the Operation Complete bit in the 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. This is only the case after the Operation Complete bit has been set in the ESR. This bit indicates that the previous setting has been completed.	Sending *OPC? directly after the command whose processing should be terminated before other commands can be executed.
*WAI	Stops further command processing until all commands sent before *WAI have been executed.	Sending *WAI directly after the command whose processing should be terminated before other commands are executed.

For a couple of commands the synchronization to the end of command execution is mandatory in order to obtain the desired result. The affected commands require either more than one measurement in order to accomplish the desired instrument setting (e.g. auto range functions), or they require a longer period of time for execution. If a new command is received during execution of the corresponding function this may either lead to an aborted measurement or to incorrect measurement data.

The following list includes the commands, for which a synchronization via *OPC, *OPC? or *WAI is mandatory:

Table 2: Commands with mandatory synchronization (overlapping commands)

Command	Purpose
`INIT`	start measurement (sweep)
`INIT:CONT OFF`	Set to single sweep
`CALC:MARK:FUNC:xx?`	All Marker function queries

7 Remote Commands Overview

The following chapters provide a detailed description of all remote control commands currently available for the R&S ETH and its firmware options.

Each section describes the commands for one of the operating modes available in the R&S ETH, beginning with the description of common commands required to operate the instrument. The structure is based on that of the Operating Manual.

- Common Commands
- Remote Commands in Spectrum Mode
- Remote Commands in Network Analyzer Mode
- Remote Commands in the Distance-to-Fault Mode
- Remote Commands in Power Meter Mode

Each section is subdivided into various tasks required to perform measurements with the R&S ETH, also based on the structure of the Operating Manual. Some commands like those for controlling markers or configuring the frequency axis are available for all operating modes. In that case you will find a list of these commands in the corresponding section. However, a detailed description is provided only in the analyzer commands section.

The spectrum analysis and network analysis modes are implemented in the basic unit. For the other modes, the corresponding options are required.

Following the remote control commands required to perform specific measurements, you will find a description of general commands used to set up and control basic instrument functions. These commands are independent of the operating mode. Therefore they are listed separately.

- Saving and Restoring Instrument Settings and Measurement Results
- Configuring the Instrument
- Remote Commands of the Status Reporting System

All chapters begin with a list of commands available in the context of that chapter. Following that list you will find a detailed description of all commands.

All individual descriptions contain:

- Complete notation and syntax of the command
- Description of the effects of the command
- List of all parameters available for that command
- Example of how a program message would look like
- *RST value
- Information on SCPI conformity

An alphabetical list of all available commands is provided at the end of this manual.

8 Common Commands

The common commands are taken from the IEEE 488.2 (IEC 625-2) standard. A particular command has the same effect on different devices. The headers of these commands consist of an asterisk "*" followed by three letters. Some of the common commands refer to the "Status Reporting System".

List of common commands

***CLS**

CLEAR STATUS sets the status byte (STB), the standard event register (ESR) and the EVENt part of the QUEStionable and the OPERation register to zero. The command does not alter the mask and transition parts of the registers. It clears the output buffer.

***ESE**

EVENT STATUS ENABLE sets the event status enable register to the value indicated. The query form `*ESE?` returns the contents of the event status enable register in decimal form.

Parameter

0 to 255

*ESR?

STANDARD EVENT STATUS QUERY returns the contents of the event status register in decimal form (0 to 255) and subsequently sets the register to zero.

Parameter

0 to 255

*IDN?

IDENTIFICATION QUERY queries the instrument identification.

You can change the format of the return values with the `SYSTem:FORMat:IDENt` command.

Return value (examples)

Example for R&S ETH:
Rohde&Schwarz,ETH,100005/014,3.00

ETH	device name
100005/014	serial number/model index
3.00	firmware version

*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 (see chapter " Command Structure and Syntax").

Parameter

0 | 1

*OPC

OPERATION COMPLETE sets bit 0 in the event status register after all preceding commands have been executed. This bit can be used to initiate a service request (see chapter " Command Structure and Syntax").

*OPT?

OPTION IDENTIFICATION QUERY queries the options included in the instrument and returns a list of the options installed. The options are separated from each other by means of commas.

Parameter

K<number> software options

For a list of all available options and their description refer to the CD-ROM.

Example

K40, K41, K42, K45

*RST

RESET sets the instrument to a defined default status. The command essentially corresponds to pressing the **PRESET** key. PRESET sets the R&S ETH to the default setup of the selected instrument mode. This allows you to enter a new configuration based on defined measurement parameters, without parameters from a previous setting still being inadvertently active.

*SRE

SERVICE REQUEST ENABLE sets the service request enable register to the indicated value. Bit 6 (MSS mask bit) remains 0. This command determines under which conditions a service request is generated. The query form `*SRE?` reads the contents of the service request enable register in decimal form. Bit 6 is always 0.

Parameter

0 to 255

*STB?

READ STATUS BYTE QUERY reads out the contents of the status byte in decimal form.

*TRG

TRIGGER initiates all actions in the currently active test screen expecting a trigger event. This command corresponds to the `INITiate:IMMediate` command. For details refer to the `INITiate[:IMMediate]`.

*TST?

SELF TEST QUERY initiates the self test of the instrument and outputs an error code in decimal form.

Parameter

0 = no error

*WAI

WAIT-to-CONTINUE permits servicing of subsequent commands only after all preceding commands have been executed and all signals have settled (see chapter " Command Structure and Syntax").

9 Remote Commands in TV Analyzer Mode

This section provides a detailed description of all remote control commands required to configure and perform measurements in TV Analyzer mode.

9.1 Configuring the TV Analyzer Measurements

The following commands configure the measurement functions of the TV Analyzer.

List of commands

- [SENSE:]DDEMod:LOOPs:SYMBol
- [SENSE:]DDEMod:TSOutput
- [SENSE:]DDEMod:BITStream:PRIority
- [SENSE:]DDEMod:SOPTimation
- [SENSE:]DDEMod:CADaption
- [SENSE:]DDEMod:FFT:WPOSitioning
- [SENSE:]DDEMod:FFT:WOFFset
- [SENSE:]DDEMod:FFT:WOFFset
- CALCulate<1|2>:AVERage:BERate:CLEar

INSTrument[:SELect]

This command selects the instrument mode of the R&S ETH.

Parameter

DVB	Selects the TV Analyzer mode
SANalyzer	Selects the Spectrum Analysis mode
NANalyzer	Selects the Network Analysis mode
DTF	Selects the Distance to Fault mode
PM	Selects the Power Meter mode

Example

```
INST DVB
```

Switches the instrument to TV Analyzer mode.

Characteristics

*RST value: DVB
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: yes

INSTrument:NSELect

This command switches between the measurement modes by means of numbers.

Parameter

1	TV Analyzer
2	Spectrum Analyzer
3	Network Analyzer
4	Distance-to-Fault
5	Power Meter

Example

```
INST:NSEL 1
```
Switches the instrument to TV Analyzer mode.

Characteristics

*RST value: 1
SCPI: conform
TV standard: all
Compatibility to R&S ETL: yes

SETup:TV:STANdard

This command selects the TV standard of the TV Analyzer. Prerequisite: the TV Analyzer instrument mode must be selected. The corresponding SW option key for the TV standard must be installed.

Parameter

DVBT	Selects the DVB-T/H TV standard
ISDBt	Selects ISDB-T the TV standard

Example

```
SET:TV:STAN ISDBT
```
Sets the TV Analyzer to TV standard ISDB-T.

Characteristics

*RST value: DVBT
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: yes

CONFigure:DTV:MEASurement

This command selects the measurement mode of the TV Analyzer. Prerequisite: the TV Analyzer instrument mode must be selected.

Parameter

LIST	Selects the Measurement List	equivalent to OVERview
OVERview	Selects the Measurement List	equivalent to LIST
CONS	Selects the Constellation Diagram	
EPATtern	Selects the Echo Pattern measurement	
MERK	Selects the MER(k) measurement	equivalent to MERFrequency
MERFrequency	Selects the MER(k) measurement	equivalent to MERK
DSPectrum	Selects the corresponding Spectrum measurement	

Example

```
CONF:DTV:MEAS CONS
```
Sets the measurement mode to constellation diagram.

Characteristics

*RST value: LIST
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: yes

DISPlay<1|2>[:WINDow]

This command defines the active viewer mode between Measurement List or Constellation Diagram and the TPS or TMCC screen. This command is available in the measurement modes Measurement List and Constellation Diagram.

Parameter

DVB	Selects the Measurement List or the Constellation Diagram screen.
TPS	Selects the TPS or TMCC screen.

Example

```
DISPLAY TPS
```
Sets the TPS screen.

Characteristics

*RST value: DVB
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

CALCulate<1|2>:DTV:PROFile:SELect

This command loads a measurement profile from a file with the name <file name> and applies its settings. The file is loaded from the current default directory if no path is set. The default directory can be set with the MMEMory:CDIRectory command.

This command is available in all TV Analyzer measurement modes.

Parameter

<string> = <file name>

Example

```
CALC:DTV:PROF:SEL 'DVB-T 8MHz'
```
Loads the measurement profile from the default directory with the name ‘DVB-T 8MHz’.

```
CALC:DTV:PROF:SEL '\Storage Card\Public\STANDARDS\DVB-T 8MHz'
```
Loads the measurement profile from the directory \SD card\public\standards\ with the name ‘DVB-T 8MHz’.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

CALCulate<1|2>:DTV:PROFile:SELect?

This command returns the file name and its description of the loaded measurement profile.

This command is an query and therefore has no *RST value.

Parameter

<string1>,<string2>

string1: “measurement profile file name”

string2: “measurement profile description”

Examples

```
CALC:DTV:PROFILE:SEL?
```
Reads the measurement profile file name and the measurement profile description.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: -

CALCulate<1|2>:DTV:PROFile:CHECk?

This command checks if the settings correspond to the loaded measurement profile. This command is available in all TV Analyzer measurement modes.

Return value

0	Settings do not correspond to the loaded measurement profile.
1	Settings correspond to the loaded measurement profile.

Example

```
CALCulate:DTV:PROFile:CHECK?
```
Checks the settings with the loaded measurement profile.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

[SENSE:]:DTV:BANDwidth:CHANnel

This command defines the channel bandwidth setting. The R&S ETH sets the correct OFDM bandwidth depending on the set channel bandwidth.

Parameter

5MHz or 5e6	5 MHz channel bandwidth
6MHz or 6e6	6 MHz channel bandwidth
7MHz or 7e6	7 MHz channel bandwidth
8MHz or 8e6	8 MHz channel bandwidth

Example

```
DTV:BAND:CHAN 7e6
```
Sets the channel bandwidth to 7 MHz

Characteristics

*RST value: 8e6
SCPI: device-specific
TV standard: DVB-T/H

[SENSE:]:DTV:BANDwidth:OFDM

This command sets the OFDM bandwidth with a resolution of 0.1 Hz.

Parameter

1.0E06 … 8.0E06 numeric value in exponential notation
1.0MHz … 8.0MHz

Example

```
SENSE:DTV:BANDWIDTH:OFDM 4.8E06
```
Sets the OFDM bandwidth to 4.8000000 MHz.

Characteristics

*RST value: 7.6071429E06
SCPI: device-specific
TV standard: DVB-T/H

[SENSE:]DDEMod:FECSync

This command defines if a locked FEC decoder is required for demodulator synchronization. This command is available in the measurement modes Measurement List, Constellation Diagram, Echo Pattern and MER(k).

Parameter

FEC	FEC decoder lock is required
NFEC	FEC decoder lock is not required

Example

```
DDEM:FECS NFEC
```
Sets the OFDM demodulator lock condition to FEC decoder lock is not required.

Characteristics

*RST value: FEC
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: yes

[SENSE:]DDEMod:LOOPs:SYMBol

This command defines the symbol loop setting. This command is available in the measurement modes Measurement List, Constellation Diagram, Echo Pattern and MER(k).

Parameter

HIGH | MEDium | LOW

Example

```
DDEMOD:LOOPS:SYMBOL HIGH
```

Sets the symbol loop bandwidth of the OFDM demodulator to high.

Characteristics

*RST value: MED
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: yes

[SENSE:]DDEMod:TSOutput

This command defines the bit stream priority setting in case of hierarchical modulation. Besides the BER measurement parameters also the TS output signal is controlled. This command is available in the Measurement List, Constellation Diagram, Echo Pattern and MER(k) measurement modes.

This command is equivalent to the `[SENSE:]DDEMod:BITStream:PRIority` command.

Parameter

HIGH | LOW

Example

```
DDEM:TSO LOW
```

The low priority bit stream will be demodulated in case of hierarchical modulation.

Characteristics

*RST value: HIGH
SCPI: device-specific
TV standard: DVB-T/H
Compatibility to R&S ETL: yes

[SENSE:]DDEMod:BITStream:PRIority

This command defines the bit stream priority setting in case of hierarchical modulation. Besides the BER measurement parameters also the TS output signal is controlled. This command is available in the Measurement List, Constellation Diagram, Echo Pattern and MER(k) measurement modes.

This command is equivalent to the `[SENSE:]DDEMod:TSOutput` command.

Parameter

HIGH | LOW

Example

```
DDEMOD:BITSTREAM LOW
```
The low priority bit stream will be demodulated in case of hierarchical modulation.

Characteristics

*RST value: HIGH
SCPI: device-specific
TV standard: DVB-T/H
Compatibility to R&S ETL: see `[SENSE:]DDEMod:TSOutput` command.

[SENSE:]DDEMod:SOPTimation

This command defines the channel adaptation setting. This command is available in the measurement modes Measurement List, Constellation Diagram, Echo Pattern and MER(k).

This command is equivalent to the `[SENSE:]DDEMod:CADaption` command.

Parameter

SLOW | MEDium | FAST

Example

```
DDEMOD:SOPT FAST
```
Sets the channel adaptation to fast adaptation.

Characteristics

*RST value: MED
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: yes

[SENSE:]DDEMod:CADaption

This command defines the channel adaptation setting. This command is available in the measurement modes Measurement List, Constellation Diagram, Echo Pattern and MER(k).

This command is equivalent to the `[SENSE:]DDEMod:SOPTimation` command.

Parameter

SLOW | MEDium | FAST

Example

```
DDEMOD:CAD FAST
```
Sets the channel adaptation to fast adaptation.

Characteristics

*RST value: MED
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: see `[SENSE:]DDEMod:SOPTimation` command.

[SENSE:]DDEMod:FFT:WPOSitioning

This command activates or deactivates the manual setting of the FFT Window for demodulation. The shift offset can be set with the `[SENSE:]DDEMod:FFT:WOFFset` command. This command is available in the Measurement List, Constellation Diagram, Echo Pattern and MER(k) measurement modes.

Parameter

AUTO | MANual

Example

```
DDEMOD:FFT:WPOS MAN
```
Sets the FFT window positioning to manual control.

Characteristics

*RST value: AUTO
SCPI: device-specific
TV standard: ISDB-T
Compatibility to R&S ETL: yes

[SENSE:]DDEMod:FFT:WOFFset

This command shifts the FFT Window position for demodulation additionally as far as half the length of the guard interval in both directions. Prerequisite: manual setting is activated by the `[SENSE:]DDEMod:FFT:WPOSitioning` command. This command is available in the Measurement List, Constellation Diagram, Echo Pattern and MER(k) measurement modes.

Parameter

-50 to +50

Example

```
DDEMOD:FFT:WOFF 10
```
Shifts the FFT window position by plus 10 % with respect to the main pulse.

Characteristics

*RST value: 0
SCPI: device-specific
TV standard: ISDB-T
Compatibility to R&S ETL: yes

CALCulate<1|2>:AVERage:BERate:CLEar

This command resets the BER measurements BER before Viterbi, BER before Reed Solomon and Packet Error Ratio. This command is available in the measurement modes Measurement List, Constellation Diagram, Echo Pattern and MER(k).

Parameter

None

Example

```
CALC:AVER:BER:CLE
```
Resets all BER measurements.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: yes

9.2 Configuring the Constellation Diagram Measurement

The following commands configure the Constellation Diagram measurement.

List of commands

- DISPlay[:WINDow]:TRACe:MODE
- DISPlay[:WINDow]:SELect:CONS:PCARriers
- CALCulate<1|2>:AVERage:SYMBol:COUNt
- CALCulate<1|2>:AVERage:TRACe:RESTart

DISPlay[:WINDow]:TRACe:MODE

This command sets the trace mode of the constellation diagram.

Parameter

FREeze | INFinite | WRIT

Example

```
DISP:WIND:TRAC:MODE INF
```
Freezes the constellation diagram screen.

Characteristics

*RST value: WRIT
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: -

DISPlay[:WINDow]:SELect:CONS:PCARriers

This command configures the display of the pilot carriers in the Constellation Diagram measurement.

Parameter

ON | OFF

Example

```
DISP:SEL:CONS:PCAR OFF
```
Hides the display of pilots in the constellation diagram screen.

Characteristics

*RST value: ON
SCPI: device-specific
TV standard: ISDB-T
Compatibility to R&S ETL: new

CALCulate<1|2>:AVERage:SYMBol:COUNt

This command defines the number of symbols that are shown on display in the trace mode Clear/Write.

Parameter

1 to 999 999 999

Example

```
CALC:AVER:SYMB:COUN 100
```
Sets the symbol counter to 100.

Characteristics

*RST value: 50
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: yes

CALCulate<1|2>:AVERage:TRACe:RESTart

This command clears all constellation samples from screen. It is only available in case the trace mode (DISPLAY:WINDOW:TRACE:MODE) is set to Clear/Write or Infinite.

Parameter

-

Example

```
CALCULATE:AVERAGE:TRACE:RESTART
```
Restarts the Constellation Diagram measurement.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

9.3 Configuring the Echo Pattern Measurement

The following commands configure the Echo Pattern measurement.

List of commands

- DISPlay: [WINDow<1|2>]:TRACe:X[:SCALe]:TRANge
- [SENSe]:DTV:EPATtern:ESPan
- DISPlay:DTV:EPATtern:ASPan
- DISPlay[:WINDow]:TRACe<1|2>]:X[:SCALe]:AUTO
- DISPlay[:WINDow<1|2>]:TRACe:X[:SCALe]:DIVision
- DISPlay:DTV:EPATtern:SPAN
- CALCulate<1|2>:DTV:UNIT:POWer:EPATern
- UNIT:DTV:EPAT:SPAN
- DISPlay[:WINDow<1|2>]:TRACe:X[:SCALe]:CENTer
- DISPlay:DTV:EPATtern:CPOSition
- DISPlay:DTV:EPATtern:MLISt
- DISPlay:DTV:EPATtern:PLISt
- DISPlay:DTV:EPATtern: PLISt:FREeze
- DISPlay:DTV:EPATtern:PLISt:THReshold
- DISPlay:DTV:EPATtern:TRACe
- DISPlay:DTV:EPATtern:MEMory
- DISPlay[:WINDow<1|2>]:MEASurement:EPATtern:THReshold:LINE:STATe
- DISPlay:DTV:EPATtern:DLINe
- DISPlay:DTV: EPATtern: PLISt:TLINe

DISPlay: [WINDow<1|2>]:TRACe:X[:SCALe]:TRANge

This command sets the x-span to extended mode. This command is available in the measurement mode Echo Pattern. This command is equivalent to the `[SENSe]:DTV:EPATtern:ESPan` command.

Parameter

NORMal | EXTended

Example

```
DISP:TRACE:X:TRAN EXT
```
Sets the span mode to extended mode.

Characteristics

*RST value: OFF
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: yes

[SENSe]:DTV:EPATtern:ESPan

This command sets the x-span to extended mode. This command is equivalent to the `DISPlay[:WINDow]:TRACe<1|2>]:X[:SCALe]:AUTO` command.

Parameter

ON | OFF

Example

```
DTV:EPAT:ESPAN ON
```
Sets the span mode to extended mode.

Characteristics

*RST value: OFF
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: see command

DISPlay:DTV:EPATtern:ASPan

This command sets the span to Auto Span or to Manual Span. This command is equivalent to the `DISPlay[:WINDow]:TRACe<1|2>]:X[:SCALe]:AUTO` command.

Parameter

ON | OFF

Example

```
DISPLAY:DTV:EPATTERN:ASPAN OFF
```
Sets the span to Manual Span.

Characteristics

*RST value: ON
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: see `DISPlay[:WINDow]:TRACe<1|2>]:X[:SCALe]:AUTO` command.

DISPlay[:WINDow]:TRACe<1|2>]:X[:SCALe]:AUTO

This command sets the span to Auto Span or to Manual Span.

This command is equivalent to the `DISPlay:DTV:EPATtern:ASPan` command.

Parameter

ON | OFF or 0 | 1

Example

```
DISPLAY:TRACE:X:AUTO OFF
```
Sets the span to Manual Span.

Characteristics

*RST value: ON
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: yes

DISPlay[:WINDow<1|2>]:TRACe:X[:SCALe]:DIVision

This command sets the x-scale per division. In total always 10 divisions (grids) are displayed. The Auto Span mode must be switched off before, see `DISPlay:DTV:EPATtern:ASPan`. The value is referred to the selected span unit.

This command is equivalent to the `DISPlay:DTV:EPATtern:SPAN` command.

Parameter

0.5e-6 to 200e-6	0.5 to 200 µs/div in case of span unit ‘µs is selected.
100 to 500e3	1 to 5000 km in case of span unit ‘km’ is selected.
1 to 2000	1 to 2000 miles in case of span unit ‘miles’ is selected.

Example

```
DISPLAY:TRACE:X:DIV 50
```
Sets the span to 500 µs in case of the span unit ‘µs’ is selected.

Characteristics

*RST value: SEC
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: yes

DISPlay:DTV:EPATtern:SPAN

This command sets the span of the echo pattern measurement in case of manual span is selected. The span can be set in 1-2-5 steps. The Auto Span mode must be switched off before, see `DISPlay:DTV:EPATtern:ASPan`. The value is referred to the selected span unit.

This command is equivalent to the `DISPlay[:WINDow<1|2>]:TRACe:X[:SCALe]:DIVision` command.

Parameter

5 to 10000	5 to 10000 µs in case of span unit 'µs is selected.
1 to 5000	1 to 5000 km in case of span unit 'km' is selected.
1 to 2000	1 to 2000 miles in case of span unit 'miles' is selected.

Example

```
DISP:DTV:EPAT:SPAN 500
```
Sets the span to 500 µs in case of the span unit 'µs' is selected.

Characteristics

*RST value: - (Auto Span)
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: see command

CALCulate<1|2>:DTV:UNIT:POWer:EPATern

This command sets the x-span unit of the echo pattern measurement.

This command is equivalent to the `UNIT:DTV:EPAT:SPAN` command.

Parameter

S | M | MILE

Example

```
CALC:DTV:UNIT:POW:EPAT M
```
Sets the span unit to meter.

Characteristics

*RST value: - (Auto Span)
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: yes

UNIT:DTV:EPAT:SPAN

This command sets the x-span unit of the echo pattern measurement.

This command is equivalent to the `CALCulate<1|2>:DTV:UNIT:POWer:EPATern` command.

Parameter

SEC | MET | MILE

Example

```
UNIT:DTV:EPAT:SPAN MET
```
Sets the span unit to meter.

Characteristics

*RST value: SEC
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: see `CALCulate<1|2>:DTV:UNIT:POWer:EPATern` command.

DISPlay[:WINDow<1|2>]:TRACe:X[:SCALe]:CENTer

This command sets the center position of the x-scale. The span must be set to manual span before, see `DISPlay:DTV:EPATtern:ASPan` command. The value is referred to the selected span unit.

This command is equivalent to the `DISPlay:DTV:EPATtern:CPOSition` command.

Parameter

-0.002 to 0.002	-0.002 to 0.002 s in case of span unit ‘µs is selected.
-600e3 to 600e3	-600 to 600 km in case of span unit ‘km’ is selected.
-372.823 to 372.823	-372.823 to 372.823 miles in case of span unit ‘miles’ is selected.

Example

```
DISPlAY:TRACE:X:CENTER 0
```
Sets the center position to 0.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: yes

DISPlay:DTV:EPATtern:CPOSition

This command sets the center position of the x-scale. The span must be set to manual span before, see `DISPlay:DTV:EPATtern:ASPan` command. The value is referred to the selected span unit.

This command is equivalent to the `DISPlay[:WINDow<1|2>]:TRACe:X[:SCALe]:CENTer` command.

Parameter

-2000 to 2000	-2 to 2000 µs in case of span unit ‘µs is selected.
-600 to 600	-600 to 600 km in case of span unit ‘km’ is selected.
-372.823 to 372.823	-372.823 to 372.823 miles in case of span unit ‘miles’ is selected.

Example

```
DISPlay:DTV:EPATTERN:CPOSITION 0
```
Sets the center position to 0.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: see `DISPlay[:WINDow<1|2>]:TRACe:X[:SCALe]:CENTer` command.

DISPlay:DTV:EPATtern:MLISt

This command activates or deactivates the marker list in the echo pattern measurement.

Parameter

ON | OFF or 0 | 1

Example

```
DISP:DTV:EPAT:MLIST ON
```
Displays the marker list.

Characteristics

*RST value: ON
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

DISPlay:DTV:EPATtern:PLISt

This command selects the echo pattern peak list or the echo pattern diagram.

Parameter

ON | OFF or 0 | 1

Example

```
DISP:DTV:EPAT:PLIST ON
```
Displays the echo peak list.

Characteristics

*RST value: OFF
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

DISPlay:DTV:EPATtern: PLISt:FREeze

This command freezes the echo pattern peak list. The Peak List is frozen independent from the measurement screen selection Echo Pattern Diagram or Echo Pattern Peak List.

Parameter

ON | OFF or 0 | 1

Example

```
DISP:DTV:EPAT:PLIST:FREEZE ON
```

Freezes the echo peak list.

Characteristics

*RST value: OFF
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

DISPlay:DTV:EPATtern:PLISt:THReshold

This command defines the threshold value in dB for the echo pattern peak list.

Parameter

-50 to 0	Values are interpreted as dB values.
-50DB to 0DB	

Example

```
DISPlay:DTV:EPATtern:PLIST:THRESHOLD -30DB
```

Defines the echo peak list threshold value to -30 dB.

Characteristics

*RST value: OFF
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

DISPlay:DTV:EPATtern:TRACe

This command switches the trace on or off.

Parameter

ON | OFF or 0 | 1

Example

```
DISP:DTV:EPAT:TRACE ON
```

Displays the trace.

Characteristics

*RST value: ON
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

DISPlay:DTV:EPATtern:MEMory

This command switches the memory trace on or off.

Parameter

ON | OFF or 0 | 1

Example

```
DISP:DTV:EPAT:MEMORY ON
```
Displays the memory trace.

Characteristics

*RST value: OFF
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

DISPlay[:WINDow<1|2>]:MEASurement:EPATtern:THReshold:LINE:STATe

This command switches the Echo Detection Threshold Line on or off. Threshold Line on or off. This command is equivalent to the `DISPlay:DTV:EPATtern:DLINe` command.

Parameter

ON | OFF or 0 | 1

Example

```
DISP:MEAS:EPAT:THR:LINE:STATE OFF
```
Switches off the Echo Detection Threshold Line.

Characteristics

*RST value: ON
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: yes

DISPlay:DTV:EPATtern:DLINe

This command switches the Echo Detection Threshold Line on or off. This command is equivalent to the `DISPlay[:WINDow<1|2>]:MEASurement:EPATtern:THReshold:LINE:STATe` command.

Parameter

ON | OFF or 0 | 1

Example

```
DISP:DTV:EPAT:DLINE OFF
```
Switches off the Echo Detection Threshold Line.

Characteristics

*RST value: ON
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: see
`DISPlay[:WINDow<1|2>]:MEASurement:EPATtern:THReshold:LINE:STATe` command.

DISPlay:DTV: EPATtern: PLISt:TLINe

This command displays the echo pattern peak list threshold line.

Parameter

ON | OFF or 0 | 1

Example

```
DISP:DTV:EPAT:PLIST:TLINE ON
```
Displays the echo peak list threshold line.

Characteristics

*RST value: OFF
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

9.4 Configuring the MER(k) Measurement

The following commands configure the MER(k) measurement.

List of commands

- DISPlay:DTV:MERK:MLISt
- DISPlay:DTV:MERK:RANGe
- DISPlay:DTV:MERK:REFerence
- [SENSe:]DTV:MERK:DETector
- DISPlay:DTV:MERK:TRACe:MODe
- DISPlay:DTV:MERK:TRACe:VIEW
- DISPlay:DTV:MERK:TRACe
- DISPlay:DTV:MERK:MEMory

DISPlay:DTV:MERK:MLISt

This command switches the marker list on or off.

Parameter

ON | OFF or 0 | 1

Example

```
DISP:DTV:MERK:MLIST ON
```

Displays the marker list.

Characteristics

*RST value: ON
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

DISPlay:DTV:MERK:RANGe

This command sets the MER range of the MER(k) diagram.

Parameter

10 | 20| 50

Example

```
DISP:DTV:MERK:RANGE 50
```

Sets the MER range to 50 dB.

Characteristics

*RST value: 50 dB
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

DISPlay:DTV:MERK:REFerence

This command sets the MER reference which is the uppermost grid line of the MER(k) diagram.

Parameter

0 to 50

Example

```
DISP:DTV:MERK:RANGE 50
```

Sets the MER reference to 50 dB.

Characteristics

*RST value: 50 dB
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

[SENSe:]DTV:MERK:DETector

This command sets the trace detector.

Parameter

APEak | NEGative | POSitive | RMS

Example

```
DTV:MERK:DETECTOR RMS
```

Sets the trace detector to rms.

Characteristics

*RST value: RMS
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

DISPlay:DTV:MERK:TRACe:MODe

This command sets the trace mode.

Parameter

WRITe | MAXHold | MINHold

Example

```
DISP:DTV:MERK:TRACE:MODE MINH
```

Sets the trace mode to min hold.

Characteristics

*RST value: WRITe
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

DISPlay:DTV:MERK:TRACe:VIEW

This command freezes the actual trace.

Parameter

ON | OFF or 0 | 1

Example

```
DISP:DTV:MERK:TRACE:VIEW ON
```

Freezes the actual trace.

Characteristics

*RST value: OFF
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

DISPlay:DTV:MERK:TRACe

This command switches the trace on or off.

Parameter

ON | OFF or 0 | 1

Example

```
DISP:DTV:MERK:TRACE ON
```
Displays the trace.

Characteristics

*RST value: ON
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

DISPlay:DTV:MERK:MEMory

This command switches the memory trace on or off.

Parameter

ON | OFF or 0 | 1

Example

```
DISP:DTV:MERK:MEMORY ON
```
Displays the memory trace.

