Operating Manual

Measuring Receiver

R&S® FSMR 3
1166.3311.03

R&S® FSMR 26
1166.3311.26

R&S® FSMR 43
1166.3311.43

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Volume 2
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ROHDE&SCHWARZ
Test and Measurement Division

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Contents of Manuals for Measuring Receiver R&S FSMR

Operating Manual R&S FSMR

The operating manual describes the following models and options of Measuring Receiver R&S FSMR:

- R&S FSMR 3 20 Hz to 3.6 GHz
- R&S FSMR 26 20 Hz to 26.5 GHz
- R&S FSMR 43 20 Hz to 43 GHz
- R&S FSMR 50 20 Hz to 50 GHz

- Option FSMR B2 YIG preselection
- Option R&S FSU-B9 tracking generator
- Option R&S FSMR-B18 removable hard drive

This operating manual contains information about the technical data of the instrument, the setup functions and about how to put the instrument into operation. It informs about the operating concept and controls as well as about the operation of the R&S FSMR via the menus and via remote control. Typical measurement tasks for the R&S FSMR are explained using the functions offered by the menus and a selection of program examples.

Additionally the operating manual includes information about maintenance of the instrument and about error detection listing the error messages which may be output by the instrument. It is subdivided into 9 chapters:

The data sheet informs about guaranteed specifications and characteristics of the instrument.

Chapter 1 describes the control elements and connectors on the front and rear panel as well as all procedures required for putting the R&S FSMR into operation and integration into a test system.

Chapter 2 gives an introduction to typical measurement tasks of the R&S FSMR which are explained step by step.

Chapter 3 describes the operating principles, the structure of the graphical interface and offers a menu overview.

Chapter 4 forms a reference for manual control of the R&S FSMR and contains a detailed description of all instrument functions and their application. The chapter also lists the remote control command corresponding to each instrument function.

Chapter 5 describes the basics for programming the R&S FSMR, command processing and the status reporting system.

Chapter 6 lists all the remote-control commands defined for the instrument. At the end of the chapter a alphabetical list of commands and a table of softkeys with command assignment is given.

Chapter 7 contains program examples for a number of typical applications of the R&S FSMR.

Chapter 8 describes preventive maintenance and the characteristics of the instrument's interfaces.

Chapter 8 gives a list of error messages that the R&S FSMR may generate.

Chapter 9 contains a list of error messages.

Chapter 10 contains an index for the operating manual.

Service Manual - Instrument

The service manual - instrument informs on how to check compliance with rated specifications, on instrument function, repair, troubleshooting and fault elimination. It contains all information required for the maintenance of R&S FSMR by exchanging modules.

Contents - Chapter 5 "Remote Control - "Basics"

5 Remote Control - Basics

In this chapter you'll find:

- instructions on how to put the R&S FSMR into operation via remote control,
- a general introduction to remote control of programmable instruments. This includes the description of the command structure and syntax according to the SCPI standard, the description of command execution and of the status registers,
- diagrams and tables describing the status registers used in the R&S FSMR.

In chapter 6, all remote control functions are described in detail. The subsystems are listed by alphabetical order according to SCPI. All commands and their parameters are listed by alphabetical order in the command list at the end of chapter 6.

Program examples for the R&S FSMR can be found in chapter 7.

The remote control interfaces and their interface functions are described in Chapter 8.

Introduction

The instrument is equipped with an IEC-bus interface according to standard IEC 625.1/IEEE 488.2 and a RS-232 interface. The connectors are located at the rear of the instrument and permit to connect a controller for remote control. In addition, the instrument can be remotely controlled in a local area network (LAN interface) if option B16 is installed.

The instrument supports the SCPI:version 1997.0 (Standard Commands for Programmable Instruments). 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 (see Section "SCPI Introduction").
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. For remote control in a network, information will be found in the relevant section, "Remote Control in a Network (RSIB Interface)".

This section assumes basic knowledge of IEC/IEEE bus programming and operation of the controller. A description of the interface commands can be obtained from the relevant manuals.

The requirements of the SCPI standard placed 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.

The program examples for IEC-bus programming are all written in VISUAL BASIC.

Getting Started

The short and simple operating sequence given below permits fast putting into operation of the instrument and setting of its basic functions. As a prerequisite, the IEC/IEEE-bus address, which is factory-set to 20, must not have been changed.

1. Connect instrument and controller using IEC/IEEE-bus cable.
2. Write and start the following program on the controller:

```
CALL IBFIND("DEV1", analyzer%)                  'Open port to the instrument
CALL IBPAD(analyzer%, 20)                       'Inform controller about instrument address
CALL IBWRT(analyzer%, '*RST;*CLS')              ''Reset instrument

CALL IBWRT(analyzer%, 'FREQ:CENT 100MHz')       ' Set center frequency to 100 MHz
CALL IBWRT(analyzer%, 'FREQ:SPAN 10MHz')        ' Set span to 10 MHz
CALL IBWRT(analyzer%, 'DISP:TRAC:Y:RLEV -10dBm')
                                                ' Set reference level to -10 dBm
```

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

3. To return to manual control, press the *LOCAL* key at the front panel

Starting Remote Control Operation

On power-on, the instrument is always in the manual operating state ("LOCAL" state) and can be operated via the front panel.
It is switched to remote control ("REMOTE" state)

IEC/IEEE-bus	as soon as it receives an addressed command from a controller.
	if it is controlled in a network (RSIB interface), as soon as it receives a command from a controller.
RS-232	as soon as it receives the command "@REM" from a controller.

During remote control, operation via the front panel is disabled. The instrument remains in the remote state until it is reset to the manual state via the front panel or via remote control interfaces. Switching from manual operation to remote control and vice versa does not affect the remaining instrument settings.

Display Contents during Remote Control

During remote control, only the LOCAL softkey appears, with which it is possible to return to manual operation.

In addition, the display of diagrams and results can be blanked out with the command "`SYSTem:DISPlay:UPDate OFF`" (default in remote control) to obtain optimum performance during remote control operation.

During program execution it is recommended to activate the display of results by means of "`SYSTem:DISPlay:UPDate ON`" so that it is possible to follow the changes in the device settings and the recorded measurement curves on the screen.

Note: *If the instrument is exclusively operated in remote control, it is recommended to switch on the power-save mode (POWER SAVE). In this mode, the required display is completely switched off after a preset time.*

Remote Control via IEC/IEEE Bus

Setting the Device Address

In order to operate the instrument via the IEC-bus, it must be addressed using the set IEC/IEEE bus address. The IEC/IEEE bus address of the instrument is factory-set to 20. It can be changed manually in the *SETUP - GENERAL SETUP* menu or via IEC bus. Addresses 0 to 30 are permissible.

Manually:

- Call *SETUP - GENERAL SETUP* menu
- Enter desired address in table *GPIB-ADDRESS*
- Terminate input using the *ENTER* key

Via IEC/IEEE bus:

```
CALL IBFIND("DEV1", analyzer%)                     'Open port to the instrument
CALL IBPAD(analyzer%, 20)                          'Inform controller about old address
CALL IBWRT(analyzer%, "SYST:COMM:GPIB:ADDR 18")    'Set instrument to new address
CALL IBPAD(analyzer%, 18)                          'Inform controller about new address
```

Return to Manual Operation

Return to manual operation is possible via the front panel or the IEC/IEEE bus.

Manually:

- Press the *LOCAL* softkey or the *PRESET* key

Notes:
– *Before the transition, command processing must be completed as otherwise transition to remote control is performed immediately.*

– *The keys can be disabled by the universal command LLO (see Chapter 8, IEC/IEEE-Bus Interface – Interface Messages) in order to prevent unintentional transition. In this case, transition to manual mode is only possible via the IEC/IEEE bus.*

– *The keys can be enabled again by deactivating the REN line of the IEC/IEEE bus (see Chapter 8, IEC/IEEE-Bus Interface – Bus Lines).*

Via IEC bus:

```
...
CALL IBLOC(analyzer%)          'Set instrument to manual operation
...
```

Remote Control via RS-232-Interface

Setting the Transmission Parameters

To enable an error-free and correct data transmission, the parameters of the unit and the controller should have the same setting.
Parameters can be manually changed in menu *SETUP-GENERAL SETUP* in table *COM PORT* or via remote control using the command `SYSTem:COMMunicate:SERial:....`

The transmission parameters of the COM interface are factory-set to the following values:
baudrate = 9600, data bits = 8, stop bits = 1, parity = NONE and owner = INSTRUMENT.
For remote control operation, the interface should be allocated to the operating system (owner = OS) so that the control characters including @ can be recognized by the interface.

Manually: Setting the COM interface

- Call *SETUP-GENERAL SETUP* menu
- Select desired baudrate, bits, stopbit, parity in table *COM PORT.*
- Set owner to OS in table *COM PORT.*
- Terminate input using the *ENTER* key.

Return to Manual Operation

Return to manual operation is possible via the front panel or via RS-232 interface.

Manually:

- Press the *LOCAL* softkey or the *PRESET* key.

Notes:

– *Before the transition, command processing must be completed as otherwise transition to remote control is performed immediately*

– *The keys can be enabled again by sending the control string "@LOC" via RS-232 (see Chapter 8, S-232-C Interface - Control Commands).*

Via RS-232:

...
`v24puts(port,"@LOC");` Set instrument to manual operation..
...

Limitations

The following limitations apply if the unit is remote-controlled via the RS-232-C interface:

– No interface messages, only control strings (see interface description in Chapter 8, *RS-232-C Interface – Control Commands*).

– Only the Common Commands *OPC? can be used for command synchronization, *WAI and *OPC are not available.

– Block data cannot be transmitted.

Remote Control in a Network (RSIB Interface)

Setting the Device Address

For control of the instrument in a network, it must be accessed using the preselected IP address. The IP address of the instrument (device address) is defined in the network configuration.

Setting the IP address:

- Call *SETUP - GENERAL SETUP* – CONFIGURE NETWORK menu.
- Select "Protocols" tab.
- Set IP address for TCP/IP protocol under "Properties" (see section on option R&S FSMR-B16).

Return to Manual Operation

Return to manual operation can be made manually via the front panel or remotely via the RSIB interface.

Manually:

- Press *LOCAL* softkey or *PRESET* key.

Note:

– *Make sure that the execution of commands is completed prior to switchover since otherwise the instrument will switch back to remote control immediately.*

Via RSIB interface:

...
`CALL RSDLLibloc(analyzer%, ibsta%, iberr%, ibcntl&)` 'Set device to manual control
...

Messages

The messages transferred via the data lines of the IEC bus (see Chapter 8, IEC/IEEE-Bus Interface) can be divided into two groups:

– **interface messages and**
– **device messages.**

IEC/IEEE-Bus Interface Messages

Interface messages are transferred on the data lines of the IEC bus, the "ATN" control line being active. They are used for communication between controller and instrument and can only be sent by a controller which has the IEC/IEEE bus control. Interface commands can be subdivided into

– **universal commands and**
– **addressed commands.**

Universal commands act on all devices connected to the IEC/IEEE bus without previous addressing, addressed commands only act on devices previously addressed as listeners. The interface messages relevant to the instrument are listed in Chapter 8, IEC/IEEE-Bus Interface – Interface Functions.

Device Messages (Commands and Device Responses)

Device messages are transferred on the data lines of the IEC bus, the "ATN" control line not being active. ASCII code is used.
A distinction is made according to the direction in which they are sent on the IEC/IEEE bus:

– **Commands** are messages the controller sends to the instrument. They operate the device functions and request informations.
The commands are subdivided according to two criteria::

1. According to the effect they have on the instrument:

   Setting commands cause instrument settings such as reset of the instrument or setting the center frequency.

   Queries cause data to be provided for output on the IEC/IEEE bus, e.g. for identification of the device or polling the marker.

2. According to their definition in standard IEEE 488.2:

   Common Commands are exactly defined as to their function and notation in standard IEEE 488.2. They refer to functions such as management of the standar-dized status registers, reset and selftest.

   Device-specific commands refer to functions depending on the features of the instrument such as frequency setting. A majority of these commands has also been standardized by the SCPI committee (cf. Section "SCPI Introduction")).

– **Device responses** are messages the instrument sends to the controller after a query. They can contain measurement results, instrument settings and information on the instrument status (cf. Section "Responses to Queries").

Structure and syntax of the device messages are described in the following Section.

Structure and Syntax of the Device Messages

SCPI Introduction

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.
Fig. 5-1 illustrates this tree structure using a section of command system SENSe, which controls the device-specific settings, that do not refer to the signal characteristics of the measurement signal.
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").

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.

Note: *The commands used in the following examples are not in every case implemented in the instrument.*

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.

Device-specific commands

Hierarchy: Device-specific commands are of hierarchical structure (see Fig. 5-1). 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 command system `SENSe`.

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 set the frequency span.

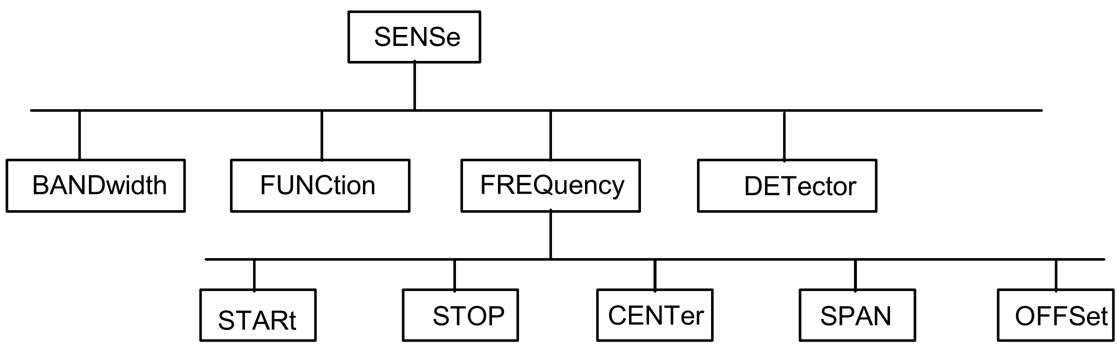

Fig. 5-1 Tree structure the SCPI command systems using the SENSe system by way of example

Some key words occur in several levels within one command system. Their effect depends on the structure of the command, that is to say, 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.

`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 optionally 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`

Note: *An optional key word must not be omitted if its effect is specified in detail by a numeric suffix.*

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 permissible.

Beispiel: `STATus:QUEStionable:ENABle 1= STAT:QUES:ENAB 1`

Note: *The short form is marked by upper-case letters, the long form corresponds to the complete word. Upper-case and lower-case notation only serve the above purpose, the instrument itself does not make any difference between 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. For a description of the types of parameter, refer to Section "Parameters".

Example: `SENSe:FREQuency:STOP? MAXimum` Response: 3.5E9
This query requests the maximal value for the stop frequency.

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.

Example:. `SYSTem:COMMunicate:SERial2:BAUD 9600`
This command sets the baudrate of a second serial interface.

Structure of a Command Line

A command line may consist of one or several commands. It is terminated by a <New Line>, a <New Line> with EOI or an EOI together with the last data byte. The IEC/IEEE driver of the controller usually produces automatically an EOI together with the last data byte.

Several commands in a command line are separated by a semicolon ";". If the next command belongs to a different command system, the semicolon is followed by a colon.

Example:

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

This command line 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 command line 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. 5-1). The colon following the semicolon must be omitted in this case.

Example:

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

This command line 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 command line, the second command begins with the level below SENSe:FREQuency. The colon after the semicolon is omitted.

The abbreviated form of the command line reads as follows:

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

However, a new command line always begins with the complete path.

Example:

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

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.

1 The requested parameter is transmitted without header.
   Example: `INPut:COUPling?` Response: `DC`

2. 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`

3. 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

4. Truth values <Boolean values> are returned as 0 (for OFF) and 1 (for ON).
   Example: `SENSe:BANDwidth:AUTO?` Response: `1` for ON

5. Text (character data) is returned in a short form (see also Section 3.5.5).
   Example: `SYSTem:COMMunicate:SERial:CONTrol:RTS?` Response(for standard): `STAN`

Parameters

Most commands require a parameter to be specified. The parameters must be separated from the header by a "white space". Permissible parameters are numerical values, Boolean parameters, text, character strings and block data. The type of parameter required for the respective command and the permissible range of values are specified in the command description

Numerical values

Numerical 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 permissible), K (kilo), M (milli), U (micro) and N (nano). It the unit is missing, the basic unit is used.

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

Special numerical

The texts MINimum, MAXimum, DEFault, UP and DOWN are interpreted as valuesspecial numerical values.

In the case of a query, the numerical value is provided.

Example: Setting command: `SENSe:FREQuency:STOP MAXimum`
Query: `SENSe:FREQuency:STOP?` Response: `3.5E9`

MIN/MAX

MINimum and MAXimum denote the minimum and maximum value.

DEF

DEFault denotes a preset value which has been stored in the EPROM. This value conforms to the default setting, as it is called by the *RST command

UP/DOWN

UP, DOWN increases or reduces the numerical value by one step. The step width can be specified via an allocated step command (see annex C, List of Commands) 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 reponses.

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.

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. 0 or 1 is provided in a query.

Example: Setting command: `DISPlay:WINDow:STATe ON`
Query: `DISPlay:WINDow:STATe?` Response: `1`

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`

Strings

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

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

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.

Overview of Syntax Elements

The following survey offers an overview of the syntax elements.

:	The colon separates the key words of a command. In a command line the colon after the separating semicolon marks the uppermost command level.
;	The semicolon separates two commands of a command line. It does not alter the path.
,	The comma separates several parameters of a command.
?	The question mark forms a query.
*	The asterix marks a common command.
"	Quotation marks introduce a string and terminate it.
#	The double dagger (#) introduces block data
	A "white space (ASCII-Code 0 to 9, 11 to 32 decimal, e.g.blank) separates header and parameter.

Instrument Model and Command Processing

The instrument model shown in Fig. 5-2 has been made viewed from the standpoint of the servicing of IEC-bus commands. The individual components work independently of each other and simultaneously. They communicate by means of so-called "messages".

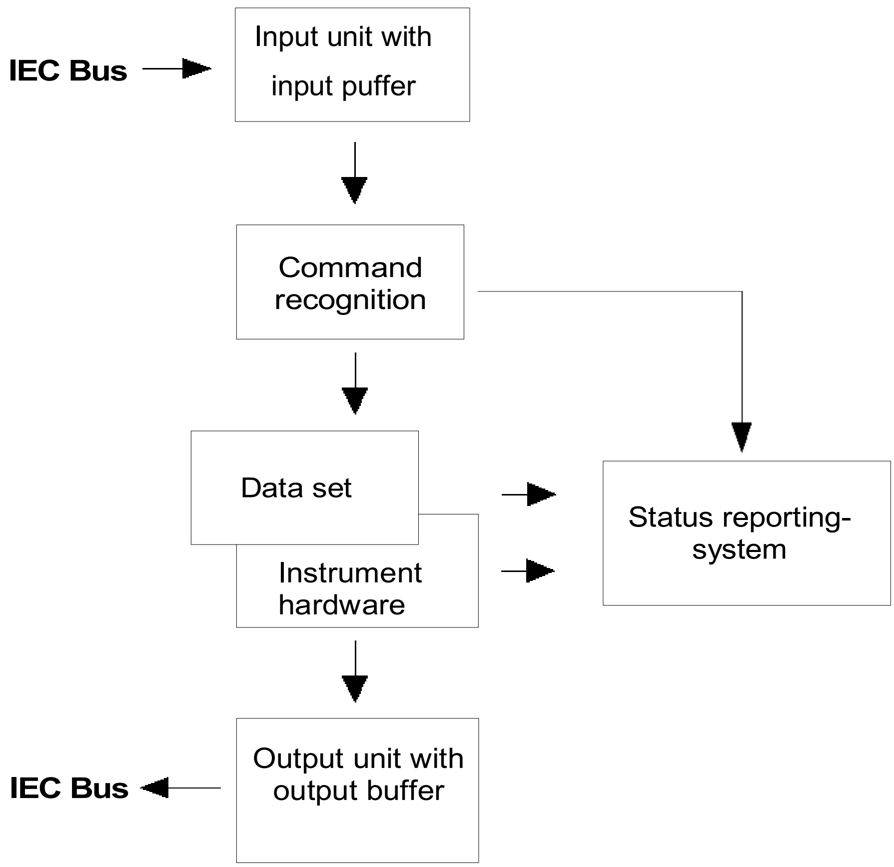

Fig. 5-2 Instrument model in the case of remote control by means of the IEC bus

Input Unit

The input unit receives commands character by character from the IEC bus 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 IEC-bus traffic is stopped and the data received up to then are processed. Subsequently the IEC-bus 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 a DCL clears the input buffer and immediately initiates a message to 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 a DCL is serviced with priority, a GET (Group Execute Trigger), e.g., is only executed after the commands received before as well. Each recognized command is immediately transferred to the instrument data base but without being executed there at once.
Syntactical errors in the command are recognized in the command recognition and supplied to the status reporting system. The rest of a command line after a syntax error is analysed further if possible and serviced.
If the command recognition recognizes a delimiter (<PROGRAM MESSAGE SEPARATOR> or <PROGRAM MESSAGE TERMINATOR>) or a DCL, it requests the instrument data base to set the commands in the instrument hardware as well now. Subsequently it is immediately prepared to process commands again. This means for the command servicing that further commands can already be serviced while the hardware is still being set ("overlapping execution").

Instrument 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 instrument data base is a detailed reproduction of the instrument hardware in the software.

IEC-bus setting commands lead to an alteration in the data set. The data base management enters the new values (e.g. frequency) into the data base, however, only passes them on to the hardware when requested by the command recognition.

The data are only checked for their compatibility among each other and with the instrument hardware immediately before they are transmitted to the instrument hardware. If the detection is made that an execution is not possible, an "execution error" is signalled to the status reporting system. The alteration of the data base are cancelled, the instrument hardware is not reset.

IEC-bus queries induce the data base management to send the desired data to the output unit.

Status Reporting System

The status reporting system collects information on the instrument state and makes it available to the output unit on request. The exact structure and function are described in Section 3.8

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 on the IEC bus, the controller waits until it has reached its time limit. This behaviour is specified by SCPI.

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 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 and has settled. By a suitable programming, the controller can be forced to wait for the respective action to occur (cf. Table 5-1).

Table 5-1 Synchronisation using *OPC, *OPC? and *WAI

Command	Action after the hardware has settled	Programming the controller
*OPC	Setting the opteration-complete bit in the ESR	- Setting bit 0 in the ESE - Setting bit 5 in the SRE - Waiting for service request (SRQ)
*OPC?	Writing a "1" into the output buffer	Addressing the instrument as a talker
*WAI	Continuing the IEC-bus handshake	Sending the next command

An example as to command synchronization can be found in Chapter "Program Examples".

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 (eg autorange 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 either to an aborted measurement or to invalid measurement data.

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

Table 5-1 Commands with mandatory synchronization (Overlapping Commands)

Command	Purpose
INIT	start measurement
INIT:CONM	continue measurement
CALC:MARK:FUNC:ZOOM	zoom frequency range around marker 1
CALC:STAT:SCAL:AUTO ONCE	optimize level settings for signal statistic measurement functions
[SENS:]POW:ACH:PRES:RLEV	optimize level settings for adjacent channel power measurements

Status Reporting System

The status reporting system (cf. Fig. 5-4) stores all information on the present operating state of the instrument, e.g. that the instrument presently carries out a calibration 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 IEC bus.

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 IST flag ("Individual STatus") and the parallel poll enable register (PPE) allocated to it are also part of the status reporting system. The IST flag, like the SRQ, combines the entire instrument status in a single bit. The PPE fulfills the same function for the IST flag as the SRE for the service request.

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 and thus is represented in Fig. 5-4.

Structure of an SCPI Status Register

Each SCPI register consists of 5 parts which each have a width of 16 bits and have different functions (cf. Fig. 5-3). The individual bits are independent of each other, i.e. each hardware status is assigned a bit number which is valid for all five parts. For example, bit 3 of the STATus:OPERation register is assigned to the hardware status "wait for trigger" in all five parts. 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.

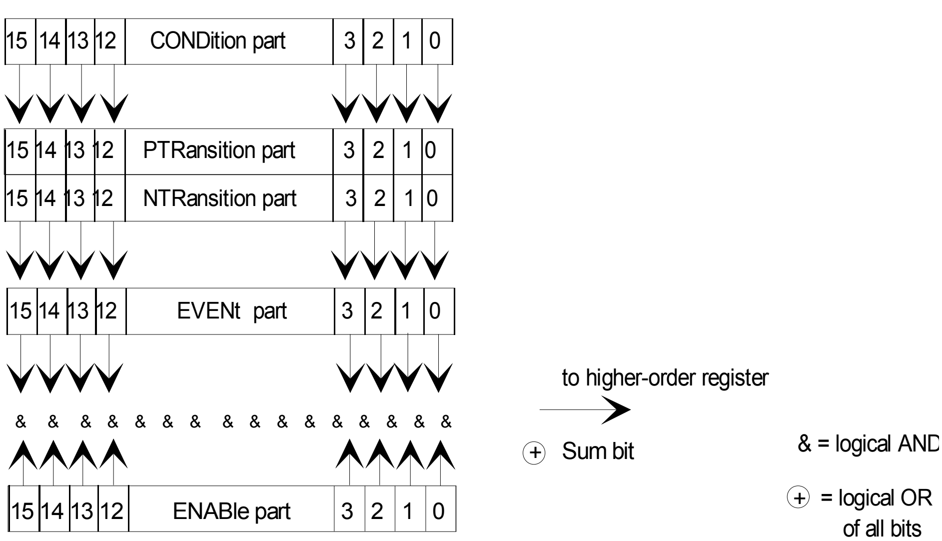

Fig. 5-3 The status-register model

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.

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.

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.

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. During reading, its contents is set to zero. In linguistic usage this part is often equated with the entire register.

ENABle part The ENABle part determines whether the associated EVENt bit contributes to the sum bit (cf. 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.

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.

Note: *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.*

Overview of the Status Registers

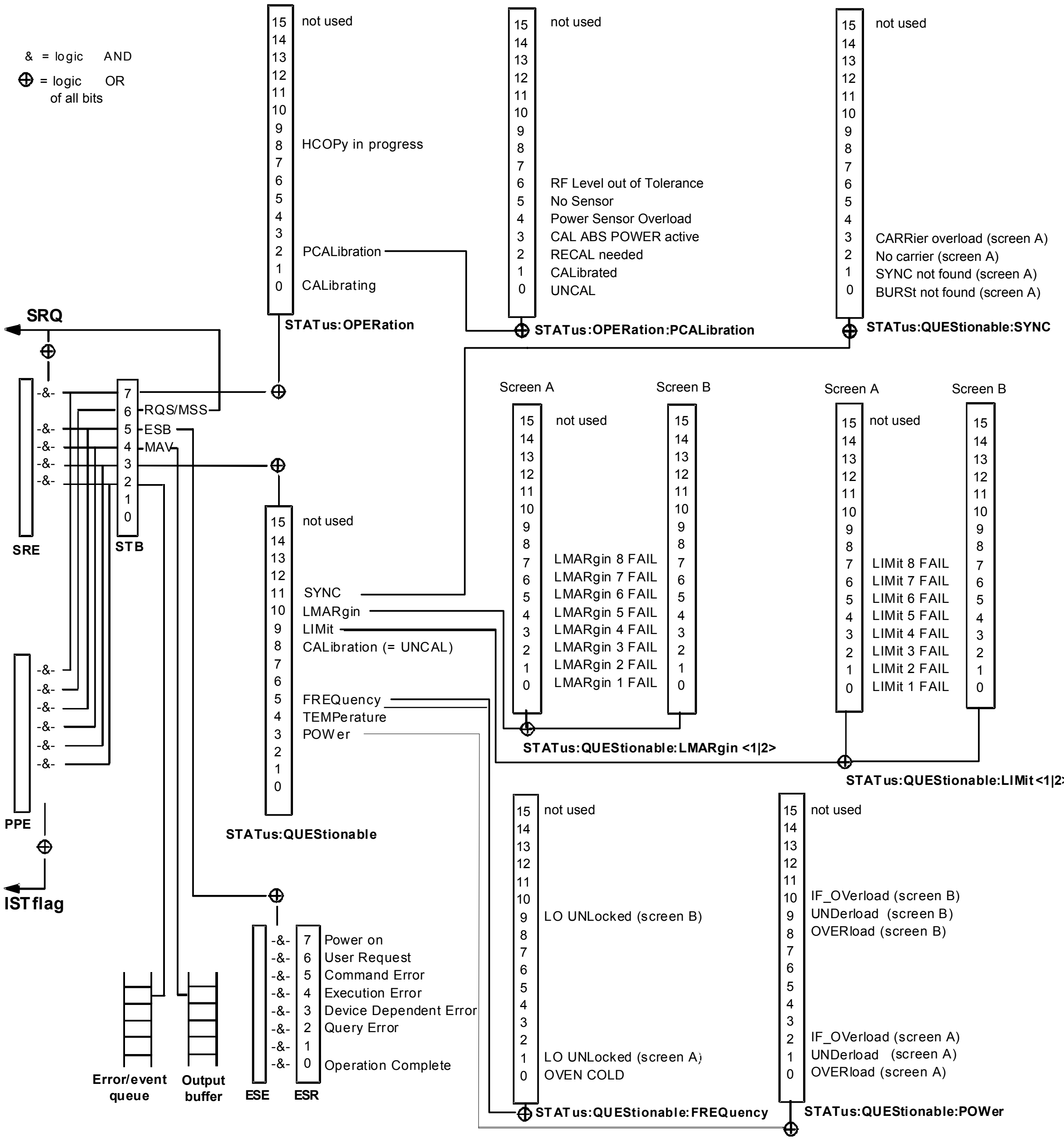

Fig. 5-4 Overview of the status registers

Description of the Status Registers

Status Byte (STB) and 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 out using the command "*STB?" or a serial poll.

The STB implies the SRE. It corresponds to the ENABle part of the SCPI registers as to 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 on the IEC bus, which triggers an interrupt in the controller if this is appropriately configured and can be further processed there.
The SRE can be set using command "*SRE" and read using "*SRE?".

Table 5-2 Meaning of the bits in the status byte

Bit No.	Meaning
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 IEC-bus 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 (cf. Chapter 7, program examples).
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 implies an error or an event 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.

IST Flag and Parallel Poll Enable Register (PPE)

By analogy with the SRQ, the IST flag combines the entire status information in a single bit. It can be queried by means of a parallel poll (cf. Section 3.8.4.3) or using command "*IST?".

The parallel poll enable register (PPE) determines which bits of the STB contribute to the IST flag. The bits of the STB are ANDed with the corresponding bits of the PPE, with bit 6 being used as well in contrast to the SRE. The Ist flag results from the ORing of all results. The PPE can be set using commands "*PRE" and read using command "*PRE?".

Event-Status Register (ESR) and Event-Status-Enable Register (ESE)

The ESR is already defined in IEEE 488.2. It can be compared with the EVENt part of an 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 command "*ESE" and read using command "*ESE?".

Table 5-3 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	This bit is not used
2	**Query Error** This bit is set if either the controller wants to read data from the instrument without having send 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 (cf. Chapter 9, Error Messages).
4	**Execution Error** This bit is set if a received command is syntactically correct, however, 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 (cf. Chapter 9, Error Messages).
5	**Command Error** This bit is set if a command which is undefined or syntactically incorrect is received. An error message with a number between -100 and -200, which denotes the error in greater detail, is entered into the error queue (cf. Chapter 9 "Error Messages").
6	**User Request** This bit is set on pressing the *LOCAL* key.
7	**Power On** (supply voltage on) This bit is set on switching on the instrument.

Table 5-4 Meaning of bits in STATus:OPERation:PCALibration register

Bit No.	Meaning
0	**UNCAL** This bit is set if there is no valid Power Calibration.
1	**CALibrated** This bit is set if the measured power values are calibrated.
2	**RECAL needed** This bit is set if the measured power is not in a valid level range.
3	**CAL ABS POWER active** This bit is set if the the CAL ABS POWER function is has been activated.
4	**Power Sensor Overload** This bit is set if Power Sensor is currently overloaded.
5	**No Sensor** This bit is set if no Power Sensor could be detected.
6	**RF Level out of Tolerance** This bit is set if the measured power during the power calibration is not in the expected range.
7 to 14	not used
15	This bit is always 0.

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 commands "`STATus:OPERation:CONDition?`" or "`STATus:OPERation[:EVENt]?`".

Table 5-5 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 7	These bits are not used
8	**HardCOPy in progress** This bit is set while the instrument is printing a hardcopy.
9 to 14	These bits are not used
15	This bit is always 0

STATus:QUEStionable Register

This register comprises information about indefinite states which may occur if the unit is operated without meeting the specifications. It can be queried by commands `STATus:QUEStionable:CONDition?` and `STATus:QUEStionable[:EVENt]?`.

Table 5-6 Meaning of bits in STATus:QUEStionable register

Bit No.	Meaning
0 to 2	These bits are not used
3	**POWer** This bit is set if a questionable power occurs (cf. also section "STATus:QUEStionable:POWer Register")
4	**TEMPerature** This bit is set if a questionable temperature occurs.
5	**FREQuency** The bit is set if a frequency is questionable (cf. section "STATus:QUEStionable:FREQuency Register")
6 to 7	These bits are not used
8	**CALibration** The bit is set if a measurement is performed uncalibrated (≙ label "UNCAL")
9	**LIMit** (device-specific) This bit is set if a limit value is violated (see also section STATus:QUEStionable:LIMit Register)
10	**LMARgin** (device-specific) This bit is set if a margin is violated (see also section STATus:QUEStionable:LMARgin Register)
11	**SYNC** (device-dependent) This bit is set if, in measurements or premeasurements in GSM MS mode, synchronization to midamble fails or no burst is found. This bit is also set if, in premeasurements in GSM MS mode, the result differs too strongly from the expected value (see also "STATus:QUEStionable:SYNC Register").
12	**ACPLimit** (device-specific) This bit is set if a limit for the adjacent channel power measurement is violated (see also section "STATus:QUEStionable:ACPLimit Register")
13 to 14	These bits are not used
15	This bit is always 0.

STATus:QUEStionable:ACPLimit Register

This register comprises information about the observance of limits during adjacent power measurements. It can be queried with commands '`STATus:QUEStionable:ACPLimit :CONDition?`' and '`STATus:QUEStionable:ACPLimit[:EVENt]?`'

Table 5-7 Meaning of bits in STATus:QUEStionable:ACPLimit register

Bit No.	Meaning
0	**ADJ UPPer FAIL(Screen A)** This bit is set if in screen A. the limit is exceeded in the upper adjacent channel
1	**ADJ LOWer FAIL (Screen A)** This bit is set if in screen A the limit is exceeded in the lower adjacent channel.
2	**ALT1 UPPer FAIL (Screen A)** This bit is set if in screen A the limit is exceeded in the upper 1st alternate channel.
3	**ALT1 LOWer FAIL (Screen A)** This bit is set if in screen A the limit is exceeded in the lower 1st alternate channel.
4	**ALT2 UPPer FAIL (Screen A)** This bit is set if in screen A the limit is exceeded in the upper 2nd alternate channel.
5	**ALT2 LOWer FAIL (Screen A)** This bit is set if in screen A the limit is exceeded in the lower 2nd alternate channel.
6 to 7	not used
8	**ADJ UPPer FAIL (Screen B)** This bit is set if in screen B the limit is exceeded in the upper adjacent channel.
9	**ADJ LOWer FAIL (Screen B)** This bit is set if in screen B the limit is exceeded in the lower adjacent channel.
10	**ALT1 UPPer FAIL (Screen B)** This bit is set if in screen B the limit is exceeded in the upper 1st alternate channel.
11	**ALT1 LOWer FAIL (Screen B)** This bit is set if in screen B the limit is exceeded in the lower 1st alternate channel.
12	**ALT2 UPPer FAIL (Screen B)** This bit is set if in screen B the limit is exceeded in the upper 2nd alternate channel.
13	**ALT2 LOWer FAIL (Screen B)** This bit is set if in screen B the limit is exceeded in the lower 2nd alternate channel.
14	not used
15	This bit is always set to 0.

STATus:QUEStionable:FREQuency Register

This register comprises information aboutthe reference and local oscillator.
It can be queried with commands `STATus:QUEStionable:FREQuency:CONDition?` and "`STATus:QUEStionable:FREQuency[:EVENt]?`.

Table 5-8 Meaning of bits in STATus:QUEStionable:FREQuency register

Bit No.	Meaning
0	**OVEN COLD** This bit is set if the reference oscillator has not yet attained its operating temperature. 'OCXO' will then be displayed.
1	**LO UNLocked** (Screen A) This bit is set if the local oscillator no longer locks. 'LOUNL will then be displayed.
2 to 8	not used
9	**LO UNLocked** (Screen B) This bit is set if the local oscillator no longer locks.' LOUNL' will then be displayed.
10 to 14	not used
15	This bit is always 0.

STATus:QUEStionable:LIMit<1|2> Register

This register comprises information about the observance of limit lines in the corresponding measurement window (LIMit 1 corresponds to Screen A, LIMit 2 to Screen B). It can be queried with commands `STATus:QUEStionable:LIMit<1|2>:CONDition?` and `STATus:QUEStionable:LIMit<1|2>[:EVENt]?`.

Table 5-9 Meaning of bits in STATus:QUEStionable:LIMit<1|2> register

Bit No.	Meaning
0	**LIMit 1 FAIL** This bit is set if limit line 1 is violated.
1	**LIMit 2 FAIL** This bit is set if limit line 2 is violated.
2	**LIMit 3 FAIL** This bit is set if limit line 3 is violated.
3	**LIMit 4 FAIL** This bit is set if limit line 4 is violated.
4	**LIMit 5 FAIL** This bit is set if limit line 5 is violated.
5	**LIMit 6 FAIL** This bit is set if limit line 6 is violated.
6	**LIMit 7 FAIL** This bit is set if limit line 7 is violated.
7	**LIMit 8 FAIL** This bit is set if limit line 8 is violated.
8 to 14	not used
15	This bit is always 0.

STATus:QUEStionable:LMARgin<1|2> Register

This register comprises information about the observance of limit margins in the corresponding measurement window (LMARgin1 corresponds to Screen A, LMARgin2 corresponds to Screen B). It can be queried with commands `STATus:QUEStionable:LMARgin<1|2>:CONDition?` and "`STATus :QUEStionable:LMARgin<1|2>[:EVENt]?`.

Table 5-10 Meaning of bits in STATus:QUEStionable:LMARgin<1|2> register

Bit No.	Meaning
0	**LMARgin 1 FAIL** This bit is set if limit margin 1 is violated.
1	**LMARgin 2 FAIL** This bit is set if limit margin 2 is violated.
2	**LMARgin 3 FAIL** This bit is set if limit margin 3 is violated.
3	**LMARgin 4 FAIL** This bit is set if limit margin 4 is violated.
4	**LMARgin 5 FAIL** This bit is set if limit margin 5 is violated.
5	**LMARgin 6 FAIL** This bit is set if limit margin 1 is violated.
6	**LMARgin 7 FAIL** This bit is set if limit margin 7 is violated.
7	**LMARgin 8 FAIL** This bit is set if limit margin 8 is violated.
8 to 14	not used
15	This bit is always 0.

STATus:QUEStionable:POWer Register

This register comprises all information about possible overloads of the unit.
It can be queried with commands `STATus:QUEStionable:POWer:CONDition?` and "`STATus :QUEStionable:POWer[:EVENt]?`.

Table 5-11 Meaning of bits in STATus:QUEStionable:POWer register

Bit No.	Meaning
0	**OVERload** (Screen A) This bit is set if the RF input is overloaded. 'OVLD' will then be displayed.
1	**UNDerload** (Screen A) This bit is set if the RF input is underloaded. 'UNLD' will then be displayed.
2	**IF_OVerload** (Screen A) This bit is set if the IF path is overloaded. 'IFOVL' will then be displayed.
3 to 7	not used
8	**OVERload** (Screen B) This bit is set if the RF input is overloaded. 'OVLD' will then be displayed.
9	**UNDerload** (Screen B) This bit is set if the RF input is underloaded. 'UNLD' will then be displayed.
10	**IF_OVerload** (Screen B) This bit is set if the IF path is overloaded. 'IFOVL' will then be displayed.
11 to 14	not used
15	This bit is always 0.

STATus:QUEStionable:SYNC Register

This register is used only with GSM MS mode. It contains information about sync and bursts not found, and about premeasurement results exceeding or falling short of expected values.
The bits can be queried with commands "`STATus:QUEStionable:SYNC:CONDition?`" and "`STATus:QUEStionable:SYNC[:EVENt]?`".

Table 5-12 Meaning of bits in STATus:QUEstionable:SYNC register

Bit No.	Meaning
0	**BURSt not found (screen A)** This bit is set if no burst is found in the measurements/premeasurements for phase/frequency error (PFE) or carrier power versus time (PVT) in GSM MS mode. If a burst is found in these measurements/premeasurements, the bit is reset.
1	**SYNC not found (screen A)** This bit is set if the synchronization sequence (training sequence) of the midamble is not found in the measurements/premeasurements for phase/frequency error (PFE) or carrier power versus time (PVT) in GSM MS mode. If the synchronization sequence (training sequence) of the midamble is found in these measurements/premeasurements, the bit is reset.
2	**No carrier (screen A)** This bit is set if, in GSM MS mode, the level value determined in the premeasurements for carrier power versus time (PVT) and spectrum due to modulation is too low. The bit is reset at the beginning of the premeasurement (see also Chapter 2, description of the named premeasurements).
3	**Carrier overload (screen A)** This bit is set if, in GSM MS mode, the level value determined in the premeasurements for carrier versus time (PVT) and spectrum due to modulation is too high. The bit is reset at the beginning of the premeasurement (see also Chapter 2, description of the named premeasurements).
4-14	Not used.
15	This bit is always 0.

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. Detailed program examples are to be found in chapter 7, Program Examples.

Service Request, Making Use of the Hierarchy Structure

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 with corresponding actions. As evident from Fig. 5-4, 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 corresponding setting of the ENABle parts of the status registers can achieve that arbitrary bits in an arbitrary status register initiate an SRQ. In order to make use of the possibilities of the service request, all bits should be set to "1" in enable registers SRE and ESE.

Examples (cf. Fig. 5-4 and chapter 7, Program Examples, as well):

Use of command "*OPC" to generate an SRQ at the end of a sweep.

- `CALL IBWRT(analyzer%, "*ESE 1")` Set bit 0 in the ESE (Operation Complete)
- `CALL IBWRT(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. A detailed example for a service request routine is to be found in chapter 7, Program Examples.

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 IEC bus.

Parallel Poll

In a parallel poll, up to eight instruments are simultaneously requested by the controller by means of a single command to transmit 1 bit of information each on the data lines, i.e., to set the data line allocated to each instrument to logically "0" or "1". By analogy to the SRE register which determines under which conditions an SRQ is generated, there is a parallel poll enable register (PPE) which is ANDed with the STB bit by bit as well considering bit 6. The results are ORed, the result is then sent (possibly inverted) as a response in the parallel poll of the controller. The result can also be queried without parallel poll by means of command "*IST".

The instrument first has to be set for the parallel poll using quick-BASIC command "IBPPC()". This command allocates a data line to the instrument and determines whether the response is to be inverted. The parallel poll itself is executed using "IBRPP()".

The parallel-poll method is mainly used in order to quickly find out after an SRQ which instrument has sent the service request if there are many instruments connected to the IEC bus. To this effect, SRE and PPE must be set to the same value. A detailed example as to the parallel poll is to be found in chapter 7, Program Examples.

Query by Means of Commands

Each part of every status register can be read by means of queries. The individual commands are indicated in the detailed description of the registers in Section 3.8.3. What is returned is always a number which represents the bit pattern of the register queried. Evaluating this number is effected by the controller program.

Queries are usually used after an SRQ in order to obtain more detailed information on the cause of the SRQ.

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 which can be looked at in the ERROR menu via manual control or queried via the IEC bus using command "SYSTem:ERRor?". Each call of "SYSTem:ERRor?" provides an 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.

Resetting Values of the Status Reporting System

Table 5-13 comprises the different commands and events causing the status reporting system to be reset. None of the commands, except for *RST and SYSTem:PRESet influences the functional instrument settings. In particular, DCL does not change the instrument settings.

Table 5-13 Resettting instrument functions

Event / Effect	Switching on supply voltage, Power-On-Status-Clear 0	Switching on supply voltage, Power-On-Status-Clear 1	DCL,SDC (Device Clear, Selected Device Clear)	*RST or SYSTem:PRESet	STATus:PRESet	*CLS
Clear STB,ESR	—	yes	—	—	—	yes
Clear SRE,ESE	—	yes	—	—	—	—
Clear PPE	—	yes	—	—	—	—
Clear EVENTt 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 command line, i.e., immediately following a <PROGRAM MESSAGE TERMINATOR> clears the output buffer.

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6 Remote Control - Description of Commands

Notation

In the following sections, all commands implemented in the instrument are first listed in tables and then described in detail, arranged according to the command subsystems. The notation is adapted to the SCPI standard. The SCPI conformity information is included in the individual description of the commands.

Table of Commands

Command: In the command column, the table provides an overview of the commands and their hierarchical arrangement (see indentations).

Parameter: The parameter column indicates the requested parameters together with their specified range.

Unit: The unit column indicates the basic unit of the physical parameters.

Comment: In the comment column an indication is made on:
- whether the command does not have a query form,
- whether the command has only one query form
- whether the command is implemented only with a certain option of the instrument

Indentations

The different levels of the SCPI command hierarchy are represented in the table by means of indentations to the right. The lower the level, the further the indentation to the right. Please note that the complete notation of the command always includes the higher levels as well.

Example: `SENSe:FREQuency:CENTer` is represented in the table as follows:

`SENSe`	first level
`  :FREQuency`	second level
`    :CENTer`	third level

Individual description

The individual description contains the complete notation of the command. An example for each command, the *RST value and the SCPI information are included as well.
The operating modes for which a command can be used are indicated by the following abbreviations:

A	Spectrum analysis
A-F	Spectrum analysis - frequency domain only
A-Z	Spectrum analysis - time domain only (zero span)

Note: *The spectrum analysis (analyzer) mode is implemented in the basic unit. For the other modes, the corresponding options are required.*

Upper/lower case notation Upper/lower case letters are used to mark the long or short form of the key words of a command in the description (see Chapter 5). The instrument itself does not distinguish between upper and lower case letters.

Special characters | 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:FREQuency:CW|:FIXed`

The two following commands with identical meaning can be created. They set the frequency of the fixed frequency signal to 1 kHz:

`SENSe:FREQuency:CW 1E3` = `SENSe:FREQuency:FIXed 1E3`

A vertical stroke in parameter indications marks alternative possibilities in the sense of "or". The effect of the command is different, depending on which parameter is used.

Example: Selection of the parameters for the command

`DISPlay:FORMat  FULL | SPLit`

If parameter FULL is selected, full screen is displayed, in the case of SPLit, split screen is displayed.

[ ] Key words in square brackets can be omitted when composing the header (cf. Chapter 5, Optional Keywords). The full command length must be accepted by the instrument for reasons of compatibility with the SCPI standards.
Parameters in square brackets can be incorporated optionally in the command or omitted as well.

{ } Parameters in braces can be incorporated optionally in the command, either not at all, once or several times.

Description of parameters Due to the standardization, the parameter section of SCPI commands consists always of the same syntactical elements. SCPI has therefore specified a series of definitions, which are used in the tables of commands. In the tables, these established definitions are indicated in angled brackets (<...>) and will be briefly explained in the following (see also Chapter 5, Section "Parameters").

<Boolean> This keyword refers to parameters which can adopt two states, "on" and "off". The "off" state may either be indicated by the keyword **OFF** or by the numeric value 0, the "on" state is indicated by **ON** or any numeric value other than zero. Parameter queries are always returned the numeric value 0 or 1.

<numeric_value>
<num> These keywords mark parameters which may be entered as numeric values or be set using specific keywords (character data).

The following keywords given below are permitted:

MINimum	This keyword sets the parameter to the smallest possible value.
MAXimum	This keyword sets the parameter to the largest possible value.
DEFault	This keyword is used to reset the parameter to its default value.
UP	This keyword increments the parameter value.
DOWN	This keyword decrements the parameter value.

The numeric values associated to MAXimum/MINimum/DEFault can be queried by adding the corresponding keywords to the command. They must be entered following the quotation mark.

Example: `SENSe:FREQuency:CENTer? MAXimum`

returns the maximum possible numeric value of the center frequency as result.

<arbitrary block program data>
This keyword is provided for commands the parameters of which consist of a binary data block.

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. Many common commands refer to the status reporting system which is described in detail in Chapter 5.

Command	Parameter	Function	Comment
***CAL?**		Calibration Query	query only
***CLS**		Clear Status	no query
***ESE**	0 to 255	Event Status Enable	
***ESR?**		Standard Event Status Query	query only
***IDN?**		Identification Query	query only
***IST?**		Individual Status Query	query only
***OPC**		Operation Complete	
***OPT?**		Option Identification Query	query only
***PCB**	0 to 30	Pass Control Back	no query
***PRE**	0 to 255	Parallel Poll Register Enable	
***PSC**	0 | 1	Power On Status Clear	
***RST**		Reset	no query
***SRE**	0 to 255	Service Request Enable	
***STB?**		Status Byte Query	query only
***TRG**		Trigger	no query
***TST?**		Self Test Query	query only
***WAI**		Wait to continue	no query

***CAL?**

CALIBRATION QUERY initiates a calibration of the instrument and subsequently queries the calibration status. Any responses > 0 indicate errors.

***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 0 to 255**

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.

***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.

***IDN?**

IDENTIFICATION QUERY queries the instrument identification.

Example: " Rohde&Schwarz, FSMR-3, 123456/789, 1.03"

FSMR-3 = Device name
123456/789 = Serial number of the instrument
1.03 = Firmware version number

***IST?**

INDIVIDUAL STATUS QUERY returns the contents of the IST flag in decimal form (0 | 1). The IST flag is the status bit which is sent during a parallel poll (cf. Chapter 5).

***OPC**

OPERATION COMPLETE sets bit 0 in the event status register when all preceding commands have been executed. This bit can be used to initiate a service request (cf. Chapter 5).