Characteristics

*RST value: OFF
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

9.5 Configuring the Spectrum Measurement

Besides the frequency and channel bandwidth settings the same commands are available as described in chapter "Remote Commands in Spectrum Mode".

For setting the frequency parameters, see chapter "Setting the Frequency".

For setting the channel bandwidth, see `[SENSE:]:DTV:BANDwidth:CHANnel` command.

For setting the OFDM bandwidth, see [SENSE:]:DTV:BANDwidth:OFDM command.

9.6 Using Measurement Functions

The following commands describe the using of the measurement functions of the DVB-T/H Receiver mode.

List of commands

- CALCulate:DTV:RESult:DEMod:SYNC?
- CALCulate:DTV:RESult:DMOD:SYNC?
- CALCulate:DTV:RESult:MPEG:SYNC?
- CALCulate:DTV:RESult:FEC:SYNC?
- CALCulate:DTV:RESult?
- CALCulate<1|2>:DTV:RESult:A|B|C?
- CALCulate:DTV:RESult:TPS?
- CALCulate:DTV:RESult:TMCC?
- CALCulate:DTV:RESult:TMCC:A | B | C?
- CALCulate:DTV:RESult:DSPectrum?

CALCulate:DTV:RESult:DEMod:SYNC?

This command reads the status of the OFDM demodulator of the DVB-T/H Receiver. This command is a query and therefore has no *RST value.

This command is equivalent to the `CALCulate:DTV:RESult:DMOD:SYNC?` command.

Return value

SYNC	The OFDM demodulator is locked.
NSYN	The OFDM demodulator is unlocked.

Example:

```
CALC:DTV:RESULT:DEMOD:SYNC?
```

Queries the OFDM demodulator status.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: yes

CALCulate:DTV:RESult:DMOD:SYNC?

This command reads the status of the OFDM demodulator of the DVB-T/H Receiver. This command is a query and therefore has no *RST value.

This command is equivalent to the `CALCulate:DTV:RESult:DEMod:SYNC?` command.

Return value

SYNC	The OFDM demodulator is locked.
NSYN	The OFDM demodulator is unlocked.

Example:

`CALC:DTV:RESULT:DMOD:SYNC?`
Queries the OFDM demodulator status.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: see `CALCulate:DTV:RESult:DEMod:SYNC?` command.

CALCulate:DTV:RESult:MPEG:SYNC?

This command reads the status of the FEC decoder of the DVB-T/H Receiver. This command is a query and therefore has no *RST value.

This command is equivalent to the `CALCulate:DTV:RESult:FEC:SYNC?` command.

Return value

1	The FEC decoder is locked.
0	The FEC decoder is unlocked.

Example:

`CALC:DTV:RESULT:FEC:SYNC?`
Queries the FEC decoder status.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: yes

CALCulate:DTV:RESult:FEC:SYNC?

This command reads the status of the FEC decoder of the DVB-T/H Receiver. This command is a query and therefore has no *RST value.

This command is equivalent to the `CALCulate:DTV:RESult:MPEG:SYNC?` command.

Return value

SYNC	The FEC decoder is locked.
NSYN	The FEC decoder is unlocked.

Example:

`CALC:DTV:RESULT:FEC:SYNC?`
Queries the FEC decoder status.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: see `CALCulate:DTV:RESult:MPEG:SYNC?` command.

CALCulate:DTV:RESult?

This command reads the measurement values for the TV Analyzer measurements. The following table shows in which measurement modes the measurement parameters are available and the compatibility to R&S ETL. This command is a query and therefore has no *RST value.

Parameter

		Measurement list	Constellation	Echo Pattern	MER(k)	DVB | ISDB-T Spectrum	Compatibility to R&S ETL
LEVel	Level respectively power of the input signal	√	√	√	√	-	√
CFactor	Ccrest factor of the input signal	√	√	√	√	-	new
SBPosition	Sideband position	√	√	√	√	-	√
CONS	Constellation; This parameter is only available in DVB-T/H;	√	√	√	√	-	√
TMODe	Transmission Mode This parameter is only available in ISDB-T;	√	√	√	√	-	√
CFOFfset	Carrier frequency offset	√	√	√	√	-	√
SROFfset	Symbol rate offset This parameter is equivalent to 'BROFfset'.	√	√	√	√	-	new
BROFfset	Bit rate offset This parameter is equivalent to 'SROFfset'.	√	√	√	√	-	√
MERRms	Root mean square of the modulation error ratio; This parameter corresponds to MER (total,rms) in ISDB-T	√	√	√	√	-	√
MERPeak	Peak of the modulation error ratio; This parameter is only available in DVB-T/H;	√	√	√	√	-	√
MTRMs	Modulation error ratio of the TMCC carriers. This parameter is only available in ISDB-T;	√	√	√	√	-	√
MARMs	Modulation error ratio of the AC carriers. This parameter is only available in ISDB-T;	√	√	√	√	-	√

		Measurement list	Constellation	Echo Pattern	MER(k)	DVB | ISDB-T Spectrum	Compatibility to R&S ETL
EVMRms	Root mean square of the error vector magnitude; This parameter is only available in DVB-T/H;	√	√	√	√	-	√
EVMPeak	Peak of the error vector magnitude; This parameter is only available in DVB-T/H;	√	√	√	√	-	√
BBViterbi	Bit error ratio before Viterbi decoder; This parameter is only available in DVB-T/H;	√	√	√	√	-	√
BBRS	Bit error ratio before Reed Solomon decoder; This parameter is only available in DVB-T/H;	√	√	√	√	-	√
PERatio	Packet error ratio; This parameter is only available in DVB-T/H;	√	√	√	√	-	√
PERRor	Packet errors; This parameter is only available in DVB-T/H;	√	√	√	√	-	√
MTBitrate	MPEG TS bit rate; This parameter is only available in DVB-T/H;	√	√	√	√	-	√
SPRocessed	Symbols processed in constellation diagram	-	√	-	-	-	√

Return value

Parameter	Return value	Description
LEVel	<numeric value>	Level respectively power of the input signal. The value corresponds according to the selected power unit.
CFactor	<numeric value>	Crest factor of the input signal in dB
SBPosition	NORM INV	Sideband position of the input signal: Normal sideband position Inverted sideband position
CONS	<QAM> <hierarchy>	Constellation of the data carriers
TMODe	1 2 3	1: Mode 1 (2K) 2: Mode 2 (4K) 3: Mode 3 (8K)
CFOFfset	<numeric value>	Carrier offset frequency in ‘Hz’
SROFfset	<numeric value>	Symbol rate offset respectively bit rate offset in ‘ppm’ This parameter is equivalent to ‘BROFfset’.
BROFfset	<numeric value>	Bit rate offset respectively symbol rate offset in ppm This parameter is equivalent to ‘SROFfset’.

Parameter	Return value	Description
MERRms	<numeric value>	MER rms respectively MER (total, rms) in ‘dB’
MERPeak	<numeric value>	MER peak respectively MER (total, peak) in ‘dB’
MTRMs	<numeric value>	MER rms of TMCC carriers in ‘dB’
MARMs	<numeric value>	MER rms of AC carriers in ‘dB’
EVMRms	<numeric value>	EVM rms in ‘%’
EVMPeak	<numeric value>	EVM peak in ‘%’
BBViterbi	<numeric value>	BER before Viterbi decoder in scientific notation
BBRS	<numeric value>	BER before Reed Solomon decoder in scientific notation
PERatio	<numeric value>	Packet Error Ratio in scientific notation
PERRor	<numeric value>	Packet Errors per second
MTBitrate	<numeric value>	MPEG TS Bitrate in ‘MBit/s’
SPRocessed	<numeric value>	processed symbols in constellation diagram

Example:

```
CALCULATE:DTV:RESULT? LEVEL
```

Queries the signal level.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: see table above

CALCulate<1|2>:DTV:RESult:A|B|C?

This command reads the layer specific measurement values of the ISDB-T Analyzer. The following table shows in which measurement modes the measurement parameters are available and the compatibility to R&S ETL. This command is a query and therefore has no *RST value.

Parameter

		Measurement list	Constellation	Echo Pattern	MER(k)	ISDB-T Spectrum	Compatibility to R&S ETL
MERRms	Root mean square of the modulation error ratio of the specific layer	√	√	√	√	-	√
BBViterbi	Bit error ratio before Viterbi decoder	√	√	√	√	-	√
BBRS	Bit error ratio before Reed Solomon decoder	√	√	√	√	-	√
BARS	Bit error ratio after Reed Solomon decoder	√	√	√	√	-	√
PERRor	Packet errors	√	√	√	√	-	√
MTBR	MPEG TS bit rate	√	√	√	√	-	-

Return value

Parameter	Return value	Description
MERRms	<numeric value>	MER rms in ‘dB’
BBViterbi	<numeric value>	BER before Viterbi decoder in scientific notation
BBRS	<numeric value>	BER before Reed Solomon decoder in scientific notation
BARS	<numeric value>	BER after Reed Solomon decoder in scientific notation
PERRor	<numeric value>	Packet Errors per second
MTBR	<numeric value>	MPEG TS Bitrate in ‘Mbit/s’

Example:

```
CALCULATE:DTV:RESULT:A? MERR
```

Queries the rms value of the modulation error ratio of layer A.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: ISDB-T
Compatibility to R&S ETL: see table above

CALCulate:DTV:RESult:TPS?

This command reads the transmission parameter signaling (TPS) values of the received signal. In measurement mode DVB Spectrum the TPS parameter are not available. This command is a query and therefore has no *RST value.

Parameter

		Measurement list	Constellation	Echo Pattern	MER(k)	DVB Spectrum
CONS	Constellation	√	√	√	√	-
FFTMode	FFT mode	√	√	√	√	-
GINTerval	Guard interval	√	√	√	√	-
CRHPriority	Code rate high priority	√	√	√	√	-
CRLPriority	Code rate low priority	√	√	√	√	-
CID	Cell ID	√	√	√	√	-
RESFrames	Reserved frames	√	√	√	√	-
INTerleaver	Interleaver	√	√	√	√	-
FECHigh	Forward error correction high	√	√	√	√	-
FECLow	Forward error correction low	√	√	√	√	-
TSHigh	Time slicing high priority	√	√	√	√	-
TSLow	Time slicing low priority	√	√	√	√	-
LINDicator	Length indicator	√	√	√	√	-

Return value

Parameter	Return value	Description
CONS	<QAM>-<hierarchy>	Constellation, QAM: QPSK | QAM16 | QAM64 hierarchy: NH | H1 | H2 | H4 examples: ‘QAM64NH’, ‘QAM16H2’
FFTMode	F2K F4K F8K	2k FFT mode 4k FFT mode 8k FFT mode
GINTerval	G1_4 G1_8 G1_16	Guard interval 1/4 Guard interval 1/8 Guard interval 1/16

Parameter	Return value	Description
	G1_32	Guard interval 1/32
CRHPriority	R1_2 R2_3 R3_4 R5_6 R7_8	Code rate 1/2 Code rate 2/3 Code rate 3/4 Code rate 5/6 Code rate 7/8
CRLPriority	R1_2 R2_3 R3_4 R5_6 R7_8	Code rate 1/2 Code rate 2/3 Code rate 3/4 Code rate 5/6 Code rate 7/8
CID	<numeric value>	Cell ID in ‘hexadecimal’
RESFrames	<value>,<value>,<value>,<value>	TPS reserved comma separated in ‘hexadecimal’
INTerleaver	NAT IND	native interleaver mode in-depth interleaver mode
FECHigh	 0 1	MPE FEC high priority off on
FECLow	 0 1	MPE FEC low priority off on
TSHigh	 0 1	Time slicing high priority off on
TSLow	 0 1	Time slicing low priority off on
LINDicator	<numeric value>	Length indicator in ‘hexadecimal’
SBPos	Sideband position	
LINDicator	<numeric value>	Length indicator in ‘hexadecimal’

Example

```
CALCULATE:DTV:RESULT:TPS? CID
```

Queries the Cell ID.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: DVB-T/H
Compatibility to R&S ETL: yes

CALCulate:DTV:RESult:TMCC?

This command reads the TMCC values of the received signal. In ISDB-T Spectrum measurement mode, the TMCC parameter are not available. This command is a query and therefore has no *RST value.

Parameter

		Measurement list	Constellation	Echo Pattern	MER(k)	ISDB-T Spectrum	Compatibility to R&S ETL
SIDent	System Identification	√	√	√	√	-	√
PSINdicator	Parameter Switching Indicator	√	√	√	√	-	-
EMERgency	Emergency Alarm Broadcasting	√	√	√	√	-	√
PRECeption	Current Partial Reception	√	√	√	√	-	√
PSHiftcorr	Phase Shift Reception	√	√	√	√	-	√
REServed	Reserved Bits	√	√	√	√	-	√

Return value

Parameter	Return value	Description
SIDent	ISDB-T	
PSINdicator	NORMAL FR_1 FR_2 FR_3 ... FR_15	bit B_{22} – B_{25} of TMCC carriers
EMERgency	0 1	0: Off 1: On
PRECeption	0 1	bit B_{27} of TMCC carriers 0: Off 1: On
PSHiftcorr	<hexadecimal value>	bit B_{107} – B_{109} of TMCC carriers
REServed	<hexadecimal value>	bit B_{110} – B_{121} of TMCC carriers

Example

```
CALC:DTV:RES:TMCC? SID
```
Queries the system identification.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: ISDB-T
Compatibility to R&S ETL: yes

CALCulate:DTV:RESult:TMCC:A | B | C?

This command reads the current TMCC values for the specified layer of the received signal. In ISDB-T Spectrum measurement mode, the TMCC parameter are not available. This command is a query and therefore has no *RST value.

Parameter

		Measurement list	Constellation	Echo Pattern	MER(k)	ISDB-T Spectrum
CONS	Modulation scheme of the corresponding layer	√	√	√	√	-
CRATe	Convolutional coding rate of the corresponding layer	√	√	√	√	-
TDEeinterleav	Time interleaving length of the corresponding layer	√	√	√	√	-
SEGMents	Number of occupied segments of the corresponding layer	√	√	√	√	-

Return value

Parameter	Return value	Description
CONS	DQPSK | QPSK | QAM16 | QAM64	Transmission Bits: B_{28} – B_{30} / B_{41} - B_{43} / B_{54} - B_{56}
CRATe	R1_2 R2_3 R3_4 R5_6 R7_8	Transmission Bits: B_{31} – B_{33} / B_{44} - B_{46} / B_{57} - B_{59}
TDEeinterleav	0 1 2 4 8 16 32	Transmission Bits: B_{34} – B_{36} / B_{47} - B_{49} / B_{60} - B_{62}
SEGMents	1 to 13	

Example

```
CALC:DTV:RES:TMCC:A? CONS
```

Queries the modulation scheme of layer A.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: ISDB-T
Compatibility to R&S ETL: yes

CALCulate:DTV:RESult:DSPectrum?

This command reads the measurement values in measurement mode DVB Spectrum. The measurement parameters are only available in measurement mode DVB Spectrum. This command is a query and therefore has no *RST value.

Parameter	Return value	Description
LEVel	<numeric value>	Channel power according to the selected power unit.
AFResponse	<numeric value>	Amplitude frequency response within the OFDM bandwidth, peak – peak value in dB.
SALower	<numeric value>	Shoulder attenuation of lower shoulder in dB.
SAUPper	<numeric value>	Shoulder attenuation of upper shoulder in dB.

Example

```
CALCULATE:DTV:RESULT:DSP? SALOWER
```

Queries the lower shoulder attenuation.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

9.7 Setting the Frequency

The following commands configure the frequency parameters in DVB-T/H Receiver mode.

List of commands

- [SENSe:]FREQuency:RF
- [SENSe:]FREQuency:RF:STEP
- [SENSe:]FREQuency:RF:OFFSet
- [SENSe:]FREQuency:INPut:MODE
- [SENSe:]CHANnel:TABLe:SELect
- [SENSe:]CHANnel:TABLe:SELect?
- [SENSe:]CHANnel

[SENSe:]FREQuency:RF

This command defines the receive frequency in case of frequency input mode.

Parameter

4 MHz to f_{max}

f_{max} is specified in the data sheet.

Example

```
FREQ:RF 100MHz
```

Sets the receive frequency to 100 MHz.

Characteristics

*RST value: f_{max} /2 with f_{max} = maximum receive frequency
SCPI: conform
TV standard: all
Compatibility to R&S ETL: yes

[SENSe:]FREQuency:RF:STEP

This command defines the step size of the receive frequency.

Parameter

0 to f_{max}

Example

```
FREQ:RF:STEP 8MHz
```
Sets the step size to 8 MHz.

Characteristics

*RST value: 1 MHz
SCPI: conform
TV standard: all
Compatibility to R&S ETL: -

[SENSe:]FREQuency:RF:OFFSet

This command defines the receive frequency offset.

Parameter

–100 GHz to 100 GHz

Example

```
FREQ:RF:OFFS 1GHZ
```

Characteristics

*RST value: 0 Hz
SCPI: conform
TV standard: all
Compatibility to R&S ETL: -

[SENSe:]FREQuency:INPut:MODE

This command selects the frequency mode. Select the Channel frequency mode only if you want to work with channel tables. In this case, the input of the receive frequency is not a frequency value, but a channel number.

Parameter

CHANnel | FREQ

Example

```
FREQ:INP:MODE CHAN
```
Sets the frequency mode to work with channel tables.

Characteristics

*RST value: FREQ
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: -

[SENSe:]CHANnel:TABLe:SELect

This command loads the specified channel table for upcoming measurements. The file is loaded from the current default directory if no path is set. The default directory can be set with the `MMEMory:CDIRectory` command.

This command is an event and therefore has no query and no *RST value.

Parameter

<string> = <file name>

Example

```
CHAN:TABL:SEL 'CATV.CHNTAB'
```
Loads the channel table with the name CATV from the current default directory.

```
CHAN:TABL:SEL '\Storage Card\Public\CHANNEL TABLES\CATV.CHNTAB'
```
Loads the channel table with the name ‘CATV’ from the directory \SD card\public\channel tables\.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: -

[SENSe:]CHANnel:TABLe:SELect?

This command returns the file name and its table description of the loaded channel table.

This command is an query and therefore has no *RST value.

Parameter

<string1>,<string2>

string1: “channel table file name”

string2: “channel table description”

Examples

```
CHAN:TABL:SEL?
```
Reads the channel table file name and channel table description.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: -

[SENSe:]CHANnel

This command defines the receive channel in case of channel input mode. A channel table must be loaded prior with the `[SENSe:]CHANNel:TABLe:SELect` command. The frequency input mode must be set to ‘CHANNEL’, see `[SENSe:]FREQuency:INPut:MODE` command.

Parameter

<numeric value> = Minimum channel number to maximum channel number w. r. t. the selected channel table.

Example

```
CHAN 35
```
Sets the receive frequency w. r. t. channel 35 of the selected channel table.

Characteristics

*RST value: 1
SCPI: conform
TV standard: all
Compatibility to R&S ETL: -

9.8 Setting Amplitude Parameters

The following commands configure the gain control, RF preselection, amplitude parameters, impedance and transducers in the measurement modes Measurement List, Constellation Diagram, Echo Pattern and MER(k). For the measurement mode DVB Spectrum the same commands are available as for Spectrum Analyzer mode, see “Setting Amplitude Parameters".

List of commands

- INPut:ATTenuation
- INPut:ATTenuation:MODE
- INPut:ATTenuation:AUTO
- INPut:PRESelection:STATe
- INPut:IMPedance
- INPut:IMPedance:PAD
- DISPlay:WINDow:DTV:RLEVel:OFFS
- [SENSe:]CORRection:TRANsducer<1...2>[:STATe]
- [SENSe:]CORRection:TRANsducer<1...2>:SELect
- [SENSe:]CORRection:TRANsducer<1...2>:UNIT?
- UNIT:POWer

INPut:ATTenuation

This command programs the input attenuator. The attenuation can be set in 5 dB steps.

The input attenuation must be set to manual control prior, see `INPut:ATTenuation:AUTO` command.

Parameter

<numeric_value> in dB; range specified in data sheet

Example

```
INP:ATT 30dB
```

Sets the attenuation on the attenuator to 30 dB and switches off the coupling to the reference level.

Characteristics

*RST value: 0 dB (AUTO is set to ON)
SCPI: conform
TV standard: all
Compatibility to R&S ETL: yes

INPut:ATTenuation:MODE

This command defines the controlling of the RF input attenuator in case of automatically controlled input attenuation.

For further information on controlling the RF attenuator refer to t the Operating Manual.

Parameter

LDIStortion | LNOise

Example

```
INP:ATT:MODE LNO
```
Sets the attenuation mode to Auto Low Noise.

Characteristics

*RST value: LDIS
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

INPut:ATTenuation:AUTO

This command automatically couples the input attenuation to the reference level (state ON) or switches the input attenuation to manual entry (state OFF).

Parameter

ON | OFF or 1 | 0

Example

```
INP:ATT:AUTO ON
```
Couples the attenuation set on the attenuator to the reference level.

Characteristics

*RST value: ON
SCPI: conform
TV standard: all
Compatibility to R&S ETL: new

INPut:PRESelection:STATe

This command switches the RF preselection path of the instrument on or off (only available with installed option R&S ETH-K1).

Parameter

ON | OFF or 1 | 0

Example

```
INP:PRESELECTION:STAT ON
```
Activates the RF preselection path.

Characteristics

*RST value: OFF
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: -

INPut:IMPedance

This command sets the nominal input impedance of the instrument. The set impedance is taken into account in all level indications of results.

The setting 75 Ω should be selected, if the 50 Ω input impedance is transformed to a higher impedance using a 75 Ω adapter of the RAZ type (= 25 Ω in series to the input impedance of the instrument). The correction value in this case is 1.76 dB = 10 log (75Ω / 50Ω). As an alternative the resistive matching pads R&S RAM or R&S FSH-Z38 can be used. In that cases the correction value is 5.72 dB. For matching pad selection see `INPut:IMPedance:PAD` command .

Parameter

50 | 75

Example

```
INP:IMP 75
```
Sets the input impedance to 75 Ohm.

Characteristics

*RST value: 50 Ω
SCPI: conform
TV standard: all
Compatibility to R&S ETL: yes

INPut:IMPedance:PAD

This command defines RF matching pad in case of the RF impedance is set to 75 Ω. For RF impedance selection see `INPut:IMPedance` command.

R&S RAZ (= 25 Ω in series to the input impedance of the instrument). The correction value in this case is 1.76 dB = 10 log (75Ω / 50Ω).

R&S RAM and R&S FSH-Z38 are resistive 50/75 Ω matching pads. In that cases the correction value is 5.72 dB.

Parameter

RAM | RAZ | HZTE

RAM	resistive 75/50 Ω matching pad R&S RAM, attenuation 5.72 dB
RAZ	resistive 75/50 Ω matching pad R&S RAZ, attenuation 1.76 dB
HZTE	resistive 75/50 Ω matching pad R&S FSH-Z38, attenuation 5.72 dB

Example

```
INP:IMP:PAD RAM
```
Sets the matching pad R&S RAM.

Characteristics

*RST value: -
SCPI: conform
TV standard: all
Compatibility to R&S ETL: yes

DISPlay:WINDow:DTV:RLEVel:OFFSet

This command sets the reference level offset in the measurement modes Constellation Diagram and Measurement List.

Parameter

-100 to 100 dB

Example

```
DISPLAY:WINDOW:DTV:RLEVEL:OFFSET 10
```
Sets the reference level offset to 10 dB.

Characteristics

*RST value: 0
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

[SENSe:]CORRection:TRANsducer<1...2>[:STATe]

This command switches the selected transducer factor on or off. A transducer file must be loaded prior with the `[SENSe:]CORRection:TRANsducer<1...2>:SELect` command.

The suffix<1...2> specifies the primary or secondary transducer.

Parameter

ON | OFF

Example

```
CORR:TRAN1 ON
```
Activates the primary transducer

Characteristics

*RST value: OFF
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

[SENSe:]CORRection:TRANsducer<1...2>:SELect

This command loads the transducer factor designated by <name>. The file is loaded from the current default directory if no path is set. The default directory can be set with the `MMEMory:CDIRectory` command. The selected transducer can be switched on or off with the `[SENSe:]CORRection:TRANsducer<1...2>[:STATe]` command.

The suffix<1...2> specifies the primary or secondary transducer.

Parameter

<string> = <name of the transducer factor> in string data form with a maximum of 8 characters.

Example

```
CORR:TRAN1:SEL 'FACTOR1.PRITRD'
```
Loads the primary transducer 'FACTOR1' from the default directory.

```
CORR:TRAN2:SEL '\Storage Card\Public\TRANSDUCERS\FACTOR1'
```
Loads the secondary transducer 'FACTOR1' from the directory \SD card\public\transducers\.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

[SENSe:]CORRection:TRANsducer<1...2>:UNIT?

This command queries the unit of the transducer factor in use.

The suffix <1...2> specified the primary or secondary transducer.

Example

```
CORR:TRAN2:UNIT?
```
Queries the unit of the primary transducer.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

UNIT:POWer

This command selects the default unit.

Parameter

DBM | DBUV | DBMV | V | W | DUVM | DUAM | V_M | W_M2

Example

```
UNIT:POW DBUV
```
Sets the power unit to dBµV.

Characteristics

*RST value: DBM
SCPI: conform
TV standard: all
Compatibility to R&S ETL: yes

9.9 Configuring Limits

The following commands define limits.

List of commands

- CALCulate:DTV:LIMit:STATe
- CALCulate:DTV:LIMit:SELect
- CALCulate:DTV:LIMit:SELect?
- CALCulate:DTV:LIMit:BEEP[:STATe]
- CALCulate:DTV:LIMit:DEMod[:STATe]
- CALCulate:DTV:LIMit:FEC[:STATe]
- CALCulate:DTV:LIMit:LEVel:LOWer:STATe
- CALCulate:DTV:LIMit:LEVel:LOWer
- CALCulate:DTV:LIMit:LEVel:UPPer:STATe
- CALCulate:DTV:LIMit:LEVel:UPPer
- CALCulate:DTV:LIMit:CFactor:LOWer:STATe
- CALCulate:DTV:LIMit:CFactor:LOWer
- CALCulate:DTV:LIMit:CFactor:UPPer:STATe
- CALCulate:DTV:LIMit:CFactor:UPPer
- CALCulate:DTV:LIMit:CFOFfset:LOWer:STATe
- CALCulate:DTV:LIMit:CFOFfset:LOWer
- CALCulate:DTV:LIMit:CFOFfset:UPPer:STATe
- CALCulate:DTV:LIMit:CFOFfset:UPPer
- CALCulate:DTV:LIMit:SROFfset:LOWer:STATe
- CALCulate:DTV:LIMit:SROFfset:LOWer
- CALCulate:DTV:LIMit:SROFfset:UPPer:STATe
- CALCulate:DTV:LIMit:SROFfset:UPPer
- CALCulate:DTV:LIMit:EVMPeak:UPPer:STATe

- CALCulate:DTV:LIMit:EVMPeak:UPPer
- CALCulate:DTV:LIMit:EVMRms:UPPer:STATe
- CALCulate:DTV:LIMit:EVMRms:UPPer
- CALCulate:DTV:LIMit:MERPeak:LOWer:STATe
- CALCulate:DTV:LIMit:MERPeak:LOWer
- CALCulate:DTV:LIMit:MERRms:LOWer:STATe
- CALCulate:DTV:LIMit:MERRms:LOWer
- CALCulate:DTV:LIMit:MERR:A | B | C:LOWer:STATe
- CALCulate:DTV:LIMit:MERR:A | B | C:LOWer
- CALCulate:DTV:LIMit:BBViterbi:UPPer:STATe
- CALCulate:DTV:LIMit:BBViterbi[:UPPer]
- CALCulate:DTV:LIMit:BBViterbi:A | B | C:UPPer:STATe
- CALCulate:DTV:LIMit:BBViterbi:A | B | C [:UPPer]
- CALCulate:DTV:LIMit:BBRS:UPPer:STATe
- CALCulate:DTV:LIMit:BBRS[:UPPer]
- CALCulate:DTV:LIMit:BBRS:A | B | C:UPPer:STATe
- CALCulate:DTV:LIMit:BBRS[:UPPer]
- CALCulate:DTV:LIMit:BBAR:A | B | C:UPPer:STATe
- CALCulate:DTV:LIMit:BBAR[:UPPer]
- CALCulate:DTV:LIMit:PERatio:UPPer:STATe
- CALCulate:DTV:LIMit:PERatio[:UPPer]
- CALCulate:DTV:LIMit:PERRors:UPPer:STATe
- CALCulate:DTV:LIMit:PERRors[:UPPer]
- CALCulate:DTV:LIMit:PERRors:A | B | C:UPPer:STATe
- CALCulate:DTV:LIMit:PERRors:A | B | C[:UPPer]

CALCulate:DTV:LIMit:STATe

This command activates or deactivates all limits checking. The limit state is the master on / off switch. In case switched off, no limits will be checked regardless of other limit settings.

Parameter

ON | OFF

1 | 0

Example

```
CALCULATE:DTV:LIMIT:STAT ON
```
Activates the limit checking.

Characteristics

*RST value: OFF
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

CALCulate:DTV:LIMit:SELect

This command loads a limit table from a file. If the filename starts with "\", the path is considered absolute. If the filename does not start with "\", the path is considered relative to the current directory that can be set with the MMEMory:CDIRectory command.

Parameter

<string> = <limit table filename>

Example

```
CALCULATE:DTV:LIMIT:SELECT "table1.dvblim"
```
Loads "table1" from the default directory.

```
CALCULATE:DTV:LIMIT:SELECT "\Storage Card\Public\TABLE1.DVBLIM"
```
Loads "table1" from the directory \storage card\public\.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

CALCulate:DTV:LIMit:SELect?

This command returns the actual loaded limit table.

Return

<string1>,<string2>,<string3>

string1 "limit table name"

string2 "limit table description"

string3 "limit table modification state" (individual fields altered after loading the limit table?)

Example

```
CALCULATE:DTV:LIMIT:SELECT?
```

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

CALCulate:DTV:LIMit:BEEP[:STATe]

This command activates or deactivates the audio beep. If active, the R&S ETH outputs a beep each time a limit is exceeded.

Parameter

ON | OFF

Example

```
CALC:DTV:LIM:BEEP ON
```
Activates the audio beep.

Characteristics

*RST value: OFF
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

CALCulate:DTV:LIMit:DEMod[:STATe]

This command activates or deactivates the limit check for the OFDM demodulator status.

Parameter

ON | OFF

1 | 0

Example

```
CALC:DTV:LIM:DEM ON
```
Activates the demodulator status limit checking.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

CALCulate:DTV:LIMit:FEC[:STATe]

This command activates or deactivates the limit check for the FEC decoder status.

Parameter

ON | OFF

1 | 0

Example

```
CALC:DTV:LIM:FEC ON
```
Activates the FEC decoder status limit checking.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

CALCulate:DTV:LIMit:LEVel:LOWer:STATe

This command activates or deactivates the level lower limit checking.

Parameter

ON | OFF or 1 | 0

Example

```
CALCULATE:DTV:LEVEL:LIMIT:LOWER:STAT ON
```
Activates the level lower limit checking.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

CALCulate:DTV:LIMit:LEVel:LOWer

This command defines the lower limit of the signal power respectively signal power. The value is referred to the selected amplitude unit.

Parameter

-199.9 … +99.9 dBm [referred to the selected ampt unit]

MINimum to MAXimum (depending on current unit)

Example

```
CALC:DTV:LIMIT:LEV:LOW -22.0
```
Sets the lower limit of the signal power to -22 dBm in case of the unit dBm is selected.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: yes

CALCulate:DTV:LIMit:LEVel:UPPer:STATe

This command activates or deactivates the level upper limit checking.

Parameter

ON | OFF

1 | 0

Example

```
CALCULATE:DTV:LEVEL:LIMIT:UPPER:STAT ON
```
Activates the level upper limit checking.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

CALCulate:DTV:LIMit:LEVel:UPPer

This command defines the upper limit of the signal power respectively signal power. The value is referred to the selected amplitude unit.

Parameter

-199.9 … +99.9 dBm [referred to the selected ampt unit]

MINimum to MAXimum (depending on current unit)

Example

```
CALC:DTV:LIMIT:LEV:UPP -12.0
```
Sets the upper limit of the signal power to -12 dBm in case of the unit dBm is selected.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: yes

CALCulate:DTV:LIMit:CFactor:LOWer:STATe

This command activates or deactivates the crest factor lower limit checking.

Parameter

ON | OFF or 1 | 0

Example

```
CALCULATE:DTV:CF:LIMIT:LOWER:STAT ON
```
Activates the crest factor lower limit checking.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

CALCulate:DTV:LIMit:CFactor:LOWer

This command defines the lower limit of the crest factor of the input signal.

Parameter

0 to 30 dB

Example

```
CALC:DTV:LIMIT:CF:LOW 10.0
```
Sets the lower limit of the crest factor to 10 dB.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

CALCulate:DTV:LIMit:CFactor:UPPer:STATe

This command activates or deactivates the crest factor upper limit checking.

Parameter

ON | OFF or 1 | 0

Example

```
CALCULATE:DTV:CF:LIMIT:UPPER:STAT ON
```
Activates the crest factor upper limit checking.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

CALCulate:DTV:LIMit:CFactor:UPPer

This command defines the upper limit of the crest factor of the input signal.

Parameter

0 to 30 dB

Example

```
CALC:DTV:LIMIT:CF:LOW 12.0
```
Sets the upper limit of the crest factor to 12 dB.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

CALCulate:DTV:LIMit:CFOFfset:LOWer:STATe

This command activates or deactivates the carrier frequency offset lower limit checking.

Parameter

ON | OFF or 1 | 0

Example

```
CALCULATE:DTV:CFOF:LIMIT:LOWER:STAT ON
```
Activates the carrier frequency offset lower limit checking.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

CALCulate:DTV:LIMit:CFOFfset:LOWer

This command defines the lower limit of the carrier frequency offset.

Parameter

-999999 to +999999 [Hz]

Example

```
CALC:DTV:LIM:CFOF:LOW -1000
```
Sets the lower limit of the carrier frequency offset to -1000 Hz.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: yes

CALCulate:DTV:LIMit:CFOFfset:UPPer:STATe

This command activates or deactivates the carrier frequency offset upper limit checking.

Parameter

ON | OFF

1 | 0

Example

```
CALCULATE:DTV:CFOF:LIMIT:UPPER:STAT ON
```
Activates the carrier frequency offset upper limit checking.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

CALCulate:DTV:LIMit:CFOFfset:UPPer

This command defines the upper limit of the carrier frequency offset.

Parameter

-999999 to +999999 [Hz]

Example

```
CALC:DTV:LIM:CFOF:UPP 1000
```
Sets the upper limit of the carrier frequency offset to 1000 Hz.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: yes

CALCulate:DTV:LIMit:SROFfset:LOWer:STATe

This command activates or deactivates the symbol rate offset lower limit checking.

Parameter

ON | OFF

1 | 0

Example

```
CALCULATE:DTV:SROF:LIMIT:LOWER:STAT ON
```
Activates the symbol rate offset lower limit checking.

Characteristics

*RST value: OFF
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

CALCulate:DTV:LIMit:SROFfset:LOWer

This command defines the lower limit of the symbol rate offset.

Parameter

-99.9 to +99.9 [ppm]

Example

```
CALC:DTV:LIM:SROF:LOW -5
```
Sets the lower limit of the symbol rate offset to -5 ppm.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: yes

CALCulate:DTV:LIMit:SROFfset:UPPer:STATe

This command activates or deactivates the symbol rate offset upper limit checking.

Parameter

ON | OFF

1 | 0

Example

```
CALCULATE:DTV:SROF:LIMIT:UPPER:STAT ON
```
Activates the symbol rate offset upper limit checking.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

CALCulate:DTV:LIMit:SROFfset:UPPer

This command defines the upper limit of the symbol rate offset.

Parameter

-99.9 to +99.9 [ppm]

Example

```
CALC:DTV:LIM:SROF:UPP 5
```
Sets the upper limit of the symbol rate offset to 5 ppm.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: yes

CALCulate:DTV:LIMit:EVMPeak:UPPer:STATe

This command activates or deactivates the EVM peak limit checking.

Parameter

ON | OFF

1 | 0

Example

```
CALCULATE:DTV:LIMIT:EVMPEAK:UPPER:STAT ON
```
Activates the EVM peak limit checking.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: DVB-T/H
Compatibility to R&S ETL: new

CALCulate:DTV:LIMit:EVMPeak:UPPer

This command defines the upper limit of the peak value of the error vector magnitude.

Parameter

0.1 to 100 [percent]

Example

```
CALC:DTV:LIM:EVMP:UPP 20
```
Sets the upper limit of the peak value of the error vector magnitude to 20 %.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: DVB-T/H
Compatibility to R&S ETL: yes

CALCulate:DTV:LIMit:EVMRms:UPPer:STATe

This command activates or deactivates the EVM rms limit checking.

Parameter

ON | OFF

1 | 0

Example

```
CALCULATE:DTV:LIMIT:EVMRMS:UPPER:STAT ON
```
Activates the EVM rms limit checking.

Characteristics

*RST value: OFF
SCPI: device-specific
TV standard: DVB-T/H
Compatibility to R&S ETL: new

CALCulate:DTV:LIMit:EVMRms:UPPer

This command defines the upper limit of the root mean square value of the error vector magnitude.

Parameter

0.1 to 100 [percent]

Example

```
CALC:DTV:LIM:EVMP:UPP 1.5
```
Sets the upper limit of the rms value of the error vector magnitude to 1.5 %.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: DVB-T/H
Compatibility to R&S ETL: yes

CALCulate:DTV:LIMit:MERPeak:LOWer:STATe

This command activates or deactivates the MER peak limit checking. For the ISDB-T standard, it is related to the parameter MER (total,peak).

Parameter

ON | OFF or 1 | 0

Example

```
CALCULATE:DTV:LIMIT:MERPEAK:LOWER:STAT ON
```
Activates the MER peak limit checking.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

CALCulate:DTV:LIMit:MERPeak:LOWer

This command defines the lower limit of the peak value of the modulation error ratio. For the ISDB-T standard, it is related to the parameter MER (total,peak).

Parameter

0.0 to 60.0 [dB]

Example

```
CALC:DTV:LIM:MERP:LOW 20
```
Sets the lower limit of the peak value of the modulation error ratio to 20 dB.

Characteristics

*RST value: ???
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: yes

CALCulate:DTV:LIMit:MERRms:LOWer:STATe

This command activates or deactivates the MER rms limit checking. For the ISDB-T standard, it is related to the parameter MER (total,rms).

Parameter

ON | OFF

1 | 0

Example

```
CALCULATE:DTV:LIMIT:MERRMS:LOWER:STAT ON
```
Activates the MER rms limit checking.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

CALCulate:DTV:LIMit:MERRms:LOWer

This command defines the lower limit of the rms value of the modulation error ratio. For the ISDB-T standard, it is related to the parameter MER (total,rms).

Parameter

0.0 dB to 60.0 [dB]

Example

```
CALC:DTV:LIM:MERR:LOW 30
```
Sets the lower limit of the rms value of the modulation error ratio to 30 dB.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: yes

CALCulate:DTV:LIMit:MERR:A | B | C:LOWer:STATe

This command activates or deactivates the MER rms limit checking of the corresponding layer.

Parameter

ON | OFF

1 | 0

Example

```
CALCULATE:DTV:LIMIT:MERR:B:LOWER:STAT ON
```
Activates the MER rms limit checking of layer B.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: ISDB-T
Compatibility to R&S ETL: new

CALCulate:DTV:LIMit:MERR:A | B | C:LOWer

This command defines the lower limit of the rms value of the modulation error ratio of the corresponding layer.

Parameter

0.0 dB to 60.0 [dB]

Example

```
CALC:DTV:LIM:MERR:B:LOW 30
```
Sets the lower limit of the rms value of the modulation error ratio of layer B to 30 dB.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: ISDB-T
Compatibility to R&S ETL: new

CALCulate:DTV:LIMit:BBViterbi:UPPer:STATe

This command activates or deactivates the BER before Viterbi limit checking.

Parameter

ON | OFF

1 | 0

Example

```
CALC:DTV:LIM:BBV:UPP:STAT ON
```
Activates the BER before Viterbi limit checking.

Characteristics

*RST value: OFF
SCPI: device-specific
TV standard: DVB-T/H
Compatibility to R&S ETL: new

CALCulate:DTV:LIMit:BBViterbi[:UPPer]

This command defines the upper limit of the bit error ratio before Viterbi decoder.

Parameter

0.0E-15 to 9.9E-1

Example

```
CALC:DTV:LIM:BBV 3.5E-4
```
Sets the upper limit of the BER before Viterbi decoder to 3.5e-4

Characteristics

*RST value: -
SCPI: device-specific
TV standard: DVB-T/H
Compatibility to R&S ETL: yes

CALCulate:DTV:LIMit:BBViterbi:A | B | C:UPPer:STATe

This command activates or deactivates the BER before Viterbi limit checking of the corresponding layer.

Parameter

ON | OFF

1 | 0

Example

```
CALC:DTV:LIM:BBV:A:UPPER:STAT ON
```
Activates the BER before Viterbi limit checking for layer A.

Characteristics

*RST value: OFF
SCPI: device-specific
TV standard: ISDB-T
Compatibility to R&S ETL: new

CALCulate:DTV:LIMit:BBViterbi:A | B | C [:UPPer]

This command defines the upper limit of the bit error ratio before Viterbi decoder of the corresponding layer.

Parameter

0.0E-15 to 9.9E-1

Example

```
CALC:DTV:LIM:BBV:A 3.5E-4
```
Sets the upper limit of the BER before Viterbi decoder of layer A to 3.5e-4

Characteristics

*RST value: -
SCPI: device-specific
TV standard: ISDB-T
Compatibility to R&S ETL: new

CALCulate:DTV:LIMit:BBRS:UPPer:STATe

This command activates or deactivates the BER before Reed Solomon decoder limit checking.

Parameter

ON | OFF or 1 | 0

Example

```
CALCULATE:DTV:LIMIT:BBRS:UPPER:STAT ON
```
Activates the BER before Reed Solomon decoder limit checking.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: DVB-T/H
Compatibility to R&S ETL: new

CALCulate:DTV:LIMit:BBRS[:UPPer]

This command defines the upper limit of the bit error ratio before Reed Solomon decoder.

Parameter

0.0E-15 to 9.9E-1

Example

```
CALC:DTV:LIM:BBV 3.5E-5
```
Sets the upper limit of the BER before Reed Solomon decoder to 3.5e-5.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: DVB-T/H
Compatibility to R&S ETL: yes

CALCulate:DTV:LIMit:BBRS:A | B | C:UPPer:STATe

This command activates or deactivates the BER before Reed Solomon decoder limit checking of the corresponding layer.

Parameter

ON | OFF or 1 | 0

Example

```
CALC:DTV:LIM:BBRS:C:UPP:STAT ON
```
Activates the BER before Reed Solomon decoder of layer C limit checking.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: ISDB-T
Compatibility to R&S ETL: new

CALCulate:DTV:LIMit:BBRS[:UPPer]

This command defines the upper limit of the bit error ratio before Reed Solomon decoder of the corresponding layer.

Parameter

0.0E-15 to 9.9E-1

Example

```
CALC:DTV:LIM:BBRS:C 3.5E-5
```
Sets the upper limit of the BER before Reed Solomon decoder of layer C to 3.5e-5.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: ISDB-T
Compatibility to R&S ETL: yes

CALCulate:DTV:LIMit:BBAR:A | B | C:UPPer:STATe

This command activates or deactivates the BER after Reed Solomon decoder limit checking of the corresponding layer.

Parameter

ON | OFF or 1 | 0

Example

```
CALC:DTV:LIM:BBAR:C:UPP:STAT ON
```
Activates the BER after Reed Solomon decoder of layer C limit checking.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: ISDB-T
Compatibility to R&S ETL: new

CALCulate:DTV:LIMit:BBAR[:UPPer]

This command defines the upper limit of the bit error ratio after Reed Solomon decoder of the corresponding layer.

Parameter

0.0E-15 to 9.9E-1

Example

```
CALC:DTV:LIM:BBAR:C 3.5E-5
```
Sets the upper limit of the BER after Reed Solomon decoder of layer C to 3.5e-5.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: ISDB-T
Compatibility to R&S ETL: yes

CALCulate:DTV:LIMit:PERatio:UPPer:STATe

This command activates or deactivates the Packet Error Ratio (PER) limit checking.

Parameter

ON | OFF

1 | 0

Example

```
CALC:DTV:LIM:PER:UPP:STAT ON
```
Activates the PER limit checking.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: DVB-T/H
Compatibility to R&S ETL: new

CALCulate:DTV:LIMit:PERatio[:UPPer]

This command defines the upper limit of the Packet Error Ratio.

Parameter

0.0E-15 to 9.9E-1

Example

```
CALC:DTV:LIM:PER:UPP 3.7E-06
```
Sets the upper limit of the packet error ratio to 3.7e-6.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: DVB-T/H
Compatibility to R&S ETL: yes

CALCulate:DTV:LIMit:PERRors:UPPer:STATe

This command activates or deactivates the packet errors limit checking.

Parameter

ON | OFF

1 | 0

Example

```
CALC:DTV:LIM:PERR:UPP:STAT ON
```
Activates the PER limit checking.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: DVB-T/H
Compatibility to R&S ETL: new

CALCulate:DTV:LIMit:PERRors[:UPPer]

This command defines the upper limit of the Packet Errors per second.

Parameter

0 to 99999

Example

```
CALC:DTV:LIM:PERR 10
```
Sets the upper limit to 10 packet errors per second.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: DVB-T/H
Compatibility to R&S ETL: yes

CALCulate:DTV:LIMit:PERRors:A | B | C:UPPer:STATe

This command activates or deactivates the packet errors limit checking of the corresponding layer.

Parameter

ON | OFF

1 | 0

Example

```
CALC:DTV:LIM:PERR:A:UPP:STAT ON
```
Activates the PER limit checking of layer A.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: DVB-T/H
Compatibility to R&S ETL: new

CALCulate:DTV:LIMit:PERRors:A | B | C[:UPPer]

This command defines the upper limit of the Packet Errors per second of the corresponding layer.

Parameter

0 to 99999

Example

```
CALC:DTV:LIM:PERR:A 10
```
Sets the upper limit of packet errors of layer A to 10 packet errors per second.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: DVB-T/H
Compatibility to R&S ETL: new

9.10 Using Limit Functions

The following commands define limits and perform the corresponding limit checks.

List of commands

- CALCulate:DTV:LIMit:RESult:LEVel:LOWer?
- CALCulate:DTV:LIMit:RESult:LEVel:UPPer?
- CALCulate:DTV:LIMit:RESult:CFactor:UPPer?
- CALCulate:DTV:LIMit:RESult:CFactor:LOWer?
- CALCulate:DTV:LIMit:RESult:CFOFfset:LOWer?
- CALCulate:DTV:LIMit:RESult:CFOFfset:UPPer?
- CALCulate:DTV:LIMit:RESult:SROFfset:LOWer?
- CALCulate:DTV:LIMit:RESult:SROFfset:UPPer?
- CALCulate:DTV:LIMit:RESult:MERRms:LOWer?
- CALCulate:DTV:LIMit:RESult:MERPeak:LOWer?
- CALCulate:DTV:LIMit:RESult:MERRms:A | B | C?
- CALCulate:DTV:LIMit:RESult:MTRMs?
- CALCulate:DTV:LIMit:RESult:MARMs?
- CALCulate:DTV:LIMit:RESult:EVMRms:UPPer?
- CALCulate:DTV:LIMit:RESult:EVMPeak:UPPer?
- CALCulate:DTV:LIMit:RESult:BBViterbi[:UPPer]?
- CALCulate:DTV:LIMit:RESult:BBViterbi:A | B | C?
- CALCulate:DTV:LIMit:RESult:BBRS[:UPPer]?
- CALCulate:DTV:LIMit:RESult:BBRS:A | B | C?
- CALCulate:DTV:LIMit:RESult:BARS:A | B | C?
- CALCulate:DTV:LIMit:RESult:PERatio[:UPPer]?
- CALCulate:DTV:LIMit:RESult:PERRors[:UPPer]?
- CALCulate:DTV:LIMit:RESult:PERRors:A | B | C?

CALCulate:DTV:LIMit:RESult:LEVel:LOWer?

This command returns the result of the lower limit check for the signal level. This command is a query and therefore has no *RST value.

Return value

0	passed
1	failed

Example

`CALCULATE:DTV:LIMIT:RESULT:LEVEL:LOWER?`
Queries the lower limit check of the signal level.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: yes

CALCulate:DTV:LIMit:RESult:LEVel:UPPer?

This command returns the result of the upper limit check for the signal level. This command is a query and therefore has no *RST value.

Return value

0	passed
1	failed

Example

`CALCULATE:DTV:LIMIT:RESULT:LEVEL:UPPER?`
Queries the upper limit check of the signal level.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: yes

CALCulate:DTV:LIMit:RESult:CFactor:UPPer?

This command returns the result of the upper limit check for the crest factor of the input signal. This command is a query and therefore has no *RST value.

Return Values

0	passed
1	failed

Example

CALCULATE:DTV:LIMIT:RESULT:CF:UPPER?
Queries the upper limit check of the crest factor.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

CALCulate:DTV:LIMit:RESult:CFactor:LOWer?

This command returns the result of the lower limit check for the crest factor of the input signal. This command is a query and therefore has no *RST value.

Return Values

0	passed
1	failed

Example

CALCULATE:DTV:LIMIT:RESULT:CF:LOWER?
Queries the lower limit check of the crest factor.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: new

CALCulate:DTV:LIMit:RESult:CFOFfset:LOWer?

This command returns the result of the lower limit check for the carrier frequency offset. This command is a query and therefore has no *RST value.

Return value

0	passed
1	failed

Example

CALCULATE:DTV:LIMIT:RESULT:CFOFFSET:LOWER?
Queries the lower limit check of the of the carrier frequency offset.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: yes

CALCulate:DTV:LIMit:RESult:CFOFfset:UPPer?

This command returns the result of the upper limit check for the carrier frequency offset. This command is a query and therefore has no *RST value.

Return value

0	passed
1	failed

Example

```
CALCULATE:DTV:LIMIT:RESULT:CFOFFSET:UPPER?
```
Queries the upper limit check of the of the carrier frequency offset.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: yes

CALCulate:DTV:LIMit:RESult:SROFfset:LOWer?

This command returns the result of the lower limit check for the symbol rate offset. This command is a query and therefore has no *RST value.

Return value

0	passed
1	failed

Example

```
CALCULATE:DTV:LIMIT:RESULT:SROFFSET:LOWER?
```
Queries the lower limit check of the symbol rate offset.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: yes

CALCulate:DTV:LIMit:RESult:SROFfset:UPPer?

This command returns the result of the upper limit check for the symbol rate offset. This command is a query and therefore has no *RST value.

Return value

0	passed
1	failed

Example

CALCULATE:DTV:LIMIT:RESULT:SROFFSET:UPPER?
Queries the upper limit check of the symbol rate offset.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: yes

CALCulate:DTV:LIMit:RESult:MERRms:LOWer?

This command returns the result of the lower limit check for the root mean square value of the Modulation Error Ratio. This command is a query and therefore has no *RST value. For the ISDB-T standard, it is related to the parameter MER (total,rms).

Return value

Example

CALCULATE:DTV:LIMIT:RESULT:MERRMS:LOWER?
Queries the lower limit check of the MER rms value.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: yes

CALCulate:DTV:LIMit:RESult:MERPeak:LOWer?

This command returns the result of the lower limit check for the peak value of the Modulation Error Ratio. This command is a query and therefore has no *RST value. For the ISDB-T standard, it is related to the parameter MER (total,rms).

Return value

0	passed
1	failed

Example

CALCULATE:DTV:LIMIT:RESULT:MERPEAK:LOWER?
Queries the lower limit check of the peak value for the Modulation Error Ratio.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: all
Compatibility to R&S ETL: yes

CALCulate:DTV:LIMit:RESult:MERRms:A | B | C?

This command returns the result of the lower limit check for the rms value of the MER of the corresponding layer. This command is a query and therefore has no *RST value.

Return value

0	passed
1	failed

Example

```
CALCULATE:DTV:LIMIT:RESULT:MERR:A?
```
Queries the lower limit check of the rms value for the MER of layer A.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: ISDB-T
Compatibility to R&S ETL: yes

CALCulate:DTV:LIMit:RESult:MTRMs?

This command returns the result of the lower limit check for the rms value of the MER of the TMCC carriers. This command is a query and therefore has no *RST value.

Return value

0	passed
1	failed

Example

```
CALCULATE:DTV:LIMIT:RESULT:MTRM?
```
Queries the lower limit check of the rms value for the MER of the TMCC carriers.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: ISDB-T
Compatibility to R&S ETL: yes

CALCulate:DTV:LIMit:RESult:MARMs?

This command returns the result of the lower limit check for the rms value of the MER of the AC carriers. This command is a query and therefore has no *RST value.

Return value

0	passed
1	failed

Example

CALCULATE:DTV:LIMIT:RESULT:MARM?
Queries the lower limit check of the rms value for the MER of the AC carriers.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: ISDB-T
Compatibility to R&S ETL: yes

CALCulate:DTV:LIMit:RESult:EVMRms:UPPer?

This command returns the result of the upper limit check for the root mean square value of the error vector magnitude. This command is a query and therefore has no *RST value.

Return value

0	passed
1	failed

Example

CALCULATE:DTV:LIMIT:RESULT:EVMRMS:UPPER?
Queries the upper limit check of the rms value for the Error Vector Magnitude.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: DVB-T/H
Compatibility to R&S ETL: yes

CALCulate:DTV:LIMit:RESult:EVMPeak:UPPer?

This command returns the result of the upper limit check for the peak value of the Error Vector Magnitude. This command is a query and therefore has no *RST value.

Return value

0	passed
1	failed

Example

CALCULATE:DTV:LIMIT:RESULT:EVMPEAK:UPPER?
Queries the upper limit check of the peak value for the Error Vector Magnitude.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: DVB-T/H
Compatibility to R&S ETL: yes

CALCulate:DTV:LIMit:RESult:BBViterbi[:UPPer]?

This command returns the result of the upper limit check for the bit error ratio before viterbi decoder. This command is a query and therefore has no *RST value.

Return value

0	passed
1	failed

Example

`CALCULATE:DTV:LIMIT:RESULT:BBVITERBI:UPPER?`
Queries the upper limit check of the bit error ratio before viterbi decoder.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: DVB-T/H
Compatibility to R&S ETL: yes

CALCulate:DTV:LIMit:RESult:BBViterbi:A | B | C?

This command returns the result of the upper limit check for the bit error ratio before viterbi decoder of the corresponding layer. This command is a query and therefore has no *RST value.

Return value

0	passed
1	failed

Example

`CALC:DTV:LIM:RES:BBV:A?`
Queries the upper limit check of the BER before viterbi decoder of layer A.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: ISDB-T
Compatibility to R&S ETL: yes

CALCulate:DTV:LIMit:RESult:BBRS[:UPPer]?

This command returns the result of the upper limit check for the bit error ratio before Reed Solomon decoder. This command is a query and therefore has no *RST value.

Return value

0	passed
1	failed

Example

CALCULATE:DTV:LIMIT:RESULT:BBRS:UPPER?
Queries the upper limit check of the bit error ratio before Reed Solomon decoder.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: DVB-T/H
Compatibility to R&S ETL: yes

CALCulate:DTV:LIMit:RESult:BBRS:A | B | C?

This command returns the result of the upper limit check for the bit error ratio before Reed Solomon decoder of the corresponding layer. This command is a query and therefore has no *RST value.

Return value

0	passed
1	failed

Example

CALC:DTV:LIM:RES:BBRS:B?
Queries the upper limit check of the bit error ratio before Reed Solomon decoder of layer B.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: ISDB-T
Compatibility to R&S ETL: yes

CALCulate:DTV:LIMit:RESult:BARS:A | B | C?

This command returns the result of the upper limit check for the bit error ratio after Reed Solomon decoder of the corresponding layer. This command is a query and therefore has no *RST value.

Return value

0	passed
1	failed

Example

CALC:DTV:LIM:RES:BARS:B?
Queries the upper limit check of the bit error ratio after Reed Solomon decoder of layer B.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: ISDB-T
Compatibility to R&S ETL: yes

CALCulate:DTV:LIMit:RESult:PERatio[:UPPer]?

This command returns the result of the upper limit check for the Packet Error Ratio. This command is a query and therefore has no *RST value.

Return value

0	passed
1	failed

Example

```
CALCULATE:DTV:LIMIT:RESULT:PERATIO:UPPER?
```
Queries the upper limit check of the packet error ratio.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: DVB-T/H
Compatibility to R&S ETL: yes

CALCulate:DTV:LIMit:RESult:PERRors[:UPPer]?

This command returns the result of the upper limit check for the Packet Errors. This command is a query and therefore has no *RST value.

Return value

0	passed
1	failed

Example

```
CALCULATE:DTV:LIMIT:RESULT:PERRORS:UPPER?
```
Queries the upper limit check of the packet errors.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: DVB-T/H
Compatibility to R&S ETL: yes

CALCulate:DTV:LIMit:RESult:PERRors:A | B | C?

This command returns the result of the upper limit check for the Packet Errors of the corresponding layer. This command is a query and therefore has no *RST value.

Return value

0	passed
1	failed

Example

```
CALC:DTV:LIM:RES:PERR:A?
```
Queries the upper limit check of the packet errors of layer A.

Characteristics

*RST value: -
SCPI: device-specific
TV standard: ISDB-T
Compatibility to R&S ETL: yes

10 Remote Commands in Spectrum Mode

This section provides a detailed description of all remote control commands required to configure and perform measurements in Spectrum Analyzer mode.

10.1 Setting the Frequency and the Span

The following commands configure the frequency axis (x-axis) of the active display.

Commands independent of the operating mode

Note that most of the commands for setting the frequency and span are also used in other operating modes. If a command is available in another mode, it is indicated by the list in the respective section.

List of commands

- [SENSe:]FREQuency:CENTer
- [SENSe:]FREQuency:CENTer:STEP
- [SENSe:]FREQuency:CENTer:STEP:LINK
- [SENSe:]FREQuency:MODE
- [SENSe:]FREQuency:OFFSet
- [SENSe:]FREQuency:SPAN
- [SENSe:]FREQuency:SPAN:AUTO
- [SENSe:]FREQuency:SPAN:FULL
- [SENSe:]FREQuency:STARt
- [SENSe:]FREQuency:STOP

- [SENSe:]CHANNel:TABLe:SELect
- [SENSe:]CHANnel:TABLe:SELect?
- [SENSe:]CHANnel

[SENSe:]FREQuency:CENTer

This command defines the center frequency or the measuring frequency for span = 0.

Parameter

0 to f_{max}

f_{max} is specified in the data sheet.

Example

```
FREQ:CENT 100MHz
```
Sets the center frequency to 100 MHz.

Characteristics

*RST value: f_{max} /2 with f_{max} = maximum frequency
SCPI: conform

[SENSe:]FREQuency:CENTer:STEP

This command defines the step size of the center frequency.

Parameter

0 to f_{max}

Example

```
FREQ:CENT:STEP 120MHz
```
Sets the step size to 120 MHz.

Characteristics

*RST value: – (AUTO 0.1*SPAN is switched on)
SCPI: conform

[SENSe:]FREQuency:CENTer:STEP:LINK

This command couples the step size of the center frequency to span (span >0) or to the resolution bandwidth (span = 0) or cancels the couplings.

Parameter

DIVTen	Coupling of the step size to 10% of the span
OFF	Manual input, no coupling

Example

```
FREQ:CENT:STEP:LINK DIVT
```
Couples the step size to 10% of the span.

Characteristics

*RST value: DIVTen
SCPI: device-specific

[SENSe:]FREQuency:MODE

This command switches between span > 0 (SWEep) and zero span (CW | FIXed).

For CW and FIXed, the frequency is set via the `[SENSe:]FREQuency:CENTer` command. In sweep mode, it is via the `[SENSe:]FREQuency:STARt`, `[SENSe:]FREQuency:STOP`, `[SENSe:]FREQuency:CENTer`, and `[SENSe:]FREQuency:SPAN` commands.

Parameter

CW | FIXed | SWEep

Example

```
FREQ:MODE SWE
```
Activates sweep mode.

Characteristics

*RST value: SWEep
SCPI: conform

[SENSe:]FREQuency:OFFSet

This command defines the frequency offset.

Parameter

–100 GHz to 100 GHz

Example

```
FREQ:OFFS 1GHZ
```

Characteristics

*RST value: 0 Hz
SCPI: conform

[SENSe:]FREQuency:SPAN

This command defines the frequency span.

Parameter

0 to f_{max}

f_{max} is specified in the data sheet.