***OPC?**

OPERATION COMPLETE QUERY writes message "1" into the output buffer as soon as all preceding commands have been executed (cf. Chapter 5).

***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.

Position	Option	
1		reserved
2	B4	OCXO
3	B2	Preselector
4		reserved
5		reserved
6		reserved
	B9	Tracking Generator 3 GHz / can be I/Q-modulated
8	B10	Ext. Generator Control
9		reserved
10	B12	Attenuator for Tracking Generator
11 to 13		reserved
14		LAN Interface
15 to 22		reserved
23	B25	Electronic Attenuator
24 to 29		reserved
30		reserved
31		reserved
32	FS-K7	FM Demodulator
33 to 51		reserved

Example:

B3,B4,0,0,0,0,0,B10,0,0,0,0,0,B16,0,0,0,0,0,0,0,0,0,B25,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0

***PCB 0 to 30**

PASS CONTROL BACK indicates the controller address which the IEC-bus control is to be returned to after termination of the triggered action.

***PRE 0 to 255**

PARALLEL POLL REGISTER ENABLE sets the parallel poll enable register to the indicated value. The query form *PRE? returns the contents of the parallel poll enable register in decimal form.

***PSC 0 | 1**

POWER ON STATUS CLEAR determines whether the contents of the ENABle registers are preserved or reset during power-up.

*PSC = 0	causes the contents of the status registers to be preserved. Thus a service request can be generated when switching on the instrument, if the status registers ESE and SRE are suitably configured.
*PSC ≠ 0	'Resets the registers.

The query form *PSC? reads out the contents of the power-on-status-clear flag. The response can be 0 or 1.

***RST**

RESET sets the instrument to a defined default status. The command essentially corresponds to pressing the *PRESET* key. The default setting is indicated in the description of the commands.

***SRE 0 to 255**

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.

***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 `INITiate:IMMediate` (cf. Section "TRIGger Subsystem").

***TST?**

SELF TEST QUERY initiates the selftest of the instrument and outputs an error code in decimal form (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 (cf. Chapter 5 and "*OPC" as well).

ABORt Subsystem

The ABORt subsystem contains the commands for aborting triggered actions. An action can be triggered again immediately after being aborted. All commands trigger events, and therefore they have no *RST value.

COMMAND	PARAMETERS	UNIT	COMMENT
ABORt	-- --	-- --	no query

ABORt

This command aborts a current measurement and resets the trigger system.

Example: "`ABOR;INIT:IMM`"

Characteristics: *RST value: 0
SCPI: conforming

CALCulate Subsystem

The CALCulate subsystem contains commands for converting instrument data, transforming and carrying out corrections. These functions are carried out subsequent to data acquistion, i.e. following the SENSe subsystem.

The numeric suffix is used in CALCulate to make the distinction between the two measurement windows SCREEN A and SCREEN B:

CALCulate1 = Screen A
CALCulate2 = Screen B.

For commands without suffix, screen A is selected automatically.

Full Screen: The settings are valid for the measurement window selected with the numeric suffix. They become effective as soon as the corresponding measurement window has been selected as active measurement window using the command `DISPLay[:WINDow<1|2>]:SELect`. Triggering measurements and querying measured values is possible only in the active measurement window.

Split Screen: The settings are valid for the measurement window selected by means of the numeric suffix and become effective immediately.

CALCulate:DELTamarker Subsystem

The CALCulate:DELTamarker subsystem controls the delta-marker functions in the instrument. The measurement windows are selected via CALCulate1 (screen A) or 2 (screen B).

<table>
<tr><th>COMMAND</th><th>PARAMETERS</th><th>UNIT</th><th>COMMENT</th></tr>
<tr><td>CALCulate<1|2></td><td></td><td></td><td></td></tr>
<tr><td>:DELTamarker<1 to 4></td><td></td><td></td><td></td></tr>
<tr><td>[:STATe]</td><td><Boolean></td><td>--</td><td></td></tr>
<tr><td>:MODE</td><td>ABSolute|RELative</td><td></td><td></td></tr>
<tr><td>:AOFF</td><td></td><td></td><td>no query</td></tr>
<tr><td>:TRACe</td><td><numeric_value></td><td>--</td><td></td></tr>
<tr><td>:X</td><td><numeric_value></td><td>HZ | S | DBM | DB</td><td></td></tr>
<tr><td>:RELative?</td><td>--</td><td>--</td><td>query only</td></tr>
<tr><td>:Y?</td><td>--</td><td>--</td><td>query only</td></tr>
<tr><td>:MAXimum</td><td></td><td></td><td></td></tr>
<tr><td>[:PEAK]</td><td>--</td><td>--</td><td>no query</td></tr>
<tr><td>:NEXT</td><td>--</td><td>--</td><td>no query</td></tr>
<tr><td>:RIGHt</td><td>--</td><td>--</td><td>no query</td></tr>
<tr><td>:LEFT</td><td>--</td><td>--</td><td>no query</td></tr>
<tr><td>:MINimum</td><td></td><td></td><td></td></tr>
<tr><td>[:PEAK]</td><td>--</td><td>--</td><td>no query</td></tr>
<tr><td>:NEXT</td><td>--</td><td>--</td><td>no query</td></tr>
<tr><td>:RIGHt</td><td>--</td><td>--</td><td>no query</td></tr>
<tr><td>:LEFT</td><td>--</td><td>--</td><td>no query</td></tr>
<tr><td>:FUNCtion</td><td></td><td></td><td></td></tr>
<tr><td>:FIXed</td><td></td><td></td><td></td></tr>
<tr><td>[:STATe]</td><td><Boolean></td><td></td><td></td></tr>
<tr><td>:RPOint</td><td></td><td></td><td></td></tr>
<tr><td>:Y</td><td><numeric_value></td><td>DBM</td><td></td></tr>
<tr><td>:OFFSet</td><td><numeric_value></td><td>DB</td><td></td></tr>
<tr><td>:X</td><td><numeric_value></td><td>HZ | S</td><td></td></tr>
<tr><td>:PNOise</td><td></td><td></td><td></td></tr>
<tr><td>[:STATe]</td><td><Boolean></td><td></td><td></td></tr>
<tr><td>:RESult?</td><td>--</td><td>--</td><td>query only</td></tr>
</table>

CALCulate<1|2>:DELTamarker<1 to 4>[:STATe] ON | OFF

This command switches on and off the delta marker when delta marker 1 is selected. The corresponding marker becomes the delta marker when delta marker 2 to 4 is selected. If the corresponding marker is not activated, it will be activated and positioned on the maximum of the measurement curve.
If no numeric suffix is indicated, delta marker 1 is selected automatically.

Example: "`CALC:DELT3 ON`" 'Switches marker 3 in screen A to delta marker mode.

Characteristics: *RST value: OFF
SCPI: device-specific

CALCulate<1|2>:DELTamarker<1 to 4>:MODE ABSolute | RELative

This command switches between relative and absolute frequency input of the delta marker (or time with span = 0). It affects all delta markers independent of the measurement window.

Example:	"`CALC:DELT:MODE ABS`"	'Switches the frequency/time indication for all delta markers to absolute values.
	"`CALC:DELT:MODE REL`"	'Switches the frequency/time indication for all 'delta markers to relative to marker 1.

Characteristics:	*RST value:	REL
	SCPI:	device-specific

CALCulate<1|2>:DELTamarker<1 to 4>:AOFF

This command switches off all active delta markers in the selected measurement window (screen A or screen B).

Example:	"`CALC2:DELT:AOFF`"	'Switches off all delta markers in screen B.

Characteristics:	*RST value:	-
	SCPI:	device-specific

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

CALCulate<1|2>:DELTamarker<1 to 4>:TRACe 1 to 3

This command assigns the selected delta marker to the indicated measurement curve in the indicated measurement window. The selected measurement curve must be active, i.e. its state must be different from "BLANK".

Example:	"`CALC:DELT3:TRAC 2`"	'Assigns deltamarker 3 to trace 2 in screen A.
	"`CALC:DELT:TRAC 3`"	'Assigns deltamarker 1 to trace 3 in screen B.

Characteristics:	*RST value:	-
	SCPI:	device-specific

CALCulate<1|2>:DELTamarker<1 to 4>:X 0 to MAX (frequency | sweep time)

This command positions the selected delta marker in the indicated measurement window to the indicated frequency (span > 0), time (span = 0) or level (APD measurement = ON or CCDFmeasurement = ON). The input is in absolute values or relative to marker 1 depending on the command `CALCulate:DELTamarker:MODE`. If Reference Fixed measurement (`CALCulate:DELTamarker:FUNCtion:FIXed:STATe ON`) is active, relative values refer to the reference position are entered. The query always returns absolute values.

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 in screen A '10.7 MHz to the right of marker 1.
	"`CALC2:DELT:X?`"	'Outputs the absolute frequency/time of delta 'marker 1 in screen B
	"`CALC2:DELT:X:REL?`"	'Outputs the relative frequency/time/level of 'delta marker 1 in screen B

Characteristics:	*RST value:	-
	SCPI:	device-specific

CALCulate<1|2>:DELTamarker<1 to 4>:X:RELative?

This command queries the frequency (span > 0) or time (span = 0) of the selected delta marker relative to marker 1 or to the reference position (for `CALCulate:DELTamarker:FUNCtion :FIXed:STATe ON`). The command activates the corresponding delta marker, if necessary.

Example:	"`CALC:DELT3:X:REL?`"	'Outputs the frequency of delta marker 3 in 'screen B relative to marker 1 or relative to the 'reference position.

Characteristics: *RST value: -
SCPI: device-specific

CALCulate<1|2>:DELTamarker<1 to 4>:Y?

This command queries the measured value of the selected delta marker in the specified measurement window. The selected delta marker will be activated if necessary. A relative value referenced to marker 1 is returned in response to this query.

To obtain a valid result, a complete sweep with synchronization to the sweep end must have been performed between switch-on of the delta marker and querying of the Y value. This is possible only in the single sweep mode.

Depending on the measurement functions activated, the result is output in one of the units below:

• FM result display:	Hz	
• PM result display:	rad | deg	
• AM result display:	%	
• RF POWER result display:	dB	(logarithmic display)
	%	(linear display)
• RF SPECTRUM result display:	dB	(logarithmic display)
	%	(linear display)
• AF SPECTRUM result display:	dB	(logarithmic display)
	Hz | % | rad | deg	(linear display)
• AUDIO result display:	V	
• AUDIO SPECTRUM result display:	V	

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 the measured value of delta marker 2.

Characteristics: *RST value: -
SCPI: device-specific

CALCulate<1|2>:DELTamarker<1 to 4>:MAXimum[:PEAK]

This command positions the delta marker to the current maximum value on the measured curve. If necessary, the corresponding delta marker will be activated first.

Example:	"`CALC2:DELT3:MAX`"	'Sets delta marker 3 in screen B to the 'maximum value of the associated trace.

Characteristics: *RST value: -
SCPI: device-specific

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

CALCulate<1|2>:DELTamarker<1 to 4>:MAXimum:NEXT

This command positions the delta marker to the next smaller maximum value on the measured curve. The corresponding delta marker will be activated first, if necessary.

Example: "`CALC1:DELT2:MAX:NEXT`" 'Sets delta marker 2 in screen A to the next 'smaller maximum value.

Characteristics: *RST value: -
SCPI: device-specific

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

CALCulate<1|2>:DELTamarker<1 to 4>:MAXimum:RIGHt

This command positions the delta marker to the next smaller maximum value to the right of the current value (i.e. ascending X values). The corresponding delta marker is activated first, if necessary.

Example: "`CALC2:DELT:MAX:RIGH`" 'Sets delta marker 1 in screen B to the next 'smaller maximum value to the right of the 'current value.

Characteristics: *RST value: -
SCPI: device-specific

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

CALCulate<1|2>:DELTamarker<1 to 4>:MAXimum:LEFT

This command positions the delta marker to the next smaller maximum value to the left of the current value (i.e. descending X values). The corresponding delta marker will be activated first, if necessary.

Example: "`CALC:DELT:MAX:LEFT`" 'Sets delta marker 1 in screen A to the next 'smaller maximum value to the left of the 'current value.

Characteristics: *RST value: -
SCPI: device-specific

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

CALCulate<1|2>:DELTamarker<1 to 4>:MINimum[:PEAK]

This command positions the delta marker to the current minimum value on the measured curve. The corresponding delta marker will be activated first, if necessary.

Example: "`CALC2:DELT3:MIN`" 'Sets delta marker 3 in screen B to the 'minimum value of the associated trace.

Characteristics: *RST value: -
SCPI: device-specific

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

CALCulate<1|2>:DELTamarker<1 to 4>:MINimum:NEXT

This command positions the delta marker to the next higher minimum value of the measured curve. The corresponding delta marker will be activated first, if necessary.

Example:	"`CALC1:DELT2:MIN:NEXT`"	'Sets delta marker 2 in screen A to the next higher minimum value.

Characteristics: *RST value: -
SCPI: device-specific

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

CALCulate<1|2>:DELTamarker<1 to 4>:MINimum:RIGHt

This command positions the delta marker to the next higher minimum value to the right of the current value (i.e. ascending X values). The corresponding delta marker will be activated first, if necessary.

Example:	"`CALC2:DELT:MIN:RIGH`"	'Sets delta marker 1 in screen B to the next 'higher minimum value to the right of the current value.

Characteristics: *RST value: -
SCPI: device-specific

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

CALCulate<1|2>:DELTamarker<1 to 4>:MINimum:LEFT

This command positions the delta marker to the next higher minimum value to the left of the current value (i.e. descending X values). The corresponding delta marker will be activated first, if necessary.

Example:	"`CALC:DELT:MIN:LEFT`"	'Sets delta marker 1 in screen A to the next 'higher minimum to the left of the current 'value.

Characteristics: *RST value: -
SCPI: device-specific

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

CALCulate<1|2>:DELTamarker<1 to 4>:FUNCtion:FIXed[:STATe] ON | OFF

This command switches the relative measurement to a fixed reference value on or off. Marker 1 will be activated previously and a peak search will be performed, if necessary. If marker 1 is activated, its position becomes the reference point for the measurement. The reference point can then be modified with commands `CALCulate:DELTamarker:FUNCtion:FIXed:RPOint:X` and `to :RPOint:Y` independently of the position of marker 1 and of a trace. It is valid for all delta markers in the selected measurement window as long as the function is active.

Example:	"`CALC2:DELT:FUNC:FIX ON`"	'Switches on the measurement with fixed 'reference value for all delta markers in 'screen B.
	"`CALC2:DELT:FUNC:FIX:RPO:X 128 MHZ`"	'Sets the reference frequency 'in screen B to 128 MHz.
	"`CALC2:DELT:FUNC:FIX:RPO:Y 30 DBM`"	'Sets the reference level in 'screen B to +30 dBm

Characteristics: *RST value: OFF
SCPI: device-specific.

CALCulate<1|2>:DELTamarker<1 to 4>:FUNCtion:FIXed:RPOint:MAXimum[:PEAK] <numeric_value>

This command sets the reference point level for all delta markers in the selected measurement window for a measurement with fixed reference point (CALC:DELT:FUNC:FIX:STAT ON) to the peak of the selected trace.

For phase-noise measurements (CALCulate:DELTamarker:FUNCtion:PNOise:STATe ON), the command defines a new reference point level for delta marker 2 in the selected measurement window.

Example: "`CALC:DELT:FUNC:FIX:RPO:MAX`"

Characteristics: *RST value: -
SCPI: device-specific

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

CALCulate<1|2>:DELTamarker<1 to 4>:FUNCtion:FIXed:RPOint:Y <numeric_value>

This command defines a new reference point level for all delta markers in the selected measurement window for a measurement with fixed reference point.
(`CALCulate:DELTamarker:FUNCtion:FIXed:STATe ON`).

For phase-noise measurements (`CALCulate:DELTamarker:FUNCtion:PNOise:STATe ON`), the command defines a new reference point level for delta marker 2 in the selected measurement window.

Example: "`CALC:DELT:FUNC:FIX:RPO:Y -10dBm`" 'Sets the reference point level for
'delta markers in screen A to -10
'dBm.

Characteristics: *RST value: - (`FUNction:FIXed[:STATe]` is set to OFF)
SCPI: device-specific

CALCulate<1|2>:DELTamarker<1 to 4>:FUNCtion:FIXed:RPOint:Y:OFFSet <numeric_value>

This command defines an additional level offset for the measurement with fixed reference value (`CALCulate:DELTamarker:FUNCtion:FIXed:STATe ON`). For this measurement, the offset is included in the display of all delta markers of the selected measurement window.

For phase-noise measurements (`CALCulate:DELTamarker:FUNCtion:PNOise:STATe ON`), the command defines an additional level offset which is included in the display of delta marker 2 in the selected measurement window.

Example: "`CALC:DELT:FUNC:FIX:RPO:Y:OFFS 10dB`"
'Sets the level offset for the measurement with fixed reference
'value or the phase-noise measurement in screen A to 10 dB.

Characteristics: *RST value: 0 dB
SCPI: device-specific

CALCulate<1|2>:DELTamarker<1 to 4>:FUNCtion:FIXed:RPOint:X <numeric_value>

This command defines a new reference frequency (span > 0) or time (span = 0) for all delta markers in the selected measurement window for a measurement with fixed reference value (`CALCulate:DELTamarker:FUNCtion:FIXed:STATe ON`).

For phase-noise measurements (`CALCulate:DELTamarker:FUNCtion:PNOise:STATe ON`), the command defines a new reference frequency or time for delta marker 2 in the selected measurement window.

Example: "`CALC2:DELT:FUNC:FIX:RPO:X 128MHz`" 'Sets the reference frequency in 'screen B to 128 MHz.

Characteristics: *RST value: - (`FUNction:FIXed[:STATe]` is set to `OFF`)
SCPI: device-specific

CALCulate<1|2>:DELTamarker<1 to 4>:FUNCtion:PNOise[:STATe] ON | OFF

This command switches on or off the phase-noise measurement with all actíve delta markers in the selected measurement window. The correction values for the bandwidth and the log amplifier are taken into account in the measurement..

Marker 1 will be activated, if necessary, and a peak search will be performed. If marker 1 is activated, its position becomes the reference point for the measurement.

The reference point can then be modified with commands `CALCulate:DELTamarker :FUNCtion:FIXed:RPOint:X` and `...:RPOint:Y` independently of the position of marker 1 and of a trace (the same commands used for the measurment with fixed reference point).

The numeric suffix <1 to 4> with `DELTamarker` is not relevant for this command.

Example: "`CALC:DELT:FUNC:PNO ON`" 'Switches on the phase-noise measurement 'with all delta markers in screen A.

"`CALC:DELT:FUNC:FIX:RPO:X 128 MHZ`" 'Sets the reference frequency 'to 128 MHz.

"`CALC:DELT:FUNC:FIX:RPO:Y 30 DBM`" 'Sets the reference level to '+30 dBm

Characteristics: *RST value: OFF
SCPI: device-specific

CALCulate<1|2>:DELTamarker<1 to 4>:FUNCtion:PNOise:RESult?

This command queries the result of the phase-noise measurement in the selected measurement window. The measurement will be switched on, if necessary.

Example: "`CALC:DELT:FUNC:PNO:RES?`" 'Outputs the result of phase-noise 'measurement of the selected delta marker in 'screen A.

Characteristics: *RST value: -
SCPI: device-specific

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

CALCulate:FEED Subsystem

The CALCulate:FEED subsystem selects the type of evaluation of the measured data. This corresponds to the selection of the Result Display in manual mode.
If the FM demodulator is active, the selection of the type of evaluation is independent of the measurement window. Therefore, the numeric suffix <1|2> is irrelevant and ignored.

Command	Parameter	Unit	Comment
CALCulate<1|2> :FEED	<string>		no query

CALCulate<1|2>:FEED <string>

This command selects the type of results to be displayed. The numeric suffix selects screen 1 or screen 2 in the split screen mode. The screen assignment is fixed for the various types of results. For example, if an AM signal is displayed in time domain in screen 1 (top), the numeric AM values are automatically displayed in screen 2 (bottom).

Parameter:
<string>::=

'XTIM:RFPower:BARGraph'	Numeric output of carrier power and frequency error Screen 1: numeric output of measured values Screen 2: not possible
'XTIM:AM:RELative[:TDOMain]'	Demodulated AM signal Screen 1: graphic time-domain display Screen 2: numeric output of measured values
'XTIM:AM:RELative:AFSPectrum<1 to 3>'	AF spectrum of demodulated AM signal (normalized display) for trace 1, 2 or 3 Screen 1: graphic spectrum display Screen 2: not possible
'XTIM:FM[:TDOMain]'	Demodulated FM signal Screen 1: graphic time-domain display Screen 2: numeric output of measured values
'XTIM:FM:AFSPectrum<1 to 3>'	AF spectrum of demodulated FM signal for trace 1, 2 or 3 Screen 1: graphic spectrum display Screen 2: not possible
'XTIM:PM[:TDOMain]'	Demodulated PM signal Screen 1: graphic time-domain display Screen 2: numeric output of measured values
'XTIM:PM:AFSPectrum<1 to 3>'	AF spectrum of demodulated PM signal Screen 1: graphic spectrum display Screen 2: not possible
'XTIM:AC[:TDOMain]'	Audio signal in *AUDIO* mode Screen 1: graphic time-domain display Screen 2: not possible
'XTIM:AC:AFSPectrum<1 to 3>'	AF spectrum of audio signal in *AUDIO* mode Screen 1: graphic spectrum display Screen 2: not possible
'XTIM:SPECtrum'	RF spectrum of signal generated from measured data by means of an FFT Screen 1: graphic spectrum display Screen 2: not possible

Example: `"CALC:FEED ‘XTIM:FM’"'` Selects display of the FM signal.

Characteristics: *RST value: ‘XTIM:FM’
SCPI: conforming

CALCulate:FORMat Subsystem

The CALCulate:FORMat subsystem determines further processing and conversion of measured data. The measurement windows are assigned to CALCulate 1 (screen A) or 2 (screen B).

COMMAND	PARAMETERS	UNIT	COMMENT
CALCulate<1|2>			
:FORMat	PHASe | UPHase	-	

CALCulate<1|2>:FORMat PHASe | UPHase

This command limits the display of the measured phase deviation to ±180°.

Parameters: PHASe: Limitation of phase display to ±180°.
UPHase: No limitation of phase display (unwrapped).

Example: `":CALC:FORM PHAS"` 'Activates limitation of the phase display to ±180°.

Characteristics: *RST value: UPAS
SCPI: conforming

CALCulate:LIMit Subsystem

The CALCulate:LIMit subsystem consists of the limit lines and the corresponding limit checks. Limit lines can be defined as upper or lower limit lines. The individual Y values of the limit lines correspond to the values of the X axis (CONTrol). The number of X and Y values must be identical.

8 limit lines can be active at the same time (marked by LIMIT1 to LIMIT8) in screen A and/or screen B. The measurement windows is selected via CALCulate 1 (screen A) or 2 (screen B).

The limit check can be switched on separately for each measurement screen and limit line. WINDow1 corresponds to screen A, WINDow2 to screen B.

Each limit line can be assigned a name (max. 8 letters) under which the line is stored in the instrument. An explanatory comment can also be given for each line (max. 40 characters).

Example (analyzer mode):
Definition and use of a new limit line 5 for trace 2 in screen A and trace 1 in screen B with the following features:

- upper limit line
- absolute X axis in the frequency domain
- 5 ref. values: 126 MHz/-40 dB, 127 MHz/-40 dB, 128 MHz/-20 dB, 129 MHz/-40 dB, 130 MHz/-40 dB
- relative Y axis with unit dB
- absolute threshold value at -35 dBm
- no safety margin

Definition of the line:

1. Defining the name:	`CALC:LIM5:NAME 'TEST1'`
2. Entering the comment:	`CALC:LIM5:COMM 'Upper limit line'`
3. Associated trace in screen A:	`CALC1:LIM5:TRAC 2`
4. Associated trace in screen B:	`CALC2:LIM5:TRAC 1`
5. Defining the X axis range:	`CALC:LIM5:CONT:DOM FREQ`
6. Defining the X axis scaling:	`CALC:LIM5:CONT:MODE ABS`
7. Defining the Y axis unit:	`CALC:LIM5:UNIT DB`
8. Defining the Y axis scaling:	`CALC:LIM5:UPP:MODE REL`
9. Defining the X axis values:	`CALC:LIM5:CONT 126MHZ, 127MHZ, 128MHZ, 129 MHZ, 130MHZ`
10. Defining the y values:	`CALC:LIM5:UPP -40, -40, -30, -40, -40`
11. Defining the y threshold value:	`CALC:LIM5:UPP:THR -35DBM`

The definition of the safety margin and shifting in X and/or Y direction can take place as from here (see commands below).

Switching on and evaluating the line in screen A:

1. Switching on the line in screen A:	`CALC1:LIM5:UPP:STAT ON`
2. Switching on the limit check in screen A:	`CALC1:LIM5:STAT ON`
3. Starting a new measurement with synchronization:	`INIT;*WAI`
4. Querying the limit check result:	`CALC1:LIM5:FAIL?`

Switching on and evaluating the line in screen B is performed in the same way by using `CALC2` instead of `CALC1`.

<table>
<tr><th>COMMAND</th><th>PARAMETERS</th><th>UNIT</th><th>COMMENT</th></tr>
<tr><td>CALCulate<1|2></td><td></td><td></td><td></td></tr>
<tr><td>:LIMit<1 to 8></td><td></td><td></td><td></td></tr>
<tr><td>:TRACe</td><td><numeric_value></td><td></td><td></td></tr>
<tr><td>:STATe</td><td><Boolean></td><td>--</td><td></td></tr>
<tr><td>:UNIT</td><td>DBM | DBPW | WATT |
DBUV | DBMV | VOLT |
DBUA | AMPere | DB |
DBUV_M | DBUA_M |
DEG | RAD | S | HZ | PCT |
UNITLESS</td><td></td><td></td></tr>
<tr><td>:FAIL?</td><td></td><td>--</td><td>query only</td></tr>
<tr><td>:CLEar</td><td></td><td></td><td></td></tr>
<tr><td>[:IMMediate]</td><td>--</td><td>--</td><td>no query</td></tr>
<tr><td>:COMMent</td><td><string></td><td>--</td><td></td></tr>
<tr><td>:COPY</td><td>1 to 8 | < name></td><td>--</td><td></td></tr>
<tr><td>:NAME</td><td><string></td><td></td><td></td></tr>
<tr><td>:DELete</td><td>--</td><td></td><td></td></tr>
</table>

CALCulate<1|2>:LIMit<1 to 8>:TRACe 1 to 3

This command assigns a limit line to a trace in the indicated measurement window.

Examples: "`CALC:LIM2:TRAC 3`" 'Assigns limit line 2 to trace 3 in screen A.

"`CALC2:LIM2:TRAC 1`" 'Assigns limit line 2 to trace 1 in screen B at the same time.

Characteristics: *RST value: 1
SCPI: device-specific

CALCulate<1|2>:LIMit<1 to 8>:STATe ON | OFF

This command switches on or off the limit check for the selected limit line in the selected measurement window.

The result of the limit check can be queried with `CALCulate:LIMit<1 to 8>:FAIL?`.

Example: "`CALC:LIM:STAT ON`" 'Switches on the limit check for limit line 1 in 'screen A.

"`CALC2:LIM:STAT OFF`" 'Switches off the limit check for limit line 1 in 'screen B.

Characteristics: *RST value: OFF
SCPI: conforming

CALCulate<1|2>:LIMit<1 to 8>:UNIT DBM | DBPW | WATT | DBUV | DBMV | VOLT |DBUA | AMPere | DB | DEG | RAD | S | HZ | PCT | UNITLESS

This command defines the unit of the selected limit line.

The definition is valid independently of the measurement window.

Upon selection of the unit DB the limit line is automatically switched to the relative mode. For units different from DB the limit line is automatically switched to absolute mode.

The units DEG, RAD, S, HZ, PCT are not available in *SPECTRUM* mode.

Example: "`CALC:LIM4:UNIT DBUV`" 'Sets the unit of limit line 4 to dBµV.

Characteristics: *RST value: DBM
SCPI: device-specific

CALCulate<1|2>:LIMit<1 to 8>:FAIL?

This command queries the result of the limit check of the limit line indicated in the selected measurement window. It should be noted that a complete sweep must have been performed for obtaining a valid result. A synchronization with *OPC, *OPC? or *WAI should therefore be provided. The result of the limit check responds with 0 for PASS, 1 for FAIL, and 2 for MARGIN.

Example: `"INIT;*WAI"` 'Starts a new sweep and waits for its end.
`"CALC2:LIM3:FAIL?"` 'Queries the result of the check for limit 'line 3 in screen B.

Characteristics: *RST value: -
SCPI: conforming

CALCulate<1|2>:LIMit<1 to 8>:CLEar[:IMMediate]

This command deletes the result of the current limit check for all limit lines in the selected measurement window.

Example: `"CALC:LIM:CLE"` 'Deletes the result of the limit check in screen A

Characteristics: *RST value: -
SCPI: conforming

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

CALCulate<1|2>:LIMit<1 to 8>:COMMent <string>

This command defines a comment for the limit line selected (max. 40 characters). The comment is independent from the measurement window.

Example: `"CALC:LIM5:COMM 'Upper limit for spectrum'"`
'Defines the comment for limit line 5.

Characteristics: *RST value: blank comment
SCPI: device-specific

CALCulate<1|2>:LIMit<1 to 8>:COPY 1 to 8 | <name>

This command copies one limit line onto another one. It is independent of the measurement window.

The name of the limit line may consist of max 8 characters.

Parameter: 1 to 8 ::= number of the new limit line or:
<name> ::= name of the new limit line given as a string

Example: `"CALC:LIM1:COPY 2"` 'Copies limit line 1 to line 2.

`"CALC:LIM1:COPY 'GSM2'"` 'Copies limit line 1 to a new line named ''GSM2'.

Characteristics: *RST value: --
SCPI: device-specific

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

CALCulate<1|2>:LIMit<1 to 8>:NAME <name of limit line>

This command assigns a name to a limit line numbered 1 to 8. If it does not exist already, a limit line with this name is created. The command is independent of the measurement window.

The name of the limit line may contain a maximum of 8 characters.

Example: "`CALC:LIM1:NAME 'GSM1'`" 'Assigns the name 'GSM1' to limit line 1.

Characteristics: *RST value: 'REM1' to 'REM8' for lines 1 to 8
SCPI: device-specific

CALCulate<1|2>:LIMit<1 to 8>:DELete

This command deletes the selected limit line. The command is independent of the measurement window.

Example: "`CALC:LIM1:DEL`" 'Deletes limit line 1.

Characteristics: *RST value: --
SCPI: device-specific

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

CALCulate:LIMit:ACPower Subsystem

The CALCulate:LIMit:ACPower subsystem defines the limit check for adjacent channel power measurement.

COMMAND	PARAMETERS	UNIT	COMMENT
CALCulate<1|2>			
LIMit<1 to 8>			
:ACPower			
[:STATe]	<Boolean>		
:ACHannel			
[:RELative]	<numeric_value>, <numeric_value>	DB, DB	
:STATe	<Boolean>		
:ABSolute	<numeric_value>, <numeric_value>	DBM, DBM	
:STATe	<Boolean>		
:RESult?	--		query only
:ALTernate<1|2>			
[:RELative]	<numeric_value>, <numeric_value>	DB, DB	
:STATe	<Boolean>		
:ABSolute	<numeric_value>, <numeric_value>	DBM, DBM	
:STATe	<Boolean>		
:RESult?	--		query only

CALCulate<1|2>:LIMit<1 to 8>:ACPower[:STATe] ON | OFF

This command switches on and off the limit check for adjacent channel power measurements in the selected measurement window. The commands `CALCulate:LIMit:ACPower:ACHannel:STATe` or `CALCulate:LIMit:ACPower:ALTernate:STATe` must be used in addition to specify whether the limit check is to be performed for the upper/lower adjacent channel or for the alternate adjacent channels.
The numeric suffixes <1 to 8> are irrelevant for this command.

Example: "`CALC:LIM:ACP ON`" 'Switches on the ACP limit check in screen A.

Characteristics: *RST value: OFF
SCPI: device-specific

CALCulate<1|2>:LIMit<1 to 8>:ACPower:ACHannel[:RELative] 0 to 100dB, 0 to 100dB

This command defines the relative limit of the upper/lower adjacent channel for adjacent channel power measurements in the selected measurement window. The reference value for the relative limit value is the measured channel power.
It should be noted that the relative limit value has no effect on the limit check as soon as it is below the absolute limit value defined with `CALCulate:LIMit: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 suffixes <1 to 8> are irrelevant for this command.

Parameter: The first numeric value is the limit for the upper (lower) adjacent channel. The second value is ignored but must be indicated for reasons of compatibility with the FSE family.

Example: "`CALC:LIM:ACP:ACH 30DB, 30DB`" 'Sets the relative limit value in
'screen A for the power in the lower
'and upper adjacent channel to
'30 dB below the channel power.

Characteristics: *RST value: 0 dB
SCPI: device-specific

CALCulate<1|2>:LIMit<1 to 8>:ACPower:ACHannel[:RELative]:STATe ON | OFF

This command activates the limit check for the relative limit value of the adjacent channel when adjacent channel power measurement is performed. Before the command, the limit check must be activated using `CALCulate:LIMit:ACPower:STATe ON`.
The result can be queried with `CALCulate:LIMit:ACPower:ACHannel:RESult?`. It should be noted that a complete measurement must be performed between switching on the limit check and the result query, since otherwise no valid results are available.
The numeric suffixes <1 to 8> are irrelevant for this command.

Example:

"CALC:LIM:ACP:ACH 30DB, 30DB"	'Sets the relative limit value in screen A for 'the power in the lower and upper adjacent 'channel to 30 dB below the channel 'power.
"CALC:LIM:ACP:ACH:ABS -35DBM, -35DBM"	'Sets the absolute limit value in screen A 'for the power in the lower and upper 'adjacent channel to -35 dBm.
"CALC:LIM:ACP ON"	'Switches on globally the limit check for the 'channel/adjacent channel measurement in 'screen A.
"CALC:LIM:ACP:ACH:REL:STAT ON"	'Switches on the check of the relative limit values for adjacent channels in 'screen A.
"CALC:LIM:ACP:ACH:ABS:STAT ON"	'Switches on the check of absolute 'limit values for the adjacent channels in 'screen A.
"INIT;*WAI"	'Starts a new measurement and waits for 'the sweep end.
"CALC:LIM:ACP:ACH:RES?"	'Queries the limit check result in the 'adjacent channels in screen A.

Characteristics: *RST value: OFF
SCPI: device-specific

CALCulate<1|2>:LIMit<1 to 8>:ACPower:ACHannel:ABSolute -200DBM to 200DBM

This command defines the absolute limit value for the lower/upper adjacent channel during adjacent-channel power measurement (Adjacent Channel Power) in the selected measurement window.
It should be noted that the absolute limit value has no effect on the limit check as soon as it is below the relative limit value defined with `CALCulate:LIMit: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 suffixes <1 to 8> in LIMIt are irrelevant for this command.

Parameter: The first value is the limit for the lower and the upper adjacent channel. The second limit value is ignored but must be indicated for reasons of compatibiltiy with the FSE family.

Example: "CALC:LIM:ACP:ACH:ABS -35DBM, -35DBM"
'Sets the absolute limit value in 'screen A for the power in the lower 'and upper adjacent channel to '-35 dBm.

Characteristics: *RST value: -200DBM
SCPI: device-specific

CALCulate<1|2>:LIMit<1 to 8>:ACPower:ACHannel:ABSolute:STATe ON | OFF

This command activates the limit check for the adjacent channel when adjacent-channel power measurement (Adjacent Channel Power) is performed. Before the command, the limit check for the channel/adjacent-channel measurement must be globally switched on using `CALC:LIM:ACP ON`. The result can be queried with `CALCulate:LIMit:ACPower:ACHannel:RESult?`. It should be noted that a complete measurement must be performed between switching on the limit check and the result query, since otherwise no valid results are available.
The numeric suffixes <1 to 8> in LIMIt are irrelevant for this command.

Example:

Example:	"`CALC:LIM:ACP:ACH 30DB, 30DB`"	'Sets the relative limit value in screen A for 'the power in the lower and upper adjacent 'channel to 30 dB below the channel power.
	"`CALC:LIM:ACP:ACH:ABS -35DBM, -35DBM`"	'Sets the absolute limit value in screen A 'for the power in the lower and upper 'adjacent channel to -35 dBm.
	"`CALC:LIM:ACP ON`"	'Switches on globally the limit check for the 'channel/adjacent channel measurement in 'screen A.
	"`CALC:LIM:ACP:ACH:REL:STAT ON`"	'Switches on the check of the relative limit 'values for adjacent channels in screen A.
	"`CALC:LIM:ACP:ACH:ABS:STAT ON`"	'Switches on the check of absolute limit 'values for the adjacent channels in screen 'A.
	"`INIT;*WAI`"	'Starts a new measurement and waits for 'the sweep end.
	"`CALC:LIM:ACP:ACH:RES?`"	'Queries the limit check result in the 'adjacent channels in screen A.

Characteristics: *RST value: OFF
SCPI: device-specific

CALCulate<1|2>:LIMit<1 to 8>:ACPower:ACHannel:RESult?

This command queries the result of the limit check for the upper/lower adjacent channel in the selected measurement window when adjacent channel power measurement is performed.

If the power measurement of the adjacent channel is switched off, the command produces a query error.
The numeric suffixes <1 to 8> are irrelevant for this command.

Parameter: The result is returned in the form <result>, <result> where <result> = PASSED | FAILED, and where the first returned value denotes the lower, the second denotes the upper adjacent channel.

Example:

"CALC:LIM:ACP:ACH 30DB, 30DB"	'Sets the relative limit value in screen A for the 'power in the lower and upper adjacent 'channel to 30 dB below the channel power.
"CALC:LIM:ACP:ACH:ABS -35DBM, -35DBM"	Sets the absolute limit value in screen A 'for the power in the lower and upper 'adjacent channel to -35 dB.
"CALC:LIM:ACP ON"	'Switches on globally the limit check for the 'channel/adjacent channel measurement in 'screen A.
"CALC:LIM:ACP:ACH:STAT ON"	'Switches on the limit check for the adjacent 'channels in screen A.
"INIT;*WAI"	'Starts a new measurement and waits for the 'sweep end.
"CALC:LIM:ACP:ACH:RES?"	'Queries the limit check result in the adjacent 'channels in screen A.

Characteristics: *RST value: --
SCPI: device-specific

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

CALCulate<1|2>:LIMit<1 to 8>:ACPower:ALTernate<1|2>[:RELative] 0 to 100dB, 0 to 100dB.

This command defines the limit for the first/second alternate adjacent channel in the selected measurement window for adjacent channel power measurements. The reference value for the relative limit value is the measured channel power.

The numeric suffix after `ALTernate<1|2>` denotes the first or the second alternate channel. The numeric suffixes <1 to 8> are irrelevant for this command.

It should be noted that the relative limit value has no effect on the limit check as soon as it is below the absolute limit defined with `CALCulate:LIMit:ACPower:ALTernate<1|2>:ABSolute`. This mechanism allows automatic checking of the absolute basic values of adjacent channel power as defined in mobile radio standards.

Parameter: The first value is the limit for the lower and the upper alternate adjacent channel. The second limit value is ignored but must be indicated for reasons of compatibility with the FSE family.

Example: "`CALC:LIM:ACP:ALT2 30DB, 30DB`" 'Sets the relative limit value in 'screen A for the power in the lower 'and upper alternate adjacent 'channel to 30 dB below the channel 'power.

Characteristics: *RST value: 0DB
SCPI: device-specific

CALCulate<1|2>:LIMit<1 to 8>:ACPower:ALTernate<1|2>[:RELative]:STATe ON | OFF

This command activates the limit check for the first/second alternate adjacent channel in the selected measurement window for adjacent channel power measurements. Before the command, the limit check must be activated using `CALCulate:LIMit:ACPower:STATe ON`.

The numeric suffix after `ALTernate<1|2>` denotes the first or the second alternate channel. The numeric suffixes <1 to 8> are irrelevant for this command.

The result can be queried with `CALCulate:LIMit:ACPower:ALTernate<1|2>:RESult?`. It should be noted that a complete measurement must be performed between switching on the limit check and the result query, since otherwise no valid results are obtained.

Example:

`"CALC:LIM:ACP:ALT2 30DB, 30DB"`	'Sets the relative limit value in screen A for the 'power in the lower and upper second alternate 'adjacent channel to 30 dB below the channel 'power.
`"CALC:LIM:ACP:ALT2:ABS -35DBM, -35DBM"`	'Sets the absolute limit value in screen A for the 'power in the lower and upper second alternate 'adjacent channel to -35 dBm.
`"CALC:LIM:ACP ON"`	'Switches on globally the limit check for the 'channel/adjacent channel measurement in 'screen A.
`"CALC:LIM:ACP:ACH:REL:STAT ON"`	'Switches on the check of the relative limit 'values for the alternate adjacent channels in 'screen A.
`"CALC:LIM:ACP:ACH:ABS:STAT ON"`	'Switches on the check of absolute limit values 'for the alternate adjacent channels in screen A.
`"INIT;*WAI"`	'Starts a new measurement and waits for the 'sweep end.
`"CALC:LIM:ACP:ACH:RES?"`	'Queries the limit check result in the second 'alternate adjacent channels in screen A.

Characteristics: *RST value: OFF
SCPI: device-specific

CALCulate<1|2>:LIMit<1 to 8>:ACPower:ALTernate<1|2>:ABSolute -200DBM to 200DBM, -200DBM to .200DBM

This command defines the absolute limit value for the lower/upper alternate adjacent channel power measurement (Adjacent Channel Power) in the selected measurement window.

The numeric suffix after `ALTernate<1|2>` denotes the first or the second alternate channel. The numeric suffixes <1 to 8> are irrelevant for this command.

It should be noted that the absolute limit value for the limit check has no effect as soon as it is below the relative limit value defined with `CALCulate:LIMit:ACPower:ALTernate<1|2>:RELative`. This mechanism allows automatic checking of the absolute basic values defined in mobile radio standards for the power in adjacent channels.

Parameter: The first value is the limit for the lower and the upper alternate adjacent channel. The second limit value is ignored but must be indicated for reasons of compatibility with the FSE family.

Example: "`CALC:LIM:ACP:ALT2:ABS -35DBM, -35DBM`"
'Sets the absolute limit value in
'screen A for the power in the lower
'and upper second alternate
'adjacent channel to -35 dBm.

Characteristics: *RST value: -200DBM
SCPI: device-specific

CALCulate<1|2>:LIMit<1 to 8>:ACPower:ALTernate<1|2>:ABSolute:STATe ON | OFF

This command activates the limit check for the first/second alternate adjacent channel in the selected measurement window for adjacent channel power measurement (Adjacent Channel Power).

Before the command, the limit check must be globally switched on for the channel/adjacent channel power with the command `CALCulate:LIMit:ACPower:STATe ON`.

The numeric suffix after `ALTernate<1|2>` denotes the first or the second alternate channel. The numeric suffixes <1 to 8> are irrelevant for this command.

The result can be queried with `CALCulate:LIMit:ACPower:ALTernate<1|2>:RESult?`. It should be noted that a complete measurement must be performed between switching on the limit check and the result query, since otherwise no valid results are available.

Example:

`"CALC:LIM:ACP:ALT2 30DB, 30DB"`	'Sets the relative limit value in screen A for the power in the lower and upper second alternate 'adjacent channel to 30 dB below the channel 'power.
`"CALC:LIM:ACP:ALT2:ABS -35DBM, -35DBM"`	'Sets the absolute limit value in screen A for the 'power in the lower and upper second alternate 'adjacent channel to -35 dBm.
`"CALC:LIM:ACP ON"`	'Switches on globally the limit check for the 'channel/adjacent channel measurement in 'screen A.
`"CALC:LIM:ACP:ACH:REL:STAT ON"`	Switches on the check of the relative limit values for the alternative adjacent channels in 'screen A.
`"CALC:LIM:ACP:ACH:ABS:STAT ON"`	'Switches on the check of absolute limit values 'for the alternative adjacent channels in screen 'A.
`"INIT;*WAI"`	'Starts a new measurement and waits for the 'sweep end.
`"CALC:LIM:ACP:ACH:RES?"`	'Queries the limit check result in the second 'alternate adjacent channels in screen A.

Characteristics: *RST value: OFF
SCPI: device-specific

CALCulate<1|2>:LIMit<1 to 8>:ACPower:ALTernate<1|2>:RESult?

This command queries the result of the limit check for the first/second alternate adjacent channel in the selected measurement window for adjacent channel power measurements.

The numeric suffix after `ALTernate<1|2>` denotes the first or the second alternate channel. The numeric suffixes <1 to 8> are irrelevant for this command.

If the power measurement of the adjacent channel is switched off, the command produces a query error.

Parameter: The result is returned in the form <result>, <result> where <result> = PASSED | FAILED and where the first (second) returned value denotes the lower (upper) alternate adjacent channel.

Example:

"CALC:LIM:ACP:ALT2 30DB, 30DB"	'Sets the relative limit value in screen A for the 'power in the lower and upper second alternate 'adjacent channel to 30 dB below the channel 'power.
"CALC:LIM:ACP:ALT2:ABS -35DBM, -35DBM"	'Sets the absolute limit value in screen A for the 'power in the lower and upper second alternate 'adjacent channel to -35 dBm.
"CALC:LIM:ACP ON"	'Switches on globally the limit check for the 'channel/adjacent channel measurement in 'screen A.
"CALC:LIM:ACP:ALT:STAT ON"	'Switches on the limit check for the adjacent 'channels in screen A.
"INIT;*WAI"	'Starts a new measurement and waits for the 'sweep end.
"CALC:LIM:ACP:ALT:RES?"	'Queries the limit check result in the second 'alternate adjacent channels in screen A.

Characteristics: *RST value: --
SCPI: device-specific

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

CALCulate:LIMit:CONTrol Subsystem

The CALCulate:LIMit:CONTrol subsystem defines the x axis (CONTrol-axis).

COMMAND	PARAMETERS	UNIT	COMMENT
CALCulate<1|2>			
:LIMit<1...8>			
:CONTrol			
[:DATA]	<numeric_value>,<numeric_value>..	HZ | S	
:DOMain	FREQuency|TIME		
:OFFSet	<numeric_value>	HZ | S	
:MODE	RELative|ABSolute		
:SHIFt	<numeric_value>	HZ | S	
:SPACing	LINear | LOGarithmic		

CALCulate<1|2>:LIMit<1 to 8>:CONTrol[:DATA] <numeric_value>,<numeric_value>..

This command defines the X axis values (frequencies or times) of the upper or lower limit lines. The values are defined independently of the measurement window.

Example: "`CALC:LIM2:CONT 1MHz,30MHz,100MHz, 300MHz,1GHz`"
'Defines 5 reference values for the X axis of 'limit line 2

"`CALC:LIM2:CONT?`" 'Outputs the reference values for the X axis of 'limit line 2 separated by a comma.

Characteristics: *RST value: - (LIMit:STATe is set to OFF)
SCPI: conforming

CALCulate<1|2>:LIMit<1 to 8>:CONTrol:DOMain FREQuency | TIME

This command defines the frequency or time domain for the x axis values.

Example: "`CALC:LIM2:CONT:DOM TIME`" 'Defines the time domain for the X axis of limit 'line 2.

Characteristics: *RST value: FREQuency
SCPI: device-specific

CALCulate<1|2>:LIMit<1 to 8>:CONTrol:OFFSet <numeric_value>

This command defines an offset for the X axis value of the selected relative limit line in the frequency or time domain.

The unit of values depends on the frequency or time domain of the X axis, i.e. it is `HZ` with `CALC:LIM:CONT:DOM FREQ and S with CALC:LIM:CONT:DOM TIME.`

Example: "`CALC:LIM2:CONT:OFFS 100us`" 'Sets the X offset for limit line 2 (defined in 'the time domain) to 100µs.

Characteristics: *RST value: 0
SCPI: device-specific

CALCulate<1|2>:LIMit<1 to 8>:CONTrol:MODE RELative | ABSolute

This command selects the relative or absolute scaling for the X axis of the selected limit line. The definition is independent of the measurement window.

Example: "`CALC:LIM2:CONT:MODE REL`" 'Defines the X axis of limit line 2 as relatively 'scaled.

Characteristics: *RST value: ABSolute
SCPI: device-specific

CALCulate<1|2>:LIMit<1 to 8>:CONTrol:SHIFt <numeric_value>

This command moves a limit line by the indicated value in x direction. In contrast to `CALC:LIM:CONT:OFFS`, the line is shifted by modifying the individual x values and not by means of an additive offset. The shift is independent of the measurement window.

Example: "`CALC:LIM2:CONT:SHIF 50KHZ`" 'Shifts all reference values of limit line 2 by '50 kHz.

Characteristics: *RST value: --
SCPI: device-specific

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

CALCulate<1|2>:LIMit<1 ... 8>:CONTrol:SPACing LINear | LOGarithmic

This command selects linear or logarithmic interpolation for the calculation of limit lines from frequency points.

Example: "`CALC:LIM:CONT:SPAC LIN`"

Characteristics: *RST value: LIN
SCPI: device-specific

CALCulate:LIMit:LOWer Subsystem

The CALCulate:LIMit:LOWer subsystem defines the lower limit line.

COMMAND	PARAMETERS	UNIT	COMMENT
CALCulate<1|2>			
:LIMit<1 to 8>			
:LOWer			
[:DATA]	<numeric_value>,<numeric_value>..	DBM | DB | DEG | RAD | S | HZ | PCT	
:STATe	<Boolean>	--	
:OFFSet	<numeric_value>	DB| DEG| RAD| S | HZ | PCT	
:MARGin	<numeric_value>	DB| DEG| RAD| S | HZ | PCT	
:MODE	RELative|ABSolute	--	
:SHIFt	<numeric_value>	DB| DEG| RAD| S | HZ | PCT	
:SPACing	LINear | LOGarithmic		
:THReshold	<numeric_value>	DBM | DB | DEG | RAD | S | HZ | PCT	

CALCulate<1|2>:LIMit<1 to 8>:LOWer[:DATA] <numeric_value>,<numeric_value>..

This command defines the values for the selected lower limit line independently of the measurement window.

The unit must be identical with the unit selected by `CALC:LIM:UNIT`. If no unit is indicated, the unit defined with `CALC:LIM:UNIT` is automatically used.

If the measured values are smaller than the LOWer limit line, the limit check signals errors.

The units DEG, RAD, S, HZ, PCT are not available in the *SPECTRUM* mode.

Example: "`CALC:LIM2:LOW -30,-40,-10,-40,-30`"
'Defines 5 lower limit values for limit line 2 in
'the preset unit.

"`CALC:LIM2:LOW?`" 'Outputs the lower limit values of limit line 2
'separated by a comma.

Characteristics: *RST value: - (LIMit:STATe is set to OFF)
SCPI: conforming

CALCulate<1|2>:LIMit<1 to 8>:LOWer:STATe ON | OFF

This command switches on or off the indicated limit line in the selected measurement window. The limit check is activated separately with `CALC:LIM:STAT ON`.

In analyzer mode, the result of the limit check can be queried with `CALCulate:LIMit<1 to 8>:FAIL?`.

Example:	"CALC:LIM4:LOW:STAT ON"	'Switches on limit line 4 (lower limit) in 'screen A.
	"CALC2:LIM4:LOW:STAT ON"	'Switches on limit line 4 (lower limit) also in 'screen B.

Characteristics: *RST value: OFF
SCPI: conforming

CALCulate<1|2>:LIMit<1 to 8>:LOWer:OFFSet <numeric_value>

This command defines an offset for the Y axis of the selected relative lower limit line. In contrast to `CALC:LIM:LOW:SHIFt`, the line is not shifted by modifying the individual Y values but by means of an additive offset. The offset is independent of the measurement window.

Example:	"CALC:LIM2:LOW:OFFS 3dB"	'Shifts limit line 2 in the corresponding 'measurement windows by 3 dB upwards.

Characteristics: *RST value: 0
SCPI: device-specific

CALCulate<1|2>:LIMit<1 to 8>:LOWer:MARGin <numeric_value>

This command defines a margin to a lower limit line, at which out-of-limit values are signalled (if the limit check is active), but not handled as a violation of the limit value. The margin is independent of the measurement window.

Example: "CALC:LIM:LOW:MARG 10dB"

Characteristics: *RST value: 0
SCPI: device-specific

CALCulate<1|2>:LIMit<1 to 8>:LOWer:MODE RELative | ABSolute

This command selects the relative or absolute scaling for the Y axis of the selected lower limit line. The setting is independent of the measurement window.

Selecting RELative causes the unit to be switched to DB.

Example:	"CALC:LIM:LOW:MODE REL"	'Defines the Y axis of limit line 2 as relative 'scaled.

Characteristics: *RST value: ABSolute
SCPI: device-specific

CALCulate<1|2>:LIMit<1 to 8>:LOWer:SHIFt <numeric_value>

This command shifts a limit line by the indicated value in Y direction. In contrast to `CALC:LIM:LOW:OFFS`, the line is shifted by modifying the individual Y values but not by means of an additive offset. The shift is independent of the measurement window.

Example: "`CALC:LIM3:LOW:SHIF 20DB`" 'Shifts all Y values of limit line 3 by 20 dB.

Characteristics: *RST value: --
SCPI: device-specific

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

CALCulate<1|2>:LIMit<1 to 8>:LOWer:SPACing LINear | LOGarithmic

This command selects linear or logarithmic interpolation for the lower limit line.

Example: "`CALC:LIM:LOW:SPAC LIN`"

Characteristics: *RST value: LIN
SCPI: device-specific

CALCulate<1|2>:LIMit<1 to 8>:LOWer:THReshold <numeric_value>

This command defines an absolute threshold value for limit lines with relative Y axis scaling independently of the measurement window. The absolute threshold value is used in the limit check as soon as it exceeds the relative limit value.

The unit must correspond to the unit selected with `CALC:LIM:UNIT` (except dB which is not allowed). If no unit is indicated, the unit defined with `CALC:LIM:UNIT` is automatically used (exception: dBm instead of dB).

The units DEG, RAD, S, HZ, PCT are not available in the *SPECTRUM* mode.

Example: "`CALC:LIM2:LOW:THR -35DBM`" 'Defines an absolute threshold value 'for limit line 2.

Characteristics: *RST value: -200 dBm

SCPI: device-specific

CALCulate:LIMit:UPPer Subsystem

The CALCulate:LIMit:UPPer subsystem defines the upper limit line.

<table>
<tr><th>COMMAND</th><th>PARAMETERS</th><th>UNIT</th><th>COMMENT</th></tr>
<tr><td>CALCulate<1|2>
:LIMit<1 to 8>
:UPPer</td><td></td><td></td><td></td></tr>
<tr><td>[:DATA]</td><td><numeric_value>,<numeric_value>..</td><td>DBM | DB |
DEG | RAD |
S | HZ | PCT</td><td></td></tr>
<tr><td>:STATe</td><td><Boolean></td><td>--</td><td></td></tr>
<tr><td>:OFFSet</td><td><numeric_value></td><td>DB| DEG| RAD|
S | HZ | PCT</td><td></td></tr>
<tr><td>:MARGin</td><td><numeric_value></td><td>DB| DEG| RAD|
S | HZ | PCT</td><td></td></tr>
<tr><td>:MODE</td><td>RELative|ABSolute</td><td>--</td><td></td></tr>
<tr><td>:SHIFt</td><td><numeric_value></td><td>DB |DEG| RAD|
S | HZ | PCT</td><td></td></tr>
<tr><td>:SPACing</td><td>LINear | LOGarithmic</td><td></td><td></td></tr>
<tr><td>:THReshold</td><td><numeric_value></td><td>DBM | DB |
DEG | RAD |
S | HZ | PCT</td><td></td></tr>
</table>

CALCulate<1|2>:LIMit<1 to 8>:UPPer[:DATA] <numeric_value>,<numeric_value>..

This command defines the values for the upper limit lines independently of the measurement window.

The number of values for the CONTrol axis and for the corresponding UPPer and/or LOWer limit line have to be identical. Otherwise default values are entered for missing values or not necessary values are deleted.

The unit must be identical with the unit selected by `CALC:LIM:UNIT`. If no unit is indicated, the unit defined with `CALC:LIM:UNIT` is automatically used.

The units DEG, RAD, S, HZ, PCT are not available in *SPECTRUM* mode.

Example: "`CALC:LIM2:UPP -10,0,0,-10,-5`" 'Defines 5 upper limit values for limit 'line 2 in the preset unit.

"`CALC:LIM2:UPP?`" 'Outputs the upper limit values for limit line 2 'separated by a comma.

Characteristics: *RST value: - (LIMit:STATe is set to OFF)
SCPI: conforming

CALCulate<1|2>:LIMit<1 to 8>:UPPer:STATe ON | OFF

This command switches on or off the indicated limit line in the selected measurement window. The limit check is activated separately with `CALC:LIM:STAT ON`.

Example:	"`CALC1:LIM4:UPP:STAT ON`"	'Switches on limit line 4 (upper limit) in 'screen A.
	"`CALC2:LIM4:UPP:STAT ON`"	'Switches on limit line 4 (upper limit) in 'screen B.

Characteristics: *RST value: OFF
SCPI: conforming

CALCulate<1|2>:LIMit<1 to 8>:UPPer:OFFSet <numeric_value>

This command defines an offset for the Y axis of the selected relative upper limit line. In contrast to `CALC:LIM:UPP:SHIFt`, the line is not shifted by modifying the individual Y values but by means of an additive offset. The offset is independent of the measurement window.

Example: "`CALC:LIM2:UPP:OFFS 3dB`" 'Shifts limit line 2 by 3 dB upwards in the 'corresponding measurement windows.

Characteristics: *RST value: 0
SCPI: device-specific

CALCulate<1|2>:LIMit<1 to 8>:UPPer:MARGin <numeric_value>

This command defines a margin to an upper limit line, at which out-of-limit values are signalled (if the limit check is active), but not handled as a violation of the limit value. The margin is independent of the measurement window.

Example: "`CALC:LIM2:UPP:MARG 10dB`" 'Defines the margin of limit line 2 to 10 dB 'below the limit value.

Characteristics: *RST value: 0
SCPI: device-specific

CALCulate<1|2>:LIMit<1 to 8>:UPPer:MODE RELative | ABSolute

This command selects the relative or absolute scaling for the Y axis of the selected upper limit line. The setting is independent of the measurement window.

Selecting RELative causes the unit to be switched to DB.

Example:	"`CALC:LIM2:UPP:MODE REL`"	'Defines the Y axis of limit line 2 as relative 'scaled.

Characteristics:	*RST value:	ABSolute
	SCPI:	device-specific

CALCulate<1|2>:LIMit<1 to 8>:UPPer:SHIFt <numeric_value>

This command moves a limit line by the indicated value in Y direction. In contrast to `CALC:LIM:UPP:OFFS`, the line is shifted by modifying the individual Y values and not by means of an additive offset. The shift is independent of the measurement window.

Example:	"`CALC:LIM3:UPP:SHIF 20DB`"	'Shifts all Y values of limit line 3 by 20 dB.

Characteristics:	*RST value:	--
	SCPI:	device-specific

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

CALCulate<1|2>:LIMit<1 to 8>:UPPer:SPACing LINear | LOGarithmic

This command selects linear or logarithmic interpolation for the upper limit line.

Example: "`CALC:LIM:UPP:SPAC LIN`"

Characteristics:	*RST value:	LIN
	SCPI:	device-specific

CALCulate<1|2>:LIMit<1 to 8>:UPPer:THReshold <numeric_value>

This command defines an absolute threshold value for limit lines with relative Y axis scaling independently of the measurement window. The absolute threshold value is used in the limit check as soon as it exceeds the relative limit value.

The unit must correspond to the unit selected with `CALC:LIM:UNIT` (except dB which is not possible). If no unit is indicated, the unit defined with `CALC:LIM:UNIT` is automatically used (exception: dBm instead of dB).

The units DEG, RAD, S, HZ, PCT are not available in the *SPECTRUM* mode.

Example:	"`CALC:LIM2:UPP:THR -35DBM`"	'Defines an absolute threshold value 'for limit line 2.

Characteristics:	*RST value:	-200 dBm
	SCPI:	device-specific

CALCulate:MARKer Subsystem

The CALCulate:MARKer subsystem checks the marker functions in the instrument. The measurement windows are assigned to CALCulate 1 (screen A) or 2 (screen B).

COMMAND	PARAMETERS	UNIT	COMMENT
CALCulate<1|2>			
:MARKer<1 to 4>			
[:STATe]	<Boolean>	--	
:AOFF			no query
:TRACe	<numeric_value>	--	
:X	<numeric_value>	HZ | S | DBM | DB	
:SLIMits			
[:STATe]	<Boolean>		
:LEFT	<numeric_value>	HZ | S	
:RIGHt	<numeric_value>	HZ | S	
:COUNt	<Boolean>	--	
:RESolution	<numeric_value>	HZ	
:FREQuency?	--	--	query only
:LOEXclude	<Boolean>		
:Y?	--	--	query only
:PERCent	<numeric_value>	PCT	
:MAXimum		--	
[:PEAK]	--	--	no query
:NEXT	--	--	no query
:RIGHt	--	--	no query
:LEFT	--	--	no query
:MINimum			
[:PEAK]	--	--	no query
:NEXT	--	--	no query
:RIGHt	--	--	no query
:LEFT	--	--	no query
:PEXCursion	<numeric_value>	DB | DEG | RAD | HZ | PCT	

CALCulate<1|2>:MARKer<1 to 4>[:STATe] ON | OFF

This command switches on or off the currently selected marker in the selected measurement window. If no indication is made, marker 1 is selected automatically. If marker 2, 3 or 4 is selected and used as a delta marker, it is switched to marker mode.

Example: "`CALC:MARK3 ON`" 'Switches marker 3 in screen A on or to marker mode.

Characteristics: *RST value: OFF
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:AOFF

This command switches off all active markers in the selected measurement window. All delta markers and active marker/delta marker measurement functions are switched off.

Example: "`CALC:MARK:AOFF`" 'Switches off all markers in screen A.

Characteristics: *RST value: -
SCPI: device-specific

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

CALCulate<1|2>:MARKer<1 to 4>:TRACe 1 to 3

This command assigns the selected marker (1 to 4) to the indicated measurement curve in the selected measurement window. The corresponding trace must be active, i.e. its status must be different from "BLANK".

If necessary the corresponding marker is switched on prior to the assignment.

Example: "`CALC:MARK3:TRAC 2`" 'Assigns marker 3 in screen A to trace 2.
"`CALC2:MARK:TRAC 3`" 'Assigns marker 1 in screen B to trace 3.

Characteristics: *RST value -
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:X 0 to MAX (frequency | sweep time)

This command positions the selected marker to the indicated frequency (span > 0), time (span = 0) or level (APD measurement or CCDF measurement ON) in the selected measurement window. If marker 2, 3 or 4 is selected and used as delta marker, it is switched to marker mode.

Example: "`CALC1:MARK2:X 10.7MHz`" 'Positions marker 2 in screen A to frequency
'10.7 MHz.

Characteristics: *RST value: -
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:X:SLIMits[:STATe] ON | OFF

This command switches between a limited (ON) and unlimited (OFF) search range in the selected measurement window. The function is independent of the selection of a marker, i.e. the numeric suffix MARKer<1 to 4> is irrelevant.

If the time domain power measurement is active, this command limits the evaluation range on the trace.

Example: "`CALC:MARK:X:SLIM ON`" 'Switches on search limitation in screen A.

Characteristics: *RST value: OFF
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:X:SLIMits:LEFT 0 to MAX (frequency | sweep time)

This command sets the left limit of the search range for markers and delta markers in the selected measurement window. Depending on the x axis domain the indicated value defines a frequency (span > 0) or time (span = 0). The function is independent of the selection of a marker, i.e. the numeric suffix in MARKer<1 to 4> is irrelevant.

If the time domain power measurement is active, this command limits the evaluation range to the trace.

Note: *The function is only available if the search limit for marker and delta marker is switched on* *(`CALC:MARK:X:SLIM ON`).*

Example:	"`CALC:MARK:X:SLIM ON`"	'Switches the search limit function on for screen A.
	"`CALC:MARK:X:SLIM:LEFT 10MHz`"	'Sets the left limit of the search range in screen A to 10 MHz.

Characteristics:	*RST value:	- (is set to the left diagram border on switching on search limits)
	SCPI:	device-specific

CALCulate<1|2>:MARKer<1 to 4>:X:SLIMits:RIGHT 0 to MAX (frequency | sweep time)

This command sets the right limit of the search range for markers and delta markers in the selected measurement window. Depending on the x axis domain the indicated value defines a frequency (span > 0) or time (span = 0). The function is independent of the selection of a marker, i.e. the numeric suffix in MARKer<1 to 4> is irrelevant.

If the time domain power measurement is active, this command limits the evaluation range to the trace.

Note:
The function is only available if the search limit for marker and delta marker is switched on *(`CALC:MARK:X:SLIM ON`).*

Example:	"`CALC:MARK:X:SLIM ON`"	'Switches the search limit function on 'for screen A.
	"`CALC:MARK:X:SLIM:RIGH 20MHz`"	'Sets the right limit of the search range 'in screen A to 20 MHz.

Characteristics:	*RST value:	- is set to the right diagram border on switching on search limits)
	SCPI:	device-specific

CALCulate<1|2>:MARKer<1 to 4>:COUNt ON | OFF

This command switches on or off the frequency counter at the marker position in the selected measurement window. The count result is queried with `CALCulate:MARKer:COUNt:FREQuency?`.

Frequency counting is possible only for one marker at a time for each measurement window. If it is activated for another marker, it is automatically de-activated 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 possible only in single-sweep mode.

Example:	`"INIT:CONT OFF"`	'Switches to single-sweep mode.
	`"CALC:MARK ON"`	'Switches on marker 1 in screen A.
	`"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 in screen A.

Characteristics:	*RST value:	OFF
	SCPI:	device-specific

CALCulate<1|2>:MARKer<1 to 4>:COUNt:RESolution 0.1 | 1 | 10 | 100 | 1000 | 10000 Hz

This command specifies the resolution of the frequency counter in the selected measurement window. The setting is independent of the selected marker, i.e. the numeric suffix in MARKer<1 to 4> is irrelevant.

Example:	`"CALC:MARK:COUN:RES 1kHz"`	'Sets the resolution of the frequency counter 'to 1 kHz.

Characteristics:	*RST value:	1kHz
	SCPI:	device-specific

CALCulate<1|2>:MARKer<1 to 4>:COUNt:FREQuency?

This command queries the result of the frequency counter for the indicated marker in the selected measurement window. Before the command, the frequency counter should be switched on and a complete measurement performed to obtain a valid count result. Therefore, a single sweep with synchronization must be performed between switching on the frequency counter and querying the count result.

Example:	`"INIT:CONT OFF"`	'Switches to single-sweep mode.
	`"CALC:MARK2 ON"`	'Switches marker 2 in screen A.
	`"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 in 'screen A.

Characteristics:	*RST value:	-
	SCPI:	device-specific

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

CALCulate<1|2>:MARKer<1 to 4>:LOEXclude ON | OFF

This command switches the local oscillator suppression for peak search on or off. This setting is valid for all markers and delta markers in all measurement windows.

Example: "`CALC:MARK:LOEX ON`"

Characteristics: *RST value: ON
SCPI: device-specific

The numeric suffixes 1|2 and 1 to 4 are irrelevant.

CALCulate<1|2>:MARKer<1 to 4>:Y?

This command queries the measured value of the selected marker in the selected measurement window. The corresponding marker is activated before or switched to marker mode, if necessary.

To obtain a valid 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.

The query result is output in the unit determined with `CALCulate:UNIT`.

In the default setting, the output is made depending on the unit determined with `CALC:UNIT`; only with linear level scaling is the output in %.

If the FM Demodulator (FS-K7) is activated, the query result is output in the following units:

- Result display FM: Hz
- Result display RF POWER LOG: dBm
- Result display RF POWER LIN: %
- Result display SPECTRUM LOG: dBm
- Result display SPECTRUM LIN: %

Example:	"`INIT:CONT OFF`"	'Switches to single-sweep mode.
	"`CALC:MARK2 ON`"	'Switches marker 2 in screen A.
	"`INIT;*WAI`"	'Starts a sweep and waits for the end.
	"`CALC:MARK2:Y?`"	'Outputs the measured value of marker 2 in screen A.

Characteristics: *RST value: -
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:Y:PERCent 0 to100%

This command positions the selected marker in the selected window to the given probability. If marker 2, 3 or 4 is selected and used as a delta marker, it is switched to marker mode.

Note: *The command is only available with the CCDF measurement switched on.*
The associated level value can be determined with the CALC:MARK:X? command.

Example: "`CALC1:MARK:Y:PERC 95PCT`" 'Positions marker 1 in screen A to a
'probability of 95%.

Characteristics: *RST value: -
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:MAXimum[:PEAK]

This command positions the marker to the current maximum value of the corresponding trace in the selected measurement window. The corresponding marker is activated first or switched to the marker mode.

Note: *If no maximum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error eode: -200) is produced.*

Example: "`CALC:MARK2:MAX`" 'Positions marker 2 in screen A to the maximum value of 'the trace.

Characteristics: *RST value: -
SCPI: device-specific

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

CALCulate<1|2>:MARKer<1 to 4>:MAXimum:NEXT

This command positions the marker to the next smaller maximum value of the corresponding trace in the selected measurement window.

Note: *If no next smaller maximum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.*

Example: "`CALC:MARK2:MAX:NEXT`" 'Positions marker 2 in screen A to the next 'lower maximum value.

Characteristics: *RST value: -
SCPI: device-specific

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

CALCulate<1|2>:MARKer<1 to 4>:MAXimum:RIGHt

This command positions the marker to the next smaller maximum value to the right of the current value (i.e. in ascending X values) on the corresponding trace in the selected measurement window.

Note: *If no next smaller maximum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.*

Example: "`CALC:MARK2:MAX:RIGH`" 'Positions marker 2 in screen A to the next 'lower maximum value to the right of the 'current value.

Characteristics: *RST value: -
SCPI: device-specific

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

CALCulate<1|2>:MARKer<1 to 4>:MAXimum:LEFT

This command positions the marker to the next smaller maximum value to the left of the current value (i.e. in descending X values) on the trace in the selected measurement window.

Note: *If no next smaller maximum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.*

Example: "`CALC:MARK2:MAX:LEFT`" 'Positions marker 2 in screen A to the next 'lower maximum value to the left of the current 'value.

Characteristics: *RST value: -
SCPI: device-specific

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

CALCulate<1|2>:MARKer<1 to 4>:MINimum[:PEAK]

This command positions the marker to the current minimum value of the corresponding trace in the selected measurement window. The corresponding marker is activated first or switched to marker mode, if necessary.

Note: *If no minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.*

Example: "`CALC:MARK2:MIN`" 'Positions marker 2 in screen A to the minimum value of 'the trace.

Characteristics: *RST value: -
SCPI: device-specific

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

CALCulate<1|2>:MARKer<1 to 4>:MINimum:NEXT

This command positions the marker to the next higher minimum value of the corresponding trace in the selected measurement window.

Note: *If no next higher minimum value is found on the trace (level spacing to adjacent values < peak excursion), an execution error (error code: -200) is produced.*

Example: "`CALC:MARK2:MIN:NEXT`" 'Positions marker 2 in screen A to the next 'higher maximum value.

Characteristics: *RST value: -
SCPI: device-specific

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

CALCulate<1|2>:MARKer<1 to 4>:MINimum:RIGHt

This command positions the marker to the next higher minimum value to the right of the current value (i.e. in ascending X direction) on the corresponding trace in the selected measurement window.

Note: *If no next higher minimum value is found on the trace (level spacing to* adjacent values < *peak excursion), an execution error (error code: -200) is produced.*

Example:	"`CALC:MARK2:MIN:RIGH`"	'Positions marker 2 in screen A to the next 'higher minimum value to the right of the 'current value.

Characteristics: *RST value: -
SCPI: device-specific

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

CALCulate<1|2>:MARKer<1 to 4>:MINimum:LEFT

This command positions the marker to the next higher minimum value to the left of the current value (i.e. in descending X direction) on the corresponding trace in the selected measurement window.

Note: *If no next higher minimum value is found on the trace (level spacing to* adjacent values < *peak excursion), an execution error (error code: -200) is produced.*

Example:	"`CALC:MARK2:MIN:LEFT`"	'Positions marker 2 in screen A to the next 'higher minimum value to the left of the 'current value.

Characteristics: *RST value: -
SCPI: device-specific

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

CALCulate<1|2>:MARKer<1 to 4>:PEXCursion <numeric_value>

This command defines the peak excursion. , i.e. the spacing below a trace maximum which must be attained before a new maximum is recognized, or the spacing above a trace minimum which must be attained before a new minimum is recognized. The set value is valid for all markers and delta markers. The unit depends on the selected operating mode.

Example:	"`CALC:MARK:PEXC 10dB`"	'Defines peak excursion 10 dB in 'SPECTRUM mode
	"`CALC:MARK:PEXC 100 HZ`"	Defines peak excursion 100 Hz in 'FM DEMOD mode

Characteristics: *RST value: 6dB
SCPI: device-specific

CALCulate:MARKer:FUNCtion Subsystem

The measurement window is selected by CALCulate 1 (screen A) or 2 (screen B).

COMMAND	PARAMETERS	UNIT	COMMENT
CALCulate<1|2>			
:MARKer<1 to 4>			
:FUNCtion			
:FPEaks			
[:IMMediate]	<numeric_value>	--	
:COUNt?	--	--	query only
:X?	--	--	
:Y?	--	--	
:SORT	X | Y	--	
:NDBDown			
:STATe	<numeric_value>	DB	
:RESult?	<Boolean>		query only
:FREQuency?	--	--	query only
:ZOOM	--	--	no query
:NOISe	<numeric_value>	HZ	
[:STATe]			
:RESult?	<Boolean>		query only
:DEModulation	--	--	option audio demodulator
:SELect			
[:STATe]	AM|FM		
:HOLDoff	<Boolean>		
:CONTinuous	<numeric_value>	S	
:MDEPth	<Boolean>		
[:STATe]			
:RESult?	<Boolean>	--	query only
:TOI	--		
[:STATe]			
:RESult?	<Boolean>	--	query only
:CENTer	--		no query
:CSTep			no query
:REFerence			no query

CALCulate:MARKer:FUNCtion:VOLTage[:WRITe][:RESult]? PPEak | RMS | THD | SINad

This command queries the results of the audio measurement.

PPEak	Result of measurement with +PK detector
RMS	Result of measurement with RMS detector
THD	Total harmonic distortion
SINad	Signal, noise and distortion

Example: "`INP:SEL AUD`" 'Switches on the audio measurement.
"`CALC:MARK:FUNC:VOLT? PPE`" 'Queries the peak value.

Characteristics: *RST value: -
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:FPEaks[:IMMediate] <numeric_value>

This command searches the selected trace for the indicated number of maxima. The results are entered in a list and can be queried with commands `CALC:MARK:FUNC:FPEaks:X?` and `CALC:MARK:FUNC:FPEaks:Y?`. The number of maxima found can be queried with `CALC:MARK:FUNC:FPEaks:COUNt?`. The trace to be examined is selected with

`CALC:MARK:TRACe`. The order of the results in the list can be defined with `CALC:MARK:FUNC:FPEaks:SORT`.

Note:
The number of maxima found depends on the waveform and value set for the Peak Excursion parameter (CALC:MARK:PEXC), however, a maximum number of 50 maxima are determined. Only the signals which exceed their surrounding values at least by the value indicated by the peak excursion parameter will be recognized as maxima. Therefore, the number of maxima found is not automatically the same as the number of maxima desired.

Example:

"INIT:CONT OFF"	'switches to single-sweep mode
"INIT;*WAI"	'starts measurement and synchronizes to end
"CALC:MARK:TRAC 1"	'sets marker 1 in screen A to trace 1
"CALC:MARK:FUNC:FPE:SORT X"	'sets the sort mode to increasing 'X values
"CALC:MARK:FUNC:FPE 3"	'searches the 3 highest maxima for trace 1
"CALC:MARK:FUNC:COUN?"	'queries the number of maxima found
"CALC:MARK:FUNC:Y?"	'queries the level of maxima found
"CALC:MARK:FUNC:X?"	'queries the frequencies (span <> 0) or 'time (span = 0) of maxima found.

Characteristics: *RST value: --
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:FPEaks:COUNt?

This query reads out the number of maxima found during the search. If no search for maxima has been performed, 0 is returned.

Example:

"CALC:MARK:FUNC:FPE 3"	'searches the 3 highest maxima for trace 1
"CALC:MARK:FUNC:FPE:COUN?"	'queries the number of maxima found

Characteristics: *RST value: --
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:FPEaks:X?

This query reads out the list of X values of the maxima found. The number of available values can be queried with `CALC:MARK:FUNC:FPEaks:COUNt?`.

With sort mode X, the X values are in increasing order; with sort mode Y the order corresponds to the decreasing order of the Y values.

Example:

"CALC:MARK:FUNC:FPE:SORT Y"	'sets the sort mode to decreasing y values
"CALC:MARK:FUNC:FPE 3"	searches the 3 highest maxima for trace 1
"CALC:MARK:FUNC:FPE:COUN?"	'queries the number of maxima found
"CALC:MARK:FPE:FUNC:X?"	'queries the frequencies (span <> 0) or. 'time (span = 0) of the maxima found.

Returned values:

"107.5E6,153.8E6,187.9E6"	'frequencies in increasing order
"2.05E-3,2.37E-3, 3.71e-3"	'times in increasing order

Characteristics: *RST value: --
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:FPEaks:Y?

This query reads out the list of X values of the maxima found. The number of available values can be queried with `CALC:MARK:FUNC:FPEaks:COUNt?`.

With sort mode X, the X values are in increasing order; with sort mode Y the order corresponds to the decreasing order of the Y values.

Example: "`CALC:MARK:FUNC:FPE:SORT Y`"'sets the sort mode to decreasing y values

"`CALC:MARK:FUNC:FPE 3`"'searches the 3 highest maxima for trace 1

"`CALC:MARK:FUNC:FPE:COUN?`"'queries the number of maxima found

"`CALC:MARK:FUNC:FPE:Y?`"'queries the levels of the maxima found.

Return value:

"`-37.5,-58.3,-59.6`"'level in decreasing order

Characteristics: *RST value: --
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:FPEaks:SORT X | Y

This command sets the sort mode for the search for maxima:

X the maxima are sorted in the list of responses according to increasing X values

Y the maxima are sorted in the list of responses according to decreasing Y values

Example: "`CALC:MARK:FUNC:FPE:SORT Y`"'sets the sort mode to decreasing y values

Characteristics: *RST value: --
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:NDBDown <numeric_value>

This command defines the level spacing of the two delta markers to the right and left of marker 1 in the selected measurement window. Marker 1 is always used as the reference marker. The numeric suffix <1 to 4> is irrelevant for this command.

The temporary markers T1 and T2 are positioned by n dB below the active reference marker. The frequency spacing of these markers can be queried with `CALCulate:MARKer:FUNCtion:NDBDown:RESult?`.

Example: "`CALC:MARK:FUNC:NDBD 3dB`" 'Sets the level spacing in screen A to 3 dB.

Characteristics: *RST value: 6dB
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:NDBDown:STATe ON | OFF

This command switches the "N dB Down" function on or off in the selected measurement window. Marker 1 is activated first, if necessary. The numeric suffix <1 to 4> is irrelevant for this command.

Example:	"`CALC:MARK:FUNC:NDBD:STAT ON`"	'Switches on the N-dB-down function in 'screen A.

Characteristics:	*RST value:	OFF
	SCPI:	device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:NDBDown:RESult?

This command queries the frequency spacing (bandwidth) of the N-dB-down markers in the selected measurement window. The numeric suffix <1 to 4> is irrelevant for this command.

A complete sweep with synchronization to sweep end must be performed between switching on the function and querying the measured value in order to obtain a valid query result. This is only possible in single sweep mode.

Example:	"`INIT:CONT OFF`"	'Switches to single-sweep mode.
	"`CALC:MARK:FUNC:NDBD ON`"	'Switches on the n-dB-down function in 'screen A.
	"`INIT;*WAI`"	'Starts a sweep and waits for the end.
	"`CALC:MARK:FUNC:NDBD:RES?`"	'Outputs the measured value of screen A.

Characteristics:	*RST value:	-
	SCPI:	device-specific

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

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:NDBDown:FREQuency?

This command queries the two frequencies of the N-dB-down marker in the selected measurement window. The numeric suffix <1 to 4> is irrelevant for this command. The two frequency values are separated by comma and output in ascending order.

A complete sweep with synchronization to sweep end must be performed between switching on the function and querying the measured value to obtain a valid query result. This is only possible in single sweep mode.

Example:	`"INIT:CONT OFF"`	'Switches to single-sweep mode.
	`"CALC:MARK:FUNC:NDBD ON"`	'Switches on the n-dB-down function in 'screen A.
	`"INIT;*WAI"`	'Starts a sweep and waits for the end.
	`"CALC:MARK:FUNC:NDBD:FREQ?"`	'Outputs the frequencies of the temporary 'markers in screen A.

Characteristics: *RST value: -
SCPI: device-specific

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

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:ZOOM <numeric_value>

This command defines the range to be zoomed around marker 1 in the selected measurement window. Marker 1 is activated first, if necessary.

The subsequent frequency sweep is stopped at the marker position and the frequency of the signal is counted. This frequency becomes the new center frequency, and the zoomed span is set. In order to recognize the end of the operation the synchronization to the sweep end should be activated. This is only possible in single sweep mode.

Example:	`"INIT:CONT OFF"`	'Switches to single-sweep mode
	`"CALC:MARK:FUNC:ZOOM 1kHz;*WAI"`	'Activates zooming in screen A and 'waits for its end.

Characteristics: *RST value: -
SCPI: device-specific

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

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:NOISe[:STATe] ON | OFF

This command switches the noise measurement on or off for all markers of the indicated measurement window. The noise power density is measured at the position of the markers. The result can be queried with `CALCulate:MARKer:FUNCtion:NOISe:RESult?`.

Example:	"CALC2:MARK:FUNC:NOIS ON"	'Switches on the noise measurement for 'screen B.

Characteristics: *RST value: OFF
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>: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 valid query result. This is only possible in single sweep mode.

Example:	"INIT:CONT OFF"	'Switches to single-sweep mode.
	"CALC:MARK2 ON"	'Switches on marker 2 in screen A.
	"CALC:MARK:FUNC:NOIS ON"	'Switches on noise measurement in screen A.
	"INIT;*WAI"	'Starts a sweep and waits for the end.
	"CALC:MARK2:NOIS:RES?"	'Outputs the noise result of marker 2 in 'screen A.

Characteristics: *RST value: -
SCPI: device-specific

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

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:DEModulation:SELect AM | FM

This command selects the demodulation type for the audio demodulator. The command is independent of the measurement window and of the selected marker, i.e. suffixes 1|2 and 1 to 4 are irrelevant.

Example: "CALC:MARK:FUNC:DEM:SEL FM"

Characteristics: *RST value: AM
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:DEModulation[:STATe] ON | OFF

This command switches on or off the audio demodulator when the indicated marker is reached in the selected measurement window. In the frequency domain (span > 0) the hold time can be defined at the corresponding marker position with `CALCulate:MARKer:FUNCtion: DEModulation:HOLD`. In the time domain (span = 0) the demodulation is permanently active.

Example: "`CALC2:MARK3:FUNC:DEM ON`" 'Switches on the demodulation for marker 3 in 'screen B.

Characteristics: *RST value: OFF
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:DEModulation:HOLDoff 10ms to 1000s

This command defines the hold time at the marker position for the demodulation in the frequency domain (span > 0). The setting is independent of the measurement window and the selected marker, i.e. the suffixes <1|2> and <1 to 4> are irrelevant

Example: "`CALC:MARK:FUNC:DEM:HOLD 3s`"

Characteristics: *RST value: - (DEModulation is set to OFF)
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:DEModulation:CONTinuous ON | OFF

This command switches on or off the continuous demodulation in the frequency domain (span >0) in the selected measurement window. Thus acoustic monitoring of the signals can be performed in the frequency domain. The function does not depend on the selected marker, i.e. the numeric suffix <1 to 4> is irrelevant.

Example: "`CALC2:MARK3:FUNC:DEM:CONT ON`" 'Switches on the continuous 'demodulation in screen B.

Characteristics: *RST value: OFF
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:MDEPth:[:STATe]

This command switches on the measurement of the AM modulation depth. An AM-modulated carrier is required on the screen for correct operation. If necessary, marker 1 is previously activated and set to the largest signal available.

The level value of marker 1 is regarded as the carrier level. On activating the function, marker 2 and marker 3 are automatically set as delta markers symetrically to the carrier to the adjacent maxima of the trace.

If the position of delta marker 2 is changed, delta marker 3 is moved symetrically with respect to the reference marker (marker 1). If the position of delta marker 3 is changed, fine adjustment can be performed independently of delta marker 2.

The R&S FSMR calculates the power at the marker positions from the measured levels.

The AM modulation depth is calculated from the ratio of power values at the reference marker and the delta markers. If the two AM sidebands differ in power, the average value of the two power values is used for calculating the AM modulation depth.

The numeric suffix <1 to 4> of :MARKer is irrelevant with this command.

Example:	`"CALC:MARK:X 10MHZ"`	'Sets the reference marker (marker 1) to 'the carrier signal at 10 MHz
	`"CALC:MARK:FUNC:MDEP ON"`	'Switches on the modulation depth 'measurement in screen A.
	`"CALC:DELT2:X 10KHZ"`	'Sets delta markers 2 and 3 to the signals 'at 10 kHz from the carrier signal
	`"CALC:DELT3:X 9.999KHZ"`	'Corrects the position of delta marker 3 'relative to delta marker 2.

Characteristics:	*RST value:	OFF
	SCPI:	device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:MDEPth:RESult?

This command queries the AM modulation depth in the indicated measurement window.

A complete sweep with synchronization to sweep end must be performed between switching on the function and querying the measured value to obtain a valid query result. This is only possible in single sweep mode.

The numeric suffix <1 to 4> of :MARKer is irrelevant for this command.

Example:	`"INIT:CONT OFF"`	'Switches to single-sweep mode.
	`"CALC:MARK:X 10MHZ"`	'Sets the reference marker (marker 1) to 'the carrier signal at 10 MHz.
	`"CALC:MARK:FUNC:MDEP ON"`	'Switches on the modulation depth 'measurement in screen A.
	`"INIT;*WAI"`	'Starts a sweep and waits for the end.
	`"CALC:MARK:FUNC:MDEP:RES?"`	'Outputs the measured value of screen A.

Characteristics:	*RST value:	-
	SCPI:	device-specific

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

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:TOI[:STATe] ON | OFF

This command initiates the measurement of the third-order intercept point.

A two-tone signal with equal carrier levels is expected at the RF input of the instrument. Marker 1 and marker 2 (both normal markers) are set to the maximum of the two signals. Delta marker 3 and delta marker 4 are positioned to the intermodulation products. The delta markers can be modified sperately afterwards with the commands `CALCulate:DELTamarker3:X` and `CALCulate:DELTamarker4:X`.

The third-order intercept is calculated from the level spacing between the normal markers and the delta markers.

The numeric suffix <1 to 4> of :MARKer is irrelevant for this command.

Example:	"CALC:MARK:FUNC:TOI ON"	'Switches on the measurement of the third-order intercept in screen A.

Characteristics: *RST value: OFF
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:TOI:RESult?

This command queries the third-order intercept point measurement in the indicated measurement window.

A complete sweep with synchronization to sweep end must be performed between switching on the function and querying the measured value to obtain a valid query result. This is only possible in single sweep mode.

The numeric suffix <1 to 4> of :MARKer is irrelevant of this command.

Example:	"INIT:CONT OFF"	'Switches to single-sweep mode.
	"CALC:MARK:FUNC:TOI ON"	'Switches the intercept measurement in 'screen A.
	"INIT;*WAI"	'Starts a sweep and waits for the end.
	"CALC:MARK:FUNC:TOI:RES?"	'Outputs the measured value of screen A.

Characteristics: *RST value: -
SCPI: device-specific

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

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:CENTer

This command sets the center frequency of the selected measurement window equal to the frequency of the indicated marker.

If marker 2, 3 or 4 is selected and used as delta marker, it is switched to the marker mode.

Example: "CALC:MARK2:FUNC:CENT" 'Sets the center frequency of screen A to the frequency of marker 2.

Characteristics: *RST value: -
SCPI: device-specific

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

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:CSTep

This command sets the step width of the center frequency in the selected measurement window to the X value of the current marker. If marker 2, 3 or 4 is selected and used as delta marker, it is switched to the marker mode.

Example: "CALC2:MARK3:FUNC:CST" 'Sets the center frequency of screen B to the 'same value as the frequency of marker 3.

Characteristics: *RST value: -
SCPI: device-specific

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

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:REFerence

This command sets the reference level in the selected measurement window to the power measured by the indicated marker. If marker 2, 3 or 4 is selected and used as delta marker, it is switched to marker mode.

Example: "CALC:MARK2:FUNC:REF" 'Sets the reference level of screen A to the 'level of marker 2.

Characteristics: *RST value: -
SCPI: device-specific

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

CALCulate:MARKer:FUNCtion:ADEMod Subsystem

The CALCulate:MARKer:FUNCtion:ADEMod subsystem contains the marker functions.

COMMAND	PARAMETERS	UNIT	COMMENT
CALCulate<1|2>			
:MARKer			
:FUNCtion			
:ADEMod			
:AFRequency			
[:RESult?]			
:AM			
[:WRITe]			
[:RESult?]	PPEak | MPEak | PAVerage | RMS | AVERage | SRMS		query only
:AVERage			
[:RESult?]	PPEak | MPEak | PAVerage | RMS | AVERage | SRMS		query only
:PHOLd			
[:RESult?]	PPEak | MPEak | PAVerage | RMS | AVERage | SRMS		query only
:FM			
[:WRITe]			
[:RESult?]	PPEak | MPEak | PAVerage | RMS | AVERage | SRMS		query only
:AVERage			
[:RESult?]	PPEak | MPEak | PAVerage | RMS | AVERage | SRMS		query only
:PHOLd			
[:RESult?]	PPEak | MPEak | PAVerage | RMS | AVERage | SRMS		query only
:PM			
[:WRITe]			
[:RESult?]	PPEak | MPEak | PAVerage | RMS | AVERage | SRMS		query only
:AVERage			
[:RESult?]	PPEak | MPEak | PAVerage | RMS | AVERage | SRMS		query only
:PHOLd			
[:RESult?]	PPEak | MPEak | PAVerage | RMS | AVERage | SRMS		
:FERRor			
[:RESult?]			query only
:SINad			
[:WRITe]			
:RESult?			query only
:AVERage			
:RESult?			query only
:PHOLd			
:RESult?			query only

COMMAND	PARAMETERS	UNIT	COMMENT
:THD			
[:WRITe]			
:RESult?			query only
:AVERage			
:RESult?			query only
:PHOLd			
:RESult?			query only
:CARRier			
[:RESult?]			query only

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:ADEMod:AFRequency[:RESult]?

This command queries the audio frequency with analog demodulation.

Example: "`ADEM ON`" ''Switches on the demodulator.
"`CALC:FEED 'XTIM:FM:TDOM`" 'Switches on the FM result display.
"`CALC:MARK:FUNC:ADEM:AFR?` "'Queries the audio frequency.

Characteristics: *RST value: -
SCPI: device-specific

CALCulate:MARKer:FUNCtion:ADEMod:AM[:WRITe][:RESult]? PPEak| MPEak| PAVerage| AVERage | RMS | SRMS

This command queries the current results of the AM modulation measurement.
For this, a suitable result display mode must have been selected before with CALC:FEED.

PPEak Result of measurement with +PK detector
MPEak Result of measurement with -PK detector
PAVerage Result of averaging ±PK/2, i.e. (plus peak + minus peak)/2
AVERage Result of measurement with average detector
(this is *not* an average over several measured values)
RMS Result of measurement with RMS detector
SRMS Result of measurement with √2 RMS detector

Example: "`ADEM ON`" 'Switches on the modulation measurement.
"`CALC2:FEED 'XTIM:AM:REL:TDOM`" 'Switches on the AM result display.
"`CALC:MARK:FUNC:ADEM:AM? PPE`" 'Queries the current peak value.

Characteristics: *RST value: -
SCPI: device-specific

CALCulate:MARKer:FUNCtion:ADEMod:AM:AVERage[:RESult]? PPEak| MPEak| PAVerage| AVERage | RMS | SRMS

This command queries the averaged results of the AM modulation measurement.
For this, a suitable result display mode must have been selected before with CALC:FEED.

PPEak	Result of measurement with +PK detector
MPEak	Result of measurement with -PK detector
PAVerage	Result of averaging ±PK/2, i.e. (plus peak + minus peak)/2
AVERage	Result of measurement with average detector
RMS	Result of measurement with RMS detector
SRMS	Result of measurement with √2 RMS detector

Example:

	"ADEM ON"	'Switches on the modulation measurement.
	"CALC2:FEED 'XTIM:AM:REL:TDOM"	'Switches on the AM result display.
	"ADEM:AVER ON"	''Switches on the averaging function.
	"CALC:MARK:FUNC:ADEM:AM:AVER? PPE"	'Queries the averaged peak value.

Characteristics: *RST value: -
SCPI: device-specific

CALCulate:MARKer:FUNCtion:ADEMod:AM:PHOLd[:RESult]? PPEak| MPEak| PAVerage| AVERage | RMS | SRMS

This command queries the highest values obtained in the AM modulation measurement.
For this, a suitable result display mode must have been selected before with CALC:FEED.

PPEak	Result of measurement with +PK detector
MPEak	Result of measurement with -PK detector
PAVerage	Result of averaging ±PK/2, i.e. (plus peak + minus peak)/2
AVERage	Result of measurement with average detector
RMS	Result of measurement with RMS detector
SRMS	Result of measurement with √2 RMS detector

Example:

	"ADEM ON"	'Switches on the modulation measurement.
	"CALC2:FEED 'XTIM:AM:REL:TDOM"	'Switches on the AM result display.
	"ADEM:PHOL ON" '	'Switches on the Peak Hold function.
	"CALC:MARK:FUNC:ADEM:AM:PHOL? PPE"	'Queries the highest peak value.

Characteristics: *RST value: -
SCPI: device-specific

CALCulate:MARKer:FUNCtion:ADEMod:FM[:WRITe][:RESult]? PPEak| MPEak| PAVerage| AVERage | RMS | SRMS

This command queries the current results of the FM modulation measurement.
For this, a suitable result display mode must have been selected before with CALC:FEED.

PPEak	Result of measurement with +PK detector
MPEak	Result of measurement with -PK detector
PAVerage	Result of averaging ±PK/2, i.e. (plus peak + minus peak)/2
AVERage	Result of measurement with average detector (this is *not* an average over several measured values)
RMS	Result of measurement with RMS detector
SRMS	Result of measurement with √2 RMS detector

Example:

"`ADEM ON`"	'Switches on the modulation measurement.
"`CALC2:FEED 'XTIM:FM:TDOM`"	'Switches on the FM result display.
"`CALC:MARK:FUNC:ADEM:FM? PPE`"	'Queries the current peak value.

Characteristics: *RST value: -
SCPI: device-specific

CALCulate:MARKer:FUNCtion:ADEMod:FM:AVERage[:RESult]? PPEak| MPEak| PAVerage| AVERage | RMS | SRMS

This command queries the averaged results of the FM modulation measurement.
For this, a suitable result display mode must have been selected before with CALC:FEED.

PPEak	Result of measurement with +PK detector
MPEak	Result of measurement with -PK detector
PAVerage	Result of averaging ±PK/2, i.e. (plus peak + minus peak)/2
AVERage	Result of measurement with average detector
RMS	Result of measurement with RMS detector
SRMS	Result of measurement with √2 RMS detector

Example:

"`ADEM ON`"	'Switches on the modulation measurement.
"`CALC2:FEED 'XTIM:FM:TDOM`"	'Switches on the FM result display.
"`ADEM:AVER ON`"	''Switches on the averaging function.
"`CALC:MARK:FUNC:ADEM:FM:AVER? PPE`"	'Queries the averaged peak value.

Characteristics: *RST value: -
SCPI: device-specific

CALCulate:MARKer:FUNCtion:ADEMod:FM:PHOLd[:RESult]? PPEak| MPEak| PAVerage| AVERage | RMS | SRMS

This command queries the highest values obtained in the FM modulation measurement.
For this, a suitable result display mode must have been selected before with CALC:FEED.

PPEak	Result of measurement with +PK detector
MPEak	Result of measurement with -PK detector
PAVerage	Result of averaging ±PK/2, i.e. (plus peak + minus peak)/2
AVERage	Result of measurement with average detector
RMS	Result of measurement with RMS detector
SRMS	Result of measurement with √2 RMS detector

Example:

"ADEM ON"	'Switches on the modulation measurement.
"CALC2:FEED 'XTIM:FM:TDOM"	'Switches on the FM result display.
"ADEM:PHOL ON"	''Switches on the Peak Hold function.
"CALC:MARK:FUNC:ADEM:FM:PHOL? PPE"	'Queries the highest peak value.

Characteristics: *RST value: -
SCPI: device-specific

CALCulate:MARKer:FUNCtion:ADEMod:PM[:WRITe][:RESult]? PPEak| MPEak| PAVerage| AVERage | RMS | SRMS

This command queries the current results of the PM modulation measurement.
For this, a suitable result display mode must have been selected before with CALC:FEED.

PPEak	Result of measurement with +PK detector
MPEak	Result of measurement with -PK detector
PAVerage	Result of averaging ±PK/2, i.e. (plus peak + minus peak)/2
AVERage	Result of measurement with average detector (this is *not* an average over several measured values)
RMS	Result of measurement with RMS detector
SRMS	Result of measurement with √2 RMS detector

Example:

"ADEM ON"	'Switches on the demodulation measurement.
"CALC2:FEED 'XTIM:PM:TDOM"	'Switches on the PM result display.
"CALC:MARK:FUNC:ADEM:PM? PPE"	'Queries the current peak value.

Characteristics: *RST value: -
SCPI: device-specific

CALCulate:MARKer:FUNCtion:ADEMod:PM:AVERage[:RESult]? PPEak| MPEak| PAVerage| AVERage | RMS | SRMS

This command queries the averaged results of the PM modulation measurement.
For this, a suitable result display mode must have been selected before with CALC:FEED.

PPEak	Result of measurement with +PK detector
MPEak	Result of measurement with -PK detector
PAVerage	Result of averaging ±PK/2, i.e. (plus peak + minus peak)/2
AVERage	Result of measurement with average detector
RMS	Result of measurement with RMS detector
SRMS	Result of measurement with √2 RMS detector

Example:

"`ADEM ON`"	'Switches on the modulation measurement.
"`CALC2:FEED 'XTIM:PM:TDOM`"	'Switches on the PM result display.
"`ADEM:AVER ON`"	''Switches on the averaging function.
"`CALC:MARK:FUNC:ADEM:PM:AVER? PPE`"	'Queries the averaged peak value.

Characteristics: *RST value: -
SCPI: device-specific

CALCulate:MARKer:FUNCtion:ADEMod:PM:PHOLd[:RESult]? PPEak| MPEak| PAVerage| AVERage | RMS | SRMS

This command queries the highest values obtained in the PM modulation measurement.
For this, a suitable result display mode must have been selected before with CALC:FEED.

PPEak	Result of measurement with +PK detector
MPEak	Result of measurement with -PK detector
PAVerage	Result of averaging ±PK/2, i.e. (plus peak + minus peak)/2
AVERage	Result of measurement with average detector
RMS	Result of measurement with RMS detector
SRMS	Result of measurement with √2 RMS detector

Example:

"`ADEM ON`"	'Switches on the modulation measurement.
"`CALC2:FEED 'XTIM:PM:TDOM`"	'Switches on the PM result display.
"`ADEM:PHOL ON`"	'Switches on the Peak Hold function.
"`CALC:MARK:FUNC:ADEM:PM:PHOL? PPE`"	'Queries the highest peak value.