Example

```
FREQ:SPAN 10MHz
```

Characteristics

*RST value: f_{max} with f_{max} = maximum frequency
SCPI: conform

[SENSe:]FREQuency:SPAN:AUTO

This command activates and deactivates automatic setting of the span. If the Auto Span is active, the R&S ETH automatically sets the span to best fit the measured channel.

Parameter

ON | OFF

Example

```
FREQ:SPAN:AUTO ON
```
Activates the Auto Span function

Characteristics

*RST value: OFF
SCPI: device-specific

[SENSe:]FREQuency:SPAN:FULL

This command sets the frequency span to its maximum.

Parameter

f_{max}, specified in the data sheet.

Example

```
FREQ:SPAN:FULL
```

Characteristics

*RST value: –
SCPI: conform

[SENSe:]FREQuency:STARt

This command defines the start frequency of the analyzer. This command is only available with span > 0.

Parameter

0 to f_{max}

f_{max} is specified in the data sheet.

Example

```
FREQ:STAR 20MHz
```

Characteristics

*RST value: 0
SCPI: conform

[SENSe:]FREQuency:STOP

This command defines the stop frequency of the analyzer. This command is only available with span > 0.

Parameter

0 to f_{max}

f_{max} is specified in the data sheet.

Example

```
FREQ:STOP 2000MHz
```

Characteristics

*RST value: f_{max}
SCPI: conform

[SENSe:]FREQuency:INPut:MODE

This command selects the frequency mode. Select the Channel frequency mode only if you want to work with channel tables. In this case, the input of the center frequency is not a frequency value, but a channel number.

Parameter

CHANnel | FREQ

Example

```
FREQ:INP:MODE CHAN
```
Sets the frequency mode to work with channel tables.

Characteristics

*RST value: FREQ
SCPI: device-specific

[SENSe:]CHANNel:TABLe:SELect

This command loads the specified channel table for upcoming measurements. The file is loaded from the current default directory if no path is set. The default directory can be set with the `MMEMory:CDIRectory` command.

This command is an event and therefore has no query and no *RST value.

Parameter

<string> = <file name>

Examples

```
CHAN:TABL:SEL 'CATV.CHNTAB'
```
Loads the channel table with the name CATV from the current default directory.

```
CHAN:TABL:SEL '\Storage Card\Public\CHANNEL TABLES\CATV.CHNTAB'
```
Loads the channel table with the name ‘CATV’ from the directory \SD card\public\channel tables\.

Characteristics

*RST value: -
SCPI: device-specific

[SENSe:]CHANnel:TABLe:SELect?

This command returns the file name including file extension of the loaded channel table.

This command is an query and therefore has no *RST value.

Parameter

<string.chntab>

string: channel table file name

Examples

`CHAN:TABL:SEL?`
Reads the channel table file name.

Characteristics

*RST value: -
SCPI: device-specific

Compatibility to R&S ETL: -

[SENSe:]CHANnel

This command defines the receive channel in case of channel input mode. A channel table must be loaded prior with the `[SENSe:]CHANnel:TABLe:SELect` command. The frequency input mode must be set to ‘CHANNEL’, see `[SENSe:]FREQuency:INPut:MODE` command.

Parameter

<numeric value> = Minimum channel number to maximum channel number w. r. t. the selected channel table.

Example

`CHANNEL 10`
Sets channel number 10.

Characteristics

*RST value: 1
SCPI: conform

10.2 Setting Amplitude Parameters

The following commands configure the level axis (y-axis) and level parameters of the active display.

Commands independent of the operating mode

Note that some of the commands for setting the level parameters are also used in other operating modes. If a command is available in another mode, it is indicated by the list in the respective section.

List of commands

- DISPlay[:WINDow]:TRACe<1|2>:Y:SPACing
- DISPlay[:WINDow]:TRACe<1|2>:Y[:SCALe]
- DISPlay[:WINDow]:TRACe<1|2>:Y[:SCALe]:ADJust
- DISPlay[:WINDow]:TRACe<1|2>:Y[:SCALe]:RLEVel
- DISPlay[:WINDow]:TRACe<1|2>:Y[:SCALe]:RLEVel:OFFSet
- DISPlay[:WINDow]:TRACe<1|2>:Y[:SCALe]:RPOSition
- INPut:ATTenuation
- INPut:ATTenuation:MODE
- INPut:ATTenuation:AUTO
- INPut:PRESelection:STATe
- INPut:IMPedance
- INPut:IMPedance:PAD
- [SENSe:]CORRection:TRANsducer<1...2>[:STATe]
- [SENSe:]CORRection:TRANsducer<1...2>:SELect
- [SENSe:]CORRection:TRANsducer<1...2>:UNIT?
- [SENSe:]CORRection:TRANsducer<1...2>:ISOTropic[:STATe]?
- UNIT:POWer

DISPlay[:WINDow]:TRACe<1|2>:Y:SPACing

This command selects the scaling for the level display range.

Parameter

LOGarithmic	Selects logarithmic scaling.
LINear	Selects linear scaling in %.

Example

```
DISP:TRAC:Y:SPAC LIN
```
Selects linear scaling of the level axis.

Characteristics

*RST value: LOGarithmic
SCPI: conform

DISPlay[:WINDow]:TRACe<1|2>:Y[:SCALe]

This command defines the display range of a level axis with logarithmic scaling (`DISPlay[:WINDow]:TRACe<1|2>:Y:SPACing`).

For linear scaling, the display range is fixed and cannot be modified.

The numeric suffix <1|2> is irrelevant.

Parameter

10 dB to 150 dB

Example

```
DISP:TRAC:Y 120dB
```
Sets the display range to 120 dB.

Characteristics

*RST value: 100dB
SCPI: device–specific

DISPlay[:WINDow]:TRACe<1|2>:Y[:SCALe]:ADJust

This command automatically sets the scaling of the level axis to best fit the measurement results of the indicated trace.

This command is an event and therefore has no query and no *RST value.

Example

```
DISP:TRAC:Y:ADJ
```
Adjusts the y-axis.

Characteristics

*RST value: -
SCPI: device-specific

DISPlay[:WINDow]:TRACe<1|2>:Y[:SCALe]:RLEVel

This command defines the reference level.

With the reference level offset <> 0, the indicated value range of the reference level is modified by the offset.

The unit depends on the setting defined with `UNIT:POWer`.

The numeric suffix <1|2> is irrelevant.

Parameter

<numeric_value> in dBm, range specified in data sheet

Example

```
DISP:TRAC:Y:RLEV -60dBm
```
Sets the reference level to -60 dBm.

Characteristics

*RST value: –20dBm
SCPI: conform

DISPlay[:WINDow]:TRACe<1|2>:Y[:SCALe]:RLEVel:OFFSet

This command defines the offset of the reference level.

The numeric suffix <1|2> is irrelevant.

Parameter

–200dB to 200dB

Example

```
DISP:TRAC:Y:RLEV:OFFS -10dB
```
Characteristics

*RST value: 0dB
SCPI: conform

DISPlay[:WINDow]:TRACe<1|2>:Y[:SCALe]:RPOSition

This command defines the position of the reference value. It requires a tracking generator and active normalization in the Tracking Generator mode.

The numeric suffixes <1|2> is irrelevant.

Parameter

0 to 100PCT

Example

```
DISP:TRAC:Y:RPOS 50PCT
```
Sets the position of the reference value to 50%

Characteristics

*RST value: 100 PCT (Spectrum Analyzer mode), 50 PCT (Network Analyzer mode)
SCPI: conform

INPut:ATTenuation

This command programs the input attenuator.

The attenuation can be set in 5 dB steps. If the defined reference level cannot be set for the set RF attenuation, the reference level will be adjusted accordingly.

In the default state with Spectrum Analyzer mode, the attenuation set on the step attenuator is coupled to the reference level of the instrument. If the attenuation is programmed directly, the coupling to the reference level is switched off.

Parameter

<numeric_value> in dB; range specified in data sheet

Example

```
INP:ATT 30dB
```

Sets the attenuation on the attenuator to 30 dB and switches off the coupling to the reference level.

Characteristics

*RST value: 0 dB (AUTO is set to ON)
SCPI: conform

INPut:ATTenuation:MODE

This command defines the controlling of the RF input attenuator in case of automatically controlled input attenuation.

For further information on controlling the RF attenuator refer to t the Operating Manual.

Parameter

LDIStortion | LNOise

Example

```
INP:ATT:MODE LNO
```

Sets the attenuation mode to Auto Low Noise.

Characteristics

*RST value: LDIS
SCPI: device-specific

INPut:ATTenuation:AUTO

This command automatically couples the input attenuation to the reference level (state ON) or switches the input attenuation to manual entry (state OFF).

Parameter

ON | OFF

Example

```
INP:ATT:AUTO ON
```

Couples the attenuation set on the attenuator to the reference level.

Characteristics

*RST value: ON
SCPI: conform

INPut:PRESelection:STATe

This command activates or deactivates the RF preselection path of the instrument (only available with installed option R&S ETH-K1).

Parameter

ON | OFF

Example

```
INP:PRESELECTION:STAT ON
```
Activates the RF preselection path.

Characteristics

*RST value: OFF
SCPI: device-specific

INPut:IMPedance

The setting 75 Ω should be selected, if the 50 Ω input impedance is transformed to a higher impedance using a 75 Ω adapter of the RAZ type (= 25 Ω in series to the input impedance of the instrument). The correction value in this case is 1.76 dB = 10 log (75Ω / 50Ω). As an alternative the resistive matching pads R&S RAM or R&S FSH-Z38 can be used. In that cases the correction value is 5.72 dB. For matching pad selection see `INPut:IMPedance:PAD` command.

Parameter

50 | 75

Example

```
INP:IMP 75
```
Sets the input impedance to 75 Ohm.

Characteristics

*RST value: 50 Ω
SCPI: conform

INPut:IMPedance:PAD

This command defines RF matching pad in case of the RF impedance is set to 75 Ω. For RF impedance selection see `INPut:IMPedance` command.

R&S RAZ (= 25 Ω in series to the input impedance of the instrument). The correction value in this case is 1.76 dB = 10 log (75Ω / 50Ω).

R&S RAM and R&S FSH-Z38 are resistive 50/75 Ω matching pads. In that cases the correction value is 5.72 dB.

Parameter

RAM | RAZ | HZTE

RAM	resistive 75/50 Ω matching pad R&S RAM, attenuation 5.72 dB
RAZ	resistive 75/50 Ω matching pad R&S RAZ, attenuation 1.76 dB
HZTE	resistive 75/50 Ω matching pad R&S FSH-Z38, attenuation 5.72 dB

Example

```
INP:IMP:PAD RAM
```

Sets the matching pad R&S RAM.

Characteristics

*RST value: -
SCPI: conform

[SENSe:]CORRection:TRANsducer<1...2>[:STATe]

This command activates or deactivates the selected transducer factor. A transducer file must be loaded prior with the `[SENSe:]CORRection:TRANsducer<1...2>:SELect` command.

The suffix<1...2> specifies the primary or secondary transducer.

Parameter

ON | OFFor 1 | 0

Example

```
CORR:TRAN1 ON
```

Activates the primary transducer

Characteristics

*RST value: OFF
SCPI: device-specific

[SENSe:]CORRection:TRANsducer<1...2>:SELect

This command loads the transducer factor designated by <name>. The file is loaded from the current default directory if no path is set. The default directory can be set with the `MMEMory:CDIRectory` command. The selected transducer can be switched on or off with the `[SENSe:]CORRection:TRANsducer<1...2>[:STATe]` command.

The suffix<1...2> specifies the primary or secondary transducer.

Parameter

<string>= <name of the transducer file including extension> in string data form with a maximum of 8 characters.

Example

```
CORR:TRAN1:SEL 'FACTOR1.PRITRD'
```

Loads the primary transducer 'FACTOR1' from the default directory.

```
CORR:TRAN2:SEL '\Storage Card\Public\TRANSDUCERS\FACTOR1'
```

Loads the secondary transducer 'FACTOR1' from the directory \SD card\public\transducers\.

Characteristics

*RST value: -
SCPI: device-specific

[SENSe:]CORRection:TRANsducer<1...2>:UNIT?

This command queries the unit of the transducer factor in use.

The suffix <1...2> specified the primary or secondary transducer.

Example

```
CORR:TRAN1:UNIT?
```

Queries the unit of the primary transducer.

Characteristics

*RST value: -
SCPI: device-specific

[SENSe:]CORRection:TRANsducer<1...2>:ISOTropic[:STATe]?

This command queries if the currently selected transducer is an isotropic antenna.

Return value

0	Transducer is not an isotropic antenna
1	Transducer is an isotropic antenna

Example

```
CORR:TRAN:ISOT?
```

Characteristics

*RST value: -
SCPI: device-specific

UNIT:POWer

This command selects the default unit.

Parameter

DBM | DBUV | DBMV | V | W | DUVM | DUAM | V_M | W_M2

Example

```
UNIT:POW DBUV
```

Sets the power unit to dBµV.

Characteristics

*RST value: DBM
SCPI: conform
TV standard: all

10.3 Setting the Bandwidths

The following commands configure the filter bandwidths of the R&S ETH. Note that both groups of commands (BANDwidth and BWIDth) are the same.

Commands independent of the operating mode

Note that most of the commands for setting the bandwidth are also used in other operating modes. If a command is available in another mode, it is indicated by the list in the respective section.

List of commands

- [SENSe:]BANDwidth|BWIDth[:RESolution]
- [SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO
- [SENSe:]BANDwidth|BWIDth:VIDeo
- [SENSe:]BANDwidth|BWIDth:VIDeo:AUTO

[SENSe:]BANDwidth|BWIDth[:RESolution]

This command defines the resolution bandwidth.

Analog resolution filters of 100 Hz to 3 MHz in 1 - 3 - 10 steps are available.

Parameter

100 Hz to 3 MHz

Example

```
BAND 100 kHz
```

Sets the IF bandwidth to 100 kHz

Characteristics

*RST value: – (AUTO is set to ON)
SCPI: conform

[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO

This command couples the resolution bandwidth to the span or cancels the coupling.

Parameter

ON | OFF

Example

```
BAND:AUTO OFF
```

Deactivates the coupling of the resolution bandwidth to the span.

Characteristics

*RST value: ON
SCPI: conform

[SENSe:]BANDwidth|BWIDth:VIDeo

This command defines the instruments video bandwidth.

Parameter

10 Hz to 3 MHz

Example

```
BAND:VID 10kHz
```

Characteristics

*RST value: – (AUTO is set to ON)
SCPI: conform

[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO

This command either automatically couples the instruments video bandwidth to the resolution bandwidth or cancels the coupling.

Parameter

ON | OFF

Example

```
BAND:VID:AUTO OFF
```

Characteristics

*RST value: ON
SCPI: conform

10.4 Setting and Triggering the Sweep

The following commands configure the sweep.

Commands independent of the operating mode

Note that most of the commands for setting and triggering are also used in other operating modes. If a command is available in another mode, it is indicated by the list in the respective section.

List of commands

- *WAI
- ABORt
- INITiate[:IMMediate]
- INITiate:CONTinuous
- [SENSe:]SWEep:COUNt
- [SENSe:]SWEep:TIME
- [SENSe:]SWEep:TIME:AUTO
- TRIGger[:SEQuence]:HOLDoff[:TIME]
- TRIGger[:SEQuence]:LEVel:VIDeo
- TRIGger[:SEQuence]:SLOPe
- TRIGger[:SEQuence]:SOURce

ABORt

This command aborts a current measurement and resets the trigger system.

Example

```
ABOR;:INIT:IMM
```

Characteristics

RST value: –
SCPI: conform

INITiate[:IMMediate]

The command initiates a new measurement sequence.

With sweep count > 0 or average count > 0, this means a restart of the indicated number of measurements. With trace functions MAXHold, MINHold and AVERage, the previous results are reset on restarting the measurement.

In single sweep mode, synchronization to the end of the indicated number of measurements can be achieved with the command *OPC, *OPC? or *WAI. In continuous–sweep mode, synchronization to the sweep end is not possible since the overall measurement never ends.

This command is an event and therefore has no *RST value and no query.

Example

```
INIT:CONT OFF
```
Switches to single sweep mode.

```
DISP:WIND:TRAC:MODE AVER
```
Activates trace averaging.

```
INIT;*WAI
```
Starts the measurement and waits for the end of the sweep.

Characteristics

*RST value: –
SCPI: conform

INITiate:CONTinuous

This command determines whether the trigger system is continuously initiated (continuous) or performs single measurements (single).

This setting refers to the sweep sequence (switching between continuous/single sweep).

Parameter

ON | OFF

Example

```
INIT:CONT OFF
```
Switches the sequence single sweep.

```
INIT:CONT ON
```
Switches the sequence to continuous sweep.

Characteristics

*RST value: ON
SCPI: conform

[SENSe:]SWEep:COUNt

This command defines the number of sweeps started with single sweep, which are used for calculating the average or maximum value. If the values 0 or 1 are set, one sweep is performed.

Parameter

0 to 999

Example

`SWE:COUN 64`
Sets the number of sweeps to 64.

`INIT:CONT OFF`
Switches to single sweep mode.

`INIT;*WAI`
Starts a sweep and waits for its end.

Characteristics

*RST value: 1
SCPI: conform

[SENSe:]SWEep:TIME

In analyzer mode, this command defines the sweep time. The available time values vary depending on the span setting.

If `[SENSe:]SWEep:TIME` is directly programmed, automatic coupling to resolution bandwidth and video bandwidth is switched off.

Parameter

Refer to data sheet

Example

`SWE:TIME 10s`
Sets the measurement time to 10 s

Characteristics

*RST value: – (AUTO is set to ON)
SCPI: conform

[SENSe:]SWEep:TIME:AUTO

This command controls the automatic coupling of the sweep time to the frequency span and bandwidth settings.

If `[SENSe:]SWEep:TIME` is directly programmed, automatic coupling is switched off.

Parameter

ON | OFF

Example

`SWE:TIME:AUTO ON`
Activates the coupling to frequency span and bandwidths.

Characteristics

*RST value: ON
SCPI: conform

TRIGger[:SEQuence]:HOLDoff[:TIME]

This command defines the length of the trigger delay.

Parameter

0 s to +100 s

Example

```
TRIG:HOLD 500us
```
Sets the trigger delay to 500 µs.

Characteristics

*RST value: 0 s
SCPI: conform

TRIGger[:SEQuence]:LEVel:VIDeo

This command sets the level of the video trigger source. Video triggering is active in Zero Span only.

Parameter

0 to 100 PCT

Example

```
TRIG:LEV:VID 50PCT
```

Characteristics

*RST value: 50 PCT
SCPI: device–specific

TRIGger[:SEQuence]:SLOPe

This command selects the slope of the trigger signal. The selected trigger slope applies to all trigger signal sources.

Parameter

POSitive | NEGative

Example

```
TRIG:SLOP NEG
```

Characteristics

*RST value: POSitive
SCPI: conform

TRIGger[:SEQuence]:SOURce

This command selects the trigger source for the start of a sweep.

Parameter

IMMediate (Free Run) | EXTern | VIDeo

Refer details on trigger modes refer to the Operating Manual.

Example

```
TRIG:SOUR EXT
```

Selects the external trigger input as source of the trigger signal

Characteristics

*RST value: IMMediate
SCPI: conform

10.5 Working with Traces

The following commands set up the trace and the various functions associated with it, e.g. trace mathematics or the selection of the detector.

Commands independent of the operating mode

Note that most of the commands concerning trace settings are also used in other operating modes. If a command is available in another mode, it is indicated by the list in the respective section.

List of commands

- CALCulate:MATH<1...2>[:EXPRession][:DEFine]
- CALCulate:MATH<1...2>:COPY:MEMory
- CALCulate:MATH<1...2>:STATe
- DISPlay[:WINDow]:TRACe<1|2>[:STATe]
- DISPlay[:WINDow]:TRACe<1|2>:MODE
- FORMat:BORDer
- [SENSe:]DETector[:FUNCtion]
- [SENSe:]DETector<1...6>[:FUNCtion]:AUTO
- TRACe<1|2>[:DATA]?

CALCulate:MATH<1...2>[:EXPRession][:DEFine]

This command defines the mathematical expression for relating traces to trace1. The trace mathematics are activated with `CALCulate:MATH<1...2>:STATe`.

Parameter

(TRACE–MTRACE) Subtracts the trace in memory from the current trace.

(MTRACE–TRACE) Subtracts the current trace from the trace in memory.

Example

```
CALC:MATH (MTRACE-TRACE)
```
Selects the subtraction of the current trace from trace in the memory.

Characteristics

*RST value: –
SCPI: conform

CALCulate:MATH<1...2>:COPY:MEMory

This command stores the current trace into the memory trace of the R&S ETH.

This command is an event and therefore has no query and no *RST value.

Example

```
CALC:MATH:COPY:MEM
```
Copies the trace into the memory.

Characteristics

*RST value: -
SCPI: device-specific

CALCulate:MATH<1...2>:STATe

This command activates or deactivates the mathematical relation of traces.

Parameter

ON | OFF

Example

```
CALC:MATH:STAT ON
```
Activates the trace mathematics.

Characteristics

*RST value: OFF
SCPI: conform

DISPlay[:WINDow]:TRACe<1|2>[:STATe]

This command activates or deactivates the display of the corresponding trace.

Parameter

ON | OFF

Example

```
DISP:TRAC2 ON
```

Characteristics

*RST value: ON for TRACe1, OFF for TRACe2
SCPI: conform

DISPlay[:WINDow]:TRACe<1|2>:MEMory[:STATe]

This command activates and deactivates the trace stored in the memory of the R&S ETH. The suffix at TRACe selects the memory slot the trace is stored in.

Parameter

ON | OFF

Example

```
DISP:TRAC:MEM ON
```
Activates memory trace 1.

Characteristics

*RST value: OFF
SCPI: device-specific

DISPlay[:WINDow]:TRACe<1|2>:MODE

This command defines the type of display and the evaluation of the traces. WRITE corresponds to the Clr/Write mode of manual operation. The trace is switched off (= BLANK in manual operation) with `DISPlay[:WINDow]:TRACe<1|2>[:STATe]`.

The number of measurements for AVERage, MAXHold and MINHold is defined with the `[SENSe:]SWEep:COUNt` command. It should be noted that synchronization to the end of the indicated number of measurements is only possible in single sweep mode.

Parameter

WRITe | AVERage | MAXHold | MINHold | VIEW

For details on trace modes refer to the Operating Manual.

Example

```
SWE:CONT OFF
```
Switching to single sweep mode.

```
SWE:COUN 16
```
Sets the number of measurements to 16.

```
DISP:TRAC:MODE MAXH
```
Activates MAXHold mode for the trace.

```
INIT;*WAI
```
Starts the measurement and waits for the end of the 16 sweeps.

Characteristics

*RST value: WRITe
SCPI: device–specific

FORMat:BORDer

This command controls whether binary data is transferred in normal or swapped byte order.

Parameter

SWAPped	The least significant byte is transferred first (little endian)
NORMal	The most significant byte is transferred first (big endian)

Example

```
FORM:BORD NORM
```
Changes the byte order to normal mode

Characteristics

*RST value SWAPped
SCPI: conform

[SENSe:]DETector[:FUNCtion]

This command selects the detector for recording measured values of the selected trace.

Parameter

APEak | NEGative | POSitive | SAMPle | RMS

For details on detectors refer to the Operating Manual.

Example

```
DET POS
```
Sets the prescan detector to "positive peak".

Characteristics

*RST value: POS
SCPI: conform

[SENSe:]DETector<1...6>[:FUNCtion]:AUTO

This command either couples the detector to the current trace setting or deactivates the coupling. The trace is selected by the numeric suffix at DETector.

Parameter

ON | OFF

Example

```
DET:AUTO OFF
```

Characteristics

*RST value: ON
SCPI: conform

TRACe<1|2>[:DATA]?

This command transfers trace data from the control computer to the instrument, the query reads trace data out of the instrument. The transfer of trace data from the control computer to the instrument takes place by indicating the trace name and then the data to be transferred.

Parameter

TRACE1 | TRACE2

Return value for trace data in Spectrum Analyzer mode

631 results are returned, one result for each point of the trace. The returned values are scaled in the currently selected unit.

Example

```
TRAC:DATA? TRACE1
```

Reads out the data for trace 1

Characteristics

*RST value: -
SCPI: conform

10.6 Using Markers

- Markers and Deltamarkers
- Marker Functions

10.6.1 Markers and Deltamarkers

The following commands are for setting and controlling markers and delta markers. If not otherwise noted, the numeric suffix <1...6> at MARKer or DELTamarker select the marker to be controlled.

In Spectrum Analyzer mode, the numeric suffix <1|2> at CALCulate is irrelevant.

Commands independent of the operating mode

Note that most of the commands for using markers are also used in other operating modes. If a command is available in another mode, it is indicated by the list in the respective section.

List of commands

CALCulate<1|2>:DELTamarker<1...6>[:STATe]

This command switches the delta marker indicated by the suffix on or off.

The suffix 1 is interpreted as delta marker 2 because the first marker has to be a normal marker. Therefore, using no suffix indicates delta marker 2. If more than one marker (2 to 6) is already active, the command turns these marker into delta markers. If no delta marker is active yet, the command activates the delta marker and positions it on the trace maximum.

Parameter

ON | OFF

Example

```
CALC:DELT3 ON
```
Switches marker 3 to delta marker mode.

Characteristics

RST value: OFF
SCPI: device–specific

CALCulate<1|2>:DELTamarker<1...6>:AOFF

This command switches off all active delta markers.

Example

```
CALC:DELT:AOFF
```
Switches off all delta markers.

Characteristics

RST value: –
SCPI: device–specific

CALCulate<1|2>:DELTamarker<1...6>:MAXimum[:PEAK]

This command positions the delta marker indicated by the suffix to the current trace maximum. If necessary, the corresponding delta marker is activated first.

This command is an event and therefore has no *RST value and no query.

Example

```
CALC:DELT3:MAX
```
Sets delta marker 3 to the maximum value of the associated trace.

Characteristics

RST value: –
SCPI: device–specific

CALCulate<1|2>:DELTamarker<1...6>:MAXimum:NEXT

This command positions the delta marker indicated by the suffix to the next smaller maximum value of the trace. The corresponding delta marker is activated first, if necessary.

This command is an event and therefore has no *RST value and no query.

Example

```
CALC:DELT2:MAX:NEXT
```
Sets delta marker 2 to the next smaller maximum value.

Characteristics

RST value: –
SCPI: device–specific

CALCulate<1|2>:DELTamarker<1...6>:MINimum[:PEAK]

This command positions the delta marker indicated by the suffix to the current trace minimum. The corresponding delta marker is activated first, if necessary.

This command is an event and therefore has no *RST value and no query.

Example

```
CALC:DELT3:MIN
```
Sets delta marker 3 to the minimum value of the associated trace.

Characteristics

RST value: –
SCPI: device–specific

CALCulate<1|2>:DELTamarker<1...6>:X

This command positions the delta marker indicated by the suffix to the specified frequency (span > 0) or time (span = 0). The corresponding delta marker is activated first, if necessary.

Note: It is possible to place the marker outside the visible trace. In that case, this value is invalid.

Parameter

0 to MAX (frequency | sweep time)

Example

`CALC:DELT:MOD REL`
Switches the input for all delta markers to relative to marker 1.

`CALC:DELT2:X 10.7MHz`
Positions delta marker 2 10.7 MHz to the right of marker 1.

`CALC:DELT:X?`
Outputs the absolute frequency/time of delta marker 1.

`CALC:DELT:X:REL?`
Outputs the relative frequency/time of delta marker 1.

Characteristics

RST value: –
SCPI: device–specific

CALCulate<1|2>:DELTamarker<1...6>:X:RELative?

This command queries the frequency (span > 0) or time (span = 0) of the delta marker indicated by the suffix relative to marker 1 or to the reference position. The command activates the corresponding delta marker, if necessary.

Return value

Frequency in Hz (span > 0) or time in seconds (span = 0)

Example

`CALC:DELT3:X:REL?`
Outputs the frequency of delta marker 3 relative to marker 1 or relative to the reference position.

Characteristics

RST value: –
SCPI: device–specific

CALCulate<1|2>:DELTamarker<1...6>:Y?

This command queries the measured value of the delta marker indicated by the suffix. The output is always a relative value referred to marker 1. The corresponding delta marker will be activated, if necessary.

To obtain a correct query result, a complete sweep with synchronization to the sweep end must have been performed between the activation of the delta marker and the query of the y value. This is only possible in single sweep mode.

Return value

Depending on the unit defined or on the activated measuring functions, the query result is output in the units below:

Parameter or measuring functions	Output unit
DBM | DBPW | DBUV | DBMV | DBUA	dB (lin/log)
WATT | VOLT | AMPere	dB (lin), % (log)

Example

```
INIT:CONT OFF
```
Switches to single sweep mode.

```
CALC:DELT2 ON
```
Switches on delta marker 2.

```
INIT;*WAI
```
Starts a sweep and waits for its end.

```
CALC:DELT2:Y?
```
Outputs measurement value of delta marker 2.

Characteristics

RST value: –
SCPI: device–specific

CALCulate<1|2>:MARKer<1...6>[:STATe]

This command switches on or off the currently selected marker. If no indication is made, marker 1 is selected automatically. If marker 2 to 6 is selected and used as a delta marker, it is switched to marker mode.

Parameter

ON | OFF

Example

```
CALC:MARK3 ON
```
Switches on marker 3 or switches to marker mode.

Characteristics

*RST value: OFF
SCPI: device–specific

CALCulate<1|2>:MARKer<1...6>:AOFF

This command switches off all active markers and all delta markers and active marker/delta marker measurement functions.

This command is an event and therefore has no *RST value and no query.

Example

```
CALC:MARK:AOFF
```
Switches off all markers.

Characteristics

*RST value: –
SCPI: device–specific

CALCulate<1|2>:MARKer<1...6>:MAXimum[:PEAK]

This command positions the marker to the current maximum value of the corresponding trace. The corresponding marker is activated first or switched to the marker mode.

This command is an event and therefore has no *RST value and no query.

Example

```
CALC:MARK2:MAX
```
Positions marker 2 to the maximum value of the trace.

Characteristics

*RST value: –
SCPI: device–specific

CALCulate<1|2>:MARKer<1...6>:MAXimum:NEXT

This command positions the marker to the next smaller maximum value of the corresponding trace.

This command is an event and therefore has no *RST value and no query.

Example

```
CALC:MARK2:MAX:NEXT
```
Positions marker 2 to the next lower maximum value.

Characteristics

*RST value: –
SCPI: device–specific

CALCulate<1|2>:MARKer<1...6>:MINimum[:PEAK]

This command positions the marker to the current minimum value of the corresponding trace. The corresponding marker is activated first or switched to marker mode, if necessary.

This command is an event and therefore has no *RST value and no query.

Example

```
CALC:MARK2:MIN
```
Positions marker 2 to the minimum value of the trace.

Characteristics

*RST value: –
SCPI: device–specific

CALCulate<1|2>:MARKer<1...6>:MINimum:NEXT

This command positions the marker to the next higher minimum value of the corresponding trace.

This command is an event and therefore has no *RST value and no query.

Example

```
CALC:MARK2:MIN
```
Positions marker 2 to the minimum value of the trace.

```
CALC:MARK2:MIN:NEXT
```
Positions marker 2 to the next higher maximum value.

Characteristics

*RST value: –
SCPI: device–specific

CALCulate<1|2>:MARKer<1...6>:X

This command positions the selected marker to the indicated frequency (span > 0) or time (span = 0). If marker 2 to 6 are selected and used as delta marker, it is switched to marker mode.

Parameter

0 to MAX (frequency | sweep time)

Example

```
CALC:MARK2:X 10.7MHz
```
Positions marker 2 to frequency 10.7 MHz.

Characteristics

*RST value: –
SCPI: device–specific

CALCulate<1|2>:MARKer<1...6>:X:SLIMits[:STATe]

This command activates and deactivates marker search limits.

If the power measurement in zero span is active, this command limits the evaluation range on the trace.

The numeric suffix <1...6> is irrelevant for this command.

Parameter

ON | OFF

Example

```
CALC:MARK:X:SLIM ON
```
Activates search limitation.

Characteristics

*RST value: OFF
SCPI: device–specific

CALCulate<1|2>:MARKer<1...6>:X:SLIMits:LEFT

This command sets the left limit of the search range for markers and delta markers. Depending on the span setting of the x–axis the indicated value defines a frequency (span > 0) or time (span = 0).

The numeric suffix <1...6> is irrelevant for this command.

If the power measurement in zero span is active, this command limits the evaluation range to the trace.

Parameter

0 to MAX (frequency | sweep time)

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.

Characteristics

*RST value: – (is set to the left diagram border when switching on search limits)
SCPI: device–specific

CALCulate<1|2>:MARKer<1...6>:X:SLIMits:RIGHt

This command sets the right limit of the search range for markers and delta markers. Depending on the span setting of the x–axis the indicated value defines a frequency (span > 0) or time (span = 0).

The numeric suffix <1...6> is irrelevant for this command.

If the power measurement in zero span is active, this command limits the evaluation range to the trace.

Parameter

0 to MAX (frequency | sweep time)

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.

Characteristics

*RST value: – (is set to the right diagram border when switching on search limits)
SCPI: device–specific

CALCulate<1|2>:MARKer<1...6>:Y?

This command queries the measured value of the selected marker. The corresponding marker is activated before or switched to marker mode, if necessary.

To obtain a correct query result, a complete sweep with synchronization to the sweep end must be performed between the activation of the marker and the query of the Y value. This is only possible in single sweep mode.

Return value

Numeric value of the marker position, the unit depends on currently set unit (see `UNIT:POWer`).

Example

`INIT:CONT OFF`
Switches to single sweep mode.

`CALC:MARK2 ON`
Switches marker 2.

`INIT;*WAI`
Starts a sweep and waits for the end.

`CALC:MARK2:Y?`
Outputs the measured value of marker 2.

Characteristics

*RST value: –
SCPI: device–specific

10.6.2 Marker Functions

The following commands perform various kinds of analysis at the marker position.

List of commands

- CALCulate:MARKer<1...6>:COUNt[:STATe]
- CALCulate:MARKer<1...6>:COUNt:FREQuency?
- CALCulate:MARKer<1...6>:FREQuency:MODE
- CALCulate:MARKer<1...6>:FUNCtion:NDBDown:STATe
- CALCulate:MARKer<1...6>:FUNCtion:NDBDown
- CALCulate:MARKer<1...6>:FUNCtion:NDBDown:FREQuency?
- CALCulate:MARKer<1...6>:FUNCtion:NDBDown:RESult?
- CALCulate:MARKer<1...6>:FUNCtion:NOISe[:STATe]
- CALCulate:MARKer<1...6>:FUNCtion:NOISe:RESult?

CALCulate:MARKer<1...6>:COUNt[:STATe]

This command switches on or off the frequency counter at the marker position.

The count result is queried with CALCulate:MARKer<1...6>:COUNt:FREQuency?.

Frequency counting is possible only for one marker at a time. If it is activated for another marker, it is automatically deactivated for the previous marker.

It should be noted that a complete sweep must be performed after switching on the frequency counter to ensure that the frequency to be measured is actually reached. The synchronization to the sweep end required for this is only possible in single sweep mode.

Parameter

ON | OFF

Example

```
INIT:CONT OFF
```
Switches to single sweep mode.

```
CALC:MARK ON
```
Switches on marker 1.

```
CALC:MARK:COUN ON
```
Switches on the frequency counter for marker 1.

```
INIT;*WAI
```
Starts a sweep and waits for the end.

```
CALC:MARK:COUN:FREQ?
```
Outputs the measured value.

Characteristics

*RST value: OFF
SCPI: device–specific

CALCulate:MARKer<1...6>:COUNt:FREQuency?

This command performs a frequency measurement at the position of the marker indicated by the suffix at MARKer and returns the result. Before the command, the frequency counter should be switched on and a complete measurement performed to obtain a correct count result. Therefore, a single sweep with synchronization must be performed between switching on the frequency counter and querying the count result.

This command is only a query and therefore has no *RST value.

Example

```
INIT:CONT OFF
```
Switches to single sweep mode.

```
CALC:MARK2 ON
```
Switches on marker 2.

```
CALC:MARK2:COUN ON
```
Switches the frequency counter for marker 2.

```
INIT;*WAI
```
Starts a sweep and waits for the end.

```
CALC:MARK2:COUN:FREQ?
```
Outputs the measured value of marker 2.

Characteristics

*RST value: –
SCPI: device–specific

CALCulate:MARKer<1...6>:FREQuency:MODE

This command sets the marker frequency display mode.

Parameter

FREQ | CHAN

Example

```
CALC:MARK:FREQ:MODE FREQ
```
Selects the frequency display mode.

Characteristics

*RST value: FREQ
SCPI: device-specific

CALCulate:MARKer<1...6>:FUNCtion:NDBDown:STATe

This command activates and deactivates the n dB Down marker function. The n dB down function sets two temporary markers n dB below the level of the reference marker (marker 1), one on the right and the other marker to the left of the reference marker.

The command is independent of the selected marker, the suffixes 1 to 6 are irrelevant.

Parameter

ON | OFF

Example

```
CALC:MARK:FUNC:NDBD:STAT ON
```
Activates the n dB down marker function.

Characteristics

*RST value: OFF
SCPI: device-specific

CALCulate:MARKer<1...6>:FUNCtion:NDBDown

This command defines the distance in dB of the two temporary n dB down markers to the reference marker.

The command is independent of the selected marker, the suffixes 1 to 6 are irrelevant.

Example

```
CALC:MARK:FUNC:NDBDown 9
```
Sets the two temporary markers 9 dB below the reference marker.

Characteristics

*RST value: 3 dB
SCPI: device-specific

CALCulate:MARKer<1...6>:FUNCtion:NDBDown:FREQuency?

This command queries the frequencies of the two temporary n dB down markers.

The command is independent of the selected marker, the suffixes 1 to 6 are irrelevant.

Return value

<frequency1>	absolute frequency of the n dB marker to the left of the reference marker in Hz.
<frequency2>	absolute frequency of the n dB marker to the right of the reference marker in Hz.

Example

```
CALC:MARK:FUNC:NDBD:FREQ?
```
This command would return, for example, 100000000, 200000000, meaning that the first marker position is at 100 MHz, the second marker position is at 200 MHz

Characteristics

*RST value: -
SCPI: device-specific

CALCulate:MARKer<1...6>:FUNCtion:NDBDown:RESult?

This command queries the frequency spacing or bandwidth of the two temporary n dB down markers.

The command is independent of the selected marker, the suffixes 1 to 6 are irrelevant.

Return value

Bandwidth in Hz.

Example

```
CALC:MARK:FUNC:NDBD:RES?
```

Characteristics

*RST value: -
SCPI: device-specific

CALCulate:MARKer<1...6>:FUNCtion:NOISe[:STATe]

This command activates or deactivates the noise measurement for all markers. The noise power density is measured at the position of the markers. The result can be queried with `CALCulate:MARKer<1...6>:FUNCtion:NOISe:RESult?`.

Parameter

ON | OFF

Example

```
CALC:MARK:FUNC:NOIS ON
```
Activates the noise measurement.

Characteristics

*RST value: OFF
SCPI: device–specific

CALCulate:MARKer<1...6>:FUNCtion:NOISe:RESult?

This command queries the result of the noise measurement.

A complete sweep with synchronization to the sweep end must be performed between switching on the function and querying the measured value in order to obtain a correct query result. This is only possible in single sweep mode.

This command is a query and therefore has no *RST value.

Return value

Noise level, the unit depends on the unit set with `UNIT:POWer`.

Example

```
INIT:CONT OFF
```
Switches to single sweep mode.

```
CALC:MARK2 ON
```
Switches on marker 2.

```
CALC:MARK2:FUNC:NOIS ON
```
Switches on noise measurement for marker 2.

```
INIT;*WAI
```
Starts a sweep and waits for the end.

```
CALC:MARK2:NOIS:RES?
```
Outputs the noise result of marker 2.

Characteristics

*RST value: –
SCPI: device–specific

10.7 Using Display Lines and Limit Lines

10.7.1 Display Lines

The following commands define the position of the display line.

List of commands

- CALCulate<1|2>:DLINe
- CALCulate<1|2>:DLINe:STATe

CALCulate<1|2>:DLINe

This command defines the position of the display line indicated by the suffix. The display line can be used to mark any level in the diagram.

The command accepts a variety of units which enables you to express a display line position in a preferred unit without the need to adapt to the instrument's current unit. Omitting an unit uses instrument's current unit.

Parameter

MINimum to MAXimum (depending on current unit)

Example

```
CALC:DLIN -20dBm
```

Characteristics

*RST value: – (STATe to OFF)
SCPI: device–specific

CALCulate<1|2>:DLINe:STATe

This command switches the display line on or off.

Parameter

ON | OFF

Example

```
CALC:DLIN2:STAT OFF
```

Characteristics

*RST value: OFF
SCPI: device–specific

10.7.2 Limit Lines

The following commands define limit lines and perform the corresponding limit checks.

List of commands

- CALCulate<1|2>:LIMit<1|2>:BEEP[:STATe]
- CALCulate<1|2>:LIMit<1|2>:COMMent?
- CALCulate<1|2>:LIMit<1|2>:DELete
- CALCulate<1|2>:LIMit<1|2>:FAIL?
- CALCulate<1|2>:LIMit<1|2>:LOWer:SELect
- CALCulate<1|2>:LIMit<1|2>:STATe
- CALCulate<1|2>:LIMit<1|2>:UNIT:X?
- CALCulate<1|2>:LIMit<1|2>:UNIT[:Y]?
- CALCulate<1|2>:LIMit<1|2>:UPPer:SELect

CALCulate<1|2>:LIMit<1|2>:BEEP[:STATe]

This command activates or deactivates the audio beep. If active, the R&S ETH outputs a beep each time a limit is exceeded.

The numeric suffix <1|2> is irrelevant.

Parameter

ON | OFF

Example

```
CALC:LIM:BEEP ON
```
Activates the audio beep.

Characteristics

*RST value: OFF
SCPI: device-specific

CALCulate<1|2>:LIMit<1|2>:COMMent?

This command queries the description of the limit line indicated by the numeric suffix <1|2>. The maximum number of characters for the comment is 32.

This command is a query and therefore has no RST value.

Return value

<string> = description of the limit line.

Example

```
CALC:LIM:COMM?
```
Queries the description of limit line 1.

Characteristics

*RST value: -
SCPI: device-specific

CALCulate<1|2>:LIMit<1|2>:DELete

This command deletes the limit line indicated by the suffix.

This command is an event and therefore has no *RST value and no query.

Example

```
CALC:LIM2:DEL
```
Deletes the second limit line

Characteristics

*RST value: -
SCPI: device-specific

CALCulate<1|2>:LIMit<1|2>:FAIL?

This command queries the result of the limit check for the limit line indicated by the suffix.

Note that a complete sweep must have been performed to obtain a correct result. A synchronization with `*OPC`, `*OPC?` or `*WAI` should therefore be applied. The result of the limit check is given with 0 for PASS, 1 for FAIL.

Return value

0 for PASS and 1 for FAIL

Example

```
INIT;*WAI
```
Starts a new sweep and waits for its end.

```
CALC:LIM1:FAIL?
```
Queries the result of the check for limit line 1.

Characteristics

*RST value: -
SCPI: conform

CALCulate<1|2>:LIMit<1|2>:LOWer:SELect

This command selects the lower limit line.

This command is an event and therefore has no *RST value and no query.

Parameter

<string> = file name of the limit line

Example

```
CALC:LIM:LOW:SEL 'LINE1'
```
Selects the limit line with the name LINE1 as the lower limit line.

Characteristics

*RST value:
SCPI: conform

CALCulate<1|2>:LIMit<1|2>:STATe

This command activates and deactivates the limits.

The result of the limit check can be queried with `CALCulate<1|2>:LIMit<1|2>:FAIL?`.

Parameter

ON | OFF

Example

```
CALC:LIM:STAT ON
```
Activates the limit check for limit line 1.

Characteristics

*RST value: OFF
SCPI: conform

CALCulate<1|2>:LIMit<1|2>:UNIT:X?

This command queries the unit of the x-axis.

This command is a query and therefore has no *RST value.

Example

```
CALC:LIM:UNIT:X?
```
Queries the x-unit of the first limit line.

Characteristics

*RST value: -
SCPI: device-specific

CALCulate<1|2>:LIMit<1|2>:UNIT[:Y]?

This command queries the unit of the level axis (y-unit).

This command is a query and therefore has no *RST value.

Example

```
CALC:LIM1:UNIT?
```
Queries the y-unit of the first limit line.

Characteristics

*RST value: -
SCPI: device-specific

CALCulate<1|2>:LIMit<1|2>:UPPer:SELect

This command selects the upper limit line.

This command is an event and therefore has no *RST value and no query.

Parameter

<string>

with <string> = file name of the limit line.

Example

```
CALC:LIM:UPP:SEL 'LINE2'
```

Selects the limit line with the name LINE2 as the upper limit line

Characteristics

*RST value: -
SCPI: conform

10.8 Configuring and Using Measurement Functions

The R&S ETH provides measurement functions which allow you to perform advanced measurements and can also be controlled remotely.

- Power Measurements
- Measuring the Channel Power
- Measuring the Adjacent Channel Power
- Measuring the Occupied Bandwidth
- TDMA Measurements

10.8.1 Power Measurements

The following commands configure power measurements. To perform the actual measurement, use the commands described in section "Setting and Triggering the Sweep".

List of commands

- CALCulate:MARKer:FUNCtion:LEVel:ONCE
- CALCulate:MARKer:FUNCtion:POWer[:STATe]
- CALCulate:MARKer:FUNCtion:POWer:PRESet
- CALCulate:MARKer:FUNCtion:POWer:PRESet:CHECk?
- CALCulate:MARKer:FUNCtion:POWer:RESult?
- CALCulate:MARKer:FUNCtion:POWer:SELect

CALCulate:MARKer:FUNCtion:LEVel:ONCE

This command adjusts the reference level of the R&S ETH to the measured power.

This ensures that the RF attenuation and reference level are optimally adjusted to the signal level without overloading the R&S ETH or limiting the dynamic range by too small a S/N ratio.

Current measurements are aborted when pressing the softkey to run a series of test sweeps. The actual measurements are resumed after the automatic level detection is finished.

Example

```
CALC:MARK:FUNC:LEV:ONCE
```

Characteristics

*RST value: -
SCPI: device–specific

CALCulate:MARKer:FUNCtion:POWer[:STATe]

This command activates and deactivates the selected power measurement.

This command is an event and therefore has no *RST value.

Parameter

ON | OFF

Example

```
CALC:MARK:FUNC:POW OFF
```

Deactivates the power measurement.

Characteristics

*RST value: –
SCPI: device–specific

CALCulate:MARKer:FUNCtion:POWer:PRESet

This command loads and initializes a predefined Standard from the specified file, and switches to the corresponding measurement mode. A Standard comprises of parameters specifying default values for settings related to power measurements. Parameters such as channel bandwidth, resolution bandwidth, detector type, and sweep time are examples of parameters stored in a Standard.

Parameter

<string> = file name of the standard

Example

```
CALC:MARK:FUNC:POW:PRES 'cdma.chpstd'
```

Selects the file CDMA.CHPSTD for the measurement.

Characteristics

*RST value: -
SCPI: device-specific

CALCulate:MARKer:FUNCtion:POWer:PRESet:CHECk?

This command determines whether the current instrument state is still in compliance with the Standard currently in use. Modifying instrument settings that are not included in a Standard do not break Standard compliance; modifying settings that are included in a Standard, will break compliance.

This command is a query and therefore has no *RST value.

Return value

0	Instrument Settings are not compliant to the selected standard.
1	Instrument settings are compliant to the selected standard.

Example

```
CALC:MARK:FUNC:POW:PRES:CHEC?
```
Queries compliance to the standard currently in use.

Characteristics

*RST value: -
SCPI: device-specific

CALCulate:MARKer:FUNCtion:POWer:RESult?

This command queries the result of the performed power measurement. If necessary, the measurement is switched on prior to the query.

To obtain a correct result, a complete sweep with synchronization to the end of the sweep must be performed before a query is output. Synchronization is possible only in the single sweep mode.

This command is a query and therefore has no *RST value.

Parameter and return value

CPOWer	Channel power measurement With logarithmic scaling (RANGE LOG), the channel power is output in the currently selected level unit; with linear scaling (RANGE LIN dB or LIN %), the channel power is output in W.
OBANdwidth | OBWidth	Measurement of occupied bandwidth The occupied bandwidth in Hz is returned.
TDMA	TDMA measurement. Returns the power of the TDMA signal.

Example of occupied bandwidth measurement

```
POW:BAND 90PCT
```
Defines 90% as the percentage of the power to be contained in the bandwidth range to be measured.

```
INIT:CONT OFF
```
Switches over to single sweep mode.

```
INIT;*WAI
```
Starts a sweep and waits for the end of the sweep.

```
CALC:MARK:FUNC:POW:RES? OBW
```
Queries the occupied bandwidth measured.

Characteristics

*RST value: –
SCPI: device–specific

CALCulate:MARKer:FUNCtion:POWer:SELect

This command selects the power measurement setting for a standard and previously activates the corresponding measurement, if required.

The configuration for a standard comprises of the parameters weighting filter, channel bandwidth and spacing, resolution and video bandwidth, as well as detector and sweep time.

Parameter

CPOWer	Channel power measurement
ACP	ACP / ACLR measurement
OBANdwidth | OBWidth	Measurement of occupied bandwidth
TDMA	Measurement on TDMA signals

Example

```
CALC:MARK:FUNC:POW:SEL CPOW
```
Selects the channel power measurement

Characteristics

*RST value: –
SCPI: device–specific

10.8.2 Measuring the Channel Power

The following commands configure channel power measurements. To perform the actual measurement, use the commands described in section "Setting and Triggering the Sweep".

Note that the numeric suffix <1…6> at MARKer is irrelevant when using these commands.

List of commands

- CALCulate:MARKer<1...6>:FUNCtion:CPOWer:BANDwidth
- CALCulate:MARKer<1...6>:FUNCtion:CPOWer:MODE
- CALCulate:MARKer<1...6>:FUNCtion:CPOWer:UNIT

CALCulate:MARKer<1...6>:FUNCtion:CPOWer:BANDwidth

This command sets the channel bandwidth for channel power measurements.

The numeric suffix <1...6> is irrelevant.

Parameter

<numeric> | UP | DOWN

Example

```
CALC:MARK:FUNC:CPOW:BAND 4 MHZ
```
Sets the channel bandwidth to 4 MHz.

Characteristics

*RST value: 3.84 MHz
SCPI: device-specific

CALCulate:MARKer<1...6>:FUNCtion:CPOWer:MODE

This command sets the power display mode to Clear / Write or Max Hold for channel power measurements.

The numeric suffix <1...6> is irrelevant.

Parameter

CLR | MAX

Example

```
CALC:MARK:FUNC:CPOW:MODE CLR
```
Selects clear/write trace mode

Characteristics

*RST value: CLR
SCPI: device-specific

CALCulate:MARKer<1...6>:FUNCtion:CPOWer:UNIT

This command defines the unit for channel power measurements.

The numeric suffix <1...6> is irrelevant.

Parameter

DBM | DBMV | DBUV | VOLT | WATT | DUVM | DUAM | V | W | V_M | W_M2

Example

```
CALC:MARK:FUNC:CPOW:UNIT DBM
```
Sets the unit to dBm.

Characteristics

*RST value: dBm
SCPI: device-specific

10.8.3 Measuring the Adjacent Channel Power

The following commands configure Adjacent Channel Power measurements. To perform the actual measurement, use the commands described in section "Setting and Triggering the Sweep".

- Configuring and Performing the ACP Measurement
- Adjacent Channel Power Limit Check

Configuring and Performing the ACP Measurement

The following commands are for configuring and performing the adjacent channel power measurement.

List of commands

- [SENSe:]POWer:ACHannel:ACPairs
- [SENSe:]POWer:ACHannel:BANDwidth[:CHANnel
- [SENSe:]POWer:ACHannel:BANDwidth:ACHannel
- [SENSe:]POWer:ACHannel:BANDwidth:ALTernate<1...11>
- [SENSe:]POWer:ACHannel:MODE
- [SENSe:]POWer:ACHannel:PRESet:RLEVel
- [SENSe:]POWer:ACHannel:REFerence:TXCHannel:AUTO
- [SENSe:]POWer:ACHannel:REFerence:TXCHannel:MANual
- [SENSe:]POWer:ACHannel:SPACing[:ACHannel]
- [SENSe:]POWer:ACHannel:SPACing:ALTernate<1...11>
- [SENSe:]POWer:ACHannel:SPACing:CHANnel<1...11>
- [SENSe:]POWer:ACHannel:TXCHannel:COUNt

[SENSe:]POWer:ACHannel:ACPairs

This command sets the number of adjacent channels pair to the left and to the right of the Tx channel.

Parameter

1 to 12

Example

```
POW:ACH:ACP 3
```

Sets 3 adjacent or alternate channels to the left and to the right of the transmission channel.

Characteristics

*RST value: 1
SCPI: device-specific

[SENSe:]POWer:ACHannel:BANDwidth[:CHANnel

This command sets the channel bandwidth of the radio communication system. The bandwidths of adjacent channels are not influenced by this command.

Instead of BANDwidth, you can also use the alias BWIDth

Parameter

100 Hz to 1000 MHz

Example

```
POW:ACH:BAND 120 KHZ
```
Sets the bandwidth to 120 kHz

Characteristics

*RST value: 14 kHz
SCPI: device-specific

[SENSe:]POWer:ACHannel:BANDwidth:ACHannel

This command sets the channel bandwidth of the adjacent channel in the radio communication system. If you change the bandwidth of the adjacent channel, the bandwidth of all other alternate channels is adjusted to the same value.

Instead of BANDwidth, you can also use the alias BWIDth

Parameter

100 Hz to 1000 MHz

Example

```
POW:ACH:BAND:ACH 120 KHZ
```
Sets the bandwidth of the adjacent channel to 120 kHz

Characteristics

*RST value: 14 kHz
SCPI: device-specific

[SENSe:]POWer:ACHannel:BANDwidth:ALTernate<1...11>

This command sets the bandwidth of the alternate channels in the radio communication system. If you change the bandwidth of the first alternate channel, the bandwidth of all other alternate channels is adjusted to the same value.

The suffix <1...11> selects the number of the alternate channel.

Instead of BANDwidth, you can also use the alias BWIDth

Parameter

100 Hz to 1000 MHz

Example

```
POW:ACH:BAND:ALT2 120 KHZ
```
Sets the bandwidth of the second alternate channel to 120 kHz

Characteristics

*RST value: 14 kHz
SCPI: device-specific

[SENSe:]POWer:ACHannel:MODE

This command selects either absolute or relative adjacent channel measurements. The command is available if span > 0 and if the number of adjacent channel is greater than 0.

Parameter

ABSolute | RELative

Example

```
POW:ACH:MODE ABS
```
Performs an absolute ACP measurement.

Characteristics

*RST value
SCPI: device-specific

[SENSe:]POWer:ACHannel:PRESet:RLEVel

This command adjusts the reference level to the currently measured channel power. It also initiates an adjacent channel power measurement.

This ensures that the signal path of the instrument is not overloaded. Since the measurement bandwidth is significantly smaller than the signal bandwidth in channel power measurements, the signal path can be overloaded although the trace is still significantly below the reference level. If the measured channel power equals the reference level, the signal path is not overloaded.

This command is an event and therefore has no *RST value and no query.

Example

```
POW:ACH:PRES:RLEV
```
Initiates an ACP measurement and adjusts the reference level.

Characteristics

*RST value: -
SCPI: device-specific

[SENSe:]POWer:ACHannel:REFerence:TXCHannel:AUTO

This command activates the automatic selection of a transmission channel to be used as a reference channel in relative ACP measurements.

You can define the Tx channel with the highest power, the lowest power, or the Tx channel nearest to the adjacent channels as the reference channel.

The command is available only for multi-carrier channel and adjacent-channel power measurements with span > 0

Parameter

MINimum	Tx channel with the lowest power
MAXimum	Tx channel with the highest power
LHIGhest	Lowest Tx channel for lower adjacent channels and highest Tx channel for upper adjacent channels

Example

POW:ACH:REF:TXCH:AUTO MIN

Sets the TX channel with the lowest power as reference channel

Characteristics

*RST value
SCPI: device-specific

[SENSe:]POWer:ACHannel:REFerence:TXCHannel:MANual

This command defines a transmission channel as the reference channel for relative ACP measurements.

The command is available only for multi-carrier channel and adjacent-channel power measurements with span > 0

Parameter

1 to 12

Example

```
POW:ACH:REF:TXCH:MAN 2
```
Sets the second Tx channel as reference channel.

Characteristics

*RST value: 1
SCPI: device-specific

[SENSe:]POWer:ACHannel:SPACing[:ACHannel]

This command sets the spacing between the carrier and its adjacent channel.

A change of the adjacent channel spacing causes a change in the spacing of all alternate channels above the adjacent channel.

Parameter

100 Hz to 2000 MHz

Example

```
POW:ACH:SPAC 10 KHZ
```
Defines a channel spacing of the adjacent channel of 10 kHz

Characteristics

*RST value: 14 kHz
SCPI: device-specific

[SENSe:]POWer:ACHannel:SPACing:ALTernate<1...11>

This command sets the spacing between transmission channel and the alternate channels. A change of the alternate channel spacing causes a change in the spacing of all alternate channels above the modified alternate channel. Alternate channels below the modified remain the same.

The numeric suffix <1...11> at ALTernate selects the alternate channel.

Parameter

100 Hz to 2000 MHz

Example

```
POW:ACH:SPAC:ALT2 20 KHZ
```
Defines a channel spacing of the second alternate channel to the transmission channel of 20 kHz.

Characteristics

*RST value: ALT1: 40 kHz; ALT2: 60 kHz; ALT3: 80 kHz etc.
SCPI: device-specific

[SENSe:]POWer:ACHannel:SPACing:CHANnel<1...11>

This command defines the channel spacing of the transmission channels.

The numeric suffix <1...11> at CHANnel selects the TX channel.

Parameter

14 kHz to 2000 MHz

Example

```
POW:ACH:SPAC:CHAN2 20 kHz
```
Defines a channel spacing of the second Tx channel of 14 kHz

Characteristics

*RST value: 20 kHz
SCPI: device-specific

[SENSe:]POWer:ACHannel:TXCHannel:COUNt

This command sets the number of transmission channels.

The command is available for measurements with span > 0.

Parameter

1 to 12

Example

```
POW:ACH:TXCH:COUN 2
```
Sets 2 Tx channels.

Characteristics

*RST value: 1
SCPI: device-specific

Adjacent Channel Power Limit Check

The following commands configure and perform limit checks when measuring the adjacent channel power.

Note that the numeric suffix <1|2> at LIMit is irrelevant when using these commands.

List of commands

- CALCulate:LIMit<1|2>:ACPower[:STATe]
- CALCulate:LIMit<1|2>:ACPower:ACHannel[:RELative]
- CALCulate:LIMit<1|2>:ACPower:ACHannel[:RELative]:STATe
- CALCulate:LIMit<1|2>:ACPower:ACHannel:ABSolute
- CALCulate:LIMit<1|2>:ACPower:ACHannel:ABSolute:STATe
- CALCulate:LIMit<1|2>:ACPower:ACHannel:RESult?
- CALCulate:LIMit<1|2>:ACPower:ALTernate<1…11>[:RELative]
- CALCulate:LIMit<1|2>:ACPower:ALTernate<1…11>[:RELative]:STATe
- CALCulate:LIMit<1|2>:ACPower:ALTernate<1…11>:ABSolute
- CALCulate:LIMit<1|2>:ACPower:ALTernate<1…11>:ABSolute:STATe
- CALCulate:LIMit<1|2>:ACPower:ALTernate<1…11>:RESult?

CALCulate:LIMit<1|2>:ACPower[:STATe]

This command activates and deactivates the limit check for ACP measurements. You have to use `CALCulate:LIMit<1|2>:ACPower:ACHannel[:RELative]:STATe` or CALCulate:LIMit<1...2>:ACPower:ALTernate<1...11>[:RELative]:STATe in combination with this command to specify whether the limit check should be performed for the upper / lower adjacent channel or for the alternate adjacent channels.

The numeric suffix <1|2> at LIMit is irrelevant.

Parameter

ON | OFF

Example

```
CALC:LIM:ACP ON
```

Activates the limit check

Characteristics

*RST value: OFF
SCPI: device-specific

CALCulate:LIMit<1|2>:ACPower:ACHannel[:RELative]

This command sets the relative limit of the upper / lower adjacent channel. The reference value for the relative limit value is the measured channel power.

Note that the relative limit has no effect on the limit check if it is below the absolute limit value (see `CALCulate:LIMit<1|2>:ACPower:ACHannel:ABSolute`). This mechanism allows automatic checking of the absolute basic values of adjacent-channel power as defined in mobile radio standards.

The numeric suffix <1|2> at LIMit is irrelevant.