Characteristics: *RST value: -
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:ADEMod:FERRor[:RESult]?

This command queries the frequency error of the carrier signal.

Example:

"`ADEM ON`"	'Switches on the demodulator.
"`CALC:FEED 'XTIM:FM:TDOM`"	'Switches the FM result display on.
"`CALC:MARK:FUNC:ADEM:FERR? `"	'Queries the frequency error.

Characteristics: *RST value: -
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:ADEMod:SINad[:WRITe]:RESult?

This command queries the current result of the SINAD measurement.

Example:

"ADEM ON"	'Switches on the demodulator.
"CALC:FEED 'XTIM:FM:AFSP"	'Switches on the AF spectrum of the FM.
"CALC:MARK:FUNC:ADEM:SIN:RES?"	'Queries the current SINAD value.

Characteristics: *RST value: -
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:ADEMod:SINad:AVERage:RESult?

This command queries the SINAD value averaged over several measurements.

Example:

"ADEM ON"	'Switches on the demodulator.
"CALC:FEED 'XTIM:FM:AFSP"	'Switches on the AF spectrum of the FM.
"ADEM:AVER ON"	'Switches on the averaging function.
"CALC:MARK:FUNC:ADEM:SIN:AVER:RES?"	'Queries the averaged SINAD value.

Characteristics: *RST value: -
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:ADEMod:SINad:PHOLd:RESult?

This command queries the highest value obtained in the SINAD measurement.

Example:

"ADEM ON"	'Switches on the demodulator.
"CALC:FEED 'XTIM:FM:AFSP"	'Switches on the AF spectrum of the FM.
"ADEM:PHOL ON"	'Switches on the Peak Hold function.
"CALC:MARK:FUNC:ADEM:SIN:PHOL:RES?"	'Queries the highest SINAD value.

Characteristics: *RST value: -
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:ADEMod:THD[:WRITe]:RESult?

This command queries the current result of the THD measurement.

Example:

"ADEM ON"	'Switches on the demodulator.
"CALC:FEED 'XTIM:FM:AFSP"	'Switches on the AF spectrum of the FM.
"CALC:MARK:FUNC:ADEM:THD:RES?"	'Queries the current THD value.

Characteristics: *RST value: -
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:ADEMod:THD:AVERage:RESult?

This command queries the THD value averaged over several measurements.

Example:	"ADEM ON"	'Switches on the demodulator.
	"CALC:FEED 'XTIM:FM:AFSP"	'Switches on the AF spectrum of the FM.
	"ADEM:AVER ON"	'Switches on the averaging function.
	"CALC:MARK:FUNC:ADEM:SIN:AVER:RES?"	'Queries the averaged THD value.

Characteristics: *RST value: -
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:ADEMod:THD:PHOLd:RESult?

This command queries the highest value obtained in the THD measurement.

Example:	"ADEM ON"	'Switches on the demodulator.
	"CALC:FEED 'XTIM:FM:AFSP"	'Switches on the AF spectrum of the FM.
	"ADEM:PHOL ON"	'Switches on the Peak Hold function.
	"CALC:MARK:FUNC:ADEM:SIN:PHOL:RES?"	'Queries the highest THD value.

Characteristics: *RST value: -
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:ADEMod:CARRier[:RESult]?

This command queries the measured value of the carrier power.

Example:	"ADEM ON"	'Switches on the FM demodulator.
	"CALC:MARK:FUNC:ADEM:CARR?"	'Queries the carrier power.

Characteristics: *RST value: -
SCPI: device-specific

CALCulate:MARKer:FUNCtion:POWer Subsystem

The CALCulate:MARKer:FUNCtion:POWER subsystem contains the commands for control of power measurement.

COMMAND	PARAMETERS	UNIT	COMMENT
CALCulate<1|2>			
:MARKer			
:FUNCtion			
:POWer			
:SELect	ACPower | CPOWer | MCACpower | OBANdwidth | OBWidth | CN | CN0		
:RESult?	ACPower | CPOWer | MCACpower | OBANdwidth | OBWidth | CN | CN0		query only
:PHZ	<Boolean>		
:PRESet	<Boolean>		
	NADC | TETRA | PDC | PHS | CDPD | FWCDma | RWCDma | F8CDma | R8CDma | F19Cdma | R19Cdma | FW3Gppcdma | RW3Gppcdma | D2CDma | S2CDma | M2CDma | FIS95A | RIS95A | FIS95C0 | RIS95C0 | FIS95C1 | RIS95C1 | FJ008 | RJ008 | TCDMa | NONE		no query
[:STATe]	OFF		

CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer:SELect ACPower | CPOWer | MCACpower | OBANdwidth | OBWidth | CN | CN0

This command selects – and switches on – one of the above types of power measurement in the selected measurement window. This function is independent of the selected marker, i.e. the numerical suffix <1...4> appended to MARKer has no effect.
The channel spacings and channel bandwidths are configured in the `SENSe:POWer:ACHannel` subsystem.
Please note the following:
If CPOWer is selected, the number of adjacent channels (command: `[SENSe:]POWer:ACHannel:ACPairs)` is set to 0. If ACPower is selected, the number of adjacent channels is set to 1, unless adjacent-channel power measurement is switched on already.
With respect to the above two settings, the behaviour of the FSMR differs from that of the FSE family.

Note: *The channel/adjacent-channel power measurement is performed for the trace selected with* *`SENSe:POWer:TRACe 1|2|3`.*

The occupied bandwidth measurement is performed for the trace on which marker 1 is positioned. To select another trace for the measurement, marker 1 is to be positioned on the desired trace by means of `CALC:MARK:TRAC 1|2|3`.

Parameters:		
	ACPower	Adjacent-channel power measurement with a single carrier signal
	CPOWer	Channel power measurement with a single carrier signal (equivalent to adjacent-channel power measurement with *NO. OF ADJ CHAN* = 0)
	MCACpower	Channel/adjacent-channel power measurement with several carrier signals
	OBANdwidth | OBWidth	Measurement of occupied bandwidth
	CN	Measurement of carrier-to-noise ratio
	CN0	Measurement of carrier-to-noise ratio referenced to 1 Hz bandwidth

Example: "CALC:MARK:FUNC:POW:SEL ACP" 'Switches on adjacent-channel power measurement in window A.

Characteristics: *RST value: -
SCPI: device-specific

CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer:RESult? ACPower | CPOWer | MCACpower | OBANdwidth | OBWidth | CN | CN0

This command queries the result of the power measurement performed in the selected window. If necessary, the measurement is switched on prior to the query.

The channel spacings and channel bandwidths are configured in the SENSe:POWer:ACHannel subsystem.

To obtain a valid 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.

Parameters:

ACPower: Adjacent-channel power measurement

Results are output in the following sequence, separated by commas:

1. Power of transmission channel
2. Power of lower adjacent channel
3. Power of upper adjacent channel
4. Power of lower alternate channel 1
5. Power of upper alternate channel 1
6. Power of lower alternate channel 2
7. Power of upper alternate channel 2

The number of measured values returned depends on the number of adjacent/alternate channels selected with SENSe:POWer:ACHannel:ACPairs.

With logarithmic scaling (RANGE LOG), the power is output in the currently selected level unit; with linear scaling (RANGE LIN dB or LIN %), the power is output in W. If SENSe:POWer:ACHannel:MODE REL is selected, the adjacent/alternate-channel power is output in dB.

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.

MCACpower: Channel/adjacent-channel power measurement with several carrier signals

Results are output in the following sequence, separated by commas:

1. Power of carrier signal 1
2. Power of carrier signal 2
3. Power of carrier signal 3
4. Power of carrier signal 4
5. Total power of all carrier signals
6. Power of lower adjacent channel
7. Power of upper adjacent channel
8. Power of lower alternate channel 1
9. Power of upper alternate channel 1
10. Power of lower alternate channel 2
11. Power of upper alternate channel 2

The number of measured values returned depends on the number of carrier signals and adjacent/alternate channels selected with `SENSe:POWer:ACHannel:TXCHannel:COUNt` and `SENSe:POWer:ACHannel:ACPairs`.

If only one carrier signal is measured, the total value of all carrier signals will not be output.

With logarithmic scaling (RANGE LOG), the power is output in dBm; with linear scaling (RANGE LIN dB or LIN %), the power is output in W. If `SENSe:POWer:ACHannel:MODE REL` is selected, the adjacent/alternate-channel power is output in dB.

OBANdwidth | OBWidth Measurement of occupied bandwidth

The occupied bandwidth in Hz is returned.

CN Measurement of carrier-to-noise ratio

The carrier-to-noise ratio in dB is returned.

CN0 Measurement of carrier-to-noise ratio referenced to 1 Hz bandwidth.

The carrier-to-noise ratio in dB/Hz is returned.

Example of channel/adjacent-channel power measurement:

`"SENS2:POW:ACH:ACP 3"`	'Sets the number of adjacent/alternate channels in screen B to 3.
`"SENS2:POW:ACH:BAND 30KHZ"`	'Sets the bandwidth of the transmission channel to 30 kHz.
`"SENS2:POW:ACH:BAND:ACH 40KHZ"`	'Sets the bandwidth of each adjacent channel to 40 kHz.
`"SENS2:POW:ACH:BAND:ALT1 50KHZ"`	'Sets the bandwidth of each alternate channel to 50 kHz.
`"SENS2:POW:ACH:BAND:ALT2 60KHZ"`	'Sets the bandwidth of alternate channel 2 to 60 kHz.
`"SENS2:POW:ACH:SPAC 30KHZ"`	'Sets the spacing between the transmission channel and the adjacent channel to 30 kHz, the spacing between the transmission channel and alternate channel 1 to 60 kHz, and the spacing between the transmission channel and alternate channel 2 to 90 kHz.
`"SENS2:POW:ACH:SPAC:ALT1 100KHZ"`	'Sets the spacing between the transmission channel and alternate channel 1 to 100 kHz, and the spacing between the transmission channel and alternate channel 2 to 150 kHz.
`"SENS2:POW:ACH:SPAC:ALT2 140KHZ"`	'Sets the spacing between the transmission channel and alternate channel 2 to 140 kHz.
`"SENS2:POW:ACH:MODE ABS"`	'Switches on absolute power measurement.
`"CALC2:MARK:FUNC:POW:SEL ACP"`	'Switches on the adjacent-channel power measurement in screen B.
`"INIT:CONT OFF"`	'Switches over to single-sweep mode.
`"INIT;*WAI"`	'Starts a sweep and waits for the end of the sweep.
`"CALC2:MARK:FUNC:POW:RES? ACP"`	'Queries the result of adjacent-channel power measurement in screen B.
`"SENS2:POW:ACH:REF:AUTO ONCE"`	'Defines the measured channel power as the reference value for relative power measurements.

If the **channel power only** is to be measured, all commands relating to adjacent/alternate channel bandwidth and channel spacings are omitted. The number of adjacent/alternate channels is set to 0 with `SENS2:POW:ACH:ACP 0`.

Example of occupied bandwidth measurement:

`"SENS2: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.
`"CALC2:MARK:FUNC:POW:RES? OBW"`	'Queries the occupied bandwidth measured in screen B.

Characteristics: *RST value: -
SCPI: device-specific

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

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:POWer:RESult:PHZ ON | OFF

This command switches the query response of the power measurement results in the indicated measurement window between output of absolute values (OFF) and output referred to the measurement bandwith (ON).

The measurement results are output with `CALCulate:MARKer:FUNCtion:POWer:RESult?`

Parameter:

ON: Results output referred to measurement bandwidth.

OFF: Results output in absolute values.

Example of channel/adjacent channel measurement:

```
"SENS2:POW:ACH:ACP 3"               'Sets the number of adjacent channels in
                                    'screen B to 3.
"SENS2:POW:ACH:BAND 30KHZ"          'Sets the bandwidth of the main channel to
                                    30 kHz.
"SENS2:POW:ACH:BAND:ACH 40KHZ"      'Sets the bandwidth of all adjacent
                                    'channels to 40 kHz.
"SENS2:POW:ACH:BAND:ALT1 50KHZ"     'Sets the bandwidth of all alternate
                                    'adjacent channels to 50 kHz.
"SENS2:POW:ACH:BAND:ALT2 60KHZ"     'Sets the bandwidth of alternate adjacent
                                    'channel 2 to 60 kHz.
"SENS2:POW:ACH:SPAC 30KHZ"          'Sets the spacing between channel and
                                    'adjacent channel as well as between all
                                    'adjacent channels to 30 kHz.
"SENS2:POW:ACH:SPAC:ALT1 40KHZ"     'Sets the spacing between adjacent
                                    'channel and alternate adjacent channel as
                                    'well as between all alternate adjacent
                                    'channels to 40 kHz.
"SENS2:POW:ACH:SPAC:ALT2 50KHZ"     'Sets the spacing between alternate
                                    'adjacent channel 1 and alternate adjacent
                                    'channel 2 to 50 kHz.
"SENS2:POW:ACH:MODE ABS"            'Switches on absolute power
                                    'measurement.
"CALC2:MARK:FUNC:POW:SEL ACP"       'Switches the adjacent channel power
                                    'measurement in screen B.
"INIT:CONT OFF"                     'Switches to single-sweep mode.
"INIT;*WAI"                         'Starts a sweep and waits for the end.
"CALC2:MARK:FUNC:POW:RES:PHZ ON"    'Output of results referred to the channel
                                    'bandwidth.
"CALC2:MARK:FUNC:POW:RES? ACP"      'Queries the result of the adjacent channel
                                    'power measurement in screen B referred
                                    'to the channel bandwidth.
```

If only the **channel power** is to be measured, all commands for defining the bandwidths of adjacent channels as well as the channel spacings are not necessary. The number of adjacent channels is set to 0 with `SENS2:POW:ACH:ACP 0`.

Characteristics: *RST value: -
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:POWer[:STATe] OFF

This command switches off the power measurement in the selected measurement window.

Example: "`CALC:MARK:FUNC:POW OFF`"'Switches off the power measurement in screen B.

Characteristics: *RST value: -
SCPI: device-specific

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

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:POWer:PRESet NADC | TETRA | PDC | PHS | CDPD | FWCDma | RWCDma | F8CDma | R8CDma | F19Cdma | R19Cdma | FW3Gppcdma | RW3Gppcdma | D2CDma | S2CDma | M2CDma | FIS95A | RIS95A | FIS95C0 | RIS95C0 | FJ008 | RJ008 | FIS95C1 | RIS95C1 | TCDMa | NONE

This command selects the power measurement setting for a standard in the indicated measurement window and previously switches on the corresponding measurement, if required. The function is independent of the marker selection, i.e. the numeric suffix <1 to 4> of MARKer is irrelevant.

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.

Meaning of the CDMA standard abbreviations:

FIS95A, F8CDma	CDMA IS95A forward
RIS95A, R8CDma	CDMA IS95A reverse
FJ008, F19CDma	CDMA J-STD008 forward
RJ008, R19CDma	CDMA J-STD008 reverse
FIS95C0	CDMA IS95C Class 0 forward
RIS95C0	CDMA IS95C Class 0 reverse
FIS95C1	CDMA IS95C Class 1 forward
RIS95C1	CDMA IS95C Class 1 reverse
FWCDma	W-CDMA 4.096 MHz forward
RWCDma	W-CDMA 4.096 MHz reverse
FW3Gppcdma	W-CDMA 3.84 MHz forward
RW3Gppcdma	W-CDMA 3.84 MHz reverse
D2CDma	CDMA 2000 direct sequence
S2CDma	CDMA 2000 MC1 multi carrier with 1 carrier
M2CDma	CDMA 2000 MC3 multi carrier with 3 carriers
TCDMa	TD-SCDMA

Notes: *The settings for standards IS95A and C differ as far as the calculation method of channel spacings is concerned. For IS95A and J-STD008 the spacing is calculated from the center of the main channel to the center of the corresponding adjacent channel, for IS95C from the center of the main channel to the nearest border of the adjacent channel.*

Example: "`CALC2:MARK:FUNC:POW:PRES NADC`" 'Selects the standard setting for
'NADC in screen B

Characteristics: *RST value: -
SCPI: device-specific

CALCulate:MARKer:FUNCtion:STRack Subsystem

The CALCulate:MARKer:FUNCtion:STRack subsystem defines the settings of the signal track.

COMMAND	PARAMETERS	UNIT	COMMENT
CALCulate<1|2>			
:MARKer			
:FUNCtion			
:STRack			
[:STATe]	<Boolean>		
:BANDwidth	<numeric_value>	HZ	
:BWIDth	<numeric_value>	HZ	
:THReshold	<numeric_value>	DBM	
:TRACe	<numeric_value>		

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:STRack[:STATe] ON | OFF

This command switches the signal-track function on or off for the selected measurement window. The function is independent of the selected marker, i.e. the numeric suffix <1 to 4> of MARKer is irrelevant.

With signal track activated, the maximum signal is determined after each frequency sweep and the center frequency is set to the frequency of this signal. Thus with drifting signals the center frequency follows the signal.

Example: "`CALC:MARK:FUNC:STR ON`" 'Switches on the signal track function for 'screen A.

Characteristics: *RST value: OFF
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:STRack:BANDwidth 10Hz to MAX(SPAN)
CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:STRack:BWIDth 10Hz to MAX(SPAN)

These commands have the same function. For the selected measurement window they define the bandwidth around the center frequency within which the largest signal is searched. The function is independent of the selected marker, i.e. the numeric suffix <1 to 4> of MARKer is irrelevant. It is only available in the frequency domain (span > 0).

Note: *The entry of the search bandwidth is only possible if the Signal Track function is switched on (`CALC:MARK:FUNC:STR ON`).*

Example: "`CALC:MARK:FUNC:STR:BAND 1MHZ`" 'Sets the search bandwidth for screen 'A to 1 MHz.

"`CALC:MARK:FUNC:STR:BWID 1MHZ`" 'Alternative command for the same 'function.

Characteristics: *RST value: -- (= span/10 on activating the function)
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:STRack:THReshold -330dBm to +30dBm

This command defines the threshold above which the largest signal is searched for in the selected measurement window. The function is independent of the selected marker, i.e. the numeric suffix <1 to 4> of MARKer is irrelevant. It is only available in the frequency domain (span > 0)..

The response unit depends on the settings defined with `CALC:UNIT`.

Note: *The entry of the search bandwidth is only possible if the Signal Track function is switched on (`CALC:MARK:FUNC:STR ON`).*

Example:	"`CALC:MARK:FUNC:STR:THR -50DBM`"	'Sets the threshold for signal tracking 'in screen A to -50 dBm.

Characteristics:	*RST value:	-120 dBm
	SCPI:	device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:STRack:TRACe 1 to 3

This command defines the trace on which the largest signal is searched for in the selected measurement window. The function is independent of the selected marker, i.e. the numeric suffix <1 to 4> of MARKer is irrelevant. It is only available in the frequency domain (span > 0).

Example:	"`CALC2:MARK:FUNC:STR:TRAC 3`"	'Defines trace 3 in screen B as the 'trace for signal tracking.

Characteristics:	*RST value:	1
	SCPI:	device-specific

CALCulate:MARKer:FUNCtion:SUMMary Subsystem

This subsystem contains the commands for controlling the time domain power functions. These are provided in the marker subsytem for reasons of compatibility with the FSE family.

COMMAND	PARAMETERS	UNIT	COMMENT
CALCulate<1|2>			
:MARKer			
:FUNCtion			
:SUMMary			
[:STATe]	<Boolean>		
:PPEak			
[:STATe]	<Boolean>		
:RESult?			query only
:AVERage			
:RESult?			query only
:PHOLd			
:RESult?			query only
:RMS			
[:STATe]	<Boolean>		
:RESult?			query only
:AVERage			
:RESult?			query only
:PHOLd			
:RESult?			query only
:MEAN			
[:STATe]	<Boolean>		
:RESult?			query only
:AVERage			
:RESult?			query only
:PHOLd			
:RESult?			query only
:SDEViation			
[:STATe]	<Boolean>		
:RESult?			query only
:AVERage			
:RESult?			query only
:PHOLd			
:RESult?			query only
:PHOLd	<Boolean>		
:AVERage	<Boolean>		
:MODE	ABSolute|RELative		
:REFerence			
:AUTO	ONCE		
:AOFF			no query
:MSUMmary?	<numeric_value>, <numeric_value>, <numeric_value>, <numeric_value>	S, S, S,	query only

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary[:STATe] ON | OFF

This command switches on or off the previously selected time domain power measurements. Thus one or several measurements can be first selected and then switched on and off together with `CALC:MARK:FUNC:SUMMary:STATe`.

The function is independent of the marker selection, i.e. the suffix of MARKer is irrelevant. It is only available in the time domain (span = 0).

Example: "`CALC:MARK:FUNC:SUMM:STAT ON`"

Characteristics: *RST value: OFF
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:PPEak[:STATe] ON | OFF

This command switches on or off the measurement of the positive peak value in the selected measurement window.

The function is independent of the marker selection, i.e. the numeric suffix <1 to 4> of MARKer is irrelevant. It is only available in the time domain (span = 0).

Example: "`CALC:MARK:FUNC:SUMM:PPE ON`" 'Switches on the function in screen A.

Characteristics: *RST value: OFF
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:PPEak:RESult?

This command is used to query the result of the measurement of the positive peak value in the selected measurement window. The measurement may have to be switched on previously.

The function is independent of the marker selection, i.e. the numeric suffix <1 to 4> of MARKer is irrelevant. It is only available in the time domain (span = 0).

A complete sweep with synchronization to sweep end must be performed between switching on the function and querying the measured value to obtain a valid query result. This is only possible in single sweep mode.

Example:

"`INIT:CONT OFF`"	'Switches to single-sweep mode.
"`CALC:MARK:FUNC:SUMM:PPE ON`"	'Switches on the function in screen A.
"`INIT;*WAI`"	'Starts a sweep and waits for the end.
"`CALC:MARK:FUNC:SUMM:PPE:RES?`"	'Outputs the result of screen A.

Characteristics: *RST value: -
SCPI: device-specific

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

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:PPEak:AVERage:RESult?

This command is used to query the result of the measurement of the averaged positive peak value in the selected measurement window. The query is only possible if averaging has been activated previously using `CALCulate<1|2>:MARKer<1 to 4>:FUNCtion: SUMMary:AVERage.`

The function is independent of the marker selection, i.e. the numeric suffix <1 to 4> in MARKer is irrelevant. It is only available in the time domain (span = 0).

A complete sweep with synchronization to sweep end must be performed between switching on the function and querying the measured value to obtain a valid query result. This is only possible in single sweep mode.

Example:	`"INIT:CONT OFF"`	'Switches to single-sweep mode.
	`"CALC:MARK:FUNC:SUMM:PPE ON"`	'Switches on the function in screen A.
	`"CALC:MARK:FUNC:SUMM:AVER ON"`	'Switches on the calculation of average 'in screen A.
	`"INIT;*WAI"`	'Starts a sweep and waits for the end.
	`"CALC:MARK:FUNC:SUMM:PPE:AVER:RES?"`	'Outputs the result of screen A.

Characteristics: *RST value: -
SCPI: device-specific

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

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:PPEak:PHOLd:RESult?

This command is used to query the result of the measurement of the positive peak value with active peak hold function. The query is only possible if the peak hold function has been activated previously using `CALCulate<1|2>:MARKer<1 to 4>: FUNCtion:SUMMary:PHOLd`.

The function is independent of the marker selection, i.e. the numeric suffix <1 to 4> of `:MARKer` is irrelevant. It is only available in the time domain (span = 0).

A complete sweep with synchronization to sweep end must be performed between switching on the function and querying the measured value to obtain a valid query result. This is only possible in single sweep mode.

Example:	`"INIT:CONT OFF"`	'Switches to single-sweep mode.
	`"CALC:MARK:FUNC:SUMM:PPE ON"`	'Switches on the function in screen A.
	`"CALC:MARK:FUNC:SUMM:PHOL ON"`	'Switches on the measurement of the 'peak value in screen A.
	`"INIT;*WAI"`	'Starts a sweep and waits for the end.
	`"CALC:MARK:FUNC:SUMM:PPE:PHOL:RES?"`	'Outputs the result of screen A.

Characteristics: *RST value: -
SCPI: device-specific

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

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:RMS[:STATe] ON | OFF

This command switches on or off the measurement of the effective (RMS) power in the selected measurement window. If necessary the function is switched on previously.

The function is independent of the marker selection, i.e. the numeric suffix <1 to 4> of `:MARKer` is irrelevant. It is only available in the time domain (span = 0).

Example: `"CALC2:MARK:FUNC:SUM:RMS ON"` 'Switches on the function in screen B.

Characteristics: *RST value: OFF
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:RMS:RESult?

This command queries the result of the measurement of the RMS power value in the selected measurement window.

The function is independent of the marker selection, i.e. the numeric suffix <1 to 4> of `:MARKer` is irrelevant. It is only available in the time domain (span = 0).

A complete sweep with synchronization to sweep end must be performed between switching on the function and querying the measured value to obtain a valid query result. This is only possible in single sweep mode.

Example:

```
"INIT:CONT OFF"                      'Switches to single-sweep mode.
"CALC:MARK:FUNC:SUMM:RMS ON"         'Switches on the function in screen A.
"INIT;*WAI"                          'Starts a sweep and waits for the end.
"CALC:MARK:FUNC:SUMM:RMS:RES?"       'Outputs the result of screen A.
```

Characteristics: *RST- value: -
SCPI: device-specific

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

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:RMS:AVERage:RESult?

This command queries the result of the measurement of the averaged RMS value in the selected measurement window. The query is only possible if averaging has been activated previously using `CALCulate<1|2>:MARKer<1 to 4>:FUNCtion: SUMMary:AVERage`.

The function is independent of the marker selection, i.e. the numeric suffix <1 to 4> of `:MARKer` is irrelevant. It is only available in the time domain (span = 0).

A complete sweep with synchronization to sweep end must be performed between switching on the function and querying the measured value to obtain a valid query result. This is only possible in single sweep mode.

Example:

```
"INIT:CONT OFF"                      'Switches to single-sweep mode.
"CALC:MARK:FUNC:SUMM:RMS ON"         'Switches on the function in screen A.
"CALC:MARK:FUNC:SUMM:AVER ON"        Swtiches on the average value
                                     'calculation in screen A.
"INIT;*WAI"                          'Starts a sweep and waits for the end.
"CALC:MARK:FUNC:SUMM:RMS:AVER:RES?"  'Outputs the result of screen A.
```

Characteristics: *RST- value: -
SCPI: device-specific

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

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:RMS:PHOLd:RESult?

This command queries the result of the measurement of the RMS value with active peak hold in the selected measurement window. The query is only possible only if the peak hold function has been activated previously using `CALCulate<1|2>:MARKer<1 to 4>: FUNCtion:SUMMary:PHOLd`.

The function is independent of the marker selection, i.e. the numeric suffix <1 to 4> of `:MARKer` is irrelevant. It is only available in the time domain (span = 0).

A complete sweep with synchronization to sweep end must be performed between switching on the function and querying the measured value to obtain a valid query result. This is only possible in single sweep mode.

Example:

`"INIT:CONT OFF"`	'Switches to single-sweep mode.
`"CALC:MARK:FUNC:SUMM:RMS ON"`	'Switches on the function in screen A.
`"CALC:MARK:FUNC:SUMM:PHOL ON"`	'Switches on the peak value 'measurement in screen A.
`"INIT;*WAI"`	'Starts a sweep and waits for the end.
`"CALC:MARK:FUNC:SUMM:RMS:PHOL:RES?"`	'Outputs the result of screen A.

Characteristics: *RST- value: -
SCPI: device-specific

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

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:MEAN[:STATe] ON | OFF

This command switches on or off the measurement of the mean value in the selected measurement window.

The function is independent of the marker selection, i.e. the numeric suffix <1 to 4> of `:MARKer` is irrelevant. It is only available in the time domain (span = 0)..

Note: *The measurement is performed on the trace on which marker 1 is positioned. In order to evaluate another trace, marker 1 must be positioned on another trace with `CALC:MARK:TRAC 1|2|3`.*

Example: `"CALC:MARK:FUNC:SUMM:MEAN ON"` 'Switches on the function in screen A.

Characteristics: *RST value: OFF
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:MEAN:RESult?

This command queries the result of the measurement of the mean value in the selected measurement window. The function is independent of the marker selection, i.e. the numeric suffix <1 to 4> of `:MARKer` is irrelevant. It is only available in the time domain (span = 0).

A complete sweep with synchronization to sweep end must be performed between switching on the function and querying the measured value to obtain a valid query result. This is only possible in single sweep mode.

Example:

`"INIT:CONT OFF"`	'Switches to single-sweep mode.
`"CALC:MARK:FUNC:SUMM:MEAN ON"`	'Switches on the function in screen A.
`"INIT;*WAI"`	'Starts a sweep and waits for the end.
`"CALC:MARK:FUNC:SUMM:MEAN:RES?"`	'Outputs the result of screen A.

Characteristics: *RST- value: -
SCPI: device-specific

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

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:MEAN:AVERage:RESult?

This command queries the result of the measurement of the averaged mean value in the selected measurement window. The query is only possible if averaging has been activated previously using `CALCulate<1|2>:MARKer<1 to 4>:FUNCtion: SUMMary:AVERage`.

The function is independent of the marker selection, i.e. the numeric suffix <1 to 4> of `:MARKer` is irrelevant. It is only available in the time domain (span = 0).

A complete sweep with synchronization to sweep end must be performed between switching on the function and querying the measured value to obtain a valid query result. This is only possible in single sweep mode.

Example:

`"INIT:CONT OFF"`	'Switches to single-sweep mode.
`"CALC:MARK:FUNC:SUMM:MEAN ON"`	'Switches on the function in screen A.
`"CALC:MARK:FUNC:SUMM:AVER ON"`	'Switches on the average value 'calculation in screen A.
`"INIT;*WAI"`	'Starts a sweep and waits for the end.
`"CALC:MARK:FUNC:SUMM:MEAN:AVER:RES?"`	'Outputs the result of screen A.

Characteristics: *RST- value: -
SCPI: device-specific

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

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:MEAN:PHOLd:RESult?

This command queries the result of the measurement of the mean value with active peak hold in the selected measurement window. The query is only possible if the peak hold function has been switched on previously using `CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary: PHOLd`.

The query is possible only if the peak hold function is active. The function is independent of the marker selection, i.e. the numeric suffix <1 to 4> of `:MARKer` is irrelevant. It is only available in the time domain (span = 0).

A complete sweep with synchronization to sweep end must be performed between switching on the function and querying the measured value to obtain a valid query result. This is only possible in single sweep mode.

Example:

`"INIT:CONT OFF"`	'Switches to single-sweep mode
`"CALC:MARK:FUNC:SUMM:MEAN ON"`	'Switches on the function in screen A
`"CALC:MARK:FUNC:SUMM:PHOL ON"`	'Switches on the peak value 'measurement in screen A
`"INIT;*WAI"`	'Starts a sweep and waits for the end
`"CALC:MARK:FUNC:SUMM:MEAN:PHOL:RES?"`	'Outputs the result of screen A.

Characteristics: *RST- value: -
SCPI: device-specific

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

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:SDEViation[:STATe] ON | OFF

This command switches on or off the measurement of the standard deviation in the selected measurement window. The function is independent of the marker selection, i.e. the numeric suffix <1 to 4> of `:MARKer` is irrelevant. It is only available in the time domain (span = 0)..

On switching on the measurement, the mean power measurement is switched on as well.

Example:	`"CALC2:MARK:FUNC:SUMM:SDEV ON"`	'Switches on the measurement of 'the standard deviation in screen B.

Characteristics: *RST value: OFF
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:SDEViation:RESult?

This command queries the results of the standard deviation measurement. The function is independent of the marker selection, i.e. the numeric suffix <1 to 4> of `:MARKer` is irrelevant. It is only available in the time domain (span = 0).

A complete sweep with synchronization to sweep end must be performed between switching on the function and querying the measured value to obtain a valid query result. This is only possible in single sweep mode.

Example:	`"INIT:CONT OFF"`	'Switches to single-sweep mode.
	`"CALC:MARK:FUNC:SUMM:SDEV ON"`	'Switches on the function in screen A.
	`"INIT;*WAI"`	'Starts a sweep and waits for the end.
	`"CALC:MARK:FUNC:SUMM:SDEV:RES?"`	'Outputs the result of screen A.

Characteristics: *RST value: -
SCPI: device-specific

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

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:SDEViation:AVERage:RESult?

This command queries the result of the averaged standard deviation determined in several sweeps in the selected measurement window. The query is possible only if averaging is active. The function is independent of the marker selection, i.e. the numeric suffix <1 to 4> of `:MARKer` is irrelevant. It is only available in the time domain (span = 0).

A complete sweep with synchronization to sweep end must be performed between switching on the function and querying the measured value to obtain a valid query result. This is only possible in single sweep mode.

Example:	`"INIT:CONT OFF"`	'Switches to single-sweep mode.
	`"CALC:MARK:FUNC:SUMM:SDEV ON"`	'Switches on the function in screen A.
	`"CALC:MARK:FUNC:SUMM:AVER ON"`	'Switches on the calculation of average 'in screen A.
	`"INIT;*WAI"`	'Starts a sweep and waits for the end.
	`"CALC:MARK:FUNC:SUMM:MEAN:SDEV:RES?"`	'Outputs the result of screen A.

Characteristics: *RST value: -
SCPI: device-specific

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

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:SDEViation:PHOLd:RESult?

This command queries the maximum standard deviation value determined in several sweeps in the selected measurement window. The query is possible only if the peak hold function is active.

The function is independent of the marker selection, i.e. the numeric suffix <1 to 4> of `:MARKer` is irrelevant. It is only available in the time domain (span = 0).

A complete sweep with synchronization to sweep end must be performed between switching on the function and querying the measured value to obtain a valid query result. This is only possible in single sweep mode.

Example:

```
"INIT:CONT OFF"                          'Switches to single-sweep mode.
"CALC:MARK:FUNC:SUMM:SDEV ON"            'Switches on the function in screen A.
"CALC:MARK:FUNC:SUMM:PHOL ON"            'Switches on the peak value
                                         'measurement in screen A.
"INIT;*WAI"                              'Starts a sweep and waits for the end.
"CALC:MARK:FUNC:SUMM:SDEV:PHOL:RES?"     'Outputs the result of screen A.
```

Characteristics: *RST value: -
SCPI: device-specific

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

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:PHOLd ON | OFF

This command switches on or off the peak-hold function for the active time domain power measurement in the indicated measurement window. The function is independent of the marker selection, i.e. the numeric suffix <1 to 4> of `:MARKer` is irrelevant. It is only available in the time domain (span = 0).

The peak-hold function is reset by switching it off and on again.

Example:

```
"CALC:MARK:FUNC:SUMM:PHOL ON"  'Switches on the function in screen A.
```

Characteristics: *RST value: OFF
SCPI: device-specific

The peak-hold function is reset by switching off and on, again.

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:AVERage ON | OFF

This command switches on or off averaging for the active time domain power measurement in the indicated window. The function is independent of the marker selection, i.e. the numeric suffix <1 to 4> of `:MARKer` is irrelevant. It is only available in the time domain (span = 0).

Averaging is reset by switching it off and on again.

The number of results required for the calculation of average is defined with `[SENSe<1|2>:]AVERage:COUNt`.

It should be noted that synchronization to the end of averaging is only possible in single sweep mode.

Example:

```
"INIT:CONT OFF"                 'Switches to single-sweep mode.
"CALC2:MARK:FUNC:SUMM:AVER ON"  'Switches on the calculation of average
                                'in screen B.
"AVER:COUN 200"                 'Sets the measurement counter to 200.
"INIT;*WAI"                     'Starts a sweep and waits for the end.
```

Characteristics: *RST value: OFF
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:MODE ABSolute | RELative

This command selects absolute or relative time domain power measurement in the indicated measurement window. The function is independent of the marker selection, i.e. the numeric suffix <1 to 4> of `:MARKer` is irrelevant. It is only available in the time domain (span = 0).

The reference power for relative measurement is defined with `CALCulate:MARKer:FUNCtion :SUMMary:REFerence:AUTO ONCE`. If the reference power is not defined, the value 0 dBm is used.

Example: `"CALC:MARK:FUNC:SUMM:MODE REL"`
'Switches the time domain power
'measurement to relative.

Characteristics: *RST value: ABSolute
SCPI: device-specific

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:REFerence:AUTO ONCE

With this command the currently measured average value (`..:SUMMary:MEAN)` and RMS value (`..:SUMMary:RMS)` are declared as reference values for relative measurements in the indicated measurement window. The function is independent of the marker selection, i.e. the numeric suffix <1 to 4> of `:MARKer` is irrelevant. It is only available in the time domain (span = 0).

If the measurement of RMS value and average is not activated, the reference value 0 dBm is used.

If the function `...:SUMMary:AVERage` or `...:SUMMary:PHOLd` is switched on, the current value is the accumulated measurement value at the time considered.

Example: `"CALC:MARK:FUNC:SUMM:REF:AUTO ONCE"`
'Takes the currently measured power in
'screen A as reference value for the relative
'time domain power measurement.

Characteristics: *RST value: -
SCPI: device-specific

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

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMary:AOFF

This command switches off all time domain measurements in the selected measurement window. The function is independent of the marker selection, i.e. the numeric suffix <1 to 4> of `:MARKer` is irrelevant. It is only available in the time domain (span = 0).

Example: `"CALC2:MARK:FUNC:SUMM:AOFF"` 'Switches off the time domain power
'measurement functions in screen B.

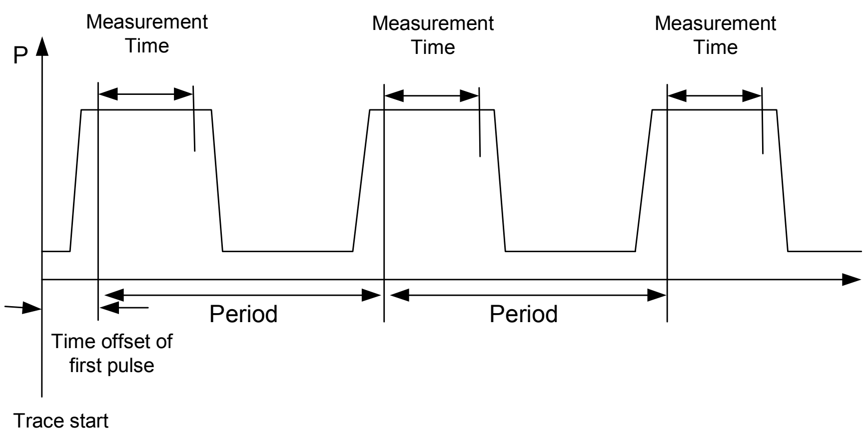
Characteristics: *RST value: _
SCPI: device-specific

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

CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:MSUMmary? <time offset of first pulse>, <measurement time>, <period>, < # of pulses to measure>

The commands of this subsystem are used to determine the power of a sequence of signal pulses having the same interval, as are typical for the slots of a GSM signal, for example. The number of pulses to be measured as well as the measurement time and the period can be set. To define the position of the first pulse in the trace, a suitable offset can be entered.

The evaluation is performed on the measurement data of a previously recorded trace. The data recorded during the set measurement time is combined to a measured value for each pulse according to the detector specified and the indicated number of results is output as a list.



TRACE 1 of the selected screen is always used by the function. The suffix of MARKer will be ignored.

Example:

"DISP:WIND:TRAC:Y:RLEV -10dBm"	'Sets the reference level to 10 dB
"INP:ATT 30 dB"	'Sets the input attenuation to 30 dB
"FREQ:CENT 935.2MHz;SPAN 0Hz"	'Sets the receive frequency to 935.2 MHz 'and the span to 0 Hz
"BAND:RES 1MHz;VID 3MHz"	'Sets the resolution bandwidth to 1 MHz 'and the video bandwidth to 3 MHz
"DET RMS"	'Sets the RMS detector
"TRIG:SOUR VID;LEV:VID 50 PCT"	'Selects the trigger source VIDeo and sets the level of the video trigger source to 50 PCT
"SWE:TIME 50ms"	'Sets the sweep time to 50 ms
"INIT;*WAI"	'Starts the measurement with 'synchronization
"CALC:MARK:FUNC:MSUM? 50US,450US,576.9US,8"	'Queries 8 bursts with an offset of 50 µs, a 'test time of 450 µs and a period of 576.9 µs

Characteristics: *RST value: -
SCPI: device-specific

CALCulate:MATH Subsystem

The CALCulate:MATH subsystem allows to process data from the SENSe-subsystem in numeric expressions. The measurement windows are selected by CALCulate1 (screen A) or CALCulate2 (screen B).

COMMAND	PARAMETERS	UNIT	COMMENT
CALCulate<1|2>			
:MATH			
[:EXPRession]			
[:DEFine]	<expr>	--	
:POSition	<numeric_value>	PCT	
:STATe	<Boolean>	--	
:MODE	LINear | LOGarithmic	--	

CALCulate<1|2>:MATH[:EXPression][:DEFine] <expr>

This command defines the mathematical expression for relating traces to trace1.

The zero point of the result display can be defined with `CALC:MATH:POS`. Command `CALCulate:MATH:STATe` switches the mathematical relation of traces on or off .

Parameter: <expr>::= ‘OP1 - OP2’
OP1 ::= TRACE1
OP2 ::= TRACE2 | TRACE3

Example: `"CALC1:MATH (TRACE1 - TRACE2)"` 'Selects the subtraction of trace 1 'from trace 2 in screen A.

`"CALC2:MATH (TRACE1 - TRACE3)"` 'Selects the subtraction of trace 1 'from trace 3 in screen B.

Characteristics: *RST value: -
SCPI: conforming

CALCulate<1|2>:MATH:POSition -100PCT to 200PCT

This command defines the position of the result of the trace mathematics in the selected measurement window. The indication is in % of the screen height, with 100% corresponding to the upper diagram border.

Example: `"CALC:MATH:POS 50PCT"` 'Sets the position in screen A to the 'horizontal diagram center.

Characteristics: *RST value: 50 %
SCPI: device-specific

CALCulate<1|2>:MATH:STATe ON | OFF

This command switches the mathematical relation of traces on or off.

Example:	"CALC:MATH:STAT ON"	'Switches on the trace mathematics in 'screen A.

Characteristics:	*RST value:	OFF
	SCPI:	conforming

CALCulate<1|2>:MATH:MODE LINear | LOGarithmic

This command selects linear or logarithmic (= video) calculation of the mathematical functions related to the traces. The calculation of the average is one of the affected functions. The setting is valid for all measurement windows, i.e. the numeric suffix <1|2> of CALCulate is irrelevant.

Example:	"CALC:MATH:MODE LIN"	'Switches on the linear calculation.

Characteristics:	*RST value:	LOG
	SCPI:	device-specific

CALCulate:STATistics Subsystem

The CALCulate:STATistics subsystem controls the statistical measurement functions in the instrument. The measurement window cannot be selected with these functions. The numeric suffix in CALCulate is therefore ignored.

Note: *The commands of this subsystem are not available during GSM measurements.*

COMMAND	PARAMETERS	UNIT	COMMENT
CALCulate			
:STATistics			
:APD			
[:STATe]	<Boolean>	--	
:CCDF			
[:STATe]	<Boolean>	--	
:NSAMples	<numeric_value>		
:SCALe			
:AUTO	ONCE		
:X			
:RLEVel	<numeric_value>	DBM	
:RANGe	<numeric_value>	DB	
:Y			
:UPPer	<numeric_value>		
:LOWer	<numeric_value>		
:PRESet			
:RESult<1 to 3>?	MEAN | PEAK | CFACtor | ALL		query only

CALCulate:STATistics:APD[:STATe] ON | OFF

This command switches on or off the measurement of amplitude distribution (APD). On activating this function, the CCDF measurement is switched off.

Example: "`CALC:STAT:APD ON`" 'Switches on the APD measurement.

Characteristics: *RST value: OFF
SCPI: device-specific

CALCulate:STATistics:CCDF[:STATe] ON | OFF

This command switches on or off the measurement of the complementary cumulative distribution function (CCDF). On activating this function, the APD measurement is switched off.

Example: "`CALC:STAT:CCDF ON`" 'Switches on the `CCDF` measurement.

Characteristics: *RST value: OFF
SCPI: device-specific

CALCulate:STATistics:NSAMples 100 to 1E9

This command sets the number of measurement points to be acquired for the statistical measurement functions.

Example: "CALC:STAT:NSAM 500" 'Sets the number of measurement points to be 'acquired to 500.

Characteristics: *RST value: 100000
SCPI: device-specific

CALCulate:STATistics:SCALe:AUTO ONCE

This command optimizes the level setting of the instrument depending on the measured peak power, in order to obtain maximum instrument sensitivity.

To obtain maximum resolution, the level range is set as a function of the measured spacing between peak power and the minimum power for the APD measurement and of the spacing between peak power and mean power for the CCDF measurement. In addition, the probability scale for the number of test points is adapted.

Note:
*Subsequent commands have to be synchronized with *WAI, *OPC or *OPC? to the end of the autorange process which would otherwise be aborted.*

Example: "CALC:STAT:SCAL:AUTO ONCE;*WAI" 'Adapts the level setting for 'statistical measurements.

Characteristics: *RST value: --
SCPI: device-specific

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

CALCulate:STATistics:SCALe:X:RLEVel -130dBm to 30dBm

This command defines the reference level for the X axis of the measurement diagram. The setting is identical to the reference level setting using the command `DISPlay:WINDow:TRACe:Y: RLEVel`.

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 performed with `CALC:UNIT`.

Example: "CALC:STAT:SCAL:X:RLEV -60dBm"

Characteristics: *RST value: -20dBm
SCPI: device-specific

CALCulate:STATistics:SCALe:X:RANGe 10dB to 200dB

This command defines the level range for the X axis of the measurement diagram. The setting is identical to the level range setting defined with the command `DISPlay:WINDow:TRACe:Y:SCALe`.

Example: "`CALC:STAT:SCAL:X:RANG 20dB`"

Characteristics: *RST value: 100dB
SCPI: device-specific

CALCulate:STATistics:SCALe:Y:UPPer 1E-8 to 1.0

This command defines the upper limit for the Y axis of the diagram in statistical measurements. Since probabilities are specified on the Y axis, the entered numerical values are dimensionless.

Example: "`CALC:STAT:Y:UPP 0.01`"

Characteristics: *RST value: 1.0
SCPI: device-specific

CALCulate:STATistics:SCALe:Y:LOWer 1E-9 to 0.1

This command defines the lower limit for the Y axis of the diagram in statistical measurements. Since probabilities are specified on the Y axis, the entered numerical values are dimensionless.

Example: "`CALC:STAT:SCAL:Y:LOW 0.001`"

Characteristics: *RST value: 1E-6
SCPI: device-specific

CALCulate:STATistics:PRESet

This command resets the scaling of the X and Y axes in a statistical measurement. The following values are set:

X axis ref level: -20 dBm
X axis range APD: 100 dB
X axis range CCDF: 20 dB

Y axis upper limit: 1.0
Y axis lower limit: 1E-6

Example: "`CALC:STAT:PRES`" 'Resets the scaling for statistical functions

Characteristics: *RST value: --
SCPI: device-specific

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

CALCulate:STATistics:RESult<1 to 3>? MEAN | PEAK | CFACtor | ALL

This command reads out the results of statistical measurements of a recorded trace. The trace is selected with the numeric suffix <1 to 3> attached to RESult.

Parameter: The required result is selected via the following parameters:

MEAN	Average (=RMS) power in dBm measured during the measurement time.
PEAK	Peak power in dBm measured during the measurement time.
CFACtor	Determined CREST factor (= ratio of peak power to average power) in dB.
ALL	Results of all three measurements mentioned before, separated by commas: <mean power>,<peak power>,<crest factor>

Example: "`CALC:STAT:RES2? ALL`"
'Reads out the three measurement results of
'trace 2. Example of answer string:
'5.56,19.25,13.69
'i.e. mean power: 5.56 dBm, peak power 19.25
'dBm, CREST factor 13.69 dB

Characteristics: *RST value: --
SCPI: device-specific

CALCulate:THReshold Subsystem

The CALCulate:THReshold subsystem controls the threshold value for the maximum/minimum search of markers. The measurement windows are selected by CALCulate 1 (screen A) or 2 (screen B).

COMMAND	PARAMETERS	UNIT	COMMENT
CALCulate<1|2>			
:DLINe<1|2>	<numeric_value>	DBM | DB | DEG | RAD | S | HZ | PCT	
:STATe	<Boolean>		
:THReshold	<numeric_value>	DBM | DB	
:STATe	<Boolean>		
:FLINe<1|2>	<numeric_value>	HZ	
:STATe	<Boolean>		
:TLINe<1|2>	<numeric_value>	S	
:STATe	<Boolean>		

CALCulate<1|2>:DLINe<1|2> MINimum .. MAXimum (depending on current unit)

This command defines the position of Display Line 1 or 2. These lines enable the user to mark any levels in the diagram. The unit depends on the setting made with `CALC:UNIT`.

Example: "`CALC:DLIN -20dBm`"

Characteristics: *RST value: - (STATe to OFF)
SCPI: device-specific

CALCulate<1|2>:DLINe<1|2>:STATe ON | OFF

This command switches Display Line 1 or 2 (level lines) on or off.

Example: "`CALC:DLIN2:STAT OFF`"

Characteristics: *RST value: OFF
SCPI: device-specific

CALCulate<1|2>:THReshold MINimum to MAXimum (depending on current unit)

This command defines the threshold value for the maximum/minimum search of markers with marker search functions MAX PEAK, NEXT PEAK, etc in the selected measurement window. The associated display line is automatically switched on.

Example: "`CALC:THR -82DBM`" 'Sets the threshold value for screen A to -82 dBm.

Characteristics: *RST value: - (STATe to OFF)
SCPI: device-specific

CALCulate<1|2>:THReshold:STATe ON | OFF

This command switches on or off the threshold line in the selected measurement window. The unit depends on the setting performed with `CALC:UNIT`.

Example: "`CALC2:THR:STAT ON`" 'Switches on the threshold line in screen B.

Characteristics: *RST value: OFF
SCPI: device-specific

CALCulate<1|2>:FLINe<1|2> 0...f_{max}

This command defines the position of the frequency lines.

The frequency lines mark the frequencies specified in the measurement window. Frequency lines are only available with SPAN > 0.