Parameter

<numeric value> = relative limit for the upper or lower adjacent channel between 0 and 100 dB

Example

```
CALC:LIM:ACP:ACH 30
```
Defines a limit of 30 dB.

Characteristics

*RST value:
SCPI: device-specific

CALCulate:LIMit<1|2>:ACPower:ACHannel[:RELative]:STATe

This command activates the relative limit check of the adjacent channel. The limit check must be activated with `CALCulate:LIMit<1|2>:ACPower[:STATe]` For the command to take effect. `CALCulate:LIMit<1|2>:ACPower:ACHannel:RESult?` queries the result.

Note that a complete measurement must be performed between switching on the limit check and the result query, since otherwise no correct results are available.

The numeric suffix <1|2> at LIMit is irrelevant.

Parameter

ON | OFF

Example

```
CALC:LIM:ACP:ACH:STAT ON
```
Activates the relative limit check.

Characteristics

*RST value: OFF
SCPI: device-specific

CALCulate:LIMit<1|2>:ACPower:ACHannel:ABSolute

This command defines the absolute limit for the lower / upper adjacent channel. It should be noted that the absolute limit has no effect on the limit check if it is below the relative limit (see `CALCulate:LIMit<1|2>:ACPower:ACHannel[:RELative]`). This mechanism allows automatic checking of the absolute basic values of adjacent-channel power as defined in mobile radio standards.

The numeric suffix <1|2> at LIMit is irrelevant.

Parameter

<numeric value> = absolute limit for the upper or lower adjacent channel. The range is from -200 dBm to + 200 dBm

Example

```
CALC:LIM:ACP:ACH:ABS -30
```
Sets the absolute limit to -30 dBm

Characteristics

*RST value: -
SCPI: device-specific

CALCulate:LIMit<1|2>:ACPower:ACHannel:ABSolute:STATe

This command activates the absolute limit check of the adjacent channel. The limit check must be activated with `CALCulate:LIMit<1|2>:ACPower[:STATe]` For this command to take effect. `CALCulate:LIMit<1|2>:ACPower:ACHannel:RESult?` queries the result.

Note that a complete measurement must be performed between switching on the limit check and the result query, since otherwise no correct results are available.

The numeric suffix <1|2> at LIMit is irrelevant.

Parameter

ON | OFF

Example

```
CALC:LIM:ACP:ACH:ABS:STAT ON
```
Activates the absolute limit check.

Characteristics

*RST value: OFF
SCPI: device-specific

CALCulate:LIMit<1|2>:ACPower:ACHannel:RESult?

This command queries the result of the limit check of the upper / lower adjacent channel. In case the ACP measurement is not active, the command returns a error.

This command is a query and therefore has no *RST value.

Return value

FAILED | PASSED

Example

```
CALC:LIM:ACP:ACH:RES?
```
Queries the limit check results.

Characteristics

*RST value: -
SCPI: device-specific

CALCulate:LIMit<1|2>:ACPower:ALTernate<1…11>[:RELative]

This command sets the relative limit of the alternate channels. The reference value for the relative limit value is the measured channel power.

Note that the relative limit has no effect on the limit check if it is below the absolute limit value (see `CALCulate:LIMit<1|2>:ACPower:ALTernate<1…11>:ABSolute`). This mechanism allows automatic checking of the absolute basic values of adjacent-channel power as defined in mobile radio standards.

The numeric suffix <1…11> at ALTernate selects the alternate channel number.

Parameter

<numeric value> = absolute limit for the alternate channels between 0 and 100 dB

Example

```
CALC:LIM:ACP:ALT3 30
```
Defines a limit of 30 dB for the third alternate channel.

Characteristics

*RST value: -
SCPI: device-specific

CALCulate:LIMit<1|2>:ACPower:ALTernate<1…11>[:RELative]:STATe

This command activates the relative limit check of the alternate channels. The limit check must be activated with `CALCulate:LIMit<1|2>:ACPower[:STATe]` for the command to take effect.. `CALCulate:LIMit<1|2>:ACPower:ACHannel:RESult?` queries the result.

Note that a complete measurement must be performed between switching on the limit check and the result query, since otherwise no correct results are available.

The numeric suffix <1…11> at ALTernate selects the alternate channel number.

Parameter

ON | OFF

Example

```
CALC:LIM:ACP:ALT3:STAT ON
```
Activates the relative limit check for the third alternate channel.

Characteristics

*RST value: OFF
SCPI: device-specific

CALCulate:LIMit<1|2>:ACPower:ALTernate<1…11>:ABSolute

This command defines the absolute limit for the lower / upper adjacent channel. It should be noted that the absolute limit has no effect on the limit check if it is below the relative limit (see `CALCulate:LIMit<1|2>:ACPower:ALTernate<1…11>[:RELative]`). This mechanism allows automatic checking of the absolute basic values of adjacent-channel power as defined in mobile radio standards.

The numeric suffix <1…11> at ALTernate selects the alternate channel number.

Parameter

<numeric value> = absolute limit for the upper or lower adjacent channel. The range is from -200 dBm to + 200 dBm

Example

```
CALC:LIM:ACP:ALT3:ABS -30
```
Sets the absolute limit to -30 dBm for the third alternate channel.

Characteristics

*RST value: -
SCPI: device-specific

CALCulate:LIMit<1|2>:ACPower:ALTernate<1…11>:ABSolute:STATe

This command activates the absolute limit check of the alternate channels. The limit check must be activated with `CALCulate:LIMit<1|2>:ACPower[:STATe]` for the command to take effect.. `CALCulate:LIMit<1|2>:ACPower:ACHannel:RESult?` queries the result.

Note that a complete measurement must be performed between switching on the limit check and the result query, since otherwise no correct results are available.

The numeric suffix <1…11> at ALTernate selects the alternate channel number.

Parameter

ON | OFF

Example

```
CALC:LIM:ACP:ALT3:ABS:STAT ON
```
Activates the absolute limit check for the third alternate channel.

Characteristics

*RST value: OFF
SCPI: device-specific

CALCulate:LIMit<1|2>:ACPower:ALTernate<1…11>:RESult?

This command queries the result of the limit check of the upper / lower alternate channels. In case the ACP measurement is not active, the command returns an error.

The numeric suffix <1…11> at ALTernate selects the alternate channel number.

This command is a query and therefore has no *RST value.

Return value

FAILED | PASSED

Example

```
CALC:LIM:ACP:ALT3:RES?
```
Queries the limit check results for the third alternate channel.

Characteristics

*RST value: -
SCPI: device-specific

10.8.4 Measuring the Occupied Bandwidth

The following commands configure the measurement of the Occupied Bandwidth. To perform the actual measurement, use the commands described in section "Setting and Triggering the Sweep".

List of commands

- CALCulate:MARKer<1...6>:FUNCtion:OBAN|OBW:BANDwidth
- CALCulate:MARKer<1...6>:FUNCtion:OBAN|OBW:BANDwidth:PCT

CALCulate:MARKer<1...6>:FUNCtion:OBAN|OBW:BANDwidth

This command sets the channel bandwidth for occupied bandwidth measurements.

Parameter
<numeric>

Example
```
CALC:MARK:FUNC:OBW:BAND 1 MHZ
```
Sets the channel bandwidth to 1 MHz

Characteristics
*RST value: 3.84 MHz
SCPI: device-specific

CALCulate:MARKer<1...6>:FUNCtion:OBAN|OBW:BANDwidth:PCT

This command sets the percentage of the total power that defines the occupied bandwidth.

Parameter
10 to 99

Example
```
CALC:MARK:FUNC:OBW:BAND:PCT 95
```
Sets the power percentage to 95%

Characteristics
*RST value: 99%
SCPI: device-specific

10.8.5 TDMA Measurements

The following commands configure TDMA measurements. To perform the actual measurement, use the commands described in section "Setting and Triggering the Sweep".

List of commands

- CALCulate:MARKer<1...6>:FUNCtion:TDMA:BURSt

CALCulate:MARKer<1...6>:FUNCtion:TDMA:BURSt

This command sets the burst length of the TDMA signal.

Parameter

31.7 us to 19 ms

Example

```
CALC:MARK:FUNC:TDMA:BURS 80 US
```
Sets the burst length to 80 us.

Characteristics

*RST value: 470 us
SCPI: device-specific

11 Remote Commands in Network Analyzer Mode

The chapter provides information on remote commands that configure and perform measurements with the tracking generator. These commands are available in Network Analyzer mode only.

Availability of remote commands for the Network Analyzer

Note that some of the listed remote commands take effect only if options R&S FSH-K42 Vector Reflection and Transmission Measurements are installed.

11.1 Setting the Frequency and Span

The following commands configure the frequency axis (x-axis) of the active display.

List of commands

- [SENSe:]FREQuency:CENTer
- [SENSe:]FREQuency:CENTer:STEP
- [SENSe:]FREQuency:CENTer:STEP:LINK
- [SENSe:]FREQuency:SPAN
- [SENSe:]FREQuency:SPAN:FULL
- [SENSe:]FREQuency:STARt
- [SENSe:]FREQuency:STOP

For a detailed description of the commands refer to "Setting the Frequency and the Span" in Spectrum Analyzer mode.

11.2 Setting Amplitude Parameters

The following commands configure the level axis (y-axis) and level parameters of the active display.

In Network Analyzer mode, the numeric suffix <1|2> at DISPlay selects the measurement screen in dual trace mode.

List of commands

- DISPlay<1|2>:GDELay:REFerence
- DISPlay<1|2>:GDELay:REFerence:POSition
- DISPlay<1|2>:GDELay:Y:SCALe
- DISPlay<1|2>:IMPedance:REFerence:POSition
- DISPlay<1|2>:LOSS:REFerence
- DISPlay<1|2>:LOSS:REFerence:POSition
- DISPlay<1|2>:LOSS:Y:SCALe
- DISPlay<1|2>:MAGNitude:REFerence
- DISPlay<1|2>:MAGNitude:REFerence:POSition
- DISPlay<1|2>:MAGNitude:Y:SCALe
- DISPlay<1|2>:MAGNitude:Y:SPACing
- DISPlay<1|2>:PHASe:REFerence
- DISPlay<1|2>:PHASe:REFerence:POSition
- DISPlay<1|2>:PHASe:Y:SCALe
- DISPlay<1|2>:PHASe:UNWRap
- DISPlay<1|2>:REFLection:Y:SCALe
- DISPlay<1|2>:REFLection:UNIT
- DISPlay<1|2>:VSWR:Y:SCALe
- INPut:ATTenuation
- INPut:ATTenuation:AUTO
- INPut:ATTenuation:MODE
- INPut:IMPedance
- SOURce:TG:ATTenuation
- UNIT:POWer

For a detailed description of commands not described below refer to "Setting Amplitude Parameters" in Spectrum Analyzer mode.

DISPlay<1|2>:GDELay:REFerence

This command sets the reference level for the Group Delay measurement format.

Parameter

1 to 10000 ns

Example

```
DISP:GDEL:REF 20
```

Sets the reference level to 20 nanoseconds

Characteristics

*RST value: 0 ns
SCPI: device-specific

DISPlay<1|2>:GDELay:REFerence:POSition

This command defines the position of the reference value on the display for the Group Delay measurement format. Each step shifts the reference position one grid line up or down.

Parameter

1 to 10

Example

```
DISP:GDEL:REF:POS 0
```

Sets the reference to the bottom of the display (i.e. the first grid line from the bottom).

Characteristics

*RST value: 5
SCPI: device-specific

DISPlay<1|2>:GDELay:Y:SCALe

This command defines the display range of the y-axis for the Group Delay measurement format.

Parameter

<numeric_value>

Example

```
DISP:GDEL:Y:SCAL 20E-9
```

Sets the display range to 20 nanoseconds

Characteristics

*RST value: 100 ns
SCPI: device-specific

DISPlay<1|2>:LOSS:REFerence

This command sets the reference level for the Cable Loss measurement format.

Parameter

<numeric_value>

Example

```
DISP:LOSS:REF 10
```

Sets the reference level to 10 dB

Characteristics

*RST value: 0 dB
SCPI: device-specific

DISPlay<1|2>:LOSS:REFerence:POSition

This command defines the position of the reference value on the display for the Cable Loss measurement format. Each step shifts the reference position one grid line up or down.

Parameter

1 to 10

Example

```
DISP:LOSS:REF:POS 5
```

Sets the reference to the center of the display (i.e. the fifth grid line from the bottom).

Characteristics

*RST value: 10
SCPI: device-specific

DISPlay<1|2>:LOSS:Y:SCALe

This command defines the display range of the y-axis with logarithmic scaling for the Cable Loss measurement format.

Use the `DISPlay[:WINDow]:TRACe<1|2>:Y:SPACing` command to switch to logarithmic scaling.

Parameter

<numeric value>

Example

```
DISP:LOSS:Y:SCAL 20
```

Sets the display range to 20 dB

Characteristics

*RST value: 100 dB
SCPI: device-specific

DISPlay<1|2>:MAGNitude:REFerence

This command sets the reference level for the magnitude measurement format.

Parameter

<numeric_value>

Example

```
DISP:MAGN:REF -10
```

Sets the reference level to -10 dB

Characteristics

*RST value: 0 dB
SCPI: device-specific

DISPlay<1|2>:MAGNitude:REFerence:POSition

This command defines the position of the reference value on the display for the magnitude measurement format. Each step shifts the reference position one grid line up or down.

Parameter

1 to 10

Example

```
DISP:MAGN:REF:POS 5
```

Sets the reference to the center of the display (i.e. the fifth grid line from the bottom).

Characteristics

*RST value: 10
SCPI: device-specific

DISPlay<1|2>:MAGNitude:Y:SCALe

This command defines the display range of the y-axis with logarithmic scaling for the Magnitude measurement format.

Use the `DISPlay[:WINDow]:TRACe<1|2>:Y:SPACing` command to switch to logarithmic scaling.

Parameter

<numeric value>

Example

```
DISP:MAGN:Y:SCAL 50 DB
```

Sets the display range of the y-axis to 50 dB

Characteristics

*RST value: 100 dB
SCPI: device-specific

DISPlay<1|2>:MAGNitude:Y:SPACing

This command sets the scaling of the y-axis for the Magnitude measurement format to either linear or logarithmic.

Parameter

LINear | LOGarithmic

Example

```
DISP:MAGN:Y:SPAC LIN
```
Cahnges the y-axis to linear scaling.

Characteristics

*RST value: LOGarithmic
SCPI: device-specific

DISPlay<1|2>:PHASe:REFerence

This command sets the reference level for the Phase measurement format.

Parameter

<numeric_value>

Example

```
DISP:MAGN:REF -10
```
Sets the reference level to -10 dB

Characteristics

*RST value: 0 dB
SCPI: device-specific

DISPlay<1|2>:PHASe:REFerence:POSition

This command defines the position of the reference value on the display for the Phase measurement format.

Parameter

1 to 10

Example

```
DISP:LOSS:REF:POS 5
```
Sets the reference to the center of the display (i.e. the fifth grid line from the bottom).

Characteristics

*RST value: 10
SCPI: device-specific

DISPlay<1|2>:PHASe:Y:SCALe

This command defines the display range of the y-axis for the Phase measurement format. Phase can have values from 0° to 100000°.

Parameter

<numeric value>

Example

```
DISP:PHAS:Y:SCAL 180
```
Sets the display range of the phase measurement to 180°

Characteristics

*RST value: 360°
SCPI: device-specific

DISPlay<1|2>:PHASe:UNWRap

This command removes the restriction limiting the value range to +/- 180°. Phase can have values from 0° to 100000°.

Parameter

ON | OFF

Example

```
DISP:PHAS:UNWR ON
```
Activates the phase unwrap

Characteristics

*RST value: OFF
SCPI: device-specific

DISPlay<1|2>:REFLection:Y:SCALe

This command defines the display range of the y-axis for the Reflection Coefficient measurement format.

Use the `DISPlay[:WINDow]:TRACe<1|2>:Y:SPACing` command to switch to logarithmic scaling.

Parameter

0 to 1000 mp

Example

```
DISP:REFL:Y:SCAL 100
```
Scales the logarithmic y-axis to 100 mp

Characteristics

*RST value: 1000 mp
SCPI: device-specific

DISPlay<1|2>:REFLection:UNIT

This command defines the unit for the reflection coefficient.

Parameter
RHO | MRHO

Example
`DISP:REFL:UNIT RHO`
Sets the unit to RHO.

Characteristics
*RST value: MRHO
SCPI: device-specific

DISPlay<1|2>:VSWR:Y:SCALe

This command defines the display range of the y-axis for the VSWR measurement format.

Parameter
1...1.1 | 1.5 | 2 | 6 | 11 | 21 | 71

Example
`DISP:VSWR:Y:SCAL 50`
Sets the range to 1...71.

Characteristics
*RST value: 1...21
SCPI: device-specific

SOURce:TG:ATTenuation

This command sets the output level of the tracking generator.

You can set the output level by selecting an attenuation value. The range is from 0 dB to 50 dB. Setting the attenuation to 0 dB results in an output level of 0 dBm. If you set the attenuation to 50 dB, the resulting output level is -50 dBm.

Parameter
0 to 50

Example
`SOUR:TG:ATT 50`
Sets the attenuation to 50 dB and therefore an output level of –50 dBm

Characteristics
*RST value: 10 dB
SCPI: device-specific

11.3 Setting the Bandwidth

The following commands configure the filter bandwidths of the R&S ETH. Note that both groups of commands (BANDwidth and BWIDth) are the same.

List of commands

- [SENSe:]BANDwidth|BWIDth[:RESolution]
- [SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO

For a detailed description of commands refer to "Setting the Bandwidths" in Spectrum Analyzer mode.

11.4 Setting and Triggering the Sweep

The following commands configure the sweep.

List of commands

- *WAI
- ABORt
- INITiate[:IMMediate]
- INITiate:CONTinuous
- [SENSe:]SWEep:COUNt
- [SENSe:]SWEep:TIME
- [SENSe:]SWEep:TIME:AUTO
- TRIGger[:SEQuence]:HOLDoff[:TIME]
- TRIGger[:SEQuence]:SLOPe
- TRIGger[:SEQuence]:SOURce

For a detailed description of commands refer to "Setting and Triggering the Sweep" in Spectrum Analyzer mode.

11.5 Working with Traces

The following commands set up the trace and the various functions associated with it, e.g. the selection of the detector.

List of commands

- DISPlay[:WINDow]:TRACe<1|2>[:STATe]
- DISPlay[:WINDow]:TRACe<1|2>:MEMory[:STATe]
- DISPlay[:WINDow]:TRACe<1|2>:MODE
- FORMat:BORDer
- [SENSe:]DETector[:FUNCtion]
- [SENSe:]DETector<1...6>[:FUNCtion]:AUTO
- TRACE<1|2>[:DATA]?

For a detailed description of commands refer to "Working with Traces" in Spectrum Analyzer mode.

TRACE<1|2>[:DATA]?

This command transfers trace data from the control computer to the instrument, the query reads trace data out of the instrument. The transfer of trace data from the control computer to the instrument takes place by indicating the trace name and then the data to be transferred.

Parameter

TRACE1 | TRACE2

Return value for trace data in Network Analyzer mode

631 results are returned, one result for each point of the trace. The result depends on the measurement format. The return values are scaled in the currently selected unit.

Note that for the MPHase format (simultaneous measurement of magnitude and phase) 631 polar values are returned in ASCII format separated by commas. For each value, first the magnitude and then the phase is output.

Example

```
TRAC:DATA? TRACE1
```

Reads out the data for trace 1

Characteristics

*RST value: -
SCPI: conform
TV standard: all

11.6 Using Markers and Deltamarkers

11.6.1 Markers and Deltamarkers

The following commands are for setting and controlling markers and delta markers. If not otherwise noted, the numeric suffix <1...6> at MARKer or DELTamarker select the marker to be controlled.

In Network Analyzer mode, the numeric suffix <1|2> at CALCulate selects the measurement screen in dual trace mode.

List of commands

- CALCulate<1|2>:DELTamarker<1...6>[:STATe]
- CALCulate<1|2>:DELTamarker<1...6>:AOFF
- CALCulate<1|2>:DELTamarker<1...6>:MAXimum[:PEAK]
- CALCulate<1|2>:DELTamarker<1...6>:MAXimum:NEXT
- CALCulate<1|2>:DELTamarker<1...6>:MINimum[:PEAK]
- CALCulate<1|2>:DELTamarker<1...6>:X
- CALCulate<1|2>:DELTamarker<1...6>:X:RELative?
- CALCulate<1|2>:DELTamarker<1...6>:Y?
- CALCulate<1|2>:MARKer<1...6>[:STATe]
- CALCulate<1|2>:MARKer<1...6>:AOFF
- CALCulate<1|2>:MARKer<1...6>:MAXimum[:PEAK]
- CALCulate<1|2>:MARKer<1...6>:MAXimum:NEXT
- CALCulate<1|2>:MARKer<1...6>:MINimum[:PEAK]
- CALCulate<1|2>:MARKer<1...6>:MINimum:NEXT
- CALCulate<1|2>:MARKer<1...6>:MODE
- CALCulate<1|2>:MARKer<1...6>:X
- CALCulate<1|2>:MARKer<1...6>:X:SLIMits[:STATe]
- CALCulate<1|2>:MARKer<1...6>:X:SLIMits:LEFT
- CALCulate<1|2>:MARKer<1...6>:X:SLIMits:RIGHt
- CALCulate<1|2>:MARKer<1...6>:Y?

For a detailed description of commands not described below refer to "Using Markers" in Spectrum Analyzer mode.

CALCulate<1|2>:MARKer<1...6>:MODE

This command selects the marker mode.

Parameter

NORMal	
RPDB	Reflection Coefficient in complex format (Magnitude (dB) and Phase (Rho))
RPL	Reflection Coefficient in complex format (Magnitude (lin) and Phase (Rho))
RSCalar	Reflection Coefficient in complex format (Real and Imaginary (Rho))
IMPedance	Impedance in complex format (Real and Imaginary)
ADMittance	Admittance in complex format (Real and Imaginary)
NIMPedance	Standardized impedance in complex format (Real and Imaginary)
NADMittance	Standardized admittance in complex format (Real and Imaginary)

Example

```
CALC:MARK:MODE ADM
```
Selects admittance in complex format with real and imaginary components

Characteristics

*RST value: NORMal
SCPI: device–specific

CALCulate<1|2>:MARKer<1...6>:Y?

This command queries the measured value of the selected marker. The corresponding marker is activated before or switched to marker mode, if necessary.

To obtain a correct query result, a complete sweep with synchronization to the sweep end must be performed between the activation of the marker and the query of the Y value. This is only possible in single sweep mode.

Return value

The return values depend on the current measurement format, set with `CALCulate<1|2>:MARKer<1...6>:MODE`.

NORMal	<value> = trace value
RPDB (Reflection Coefficient)	<magnitude in dB>, <phase>
RPL (Reflection Coefficient)	<magnitude linear>, <phase>
RSCalar (Reflection Coefficient)	<real part>, <imaginary part>
IMPedance (complex impedance)	<real part>, <imaginary part>
ADMittance (complex admittance)	<real part>, <imaginary part>
NIMPedance (complex normalized impedance)	<real part>, <imaginary part>
NADMittance (complex normalized admittance)	<real part>, <imaginary part>

Example

```
INIT:CONT OFF
```
Switches to single sweep mode.

```
CALC:MARK2 ON
```
Switches marker 2.

```
INIT;*WAI
```
Starts a sweep and waits for the end.

```
CALC:MARK2:Y?
```
Outputs the measured value of marker 2.

Characteristics

*RST value: –
SCPI: device–specific

11.6.2 Marker Functions

The following commands perform various kinds of analysis at the marker position.

In Network Analyzer mode, the numeric suffix <1|2> at DISPlay selects the measurement screen in dual trace mode.

List of commands

- DISPlay<1|2>:IMPedance:REFerence:POSition
- DISPlay<1|2>:ZOOM:AREA[:STATe]
- DISPlay<1|2>:ZOOM:FACTor
- DISPlay<1|2>:ZOOM:X
- DISPlay<1|2>:ZOOM:Y

DISPlay<1|2>:IMPedance:REFerence:POSition

This command defines the reference impedance for the Smith chart measurement format. The impedance can be between 1mΩ and 10 kΩ.

Parameter

<numeric_value>

Example

```
DISP:IMP:REF:POS 75 OHM
```
Sets the reference impedance to 75 Ohm.

Characteristics

*RST value: 50
SCPI: device-specific

DISPlay<1|2>:ZOOM:AREA[:STATe]

This command activates and deactivates the marker zoom function in a Smith chart.

Parameter

ON | OFF

Example

```
DISP:ZOOM:AREA ON
```

Activates the marker zoom function.

Characteristics

*RST value: OFF
SCPI: device-specific

DISPlay<1|2>:ZOOM:FACTor

This command defines the zoom factor of the marker zoom function in a Smith chart.

Parameter

2 | 4 | 8

Example

```
DISP:ZOOM:FACT 4
```

Sets the zoom factor to 4

Characteristics

*RST value: -
SCPI: device-specific

DISPlay<1|2>:ZOOM:X

This command shifts the zoom window on the x-axis of the Smith chart. '0%' marks the center of the x-axis in the Smith chart.

Parameter

-50 to 50

Example

```
DISP:ZOOM:X 10
```

Shift the zoom window 10% to the right.

Characteristics

*RST value: 0
SCPI: device-specific

DISPlay<1|2>:ZOOM:Y

This command shifts the zoom window on the y-axis of the Smith chart. '0%' marks the center of the y-axis in the Smith chart.

Parameter

-50 to 50

Example

```
DISP:ZOOM:Y -25
```
Shifts the zoom window 25% down.

Characteristics

*RST value: 0
SCPI: device-specific

11.7 Configuring the Measurement

This chapter provides information on how to configure two-port measurements with the tracking generator. The structure follows the order of the actual operation sequence used when performing a measurement:

- Selecting the Measurement Mode
- Calibrating the Measurement
- Selecting the Result Display
- Selecting the Measurement Format

To perform the actual measurement, use the commands described in section "Setting and Triggering the Sweep".

Commands independent of the operating mode

Note that some of the commands for configuring two-port measurements are also used in other operating modes. If a command is available in another mode, it is indicated by the list in the respective section.

11.7.1 Selecting the Measurement Mode

The following commands select the measurement mode and configure user calibration for two-port measurements.

List of commands

- MEASurement<1|2>:MODE
- CALCulate:CALKit:USER[:STATe]
- CALCulate:CALKit:USER:LENGth
- CALCulate:CALKit:USER:OFFSet:LENGth
- CALCulate:CALKit:USER:NAME

MEASurement<1|2>:MODE

This command sets the measurement mode for network analysis measurements.

The numeric suffix <1|2> at MEASurement selects the measurement screen in dual trace mode.

Parameter

Network analysis SCALar | VECTor | VVMeter

Example

```
MEAS:MODE SCAL
```

Switches the network analysis to scalar measurement mode.

Characteristics

*RST value: VECTor
SCPI: device-specific

CALCulate:CALKit:USER[:STATe]

This command activates and deactivates the user calibration.

Parameter

ON | OFF

Example

```
CALK:USER ON
```

Activates the calibration standard.

Characteristics

*RST value: OFF
SCPI: device-specific

CALCulate:CALKit:USER:LENGth

This command defines the electrical length of the user calibration. It is taken into account for phase measurements and in the Smith Chart.

Parameter

0 mm to 1 m

Example

```
CALK:USER:LENG 5 MM
```
Sets the electrical length to 5 millimeter

Characteristics

*RST value: 5.27 mm
SCPI: device-specific

CALCulate:CALKit:USER:OFFSet:LENGth

This command defines the electrical length offset. It is taken into account for phase measurements and in the Smith Chart when phase correction for additional cables and adapters has to be performed.

Parameter

0 mm to 100 m

Example

```
CALK:USER:LENG 500 MM
```
Sets the offset length to 500 millimeter.

Characteristics

*RST value: 0 mm
SCPI: device-specific

CALCulate:CALKit:USER:NAME

This command defines a name for the user calibration to save the customized settings under a user defined name.

Parameter

<string>

Example

```
CALKit:USER:NAME CALKIT1
```
Renames the calibration standard to CALKIT1

Characteristics

*RST value: -
SCPI: device-specific

11.7.2 Calibrating the Measurement

The following commands query and control calibration for two-port measurements.

List of commands

- CALibration:MODE?
- CALibration:STATus?

CALibration:MODE?

This command queries if the current measurement mode is calibrated.

This command is a query and therefore has no *RST value.

Return value

0	not calibrated
1	calibrated

Example

```
CAL:MODE?
```

Characteristics

*RST value: -
SCPI: device-specific

CALibration:STATus?

This command queries whether the R&S ETH is fully calibrated for the current measurement mode or not.

This command is a query and therefore has no *RST value.

Return value

NORM	The R&S ETH is fully calibrated
APPR	The R&S ETH is approximately calibrated, meaning that greater measurement uncertainty must be anticipated

Example

```
CAL:STAT?
```

Queries the calibration status of the R&S ETH

Characteristics

*RST value: -
SCPI: device-specific

11.7.3 Selecting the Result Display

The following commands select the result display for two-port measurements.

List of commands

- MEASurement<1|2>:FUNCtion:SELect

MEASurement<1|2>:FUNCtion:SELect

This command selects the result display.

The numeric suffix <1|2> at MEASurement selects the measurement screen in dual trace mode.

Parameter

S11 | S12 | S21 | S22

Example

```
MEAS:FUNC:SEL S11
```

Characteristics

*RST value: S11
SCPI: device-specific

11.7.4 Selecting the Measurement Format

The following commands are for selecting and configuring the measurement formats available for two-port measurements.

List of commands

- CALCulate:TRACe:CABLe:LENGth[:STATe]
- CALCulate:TRACe:CABLe:LENGth:RESult?
- CALCulate:TRACe:LIMit:VSWR:FAIL?
- DISPlay:GDELay:APERture:STEP
- MEASurement<1|2>:FORMat

CALCulate:TRACe:CABLe:LENGth[:STATe]

This command sets the electrical cable length state.

Parameter

ON | OFF

Example

```
CALC:TRAC:CABL:LENG ON
```

Activates the electrical cable length.

Characteristics

*RST value: OFF
SCPI: device-specific

CALCulate:TRACe:CABLe:LENGth:RESult?

This command queries the measurement result of the electrical cable length.

This command is a query and therefore has no *RST value.

Example

```
CALC:TRAC:CABL:LENG:RES?
```

Queries the measurement result of the electrical cable length.

Characteristics

*RST value: -
SCPI: device-specific

CALCulate:TRACe:LIMit:VSWR:FAIL?

This command queries the results of the limit check for the VSWR measurement format.

This command is a query and therefore has no *RST value.

Return value

0	fail
1	pass

Example

```
CALC:TRAC:LIM:VSWR:FAIL?
```

Queries the results of the limit check.

Characteristics

*RST value: -
SCPI: device-specific

DISPlay:GDELay:APERture:STEP

This command sets the aperture steps for Group Delay measurements.

Parameter

1 to 630

Example

```
DISP:GDEL:APER:STEP 100
```

Sets 100 aperture steps.

Characteristics

*RST value: 10
SCPI: device-specific

MEASurement<1|2>:FORMat

This command specifies the graphical format in which the measurement result are presented.

The numeric suffix <1|2> at MEASurement selects the measurement screen in dual trace mode.

Parameter

Reflection Measurements	MAGNitude | PHASe | MPHase | VSWR | REFlection | SMITh | LOSS | GDELay
Transmission Measurements	MAGNitude | PHASe | MPHase | GDELay

Example

`MEAS:MODE VECT`
Switches to vector measurement mode.

`MEAS:FUNC:REFL ON`
Activates reflection measurement.

`MEAS:FORM SMITh`
Displays the reflection in a Smith Chart.

Characteristics

*RST value: MAGNitude
SCPI: device-specific

12 Remote Commands in the Distance-to-Fault Mode

The chapter provides information on remote commands that configure and perform two-port measurements with the tracking generator. These commands are available in Network Analyzer mode only.

Availability of remote commands for DTF measurements

Note that the listed remote commands take effect only if option R&S FSH-K41 Distance-to-Fault Measurements is installed.

12.1 Setting the Frequency and Span

The following commands configure the frequency axis (x-axis) of the active display.

List of commands

- [SENSe:]FREQuency:CENTer
- [SENSe:]FREQuency:CENTer:STEP
- [SENSe:]FREQuency:CENTer:STEP:LINK
- [SENSe:]FREQuency:SPAN
- [SENSe:]FREQuency:SPAN:AUTO
- [SENSe:]FREQuency:SPAN:FULL
- [SENSe:]FREQuency:STARt
- [SENSe:]FREQuency:STOP

For a detailed description of the commands refer to "Setting the Frequency and the Span" in Spectrum Analyzer mode.

12.2 Setting Amplitude Parameters

List of commands

- DISPlay[:WINDow]:TRACe<1|2>:Y[:SCALe]:ADJust
- INPut:ATTenuation
- INPut:ATTenuation:MODE
- INPut:ATTenuation:AUTO
- INPut:PRESelection:STATe
- SOURce:TG:ATTenuation

For a detailed description of commands refer to "Setting Amplitude Parameters" in Spectrum Analyzer mode.

12.3 Setting the Bandwidth

The following commands configure the filter bandwidths of the R&S ETH. Note that both groups of commands (BANDwidth and BWIDth) are the same.

List of commands

- [SENSe:]BANDwidth|BWIDth[:RESolution]
- [SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO

For a detailed description of commands refer to "Setting the Bandwidths" in Spectrum Analyzer mode.

12.4 Setting and Triggering the Sweep

The following commands configure the sweep.

List of commands

- *WAI
- ABORt
- INITiate[:IMMediate]
- INITiate:CONTinuous
- [SENSe:]SWEep:COUNt
- [SENSe:]SWEep:TIME
- [SENSe:]SWEep:TIME:AUTO

For a detailed description of commands refer to "Setting and Triggering the Sweep" in Spectrum Analyzer mode.

12.5 Working with Traces

The following commands set up the trace and the various functions associated with it, e.g. the selection of the detector.

List of commands

- DISPlay[:WINDow]:TRACe<1|2>[:STATe]
- DISPlay[:WINDow]:TRACe<1|2>:MEMory[:STATe]
- DISPlay[:WINDow]:TRACe<1|2>:MODE
- [SENSe:]PMETer:DETector[:FUNCtion]
- [SENSe:]DETector[:FUNCtion]
- [SENSe:]DETector<1...6>[:FUNCtion]:AUTO
- TRACe<1|2>:DATA?
- UNIT:LENGth

For a detailed description of commands refer to "Working with Traces" in Spectrum Analyzer mode.

TRACe<1|2>:DATA?

This command transfers trace data from the control computer to the instrument, the query reads trace data out of the instrument. The transfer of trace data from the control computer to the instrument takes place by indicating the trace name and then the data to be transferred.

Parameter

TRACE1 | TRACE2 | <numeric_value>

Return value for trace data in Distance-to-Fault mode

631 results are returned, one result for each point of the trace. The returned values are scaled in the currently selected unit.

Example

```
TRAC:DATA? TRACE1
```

Reads out the data for trace 1

Characteristics

*RST value: -
SCPI: conform

UNIT:LENGth

This command sets the instrument's default unit of length.

Parameter
METer | FEET

Example
```
UNIT:LENGth FEET
```
Sets the unit of length to feet.

Characteristics
*RST value: METer
SCPI: conform

12.6 Using Markers

12.6.1 Markers and Deltamarkers

The following commands are for setting and controlling markers and delta markers. If not otherwise noted, the numeric suffix <1...6> at MARKer or DELTamarker select the marker to be controlled.

List of commands

- CALCulate<1|2>:DELTamarker<1...6>[:STATe]
- CALCulate<1|2>:DELTamarker<1...6>:AOFF
- CALCulate<1|2>:DELTamarker<1...6>:MAXimum[:PEAK]
- CALCulate<1|2>:DELTamarker<1...6>:MAXimum:NEXT
- CALCulate<1|2>:DELTamarker<1...6>:MINimum[:PEAK]
- CALCulate<1|2>:DELTamarker<1...6>:X
- CALCulate<1|2>:DELTamarker<1...6>:X:RELative?
- CALCulate<1|2>:DELTamarker<1...6>:Y?
- CALCulate<1|2>:MARKer<1...6>[:STATe]
- CALCulate<1|2>:MARKer<1...6>:AOFF
- CALCulate<1|2>:MARKer<1...6>:MAXimum[:PEAK]
- CALCulate<1|2>:MARKer<1...6>:MAXimum:NEXT
- CALCulate<1|2>:MARKer<1...6>:MINimum[:PEAK]
- CALCulate<1|2>:MARKer<1...6>:MINimum:NEXT
- CALCulate<1|2>:MARKer<1...6>:X

- CALCulate<1|2>:MARKer<1...6>:X:SLIMits[:STATe]
- CALCulate<1|2>:MARKer<1...6>:X:SLIMits:LEFT
- CALCulate<1|2>:MARKer<1...6>:X:SLIMits:RIGHt
- CALCulate<1|2>:MARKer<1...6>:Y?

For a detailed description of commands not described below refer to "Markers and Deltamarkers" in Spectrum Analyzer mode.

12.7 Configuring the Measurement

The following commands configure distance-to-fault measurements. To perform the actual measurement, use the commands described in section "Setting and Triggering the Sweep".

List of commands

- CALCulate:DTF:CABle:LENGth
- CALCulate:DTF:CABle:PRESet
- CALCulate:MARKer<1...6>:FUNCtion:DTF:PEAK:RESult?
- CALCulate:MARKer<1...6>:FUNCtion:DTF:PEAK:THReshold
- MEASurement:MODE

CALCulate:DTF:CABle:LENGth

This command defines the maximum length of the cable that is used for distance-to-fault measurements.

Parameter

3 to 1500 m

Example

```
CALCulate:DTF:CAB:LENG 2 M
```
Sets the cable length to 2 meter.

Characteristics

*RST value: 20 m
SCPI: device-specific

CALCulate:DTF:CABle:PRESet

This command selects the cable model that is used for distance-to-fault measurements.

Parameter

<string> = file name of the cable model

Example

```
CALC:DTF:CAB:PRES 'HLFR.CBLMOD'
```

Selects the cable model from the file HLFR.CBLMOD

Characteristics

*RST value: -
SCPI: device-specific

CALCulate:MARKer<1...6>:FUNCtion:DTF:PEAK:RESult?

This command queries the DTF list. It contains the return loss and distance from the measurement plane of all reflections that exceed the threshold level. The threshold level is defined with the `CALCulate:MARKer<1...6>:FUNCtion:DTF:PEAK:THReshold` command.

The numeric suffix <1..6> is irrelevant.

This command is a query and therefore has no *RST value.

Example

```
CALC:MARK:FUNC:DTF:PEAK:RES?
```

Reads out the DTF peak list.

Characteristics

*RST value: -
SCPI: device-specific

CALCulate:MARKer<1...6>:FUNCtion:DTF:PEAK:THReshold

This commands defines the threshold for the DTF list.

All values which exceed the threshold are in the DTF list and can be queried with the `CALCulate:MARKer<1...6>:FUNCtion:DTF:PEAK:RESult?` command.

The numeric suffix <1...6> is irrelevant.

Parameter

<numeric>

Example

```
CALC MARK:FUNC:DTF:PEAK:THR -20
```

Sets the threshold to -20 dB

Characteristics

*RST value: -
SCPI: device-specific

MEASurement:MODE

This command sets the measurement mode for distance to fault measurements..

Parameter

DTFault | REFLection | SPECtrum

Example

```
MEAS:MODE SCAL
```

Switches to scalar measurement mode.

Characteristics

*RST value: VECTor
SCPI: device-specific

13 Remote Commands in Power Meter Mode

The chapter provides information on remote commands that configure and perform power measurements with the power sensor. These commands are available in Network Analyzer mode only.

Availability of remote commands for Power Sensor measurements

Note that the listed remote commands take effect only if the power sensors R&S FSH-Z1, R&S FSH-Z18, R&S FSH-Z14 or R&S FSH-Z44 are installed.

13.1 Setting the Frequency

The following chapter describes commands necessary to define frequency settings.

List of commands

- [SENSe:]PMETer:FREQuency

[SENSe:]PMETer:FREQuency

This command sets the frequency of the power sensor.

Parameter

<numeric value> = frequency in Hz

Example

```
PMET:FREQ 500 MHZ
```

Sets the power sensor's frequency to 500 MHz

Characteristics

*RST value: -
SCPI: device-specific

13.2 Configuring Power Level Readout

The following chapter describes commands that configure the power level readout.

List of commands

- [SENSe:]PMETer:FREQuency
- CALCulate:PMETer:RELative[:MAGNitude]
- CALCulate:PMETer:RELative[:MAGNitude]:AUTO
- CALCulate:PMETer:RELative[:MAGNitude]:OFFSet
- UNIT<1|2>:PMETer:POWer

CALCulate:PMETer:RELative[:MAGNitude]

This command sets the reference level for relative measurements.

Parameter

<numeric value> = level of the reference value

Example

```
CALC:PMET:REL 30
```

The reference value to 30 dBm.

Characteristics

*RST value: -
SCPI: device-specific

CALCulate:PMETer:RELative[:MAGNitude]:AUTO

This command sets the current measurement result as the reference level for relative measurements.

This command is an event and therefore has no *RST value and no query.

Parameter

ONCE

Example

```
CALC:PMET:REL ONCE
```

Characteristics

*RST value: -
SCPI: device-specific

CALCulate:PMETer:RELative[:MAGNitude]:OFFSet

This command sets the offset of the reference level for relative measurements.

Parameter

<numeric value> = reference offset

Example

```
CALC:PMET:REL -10
```

Characteristics

*RST value: -
SCPI: device-specific

UNIT<1|2>:PMETer:POWer

This command selects the unit of the power sensor.

The suffix at UNIT has the following effects:

Power Measurement with R&S FSH-Z1 and R&S FSH-Z18:

Unit 1	Power unit
Unit 2	not available.

Power Measurement with R&S FSH-Z14 and R&S FSH-Z44:

Unit 1	Forward Power
Unit 2	Reflected Power

Parameter

DBM | WATT | W | DB | VSWR

Note on the parameter DB: when applied to UNIT1, the power is relative to the reference level, when applied to UNIT2, the return loss is displayed.

Note on the parameter VSWR: the parameter is only available if applied to UNIT2.

Example

```
UNIT1:PMET:POW DBM
```

When measuring with the R&S FSH-Z1 or R&S FSH-Z18: sets unit to dBm.

When measuring with the R&S FSH-Z14 or R&S FSH-Z44: sets unit of forward power to dBm.

Characteristics

*RST value: -
SCPI: device-specific

13.3 Setting the Bandwidths

The following commands configure the filter bandwidths of the R&S ETH.

- CALCulate:PMETer:PRESet:BANDwidth:VIDeo

CALCulate:PMETer:PRESet:BANDwidth:VIDeo

This command sets the video bandwidth for power sensor measurements.

Parameter

<numeric value> = video bandwidth in Hz

Example

```
CALC:PMET:PRES:BAND:VID 4 kHz
```

Sets a 4 kHz video bandwidth

Characteristics

*RST value: -
SCPI: device-specific

13.4 Defining the Measurement Time

The following chapter describes commands to define the measurement time of the power sensor.

- [SENSe:]PMETer:MTIMe

[SENSe:]PMETer:MTIMe

This command sets the duration of measurements with the power sensor.

Parameter

SHORt | NORMal | LONG

Example

```
PMET:MTIMe SHOR
```

Sets a short measurement time for power measurements.

Characteristics

*RST value: -
SCPI: device-specific

13.5 Performing Measurements with the Power Sensor

The following chapter describes all commands that are available for performing power measurements with the power sensor.

- CALibration:PMETer:ZERO:AUTO
- [SENSe:]PMETer:DETector[:FUNCtion]
- FETch<1...2>:PMETer?
- CALCulate:PMETer:PRESet[:STATe]
- CALCulate:PMETer:PRESet:SELect

13.5.1 Zeroing of the Power Sensor

CALibration:PMETer:ZERO:AUTO

This commands starts to zero the power sensor.

Parameter

ONCE

Example

```
CAL:PMET:ZERO:AUTO ONCE
```

Starts to zero the power meter.

Characteristics

*RST value: -
SCPI: device-specific

13.5.2 Forward Power Display

Note that the forward power is only available in conjunction with the R&S FSH-Z14 or R&S FSH-Z44.

[SENSe:]PMETer:DETector[:FUNCtion]

This command selects the forward power display of the power sensor.

Parameter

AVERage	average power
PENVelope	peak envelope power

Example

```
PMET:DET AVER
```

Selects the Average weighting mode.

Characteristics
*RST value: -
SCPI: device-specific

13.5.3 Reading Out Measurement Results

FETch<1...2>:PMETer?

This command queries the results of measurements with the power sensor.

Return value
Measurements with R&S FSH-Z1 or R&S FSH-Z18:

FETch1	returns the power unit
FETch2	not available

Measurements with R&S FSH-Z14 or R&S FSH-Z44

FETch1	forward power
FETch2	reflected power

Example
`FET2:PMET?`
Returns nothing for R&S FSH-Z1 / R&S FSH-Z18 and the reflected power for R&S FSH-Z14 / Z44.

Characteristics
*RST value: -
SCPI: device-specific

13.5.4 Selecting a Standard

These commands apply radio communication standards to measurements with the power sensor.

CALCulate:PMETer:PRESet[:STATe]

This command activates and deactivates the usage of a standard for power sensor measurements.

Parameter
ON | OFF

Example
`CALC:PMET:PRES ON`
Activates usage of a standard

Characteristics
*RST value: -
SCPI: device-specific

CALCulate:PMETer:PRESet:SELect

This command selects the standard for measurements with the power sensor.

Parameter

GSM | EDGE | WCDMA | CDMAOne | CDMA2000 | DVBT | DAB | TETRA | USER

Example

```
CALC:PMET:PRES:SEL GSM
```

Selects the GSM standard for power sensor measurements

Characteristics

*RST value: -
SCPI: device-specific

14 Saving and Restoring Instrument Settings and Measurement Results

The following commands perform various tasks in the context of file management.

These commands are independent from the operating mode.

List of commands

- DISPlay:WINDow:STORe
- MMEMory:LOAD:STATe
- MMEMory:STORe:STATe
- MMEMory:CATalog?
- MMEMory:CATalog:DIRectories?
- MMEMory:CDIRectory?
- MMEMory:CDIRectory
- MMEMory:COPY
- MMEMory:DATA
- MMEMory:DATA?
- MMEMory:DELete
- MMEMory:FILE
- MMEMory:FILE:DATE
- MMEMory:FILE:DATE?
- MMEMory:FILE:TIME
- MMEMory:FILE:TIME?
- MMEMory:INIT
- MMEMory:MDIRectory
- MMEMory:MOVE
- MMEMory:RDIRectory

DISPlay:WINDow:STORe

This command makes a screenshot of the current screen and stores it in a file with the name <file name> in PNG format. The file is stored in the current default directory if no path is set. The default directory can be set with the `MMEMory:CDIRectory` command.

This command is an event and therefore has no *RST value and no query.

Parameter

<string> = <file name>

Examples

```
DISP:WIND:STOR "SCREEN.PNG"
```
Creates a “SCREEN.PNG” file in the current default directory.

```
DISP:WIND:STOR "\Storage Card\Screen Shots\SCREEN.PNG"
```
Creates a “SCREEN.PNG” file in the directory \Storage Card\Screen Shots\.

Characteristics

*RST value: -
SCPI: device-specific

MMEMory:LOAD:STATe

This command loads the device settings from *.set files. The contents of the file are loaded and set as the new device state.

Parameter

1,'<file_name>'

with <file_name> = DOS file name including path and the extension .set

The file name includes indication of the path and may also include the drive name. The path name complies with DOS conventions.

Example

```
MMEM:LOAD:STAT 1,'\Public\Datasets\TEST01.SET'
```
Loads the settings from the file TEST01.SET of the internal directory \Public\Datasets\.

Characteristics

*RST value: -
SCPI: conform

MMEMory:STORe:STATe

This command stores the current device settings in a *.set file.

This command is an event and therefore has no *RST value and no query.

Parameter

1,<file_name>

with <file_name> = DOS file name without extension

The file name includes the path and may also include the drive name. The path name complies with DOS conventions.

Example

```
MMEM:STOR:STAT 1,'DATASET001.SET'
```
Saves the current device settings in the file DATASET001.SET.

Characteristics

*RST value: -
SCPI: conform

MMEMory:CATalog?

This command queries the storage information of the memory and lists the files of the current default directory. The default directory can be set with the `MMEMory:CDIRectory` command.

This command is a query and therefore has no *RST value.

Parameter

none

Return value

<used_storage>,<available_storage>{,<file_entry>}

String	Description
<used_storage>	used storage in bytes
<available_storage>	available storage in bytes
<file_entry>	<file_name>,<file_type>,<file_size>,<file_date>,<file_time>
<file_name>	string of characters
<file_type>	file extension (part after the last dot in the name)
<file_size>	size of the file in bytes
<file_date>	date of file in format <year>, <month>, <day> The format in NOT influenced by the DISP:DATE:FORM command.
<file_time>	time of file in format <hours>, <minutes>, <seconds>

Example

```
MMEM:CAT?
3395584,12517376,BP629MHz,set,70559,2010,01,20,15,10,42,DATASET,SET,
312656,2010,01,27,14,29,16,Transducer OFF,set,59246,2009,12,21,09,10,52
```
Used Bytes of this memory: `3395584`
Available Bytes of this memory: `12517376`

```
BP629MHz,set,70559,2010,01,20,15,10,42
```
File name: `BP629MHz`
File type: `set`
File size in Bytes: `70559`
File date: `2010-01-20`
File time: `15:10:10`

`DATASET,SET,312656,2010,01,27,14,29,16`
File name: `DATASET`
File type: `SET`
File size in Bytes: `312656`
File date: `2010-01-27`
File time: `14:29:16`

`Transducer OFF,set,59246,2009,12,21,09,10,52`
File name: `Transducer OFF`
File type: `set`
File size in Bytes: `59246`
File date: `2009-12-21`
File time: `:09:10:52`

Characteristics

*RST value: -
SCPI: conform

MMEMory:CATalog:DIRectories?

This command queries the storage information of the memory and lists the directories of the current default directory. The default directory can be set with the `MMEMory:CDIRectory` command.

This command is a query and therefore has no *RST value.

Example

```
MMEM:CAT:DIR?
84115456,945717248,Test,2010,02,02,17,16,36
```
Used Bytes of this memory: `84115456`
Available Bytes of this memory: `945717248`

`Test,2010,02,02,17,16,36`
Directory name: `TEST`
Directory date: `2010-02-02`
File time: `17:16:36`

Characteristics

*RST value: -
SCPI: device-specific

MMEMory:CDIRectory?

This command queries the current default directory. The default folder is used for all other MMEMory commands and queries.

Parameter

none

Example

```
MMEM:CDIR?
'\Public\Datasets'
```
The current default directory is '\Public\Datasets'.

Characteristics

*RST value: -
SCPI: conform

MMEMory:CDIRectory

This command sets the current default directory. The default folder is used for all other MMEMory commands and queries. If the folder does not exist, an error is generated: .-292, “Referenced name does not exist”.

Parameter

'<directory_name>' = DOS path name

Example

```
MMEM:CDIR '\Public\Datasets'
```
Selects the directory \Public\Datasets.

Characteristics

*RST value: -
SCPI: conform

MMEMory:COPY

This command copies the specified source file/folder to the specified destination. If the specified source file/folder does not exist in the current folder, an error is generated: .-292, “Referenced name does not exist”. If the specified destination file/folder already exists in the current folder, an error is generated: .-293, “Referenced name already exists”. The default directory must be selected before.

This command is an event and therefore has no *RST value and no query.

Parameter

'<src_name>','<dest_name>'

String	Description
<src_name>	source file/folder, string of characters (comma not allowed)
<dest_name>	destination file/folder, string of characters (comma not allowed)

Example

```
MMEM:COPY 'test.set','copy_of_test.set'
```
Generates the copy_of_test.set file which is identically to the test.set file.

Characteristics

*RST value: -
SCPI: conform

MMEMory:DATA

This command creates a new file or overwrites an existing one. The file carries the specified name and is filled with the binary data of <block_data>.

This command is equivalent to the `MMEMory:FILE` command.

Parameter

'<file_name>',<block_data>

String	Description
<file_name>	file name, string of characters (comma not allowed)
<block_data>	binary data block with the following structure:
	character '#'
	digit for the length of the length information
	indicated number of digits as length information (number of bytes) for the binary data themselves
	binary data with the indicated number of bytes

Example

```
MMEMory:DATA 'limit.txt',#232This is the content of the file.
```

File name: `'limit.txt'`
Next 2 characters are the length indication: `#2`
Number of subsequent binary data bytes: `32`
32 bytes stored as binary data in the file limit.txt: `This is the content of the file.`

Characteristics

*RST value: -
SCPI: conform

MMEMory:DATA?

This command returns the content of the file <file_name> as <block>.

Parameter

<file_name> = file name, string of characters (comma not allowed)

Return value

<block_data>

String	Description
<block_data>	binary data block with the following structure:
	character '#'
	digit for the length of the length information
	indicated number of digits as length information (number of bytes) for the binary data themselves
	binary data with the indicated number of bytes (block_data)

Example

```
MMEM:DATA? 'limit.txt'
```

Transfers the content of the file limit.txt from the instrument to the control computer.

```
#232This is the content of the file.
```
Return value: block data

Characteristics

*RST value: -
SCPI: conform

MMEMory:DELete

This command deletes the specified file name. If the specified file name does not exist, an error is generated: .-292, “Referenced name does not exist”.

Parameter

'<file_name>' = DOS file name

Example

```
MMEM:DEL 'TEST01.SET'
```
The file TEST01.SET of the current directory is deleted.

Characteristics

*RST value: -
SCPI: conform

MMEMory:FILE

This command creates a new file or overwrites an existing one. The file carries the specified name and is filled with the binary data of <block_data>.

This command is equivalent to the `MMEMory:DATA` command.

Parameter

<file_name>[,<block>]

String	Description
<file_name>	file name, string of characters (comma not allowed)
<block_data>	binary data block with the following structure:
	character '#'
	digit for the length of the length information
	indicated number of digits as length information (number of bytes) for the binary data themselves
	binary data with the indicated number of bytes

Example

```
MMEMory:FILE 'limit.txt',#232This is the content of the file.
```
File name: `'limit.txt'`
Next 2 characters are the length indication: `#2`
Number of subsequent binary data bytes: `32`
32 bytes stored as binary data in the file limit.txt: `This is the content of the file.`

Characteristics

*RST value: -
SCPI: conform

MMEMory:FILE:DATE

This command sets the modification date of the specified file. If the specified file does not exist, an error is generated: .-292, “Referenced name does not exist”. If the date is invalid, an execution error -200,"Execution error" is generated.

Parameter

'<file_name>',<year>,<month>,<day>

String	Description
<file_name>	file: String of characters (comma not allowed)
<year>	integer number in the range [2000-2099]
<month>	integer number in the range [1,12] (1 = January, 12 = December)
<day>	integer number in the range [1,31]

Example

```
MMEMory:FILE:DATE 'test.txt',2006,12,14
```
Sets the date of the file test.txt to December, 14th, 2006.

Characteristics

*RST value: -
SCPI: conform

MMEMory:FILE:DATE?

This command returns the date of the specified file. If the specified file does not exist, an error is generated: .-292, “Referenced name does not exist”.

Parameter

'<file_name>' = file name, string of characters (comma not allowed)

Example

```
MMEMory:FILE:DATE? 'test.txt'
```
Queries the date of the specified file.

```
2006,12,14
```
Return value: The file test.txt has the date December, 14th, 2006.

Characteristics

*RST value: -
SCPI: conform

MMEMory:FILE:TIME

This command sets the time of the specified file. If the specified file does not exist, an error is generated: .-292, “Referenced name does not exist”. If the time is invalid, an execution error -200,"Execution error" is generated.

Parameter

'<file_name>',<hours>,<minutes>,<seconds>

String	Description
<file_name>	file name, string of characters (comma not allowed)
<hours>	integer number in the range [0:23]
<minutes>	integer number in the range [0:59]
<seconds>	any number in the range [0:60]

Example

```
MMEMory:FILE:TIME 'test.txt', 22, 23, 24
```

Sets the time of the test.txt file to 22:23:24.

Characteristics

*RST value: -
SCPI: conform

MMEMory:FILE:TIME?

This command returns the time of the specified file. If the specified file does not exist, an error is generated: .-292, “Referenced name does not exist”.

Parameter

<file_name> = file name, string of characters (comma not allowed)

Example

```
MMEMory:FILE:TIME? 'test.txt'
```

Queries the time of the specified file.

```
22,23,24.000
```

Return value: The time of the file test.txt is 22:23:24.

Characteristics

*RST value: -
SCPI: conform

MMEMory:INIT

This command formats the specified memory.

Note: Formatting deletes all data stored on the memory drive.

This command is an event and therefore has no *RST value and no query.

Example:

```
MMEM:INIT
```

Formats and deletes all data from the indicated memory.

Characteristics:

*RST value: -
SCPI: conform

MMEMory:MDIRectory

This command creates a new directory in the current directory. If the specified directory name already exists in the current directory, an error is generated: .-293, “Referenced name already exists”.

This command is an event and therefore has no *RST value and no query.

Parameter

<directory_name> = string of characters (comma not allowed)

Examples

```
MMEM:MDIR '\Public\MyDir'
```

Creates the "MyDir" directory on the internal memory.

```
MMEM:MDIR '\Storage Card\User'
```

Creates the "User" directory on the storage card.

Characteristics

*RST value: -
SCPI: device-specific

MMEMory:MOVE

This command renames the specified file/folder as specified in the destination name. If the specified file/folder does not exist in the current folder, an error is generated: .-292, “Referenced name does not exist”. If the destination name already exists in the current folder, an error is generated: .-293, “Referenced name already exists”.

This command is an event and therefore has no *RST value and no query.

Parameter

'<src_name>','<dest_name>'

String	Description
<src_name>	source file/folder, string of characters (comma not allowed)
<dest_name>	destination file/folder, string of characters (comma not allowed)

Example

```
MMEM:MOVE '\Public\Screen Shots','\Public\PNGs'
```

Renames the directory Public\Screen Shots to Public\PNGs.

Characteristics

*RST value: -
SCPI: conform

MMEMory:RDIRectory

This command deletes the specified directory in the current directory. If the specified directory does not exist in the current directory, an error is generated: -292, “Referenced name does not exist”.

This command is an event and therefore has no *RST value and no query.

Parameter

'<directory_name>' = string of characters (comma not allowed)

Example

```
MMEMory:RDIRectory '\Public\MyDir'
```
Deletes the "Public\MyDir" directory.

Characteristics

*RST value: -
SCPI: device-specific

15 Configuring the Instrument

The following commands configure general instrument settings.

These commands are independent from the operating mode.

15.1 Mode Selection

This chapter describes all commands that select the operating mode of the R&S ETH.

List of commands

- INSTrument[:SELect]
- INSTrument:NSELect

15.2 Controlling the GPS Receiver

This chapter describes all commands that control the GPS receiver.

List of commands

- SYSTem:POSition:GPS[:STATe]
- SYSTem:POSition:GPS:CONNected?
- SYSTem:POSition:GPS:CORRection:FREQuency?
- SYSTem:POSition:GPS:QUALity
- SYSTem:POSition:GPS:SATellites?
- SYSTem:POSition:LATitude?
- SYSTem:POSition:LONGitude?
- SYSTem:POSition:VALid?

SYSTem:POSition:GPS[:STATe]

This command activates and deactivates the GPS receiver (R&S HA-Z240).

Note that the GPS receiver only works if a connection between the R&S ETH and a GPS signal transmitter is established.

Parameter

ON | OFF

Example

```
SYST:POS:GPS ON
```
Activates the GPS receiver.

Characteristics

*RST value: OFF
SCPI: device-specific

SYSTem:POSition:GPS:CONNected?

This command queries if the R&S ETH is currently connected to the GPS receiver (R&S HA-Z240).

Return value

0	no connection to a GPS device
1	connection to a GPS device is established

Example

```
SYST:POS:GPS:CONN?
```

Characteristics

*RST value: -
SCPI: device-specific

SYSTem:POSition:GPS:CORRection:FREQuency?

This command queries the frequency correction factor. This factor is calculated from a reference signal provided by the GPS receiver R&S HA-Z240. The reference signal is used to determine the deviation of the internal clock of the instrument, which can be turned into a correction factor for the measured frequency.

Return value

<floating point value>

If the GPS receiver is deactivated, this query returns 0.

Example

```
SYST:POS:GPS:CORR:FREQ?
```

Characteristics

*RST value: -
SCPI: device-specific

SYSTem:POSition:GPS:QUALity

This command queries the quality of the GPS signal.

Return value

INSufficient | LOW | MEDium | HIGh | EXCellent

Example

```
SYST:POS:GPS:QUAL?
```

Characteristics

*RST value: -
SCPI: device-specific

SYSTem:POSition:GPS:SATellites?