Example: "CALC:FLIN2 120MHz"

Characteristics: *RST value: - (STATe to OFF)
SCPI: device-specific

CALCulate<1|2>:FLINe<1|2>:STATe ON | OFF

This command switches the frequency line on or off.

Example: "`CALC:FLIN2:STAT ON`"

Characteristics: *RST value: OFF
SCPI: device-specific

CALCulate<1|2>:TLINe<1|2> 0 ... 1000s

This command defines the position of the time lines.

The time lines mark the times specified in the measurement window. Time lines are only available with SPAN = 0.

Example: "`CALC:TLIN 10ms`"

Characteristics: *RST value: - (STATe to OFF)
SCPI: device-specific

CALCulate<1|2>:TLINe<1|2>:STATe ON | OFF

This command switches the time line on or off.

Example: "`CALC:TLIN2:STAT ON`"

Characteristics: *RST value: OFF
SCPI: device-specific

CALCulate:UNIT Subsystem

The CALCulate:Unit subsystem defines the units for power measurement settings.

COMMAND	PARAMETERS	UNIT	COMMENT
CALCulate<1|2> :UNIT :POWer	DBM | V | A | W | DB | PCT | UNITLESS | DBPW | WATT | DBUV | DBMV | VOLT | DBUA | AMPere |		

CALCulate<1|2>:UNIT:POWer DBM | V | A | W | DB | PCT | UNITLESS |DBPW | WATT | DBUV | DBMV | VOLT | DBUA | AMPere

This command selects the unit for power in the selected measurement window.

During GSM measurements the unit is either dBm (power measurements) or deg (phase error measurements).

Example: "`CALC:UNIT:POW DBM`" 'Sets the power unit for screen A to dBm.

Characteristics: *RST value: dBm
SCPI: device-specific

CALibration Subsystem

The commands of the CALibration subsystem determine the data for system error correction in the instrument.

COMMAND	PARAMETERS	UNIT	COMMENT
CALibration			
[:ALL]?	--	--	query only
:ABORt	--	--	no query
:RESult?	--	--	query only
:STATe	<Boolean>	--	

CALibration[:ALL]?

This command initiates the acquisition of system error correction data. A "0" is returned if the acquisition was successful.

Note: *During the acquisition of correction data the instrument does not accept any remote control commands, except*
**RST*
CALibration:ABORt

In order to recognize when the acquisition of correction data is completed, the MAV bit in the status byte can be used. If the associated bit is set in the Service Request Enable Register, the instrument generates a service request after the acquisition of correction data has been completed.

Example: "`*CLS`" 'Resets the status management.
"`*SRE 16`" 'Enables MAV bit in the Service Request Enable Register.
"`*CAL?`" 'Starts the correction data recording and then a service 'request is generated.

Characteristics: *RST value: -
SCPI: conforming

CALibration:ABORt

This command aborts the acquisition of correction data and restores the last complete correction data set.

Example: "`CAL:ABOR`"

Characteristics: *RST value: -
SCPI: device-specific

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

CALibration:RESult?

This command outputs the results of the correction data acquisition. The lines of the result table (see section "Recording the correction data of R&S FSMR – *CAL* key") are output as string data separated by commas:

```
"Total Calibration Status: PASSED","Date (dd/mm/yyyy): 12/07/1999",
"Time: 16:24:54","Runtime:00.06"
```

Example: "`CAL:RES?`"

Characteristics: *RST value: --
SCPI: device-specific

CALibration:STATe ON | OFF

This command determines whether the current calibration data are taken into account by the instrument (ON) or not (OFF).

Example: "`CAL:STAT OFF`" 'Sets up the instrument to ignore the calibration data.

Characteristics: *RST value: -
SCPI: conforming

DIAGnostic Subsystem

The DIAGnostic subsystem contains the commands which support instrument diagnostics for maintenance, service and repair. In accordance with the SCPI standard, all of these commands are device-specific.
The measurement windows are selected by DIAGnostic1 (screen A) or DIAGnostic2 (screen B) .

COMMAND	PARAMETERS	UNIT	COMMENT
DIAGnostic<1|2>			
:SERVice			
:INPut			
[:SELect]	CALibration | RF	--	
:PULSed			
[:STATe]	<Boolean>		
:PRATe	<numeric_value>	Hz	
:SFUNction	<string>		no query
:NSOurce	<Boolean>		
:CSOurce			
[:POWer]	<numeric_value>	DBM	
:STESt			
:RESult?			query only
:HWINfo?			query only

DIAGnostic<1|2>:SERVice:INPut[:SELect] CALibration | RF

This command toggles between the RF input on the front panel and the internal 128-MHz reference signal in the selected measurement window. The level of the 128-MHz signals can be selected by command `DIAG:SERV:CSOurce`.

Example: `"DIAG:SERV:INP CAL"`

Characteristics: *RST value: RF
SCPI: device-specific

DIAGnostic<1|2>:SERVice:INPut:PULSed[:STATe] ON | OFF

This command toggles the calibration signal in the selected measurement window between pulsed and non-pulsed. The selection takes effect only if the RF input has been set to the internal reference signal using `DIAG:SERV:INP CAL`.

Example: `"DIAG:SERV:INP CAL;`
`DIAG:SERV:INP:PULS ON"`

Characteristics: *RST value: OFF
SCPI: device-specific

DIAGnostic<1|2>:SERVice:INPut:PULSed:PRATe 10 kHz | 62.5 kHz | 1 MHz | 128 MHz | 640 MHz

This command selects the pulse rate for the pulsed calibration signal in the selected measurement window.

Available pulse frequencies are 10 kHz, 62.5 kHz, 100 kHz, 1 MHz, 128 MHz and 640 MHz.

Example: `"DIAG:SERV:INP:PRAT 128 MHz"`

Characteristics: *RST value: 128 MHz
SCPI: device-specific

DIAGnostic<1|2>:SERVice:SFUNction <string>...

This command activates a service function which can be selected by indicating the five parameters: function group number, board number, function number, parameter 1 and parameter 2 (see service manual). The contents of the parameter string is identical to the code to be entered in the data entry field of manual operation.

The entry of a service function is accepted only if the system password Level 1 or Level 2 has been entered previously (command: `SYSTem:SECurity`).

The numeric suffix <1|2> is ignored with this command.

Note: *The service functions of the instrument are not identical to those of the FSE family. That is why the IEC/IEEE-bus command differs in syntax and data format.*

Example: `"DIAG:SERV:SFUN '2.0.2.12.1'"`

Characteristics: *RST value: -
SCPI: device-specific

DIAGnostic<1|2>:SERVice:NSOurce ON | OFF

This command switches the 28-V supply of the noise source at the rear panel on or off.

The numeric suffix <1|2> is ignored with this command.

Example: `"DIAG:SERV:NSO ON"`

Characteristics: *RST value: OFF
SCPI: device-specific

DIAGnostic<1|2>:SERVice:CSOource[:POWer] <numeric_value>

This command switches the level of the 128 MHz reference signal source between 0 dBm and -30 dBm in the selected measurement window.

Example: `"DIAG:SERV:CSO 0DBM"`

Characteristics: *RST value: -30 dBm
SCPI: device-specific

DIAGnostic<1|2>:SERVice:STESt:RESult?

This command reads the results of the selftest out of the instrument. The lines of the result table are output as string data separated by commas:

```
"Total Selftest Status: PASSED","Date (dd/mm/yyyy): 09/07/1999
TIME: 16:24:54","Runtime: 00:06","...
```

The numeric suffix <1|2> is ignored with this command.

Example: `"DIAG:SERV:STES:RES?"`

Characteristics: *RST value: --
SCPI: device-specific

DIAGnostic<1|2>:SERVice:HWINfo?

This command queries the contents of the module info table. Table lines are output as string data and are separated by commas.

"<component 1>|<serial #>|<order #>|<model>|<HWC>|<rev>|<sub rev>",
"<component 2>|<serial #>|<order #>|<model>|<HWC>|<rev>|<sub rev>",...

The individual columns of the table are separated from each other by '|'.

The numeric suffix <1|2> is ignored with this command.

Example: `"DIAG:SERV:HWIN?"`

Result (shortened):

```
"RF_ATTEN_7|650551/007|1067.7684|02|00|20|04",
"IF-FILTER|648158/037|1093.5540|03|01|07|05",
...
```

Characteristics: *RST value: --
SCPI: device-specific

DISPlay Subsystem

The DISPLay subsystem controls the selection and presentation of textual and graphic information as well as of measurement data on the display.
The measurement windows are selected by WINDow1 (screen A) or WINDow2 (screen B) .

COMMAND	PARAMETERS	UNIT	COMMENT
:FORMat	SINGle|SPLit		
:ANNotation			
:FREQuency	<Boolean>		
:LOGO	<Boolean>		
:PSAVe			
[:STATe]	<Boolean>		
:HOLDoff	1...60	--	
:CMAP<1...26>			
:DEFault<1|2>			
:HSL	0..1,0..1,0..1		
:PDEFined	BLACk | BLUE | BROWn | GREen | CYAN | RED | MAGenta | YELLow | WHITe | DGRAy | LGRAy | LBLUe | LGREen | LCYan | LRED | LMAGenta		
[:WINDow<1|2>]			
:SELect			no query
:SIZE	LARGe|SMALl		
:TEXT			
[:DATA]	<string>		
:STATe	<Boolean>		
:TIME	<Boolean>		
:TRACe<1...3>			
:X			
:Y			
[:SCALe]	<numeric_value>	DB	
:MODE	ABSolute | RELative		
:RLEVel	<numeric_value>	DBM	
:OFFSet	<numeric_value>	DB	
:RVALue	<numeric_value>	DB | HZ	
:RPOSition	<numeric_value>	PCT	
:PDIVision	<numeric_value>	DBM|DB|HZ|	Option FM Demodulator (FS-K7)
:SPACing	LINear|LOGarithmic|LDB	--	
:MODE	WRITe|VIEW|AVERage|MAXHold|MINHold|RMS	--	
[:STATe]	<Boolean>	--	

DISPlay:FORMat SINGle | SPLit

This command switches the measurement result display between FULL SCREEN and SPLIT SCREEN. The coupling of settings between screen A and screen B can be selected with the command `INSTrument:COUPle`.
In full-screen display the active measurement window can be selected with `DISPlay:WINDow<1|2>:SELect`.

For GSM/EDGE mode, the display is always set to FULL SCREEN.

Example: "`DISP:FORM SPL`" 'Switches the display to 2 measurement windows.

Characteristics: *RST value: SINGle
SCPI: device-specific

DISPlay:ANNotation:FREQuency ON | OFF

This command switches the X axis annotation on or off.

Example: "`DISP:ANN:FREQ OFF`"

Characteristics: *RST value: ON
SCPI: conforming

DISPlay:LOGO ON | OFF

This command switches the company logo on the screen on or off.

Example: "`DISP:LOGO OFF`"

Characteristics: *RST value: ON
SCPI: device-specific

DISPlay:PSAVe[:STATe] ON | OFF

This command switches on or off the power-save mode of the display. With the power-save mode activated the display including backlight is completely switched off after the elapse of the response time (see command `DISPlay:PSAVe:HOLDoff`).

Note: *This mode is recommended for preserving the display especially if the instrument is exclusively operated via remote control.*

Example: "`DISP:PSAVe ON`" 'Switches on the power-save mode.

Characteristics: *RST value: OFF
SCPI: device-specific

DISPlay:PSAVe:HOLDoff 1 to 60

This command sets the holdoff time for the power-save mode of the display. The available value range is 1 to 60 minutes, the resolution 1 minute. The entry is dimensionless.

Example: "`DISP:PSAV:HOLD 30`"

Characteristics: *RST value: 15
SCPI: device-specific

DISPlay:CMAP<1 to 26>:DEFault<1|2>

This command resets the screen colors of all display items to their default settings. Two default settings DEFault1 and DEFault2 are available. The numeric suffix of CMAP is irrelevant.

Example: "`DISP:CMAP:DEF2`" 'Selects default setting 2 for setting the colors.

Characteristics: *RST value: --
SCPI: conforming

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

DISPlay:CMAP<1 to 26>:HSL <hue>,<sat>,<lum>

This command defines the color table of the instrument.

Each numeric suffix of CMAP is assigned one or several graphical elements which can be modified by varying the corresponding color setting. The following assignment applies:

CMAP1	Background
CMAP2	Grid
CMAP3	Function field + status field + data entry text
CMAP4	Function field LED on
CMAP5	Function field LED warn
CMAP6	Enhancement label text
CMAP7	Status field background
CMAP8	Trace 1
CMAP9	Trace 2
CMAP10	Trace 3
CMAP11	Marker
CMAP12	Lines
CMAP13	Measurement status + limit check pass
CMAP14	Limit check fail
CMAP15	Table + softkey background
CMAP16	Table + softkey text
CMAP17	Table selected field text
CMAP18	Table selected field background
CMAP19	Table + data entry field opaq titlebar
CMAP20	Data entry field opaq text
CMAP21	Data entry field opaq background
CMAP22	3D shade bright part
CMAP23	3D shade dark part
CMAP24	Softkey state on
CMAP25	Softkey state data entry
CMAP26	Logo

Parameter: hue = TINT
sat = SATURATION
lum = BRIGHTNESS

The value range is 0 to 1 for all parameters.

Example: "`DISP:CMAP2:HSL 0.3,0.8,1.0`" Changes the grid color.

Characteristics: *RST value: --
SCPI: conforming

The values set are not changed by *RST.

DISPlay:CMAP<1 to 26>:PDEFined BLACk | BLUE | BROWn | GREEn | CYAN | RED | MAGenta | YELLow | WHITe | DGRAy | LGRAy | LBLUe | LGREen | LCYan | LRED | LMAGenta

This command defines the color table of the instrument using predefined color values. Each numeric suffix of CMAP is assigned one or several graphical elements which can be modified by varying the corresponding color setting.
The same assignment as for `DISPlay:CMAP<1 to 26>:HSL` applies.

Example: "`DISP:CMAP2:PDEF GRE`"

Characteristics: *RST value: --
SCPI: conforming

The values set are not changed by *RST.

DISPlay[:WINDow<1|2>]:SELect

This command selects the active measurement window. WINDow1 corresponds to SCREEN A, WINDow2 to SCREEN B.
In FULL SCREEN mode, the measurements are only performed in the active measurement window. Measurements are therefore initiated in the active window and result queries (marker, trace data and other results) answered also in the active window.
Initiating measurements and queryíng results in the inactive window yields an error message (execution error).

In split screen mode, the selection of the active window for result queries is irrelevant.

Note: **-** *In FULL SCREEN mode, settings can also be performed in the inactive measurement window. They become effective as soon as the corresponding window becomes active.*

Example: "`DISP:WIND2:SEL` 'Selects SCREEN B as active measurement window.

Characteristics: *RST value: SCREEN A active
SCPI: device-specific

This command is an event and therefore has no query.

DISPlay[:WINDow<1|2>]:SIZE LARGe | SMALl

This command switches the measurement window for channel and adjacent-channel power measurements or for active FM Demodulator (FS-K7) to full screen or half screen. Only "1" is allowed as a numerical suffix.

Example: "`DISP:WIND1:SIZE LARG`"'Switches the measurement window to full screen.

Characteristics: *RST value: SMALl
SCPI: device-specific

DISPlay[:WINDow<1|2>]:TEXT[:DATA] <string>

This command defines a comment (max. 20 characters) which can be displayed on the screen in the selected measurement window.

Example: "`DISP:WIND2:TEXT 'Noise Measurement'`" 'Defines the title for screen B

Characteristics: *RST value: "" (empty)
SCPI: conforming

DISPlay[:WINDow<1|2>]:TEXT:STATe ON | OFF

This command switches on or off the display of the comment (screen title) in the selected measurement window.

Example: "`DISP:TEXT:STAT ON`" 'Switches on the title of screen B.

Characteristics: *RST value: OFF
SCPI: conforming

DISPlay[:WINDow<1|2>]:TIME ON | OFF

This command switches on or off the screen display of date and time. The numeric suffix in WINDow<1| 2> is irrelevant.

Example: "`DISP:TIME ON`"

Characteristics: *RST value: OFF
SCPI: device-specific

DISPlay[:WINDow<1|2>]:TRACe<1 to 3>:Y[:SCALe]:RLEVel:AUTO<] ON | OFF

This command activates the autoranging function. This function automatically adapts the attenuation and IF gain and, if a preamplifier is installed, the preamplification to the RF input signal.

Example: "`DISP:WIND1:TRAC:Y:RLEV:AUTO ON`"

Characteristics: *RST value: ON
SCPI: device-specific

DISPlay[:WINDow<1|2>]:TRACe<1 to 3>:Y[:SCALe] 10dB to 200dB

This command defines the display range of the Y axis (level axis) in the selected measurement window with logarithmic scaling (`DISP:TRAC:Y:SPAC LOG`).
For linear scaling, (`DISP:TRAC:Y:SPAC LIN | PERC`) the display range is fixed and cannot be modified. The numeric suffix in TRACe<1 to 3> is irrelevant.

Example: "`DISP:TRAC:Y 110dB`"

Characteristics: *RST value: 100dB
SCPI: device-specific

DISPlay[:WINDow<1|2>]:TRACe<1 to 3>:Y[:SCALe]:MODE ABSolute | RELative

This command defines the scale type of the Y axis (absolute or relative) in the selected measurement window.
When `SYSTem:DISPlay` is set to `OFF,` this command has no immediate effect on the screen. The numeric suffix in TRACe<1 to 3> is irrelevant.

Example:	"`DISP:TRAC:Y:MODE REL`"	
Characteristics:	*RST value:	ABS
	SCPI:	device-specific

DISPlay[:WINDow<1|2>]:TRACe<1 to 3>:Y[:SCALe]:RLEVel –130dBm to 30dBm

This command defines the reference level in the selected measurement window. Depending on the coupling of the measurement windows, it is valid for both screens (`INSTrument:COUPle ALL`) or only for the selected measurement window (`INSTrument:COUPle NONE`).
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 `CALCulate:UNIT`. The numeric suffix in TRACe<1 to 3> is irrelevant.

Example:	"`DISP:TRAC:Y:RLEV -60dBm`"	
Characteristics:	*RST value:	-20dBm
	SCPI:	conforming

DISPlay[:WINDow<1|2>]:TRACe<1 to 3>:Y[:SCALe]:RLEVel:OFFSet –200dB to 200dB

This command defines the offset of the reference level in the selected measurement window. Depending on the coupling of the measurement windows, it is valid for both screens (`INSTrument:COUPle ALL`) or only for the selected measurement window (`INSTrument:COUPle NONE`).

The numeric suffix at TRACe<1 to 3> is irrelevant.

Example:	"`DISP:TRAC:Y:RLEV:OFFS -10dB`"	
Characteristics:	*RST value:	0dB
	SCPI:	conforming

DISPlay[:WINDow<1|2>]:TRACE<1 to 3>:Y[:SCALe]:RVALue <numeric_value>

If the external generator control option (FSP-B10) is mounted and the normalization in the NETWORK mode is activated, this value defines the power value assigned to the reference position in the selected measurement window. This value corresponds to the parameter REFERENCE VALUE in manual operation.

The numeric suffix at TRACe<1 to 3> is irrelevant.

Example:	"`DISP:TRAC:Y:RVAL -20dBm`"	(spectrum analysis)
	"`DISP:TRAC:Y:RVAL 0`"	'Sets the power value assigned to the 'reference position to 0 dB (Tracking Generator/Ext. Generator Control option) or 0 Hz (FM demodulator option FS-K7).

Characteristics:	*RST value:	0 dB (Mode NETWORK) 0 Hz (FM demodulator mode with FM display) 2.5MHz (FM demodulator mode with AF spectrum display of FM) - coupled to reference level 0 dB
	SCPI:	device specific

DISPlay[:WINDow<1|2>]:TRACe<1 to 3>:Y[:SCALe]:RPOSition 0 to 100PCT

This command defines the position of the reference value in the selected measurement window. The numeric suffix in TRACe<1 to 3> is irrelevant.

With the FM Demodulator (FS-K7) switched on, the reference position for result display RF POWER and SPECTRUM is kept separate from that for result display FM.

In operating mode NETWORK (Ext. Generator Option FSP-B10) with active normalization, RPOSition defines the reference point for the output of the normalized measurement results.

Example: `"DISP:TRAC:Y:RPOS 50PCT"`

Characteristics: *RST value: 100PCT(SPECTRUM mode)
50 PCT (NETWORK and FM DEMOD mode)
50 PCT (Mode FM-DEMOD with FM display)
100 PCT(Mode FM-DEMOD with AF spectrum display of FM)
SCPI: conforming

DISPlay[:WINDow<1|2>]:TRACE<1 to 3>:Y[:SCALe]:PDIVision <numeric_value>

This command defines the scaling of the Y axis in the current unit.

Example: `"DISP:TRAC:Y:PDIV +1.20"`

Characteristics: *RST value: -
SCPI: conforming

The numeric suffix in TRACE<1 to 3> is irrelevant.

DISPlay[:WINDow<1|2>]:TRACe<1 to 3>:Y:SPACing LINear | LOGarithmic| LDB

This command toggles between linear and logarithmic display in the selected measurement window. On a linear scale, switchover between the unit % (command `DISP:WIND:TRAC:Y:SPAC LIN`) and the unit dB (command `DISP:WIND:TRAC:Y:SPAC LDB`) is also possible.

If the FM Demodulator (FS-K7) is active and result display AF spectrum of FM is selected, only the parameters LINear and LOGarithmic are permissible.

The numeric suffix in TRACe<1 to 3> is irrelevant.

Example: `"DISP:TRAC:Y:SPAC LIN"`

Characteristics: *RST value: LOGarithmic
SCPI: conforming

DISPlay[:WINDow<1|2>]:TRACe<1 to 3>:MODE WRITe | VIEW | AVERage | MAXHold | MINHold

This command defines the type of display and the evaluation of the traces in the selected measurement window. WRITE corresponds to the Clr/Write mode of manual operation. The trace is switched off (= BLANK in manual operation) with `DISP:WIND:TRAC:STAT OFF`.

The number of measurements for AVERage, MAXHold and MINHold is defined with the command `SENSe:AVERage:COUNt` or `SENSe:SWEep:COUNt`. It should be noted that synchronization to the end of the indicated number of measurements is only possible in single sweep mode.

If calculation of average values is active, selection between logarithmic and linear averaging is possible. For more detail see command `SENSe:AVERage:TYPE`.

Example:

"SWE:CONT OFF"	Switching to single-sweep mode.
"SWE:COUN 16"	'Sets the number of measurements to 16.
"DISP:WIND1:TRAC3:MODE MAXH"	'Switches on the calculation of the for 'trace 3 in screen A.
"INIT;*WAI"	'Starts the measurement and waits for the end of the '16 sweeps.

Characteristics: *RST value: WRITe for TRACe1, STATe OFF for TRACe2/3
SCPI: device-specific

DISPlay[:WINDow<1|2>]:TRACE<1 to 3>[:STATe] ON | OFF

This command switches on or off the display of the corresponding trace in the selected measurement window.

Example: "DISP:WIND1:TRAC3 ON"

Characteristics: *RST value: ON for TRACe1, OFF for TRACe2 to 4
SCPI: conforming

FORMat Subsystem

The FORMat subsystem specifies the data format of the data transmitted from and to the instrument.

COMMAND	PARAMETERS	UNIT	COMMENT
FORMat			
[:DATA]	ASCii|REAL|UINT[,<numeric_value>]	-	
:DEXPort			
:DSEParator	POINt|COMMa		

FORMat[:DATA] ASCii | REAL| UINT [, 8 | 32]

This command specifies the data format for the data transmitted from the instrument to the control PC.

The format settings below are valid for the binary transmission of trace data(see also `TRACE:DATA?`):

Mode SPECTRUM: REAL, 32

Mode 3G FDD: UINT, 8 with bit stream measurement
REAL, 32 otherwise

Example:
```
"FORM REAL,32"
"FORM ASC"
"FORM UINT,8"
```

Characteristics: *RST value: ASCII
SCPI: conforming

The data format is either ASCII or one of the formats REAL . ASCII data are transmitted in plain text, separated by commas. REAL data are transmitted as 32-bit IEEE 754 floating-point numbers in the "definite length block format".

The FORMat command is valid for the transmission of trace data. The data format of trace data received by the instrument is automatically recognized, regardless of the format which is programmed.

Format setting for the binary transmission of trace data (see also `TRACE:DATA?`):

Analyzer mode: REAL, 32

FORMat:DEXPort:DSEParator POINt|COMMA

This command defines which decimal separator (decimal point or comma) is to be used for outputting measurement data to the file in ASCII format. Different languages of evaluation programs (e.g. MS-Excel) can thus be supported.

Example: `"FORM:DEXP:DSEP POIN` 'Sets the decimal point as separator.

Characteristics: *RST value: -- (factory setting is POINt; *RST does not affect setting)
SCPI: device-specific

HCOPy Subsystem

The HCOPy subsystem controls the output of display information for documentation purposes on output devices or files. The instrument allows two independent printer configurations which can be set separately with the numeric suffix <1|2>.

COMMAND	PARAMETERS	UNIT	COMMENT
HCOPy			
:ABORt	--	--	no query
:CMAP<1 to 26>			
:DEFault<1|2|3>			
:HSL	0..1,0..1,0..1		
:PDEFined	BLACk | BLUE | BROWn | GREen | CYAN | RED | MAGenta | YELLow | WHITe | DGRAy | LGRAy | LBLUe | LGREen | LCYan | LRED | LMAGenta		
:DESTination<1|2>	<string>		no query
:DEVice			
:COLor	<Boolean>		
:LANGuage<1|2>	WMF|GDI|EWMF|BMP		
[:IMMediate<1|2>]	--	--	no query
:ITEM			
:ALL			no query
:WINDow<1|2>			
:TABle			
:STATe	<Boolean>		
:TEXT	<string>		
:TRACe			
:STATe	<Boolean>		
:PAGE			
:ORIentation<1|2>	LANDscape|PORTrait		

HCOPy:ABORt

This command aborts a running hardcopy output.

Example: "HCOP:ABOR"

Characteristics: *RST value: -
SCPI: conforming

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

HCOPy:CMAP<1 to 26>:DEFault1|2|3

This command resets the colors for a hardcopy to the selected default settings. DEFault1(SCREEN COLORS, but background white), DEFault2 (OPTIMIZED COLOR SET) and DEFault3 (USER DEFINED). The numeric suffix in CMAP is not significant.

Example: "HCOP:CMAP:DEF2" 'selects OPTIMIZED COLOR SET for the color settings of a hardcopy.

Characteristics: *RST value: --
SCPI: conforming

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

HCOPy:CMAP<1 to 26>:HSL <hue>,<sat>,<lum>

This command defines the color table in USER DEFINED COLORS mode.
To each numeric suffix of CMAP is assigned one or several picture elements which can be modified by varying the corresponding color setting. The following assignment applies:

CMAP1	Background
CMAP2	Grid
CMAP3	Function field + status field + data entry text
CMAP4	Function field LED on
CMAP5	Function field LED warn
CMAP6	Enhancement label text
CMAP7	Status field background
CMAP8	Trace 1
CMAP9	Trace 2
CMAP10	Trace 3
CMAP11	Marker
CMAP12	Lines
CMAP13	Measurement status + Limit check pass
CMAP14	Limit check fail
CMAP15	Table + softkey background
CMAP16	Table + softkey text
CMAP17	Table selected field text
CMAP18	Table selected field background
CMAP19	Table + data entry field opaque titlebar
CMAP20	Data entry field opaque text
CMAP21	Data entry field opaque background
CMAP22	3D shade bright part
CMAP23	3D shade dark part
CMAP24	Softkey state on
CMAP25	Softkey state data entry
CMAP26	Logo

Parameter: hue = tint
sat = saturation
lum = brightness
The value range is 0 to 1 for all parameters

Example: "`HCOP:CMAP2:HSL 0.3,0.8,1.0`"'changes the grid color

Characteristics: *RST value: --
SCPI: conforming

The values set are not changed by *RST.

HCOPy:CMAP<1 to 26>:PDEFined BLACk | BLUE | BROWn | GREen | CYAN | RED | MAGenta | YELLow | WHITe | DGRAy | LGRAy | LBLUe | LGREen | LCYan | LRED | LMAGenta

This command defines the color table in USER DEFINED COLORS using predefined color values. To each numeric suffix of CMAP is assigned one or several picture elements which can be modified by varying the corresponding color setting. The same assignment as for `:HCPOy:CMAP<1 to 26>:HSL` applies

Example: "`HCOP:CMAP2:PDEF GRE`"

Characteristics: *RST value: --
SCPI: conforming

The values set are not changed by *RST.

HCOPy:DESTination<1|2> <string>

This command selects the printer output medium (Disk, Printer or Clipboard) associated with configuration 1 or 2.

Note: *The type of instrument is selected with* `SYSTem:COMMunicate:PRINter:SELect`*, which will automatically select a default output medium. Therefore the command* `HCOPy:DESTination` *should always be sent* ***after*** *setting the device type.*

Parameter: <string>::= `'MMEM' | 'SYST:COMM:PRIN' | 'SYST:COMM:CLIP'`

`'MMEM'`	'Directs the hardcopy to a file. Command `MMEM:NAME` '`<file_name>` defines the file name. All formats can be 'selected for `HCOPy:DEVice:LANGuage`.
`'SYST:COMM:PRIN'`	'Directs the hardcopy to the printer. The printer is 'selected with command '`SYSTEM:COMMunicate:PRINter:SELect`. '`GDI` should be selected for '`HCOPy:DEVice:LANGuage`.
`'SYST:COMM:CLIP'`	'Directs the hardcopy to the clipboard. `EWMF` should be 'selected for `HCOPy:DEVice:LANGuage`.

Example:

`"SYST:COMM:PRIN:SEL2 'LASER on LPT1'"`	'Selects the printer and output 'medium for device 2
`"HCOP:DEST2 'SYST:COMM:PRIN'"`	'Selects the printer interface 'as device 2.

Characteristics: *RST value: -
SCPI: conforming

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

HCOPy:DEVice:COLor ON|OFF

This command selects between color and monochrome hardcopy of the screen.

Example: `"HCOP:DEV:COL ON"`

Characteristics: *RST value: OFF
SCPI: conforming

HCOPy:DEVice:LANGuage<1|2> GDI | WMF | EWMF | BMP

This command determines the data format of the printout.

Parameter:	GDI	Graphics Device Interface: Default format for the output to a printer configured under Windows. Must be selected for the output to the printer interface (`HCOPy:DEVice 'SYST:COMM:PRIN'`). Can be used for the output to a file (`HCOPy:DEVice 'SYST:COMM:MMEM'`). The printer driver configured under Windows is used in this case and a printer-specific file format is thus generated.
	WMF and EWMF	WINDOWS Metafile and Enhanced Metafile Format: Data formats for output files which can be integrated in corresponding programs for documentation purposes at a later time. WMF can only be used for output to a file (`HCOPy:DEVice 'SYST:COMM:MMEM'`) and EWMF also for the output to the clipboard (`HCOPy:DEVice 'SYST:COMM:CLIP'`).
	BMP	Bitmap. Data format for output to files only (`HCOPy:DEVice 'SYST:COMM:MMEM'`).

Example: `"HCOP:DEV:LANG WMF"`

Characteristics: *RST value: -
SCPI: conforming

HCOPy[:IMMediate<1|2>]

This command starts a hardcopy output. The numeric suffix selects which printer configuration (1 or 2) is to be used for the hardcopy output. If there is no suffix, configuration 1 is automatically selected.

`HCOPy:IMM[1]` 'Starts the hardcopy output to device 1 (default).
`HCOPy:IMM2` 'Starts the output to device 2.

Example: `"HCOP"`

Characteristics: *RST value: -
SCPI: conforming

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

HCOPy:ITEM:ALL

This command selects the complete screen to be output.

Example: `"HCOP:ITEM:ALL"`

Characteristics: *RST value: OFF
SCPI: conforming

The hardcopy output is always provided with comments, title, time and date. As an alternative to the whole screen, only traces (commands `'HCOPy:ITEM:WINDow:TRACe: STATe ON'`) or tables (command `'HCOPy:ITEM:WINDow:TABLe:STATe ON'`) can be output.

HCOPy:ITEM:WINDow<1|2>:TABle:STATe ON | OFF

This command selects the output of the currently displayed tables.

Example: "HCOP:ITEM:WIND:TABL:STAT ON"

Characteristics: *RST value: OFF
SCPI: device-specific

The command HCOPy:DEVice:ITEM:WINDow<1|2>:TABle:STATe OFF as well as command HCOPy:DEVice:ITEM:ALL enables the output of the whole screen.

HCOPy:ITEM:WINDow<1|2>:TEXT <string>

This command defines the comment text for measurement window 1 or 2 for printout, with a maximum of 100 characters; line feed by means of character @).

Example: "HCOP:ITEM:WIND2:TEXT 'comment'"

Characteristics: *RST value: -
SCPI: device-specific

HCOPy:ITEM:WINDow<1|2>:TRACe:STATe ON | OFF

This command selects the output of the currently displayed trace.

Example: "HCOP:ITEM:WIND:TRACe:STAT ON"

Characteristics: *RST value: OFF
SCPI: device-specific

The command HCOPy:ITEM:WINDow<1|2>:TRACe:STATe OFF as well as command HCOPy:ITEM:ALL enables the output of the whole screen.

HCOPy:PAGE:ORIentation<1|2> LANDscape | PORTrait

The command selects the format of the output (portrait and landscape) (hardcopy unit 1 or 2).

Note:
The command is only available provided that the output device "printer" (HCOP:DEST 'SYST:COMM:PRIN') has been selected.

Example: "HCOP:PAGE:ORI LAND"

Characteristics: *RST value: -
SCPI: conforming

INITiate Subsystem

The INITiate subsystem is used to control the init-measurement function in the selected measurement window. The measurement windows are assigned to INITiate1 (screen A) and INITiate2 (screen B).

COMMAND	PARAMETERS	UNIT	COMMENT
INITiate<1|2>			
:CONTinuous	<Boolean>	--	
:CONMeas	--	--	no query
[:IMMediate]	--	--	no query
:DISPlay	<Boolean>	--	

INITiate<1|2>:CONTinuous ON | OFF

This command determines whether the trigger system is continuously initiated (continuous) or performs single measurements (single).

In the spectrum analysis mode, this setting refers to the sweep sequence (switching between continuous/single sweep).

Example: `"INIT2:CONT OFF"` 'Switches the sequence in screen B to single sweep.

`"INIT2:CONT ON"` 'Switches the sequence to continuous sweep.

Characteristics: *RST value: ON
SCPI: conforming

INITiate<1|2>:CONMeas

This command continues a stopped measurement at the current position in single sweep mode. The function is useful especially for trace functions MAXHold, MINHold and AVERage if the previous results are not to be cleared with Sweep Count > 0 or Average Count > 0 on restarting the measurement (INIT:IMMediate resets the previous results on restarting the measurement).

The single-sweep mode is automatically switched on. Synchronization to the end of the indicated number of measurements can then be performed with the command *OPC, *OPC? or *WAI. In the continuous-sweep mode, synchronization to the sweep end is not possible since the overall measurement "never" ends.

Example:

```
"INIT:CONT OFF"                 'Switches to single-sweep mode.
"DISP:WIND:TRAC:MODE AVER       'Switches on trace averaging.
"SWE:COUN 20"                   Setting the sweep counter to 20 sweeps.
"INIT;*WAI"                     'Starts the measurement and waits for the
                                'end of the 20 sweeps.
"INIT:CONM;*WAI"                'Continues the measurement (next 20
                                'sequences) and waits for the end.
```

Characteristics: *RST value: -
SCPI: device-specific

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

INITiate<1|2>[:IMMediate]

The command initiates a new sweep in the indicated measurement window.

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.

Example:	`"INIT:CONT OFF"`	'Switches to single-sweep mode.
	`"DISP:WIND:TRAC:MODE AVER`	'Switches on trace averaging.
	`"SWE:COUN 20"`	Setting the sweep counter to 20 sweeps.
	`"INIT;*WAI"`	'Starts the measurement and waits for the 'end of the 20 sweeps.

Characteristics:	*RST value:	-
	SCPI:	conforming

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

INITiate<1|2>:DISPlay ON | OFF

This command configures the behavior of the display during a single sweep.
`INITiate:DISPlay OFF` means that the display is switched off during the measurement,
`INITiate:DISPlay ON` means that the display is switched on during the measurement.
The numeric suffix of INITiate is irrelevant with this command.

Example:	`"INIT:CONT OFF"`	'Switches to single-sweep mode
	`"INIT:DISP OFF`	'Sets the display behavior to `OFF`
	`"INIT;*WAI"`	'Starts the measurement with display 'switched off.

Characteristics:	*RST value:	ON
	SCPI:	device-specific

INPut Subsystem

The INPut subsystem controls the input characteristics of the RF inputs of the instrument. The measurement windows are assigned to INPut1 (screen A) and INPut2 (screen B).

COMMAND	PARAMETERS	UNIT	COMMENT
INPut<1|2>			
:ATTenuation	<numeric_value>	DB	
:AUTO	ON | OFF | ONCE | RECal	--	
:PROTection			no query
[:STATe]	ON | OFF	DB	with option B25 only
:RESet		--	with option B25 only
:EATT	<numeric_value>	DB	with option B25 only
:AUTO	ON | OFF	--	
:STATe	ON | OFF		
:FILTer		OHM	
:YIG	ON | OFF		with option B2 only
:IMPedance	50 | 75	DBM	
:MIXer			
[:POWer]	<numeric_value>		
:AUTO	ON | OFF		
:COUPling	AC | DC		
:GAIN			with option B23 or B25 only
:STATe	ON | OFF		
SELect	AUDio | RF		

INPut<1|2>:ATTenuation 0 ... 75dB

This command programs the input attenuator. To protect the input mixer against damage from overloads, the setting 0 dB can be obtained by entering numerals, not by using the command DEC.
The step width is 5 dB, the range is 0 dB to..75 dB.
The step width is 10 dB without the option electronic attenuator, the range 0 dB to 70 dB.
The input attenuation can be set in 5 dB steps between 0 dB and 75 dB with the option electronic attenuator.
In the default state with 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.

Example: `"INP:ATT 40dB"` 'Sets the attenuation on the attenuator to 40 dB and 'switches off the coupling to the reference level.

Characteristics: *RST value: 10 dB (AUTO is set to ON)
SCPI: conforming

INPut<1|2>:ATTenuation:AUTO ON | OFF | ONCE | RECal

This command automatically couples the input attenuation to the reference level (ON state) or switches the input attenuation to manual control (OFF state).
The ONCE parameter starts a single autoranging procedure. The input attenuation, IF gain and, if a preamplifier is installed, the preamplification are adjusted in order to optimally match the receiver sensitivity to the input signal to be measured.
The RECAL parameter starts a calibration of the adjacent range in order to extend the calibrated measurement range. The RECAL function is available if the measured level is in the range adjacent to the calibrated range. This condition is indicated by the STATus:OPERation:PCALibration register.

Example: `"INP:ATT:AUTO REC"`'Starts calibration of the adjacent range.

Characteristics: *RST value: ON
SCPI: conforming

INPut<1|2>:ATTenuation:PROTection[:STATe] ON | OFF

This command determines whether the attenuator may be switched to 0 dB in manual or automatic attenuation control.

Example:

Characteristics:	*RST value:	OFF
	SCPI:	device-specific

INPut<1|2>:ATTenuation:PROTection:RESet

The FSMR is equipped with an overload protection mechanism. This mechanism becomes active as soon as the power at the input mixer exceeds a value of 27 dBm. It ensures that the connection between RF input and input mixer is cut off.
The command resets the attenuator into the state that it had before the overload condition was detected. It re-connects the RF input with the input mixer.

Note:
This command comes into effect only if the reason for the overload condition has been eliminated. Otherwise the connection between RF input and input mixer is left open.

Example: `"INP:ATT:PROT:PRES"`

Characteristics:	*RST value:	--
	SCPI:	device-specific

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

INPut:COUPling AC | DC

This command switches the input coupling of the RF input between AC and DC.

Example: `"INP:COUP DC"`

Characteristics:	*RST value:	AC
	SCPI:	conforming

INPut<1|2>:EATT 0 to 30dB

This command programs the attenuation of the electronic input attenuator. The attenuation can be varied in 5 dB steps from 0 to 30 dB. Other entries are rounded to the next lower integer value. If the attenuation is programmed directly, the coupling to the reference level is switched off.
If the defined reference level cannot be set with the given RF attenuation, this level is adapted to the maximum possible value.
The electronic attenuator is switched off in the default state.

Example:	`"INP:EATT:STAT ON"`	'Switches the electronic attenuator into the signal path.
	`"INP:EATT 15dB"`	'Sets the attenuation of the electronic attenuator to '15 dB and switches off the coupling to the reference level.

Characteristics:	*RST value:	0 dB (state is set to OFF)
	SCPI:	device-specific

The command is only available with the electronic attenuator option B25.

INPut<1|2>:EATT:AUTO ON | OFF

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

Example: `"INP:EATT:STAT ON"` 'Switches the electronic attenuator into the signal path.
`"INP:EATT:AUTO ON"` 'Couples the attenuation of the electronic attenuator to 'the reference level.

Characteristics: *RST value: ON
SCPI: device-specific

The command is only available with the electronic attenuator option B25.

INPut<1|2>:EATT:STATe ON | OFF

This command switches the electronic input attenuation into the signal path (state ON) or removes it from the signal path (state OFF).

Example: `"INP:EATT:STAT ON"` 'Switches the electronic attenuator into the signal path.

Characteristics: *RST value: OFF
SCPI: device-specific

The command is only available with the option electronic attenuator B25.

INPut<1|2>:FILTer:YIG[:STATe] ON | OFF

This command switches the YIG filter for image rejection into the signal path (ON) or removes it from the signal path (OFF).

Example: `"INP:FILT:YIG OFF"`' YIG filter switch off

Characteristics: *RST value: ON
SCPI: device-specific

The command is only available with the YIG preselection option B2.

INPut<1|2>:IMPedance 50 | 75

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).

Example: `"INP:IMP 75"`

Characteristics: *RST value: 50 Ω
SCPI: conforming

INPut<1|2>:GAIN:STATe ON | OFF

This command switches on the preamplifier for the instrument. The switchable gain is fixed to 20 dB..

Example: `"INP:GAIN ON"` 'Switches on 20 dB preamplification

Characteristics: *RST value: OFF
SCPI: conforming

The command is only available with the option electronic attenuator B25.

INPut<1|2>:MIXer:AUTO ON | OFF

This command enables/disables the automatic setup of the mixer level.

Example:	`"INP:MIX:AUTO ON"`	
Characteristics:	*RST value:	ON
	SCPI:	device-specific

INPut<1|2>:SELect AUDio | RF

This command switches the audio input – and thus the *AUDIO* mode – on (AUDio) or off (RF).

The numeric suffix <1|2> has no meaning with this command.

Example:	`"INP:SEL AUD"`	'Switches on the *AUDIO* mode.
Characteristics:	*RST value:	RF
	SCPI:	device-specific

INSTrument Subsystem

The INSTrument subsystem selects the operating mode of the unit either via text parameters or fixed numbers.

COMMAND	PARAMETERS	UNIT	COMMENT
INSTrument			
[:SELect]	SANalyzer|MREceiver		
:NSELect	<numeric_value>		
:COUPle	NONE | RLEVel | CF_B | CF_A		no query

INSTrument[:SELect] SANalyzer | MREceiver

This command switches between the operating modes by means of text parameters.

Parameter: SANalyzer: Spectrum analysis
MREceiver Measuring receiver

Example: `"INST SAN"` 'Switches the instrument to *SPECTRUM*.

Characteristics: *RST value: MREceiver
SCPI: conforming

INSTrument:NSELect <numeric value>

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

Parameter: 1: Spectrum analysis
21: Measuring receiver

Example: `"INST:NSEL 1"` 'Switches the instrument to *SPECTRUM*.

Characteristics: *RST value: 21
SCPI: conforming

INSTrument:COUPle NONE | RLEVel | CF_B | CF_A

In operating mode *SPECTRUM* this command selects the parameter coupling between the two measurement windows screen A and B.

Parameter:
NONE No coupling. The two measurement windows are operated like two independent "virtual" devices.
RLEVel The reference levels of the two measurement windows are coupled.
CF_B The center frequency of screen B is coupled to the frequency of marker 1 in screen A.
CF_A The center frequency of screen A is coupled to the frequency of marker 1 in screen B.

Example: `"INST:COUP NONE"` 'Switches off the coupling of measurement windows.
'This leads to two independent "virtual" devices.

Characteristics: *RST value: NONE
SCPI: device specific

MMEMory Subsystem

The MMEMory (mass memory) subsystem provides commands which allow for access to the storage media of the instrument and for storing and loading various instrument settings.

The various drives can be addressed via the "mass storage unit specifier" <msus> using the conventional DOS syntax. The internal hard disk is addressed by "D:", the floppy disk drive by "A:".

***Note**: For reasons of compatibility with the FSE instruments, addressing the hard disk by "C:" is also accepted. Since hard disk "C:" is reserved for instrument software, all read and write operations are rerouted to hard disk "D:" in normal operation (service level 0).*

The file names <file_name> are indicated as string parameters with the commands being enclosed in quotation marks. They also comply with DOS conventions.

DOS file names consist of max. 8 ASCII characters and an extension of up to three characters separated from the file name by a dot "." Both, the dot and the extension are optional. The dot is not part of the file name. DOS file names do not distinguish between uppercase and lowercase notation. All letters and digits are permitted as well as the special characters "_", "^", "$", "~", "!", "#", "%", "&", "-", "{", "}", "(", ")", "@" and "`". Reserved file names are CLOCK$, CON, AUX, COM1 to COM4, LPT1 to LPT3, NUL and PRN.

The two characters "*" and "?" have the function of so-called "wildcards", i.e., they are variables for selection of several files. The question mark "?" replaces exactly one character, the asterisk means any of the remaining characters in the file name. "*.*" thus means all files in a directory.

COMMAND	PARAMETERS	UNIT	COMMENT
MMEMory			
:CATalog?	<string>		
:CDIRectory	<directory_name>	--	
:COPY	<file_name>,<file_name>	--	no query
:DATA	<file_name>[,<block>]	--	
:DELete	<file_name>	--	no query
:INITialize	<msus>	--	no query
:LOAD			
:STATe	1,<file_name>	--	no query
:AUTO	1,<file_name>	--	no query
:MDIRectory	<directory_name>	--	no query
:MOVE	<file_name>,<file_name>	--	no query
:MSIS	<msus>	--	
:NAME	<file_name>	--	
:RDIRectory	<directory_name>	--	no query
:STORe<1|2>			
:STATe	1,<file_name>	--	no query
:TRACe	<numeric_value>, <file_name>		
:CLEar			
:STATe	1,<file_name>	--	no query
:ALL			no query
:SELect			
[:ITEM]			
:HWSettings	<Boolean>		
:TRACe			
[:ACTive]	<Boolean>		
:LINes			
:ALL	<Boolean>		
:SCData	<Boolean>		Tracking generator option
:ALL	--		no query
:NONE	--		no query
:DEFault	--		no query
:COMMent	<string>		

MMEMory:CATalog? <path>

This command reads the indicated directory. According to DOS convention, wild card characters can be entered in order to query e.g. a list of all files of a certain type.

The path name should be in conformance with DOS conventions and may also include the drive name.

Parameter: <path>::= DOS Path name

Example: " `MMEM:CAT:LONG? 'D:\USER\DATA'` 'queries the contents of directory 'D:\USER\DATA directory

"`MMEM:CAT? 'D:\USER\DATA\*.LOG'` 'Returns all files in D:\USER\DATA 'with extension ".LOG"

"`MMEM:CAT? 'D:\USER\DATA\SPOOL?.WMF'` 'Returns all files in D:\USER\DATA whose 'names start with SPOOL, have 6 letters 'and the extension ".WMF".

Return value: <used_bytes_in_this_directory>,<free_bytes_on_this_disk>,
”<file_name>,<file_type>,<filesize_in_bytes>”,
”<file_name>,<file_type>,<filesize_in_bytes>”, …

with
<file_name> name of file or directory
<file_type> file type: DIR (directory), ASCii (ASCII file), BINary (binary file) and STATe (file with device settings)
<filesize_in_bytes> size of file, 0 for directories

Response value: List of file names in the form of strings separated by commas, i.e.
`'SPOOL1.WMF','SPOOL2.WMF','SPOOL3.WMF'`

Characteristics: *RST value: -
SCPI: conformal

MMEMory:CDIRectory <directory_name>

This command changes the current directory.

In addition to the path name, the indication of the directory may contain the drive name. The path name complies with the DOS conventions.

Parameter: <directory_name>::= DOS path name

Example: "`MMEM:CDIR 'D:\USER\DATA'`" 'Returns the list of files in directory 'D:\USER\DATA.

Characteristics: *RST value: -
SCPI: conforming

MMEMory:COPY <file_source>,<file_destination>

This command copies the files indicated in <file_source> to the destination directory indicated with <file_destination> or to the destination file indicated by <file_destination> when <file_source> is just a file.

The indication of the file name may include the path and the drive name. The file names and path information must be in accordance with the DOS conventions.

Parameter: <file_source>,<file_destination> ::= <file_name>
<file_name> ::= DOS file name

Example: "MMEM:COPY 'D:\USER\DATA\SETUP.CFG','A:'"

Characteristics: *RST value: -
SCPI conforming

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

MMEMory:DATA <file_name>[,<block data>]

This command writes the block data contained in <block> into the file characterized by <file_name>. The IEC/IEEE-bus delimiter must be set to EOI to obtain error-free data transfer.

The associated query command reads the indicated file from the mass memory and transfers it to the control computer via the IEC/IEEE bus. It should be noted that the buffer memory of the control computer should be large enough to store the file. The setting of the IEC/IEEE-bus delimiter is irrelevant in this case.

The command is useful for reading stored device settings or trace data from the instrument or for transferring them to the instrument.

Syntax:

MMEMory:DATA <file_name>,<block data>	Data transfer from control computer to instrument.
MMEMory:DATA? <file_name>	Data transfer from instrument to control computer.

<file_name> selects the file to be transferred.

The binary data block <block> has the following structure:

- it always begins with the character '#',
- followed by a digit for the length of the length information,
- followed by the indicated number of digits as length information (number of bytes) for the binary data themselves,
- finally the binary data with the indicated number of bytes

Example: "MMEM:DATA 'TEST01.HCP', #217This is the file"
'means:
'#2: the next 2 characters
' are the length indication
'17: number of subsequent binary data
' bytes
'This is the file:
' 17 bytes stored as binary data in the
' file TEST01.HCP.

"MMEM:DATA? 'TEST01.HCP'" 'Transfers the file TEST01.HCP from the
'instrument to the control computer.

Characteristics: *RST value: -
SCPI: conforming

MMEMory:DELete <file_name>

This command deletes the indicated files.

The indication of the file name contains the path and, optionally, the drive name. Indication of the path complies with DOS conventions.

Parameter: <file_name> ::= DOS file name

Example: "`MMEM:DEL 'TEST01.HCP'`" `'`The file TEST01.HCP is deleted.

Characteristics: *RST value: -
SCPI: conforming

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

MMEMory:INITialize <msus>

This command formats the disk in drive A. Formatting deletes all data stored on the floppy disk.

Parameter: <msus> ::= 'A:'
Only drive name A: is accepted.

Example: "`MMEM:INIT 'A:'`"

Characteristics: *RST value: -
SCPI: conforming

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

MMEMory:LOAD:STATe 1,<file_name>

This command loads device settings from files. The contents of the file are loaded and set as the new device state. The device automatically recognizes the files that are required for the whole setup from the list of file extensions:

Contents	Extension
Current setting of measurement hardware and associated title, if indicated	.SET
Activated limit lines	.LIN
Current configuration of general device parameters	.CFG
Configuration for the hardcopy output	.HCS
User-defined color setting	.COL
All defined limit lines	.LIA
Measured data trace 1 to trace 3 screen A	.TR1 to 3
Measured data trace 1 to trace 3 screen B	.TR4 to 6
Tracking generator settings (only with Option Ext. Generator Control B10)	.TCi
Setting for source calibration (only with Option Ext. Generator Control B10)	.TS1 .TS2
Correction data for source calibration (only with Tracking Generator Option B9 or Ext. Generator Control B10) Correction data for source calibration (only with Option Ext. Generator Control B10)	.TC1 .TC2
Activated transducer factors	.TF

The file name includes indication of the path and may also include the drive name. The path name complies with DOS conventions.

Parameter: <file_name> ::= DOS file name without extension, extensions see table

Example: "`MMEM:LOAD:STAT 1,'A:TEST'`"

Characteristics: *RST value: -
SCPI: conforming

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

MMEMory:LOAD:AUTO 1,<file_name>

This command defines which device setting is automatically loaded after the device is switched on. The contents of the file are read after switching on the device and used to define the new device state. The file name includes indication of the path and may also include the drive. The path name complies with DOS conventions.

Note: *The data set defined as auto recall set will also be restored by a *RST-command.*

Parameter: <file_name> ::= DOS file name without extension;
FACTORY denotes the data set previously in the instrument

Example: "`MMEM:LOAD:AUTO 1,'D:\USER\DATA\TEST'`"

Characteristics: *RST value: FACTORY
SCPI: device-specific

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

MMEMory:MDIRectory <directory_name>

This command creates a new directory. The file name includes indication of the path and may also include the drive name. The path name complies with DOS conventions.

Parameter: <directory_name>::= DOS path name

Example: "`MMEM:MDIR 'D:\USER\DATA'`"

Characteristics: *RST value: -
SCPI: device-specific

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

MMEMory:MOVE <file_source>,<file_destination>

This command renames existing files, if <file_destination> contains no path indication. Otherwise the file is moved to the indicated path and stored under the file name specified there, if any.
The file name includes indication of the path and may also include the drive. The path name complies with DOS conventions.

Parameter: <file_source>,<file_destination> ::= <file_name>
<file_name> ::= DOS file name

Example: "`MMEM:MOVE 'D:\TEST01.CFG','SETUP.CFG'`"
'Renames TEST01.CFG in SETUP.CFG
'in directory D:\.

"`MMEM:MOVE 'D:\TEST01.CFG','D:\USER\DATA'`"
'Moves TEST01.CFG from D:\ to
'D:\USER\DATA.

"`MMEM:MOVE 'D:\TEST01.CFG','D:\USER\DATA\SETUP.CFG'`"
'Moves TEST01.CFG from D:\ to
'D:\USER\DATA and renames the file in
'SETUP.CFG.

Characteristics: *RST value: -
SCPI: conforming

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

MMEMory:MSIS <device>

This command changes to the drive indicated. The drive may be the internal hard disk D: or the floppy disk drive A:.

Example: "`MMEM:MSIS 'A:'`"

Characteristics: *RST value: "D:'
SCPI: conforming

MMEMory:NAME <file_name>

This command defines a destination file for the printout started with the command `HCOPy:IMMediate`. In this case the printer output must be routed to destination *FILE* using the command "`HCOP:DEST 'MMEM'` ".

The file name includes indication of the path and may also include the drive name. The file name and path information comply with DOS conventions.

Parameter: <file_name> ::= DOS file name

Example:

"`HCOP:DEV:LANG BMP`"	Selection of data format.
"`HCOP:DEST 'MMEM' `"	Selection of the output device
"`MMEM:NAME 'PRINT1.BMP'`"	Selection of file name.
"`HCOP:IMM`"	Start of the printout.

Characteristics: *RST value: -
SCPI: conforming

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

MMEMory:RDIRectory <directory_name>

This command deletes the indicated directory. The directory name includes indication of the path and may also include the drive name. The path name complies with DOS conventions.

Parameter: <directory_name>::= DOS path name

Example: "`MMEM:RDIR 'D:\TEST'`"

Characteristics: *RST value: -
SCPI: device-specific

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

MMEMory:STORe<1|2>:STATe 1,<file_name>

This command stores the current device settings in a series of files which have the indicated file name, but different extensions. The file name includes indication of the path and may also include the drive name. The path name complies with DOS conventions. The numeric suffix in STORe<1|2> is irrelevant with this command.
A list of the extensions used is contained under `MMEMory:LOAD:STATe`.

Parameter: <file_name> := DOS file name without extension

Example: "`MMEM:STOR:STAT 1,'TEST'`"

Characteristics: *RST value: -
SCPI: conforming

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

MMEMory:STORe<1|2>:TRACe 1 to 3,<file_name>

This command stores the selected trace (1 to 3) in the measurement window indicated by STORe<1|2> (screen A or B) in a file with ASCII format. The file format is described in chapter 4 in the TRACE menu under the *ASCII-FILE EXPORT* softkey.
The decimal separator (decimal point or comma) for floating-point numerals contained in the file is defined with the command `FORMat:DEXPort:DSEParator`.
The file name includes indication of the path and the drive name. Indication of the path complies with DOS conventions.

Parameter: 1 to 3 := selected measurement curve Trace 1 to 3
<file_name> := DOS file name

Example: "`MMEM:STOR2:TRAC 3,'A:\TEST.ASC'`"
'Stores trace 3 from screen B in the file 'TEST.ASC on a disk.

Characteristics: *RST value: -
SCPI: device-specific

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

MMEMory:CLEar:STATe 1,<file_name>

This command deletes the instrument setting selected by <file_name>. All associated files on the mass memory storage are cleared. A list of the extensions used is included under `MMEMory:LOAD:STATe`.
The file name includes indication of the path and may also include the drive. The path name complies with DOS conventions.

Parameter: <file_name> ::= DOS file name without extension

Example: "`MMEM:CLE:STAT 1,'TEST'`"

Characteristics: *RST value: -
SCPI: device-specific

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

MMEMory:CLEar:ALL

This command deletes all device settings in the current directory. The current directory can be selected with `MMEM:CDIR`. The default directory is D:.

Example: "`MMEM:CLE:ALL`"

Characteristics: *RST value: -
SCPI: device-specific

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

MMEMory:SELect[:ITEM]:HWSettings ON | OFF

This command includes the hardware settings in the list of data subsets of a device setting to be stored/loaded. The hardware settings include:

- current configuration of general device parameters (general setup)
- current setting of the measurement hardware including markers
- activated limit lines:
  A data set may include 8 limit lines at maximum in each measurement window. This number includes the activated limit lines and, if available, the de-activated limit lines last used. Therefore the combination of the non-activated restored limit lines depends on the sequence of use with the command `MMEM:LOAD`.
- user-defined color setting
- configuration for the hardcopy output

Tracking generator settings
(only in conjunction with option External Generator Control B10)
Correction data for source calibration
(only in conjunction with option External Generator Control B10)

Example: "MMEM:SEL:HWS ON"

Characteristics: *RST value: ON
SCPI: device-specific

MMEMory:SELect[:ITEM]:TRACe[:ACTive] ON | OFF

This command adds the active traces to the list of data subsets of a save/recall device setting. Active traces are all traces whose state is not blank.

Example: "MMEM:SEL:TRAC ON"

Characteristics: *RST value: OFF, i.e. no traces will be stored
SCPI: device-specific

MMEMory:SELect[:ITEM]:LINes:ALL ON | OFF

This command adds all limit lines (activated and de-activated) to the list of device settings to be stored/loaded.

Example: "MMEM:SEL:LIN:ALL ON"

Characteristics: *RST value: ON
SCPI: device-specific

MMEMory:SELect[:ITEM]:SCData ON | OFF

This command adds the tracking generator calibration data to the list of device settings to be stored/loaded.

Example: "MMEM:SEL:SCD ON" 'Inserts the tracking generator correction data
'in the list of data subsets

Characteristics: *RST value: OFF
SCPI: device-specific

MMEMory:SELect[:ITEM]:TRANsducer[:ACTive] ON | OFF
This command is available from firmware version 1.40 or higher.

MMEMory:SELect[:ITEM]:TRANsducer:ALL ON | OFF

This command includes all transducer factors and sets in the list of data subsets of a device setting to be stored/loaded.

Example: "MMEM:SEL:TRAN:ALL ON"

Characteristics: *RST value: ON
SCPI: device-specific

This command is available from firmware version 1.40 or higher.

MMEMory:SELect[:ITEM]:ALL

This command includes all data subsets in the list device settings to be stored/loaded.

Example: "MMEM:SEL:ALL"

Characteristics: *RST value: --
SCPI: device-specific

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

MMEMory:SELect[:ITEM]:NONE

This command deletes all data subsets from the list of device settings to be stored/loaded.

Example: "MMEM:SEL:NONE"

Characteristics: *RST value: --
SCPI: device-specific

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

MMEMory:SELect[:ITEM]:DEFault

This command sets the default list of device settings to be stored/loaded. The latter includes:

- current configuration of general device parameters (general setup)
- current setting of the measurement hardware including markers
- activated limit lines
- user-defined color setting
- configuration for the hardcopy output

Tracking generator settings
(only in conjunction with option External Generator Control B10)
Correction data for source calibration
(only in conjunction with option External Generator Control B10)

Trace data and non-used limit lines are not included.

Example: "MMEM:SEL:DEFault"

Characteristics: *RST value: --
SCPI: device-specific

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

MMEMory:COMMent <string>

This command defines a comment (max. 60 characters) for a device setting to be stored.

Example: "MMEM:COMM 'Setup for GSM measurement'"

Characteristics: *RST value: blank comment
SCPI: device-specific

OUTPut Subsystem

The OUTPut subsystem controls the output features of the instrument.
In conjunction with the tracking generator option, a distinction is made between OUTPut1 (screen A) and OUTPut2 (screen B).

COMMAND	PARAMETERS	UNIT	COMMENT
OUTPut<1|2>			
:REFerence			
:STATe	ON | OFF	--	
[:STATe]	ON | OFF	--	Tracking generator option

OUTPut:REFerence:STATe ON | OFF

This command switches on or off the POWER REF reference source on the front panel.

Example: `"OUTP:REF:STAT ON"`

Characteristics: *RST value: OFF
SCPI: device-specific

OUTPut<1|2>[:STATe] ON | OFF

This command switches the tracking generator on or off.

Notes:
- *With the tracking generator switched on, the maximum stop frequency is limited to 3 GHz. This upper limit is automatically modified by the set frequency offset of the generator.*
- *If measurements in compliance with specs are to be performed with the tracking generator, the start frequency has to be ≥3 x resolution bandwidth.*
- *The minimum sweep time for measurements in compliance with the data sheet is 100 ms in the frequency domain (span >0). If a shorter sweep time is selected, the sweep time indicator SWT on the screen is marked with a red asterisk and the message UNCAL is also displayed.*
- *With the tracking generator switched on, the FFT filters (BAND:MODE:FFT) are not available.*

Example: `"OUTP ON"` 'Switches on the tracking generator in screen A.

Characteristics: *RST value: -
SCPI: conforming

This command is only valid in conjunction with option tracking generator.

SENSe Subsystem

The SENSe subsystem is organized in several subsystems. The commands of these subsystems directly control device-specific settings, they do not refer to the signal characteristics of the measurement signal.
The SENSe subsystem controls the essential parameters of the analyzer. In accordance with the SCPI standard, the keyword "SENSe" is optional for this reason, which means that it is not necessary to include the SENSe node in command sequences.
The measurement windows are selected by SENSe1 and SENSe2:

SENSe1 = Modification of screen A settings
SENSe2 = Modification of screen B settings.

Screen A is automatically selected if 1 or 2 is missing.

[SENSe:]ADEMod - Subsystem

This subsystem provides commands for measurement of analog modulation parameters.

<table>
<tr><th>COMMAND</th><th>PARAMETERS</th><th>UNIT</th><th>COMMENT</th></tr>
<tr><td>[SENSe<1|2>]</td><td></td><td></td><td></td></tr>
<tr><td>:ADEMod</td><td></td><td></td><td></td></tr>
<tr><td>:AF</td><td></td><td></td><td></td></tr>
<tr><td>:COUPling</td><td>AC | DC</td><td></td><td></td></tr>
<tr><td>:BANDwidth</td><td></td><td></td><td></td></tr>
<tr><td>:DEModulation</td><td><numeric_value></td><td>HZ</td><td></td></tr>
<tr><td>:BWIDth</td><td></td><td></td><td></td></tr>
<tr><td>:DEModulation</td><td><numeric_value></td><td>HZ</td><td></td></tr>
<tr><td>:DETector</td><td>PPEak|MPEak|PAVerage|RMS | AVERage | SRMS | THD | SINad [[,PPEak|MPEak|PAVerage|RMS | AVERage | SRMS | THD | SINad],…]</td><td></td><td></td></tr>
<tr><td>:PPEak</td><td></td><td></td><td></td></tr>
<tr><td>[:STATe]</td><td>ON| OFF</td><td></td><td></td></tr>
<tr><td>:MODe</td><td>ABSolute | RELative</td><td></td><td></td></tr>
<tr><td>:REFerence</td><td><numeric_value></td><td>DBM</td><td></td></tr>
<tr><td>:AUTO</td><td>ONCE</td><td></td><td></td></tr>
<tr><td>:MPEak</td><td></td><td></td><td></td></tr>
<tr><td>[:STATe]</td><td>ON | OFF</td><td></td><td></td></tr>
<tr><td>:MODe</td><td>ABSolute | RELative</td><td></td><td></td></tr>
<tr><td>:REFerence</td><td><numeric_value></td><td>DBM</td><td></td></tr>
<tr><td>:AUTO</td><td>ONCE</td><td></td><td></td></tr>
<tr><td>:PAVerage</td><td>O N| OFF</td><td></td><td></td></tr>
<tr><td>[:STATe]</td><td><Boolean></td><td></td><td></td></tr>
<tr><td>:MODe</td><td>ABSolute|RELative</td><td></td><td></td></tr>
<tr><td>:REFerence</td><td><numeric_value></td><td>DBM</td><td></td></tr>
<tr><td>:AUTO</td><td>ONCE</td><td></td><td></td></tr>
<tr><td>:RMS</td><td></td><td></td><td></td></tr>
<tr><td>[:STATe]</td><td><Boolean></td><td></td><td></td></tr>
<tr><td>:MODe</td><td>ABSolute|RELative</td><td></td><td></td></tr>
<tr><td>:REFerence</td><td><numeric_value></td><td>DBM</td><td></td></tr>
<tr><td>:AUTO</td><td>ONCE</td><td></td><td></td></tr>
<tr><td>:AVERage</td><td></td><td></td><td></td></tr>
<tr><td>[:STATe]</td><td><Boolean></td><td></td><td></td></tr>
<tr><td>:MODe</td><td>ABSolute | RELative</td><td></td><td></td></tr>
<tr><td>:REFerence</td><td><numeric_value></td><td>DBM</td><td></td></tr>
<tr><td>:AUTO</td><td>ONCE</td><td></td><td></td></tr>
<tr><td>:SRMS</td><td></td><td></td><td></td></tr>
<tr><td>[:STATe]</td><td><Boolean></td><td></td><td></td></tr>
<tr><td>:MODe</td><td>ABSolute|RELative</td><td></td><td></td></tr>
<tr><td>:REFerence</td><td><numeric_value></td><td>DBM</td><td></td></tr>
<tr><td>:AUTO</td><td>ONCE</td><td></td><td></td></tr>
<tr><td>:THD</td><td></td><td></td><td></td></tr>
<tr><td>[:STATe]</td><td><Boolean></td><td></td><td></td></tr>
<tr><td>:SINad</td><td></td><td></td><td></td></tr>
<tr><td>[:STATe]</td><td><Boolean></td><td>DBM</td><td></td></tr>
<tr><td>:REFerence</td><td>AOFF</td><td></td><td></td></tr>
<tr><td>:AUTO</td><td>ONCE</td><td></td><td></td></tr>
</table>

COMMAND	PARAMETERS	UNIT	COMMENT
:MTIMe	<numeric_value>	S	
:RLENgth?			query only
[:STATe]	<Boolean>		
:SRATe?			
:SPECtrum			
:BANDwidth			
[:RESolution]	<numeric_value>	HZ	
:BWIDth			
[:RESolution]	<numeric_value>	HZ	
:SPAN	<numeric_value>	HZ	

[SENSe:]ADEMod:AF:COUPling AC | DC

This command selects the coupling of the AF path of the analyzer.

Example: "ADEM:AF:COUP DC" 'Switches on DC coupling.

Characteristics: *RST value: AC
SCPI: device-specific

[SENSe:]ADEMod:AVERage[:STATe] ON | OFF

This command switches on or off the display of averaged results in the modulation summary. Averaged results are displayed in addition to current results.

Note: *If the average-value measurement is switched on, the relative-value display is referenced to the average values rather than to the current measured values.*
If the Peak Hold display is active, this display has priority, and the relative-value display is referenced to the Peak Hold values.

Example:

"ADEM ON"	'Switches on the demodulator.
"CALC2:FEED 'XTIM:FM:TDOM"	'Switches on the FM modulation summary.
"ADEM:AVER ON"	'Switches on the display of averaged results.

Characteristics: *RST value: OFF
SCPI: device-specific

[SENSe:]ADEMod:BANDwidth | BWIDth:DEModulation <numeric_value>

This command defines the demodulation bandwidth used for analog demodulation. The required sampling rate is automatically set depending on the selected demodulation bandwidth.
The available demodulation bandwidths are determined by the existing sampling rates.

Rounded demodulation bandwidth	Sampling rate
10 MHz	32 MHz
8 MHz	16 MHz
5 MHz	8 MHz
3 MHz	4 MHz
1.6 MHz	2 MHz
800 kHz	1 MHz
400 kHz	500 kHz
200 kHz	250 kHz
100 kHz	125 kHz
50 kHz	62.5 kHz
25 kHz	31.25 kHz
12.5 kHz	15.625 kHz

Example: "ADEM:BAND:DEM 1MHz" 'Sets the demodulation bandwidth to 1 MHz.

Characteristics: *RST value: 5 MHz
SCPI: device-specific

[SENSe:]ADEMod:DETector PPEak | MPEak | PAVerage | RMS | AVERage | SRMS | THD | SINad [[,PPEak | MPEak | PAVerage | RMS | AVERage | SRMS | THD | SINad],…]

This command switches on the detectors whose results are to be displayed in the modulation summary.

PPEak	Result of measurement with +PK detector
MPEak	Result of measurement with -PK detector
PAVerage	Result of averaging ±PK/2, i.e. (plus peak + minus peak)/2
AVERage	Result of measurement with average detector
RMS	Result of measurement with RMS detector
SRMS	Result of measurement with √2 RMS detector
THD	Total harmonic distortion
SINad	Signal, noise and distortion

Note: *THD and SINad are always displayed together. The above command can be used to activate any combination of detectors. For the detailed configuration of the individual detectors, including relative measurements, see the commands below.*

Example: "`ADEM:DET PPE, RMS, THD`" 'The peak and RMS detectors are switched on together with the THD and the SINAD display.

Characteristics: *RST value: PPE
SCPI: device-specific

[SENSe:]ADEMod:DETector:PPEak[:STATe] ON | OFF

This command switches on or off the plus peak detector in the modulation summary. The command is executed independently of the settings for the other detectors.

Example:

"`ADEM ON`"	'Switches on the demodulator.
"`CALC2:FEED 'XTIM:FM:TDOM`"	'Switches on the FM modulation summary.
"`ADEM:DET:PPE ON`"	'Switches on the plus peak detector.

Characteristics: *RST value: ON
SCPI: device-specific

[SENSe:]ADEMod:DETector:PPEak:MODE ABSolute | RELative

This command switches on absolute or relative measurement for the plus peak detector in the modulation summary. Each time the relative measurement mode is switched on, the current measured value is taken as a reference for the subsequent relative measurements. This command is executed independently of the settings for the other detectors.

Example: "`ADEM:DET:PPE:MODE REL`" 'Switches on the relative measurement for the plus peak detector.

Characteristics: *RST value: ABS
SCPI: device-specific

[SENSe:]ADEMod:DETector:PPEak:REFerence <numeric_value>

This command sets or queries the reference value for the relative measurement for the plus peak detector in the modulation summary.

Example:

"`ADEM ON`"	'Switches on the demodulator.
"`CALC2:FEED 'XTIM:FM:TDOM'`"	'Switches on the FM modulation summary.
"`ADEM:DET:PPE ON`"	'Switches on the plus peak detector.
"`ADEM:DET:PPE:MOD REL`"	'Switches on the relative measurement for the plus peak detector.
"`ADEM:DET:PPE:REF 20 kHz`"	'Sets the reference value.

Characteristics: *RST value: 0
SCPI: device-specific

[SENSe:]ADEMod:DETector:PPEak:REFerence:AUTO ONCE

This command uses the current measured value as a reference for the relative measurement for the plus peak detector in the modulation summary.

Example: " `ADEM:DET:PPE:REF:AUTO ONCE`" 'Uses the current measured value as a reference for the relative measurement.

Characteristics: *RST value: -
SCPI: device-specific

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

[SENSe:]ADEMod:DETector:MPEak[:STATe] ON | OFF

This command switches on or off the minus peak detector in the modulation summary.
The command is executed independently of the settings for the other detectors.

Example:	"`ADEM ON`"	'Switches on the demodulator.
	"`CALC2:FEED 'XTIM:FM:TDOM`"	'Switches on the FM modulation summary.
	"`ADEM:DET:MPE ON`"	'Switches on the minus peak detector.

Characteristics: *RST value: OFF
SCPI: device-specific

[SENSe:]ADEMod:DETector:MPEak:MODE ABSolute | RELative

This command switches on absolute or relative measurement for the minus peak detector in the modulation summary. Each time the relative measurement mode is switched on, the current measured value is taken as a reference for the subsequent relative measurements. The command is executed independently of the settings for the other detectors.

Example: "`ADEM:DET:MPE:MODE REL`" 'Switches on the relative measurement for the minus peak detector.

Characteristics: *RST value: ABS
SCPI: device-specific

[SENSe:]ADEMod:DETector:MPEak:REFerence <numeric_value>

This command sets or queries the reference value for the relative measurement for the minus peak detector in the modulation summary.

Example:	"`ADEM ON`"	'Switches on the demodulator.
	"`CALC2:FEED 'XTIM:FM:TDOM'`"	'Switches on the FM modulation summary.
	"`ADEM:DET:MPE ON`"	'Switches on the minus peak detector.
	"`ADEM:DET:MPE:MODE REL`"	'Switches on the relative measurement for the minus peak detector.
	"`ADEM:DET:MPE:REF 20 kHz`"	'Sets the reference value.

Characteristics: *RST value: 0
SCPI: device-specific

[SENSe:]ADEMod:DETector:MPEak:REFerence:AUTO ONCE

This command uses the current measured value as a reference for the relative measurement for the minus peak detector in the modulation summary.

Example:	`" ADEM:DET:MPE:REF:AUTO ONCE"`	'Uses the current measured value as a reference for the relative measurement.

Characteristics: *RST value: -
SCPI: device-specific

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

[SENSe:]ADEMod:DETector:PAVerage[:STATe] ON | OFF

This command switches on or off the (plus peak + minus peak)/2 (±PK/2) detector in the modulation summary. The command is executed independently of the settings for the other detectors.

Example:	`"ADEM ON"`	'Switches on the demodulator.
	`"CALC2:FEED 'XTIM:FM:TDOM"`	'Switches on the FM modulation summary.
	`"ADEM:DET:PAV ON"`	'Switches on the (plus peak + minus peak)/2 'detector.

Characteristics: *RST value: OFF
SCPI: device-specific

[SENSe:]ADEMod:DETector:PAVerage:MODE ABSolute | RELative

This command switches on absolute or relative measurement for the (plus peak + minus peak)/2 (±PK/2) detector in the modulation summary. Each time the relative measurement mode is switched on, the current measured value is taken as a reference for the subsequent relative measurements. The command is executed independently of the settings for the other detectors.

Example:	`"ADEM:DET:PAV:MODE REL"`	'Switches on the relative measurement 'for the (plus peak + minus peak)/2 detector.

Characteristics: *RST value: ABS
SCPI: device-specific

[SENSe:]ADEMod:DETector:PAVerage:REFerence <numeric_value>

This command sets or queries the reference value for the relative measurement for the (plus peak + minus peak)/2 (±PK/2) detector in the modulation summary.

Example:	`"ADEM ON"`	'Switches on the demodulator.
	`"CALC2:FEED 'XTIM:FM:TDOM'"`	'Switches on the FM modulation summary.
	`"ADEM:DET:PAV ON"`	'Switches on the (plus peak + minus peak)/2 'detector.
	`"ADEM:DET:PAV:MODE REL"`	'Switches on the relative measurement 'for the (plus peak + minus peak)/2 detector.
	`"ADEM:DET:PAV:REF 20 kHz"`	'Sets the reference value.

Characteristics: *RST value: 0
SCPI: device-specific

[SENSe:]ADEMod:DETector:PAVerage:REFerence:AUTO ONCE

This command uses the current measured value as a reference for the relative measurement for the (plus peak + minus peak)/2 (±PK/2) detector in the modulation summary.

Example:	`" ADEM:DET:PAV:REF:AUTO ONCE"`	'Uses the current measured value 'as a reference for the relative 'measurement.

Characteristics: *RST value: -
SCPI: device-specific

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

[SENSe:]ADEMod:DETector:RMS[:STATe] ON | OFF

This command switches on or off the RMS detector in the modulation summary. The command is executed independently of the settings for the other detectors.

Example:	`"ADEM ON"`	'Switches on the demodulator.
	`"CALC2:FEED 'XTIM:FM:TDOM"`	'Switches on the FM modulation summary.
	`"ADEM:DET:RMS ON"`	'Switches on the RMS detector.

Characteristics: *RST value: OFF
SCPI: device-specific

[SENSe:]ADEMod:DETector:RMS:MODE ABSolute | RELative

This command switches on absolute or relative measurement for the RMS detector in the modulation summary. Each time the relative measurement mode is switched on, the current measured value is taken as a reference for the subsequent relative measurements. The command is executed independently of the settings for the other detectors.

Example:	`"ADEM:DET:RMS:MODE REL"`	'Switches on the relative measurement for the RMS detector.

Characteristics: *RST value: ABS
SCPI: device-specific

[SENSe:]ADEMod:DETector:RMS:REFerence <numeric_value>

This command sets or queries the reference value for the relative measurement for the RMS detector in the modulation summary.

Example:	`"ADEM ON"`	'Switches on the demodulator.
	`"CALC2:FEED 'XTIM:FM:TDOM'"`	'Switches on the FM modulation summary.
	`"ADEM:DET:RMS ON"`	'Switches on the RMS detector.
	`"ADEM:DET:RMS:MODE REL"`	'Switches on the relative measurement for the RMS detector.
	`"ADEM:DET:RMS:REF 20 kHz"`	'Sets the reference value.

Characteristics: *RST value: 0
SCPI: device-specific

[SENSe:]ADEMod:DETector:RMS:REFerence:AUTO ONCE

This command uses the current measured value as a reference for the relative measurement for the RMS detector in the modulation summary.

Example:	`" ADEM:DET:RMS:REF:AUTO ONCE"`	'Uses the current measured value 'as a reference for the relative 'measurement.

Characteristics: *RST value: -
SCPI: device-specific

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

[SENSe:]ADEMod:DETector:AVERage[:STATe] ON | OFF

This command switches on or off the average detector in the modulation summary. The command is executed independently of the settings for the other detectors.

Example:	`"ADEM ON"`	'Switches on the demodulator.
	`"CALC2:FEED 'XTIM:FM:TDOM"`	'Switches on the FM modulation summary.
	`"ADEM:DET:AVER ON"`	'Switches on the average detector.

Characteristics: *RST value: OFF
SCPI: device-specific

[SENSe:]ADEMod:DETector:AVERage:MODE ABSolute | RELative

This command switches on absolute or relative measurement for the average detector in the modulation summary. Each time the relative measurement mode is switched on, the current measured value is taken as a reference for the subsequent relative measurements. The command is executed independently of the settings for the other detectors.

Example:	`"ADEM:DET:AVER:MODE REL"`	'Switches on the relative measurement 'for the average detector.

Characteristics: *RST value: ABS
SCPI: device-specific

[SENSe:]ADEMod:DETector:AVERage:REFerence <numeric_value>

This command sets or queries the reference value for the relative measurement for the average detector in the modulation summary.

Example:	`"ADEM ON"`	'Switches on the demodulator.
	`"CALC2:FEED 'XTIM:FM:TDOM'"`	'Switches on the FM modulation summary.
	`"ADEM:DET:AVER ON"`	'Switches on the average detector.
	`"ADEM:DET:AVER:MODE REL"`	'Switches on the relative measurement for the average detector.
	`"ADEM:DET:AVER:REF 20 kHz"`	'Sets the reference value.

Characteristics: *RST value: 0
SCPI: device-specific

[SENSe:]ADEMod:DETector:AVERage:REFerence:AUTO ONCE

This command uses the current measured value as a reference for the relative measurement for the average detector in the modulation summary.

Example:	`" ADEM:DET:AVER:REF:AUTO ONCE"`	'Uses the current measured value 'as a reference for the relative 'measurement.
Characteristics:	*RST value SCPI:	- device-specific

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

[SENSe:]ADEMod:DETector:SRMS[:STATe] ON | OFF

This command switches on or off the √2 RMS detector in the modulation summary. The command is executed independently of the settings for the other detectors.

Example:	`"ADEM ON"`
	`"CALC2:FEED 'XTIM:FM:TDOM"`
	`"ADEM:DET:SRMS ON"`
		'Switches on the demodulator.
		'Switches on the FM modulation summary.
		'Switches on the √2 RMS detector.

Characteristics:	*RST value: SCPI:	OFF device-specific

[SENSe:]ADEMod:DETector:SRMS:MODE ABSolute | RELative

This command switches on absolute or relative measurement for the √2 RMS detector in the modulation summary. Each time the relative measurement mode is switched on, the current measured value is taken as a reference for the subsequent relative measurements. The command is executed independently of the settings for the other detectors.

Example:	`"ADEM:DET:SRMS:MODE REL"`	'Switches on the relative measurement 'for the √2 RMS detector.
Characteristics:	*RST value: SCPI:	ABS device-specific

[SENSe:]ADEMod:DETector:SRMS:REFerence <numeric_value>

This command sets or queries the reference value for the relative measurement for the √2 RMS detector in the modulation summary.

Example:	`"ADEM ON"`
	`"CALC2:FEED 'XTIM:FM:TDOM'"`
	`"ADEM:DET:SRMS ON"`
	`"ADEM:DET:SRMS:MODE REL"`
	
	`"ADEM:DET:SRMS:REF 20 kHz"`
		'Switches on the demodulator.
		'Switches on the FM modulation summary.
		'Switches on the √2 RMS detector.
		'Switches on the relative measurement
		for the √2 RMS detector.
		'Sets the reference value.

Characteristics:	*RST value: SCPI:	0 device-specific

[SENSe:]ADEMod:DETector:SRMS:REFerence:AUTO ONCE

This command uses the current measured value as a reference for the relative measurement for the √2 RMS detector in the modulation summary.

Example:	" `ADEM:DET:SRMS:REF:AUTO ONCE`"	'Uses the current measured value as a reference for the relative measurement.

Characteristics:	*RST value:	-
	SCPI:	device-specific

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

[SENSe:]ADEMod:DETector:THD[:STATe] ON | OFF

This command switches on or off the THD display in the modulation summary. The command is executed independently of the settings for the other detectors.

Example:	"`ADEM ON`"	'Switches on the demodulator.
	"`CALC2:FEED 'XTIM:FM:TDOM`"	'Switches on the FM modulation summary.
	"`ADEM:DET:THD ON`"	'Switches on the THD display.

Characteristics:	*RST value:	OFF
	SCPI:	device-specific

[SENSe:]ADEMod:DETector:SINad[:STATe] ON | OFF

This command switches on or off the SINAD display in the modulation summary. The command is executed independently of the settings for the other detectors.

Example:	"`ADEM ON`"	'Switches on the demodulator.
	"`CALC2:FEED 'XTIM:FM:TDOM`"	'Switches on the FM modulation summary.
	"`ADEM:DET:SIN ON`"	'Switches on the SINAD display.

Characteristics:	*RST value:	OFF
	SCPI:	device-specific

[SENSe:]ADEMod:DETector:REFerence AOFF

This command switches from relative-value to absolute-value display for all measured values shown in the modulation summary. This is also the default setting of the detectors.

Example:	" `ADEM:DET:SIN:REF AOFF`"	'Selects absolute-value display 'for all measured values shown.

Characteristics:	*RST value:	-
	SCPI:	device-specific

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

[SENSe:]ADEMod:DETector:REFerence:AUTO ONCE

This command uses the current measured values as reference values for the relative measurement for all results displayed in the modulation summary.

Example:	" `ADEM:DET:REF:AUTO ONCE`"	'Uses the current measured values as reference values for the relative measurement for all results displayed.

Characteristics:	*RST value:	-
	SCPI:	device-specific

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

[SENSe:]ADEMod:MTIMe <numeric_value>

This command defines the measurement time for analog demodulation.

Example: "ADEM:BAND:MTIM 62.625us" 'Sets the measurement time to 62.625 µs.

Characteristics: *RST value: 62.625us
SCPI: device-specific

[SENSe:]ADEMod:PHOLd[:STATe] ON | OFF

This command switches on or off the display of the highest results obtained in the modulation summary. The highest results are displayed in addition to the current results.

Note: *If the average-value measurement is switched on, the relative-value display is referenced to the average values rather than to the current measured values.*
If the Peak Hold display is active, this display has priority, and the relative-value display is referenced to the Peak Hold values.

Example:

"ADEM ON"	'Switches on the demodulator.
"CALC2:FEED 'XTIM:FM:TDOM"	'Switches on the FM modulation summary.
"ADEM:PHOL ON"	'Switches on the display of the highest results obtained.

Characteristics: *RST value: OFF
SCPI: device-specific

[SENSe:]ADEMod:RLENgth?

This command returns the record length set up for the current analog demodulation measurement.

Example: "ADEM:RLEN?" 'Returns the current record length.

Characteristics: *RST value: -
SCPI: device-specific

[SENSe:]ADEMod:AF:SPAN <numeric_value>

This command sets the span for result display AF spectrum.

The span is limited to half the measurement bandwidth of analog demodulation (SENS:ADEM:BAND).

Example:

"ADEM ON"	'Switches on the FM demodulator
"CALC:FEED 'XTIM:FM:AFSP'	'Switches on result display AF spectrum of FM

or

"CALC:FEED 'XTIM:RFP:AFSP'	'Switches on result display AF spectrum of 'RF power signal
"ADEM:BAND 5 MHz"	'Sets the measurement bandwidth to 5 MHz
"ADEM:AF:CENT 500kHz"	'Sets the AF center frequency to 500 kHz
"ADEM:AF:SPAN 200kHz"	'Sets the AF span to 200 kHz

Characterstics: *RST value: 2.5 MHz
SCPI: device-specific

[SENSe:]ADEMod:AF:SPAN:FULL

This command sets the maximum span for result display AF spectrum.

The maximum span corresponds to half the measurement bandwidth of analog demodulation (SENS:ADEM:BAND).

Example:	`"ADEM ON"`	'Switches on the FM demodulator
	`"CALC:FEED 'XTIM:FM:AFSP'`	'Switches on result display AF spectrum of 'FM
or		
	`"CALC:FEED 'XTIM:RFP:AFSP'`	'Switches on result display AF spectrum of 'RF power signals
	`"ADEM:BAND 5 MHz"`	'Sets the measurement bandwidth to 5 MHz
	`"ADEM:AF:SPAN:FULL"`	'Sets the AF span to 2.5 MHz

Characteristics: *RST value: -
SCPI: device-specific

[SENSe:]ADEMod:AF:CENTer <numeric_value>

This command sets the center frequency for result display AF spectrum.

Example:	`"ADEM ON"`	'Switches on the FM demodulator
	`"CALC:FEED 'XTIM:FM:AFSP'`	'Switches on result display AF spectrum of FM
or		
	`"CALC:FEED 'XTIM:RFP:AFSP'`	'Switches on result display AF spectrum of 'RF power signal
	`"ADEM:BAND 5 MHz"`	'Sets the measurement bandwidth to 5 MHz
	`"ADEM:AF:CENT 500kHz"`	'Sets the AF center frequency to 500 kHz
	`"ADEM:AF:SPAN 200kHz"`	'Sets the AF span to 200 kHz

Characteristics: *RST value: 1.25 MHz
SCPI: device-specific

[SENSe:]ADEMod:AF:STARt <numeric_value>

This command sets the start frequency for result display AF spectrum.

Example:	`"ADEM ON"`	'Switches on FM demodulator
	`"CALC:FEED 'XTIM:FM:AFSP'`	'Switches on result display AF spectrum of FM
or		
	`"CALC:FEED 'XTIM:RFP:AFSP'`	'Switches on result display AF spectrum of 'RF power signal
	`"ADEM:BAND 5 MHz"`	'Sets the measurement bandwidth to 5 MHz
	`"ADEM:AF:STAR 0kHz"`	'Sets the AF start frequency to 0 kHz
	`"ADEM:AF:STOP 500kHz"`	'Sets the AF stop frequency to 500 kHz

Characteristics: *RST value: 0 MHz
SCPI: device-specific

[SENSe:]ADEMod:AF:STOP <numeric_value>

This command sets the stop frequency for result display AF spectrum.

The stop frequency is limited to half the measurement bandwidth of analog demodulation (SENS:ADEM:BAND).

Example: `"ADEM ON"` 'Switches on the FM demodulator
`"CALC:FEED 'XTIM:FM:AFSP'` 'Switches on result display AF spectrum of FM
or
`"CALC:FEED 'XTIM:RFP:AFSP'` 'Switches on result display AF spectrum of 'RF power signal
`"ADEM:BAND 5 MHz"` 'Sets the measurement bandwidth to 5 MHz
`"ADEM:AF:STAR 0kHz"` 'Sets the AF start frequency to 0 kHz
`"ADEM:AF:STOP 500kHz"` 'Sets the AF stop frequency to 500 kHz

Characteristics: *RST value: 2.5 MHz
SCPI: device-specific

[SENSe:]ADEMod[:STATe] ON | OFF

This command activates the FM demodulator of the instrument. The instrument will be set to time domain measurement (span = 0) at the current center frequency.

Example: `"ADEM ON"` 'Switches the AM/FM demodulator on

Characteristics: *RST value: OFF
SCPI: device-specific

[SENSe:]ADEMod:SRATe?

This command returns the sample rate set up for the current analog demodulation measurement.

Example: `"ADEM:SRAT?"` 'Returns the current sample rate.

Characteristics: *RST value: -
SCPI: device-specific

COMMAND	PARAMETERS	UNIT	COMMENT
[SENSe<1|2>]			
:ADEMod			Option FM-Demodulator
:SPECtrum			
:BANDwidth			
[:RESolution]	<numeric_value>	HZ	
:BWIDth			
[:RESolution]	<numeric_value>	HZ	

[SENSe:]ADEMod:SPECtrum:BANDwidth|BWIDth[:RESolution] 1 Hz to 10 MHz

This command sets the resolution bandwidth for spectrum represetation that was determined from the analog demodulation data.

The recording time required is calculated from the and the sampling rate indirectly set via ADEM:SPEC:SPAN:MAX or ADEM:BAND. If the available recording time is not sufficient for the given bandwidth, the recording time is set to is maximum and the resolution bandwidth is enlarged to the resulting bandwidth.

Example:

	"ADEM ON"	' Switches on the FM demodulator
	"CALC:FEED 'XTIM:SPEC'	' Switches on the result display RF spectrum
or		
	"CALC:FEED 'XTIM:FM:AFSP'	' Switches on the result display AF spectrum 'of FM
or		
	"CALC:FEED 'XTIM:RFP:AFSP'	'Switches on the result display AF spectrum 'of RF power signal
	"ADEM:BAND:RES 61.2kHz"	'Sets the resolution bandwidth to 61.2 kHz.

Characteristics: *RST value: 61.2 kHz
SCPI: device-specific

[SENSe:]ADEMod:SPECtrum:SPAN[:MAXimum] <numeric_value>

This command sets the maximum frequency range for displaying the RF spectrum that was determined from the FM demodulation data. The maximum span corresponds to the measurement bandwidth of analog demodulation (SENS:ADEM:BAND).

Only discrete values are possible for the span since the available sampling rates are discrete.

Span	Sampling rate
10 MHz	32 MHz
8 MHz	16 MHz
5 MHz	8 MHz
3 MHz	4 MHz
1.6 MHz	2 MHz
800 kHz	1 MHz
400 kHz	500 kHz
200 kHz	250 kHz
100 kHz	125 kHz
50 kHz	62.5 kHz
25 kHz	31.25 kHz
12.5 kHz	15.625 kHz

Example:

"ADEM ON"	'Switches on the FM demodulator
"CALC:FEED 'XTIM:SPEC'	'Switches on result display RF spectrum
"ADEM:SPEC:SPAN:MAX 5 MHz"	'Sets the max. span to 5 MHz
"ADEM:SPEC:SPAN:ZOOM 1 MHz"	'Sets the displayed span to 1 MHz

Characteristics: *RST value: 5 MHz
SCPI: device-specific

SENSe:AVERage Subsystem

The SENSe:AVERage subsystem calculates the average of the acquired data. A new test result is obtained from several successive measurements.
There are two types of average calculation: logarithmic and linear. In case of logarithmic average calculation (denoted with VIDeo), the average value of the measured logarithmic power is calculated and in case of linear average calculation, the linear power is averaged before the logarithm is applied.
The measurement windows are selected by SENSe1 (screen A) and SENSe2 (screen B).

COMMAND	PARAMETERS	UNIT	COMMENT
[SENSe<1|2>]			
:AVERage			
:COUNt	<numeric_value>	--	
[:STATe<1 to 3>]	<Boolean>	--	
:TYPE	VIDeo | LINear	--	

[SENSe<1|2>:]AVERage:COUNt 0 to 32767

This command defines the number of measurements which contribute to the average value.

It should be noted that continuous averaging will be performed after the indicated number has been reached in continuous sweep mode.

In single sweep mode, the sweep is stopped as soon as the indicated number of measurements (sweeps) is reached. Synchronization to the end of the indicated number of measurements is only possible in single sweep mode.

The command `[SENSe<1|2>:]AVERage:COUNt` is the same as command `[SENSe<1|2>:]SWEep:COUNt`. In both cases, the number of measurements is defined whether the average calculation is active or not.

The number of measurements is valid for all traces in the indicated measurement window.

Example: "SWE:CONT OFF" Switching to single-sweep mode.
"AVER:COUN 16" 'Sets the number of measurements to 16.
"AVER:STAT ON" 'Switches on the calculation of average.
"INIT;*WAI" 'Starts the measurement and waits for the end of the 16 'sweeps.

Characteristics: *RST value: 0
SCPI: conforming

[SENSe<1|2>:]AVERage[:STATe<1 to 3>] ON | OFF

This command switches on or off the average calculation for the selected trace (STATe<1 to 3>) in the selected measurement window.

Example: "AVER OFF" 'Switches off the average calculation for trace 1 in screen A.

"SENS2:AVER:STAT3 ON" 'Switches on the average calculation for trace 3 'in screen B.

Characteristics: *RST value: OFF
SCPI: conforming

[SENSe<1|2>:]AVERage:TYPE VIDeo | LINear

This command selects the type of average function. If VIDeo is selected, the logarithmic power is averaged and, if LINear is selected, the power values are averaged before they are converted to logarithmic values.

The type of average calculation is equally set for all traces in one measurement window.

Example: "AVER:TYPE LIN" 'Switches screen A to linear average calculation.

Characteristics: *RST value: VIDeo
SCPI: device-specific

SENSe:BANDwidth Subsystem

This subsystem controls the setting of the instrument's filter bandwidths. Both groups of commands (BANDwidth and BWIDth) perform the same functions. The measurement windows are selected by SENSe1 (screen A) and SENSe2 (screen B).

COMMAND	PARAMETERS	UNIT	COMMENT
[SENSe<1|2>]			
:BANDwidth			
[:RESolution]	<numeric_value>	HZ	
:AUTO	<Boolean>	--	
:RATio	<numeric_value>	--	
:TYPE	NORMal | FFT | CFILter | RRC | NOISe | PULSe	--	
:VIDeo	<numeric_value>	HZ	
:AUTO	<Boolean>	--	
:RATio	<numeric_value>	--	
:TYPE	LINear | LOGarithmic		
:DEMod	<numeric_value>	HZ	
:PLL	AUTO | HIGH | MEDium | LOW		
:BWIDth			
[:RESolution]	<numeric_value>	HZ	
:AUTO	<Boolean>	--	
:RATio	<numeric_value>	--	
:TYPE	NORMal | FFT | CFILter | RRC	--	
:VIDeo	<numeric_value>	HZ	
:AUTO	<Boolean>	--	
:RATio	<numeric_value>	HZ	
:TYPE	LINear | LOGarithmic		
:DEMod	<numeric_value>		
:AUTO	ON | OFF		
:PLL	NORMal | WIDE | NARRow | AUTO | HIGH | MEDium | LOW		

[SENSe<1|2>:]BANDwidth|BWIDth:DEMod:AUTO ON | OFF

This command activates automatic setting of the demodulation bandwidth. The demodulation bandwidth is set as a function of the operating mode (audio, AM, FM, PM, RF Level) in order to minimize the measurement error in the specified measurement range.

Example: `"BAND:DEM:AUTO OFF"`

Characteristics: *RST value: ON
SCPI: device-specific

[SENSe<1|2>:]BANDwidth|BWIDth[:RESolution] 10 Hz to max

This command defines the analyzer's resolution bandwidth. This corresponds to the IF bandwidth of the demodulator in FM demodulator mode.

Analog resolution filters of 10 Hz to 20 MHz in 1, 2, 3, 5, 10 steps are available. Additionally there is a 50 MHz (FSMR43: 10 Hz to 10 MHz) resolution bandwidth. These filters are implemented as 5-circuit LC filters in the range from 300 kHz to 10 MHz and as digital filters with analog characteristic in the range of 10 Hz to 100 kHz.

In addition, the EMI bandwidths 200 Hz, 9 kHz and 120 kHz are available (6 dB bandwidths each). These bandwidths can only be obtained by entering numeric values and not with the commands `INCrement` and `DECrement`.

FFT filters from 1 Hz to 30 kHz (3 dB bandwidth each) are also available in the frequency domain (span > 0) for fast measurements on periodic signals. The instrument automatically switches to analog filters above 30 kHz.

A number of especially steep-edged channel filters can be selected from firmware version 1.10 or higher provided that parameters `CFILter` or `RRC` are selected using the `BAND:TYPE` command. The possible combinations of filter type and filter bandwidth are listed in the table "List of available channel filters" of chapter 4, section "Setting Bandwidths and Sweep Time– Key *BW"*.

If the resolution bandwidth is modified in SPECTRUM mode, the coupling to the span is automatically switched off.

If the resolution bandwidth is modified in FM DEMOD mode, the coupling to the demodulation bandwidth is automatically switched off.

Example: `"BAND 1MHz"` 'Sets the resolution bandwidth to 1 MHz

Characteristics: *RST value: - (AUTO is set to ON)
SCPI: conforming

[SENSe<1|2>:]BANDwidth|BWIDth[:RESolution]:AUTO ON | OFF

In SPECTRUM mode, this command either automatically couples the resolution bandwidth of the instrument to the span or cancels the coupling. In FM DEMOD mode, this command either automatically couples the IF bandwidth of the instrument to the demodulation bandwidth or cancels the coupling (BW_{RBW} = 10 * BW_{Demod}).

In FM DEMOD mode, the coupling refers to the demodulation bandwidth (BW_{RBW} = 10 * BW_{Demod}).

The automatic coupling adapts the resolution bandwidth to the currently set frequency span according to the relationship between frequency span and resolution bandwidth. The 6 dB bandwidths 200 Hz, 9 kHz and 120 kHz and the channel filters available from Version 1.10 are not set by the automatic coupling.

The ratio resolution bandwidth/span can be modified with the command `[SENSe<1|2>:]BANDwidth[:RESolution]:RATio`.

Example: `"BAND:AUTO OFF"` 'Switches off the coupling of the resolution bandwidth to
'the span (analyzer mode)..
'Switches off the coupling of the IF bandwidth to the
'demodulation bandwidth (FM demod mode)

Characteristics: *RST value: ON
SCPI: conforming

[SENSe<1|2>:]BANDwidth|BWIDth[:RESolution]:RATio 0.0001 to 1

This command defines the ratio resolution bandwidth (Hz) / span (Hz). The ratio to be entered is reciprocal to the ratio span/RBW used in manual control.