This command queries the number of tracked satellites.

Return value

<number of satellites>

Example

```
SYST:POS:GPS:SAT?
```

Characteristics

*RST value: -
SCPI: device-specific

SYSTem:POSition:LATitude?

This command queries the latitude of the current position of the R&S ETH.

Return value

<sign><degrees>,<minutes>,<seconds>

<sign>	no sign = northern hemisphere, negative sign (-) = southern hemisphere
<degrees>	degrees of latitude (integer value)
<minutes>	minutes of latitude (integer value)
<seconds>	seconds of latitude (floating point value)

Example

```
SYST:POS:LAT?
```

Return value would be, for example, 48,7,40.0 for 48°, 7 ', 40.0" in the northern hemisphere.

Characteristics

*RST value: -
SCPI: device-specific

SYSTem:POSition:LONGitude?

This command queries the longitude of the current position of the R&S ETH.

Return value

<sign><degrees>,<minutes>,<seconds>

<sign>	no sign = east, negative sign (-) = west
<degrees>	degrees of longitude (integer value)
<minutes>	minutes of longitude (integer value)
<seconds>	seconds of longitude (floating point value)

Example

```
SYST:POS:LONG?
```

Return value would be, for example, 11,36,46.2 for 11°, 36', 46.2" East

Characteristics

*RST value: -
SCPI: device-specific

SYSTem:POSition:VALid?

This command queries the validity of the position information.

Return value

0	The position information is not valid
1	The position information is valid.

Example

```
SYST:POS:VAL?
```

Characteristics

*RST value: -
SCPI: device-specific

15.3 Display Configuration

This chapter describes commands to set up the display of the R&S ETH via remote control.

List of commands

- DISPlay:BRIGhtness
- DISPlay:CMAP
- DISPlay:CMAP:DEFault
- DISPlay:DATE:FORMat

DISPlay:BRIGhtness

This command sets the brightness of the display backlight.

Parameter

1 to 1

Example

```
DISP:BRIG 0.80
```

Sets the brightness of the display to 80%

Characteristics

*RST value: 0.5 (50%)
SCPI: device-specific

DISPlay:CMAP

This command sets the color scheme of the display to either color or black and white.

Parameter

COLor | BW

Example

```
DISP:CMAP BW
```

Sets the screen colors to black and white

Characteristics

*RST value: -
SCPI: conform

DISPlay:CMAP:DEFault

This command resets the screen colors of all display items to their default settings, i.e. to the color scheme.

This command is an event and therefore has no query and no *RST value.

Example

```
DISP:CMPA:DEF
```

Restores the default screen colors

Characteristics

*RST value: -
SCPI: conform

DISPlay:DATE:FORMat

This command sets the display date format.

Parameter

DDMMyyyy | MMDDyyyy

Example

```
DISP:DATE:FORM DDMMyyyy
```

Characteristics
*RST value: DDMMyyyy
SCPI: device-specific

15.4 Audio Settings

This chapter describes all commands to control the audio functions of the R&S ETH.

List of commands

- SYSTem:AUDio:VOLume
- SYSTem:BEEPer:VOLume
- SYSTem:BEEPer:KEY:VOLume

SYSTem:AUDio:VOLume

This command sets the volume of the internal speaker. The range is between 0 and 1, with 1 being the maximum possible volume.

Parameter
0 to 1

Example
`SYST:AUD:VOL 0.40`
Sets the volume to 40%

Characteristics
*RST value: 0.3 (30%)
SCPI: device-specific

SYSTem:BEEPer:VOLume

This command sets the volume of the beeper, activated with `CALCulate<1|2>:LIMit<1|2>:BEEP[:STATe]`. The range is between 0 and 1, with 1 being the maximum possible volume.

Parameter
0 to 1

Example
`SYST:BEEP:VOL 0.50`
Sets the volume of the beeper to 50%

Characteristics
*RST value: 0.6 (60%)
SCPI: conform

SYSTem:BEEPer:KEY:VOLume

This command sets the volume of the keyboard clicking. The range is between 0 and 1, with 1 being the maximum possible volume.

Parameter

0 to 1

Example

```
SYST:BEEP:KEY:VOL 0.10
```
Sets of keyboard clicking volume to 10%

Characteristics

*RST value: 0.3 (30%)
SCPI: conform

15.5 Setting up a Network Connection

This chapter describes all commands that are used if the R&S ETH is part of a network.

List of commands

- SYSTem:COMMunicate:LAN:ETHernet?
- SYSTem:COMMunicate:LAN:SUBMask
- SYSTem:COMMunicate:SOCKet:ADDRess
- SYSTem:COMMunicate:SOCKet:DHCP[:STATe]
- SYSTem:COMMunicate:SOCKet:PORT

SYSTem:COMMunicate:LAN:ETHernet?

This command queries the MAC address of the R&S ETH.

This command is a query and therefore has no *RST value.

Example

```
SYST:COMM:LAN:ETH?
```
Returns the MAC address

Characteristics

*RST value: -
SCPI: device-specific

SYSTem:COMMunicate:LAN:SUBMask

This command sets the subnet mask address of the R&S ETH.

Parameter
<string> = subnet mask address

Example
```
SYST:COMM:LAN:SUBM '255.255.255.0'
```
Sets the subnet mask address to 255.255.255.0

Characteristics
*RST value: 255.255.255.0
SCPI: device-specific

SYSTem:COMMunicate:SOCKet:ADDRess

This command sets the IP address of the R&S ETH.

Parameter
<string> = IP address

Example
```
SYST:COMM:SOCK:ADDR '172.76.68.30'
```
Sets the IP address of the R&S ETH to 172.76.68.30

Characteristics
*RST value: 172.76.68.24
SCPI: device-specific

SYSTem:COMMunicate:SOCKet:DHCP[:STATe]

This command activates and deactivates the Dynamic Host Configuration Protocol (DHCP).

Parameter
ON | OFF

Example
```
SYST:COMM:SOCK:DHCP ON
```
Activates DHCP.

Characteristics
*RST value: ON
SCPI: device-specific

SYSTem:COMMunicate:SOCKet:PORT

This command sets the port number for the connection.

Parameter
<port_number>

Example

```
SYST:COMM:SOCK:PORT 1000
```

Sets the port number to 1000

Characteristics

*RST value: 5555
SCPI: device-specific

15.6 System Settings

This chapter describes all commands that define or query general system settings.

List of commands

- [SENSe:]ROSCilator:SOURce
- SYSTem:BNC<1...2>:MODE
- SYSTem:DATE
- SYSTem:ERRor[:NEXT]?
- SYSTem:ERRor:ALL?
- SYSTem:ERRor:CODE[:NEXT]?
- SYSTem:ERRor:CODE:ALL?
- SYSTem:ERRor:COUNt?
- SYSTem:FORMat:IDENt
- SYSTem:HELP:HEADers?
- SYSTem:HELP:SYNTax?
- SYSTem:LANGuage
- SYSTem:LANGuage:CATalog?
- SYSTem:POWer:SOURce?
- SYSTem:POWer:STATus?
- SYSTem:PRESet:FACTory
- SYSTem:TIMESYSTem:VERSion?

[SENSe:]ROSCilator:SOURce

This command selects the source of the frequency reference oscillator.

If you use an external reference signal, make sure to connect the signal to the Ext Ref BNC connector of the R&S ETH.

Parameter

INTernal | EXTernal

Example

```
ROSC:SOUR EXT
```
Activates external source as reference signal.

Characteristics

*RST value: internal
SCPI: device-specific

SYSTem:BNC<1...2>:MODE

This command selects the function the BNC socket indicated by the numeric suffix is used for.

Parameter

REFerence | TRIGger | BIAS | IF3 | IFDac

Example

```
SYST:BNC2:MODE BIAS
```
Sets the seconds BNC socket to BIAS.

Characteristics

*RST value: BNC 1: TRIGger, BNC 2: IF3
SCPI: device-specific

SYSTem:DATE

This command sets the date for the internal calendar.

The sequence of entry is year, month, day.

Parameter

1980 to 2099, 1 to 12, 1 to 31

Example

```
SYST:DATE 2000,6,1
```

Characteristics

*RST value: -
SCPI: conform

SYSTem:ERRor[:NEXT]?

This command queries the earliest error queue entry and deletes it. The entry consists of an error number and a short description of the error.

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.

This command is a query and therefore has no *RST value.

Example

```
STAT:ERR?
```

Characteristics

*RST value: -
SCPI: conform

SYSTem:ERRor:ALL?

This command retrieves all entries in the error queue. The entry consists of an error number and a short description of the error.

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 is returned.

This command is a query and therefore no *RST value.

Example

```
SYST:ERR:ALL?
```

Characteristics

*RST value: -
SCPI: device-specific

SYSTem:ERRor:CODE[:NEXT]?

This command queries the earliest error queue entry and deletes it. The entry consists of the error number only..

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.

This command is a query and therefore has no *RST value.

Example

```
STAT:ERR:CODE?
```

Characteristics

*RST value: -
SCPI: conform

SYSTem:ERRor:CODE:ALL?

This command retrieves all entries in the error queue. The entry consists of the error number only..

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 is returned.

This command is a query and therefore no *RST value.

Example

```
SYST:ERR:CODE:ALL?
```

Characteristics

*RST value: -
SCPI: device-specific

SYSTem:ERRor:COUNt?

This command queries the number of errors currently in the error queue.

This command is a query and therefore no *RST value.

Example

```
SYST:ERR:COUN?
```

Characteristics

*RST value: -
SCPI: device-specific

SYSTem:FORMat:IDENt

This command sets the response format to the *IDN? query. This function is intended for re-use of existing control programs together with the R&S ETH.

Parameter

LEGacy	A *IDN? returns for example ‘Rohde&Schwarz,ETH,105345/014,3.10’
NEW	A *IDN? returns for example ‘Rohde&Schwarz,ETH,2114.1508K14/105345,3.10’

Example

```
SYST:FORM:IDEN NEW
```

Characteristics

*RST value: -
SCPI: device-specific

SYSTem:HELP:HEADers?

This command returns a list of all common commands and instrument-control commands and queries implemented in the instrument.

This command is a query and therefore no *RST value.

Example

`SYST:HELP:HEAD?`
Returns the syntax of all available commands.

Characteristics

*RST value: -
SCPI: conform

SYSTem:HELP:SYNTax?

This command returns the full syntax and all parameters of the specified command.

This command is a query and therefore no *RST value.

Parameter

<string> = syntax of command

Example

`SYST:HELP:SYNT? 'SYST:ERR?'`
Returns the full syntax. In this case: '`SYSTem:ERRor[:NEXT]`'.

Characteristics

*RST value: -
SCPI: device-specific

SYSTem:LANGuage

This command sets the language of the R&S ETH user interface. You can query a list of available languages with `SYSTem:LANGuage:CATalog?`.

Parameter

<language> = string of the language

Example

`SYST:LANG 'English'`
Sets the system language to English

Characteristics

*RST value: -
SCPI: conform

SYSTem:LANGuage:CATalog?

This command lists all available system languages.

This command is a query and therefore no *RST value.

Example

```
SYST:LANG:CAT?
```

Characteristics

*RST value: -
SCPI: device-specific

SYSTem:POWer:SOURce?

This command queries whether R&S ETH is battery-powered or line-powered.

This command is a query and therefore has no *RST value.

Return value

ADAP	R&S ETH is powered by the mains adapter.
BATT	R&S ETH is powered by the battery.

Example

```
SYST:POW:SOUR?
```

Characteristics

*RST value: -
SCPI: conform

SYSTem:POWer:STATus?

This command queries the remaining power of the battery.

This command is a query and therefore has no *RST value.

Return value

0...100 %

Example

```
SYST:POW:STAT?
```

Characteristics

*RST value: -
SCPI: conform

SYSTem:PRESet:FACTory

This command initiates an instrument reset back to factory settings.

Example

```
SYST:PRES:FACT
```

Resets the R&S ETH to its factory settings.

Characteristics

*RST value: -
SCPI: device-specific

SYSTem:TIME

This command sets the internal clock. The sequence of entry is hour, minute, second.

Parameter

0 to 23, 0 to 59, 0 to 59

Example

```
SYST:TIME 12,30,30
```

Characteristics

*RST value: -
SCPI: conform

SYSTem:VERSion?

This command queries the number of the SCPI version, which is relevant for the instrument.

This command is a query and therefore has no *RST value.

Example

```
SYST:VERS?
```

Characteristics

*RST value: -
SCPI: conform

16 Status Reporting System

The status reporting system (Figure 2) stores all information on the present operating state of the instrument, and on errors which have occurred. This information is stored in the status registers and in the error queue. The status registers and the error queue can be queried via Ethernet.

The information is of a hierarchical structure. The register status byte (STB) defined in IEEE 488.2 and its associated mask register service request enable (SRE) form the uppermost level. The STB receives its information from the standard event status register (ESR) which is also defined in IEEE 488.2 with the associated mask register standard event status enable (ESE) and registers STATus:OPERation and STATus:QUEStionable which are defined by SCPI and contain detailed information on the instrument.

The output buffer contains the messages the instrument returns to the controller. It is not part of the status reporting system but determines the value of the MAV bit in the STB.

16.1 Structure of an SCPI Status Register

Each standard SCPI register consists of 5 parts which each have a width of 16 bits and have different functions (Figure 1). The individual bits are independent of each other, i.e. each hardware status is assigned a bit number that applies to all five parts. For example, bit 0 of the STATus:OPERation register is assigned to the calibration status of the R&S ETH. Bit 15 (the most significant bit) is set to zero for all parts. Thus the contents of the register parts can be processed by the controller as positive integer.

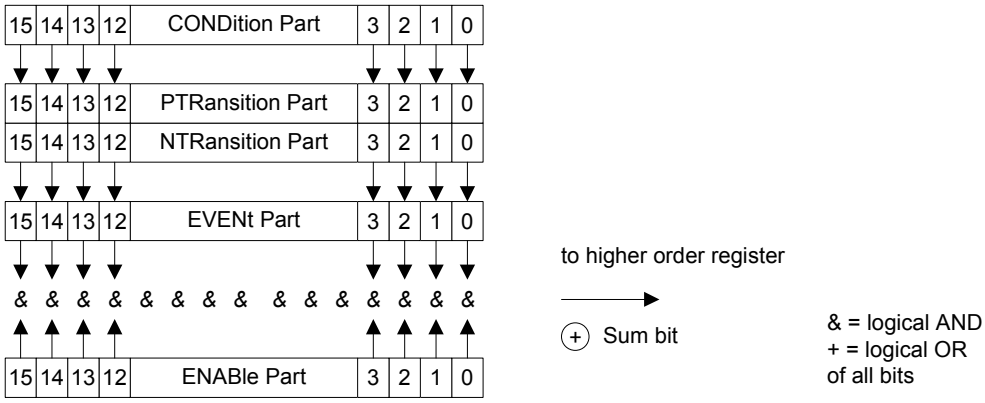


Figure 1: The status-register model

16.1.1 CONDition part

The CONDition part is directly written into by the hardware or the sum bit of the next lower register. Its contents reflects the current instrument status. This register part can only be read, but not written into or cleared. Its contents is not affected by reading.

16.1.2 PTRansition part

The positive TRansition part acts as an edge detector. When a bit of the CONDition part is changed from 0 to 1, the associated PTR bit decides whether the EVENt bit is set to 1.

PTR bit =1: the EVENt bit is set.

PTR bit =0: the EVENt bit is not set.

This part can be written into and read at will. Its contents is not affected by reading.

16.1.3 NTRansition part

The negative TRansition part also acts as an edge detector. When a bit of the CONDition part is changed from 1 to 0, the associated NTR bit decides whether the EVENt bit is set to 1.

NTR-Bit = 1: the EVENt bit is set.

NTR-Bit = 0: the EVENt bit is not set.

This part can be written into and read at will. Its contents is not affected by reading.

With these two edge register parts the user can define which state transition of the condition part (none, 0 to 1, 1 to 0 or both) is stored in the EVENt part.

16.1.4 EVENt part

The EVENt part indicates whether an event has occurred since the last reading, it is the "memory" of the condition part. It only indicates events passed on by the edge filters. It is permanently updated by the instrument. This part can only be read by the user. Reading the register clears it. This part is often equated with the entire register.

16.1.5 ENABle part

The ENABle part determines whether the associated EVENt bit contributes to the sum bit (see below). Each bit of the EVENt part is ANDed with the associated ENABle bit (symbol '&'). The results of all logical operations of this part are passed on to the sum bit via an OR function (symbol '+').

ENABle-Bit = 0: the associated EVENt bit does not contribute to the sum bit

ENABle-Bit = 1: if the associated EVENT bit is "1", the sum bit is set to "1" as well.

This part can be written into and read by the user at will. Its contents is not affected by reading.

16.1.6 Sum bit

As indicated above, the sum bit is obtained from the EVENt and ENABle part for each register. The result is then entered into a bit of the CONDition part of the higher-order register.

The instrument automatically generates the sum bit for each register. Thus an event, e.g. a PLL that has not locked, can lead to a service request throughout all levels of the hierarchy.

The service request enable register SRE defined in IEEE 488.2 can be taken as ENABle part of the STB if the STB is structured according to SCPI. By analogy, the ESE can be taken as the ENABle part of the ESR.

16.2 Overview of the Status Register

The following figure shows the status registers used by the R&S ETH base unit. The status registers used by the R&S ETH options are described in separate sections at the end of this chapter.

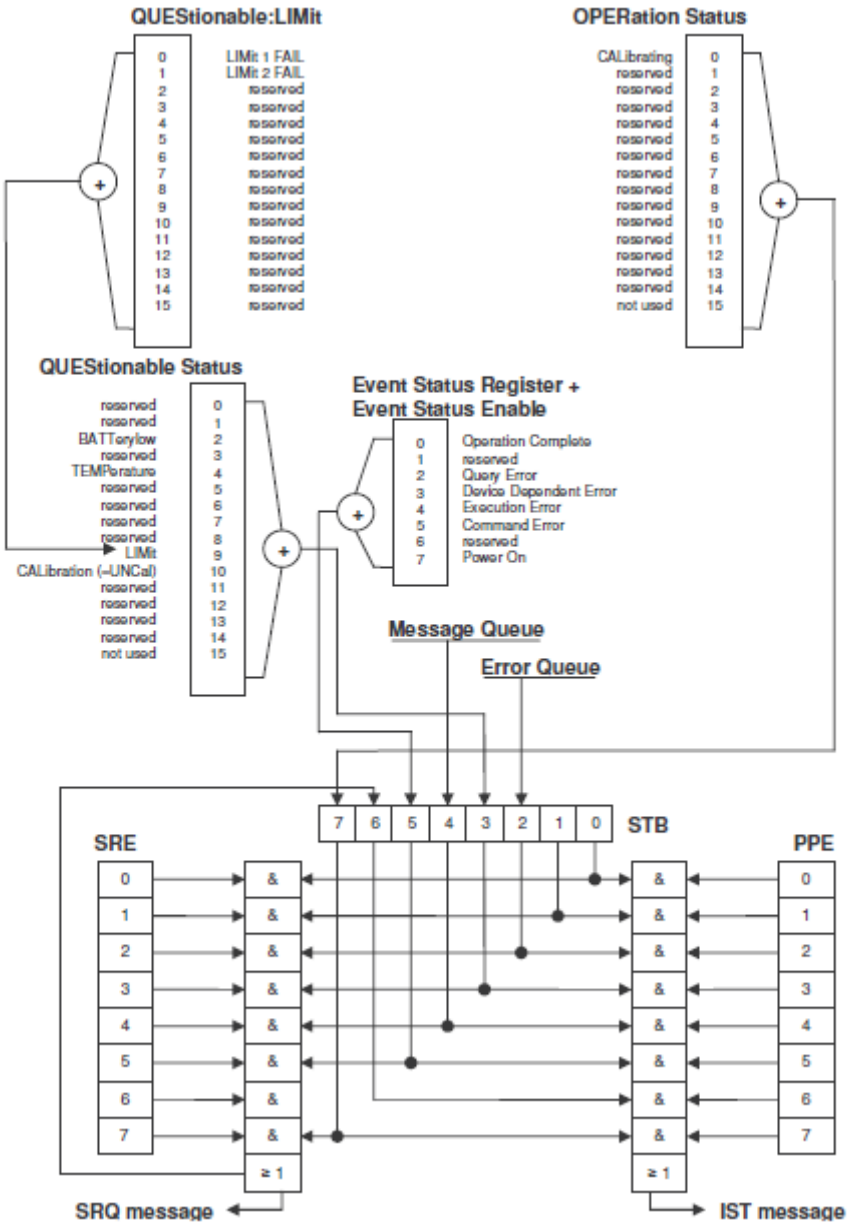


Figure 2: Overview of the status registers

16.3 Status Byte (STB) & Service Request Enable Register (SRE)

The 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. It can thus be compared with the CONDition part of an SCPI register and assumes the highest level within the SCPI hierarchy. A special feature is that bit 6 acts as the sum bit of the remaining bits of the status byte.

The STATUS BYTE is read using the command "*STB?" or a serial poll.

The STB is linked to the SRE. The latter corresponds to the ENABle part of the SCPI registers in its function. 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, which triggers an interrupt in the controller if this is appropriately configured and can be further processed there. The SRE can be set using the command "*SRE" and read using the command "*SRE?"

Table 1: 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 sum bit** The bit is set if an EVENt bit is set in the QUEStionable: status register and the associated ENABle bit is set to 1. A set bit indicates a questionable instrument status, which can be specified in greater detail by polling the QUEStionable status register.
4	**MAV bit** (message available) The bit is set if a message is available in the output buffer which can be read. This bit can be used to enable data to be automatically read from the instrument to the controller.
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** (master 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	**OPERation status register sum 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 polling the OPERation status register.

16.4 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 is the associated ENABle part. It can be set using the command *ESE and read using the command *ESE?.

Table 2: Meaning of the bits in the event status register

Bit No.	Meaning
0	**Operation Complete** This bit is set on receipt of the command *OPC 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.
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	Not used
7	**Power On** (supply voltage on) This bit is set on switching on the instrument.

16.4.1 STATus:OPERation Register

In the CONDition part, this register contains information on which actions the instrument is being executing or, in the EVENt part, information on which actions the instrument has executed since the last reading. It can be read using the commands STATus:OPERation:CONDition? or STATus:OPERation[:EVENt]?.

Table 3: Meaning of the bits in the STATus:OPERation register

Bit No.	Meaning
0	**CALibrating** This bit is set as long as the instrument is performing a calibration.
1 to 14	Not used
15	This bit is always 0

16.4.2 STATus:QUEStionable Register

This register contains information about indefinite states which may occur if the unit is operated without meeting the specifications. It can be read using the commands STATus:QUEStionable: CONDition? and STATus:QUEStionable[:EVENt]?.

Table 4: Meaning of bits in STATus:QUEStionable register

Bit No.	Meaning
0 to 1	These bits are not used
2	**BATTERY LOW** If the instrument is running without any external power supply and the charging level of the internal battery is approximately lower than 5% this bit is set to indicate that the system will be shut down automatically in approx. 5 minutes.
3	Not used
4	**TEMPerature** This bit is set if a questionable temperature occurs.
5 to 8	Not used
9	**LIMit** (device-specific) This bit is set if a limit value is violated
10	**CALibration** The bit is set if a measurement is performed unaligned (label **UNCAL**)
11 to 14	Not used
15	This bit is always 0.

16.4.3 STATus:QUEStionable:LIMit Register

This register contains information about the observance of limit lines. It can be read using the commands STATus:QUEStionable:LIMit:CONDition? and STATus:QUEStionable:LIMit[:EVENt]?.

Table 5: Meaning of bits in 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 to 14	Not used
15	This bit is always 0.

16.5 Application of the Status Reporting Systems

In order to be able to effectively use the status reporting system, the information contained there must be transmitted to the controller and further processed there. There are several methods which are represented in the following.

16.5.1 Service Request

Under certain circumstances, the instrument can send a service request (SRQ) to the controller. Usually this service request initiates an interrupt at the controller, to which the control program can react appropriately. As evident from Fig. 1-4, an SRQ is always initiated if one or several of bits 2, 3, 4, 5 or 7 of the status byte are set and enabled in the SRE. Each of these bits combines the information of a further register, the error queue or the output buffer. The ENABle parts of the status registers can be set so that arbitrary bits in an arbitrary status register initiate an SRQ. In order to make use of the possibilities of the service request effectively, all bits should be set to "1" in enable registers SRE and ESE.

Example

Use of the command *OPC to generate an SRQ at the end of a sweep

```
CALL InstrWrite(analyzer, "*ESE 1")
'Set bit 0 in the ESE (Operation Complete)
CALL InstrWrite(analyzer, "*SRE 32")
```

'Set bit 5 in the SRE (ESB)?

After its settings have been completed, the instrument generates an SRQ.

The SRQ is the only possibility for the instrument to become active on its own. Each controller program should set the instrument in a way that a service request is initiated in the case of malfunction. The program should react appropriately to the service request.

16.5.2 Serial Poll

In a serial poll, just as with command *STB, the status byte of an instrument is queried. However, the query is realized via interface messages and is thus clearly faster. The serial-poll method has already been defined in IEEE 488.1 and used to be the only standard possibility for different instruments to poll the status byte. The method also works with instruments which do not adhere to SCPI or IEEE 488.2.

The VISUAL BASIC command for executing a serial poll is IBRSP(). Serial poll is mainly used to obtain a fast overview of the state of several instruments connected to the controller.

16.5.3 Query by Means of Commands

Each part of any status register can be read by means of queries. The individual commands are listed in the description of the STATus Subsystem. The returned value is always a number that represents the bit pattern of the queried register. This number is evaluated by the controller program.

Queries are usually used after an SRQ in order to obtain more detailed information on the cause of the SRQ.

16.5.4 Error Queue Query

Each error state in the instrument leads to an entry in the error queue. The entries of the error queue are detailed plain-text error messages that can be displayed via manual operation using the setup menu or queried via remote control using the command SYSTem:ERRor?. Each call of SYSTem:ERRor? provides one entry from the error queue. If no error messages are stored there any more, the instrument responds with 0, "No error".

The error queue should be queried after every SRQ in the controller program as the entries describe the cause of an error more precisely than the status registers. Especially in the test phase of a controller program the error queue should be queried regularly since faulty commands from the controller to the instrument are recorded there as well.

16.6 Reset Values of the Status Reporting System

Table 6 contains the different commands and events causing the status reporting system to be reset. None of the commands, except *RST and SYSTem:PRESet, influences the functional instrument settings. In particular, DCL does not change the instrument settings.

Table 6: Resetting the status reporting system

Event	**Switching on supply voltage**		**DCL,SDC**			
	Power-On-Status-Clear		**(Device Clear, Selected Device Clear)**	***RST or SYSTem:PRESet**	**STATus:PRESet**	***CLS**
Effect	**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)
Clear command processing and input buffer	yes	yes	yes	—	—	—

1) Every command being the first in a program message, i.e., immediately following a <PROGRAM MESSAGE TERMINATOR> clears the output buffer.

17 Remote Commands of the Status Reporting System

The following commands control the status-reporting system. *RST does not influence the status registers.

The OPERation status register contains information about the calibration status of the instrument.

The QUEStionable status register contains information about the status of the reference and local oscillator, possible overloads of the instrument and the status of limit checks and limit margins.

The commands are independent from the operating mode.

List of commands

STATus:PRESet

This command 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.

Example

```
STAT:PRES
```

Characteristics

*RST value: -
SCPI: conform

STATus:QUEue[:NEXT]

This command returns the earliest entry to the error queue 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. This command is identical with the command SYSTem:ERRor.

Example

```
STAT:QUE?
```

Characteristics

*RST value: –
SCPI: conform

STATus:OPERation[:EVENt]?

This command queries the contents of the EVENt section of the STATus:OPERation register.

The contents of the EVENt section are deleted after readout.

Example

```
STAT:OPER?
```

Characteristics

*RST value: -
SCPI: conform

STATus:OPERation:CONDition?

This command queries the CONDition section of the STATus:OPERation register. Readout does not delete the contents of the CONDition section. The value returned reflects the current hardware status.

Example

```
STAT:OPER:COND?
```

Characteristics

*RST value: -
SCPI: conform

STATus:OPERation:ENABle

This command sets the bits of the ENABle section of the STATus:OPERation register. The ENABle register selectively enables the individual events of the associated EVENt section for the summary bit in the status byte.

Parameter

0 to 65535

Example

```
STAT:OPER:ENAB 65535
```

Characteristics

*RST value: -
SCPI: conform

STATus:OPERation:NTRansition

This command sets the edge detectors of all bits of the STATus:OPERation register from 1 to 0 for the transitions of the CONDition bit.

Parameter

0 to 65535

Example

```
STAT:OPER:NTR 65535
```

Characteristics

*RST value: -
SCPI: conform

STATus:OPERation:PTRansition

This command sets the edge detectors of all bits of the STATus:OPERation register from 0 to 1 for the transitions of the CONDition bit.

Parameter

0 to 65535

Example

```
STAT:OPER:PTR 65535
```

Characteristics

*RST value: -
SCPI: conform

STATus:QUEStionable[:EVENt]?

This command queries the contents of the EVENt section of the STATus:QUEStionable register.

The contents of the EVENt section are deleted after readout.

Example

```
STAT:QUES?
```

Characteristics

*RST value: -
SCPI: conform

STATus:QUEStionable:CONDition?

This command queries the CONDition section of the STATus:QUEStionable register. Readout does not delete the contents of the CONDition section. The value returned reflects the current hardware status.

Example

```
STAT:QUES:COND?
```

Characteristics

*RST value: -
SCPI: conform

STATus:QUEStionable:ENABle

This command sets the bits of the ENABle section of the STATus:QUEStionable register. The ENABle register selectively enables the individual events of the associated EVENt section for the summary bit in the status byte.

Parameter

0 to 65535

Example

```
STAT:QUES:ENAB 65535
```

Characteristics

*RST value: -
SCPI: conform

STATus:QUEStionable:NTRansition

This command sets the edge detectors of all bits of the STATus:QUEStionable register from 1 to 0 for the transitions of the CONDition bit.

Parameter

0 to 65535

Example

```
STAT:QUES:NTR 65535
```

Characteristics

*RST value: -
SCPI: conform

STATus:QUEStionable:PTRansition

This command sets the edge detectors of all bits of the STATus:QUEStionable register from 0 to 1 for the transitions of the CONDition bit.

Parameter

0 to 65535

Example

```
STAT:OPER:PTR 65535
```

Characteristics

*RST value: -
SCPI: conform

18 Alphabetical List of Remote Commands