Example: `"BAND:RAT 0.1"`

Characteristics: *RST value: 0.02 with BAND:TYPE NORMal or RBW > 30 kHz
0.01 with BAND:TYPE FFT for RBW ≤ 30 kHz
SCPI: conforming

[SENSe<1|2>:]BANDwidth|BWIDth[:RESolution]:TYPE NORMal | FFT | CFILter | RRC

This command switches the filter type for the resolution bandwidth between "normal" analog or FIR filters in 1, 3, 10 steps and the FFT filtering for bandwidths <100 kHz.

The advantage of FFT filtering is the higher measurement speed compared to digital filters with analog filter characteristic. However, FFT filters are only suitable for periodic signals, and they are only available for span > 0 Hz.

From firmware version 1.10 onwards, steep-edged channel filters and filters with RRC (Root Raised Cosine) characteristic are available. The possible combinations of filter type and filter bandwidth are listed in the table "List of available channel filters" in chapter 4, section "Setting Bandwidths and Sweep Time– Key *BW".*

Notes: *- When changing the filter type, the next larger filter bandwidth is selected if the same filter bandwidth is not available for the new filter type.*

Example: `"BAND:TYPE NORM"`

Characteristics: *RST value: NORMal
SCPI: device-specific

[SENSe<1|2>:]BANDwidth|BWIDth:VIDeo 1Hz to 10MHz

This command defines the instrument's video bandwidth. Bandwidths from 10 Hz to 10 MHz in 1, 2, 3, 5, 10 steps are available. The command is not available if FFT filtering is switched on and the set bandwidth is ≤ 30 kHz or if the quasi-peak detector is switched on.

Example: `"BAND:VID 10kHz"`

Characteristics: *RST value: - (AUTO is set to ON)
SCPI: conforming

[SENSe<1|2>:]BANDwidth|BWIDth:VIDeo:AUTO ON | OFF

This command either automatically couples the instrument's video bandwidth to the resolution bandwidth or cancels the coupling.

The ratio video bandwidth/resolution bandwidth can be modified with the command `[SENSe<1|2>:]BANDwidth:VIDeo:RATio`.

Example: `"BAND:VID:AUTO OFF"`

Characteristics: *RST value: ON
SCPI: conforming

[SENSe<1|2>:]BANDwidth|BWIDth:VIDeo:RATio 0.01 to 1000

This command defines the ratio video bandwidth (Hz) / resolution bandwidth (Hz).The ratio to be entered is reciprocal to the ratio RBW/VBW used in manual control.

Example: `"BAND:VID:RAT 3"` 'Sets the coupling of video bandwidth to video 'bandwidth = 3*resolution bandwidth

Characteristics: *RST value: 3
SCPI: conforming

[SENSe<1|2>:]BANDwidth|BWIDth:VIDeo:TYPE LINear | LOGarithmic

This command selects the position of the video filter in the signal path, provided that the resolution bandwidth is ≤100 kHz:

- If LINear is selected, the video filter is connected ahead of the logarithmic amplifier (default)
- If LOGarithmic is selected, the video filter follows the logarithmic amplifier

The essential difference between the two modes is the transient response at falling signal edges:

If LINear is selected, the measurement with logarithmic level scaling yields a much "flatter" falling edge than LOGarithmic.

This behaviour is due to the conversion of linear power into logarithmic level. If the linear power is halved, the level decreases by only 3 dB.

Example: `"BAND:VID:TYPE LIN"` 'Video filter ahead of the logarithmic amplifier

Characteristics: *RST value: LIN
SCPI: device-specific

[SENSe<1|2>:]BANDwidth|BWIDth:DEMod <numeric-value>

This command defines the demodulation bandwidth of the instrument for analog demodulation. The required sampling rate is automatically set depending on the selected demodulation bandwidth. The available demodulation bandwidths are determined by the existing sampling rates.

rounded demodulation bandwidth	**Sampling rate**
10 MHz	32 MHz
8 MHz	16 MHz
5 MHz	8 MHz
3 MHz	4 MHz
1.6 MHz	2 MHz
800 kHz	1 MHz
400 kHz	500 kHz
200 kHz	250 kHz
100 kHz	125 kHz
50 kHz	62.5 kHz
25 kHz	31.25 kHz
12.5 kHz	15.625 kHz

Example: `"ADEM:BAND:DEM 1MHz"` 'Sets demodulation bandwidth to 1 MHz.

Characteristics: *RST value: 1,6 MHz
SCPI: device specific

SENSe:CORRection Subsystem

This subsystem also controls calibration and normalization during operation with the external generator control option (B10). The measurement windows are selected by SENSe1 (screen A) and SENSe2 (screen B).

COMMAND	PARAMETERS	UNIT	COMMENT
[SENSe<1|2>]			
:CORRection			Tracking generator option
:COLLect			
[:ACQuire]	INPut| PMeter | PSPLitter		no query e
[:STATe]	<Boolean>		
:RECalll			no query
:PLOSs			
:INPut			
:STATe	<Boolean>		
:SPATh	<numeric_value>		
:METHod	TRANsmission | REFLexion |		
:EGAin			
:INPut			
[:MAGnitude]	<numeric_value>	DB	
:TRANsducer			
:SELect	<name>		
:UNIT	<string>		
:SCALing	LINear|LOGarithmic		
:COMMent	<string>		
:DATA	<freq> , <level> ..	HZ , --	
[:STATe]	<Boolean>		
:DELete	--	--	no query
:VIEW	<Boolean>		
:YIG			
:TEMPerature			
[:AUTO]	<Boolean>		

[SENSe<1|2>:]CORRection:COLLect[:ACQuire] INPut | PMETer | PSPLitter

This command carries out the various steps of absolute level calibration in the *Tuned RF Level* mode.

PMETer Measures the reference level with a power meter.

INPut Measures the comparison value at the receiver's RF input and corrects it to the reference level.

PSPLitter Measures the reference level and then the comparison value.
For this measurement, the power meter and the receiver's RF input must be connected to the DUT via a power splitter.

Example: `"CORR:COLL PSPL;*WAI"` 'Starts the reference measurement and the comparison measurement one after the other and waits for the operation to be completed.

Characteristics: *RST value: --
SCPI: device-specific

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

[SENSe<1|2>:]CORRection:PLOSs:INPut <freq>,<level>..

This command defines the interpolation points for the frequency response correction for the power splitter on the path between the signal source and the power meter. The points are to be entered as a sequence of frequency/level pairs, with the frequencies to be specified in ascending order.

Example: "`CORR:PLOS:INP 10MHZ,-4.2,20MHZ,-4.6`"

Characteristics: *RST value: -
SCPI: device-specific

[SENSe:]CORRection:PLOSs:INPut[:STATe] ON | OFF

This command switches on or off automatic correction of the insertion loss of the power splitter, which distributes the incoming RF signal to the power meter and the RF input of the receiver.

Example: "`CORR:PLOS:INP ON`" 'Corrects the insertion loss of the power splitter.

Characteristics: *RST value: OFF
SCPI: device-specific

[SENSe:]CORRection:PLOSs:INPut:SPATh <numeric_value>

This command defines the insertion loss of the power splitter between the signal source and the RF input of the receiver. The value entered here only serves for plausibility checking during absolute value calibration. The correct value is then determined during absolute value calibration.

Example: "`CORR:PLOS:INP:SPAT 4 dB`"'Defines a 4 dB insertion loss.

Characteristics: *RST value: 0
SCPI: device-specific

[SENSe<1|2>:]CORRection[:STATe] ON | OFF

This command activates/deactivates the normalization of the measurement results in the selected window provided that the tracking generator is active. The command is available only after acquisition of a reference trace for the selected type of measurement (transmission/reflection, see command `[SENSe<1|2>:]CORRection:COLLect[:ACQire]`).

Example: "`CORR ON `" 'Activates normalization in screen A.

Characteristics: *RST value: OFF
SCPI: conforming

This command is only valid in conjunction with the ext. generator control option (B10).

[SENSe<1|2>:]CORRection:METHod TRANsmission | REFLection

This command selects the type of measurement with active tracking generator (transmission/reflection).

Example: "`CORR:METH TRAN `" 'Sets the type of measurement in screen A to “transmission“.

Characteristics: *RST value: TRANsmission
SCPI: device specific

This command is only valid in conjunction with the ext. generator control option (B10).

[SENSe<1|2>:]CORRection:RECall

This command restores the instrument setting that was valid for the measurement of the reference data, provided that the tracking generator is active.

Example: "CORR:REC"

Characteristics: *RST value: -
SCPI: conforming

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

It is only valid in conjunction with the ext. generator control option (B10).

[SENSe<1|2>:]CORRection:TRANsducer:SELect <name>

This command selects the transducer factor designated by <name>. If <name> does not exist yet, a new transducer factor is created.

Notes:
This command must be sent prior to the subsequent commands for modifying/activating transducer factors.

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

Example: ":CORR:TRAN:SEL 'FACTOR1'"

Characteristics: *RST value: -
SCPI: device-specific

This command is available from firmware version 1.40 or higher.

[SENSe<1|2>:]CORRection:TRANsducer:UNIT <string>

This command defines the unit of the transducer factor selected.

Note:
Prior to this command, the command SENS:CORR:TRAN:SEL must be sent.

Parameter: <string>::= 'DB' | 'DBM' | 'DBMV' | 'DBUV' | 'DBUV/M' | 'DBUA'
'DBUA/M' | 'DBPW' | 'DBPT'

Example: ":CORR:TRAN:UNIT 'DBUV'"

Characteristics: *RST value: 'DB'
SCPI: device-specific

This command is available from firmware version 1.40 or higher.

[SENSe<1|2>:]CORRection:TRANsducer:SCALing LINear | LOGarithmic

This command defines whether the frequency scaling of the transducer factor is linear or logarithmic.

Note:
Prior to this command, the command SENS:CORR:TRAN:SEL must be sent.

Example: ":CORR:TRAN:SCAL LOG"

Characteristics: *RST value: LINear
SCPI: device-specific

This command is available from firmware version 1.40 or higher.

[SENSe<1|2>:]CORRection:TRANsducer:COMMent <string>

This command defines the comment for the selected transducer factor.

Note:
Prior to this command, the command `SENS:CORR:TRAN:SEL` must be sent.

Example: `":CORR:TRAN:COMM 'FACTOR FOR ANTENNA'"`

Characteristics: *RST value '' (empty comment)
SCPI: device specific

[SENSe<1|2>:]CORRection:TRANsducer:DATA <freq>,<level>..

This command defines the reference values of the transducer factor selected. These values are entered as a sequence of frequency/level pairs. The frequencies must be sent in ascending order.

Note:
Prior to this command, the command `SENS:CORR:TRAN:SEL` must be sent. The level values are sent as dimensionless numbers; the unit is specified by means of the command `SENS:CORR:TRAN:UNIT`.

Example: `":CORR:TRAN:TRANsducer:DATA 1MHZ,-30,2MHZ,-40"`

Characteristics: *RST value: -
SCPI: device-specific

[SENSe<1|2>:]CORRection:TRANsducer[:STATe] ON | OFF

This command switches the selected transducer factor on or off.

Note:
Prior to this command, the command `SENS:CORR:TRAN:SEL` must be sent.

Example: `":CORR:TRAN ON"`

Characteristics: *RST value: OFF
SCPI: device-specific

[SENSe<1|2>:]CORRection:TRANsducer:DELete

This command deletes the selected transducer factor.

Note:
Prior to this command, the command `SENS:CORR:TRAN:SEL` must be sent.

Example: `":CORR:TRAN:DEL"`

Characteristics: *RST value: -
SCPI: device-specific

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

[SENSe<1|2>:]CORRection:TRANsducer:VIEW ON | OFF

This command switches on the display of the active transducer factor or set.

Note:
Prior to this command, the command `SENS:CORR:TRAN:SEL` must be sent.

Example: `"CORR:TRAN:VIEW ON"`

Characteristics: *RST value: OFF
SCPI: device-specific

[SENSe<1|2>:]CORRection:YIG:TEMPerature:AUTO ON | OFF

This command switches on or off the automatic correction of the YIG filter frequency drift.

When correction is switched on, it is checked once per minute whether the temperature on the YIG filter has changed by more than 5K relative to the last instance of correction. If this is the case, the frequency of the YIG filter is – at the end of the next measurement – adjusted as required for the new temperature. For time-critical applications, the correction function can be switched off after an operating period of ≥ 30 minutes.

Example: `"CORR:YIG:TEMP OFF"` 'Switches off automatic correction of the YIG filter frequency drift.

Characteristics: *RST value: ON
SCPI: device-specific

The ON parameter is available only if the MW CONV UNIT module has one of the following modification states:

Order No.	Rev	SubRev
1130.2396	≥ 02	≥ 01
1130.2544	≥ 02	≥ 01
1093.8249	≥ 08	≥ 01
1093.8584	≥ 02	≥ 01
1130.3240	≥ 02	≥ 01

The option Preselektor must be installed.

SENSe:DETector Subsystem

The SENSe:DETector subsystem controls the acquisition of measurement data via the selection of the detector for the corresponding trace. The measurement windows are selected by SENSe1 (screen A) and SENSe2 (screen B).

COMMAND	PARAMETERS	UNIT	COMMENT
[SENSe<1|2>]			
:DETector<1..3>			
[:FUNCtion]	APEak | NEGative | POSitive | SAMPle | RMS | AVERage | QPEak	--	
:AUTO	<Boolean>		
	POSitive|NEGative |RMS| AVERage|QPEak		

[SENSe<1|2>:]DETector<1..3>[:FUNCtion] APEak | NEGative | POSitive | SAMPle | RMS | AVERage | QPEak

This command switches on the detector for the data acquisition in the selected trace and the indicated measurement window.

- The APEak detector (AutoPeak) displays the positive and also the negative peak value of the noise floor. If a signal is detected, only the positive peak value is displayed.
- The POSitive or NEGative detector only displays the positive or the negative peak value.
- With the Sample detector the value measured at the sampling time is displayed, whereas the RMS value of the power measured at each test point is displayed with the RMS detector.
- The AVERage detector displays the power average value at each test point.
- The QPEak detector performs a signal evaluation for EMC measurements.

If QPEak is selected, the video filter is automatically switched off. The couplings between span and RBW as well as between RBW and sweep time are also switched off and restored on selecting another detector. A long sweep time should be selected so that the quasi-peak detector can fully settle at each test point.

The trace is indicated as numeric suffix in `DETector`.

Example: `"DET POS"` 'Sets the detector in screen A to "positive peak".

Characteristics: *RST value: APEak
SCPI: conforming

[SENSe<1|2>:]DETector<1 to 3>[:FUNCtion]:AUTO ON | OFF

This command either couples the detector in the selected measurement window to the current trace setting or turns coupling off. The trace is selected by the numeric suffix at DETector.

Example: `"DET:AUTO OFF"`

Characteristics: *RST value: ON
SCPI: conforming

SENSe:FILTer - Subsystem

COMMAND	PARAMETERS	UNIT	COMMENT
[SENSe<1|2>]			
FILTer			
HPASs			
[:STATe]	<Boolean>	--	
FREQuency	50 | 300	Hz	
LPASs			
[:STATe]	<Boolean>	--	
FREQuency	3 | 15 | 100	kHz	
DEMPhasis			
[:STATe]	<Boolean>	--	
TCOstant	25 | 50 | 75 | 750	s	

[SENSe:]FILTer:HPASs[:STATe] ON | OFF

This command switches on or off a highpass filter in the audio signal path.

Note: *Audio filters can be used in the Demodulation and Audio modes.*

Example: "`FILT:HPAS ON`" 'Switches on the highpass filter.

Characteristics: *RST value: OFF
SCPI: conforming

[SENSe:]FILTer:HPASs:FREQuency 50 Hz | 300 Hz

This command defines the cutoff frequency of the highpass filter in the AF path.

Note: *Audio filters can be used in the Demodulation and Audio modes.*

Example: "`FILT:HPAS:FREQ 300 Hz`"'Selects the highpass filter.

Characteristics: *RST value: -- (STATe OFF)
SCPI: conforming

[SENSe:]FILTer:LPASs[:STATe] ON | OFF

This command switches on or off a lowpass filter in the audio signal path.

Note: *Audio filters can be used in the Demodulation and Audio modes.*

Example: "`FILT:LPAS ON`" 'Switches on the lowpass filter.

Characteristics: *RST value: OFF
SCPI: conforming

[SENSe:]FILTer:LPASs:FREQuency 3 kHz | 15 kHz | 100 kHz

This command defines the cutoff frequency of the lowpass filter in the AF path.

Note: Audio filters can be used in the Demodulation and Audio modes.

Example: "`FILT:LPAS:FREQ 100 kHz`"'Selects the lowpass filter.

Characteristics: *RST value: -- (STATe OFF)
SCPI: conforming

[SENSe:]FILTer:DEMPhasis[:STATe] ON | OFF

This command switches on or off a deemphasis in the audio signal path.

Note: Audio filters can be used in the Demodulation and Audio modes.

Example: "`FILT:DEMP ON`" 'Switches on the deemphasis.

Characteristics: *RST value: OFF
SCPI: conforming

[SENSe:]FILTer:DEMPhasis:TCONstant 25 us | 50 us | 75 us | 750 us

This command defines the time constant for the deemphasis.

Note: Audio filters can be used in the Demodulation and Audio modes.

Example: "`FILT:DEMP:TCON 25 us`"'Selects the time constant.

Characteristics: *RST value: -- (STATe OFF)
SCPI: conforming

SENSe:FREQuency Subsystem

The SENSe:FREQuency subsystem defines the frequency axis of the active display. The frequency axis can either be defined via the start/stop frequency or via the center frequency and span. The measurement windows are selected by SENSe1 (screen A) and SENSe2 (screen B).

COMMAND	PARAMETERS	UNIT	COMMENT
[SENSe<1|2>]			
:FREQuency			
:CENTer	<numeric_value>	HZ	
:STEP	<numeric_value>	HZ	
:LINK	SPAN|RBW|OFF	--	
:FACTor	<numeric_value>	PCT	
:SPAN	<numeric_value>	HZ	
:FULL	--	--	
:STARt	<numeric_value>	HZ	
:STOP	<numeric_value>	HZ	
:MODE	CW|FIXed|SWEep		
:OFFSet	<numeric_value>	HZ	

[SENSe<1|2>:]FREQuency:CENTer 0 to f_{max}

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

Example: `"FREQ:CENT 100MHz"`

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

[SENSe<1|2>:]FREQuency:CENTer:STEP 0 to f_{max}

This command defines the step width of the center frequency.

Example: `"FREQ:CENT:STEP 120MHz"`

Characteristics: *RST value: - (AUTO 0.1 × SPAN is switched on)
SCPI: conforming

[SENSe<1|2>:]FREQuency:CENTer:STEP:LINK SPAN | RBW | OFF

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

Parameters:
SPAN = Coupling to frequency display range (for span > 0)
RBW = Coupling to resolution bandwidth (for span = 0)
OFF = manual input, no coupling.

Example: `"FREQ:CENT:STEP:LINK SPAN"`

Characteristics: *RST value: SPAN
SCPI: device-specific

[SENSe<1|2>:]FREQuency:CENTer:STEP:LINK:FACTor 1 to 100 PCT

This command couples the step width of the center frequency with a factor to the span (span >0) or to the resolution bandwidth (span = 0).

Example: "FREQ:CENT:STEP:LINK:FACT 20PCT"

Characteristics: *RST value: - (AUTO 0.1 × SPAN is switched on)
SCPI: device-specific

[SENSe<1|2>:]FREQuency:SPAN 0 to f_{max}

This command defines the frequency span in the analyzer mode.

Example: "FREQ:SPAN 10MHz"

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

[SENSe<1|2>:]FREQuency:SPAN:FULL

This command sets the frequency span in the analyzer mode to its maximum.

Example: "FREQ:SPAN:FULL"

Characteristics: *RST value: -
SCPI: conforming

[SENSe<1|2>:]FREQuency:STARt 0 to f_{max}

This command defines the start frequency of the analyzer. This command is only available in the frequency domain (span >0).

Example: "FREQ:STAR 20MHz"

Characteristics: *RST value: 0
SCPI: conforming

[SENSe<1|2>:]FREQuency:STOP 0 to f_{max}

This command defines the stop frequency of the analyzer. This command is only available in the frequency domain (span >0).

Example: "FREQ:STOP 2000MHz"

Characteristics: *RST value: f_{max}
SCPI: conforming

[SENSe<1|2>:]FREQuency:MODE CW | FIXed | SWEep

This command switches between frequency domain (SWEep) and time domain (CW | FIXed) in the analyzer mode.

For CW and FIXed, the frequency setting is via command `FREQuency:CENTer`. In the SWEep mode, the setting is via commands `FREQuency:STARt`, `STOP`, `CENTer` and `SPAN`.

Example: "FREQ:MODE SWE"

Characteristics: *RST value: SWEep
SCPI: conforming

[SENSe<1|2>:]FREQuency:OFFSet <numeric_value>

This command defines the frequency offset of the instrument.

Example: "FREQ:OFFS 1GHZ"

Characteristics: *RST value: 0 Hz
SCPI: conforming

SENSe:LIST Subsystem

The commands of this subsystem are used for measuring the power at a list of frequency points with different device settings. The measurement is always performed in the time domain (span = 0 Hz).

A new trigger event is required for each test point (exception: Trigger FREE RUN).

The results are output as a list in the order of the entered frequency points. The number of results per test point depends on the number of concurrently active measurements (peak/RMS/average).

Selection of concurrently active measurements and setting of parameters that are constant for the whole measurement is via a configuration command (`SENSe:LIST:POWer:SET`). This also includes the setting for trigger and gate parameters.

The following setting parameters can be selected independently for each frequency point:

- Analyzer frequency
- Reference level
- RF attenuation
- RF attenuation of attenuator (only with option B25)
- Resolution filter
- Resolution bandwidth
- Video bandwidth
- Measurement time
- Detector

The number of frequencies is limited to 100 entries.

The commands of this subsystem can be used in two different ways:

1. Instrument setup, measurement and querying of the results in a single command:
   With this method, there is the least delay between the measurement and the result output. However, it requires the control computer to wait for the response from the instrument.
2. Instrument setup and querying of the result list at the end of the measurement:
   With this method, the control computer may be used for other activities while the measurement is being performed. However, more time is needed for synchronization via service request.

Note: *Settings that are not directly included in commands of this subsystem can be configured by sending the corresponding commands prior to the SENSe:LIST-commands.*

Please note that changes to the trigger level have to be executed in time domain (span = 0 Hz) in order to take effect for the SENSe:LIST-commands.

COMMAND	PARAMETER	UNIT	COMMENT
[SENSe<1|2>]			
:LIST			
:POWer			
:RESult?			query only
[:SEQuence]	<numeric_value>, <numeric_value>, <numeric_value>, <numeric_value> | OFF, NORMal | CFILter | RRC, <numeric_value>, <numeric_value>, <numeric_value>, <numeric_value> ...	HZ, DBM, DB, DB, --, HZ, HZ, S, PCT|DBM	
:SET	<Boolean>, <Boolean>, <Boolean>, IMMediate | EXTernal | VIDeo | IFPower, POSitive|NEGative, <numeric_value>, <numeric_value>	--, --, --, --, --, S, S	
:STATe	OFF		

[SENSe<1|2>:]LIST:POWer[:SEQuence] <analyzer freq>,<ref level>,<rf att>,<el att>,
<filter type>,<rbw>,<vbw>,<meas time>,<trigger level>,...

This command configures the list of settings (max. 100 entries) for the multiple power measurement and starts a measurement sequence. When synchronizing the command with *OPC, a service request is generated as soon as all frequency points are processed and the defined number of individual measurements is reached.

To reduce the setting time, all indicated parameters are set up simultaneously at each test point.

The query form of the command processes the list and immediately returns the list of results. The number of results per test point depends on the setting of the "`SENSe:LIST:POWer:SET`" command.

Parameter: ***Note:*** *The following parameters are the settings for an individual frequency point. They are repeated for every other frequency point.*

<analyzer freq>: Receive frequency for the signal to be measured (= center frequency in manual operation)

Range of values: 0 Hz to max. frequency, depending on the instrument model.

<ref level>: Reference level

Range of values: +30 dBm to -70 dBm in 10 dB steps
+30 dBm to -75 dBm in 5 dB steps with El. Attenuator option B25

Range of values: 0 dB to 70 dB in 10 dB steps
0 dB to 75 dB in 5 dB steps with El. Attenuator Option B25

<el att>: RF input attenuation of electronic attenuator

Range of values: 0 dB to 30 dB in 10 dB steps
OFF electronic attenuator not in signal path

If option B25 is missing, OFF is to be used.

<filter type>: NORMal: normal resolution filter
CFILter: channel filter. These are especially steep-edged

measurement to ensure the band-limiting of a transmission channel in the time domain.

RRC: Root Raised Cosine filter. This special filter form is used to determine the channel power for some mobile radio standards.

<rbw>: Resolution bandwidth

Range of values: 10 Hz to 20 MHz in 1, 2, 3, 5, 10 steps and 50 MHz (R&S FSMR43: 10Hz to 10MHz) for <filter type> = NORMal.

<vbw>: Video bandwidth

Range of values: 1 Hz to 10 MHz in 1, 2, 3, 5, 10 steps. (30 MHZ for RBW > 10 MHz, not R&S FSMR

The value is ignored for <filter type> = CFILter or RRC

<meas time>: Measurement time

Range of values: 1us to 30s

<trigger level>: Reserved. Must be set to 0.

Returned values:

The query command returns a list of comma-separated values (CSV) which contains the power measurement results in floating-point format. The unit depends on the setting with `CALC:UNIT`.

Command

```
"SENSe:LIST:POWer?    935.2MHz,-20dBm,10dB,OFF,NORM,1MHz,3MHz,434us,0,
                      935.4MHz,-20dBm,10dB,10dB,NORM,30kHz,100kHz,434us,0,
                      935.6MHz,-20dBm,10dB,20dB,NORM,30kHz,100kHz,434us,0"
```

thus returns the following list, for example:

-28.3,-30.6,-38.1

If the command sequence is extended to

```
"SENSe:LIST:POWer:SET ON,ON,ON,IMM,POS,0,0"
```

```
"SENSe:LIST:POWer?    935.2MHz,-20dBm,10dB,OFF,NORM,1MHz,3MHz,434us,0,
                      935.4MHz,-20dBm,10dB,10dB,NORM,30kHz,100kHz,434us,0,
                      935.6MHz,-20dBm,10dB,20dB,NORM,30kHz,100kHz,434us,0"
```

the result list is extended to 3 results per frequency point (peak, RMS and average):

-28.3, -29.6, 1.5, -30.6, -31.9, 0.9, -38.1, -40.0, 2.3

Examples:

```
"SENSe:LIST:POWer     935.2MHz,-20dBm,10dB,OFF,NORM,1MHz,3MHz,434us,0,
                      935.4MHz,-20dBm,10dB,10dB,CFIL,30kHz,100kHz,434us,0,
                      935.6MHz,-20dBm,10dB,20dB,CFIL,30kHz,100kHz,434us,0"
```

performs a measurement sequence with the following settings:

Step	Freq. [MHz]	Ref Level	RF Att	el Att	Filter type	RBW	VBW	Meas Time	TRG Level (reserved)
1	935.2	-20 dBm	10 dB	OFF	Normal	1 MHz	3 MHz	434 us	0
2	935.4	-20 dBm	10 dB	10dB	Channel	30 kHz	100 kHz	434 us	0
3	935.6	-20 dBm	10 dB	20dB	Channel	30 kHz	100 kHz	434 us	0

```
"SENSe:LIST:POWer?    935.2MHz,-20dBm,10dB,OFF,NORM,1MHz,3MHz,434us,0,
                      935.4MHz,-20dBm,10dB,10dB,CFIL,30kHz,100kHz,434us,0,
                      935.6MHz,-20dBm,10dB,20dB,CFIL,30kHz,100kHz,434us,0"
```

performs the same measurement and returns the result list immediately after the last frequency point.

Notes: - *The measurement is performed in the time domain and therefore the span is set to 0 Hz. If the time domain is abandoned, the function is automatically switched off.*

- *The measurement is not compatible with other measurements, especially as far as marker, adjacent channel power measurement or statistics are concerned. The corresponding commands thus automatically deactivate the function.*

- *The function is only available in REMOTE operation. It is deactivated when switching the instrument back to LOCAL.*

Characteristics: *RST value: --
SCPI: device-specific

[SENSe<1|2>:]LIST:POWer:SET <PEAK meas>,<RMS meas>,<AVG meas>, <trigger mode>,<trigger slope>,<trigger offset>,<gate length>

This command defines the constant settings for the list during multiple power measurement.

Parameters <PEAK meas>, <RMS meas> and <AVG meas> define, which measurements are to be performed at the same time at the frequency point. Correspondingly, one, two or three results per frequency point are returned for the `SENS:LIST:POW?` command. If all three parameters are set to OFF, the command generates an execution error.

Parameter:

<PEAK meas>:	ON	activates the measurement of the peak power (peak detector).
	OFF	deactivates the measurement of the peak power.
<RMS meas>:	ON	activates the measurement of the RMS power (RMS detector) .
	OFF	deactivates the measurement of the RMS power.
<AVG meas>:	ON	activates the measurement of the average power (average detector).
	OFF	deactivates the measurement of the average power.

<trigger mode>: Selection of the trigger source used for the list measurement.

Possible values:

IMMediate | VIDeo | EXTernal | IFPower

<trigger slope>: Used trigger slope.

Possible values:

POSitive | NEGative

<trigger offset>: Offset between the detection of the trigger signal and the start of the measurement at the next frequency point.

Range of values: 0 s, 125 ns to 100s

<gate length>: Gate length with Gated Sweep.

Range of values: 0 s, 125 ns to 100s

Note:

- *The value 0 s deactivates the use of GATED TRIGGER; other values activate the GATED TRIGGER function.*
- *Values <> 0 s are only possible if <trigger mode> is different from IMMediate. Otherwise, an execution error is triggered.*

Returned values:

The query command returns a list of comma-separated values (CSV) of the settings, i.e.

`ON,ON,ON,IMM,POS,0,0`

if the configuration has been set with the command

`"SENSe:LIST:POWer:SET ON,ON,ON,IMM,POS,0,0"`

Examples:
```
"SENSe:LIST:POWer:SET ON,OFF,OFF,EXT,POS,10US,434US"
"SENSe:LIST:POWer:SET ON,ON,ON,VID,NEG,10US,0"
```

Characteristics: *RST values: `ON,OFF,OFF,IMM,POS,0S,0S`
SCPI: device-specific

[SENSe<1|2>:]LIST:POWer:RESult?

This command queries the result of a previous list measurement as configured and initiated with `SENSe:LIST:POWer[:SEQuence]`. The measured results are output in a list of floating point values separated by commas. The unit of the results depends on the setting made with the `CALC:UNIT` command.

This command may be used to obtain measurement results in an asynchronous way, using the service request mechanism for synchronization with the end of the measurement.

If no measurement results are available, the command will return a query error.

Example:

```
'Configuration of the status reporting system for the generation of an SRQ
on operation complete

*ESE 1

*SRE 32

'Configuring and starting the measurement

"SENSe:LIST:POWer     935.2MHz,-20dBm,10dB,OFF,NORM,1MHz,3MHz,434us,0,
                      935.4MHz,-20dBm,10dB,10dB,NORM,30kHz,100kHz,434us,0,
                      935.6MHz,-20dBm,10dB,20dB,NORM,30kHz,100kHz,434us,0;
                      *OPC"

'Further actions of the control computer during measurement

...

'Response to service request

On SRQ:

SENSe:LIST:POWer:RESult?
```

Characteristics: *RST value: --
SCPI: device-specific

[SENSe<1|2>:]LIST:POWer:STATe OFF

This command deactivates the list measurement.

Example: `"SENSe:LIST:POWer:STATe OFF"`

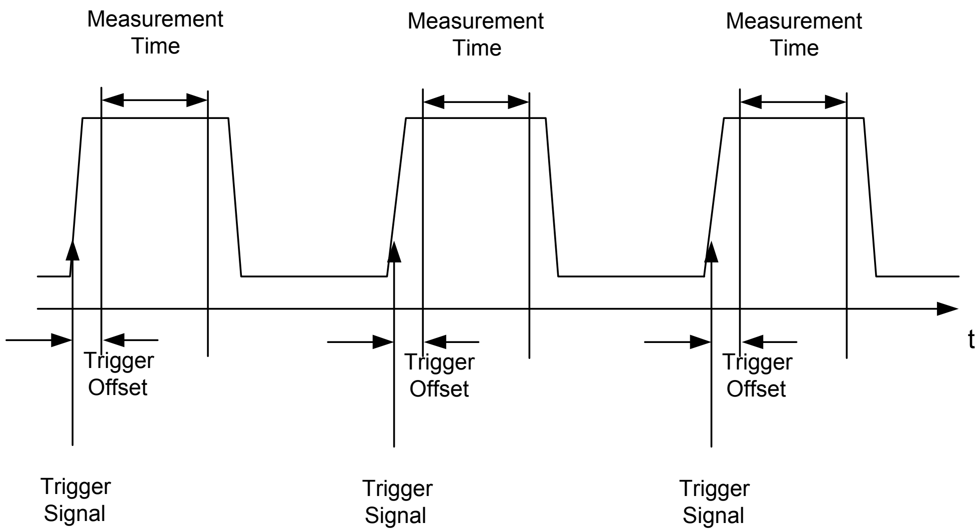
Characteristics: *RST value: --
SCPI: device-specific

SENSe:MPOWer Subsystem

The commands of this subsystem are used to determine the mean burst power or peak burst power for a given number of signal bursts, and for outputting the results in a list. Since all the settings required for a measurement are combined in a single command, the measurement speed is considerably higher than when using individual commands.

For measuring the signal bursts, the GATED SWEEP function is used in the time domain. The gate is controlled either by an external trigger signal or by the video signal. An individual trigger event is required for each burst to be measured. If an external trigger signal is used, the threshold is fixed to TTL level, while with a video signal the threshold can be set as desired.

The following graphics shows the relation between trigger time, trigger offset (for delayed gate opening) and measurement time.



Depending on the settings made, the measurements are performed with the RMS detector for RMS power or the PEAK detector for peak power. For all these measurements, TRACE 1 of the selected system is used.

The setting parameters for this measurement are:

analyzer frequency

resolution bandwidth

measurement time used for a single burst

trigger source

trigger level

trigger offset

type of power measurement (PEAK, MEAN)

number of bursts to be measured

The commands of this subsystem can be used in two different ways:

1. Setting up the instrument and at the same time querying the result list: This method ensures the smallest delay between measurement and the output of the measured values, but requires the control computer to wait actively for the response of the instrument.
2. Setting up the instrument and querying the result list after synchronization to the end of measurement:
   With this method the control computer can be used for other activities while the instrument is performing the measurement at the cost of additional time needed for synchronization via service request.

COMMAND	PARAMETER	UNIT	COMMENT
[SENSe<1|2>]			
:MPOWer			
[:SEQuence]	<numeric_value>, <numeric_value>, <numeric_value>, EXTernal | VIDeo, <numeric_value>, <numeric_value>, MEAN | PEAK, <numeric_value>	HZ, HZ, S, --, PCT, S, --, --	
:RESult			
[:LIST]?			Query only
:MIN?			Query only

[SENSe<1|2>:]MPOWer[:SEQuence] <analyzer freq>,<rbw>,<meas time>,<trigger source>, <trigger level>,<trigger offset>,<type of meas>,<# of meas>

This command configures the instrument setup for multiple burst power measurement and starts a measurement sequence. When synchronizing the command with *OPC, a service request is generated as soon as the defined number of individual measurements (# of meas) is reached.

To reduce the setting time, the setup is performed simultaneously for all selected parameters.

The command in the form of a query makes the instrument settings, performs the defined number of measurements and outputs the measurement results list.

Parameters:

<analyzer freq>: Receive frequency for the burst signals to be measured (= center frequency in manual operation)

Range: 0 Hz to max. frequency, depending on instrument model

<rbw>: resolution bandwidth for the measurement

Range: 10 Hz to 10 MHz in steps of 1, 3, 10

<meas time>: Time span during which measurement samples are sampled for RMS / peak measurement The type of measurement is selected by <type of meas>.

Range: 1us to 30s

<trigger source>: trigger signal source. Possible settings:

EXTernal The trigger signal is fed from the "Ext. Trigger/Gate" input on the rear of the unit.

VIDeo The internal video signal is used as trigger signal.

<trigger level>: Signal level at which the trigger becomes active. For <trigger source> = VIDeo this is the level of the video signal as a percentage of the diagram height. If <trigger source> = EXTernal is selected, the value entered here is ignored, as in this case the trigger input uses TTL levels.

Range: 0 – 100PCT (<trigger source> = VIDeo)

<trigger offset>: Offset between the detection of the trigger signal and the start of the measurement.

Range: 125 ns to 100s

<type of meas>: Determines whether mean power (RMS) or peak power (PEAK) is to be measured. The detector is selected accordingly.

Possible values:MEAN, PEAK

<# of meas>: Number of individual bursts to be measured.

Range: 1 to 501

Return values:

The query command returns a list separated by commas (comma separated values = CSV), which contains the power measurement results in floating-point format. The unit used for the return values is always dBm.

The command `"SENSe:MPOWer? 935.2MHz,1MHz,434us,VIDEO,50PCT,5us,MEAN,20"` may, for instance, cause the following list to be returned:

18.3,18.6,18.1,18.0,17.9,18.3,18.6,18.1,18.0,17.9,18.3,18.6,18.1,18.0,17.9,18.3,18.6,18.1,18.0,17.9

Examples: `"SENSe:MPOWer 935.2MHz,1MHz,434us,VIDEO,50PCT,5us,MEAN,20"`
performs a measurement sequence with the following settings:

Frequency	= 935.2 MHz,
Resolution bandwidth	= 1 MHz
Measurement time	= 434 µs
Trigger source	= VIDEO
Trigger threshold	= 50%
Trigger offset	= 5 µs
Type of measurement	= MEAN power
No. of measurements	= 20

`"SENSe:MPOWer? 935.2MHz,1MHz,434us,VIDEO,50PCT,5us,MEAN,20"`

performs the same measurement and in addition returns the results list immediately after completion of the last measurement.

Notes: *The measurement function always uses trace 1 in the selected screen, and activates the selected screen.*
Repeated use of the command without changes to its parameters (i.e. using the same settings again) will speed up the measurement since the previous hardware settings will be cached and therefore additional hardware settling times will be avoided. This also holds true if only part of the parameters (e.g. only the trigger delay) are changed, as in this case the rest of the parameters will be cached.

This measurement is not compatible with other measurements, especially as far as marker functions, adjacent-channel measurement or statistics are concerned. The corresponding functions are therefore automatically switched off. In return incompatible commands will automatically deactivate the multi burst power function.

The function is only available in the REMOTE operation. It is deactivated on switching back to LOCAL.

Characteristics: *RST value: --
SCPI: instrument-specific

SENSe:MPOWer:RESult[:LIST]?

This command queries the results of a multiple burst power measurement as configured and initiated with `SENSe:MPOWer[:SEQuence]`. The results are output in a comma-separated list of floating point values. The unit used for the return values is always dBm.
This command may be used to obtain measurement results in an asynchronous way using the service request mechanism for synchronization with the end of the measurement.
If no measurement results are available, the command will return a query error.

Example:

`*ESE 1`	'Configuration of status reporting systems for the
`*SRE 32`	'generation of an SRQ on operation complete
`SENSe:MPOWer 935.2MHz,1MHz,434us,VIDEO,50PCT,5us,MEAN,20;*OPC`	'Configuring and starting the measurement
`...`	'Further actions of the control computer during 'measurement
`On SRQ:`	'Response to service request
`SENSe:MPOWer:RESult?`	

Characteristics: *RST value: --
SCPI: instrument-specific

SENSe:MPOWer:RESult:MIN?

This command queries the minimum power value in a multiple burst power measurement as configured and initiated with `SENSe:MPOWer[:SEQuence]`. The unit used for the return values is always dBm.

If no measurement result is available, the command will return a query error.

Example:

`*ESE 1`	'Configuration of status reporting systems for the
`*SRE 32`	'generation of an SRQ on operation complete
`SENSe:MPOWer 935.2MHz,1MHz,434us,VIDEO,50PCT,5us,MEAN,20;*OPC`	'Configuring and starting the measurement
`...`	'Further actions of the control computer during 'measurement
`On SRQ:`	'Response to service request
`SENSe:MPOWer:RESult:MIN?`	

Characteristics: *RST value: --
SCPI: instrument-specific

SENSe:PMETer Subsystem

This subsystem controls the settings of the instrument for measurements with a power sensor. The measurement window is selected via SENSe1 (SCREEN A) and SENSe2 (SCREEN B).

COMMAND	PARAMETERS	UNIT	COMMENT
[SENSe<1|2>]			
:PMETer			
[:STATe]	<Boolean>		
:EXTern			
[:STATe]	<Boolean>		

[SENSe<1|2>:]PMETer:EXTern[:STATe] ON | OFF

This command switches on or off the measurements with an external power meter.

Example: `"PMET:EXT ON"` 'Switches on the measurements with an external power meter.

Characteristics: *RST value: OFF
SCPI: device-specific

SENSe:POWer Subsystem

This subsystem controls the setting of the instrument's channel and adjacent channel power measurements. The measurement windows are selected by SENSe1 (screen A) and SENSe2 (screen B).

<table>
<tr><th>COMMAND</th><th>PARAMETERS</th><th>UNIT</th><th>COMMENT</th></tr>
<tr><td>[SENSe<1|2>]</td><td></td><td></td><td></td></tr>
<tr><td> :POWer</td><td></td><td></td><td></td></tr>
<tr><td>   :AC</td><td></td><td></td><td></td></tr>
<tr><td>   :REFerence</td><td><numeric_value></td><td></td><td></td></tr>
<tr><td>   :STATe</td><td><Boolean></td><td></td><td></td></tr>
<tr><td>   :AUTO</td><td>ONCE</td><td></td><td></td></tr>
<tr><td>   :AVERage</td><td></td><td></td><td></td></tr>
<tr><td>   [:STATe]</td><td><Boolean></td><td></td><td></td></tr>
<tr><td>   :COUNt</td><td><numeric_value></td><td></td><td></td></tr>
<tr><td>   :STATe</td><td><Boolean></td><td></td><td></td></tr>
<tr><td>   :ACHannel</td><td></td><td></td><td></td></tr>
<tr><td>   :SPACing</td><td></td><td></td><td></td></tr>
<tr><td>   :CHANnel</td><td><numeric_value></td><td>HZ</td><td></td></tr>
<tr><td>   [:ACHannel]</td><td><numeric_value></td><td>HZ</td><td></td></tr>
<tr><td>   :ALTernate<1|2></td><td><numeric_value></td><td>HZ</td><td></td></tr>
<tr><td>   :TXCHannel</td><td></td><td></td><td></td></tr>
<tr><td>   :COUNt</td><td>1 | 2 | 3 | 4</td><td></td><td></td></tr>
<tr><td>   :ACPairs</td><td>0 | 1 | 2 | 3</td><td></td><td></td></tr>
<tr><td>   :BANDwidth</td><td></td><td></td><td></td></tr>
<tr><td>   [:CHANnel]</td><td><numeric_value></td><td>HZ</td><td></td></tr>
<tr><td>   :ACHannel</td><td><numeric_value></td><td>HZ</td><td></td></tr>
<tr><td>   :ALTernate<1|2></td><td><numeric_value></td><td>HZ</td><td></td></tr>
<tr><td>   :BWIDth</td><td></td><td></td><td></td></tr>
<tr><td>   [:CHANnel]</td><td><numeric_value></td><td>HZ</td><td></td></tr>
<tr><td>   :ACHannel</td><td><numeric_value></td><td>HZ</td><td></td></tr>
<tr><td>   :ALTernate<1|2></td><td><numeric_value></td><td>HZ</td><td></td></tr>
<tr><td>   :MODE</td><td>ABSolute | RELative</td><td></td><td></td></tr>
<tr><td>   :REFerence</td><td></td><td></td><td></td></tr>
<tr><td>   :AUTO</td><td>ONCE</td><td></td><td>no query</td></tr>
<tr><td>   :TXCHannel</td><td></td><td></td><td></td></tr>
<tr><td>   :AUTO</td><td>MINimum | MAXimum | LHIGhest</td><td></td><td>no query</td></tr>
<tr><td>   :MANUAL</td><td>1 | 2 | 3 | 4</td><td></td><td>no query</td></tr>
<tr><td>   :PRESet</td><td>ACPower | CPOWer | MCACpower | OBANdwidth |OBWidth | CN | CN0</td><td></td><td></td></tr>
<tr><td>   :RLEVel</td><td></td><td></td><td></td></tr>
<tr><td>   :BANDwidth</td><td><numeric_value></td><td>PCT</td><td></td></tr>
<tr><td>   :BWIDth</td><td><numeric_value></td><td>PCT</td><td></td></tr>
<tr><td>   :HSPeed</td><td><Boolean></td><td></td><td></td></tr>
<tr><td>   :NCORrection</td><td><Boolean></td><td></td><td></td></tr>
<tr><td>   :TRACe</td><td><numeric_value></td><td>--</td><td></td></tr>
</table>

[SENSe:]POWer:AC:AVERage:COUNt <numeric_value>

This command defines, in the *RF LEVEL* mode, the number of measurements that are to be started as "single measurements" and used to form an average. The value "0" causes a sliding average to be generated over ten measurements.

Example: `"POW:AC:AVER:COUN 40"` 'Sets 40 measurements to be included in the averaging process.

Characteristics: *RST value: 10
SCPI: device-specific

[SENSe:]POWer:AC:AVERage[:STATe] ON | OFF

This command switches on or off averaging of the measured level values in the *RF LEVEL* mode.

Example: `"POW:AC:AVER ON"` 'Switches on the averaging function.

Characteristics: *RST value: OFF
SCPI: device-specific

[SENSe:]POWer:AC:REFerence <numeric_value>

This command defines the reference value for the relative measured-value display in the *RF LEVEL* mode.

Example: `"POW:AC:REF -28 dBm"` 'Sets the reference value to –28 dBm.

Characteristics: *RST value: 0
SCPI: device-specific

[SENSe:]POWer:AC:REFerence[:STATe] ON | OFF

This command switches on absolute or relative measured-value display in the *RF LEVEL* mode.

Example: `"POW:AC:STAT ON"` 'Switches on the *RF LEVEL* mode.
`"POW:AC:REF ON"` 'Switches on relative measured-value display.

Characteristics: *RST value: OFF
SCPI: device-specific

[SENSe:]POWer:AC:REFerence:AUTO ONCE

This command uses the current measured value as a reference for the relative measured-level display in the *RF LEVEL* mode.

Example: `"POW:AC:REF:AUTO ONCE"` 'Uses the current measured value as a reference for the relative measured-level display.

Characteristics: *RST value: -
SCPI: device-specific

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

[SENSe:]POWer:AC:STATe ON | OFF

This command switches on or off the *RF LEVEL* mode.

Example:	"`POW:AC:STATE ON`"	'Switches on the *RF LEVEL* mode.
Characteristics:	*RST value:	OFF
	SCPI:	device-specific

[SENSe<1|2>:]POWer:ACHannel:SPACing:CHANnel 100 Hz to 2000 MHz

This command defines the channel spacing for the carrier signals.

The command is available only for measurements in the frequency domain (span > 0).

Example:	"`POW:ACH:SPAC:CHAN 25kHz`"	
Characteristics:	*RST value:	20 kHz
	SCPI:	device-specific

[SENSe<1|2>:]POWer:ACHannel:SPACing:ACHannel 100 Hz to 2000 MHz

This command defines the channel spacing of the adjacent channel to the TX channel. At the same time, the spacing of alternate adjacent channels 1 and 2 is set to the double or triple of the entered value.
The command is only available in the frequency domain (span > 0).

Example: "`POW:ACH:SPAC:ACH 33kHz`"
'Sets the spacing between the carrier signal
'and
'- the adjacent channel to 33 kHz
'- the alternate adjacent channel 1 to 66 kHz
'- the alternate adjacent channel 2 to 99 kHz

Characteristics:	*RST value:	14 kHz
	SCPI:	device-specific

[SENSe<1|2>:]POWer:ACHannel:SPACing:ALTernate<1|2> 100 Hz to 2000 MHz

This command defines the spacing between the first (ALTernate1) or the second alternate adjacent channel (ALTernate2) and the TX channel. If the spacing to the alternate adjacent channel ALTernate1 is modified, the spacing to alternate adjacent channel 2 is set to 1.5 times the entered value.
This command is only available in the frequency domain (span > 0).

Example: "`POW:ACH:SPAC:ALT1 100kHz`"
'Sets the spacing between TX channel and
'alternate adjacent channel 1 to 100 kHz and
'between TX channel and alternate adjacent
'channel 2 to 150 kHz.

Characteristics:	*RST value:	40 kHz (ALT1)
		60 kHz (ALT2)
	SCPI:	device-specific

[SENSe<1|2>:]POWer:ACHannel:TXCHannel:COUNt 1 | 2 | 3 | 4

This command selects the number of carrier signals.

The command is available only for multicarrier channel and adjacent-channel power measurements (`CALC:MARK:FUNC:POW:SEL MCAC`) in the frequency domain (span > 0).

Example:	"`POW:ACH:TXCH:COUN 3`"	
Characteristics:	*RST value:	4
	SCPI:	device-specific

[SENSe<1|2>:]POWer:ACHannel:ACPairs 0 | 1.| 2 | 3

This command sets the number of adjacent channels (upper and lower channel in pairs). The figure 0 stands for pure channel power measurement.
The command is only available in the frequency domain (span > 0).

Example: `"POW:ACH:ACP 3"` 'Sets the number of adjacent channels to 3, i.e. the 'adjacent channel and alternate adjacent channels 1 and '2 are switched on.

Characteristics: *RST value: 1
SCPI: device-specific

[SENSe<1|2>:]POWer:ACHannel:BANDwidth|BWIDth[:CHANnel] 100 Hz to 1000 MHz

This command sets the channel bandwidth of the radio communication system. The bandwidths of adjacent channels are not influenced by this modification (in contrast to the FSE family).

With `SENS:POW:HSP ON` the steep-edged channel filters from the table "List of available channel filters" in Section "Setting Bandwidths and Sweep Time – Key *BW*" are available.

Example: `"POW:ACH:BWID 30kHz"` 'Sets the bandwidth of the TX channel to '30 kHz.

Characteristics: *RST value: 14 kHz
SCPI: device-specific

[SENSe<1|2>:]POWer:ACHannel:BANDwidth|BWIDth:ACHannel 100 Hz to 1000 MHz

This command defines the channel bandwidth of the adjacent channel of the radio transmission system. If the bandwidth of the adjacent channel is changed, the bandwidths of all alternate adjacent channels are automatically set to the same value.

With `SENS:POW:HSP ON` the steep-edged channel filters from the table "List of available channel filters" in Section "Setting Bandwidths and Sweep Time – Key *BW*" are available.

Example: `"POW:ACH:BWID:ACH 30kHz"` 'Sets the bandwidth of all adjacent channels to '30 kHz.

Characteristics: *RST value: 14 kHz
SCPI: device-specific

[SENSe<1|2>:]POWer:ACHannel:BANDwidth|BWIDth:ALTernate<1|2> 100 Hz to 1000 MHz

This command defines the channel bandwidth of the first/second alternate adjacent channel of the radio transmission system. If the channel bandwidth of alternate adjacent channel 1 is changed, the bandwidth of alternate adjacent channel 2 is automatically set to the same value.

With `SENS:POW:HSP ON` the steep-edged channel filters from the table "List of available channel filters" in Section "Setting Bandwidths and Sweep Time – Key *BW*" are available.

Example: `"POW:ACH:BWID:ALT2 30kHz"`

Characteristics: *RST value: 14 kHz
SCPI: device-specific

[SENSe<1|2>:]POWer:ACHannel:MODE ABSolute | RELative

This command toggles between absolute and relative adjacent channel measurement.

For the relative measurement the reference value is set to the currently measured channel power by command `SENSe:POWer:ACHannel:REFerence:AUTO ONCE`.

The command is only available in the frequency domain (span > 0).

Example: `"POW:ACH:MODE REL"`

Characteristics: *RST value: ABSolute
SCPI: device-specific

[SENSe<1|2>:]POWer:ACHannel:REFerence:AUTO ONCE

This command sets the reference value for the relative measurement to the currently measured channel power.

The command is only available in the frequency domain (span > 0).

Example: `"POW:ACH:REF:AUTO ONCE"`

Characteristics: *RST value: -
SCPI: device-specific

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

[SENSe<1|2>:]POWer:ACHannel:REFerence:TXCHannel:AUTO MINimum | MAXimum | LHIGhest

This command activates the automatic selection of a transmission channel to be used as a reference channel in relative adjacent-channel power measurements.

The transmission channel with the highest power, the transmission channel with the lowest power, or the transmission channel nearest to the adjacent channels can be defined as a reference channel.

The command is available only for multicarrier channel and adjacent-channel power measurements (`CALC:MARK:FUNC:POW:SEL MCAC`) in the frequency domain (span > 0).

Parameters:

MINimum	Transmission channel with the lowest power
MAXimum	Transmission channel with the highest power
LHIGhest	Lowermost transmission channel for the lower adjacent channels, uppermost transmission channel for the upper adjacent channels

Example: `"POW:ACH:REF:TXCH:AUTO MAX"` 'The transmission channel with the highest power is used as a reference channel.

Characteristics: *RST value: -
SCPI: device-specific

[SENSe<1|2>:]POWer:ACHannel:REFerence:TXCHannel:MANual 1 | 2 | 3 | 4

This command selects a transmission channel to be used as a reference channel in relative adjacent-channel power measurements.

The command is available only for multicarrier channel and adjacent-channel power measurements (`CALC:MARK:FUNC:POW:SEL MCAC`) in the frequency domain (span > 0).

Example: `"POW:ACH:REF:TXCH:MAN 3"` 'Transmission channel 3 is used as a reference channel.

Characteristics: *RST value: 1
SCPI: device-specific

[SENSe<1|2>:]POWer:ACHannel:PRESet ACPower | CPOWer | MCACpower | OBANdwidth | OBWidth | CN | CN0

This command adjusts the frequency span, the measurement bandwidths and the detector as required for the number of channels, the channel bandwidths and the channel spacings selected in the active power measurement. If necessary, adjacent-channel power measurement is switched on prior to the adjustment.

To obtain valid results, a complete sweep with synchronization to the end of the sweep must be performed after the adjustment. Synchronization is possible only in the single-sweep mode.

The result is queried with the command `CALCulate:MARKer:FUNCtion:POWer:RESult?`.

The command is available only for measurements in the frequency domain (span > 0).

Example:

`"POW:ACH:PRES ACP"`	'Sets the frequency span, the measurement bandwidths and the detector as required for the ACP measurement in screen A.
`"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? ACP"`	'Queries the result of the adjacent-channel power measurement.

Characteristics: *RST value: -
SCPI: device-specific

[SENSe<1|2>:]POWer:ACHannel:PRESet:RLEVel

This command adapts the reference level to the measured channel power and – if required - switches on previously the 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.

The command is only available in the frequency domain (span > 0).

Note: *Subsequent commands have to be synchronized with *WAI, *OPC or *OPC? to the end of the autorange process which would otherwise be aborted.*

Example: `"POW:ACH:PRES:RLEV;*WAI"` 'Adapts the reference level to the measured 'channel power.

Characteristics: *RST value: -
SCPI: device-specific

[SENSe<1|2>:]POWer:BANDwidth|BWIDth 10 to 99.9PCT

This command defines the percentage of the power with respect to the total power. This value is the basis for the occupied bandwidth measurement (command: `POWer:ACHannel:PRESet OBW`).

The command is only available in the frequency domain (span > 0).

Example: `"POW:BWID 95PCT"`

Characteristics: *RST value: 99PCT
SCPI: device-specific

[SENSe<1|2>:]POWer:HSPeed ON | OFF

This command switches on or off the high-speed channel/adjacent channel power measurement. The measurement itself is performed in the time domain on the center frequencies of the individual channels. The command automatically switches to the time domain and back.

Depending on the selected mobile radio standard, weighting filters with √cos characteristic or very steep-sided channel filters are used for band limitation.

The command is only available in the frequency domain (span > 0).

Example: `"POW:HSP ON"`

Characteristics: *RST value: OFF
SCPI: device-specific

[SENSe<1|2>:]POWer:NCORrection ON | OFF

This command switches on or off the correction of the instrument inherent noise for channel power measurement. On activating this function, a reference measurement of the instrument inherent noise is performed. The measured noise power is then subtracted from the power in the examined channel.
The instrument inherent noise is then re-determined after any change of the center frequency, resolution bandwidth, sweep time and level setting by repeating the reference measurement in the new instrument setting.

Example: `"POW:NCOR ON"`

Characteristics: *RST value: OFF
SCPI: device-specific

[SENSe<1|2>:]POWer:TRACe 1 to 3

This command assigns the channel/adjacent channel power measurement to the indicated trace in the selected measurement window. The corresponding trace must be active, i.e. its state must be different from blank.

Note: *The measurement of the occupied bandwidth (OBW) is performed on the trace on which marker 1 is positioned. To evaluate another trace, marker 1 must be positioned to another trace with `CALCulate:MARKer:TRACe`.*

Example:
`"POW:TRAC 2"` 'Assigns the measurement in screen A to trace 2.
`"SENS2:POW:TRAC 3"` 'Assigns the measurement in screen B to trace 3.

Characteristics: *RST value: -
SCPI: device-specific

SENSe:ROSCillator Subsystem

This subsystem controls the reference oscillator. The numeric suffix in SENSe is irrelevant for the commands of this subsystem.

COMMAND	PARAMETERS	UNIT	COMMENT
[SENSe<1|2>]			
:ROSCillator			
:SOURce	INTernal | EXTernal	--	
[:INTernal]			
:TUNe	<numeric_value>		
:SAVe			no query

[SENSe<1|2>:]ROSCillator:SOURce INTernal | EXTernal

This command controls selection of the reference oscillator.

If the external reference oscillator is selected, the reference signal must be connected to the rear panel of the instrument.

Example: `"ROSC:SOUR EXT"`

Characteristics: *RST value: –
SCPI: conforming

[SENSe<1|2>:]ROSCillator[:INTernal]:TUNe 0 to 4095

This command defines the value for the tuning of the internal reference oscillator.

The reference oscillator should be tuned only if an error has been detected in the frequency accuracy check. After rebooting the instrument, the factory-set reference frequency or the previously saved reference frequency is restored.

Note: *This command is only available at service level 1.*

Example: `"ROSC:TUN 128"`

Characteristics: *RST value: –
SCPI: device-specific

[SENSe<1|2>:]ROSCillator[:INTernal]:TUNe:SAVe

This command saves the new value for the tuning of the internal reference oscillator. The factory-set value in the EEPROM is overwritten.

Note: *This command is only available at service level 1.*

Example: `"ROSC:TUN:SAV"`

Characteristics: *RST value: –
SCPI: device-specific

SENSe:SWEep Subsystem

This subsystem controls the sweep parameters. The measurement windows are selected by SENSe1 (screen A) and SENSe2 (screen B).

COMMAND	PARAMETERS	UNIT	COMMENT
[SENSe<1|2>]			
:SWEep			
:TIME	<numeric_value>	S	
:AUTO	<Boolean>	--	
:COUNt	<numeric_value>	--	
:EGATe	<Boolean>	--	
:TYPE	LEVel|EDGE	--	
:POLarity	POSitive|NEGative	--	
:HOLDoff	<numeric_value>	S	
:LENGth	<numeric_value>	S	
:SOURce	EXTernal| RFPower | IFPower		
:POINts	<numeric_value>		

[SENSe<1|2>:]SWEep:TIME 2,5ms to 16000s (frequency domain) **|** 1µs to 16000s (time domain**)**

This command defines the sweep time. The available time values are different in the frequency domain (2.5 ms to 16000s with span > 0) and in the time domain (1 µs to 16000s with span = 0).

If `SWEep:TIME` is directly programmed, automatic coupling to resolution bandwidth and video bandwidth is switched off.

Example: `"SWE:TIME 10s"`

Characteristics: *RST value - (AUTO is set to ON)
SCPI: conforming

[SENSe<1|2>:]SWEep:TIME:AUTO ON | OFF

This command controls the automatic coupling of the sweep time to the frequency span and bandwidth settings.

If `SWEep:TIME` is directly programmed, automatic coupling is switched off.

Example: `"SWE:TIME:AUTO ON"` 'Switches on the coupling to frequency span and bandwidths.

Characteristics: *RST value: ON
SCPI: conforming

[SENSe<1|2>:]SWEep:COUNt 0 to 32767

This command defines the number of sweeps started with single sweep, which are used for calculating the average or maximum value. In average mode, the value 0 defines a continuous averaging of measurement data over 10 sweeps.

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:	0
	SCPI:	conforming

[SENSe<1|2>:]SWEep:COUNt:CURRent?

This query command returns the current number of started sweeps. A sweep count value should be set and the device should be in single sweep mode.

Example:	`"SWE:COUNt 64"`	'sets sweep count to 64
	`"INIT:CONT OFF"`	'switches to single sweep mode
	`"INIT"`	'starts a sweep (without waiting for the sweep end!)
	`"SWE:COUN:CURR?"`	'queries the number of started sweeps

Characteristics:	*RST value:	0
	SCPI:	conforming

[SENSe<1|2>:]SWEep:EGATe ON | OFF

This command switches on/off the sweep control by an external gate signal. If the external gate is selected the trigger source is automatically switched to EXTernal as well.

In case of measurement with external gate, the measured values are recorded as long as the gate is opened. There are two possibilities:

1. The gate is edge-triggered (`"SWEep:EGATe:TYPE EDGE"`):
   After detection of the set gate signal edge, the gate remains open until the gate delay (`SWEep:EGATe:HOLDoff`) has expired.
2. The gate is level-triggered (`"SWEep:EGATe:TYPE LEVel"`):
   After detection of the gate signal, the gate remains open until the gate signal disappears.

A delay between applying the gate signal and the start of recording measured values can be defined with `SWEep:EGATe:HOLDoff`.

During a sweep the gate can be opened and closed several times. The synchronization mechanisms with *OPC, *OPC? and *WAI remain completely unaffected.

The sweep end is detected when the required number of measurement points (625 in analyzer mode) has been recorded.

Example:	`"SWE:EGAT ON"`	'Switches on the external gate mode.
	`"SWE:EGAT:TYPE EDGE"`	'Switches on the edge-triggered mode.
	`"SWE:EGAT:HOLD 100US"`	'Sets the gate delay to 100 μs.
	`"SWE:EGAT:LEN 500US"`	'Sets the gate opening time to 500 μs.
	`"INIT;*WAI"`	'Starts a sweep and waits for its end.

Characteristics:	*RST value:	OFF
	SCPI:	device-specific

[SENSe<1|2>:]SWEep:EGATe:TYPE LEVel | EDGE

This command sets the type of triggering (level or edge) by the external gate signal.

The gate opening time cannot be defined with the parameter `EGATe:LENGth` in case of level triggering. The gate is closed when the gate signal disappears.

Example: `"SWE:EGAT:TYPE EDGE"`

Characteristics: *RST value: EDGE
SCPI: device-specific

[SENSe<1|2>:]SWEep:EGATe:POLarity POSitive | NEGative

This command determines the polarity of the external gate signal. The setting is valid both for the edge of an edge-triggered signal and the level of a level-triggered signal.

Example: `"SWE:EGAT:POL POS"`

Characteristics: *RST value: POSitive
SCPI: device-specific

[SENSe<1|2>:]SWEep:EGATe:HOLDoff 125 ns to 100 s

This command defines the delay time between the external gate signal and the continuation of the sweep.

Example: `"SWE:EGAT:HOLD 100us"`

Characteristics: *RST value: 0s
SCPI: device-specific

[SENSe<1|2>:]SWEep:EGATe:LENGth 0 to 100 s

In case of edge triggering, this command determines the time interval during which the instrument sweeps.

Example: `"SWE:EGAT:LENG 10ms"`

Characteristics: *RST value: 0s
SCPI: device-specific

[SENSe<1|2>:]SWEep:EGATe:SOURce EXTernal | IFPower

This command toggles between external gate signal and IF power signal as a signal source for the gate mode. If an IF power signal is used, the gate is opened as soon as a signal at > -20 dBm is detected within the IF path bandwidth (50 MHz).

Notes: *Selection RFPower is only available with option FSP-B6 (TV and RF Trigger).*

Example: `"SWE:EGAT:SOUR IFP"` 'Switches the gate source to IF power.

Characteristics: *RST value: IFPower
SCPI: device-specific

[SENSe<1|2>:]SWEep:POINts 155 to 10001

This command defines the number of measurement points for one sweep run.

Parameter: SENSe<1|2>]SWEep:POINts <numeric_value>

Characteristics: *RST value: 625
SCPI: conforming

SENSe:VOLTage Subsystem

COMMAND	PARAMETERS	UNIT	COMMENT
[SENSe<1|2>]			
VOLTage			
:REFerence	<numeric_value>		
:STATe	<Boolean>		
:AUTO	ONCE		
:RANGe			
[:UPPer]	<numeric_value>	V	

[SENSe:]VOLTage:AC:REFerence[:STATe] ON | OFF

This command switches on absolute or relative measured-value display in the *AUDIO* mode.

Example: ""INP AUD" 'Switches on the *AUDIO* mode.
"VOLT:AC:REF ON" 'Switches on relative measured-value display.

Characteristics: *RST value: OFF
SCPI: device-specific

[SENSe:]VOLTage:AC:REFerence:AUTO ONCE

This command uses the current measured values as reference values for the relative measured-value display for all detectors shown in the audio summary.

Example: "VOLT:AC:REF:AUTO ONCE"'Uses the current measured values as reference values for the relative measurement for all detectors displayed.

Characteristics: *RST value: -
SCPI: device-specific

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

[SENSe:]VOLTage:AC:RANGe[:UPPer] <numeric_value>

This command selects 4 V or 400 mV as the input voltage range for the audio input.

Example: "INP AUD" 'Switches on the *AUDIO* mode.
"VOLT:AC:RANG 0.4 V"'Selects 400 mV as the input voltage range.

Characteristics: *RST value: 4 V
SCPI: device-specific

SOURce Subsystem

The SOURce subsystem controls the output signals of the instrument if the options tracking generator (B9) or External Generator Control (B10) are installed. The measurement window is selected by SOURce1 (screen A) and SOURce2 (screen B).

The SOURce subsystem controls the output signals of the analyzer if the option External Generator Control (FSP-B10) is installed. The measurement window is selected by SOURce1 (screen A) and SOURce2 (screen B).

Internal Tracking Generator

COMMAND	PARAMETERS	UNIT	COMMENT
SOURce<1|2>			Tracking generator option
:AM			
:STATe	<Boolean>		
:DM			
:STATe	<Boolean>		
:FM			
:STATe	<Boolean>		
:DEViation	<numeric_value>	HZ	
:FREQuency			
:OFFSet	<numeric_value>	HZ	
:POWer			
[:LEVel]			
[:IMMediate]			
[:AMPLitude]	<numeric_value>	DBM	
:OFFSet	<numeric_value>	DB	

SOURce<1|2>:AM:STATe ON | OFF

This command switches on or off the external amplitude modulation of the tracking generator in the selected measurement window.
External I/Q modulation is switched off, if active. This command is only valid in conjunction with the tracking generator option B9.

Example: "SOUR:AM:STAT ON "'Switches on the external amplitude modulation of 'the tracking generator for screen A.

Characteristics: *RST value: OFF
SCPI: conforming

SOURce<1|2>:DM:STATe ON | OFF

This command switches on or off the external I/Q modulation of the tracking generator in the selected measurement window.
External AM and external FM are switched off, if active. This command is only valid in conjunction with the tracking generator option B9.

Example: "SOUR2:DM:STAT ON "'Switches on the external I/Q modulation of the 'tracking generator for screen B.

Characteristics: *RST- value: OFF
SCPI: conforming

SOURce<1|2>:FM:STATe ON | OFF

This command switches on or off the external frequency modulation of the tracking generator in the selected measurement window.

External I/Q modulation is switched off, if active. This command is only valid in conjunction with the tracking generator option B9.

Example: `"SOUR:FM:STAT ON "`'Switches on the external frequency modulation of 'the tracking generator for screen A.

Characteristics: *RST value: OFF
SCPI: conforming

SOURce<1|2>:FM:DEViation 100Hz to 10MHz

This command defines the maximum frequency deviation at 1 V input voltage at the FM input of the tracking generator.

The possible value range is 100 Hz to 10 MHz in steps of one decade.

This command is only available in connection with the Tracking Generator Option B9.

Example: `"SOUR:FM:DEV 1MHz "` 'Sets the maximum frequency deviation of the 'tracking generator for screen A to 1 MHz.

Characteristics: *RST value: 100 Hz
SCPI: conforming

SOURce<1|2>:FREQuency:OFFSet -150MHz to 150MHz

This command defines a frequency offset of the tracking generator for the indicated measurement window. Frequency-converting DUTs can be measured with this setting.

The possible value range is -150 MHz to 150 MHz. It should be noted that the terms (start frequency - tracking frequency offset) and (stop frequency - tracking frequency offset) are both > 1 kHz or both < -1 kHz.

External I/Q modulation is switched off, if active. This command is only valid in conjunction with the tracking generator option B9.

Example: `"SOUR:FREQ:OFFS 10MHz"`'Switches on the frequency offset of the 'tracking generator for screen A to 10 MHz.

Characteristics: *RST value: 0 Hz
SCPI: conforming

SOURce<1|2>:POWer[:LEVel][:IMMediate][:AMPLitude] <numeric_value>

This command defines the output level of the tracking generator in the current measurement window.

This command is only valid in conjunction with the tracking generator option B9.

Parameter: <numeric value>::= -30 dBm to 5 dBm. (-100 dBm to + 5dBm with option B12)

Example: `"SOUR:POW -20dBm"` 'Sets the tracking generator level in screen A to -20 dBm.

Characteristics: *RST value: -20 dBm
SCPI: conforming

SOURce<1|2>:POWer[:LEVel][:IMMediate]:OFFSet -200dB to +200dB

This command defines a level offset for the tracking generator level. Thus, for example, attenuators or amplifiers at the output of the tracking generator can be taken into account for the setting.

This command is only valid in conjunction with the tracking generator option B9.

Example: `"SOUR:POW:OFFS -10dB"`'Sets the level offset of the tracking generator in 'screen A to - 20 dBm.

Characteristics: *RST- value: 0dB
SCPI: conforming

SOURce:EXTernal Subsystem

The SOURce:EXTernal subsystem controls the operation of the unit with option Ext. Generator Control (B10). The commands are only valid for the selected window, with SOURce1 changing the setting in screen A and SOURce2 the setting in screen B.

The selection of the external generator 1 or 2 is via EXTernal<1|2>.

Note: *The commands of the SOURce:EXTernal subsystem assume that the addressed generator was correctly configured with the commands of subsystem* `SYSTem:COMMunicate:GPIB:RDEVice:GENerator`.

If no external generator is selected, if the IEC bus address is not correct or the generator is not ready for operation, an execution error will be generated.

COMMAND	PARAMETER	UNIT	COMMENT
SOURce<1|2>			
:EXTernal<1|2>			Ext. generator option
[:STATe]	<Boolean>		
:FREQuency			
:OFFSet	<numeric_value>	HZ	
[:FACTor]			
:NUMerator	<numeric_value>		
:DENominator	<numeric_value>		
:SWEep			
[:STATe]	<Boolean>		
:POWer			
[:LEVel]	<numeric_value>	DBM	
:ROSCillator			
[:SOURce]	INTernal | EXTernal		

SOURce<1|2>:EXTernal<1|2>[:STATe] ON | OFF

This command activates or deactivates the external generator selected with `SOUR:EXT<1|2>:FREQ:SWE ON` in the selected window.

The suffix behind EXTernal is irrelevant for this command.

This command is only available in connection with option Ext. Generator Control B10.

Example:

`"SYST:COMM:RDEV:GEN1:TYPE 'SMP02'"` 'Selects SMP02 as generator 1.

`"SYST:COMM:RDEV:GEN1:LINK TTL"` 'Selects IECBUS + TTL link as interface.

`"SYST:COMM:RDEV:GEN1:ADDR 28"` 'Sets the generator address to 28.

`"SOUR:EXT1:FREQ:SWE ON"` 'Activates the frequency sweep for generator 1.

`"SOUR:EXT ON"` 'Activates the external generator

Characteristics: *RST value: OFF
SCPI: device-specific

SOURce<1|2>:EXTernal<1|2>:FREQuency[:FACTor]:DENominator <numeric_value>

This command defines the denominator of the factor with which the analyzer frequency is multiplied in order to obtain the transmit frequency of the selected generator 1 or 2 in the selected window.

Note: *Select the multiplication factor in a way that the frequency range of the generator is not exceeded by the following formula*

$$F_{Generator} = F_{Analyzer} * \frac{Numerator}{Denominator} + F_{Offset}$$

if applied to the start and stop frequency of the analyzer.

This command is only valid in combination with option Ext. Generator Control B10.

Example: `"SOUR:EXT:FREQ:NUM 4"`

`"SOUR:EXT:FREQ:DEN 3"` 'Sets a multiplication factor of 4/3, i.e. the 'transmit frequency of the generator is '4/3 times the analyzer frequency.

Characteristics: *RST value: 1
SCPI: device-specific

SOURce<1|2>:EXTernal<1|2>:FREQuency[:FACTor]:NUMerator <numeric_value>

This command defines the numerator of the factor with which the analyzer frequency is multiplied to obtain the transmit frequency of the selected generator 1 or 2 in the selected window.

Note: *Select the multiplication factor so that the frequency range of the generator is not exceeded if the following formula*

$$F_{Generator} = F_{Analyzer} * \frac{Numerator}{Denominator} + F_{Offset}$$

is applied to the start and stop frequency of the analyzer.

This command is only valid in combination with option Ext. Generator Control B10.

Example: `"SOUR:EXT:FREQ:NUM 4"`

`"SOUR:EXT:FREQ:DEN 3"` 'Sets a multiplication factor of 4/3, i.e. the 'transmit frequency of the generator is '4/3 times the analyzer frequency.

Characteristics: *RST value: 1
SCPI: device-specific

SOURce<1|2>:EXTernal<1|2>:FREQuency:OFFSet <numeric_value>

This command defines the frequency offset of the selected generator 1 or 2 with reference to the receive frequency in the selected window.

Note: *Select the frequency offset of the generator so that the frequency range of the generator is not exceeded with the following formula*

$$F_{Generator} = F_{Analyzer} * \frac{Numerator}{Denominator} + F_{Offset}$$

applied to the start and stop frequency of the analyzer.

This command is only valid in combination with option Ext. Generator Control B10.

Example: "SOUR:EXT:FREQ:OFFS 1GHZ" 'Sets a frequency offset of the 'generator transmit frequency 'compared to the analyzer receive 'frequency of 1 GHz.

Characteristics: *RST value: 0 Hz
SCPI: device-specific

SOURce<1|2>:EXTernal<1|2>:FREQuency:SWEep[:STATe] ON | OFF

This command activates or deactivates the frequency sweep for generator 1 or 2 in the selected window.

This command is only valid in combination with option Ext. Generator Control B10.

Example: "SOUR:EXT1:FREQ:SWE ON" 'Activates the frequency sweep for ext. generator 1.

Characteristics: *RST value: OFF
SCPI: device-specific

SOURce<1|2>:EXTernal<1|2>:POWer[:LEVel] <numeric_value>

This command sets the output power of the selected generator 1 or 2 in the selected window.

This command is only valid in combination with option Ext. Generator Control B10.

Example: "SOUR:EXT:POW –30dBm" 'Sets the generator level to –30 dBm

Characteristics: *RST value: -20 dBm
SCPI: device-specific

SOURce<1|2>:EXTernal<1|2>:ROSCillator[:SOURce] INTernal | EXTernal

This command switches between external and internal reference oscillator for the frequency processing of external generator 1 and 2.

The command always works on both generators. Therefore, the numeric suffix in EXTernal<1|2> is not significant.

This command is only valid in combination with option Ext. Generator Control B10.

Example: "SOUR:EXT:ROSC EXT" 'switches to external reference oscillator

Characteristics: *RST value: INT
SCPI: device-specific

STATus Subsystem

The STATus subsystem contains the commands for the status reporting system (see Chapter 5, Status Reporting System"). *RST does not influence the status registers.

COMMAND	PARAMETERS	UNIT	COMMENT
STATus			
:OPERation			
[:EVENt?]	--	--	
:CONDition?	--	--	
:ENABle	0 to 65535	--	
:PTRansition	0 to 65535	--	
:NTRansition	0 to 65535	--	
:PRESet	--	--	
:QUEStionable			
[:EVENt?]	--	--	
:CONDition?	--	--	
:ENABle	0 to 65535	--	
:PTRansition	0 to 65535	--	
:NTRansition	0 to 65535	--	
:POWer			
[:EVENt?]	--	--	
:CONDition?	--	--	
:ENABle	0 to 65535	--	
:PTRansition	0 to 65535	--	
:NTRansition	0 to 65535	--	
:LIMit<1|2>			
[:EVENt?]	--	--	
:CONDition?	--	--	
:ENABle	0 to 65535	--	
:PTRansition	0 to 65535	--	
:NTRansition	0 to 65535	--	
:LMARgin<1|2>			
[:EVENt?]	--	--	
:CONDition?	--	--	
:ENABle	0 to 65535	--	
:PTRansition	0 to 65535	--	
:NTRansition	0 to 65535	--	
:ACPLimit			
[:EVENt?]	--	--	
:CONDition?	--	--	
:ENABle	0 to 65535	--	
:PTRansition	0 to 65535	--	
:NTRansition	0 to 65535	--	
:FREQuency			
[:EVENt?]	--	--	
:CONDition?	--	--	
:ENABle	0 to 65535	--	
:PTRansition	0 to 65535	--	
:NTRansition	0 to 65535	--	
:SYNC			
[:EVENt?]	--	--	
:CONDition?	--	--	
:ENABle	0 to 65535	--	
:PTRansition	0 to 65535	--	
:NTRansition	0 to 65535	--	

COMMAND	PARAMETERS	UNIT	COMMENT
STATus			
:QUEue	--	--	
[:NEXT?]	--	--	

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: conforming

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: conforming

STATus:OPERation:ENABle 0 to 65535

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.

Example: `"STAT:OPER:ENAB 65535"`

Characteristics: *RST value: –
SCPI: conforming

STATus:OPERation:PTRansition 0 to 65535

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.

Example: `"STAT:OPER:PTR 65535"`

Characteristics: *RST value: –
SCPI: conforming

STATus:OPERation:NTRansition 0 to 65535

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.

Example: "STAT:OPER:NTR 65535"

Characteristics: *RST value: –
SCPI: conforming

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: conforming

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 the readout.

Example: "STAT:QUES?"

Characteristics: *RST value: –
SCPI: conforming

STATus:QUEStionable:CONDition?

This command queries the CONDition section of the STATus:QUEStionable register. Readout does not delete the contents of the CONDition section.

Example: "STAT:QUES:COND?"

Characteristics: *RST value: –
SCPI: conforming

STATus:QUEStionable:ENABle 0 to 65535

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.

Example: "STAT:QUES:ENAB 65535"

Characteristics: *RST value: –
SCPI: conforming

STATus:QUEStionable:PTRansition 0 to 65535

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.

Example: "STAT:QUES:PTR 65535"

Characteristics: *RST value: –
SCPI: conforming

STATus:QUEStionable:NTRansition 0 to 65535

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.

Example: "STAT:QUES:NTR 65535"

Characteristics: *RST value: –
SCPI: conforming

STATus:QUEStionable:POWer[:EVENt]?

This command queries the contents of the EVENt section of the STATus:QUEStionable:POWer register. Readout deletes the contents of the EVENt section.

Example: "STAT:QUES?"

Characteristics: *RST value: –
SCPI: conforming

STATus:QUEStionable:POWer:CONDition?

This command queries the contents of the CONDition section of the STATus:QUEStionable:POWer register. Readout does not delete the contents of the CONDition section.

Example: "STAT:QUES:COND?"

Characteristics: *RST value: –
SCPI: conforming

STATus:QUEStionable:POWer:ENABle 0 to 65535

This command sets the bits of the ENABle section of the STATus:QUEStionable:POWer register. The ENABle register selectively enables the individual events of the associated EVENt section for the summary bit.

Example: "STAT:QUES:ENAB 65535"

Characteristics: *RST value: –
SCPI: conforming

STATus:QUEStionable:POWer:PTRansition 0 to 65535

This command sets the edge detectors of all bits of the STATus:QUEStionable:POWer register from 0 to 1 for the transitions of the CONDition bit.

Example: `"STAT:QUES:PTR 65535"`

Characteristics: *RST value: –
SCPI: conforming

STATus:QUEStionable:POWer:NTRansition 0 to 65535

This command sets the edge detectors of all bits of the STATus:QUEStionable:POWer register from 1 to 0 for the transitions of the CONDition bit.

Example: `"STAT:QUES:NTR 65535"`

Characteristics: *RST value: –
SCPI: conforming

STATus:QUEStionable:LIMit<1|2> [:EVENt]?

This command queries the contents of the EVENt section of the STATus:QUEStionable:LIMit register. Readout deletes the contents of the EVENt section.

Example: `"STAT:QUES?"`

Characteristics: *RST value: –
SCPI: device-specific

STATus:QUEStionable:LIMit<1|2>:CONDition?

This command queries the contents of the CONDition section of the STATus:QUEStionable:LIMit register.

Readout does not delete the contents of the CONDition section.

Example: `"STAT:QUES:LIM:COND?"`

Characteristics: *RST value: –
SCPI: device-specific

STATus:QUEStionable:LIMit<1|2>:ENABle 0 to 65535

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.

Example: `"STAT:QUES:ENAB 65535"`

Characteristics: *RST value: –
SCPI: device-specific

STATus:QUEStionable:LIMit<1|2>:PTRansition 0 to 65535

This command sets the edge detectors of all bits of the STATus:QUEStionable:LIMit register from 0 to 1 for the transitions of the CONDition bit.

Example: `"STAT:QUES:PTR 65535"`

Characteristics: *RST value: –
SCPI: device-specific

STATus:QUEStionable:LIMit<1|2>:NTRansition 0 to 65535

This command sets the edge detectors of all bits of the STATus:QUEStionable:LIMit register from 1 to 0 for the transitions of the CONDition bit.

Example: `"STAT:QUES:NTR 65535"`

Characteristics: *RST value: –
SCPI: device-specific

STATus:QUEStionable:LMARgin<1|2> [:EVENt]?

This command queries the contents of the EVENt section of the STATus:QUEStionable:LMARgin register. Readout deletes the contents of the EVENt section.

Example: `"STAT:QUES:LMAR?"`

Characteristics: *RST value: –
SCPI: device-specific

STATus:QUEStionable:LMARgin<1|2>:CONDition?

This command queries the contents of the CONDition section of the STATus:QUEStionable:LMARgin register. Readout does not delete the contents of the CONDition section.

Example: `"STAT:QUES:LMAR:COND?"`

Characteristics: *RST value: –
SCPI: device-specific

STATus:QUEStionable:LMARgin<1|2>:ENABle 0 to 65535

This command sets the bits of the ENABle section of the STATus:QUEStionable:LMARgin register. The ENABle register selectively enables the individual events of the associated EVENt section for the summary bit.

Example: `"STAT:QUES:LMAR:ENAB 65535"`

Characteristics: *RST value: –
SCPI: device-specific

STATus:QUEStionable:LMARgin<1|2>:PTRansition 0 to 65535

This command sets the edge detectors of all bits of the STATus:QUEStionable:LMARgin register from 0 to 1 for the transitions of the CONDition bit.

Example: `"STAT:QUES:LMAR:PTR 65535"`

Characteristics: *RST value: –
SCPI: device-specific

STATus:QUEStionable:LMARgin<1|2>:NTRansition 0 to 65535

This command sets the edge detectors of all bits of the STATus:QUEStionable:LMARgin register from 1 to 0 for the transitions of the CONDition bit.

Example: `"STAT:QUES:LMAR:NTR 65535"`

Characteristics: *RST value: –
SCPI: device-specific

STATus:QUEStionable:ACPLimit[:EVENt]?

This command queries the contents of the EVENt section of the STATus:QUEStionable:ACPLimit register. Readout deletes the contents of the EVENt section.

Example: `"STAT:QUES:ACPL?"`

Characteristics: *RST value: –
SCPI: device-specific

STATus:QUEStionable:ACPLimit:CONDition?

This command queries the contents of the CONDition section of the STATus:QUEStionable:ACPLimit register. Readout does not delete the contents of the CONDition section.

Example: `"STAT:QUES:ACPL:COND?"`

Characteristics: *RST value: –
SCPI: device-specific

STATus:QUEStionable:ACPLimit:ENABle 0 to 65535

This command sets the bits of the ENABle section of the STATus:QUEStionable:ACPLimit register. The ENABle register selectively enables the individual events of the associated EVENt section for the summary bit.

Example: `"STAT:QUES:ACPL:ENAB 65535"`

Characteristics: *RST value: –
SCPI: device-specific

STATus:QUEStionable:ACPLimit:PTRansition 0 to 65535

This command sets the edge detectors of all bits of the STATus:QUEStionable: ACPLimit register from 0 to 1 for the transitions of the CONDition bit.

Example: `"STAT:QUES:ACPL:PTR 65535"`

Characteristics: *RST value: –
SCPI: device-specific

STATus:QUEStionable:ACPLimit:NTRansition 0 to 65535

This command sets the edge detectors of all bits of the STATus:QUEStionable: ACPLimit register from 1 to 0 for the transitions of the CONDition bit.

Example: `"STAT:QUES:ACPL:NTR 65535"`

Characteristics: *RST value: –
SCPI: device-specific

STATus:QUEStionable:FREQuency[:EVENt]?

This command queries the contents of the EVENt section of the STATus:QUEStionable: FREQuency register.

Example: `"STAT:QUES:FREQ?"`

Characteristics: *RST value: –
SCPI: device-specific

Readout deletes the contents of the EVENt section.

STATus:QUEStionable:FREQuency:CONDition?

This command queries the contents of the CONDition section of the STATus:QUEStionable:FREQuency register. Readout does not delete the contents of the CONDition section.

Example: `"STAT:QUES:FREQ:COND?"`

Characteristics: *RST value: –
SCPI: device-specific

STATus:QUEStionable:FREQuency:ENABle 0 to 65535

This command sets the bits of the ENABle section of the STATus:QUEStionable:FREQuency register. The ENABle register selectively enables the individual events of the associated EVENt section for the summary bit.

Example: `"STAT:QUES:FREQ:ENAB 65535"`

Characteristics: *RST value: –
SCPI: device-specific

STATus:QUEStionable:FREQuency:PTRansition 0 to 65535

This command sets the edge detectors of all bits of the STATus:QUEStionable:FREQuency register from 0 to 1 for the transitions of the CONDition bit.

Example: `"STAT:QUES:FREQ:PTR 65535"`

Characteristics: *RST value: –
SCPI: device-specific

STATus:QUEStionable:FREQuency:NTRansition 0 to 65535

This command sets the edge detectors of all bits of the STATus:QUEStionable:FREQuency register from 1 to 0 for the transitions of the CONDition bit.

Example: `"STAT:QUES:FREQ:NTR 65535"`

Characteristics: *RST value: –
SCPI: device-specific

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 (cf. Chapter 9). 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: conforming

SYSTem Subsystem

This subsystem contains a series of commands for general functions.

COMMAND	PARAMETERS	UNIT	COMMENT
SYSTem			
:COMMunicate			
:GPIB			
[:SELF]			
:ADDRess	0 to 30	--	
:RTERminator	LFEoi | EOI		
:RDEVice			
:GENerator<1|2>			ext. generator option
:ADDRess	0 to 30		ext. generator option
:RDEVice			
:GENerator<1|2>			
:LINK	GPIB | TTL		tracking generator option
:TYPE	<name>		tracking generator option
:PMETer			
:CFACtor			
[:SELect]	ASENsor | BSENsor		
:ASENsor	<numeric_value>, <numeric_value>...	HZ, PCT	
:LABel	<name>		
:BSENsor	<numeric_value>, <numeric_value>...	HZ, PCT	
:LABel	<name>		
:AZERo			
[:STATe]	<Boolean>		
:TYPE	<name>		
:SERial			
:CONTrol			
:DTR	IBFull | OFF		
:RTS	IBFull | OFF		
[:RECeive]			
:BAUD	<numeric_value>	--	
:BITS	7 | 8	--	
:PARity			
[:TYPE]	EVEN | ODD | NONE		
:SBITs	1 | 2	--	
:PACE	XON | NONE		
:PRINter			
:ENUMerate			
[:NEXT?]			query only
:FIRSt?			query only
:SELect<1|2>	<printer_name>		

COMMAND	PARAMETERS	UNIT	COMMENT
:DATE	<num>, <num>, <num>		
:DISPlay		--	
:FPANel	<Boolean>		
:UPDate	<Boolean>		
:ERRor?	--		query only
:FIRMware		--	
:UPDate	<string>		no query
:FIRMware			
:UPDate	<string>		no query
:LANGuage	<string>		no query
:PASSword		--	
[:CENable]	<string>		no query
:PRESet	--		no query
:SET	<block>	--	
:SPEaker		--	audio demodulator option
:VOLume	<numeric_value>	--	
:TIME	0 to 23, 0 to 59, 0 to 59		
:VERSion?	--		query only

SYSTem:COMMunicate:RDEVice:PMETer:CFACtor:ASENsor <numeric_value>,<numeric_value>..

This command defines the interpolation points for the frequency response correction for the external power meter. The points are to be entered as a sequence of frequency/factor pairs, with the frequencies to be specified in ascending order. The correction factors are percentage values.

The receiver can store two correction tables; the values defined here are stored in correction table A.

Example: `"SYST:COMM:RDEV:PMET:CFAC:ASEN 10MHz,99,20MHZ,98"`

Characteristics: *RST value: -
SCPI: device-specific

SYSTem:COMMunicate:RDEVice:PMETer:CFACtor:ASENsor:LABel <name>

This command defines a name for correction table A for the external power meter. This name may designate a specific power sensor, for example.

Example: `"SYST:COMM:RDEV:PMET:CFAC:ASEN:LAB 'SN 317'"`

Characteristics: *RST value: -
SCPI: device-specific

SYSTem:COMMunicate:RDEVice:PMETer:CFACtor:BSENsor <numeric_value>,<numeric_value>..

This command defines the interpolation points for the frequency response correction for the external power meter. The points are to be entered as a sequence of frequency/factor pairs, with the frequencies to be specified in ascending order. The correction factors are percentage values.

The receiver can store two correction tables; the values defined here are stored in correction table B.

Example: `"SYST:COMM:RDEV:PMET:CFAC:BSEN 10MHz,99,20MHZ,98"`

Characteristics: *RST value: -
SCPI: device-specific

SYSTem:COMMunicate:RDEVice:PMETer:CFACtor:BSENsor:LABel <name>

This command defines a name for correction table B for the external power meter. This name may designate a specific power sensor, for example.

Example: `"SYST:COMM:RDEV:PMET:CFAC:BSEN:LAB 'SN 319'"`

Characteristics: *RST value: -
SCPI: device-specific

SYSTem:COMMunicate:RDEVice:PMETer:CFACtor:SELect ASENsor | BSENsor

This command selects correction table A or B for the external power meter.

Example: `"SYST:COMM:RDEV:PMET:CFAC:SEL ASEN"`'Selects correction table A.

Characteristics: *RST value: BSENsor
SCPI: device-specific

SYSTem:COMMunicate:RDEVice:PMETer:TYPE <name>

This command selects the type of external power meter.

Example: `"SYST:COMM:RDEV:PMET:TYPE 'NRVD'"`'Selects a type NRVD external power meter.

Characteristics: *RST value: NONE
SCPI: device-specific

SYSTem:COMMunicate:GPIB[:SELF]:ADDRess 0 to 30

This command changes the IEC/IEEE-bus address of the unit.

Example: `"SYST:COMM:GPIB:ADDR 18"`

Characteristics: *RST value: - (no influence on this parameter, factory default 20)
SCPI: conforming

SYSTem:COMMunicate:GPIB[:SELF]:RTERminator LFEOI | EOI

This command changes the GPIB receive terminator.

According to the standard the terminator in ASCII is <LF> and/or <EOI>. For binary data transfers (e.g. trace data) from the control computer to the instrument, the binary code (0AH) used for <LF> might be included in the binary data block, and therefore should not be interpreted as a terminator in this particular case. This can be avoided by changing the receive terminator to EOI.

Output of binary data from the instrument to the control computer does not require such a terminator change.

Example: `"SYST:COMM:GPIB:RTER EOI"`

Characteristics: *RST value: -- (no influence on this parameter, factory default LFEOI)
SCPI: device-specific

SYSTem:COMMunicate:GPIB:RDEVice:GENerator<1|2>:ADDRess 0 to 30

This command changes the IEC/IEEE-bus address of the device selected as external generator 1 or 2.

Note: *If two generators are connected at the same time to IECBUS 2 their addresses must be different.*

The command is only available with option Ext. Generator Control B10.

Example: `"SYST:COMM:GPIB:RDEV:GEN1:ADDR 19"` 'Changes the IECBUS address 'of generator 1 to 19

Characteristics: *RST value: 28
SCPI: device-specific

SYSTem:COMMunicate:RDEVice:GENerator<1|2>:LINK GPIB | TTL

This command selects the interface type of the external generator 1 or 2.
The following types are available

- IECBUS alone (= GPIB, for all the generators of other manufacturers and some Rohde & Schwarz units)

or

- IECBUS and TTL interface for synchronization (= TTL, for most of the Rohde & Schwarz generators, see table in command SYSTem:COMMunicate:RDEVice:GENerator:TYPE).

The difference between the two operating modes is the execution speed. While, during IECBUS operation, each settable frequency is transmitted separately to the generator, a whole frequency list can be programmed in one go if the TTL interface is also used. Frequency switching can then be performed per TTL handshake which results in considerable speed advantages.

Note: *Only one of the two generators can be operated via the TTL interface at a time. The other generator must be configured for IECBUS (GPIB).*

The command is only available with option Ext. Generator Control B10.

Example: `"SYST:COMM:RDEV:GEN:LINK TTL"` 'Selects IECBUS + TTL interface 'for generator operation

Characteristics: *RST value: GPIB
SCPI: device-specific

SYSTem:COMMunicate:RDEVice:GENerator<1|2>:TYPE <name>

This command selects the type of external generator 1 or 2. The following table shows the available generator types including the associated interface:

Generator	Interface Type	Generator Min Freq	Generator Max Freq	Generator Min Power dBm	Generator Max Power dBm
SME02	TTL	5 kHz	1.5 GHz	-144	+16
SME03	TTL	5 kHz	3.0 GHz	-144	+16
SME06	TTL	5 kHz	6.0 GHz	-144	+16
SMG	GPIB	100 kHz	1.0 GHz	-137	+13
SMGL	GPIB	9 kHz	1.0 GHz	-118	+30
SMGU	GPIB	100 kHz	2.16 GHz	-140	+13
SMH	GPIB	100 kHz	2.0 GHz	-140	+13
SMHU	GPIB	100 kHz	4.32 GHz	-140	+13
SMIQ02B	TTL	300 kHz	2.2 GHz	-144	+13
SMIQ02E	GPIB	300 kHz	2.2 GHz	-144	+13
SMIQ03B	TTL	300 kHz	3.3 GHz	-144	+13
SMIQ03E	GPIB	300 kHz	3.3 GHz	-144	+13
SMIQ04B	TTL	300 kHz	4.4 GHz	-144	+10
SMIQ06B	TTL	300 kHz	6.4 GHz	-144	+10
SML01	GPIB	9 kHz	1.1 GHz	-140	+13
SML02	GPIB	9 kHz	2.2 GHz	-140	+13
SML03	GPIB	9 kHz	3.3 GHz	-140	+13
SMR20	TTL	1 GHz	20 GHz	-130 [2)]	+11 [2)]
SMR20B11 [1)]	TTL	10 MHz	20 GHz	-130 [2)]	+13 [2)]
SMR27	TTL	1 GHz	27 GHz	-130 [2)]	+11 [2)]
SMR27B11 [1)]	TTL	10 MHz	27 GHz	-130 [2)]	+12 [2)]
SMR30	TTL	1 GHz	30 GHz	-130 [2)]	+11 [2)]
SMR30B11 [1)]	TTL	10 MHz	30 GHz	-130 [2)]	+12 [2)]
SMR40	TTL	1 GHz	40 GHz	-130 [2)]	+9 [2)]
SMR40B11 [1)]	TTL	10 MHz	40 GHz	-130 [2)]	+12 [2)]
SMR50	TTL	1 GHz	50 GHz	-130 [2)]	+9 [2)]
SMR50B11 [1)]	TTL	10 MHz	50 GHz	-130 [2)]	+12 [2)]
SMR60	TTL	1 GHz	60 GHz	-130 [2)]	+9 [2)]
SMR60B11 [1)]	TTL	10 MHz	60 GHz	-130 [2)]	+12 [2)]
SMP02	TTL	10 MHz	20 GHz	-130 [3)]	+17 [3)]
SMP03	TTL	10 MHz	27 GHz	-130 [3)]	+13 [3)]
SMP04	TTL	10 MHz	40 GHz	-130 [3)]	+12 [3)]
SMP22	TTL	10 MHz	20 GHz	-130 [3)]	+20 [3)]
SMT02	GPIB	5.0 kHz	1.5 GHz	-144	+13
SMT03	GPIB	5.0 kHz	3.0 GHz	-144	+13
SMT06	GPIB	5.0 kHz	6.0 GHz	-144	+13
SMV03	GPIB	9 kHz	3.3 GHz	-140	+13

1) Requires mounting of option SMR-B11.

2) Maximum/Minimum Power depends on the presence of option SMR-B15/-B17 and of the selected frequency range. For details please consult the SMR datasheet.

3) Maximum/Minimum Power depends on the presence of option SMP-B15/-B17 and of the selected frequency range. For details please consult the SMP datasheet.

Generator	Interface Type	Generator Min Freq	Generator Max Freq	Generator Min Power dBm	Generator Max Power dBm
SMX	GPIB	100 kHz	1.0 GHz	-137	+13
SMY01	GPIB	9 kHz	1.04 GHz	-140	+13
SMY02	GPIB	9 kHz	2.08 GHz	-140	+13
HP8340A	GPIB	10 MHz	26.5 GHz	-110	10
HP8648	GPIB	9 kHz	4 GHz	-136	10
HP ESG-A Series 1000A, 2000A, 3000A, 4000A	GPIB	250 kHz	4 GHz	-136	20
HP ESG-D SERIES E4432B	GPIB	250 kHz	3 GHz	-136	+10

Notes: *Generators with TTL interface can also be operated via IECBUS (= GPIB) alone.*

With NONE selected, the corresponding generator 1 or 2 is deactivated.

The command is only available with option Ext. Generator Control B10.

Example: `"SYST:COMM:RDEV:GEN2:TYPE 'SME02'"` 'Selects SME02 as generator 2.

Characteristics: *RST value: NONE
SCPI: device-specific

SYSTem:COMMunicate:SERial:CONTrol:DTR IBFull | OFF
SYSTem:COMMunicate:SERial:CONTrol:RTS IBFull | OFF

These commands switch the hardware handshake procedure for the serial interface off (OFF) or on (IBFull).

The two commands are equivalent.

Examples: `"SYST:COMM:SER:CONT:DTR OFF"`
`"SYST:COMM:SER:CONT:RTS IBF"`

Characteristics: *RST value: -- (no influence on this parameter, factory default OFF)
SCPI: conforming

SYSTem:COMMunicate:SERial[:RECeive]:BAUD 110 | 300 | 600 | 1200 | 2400 | 9600 | 19200

This command sets the transmission speed for the serial interface (COM).

Example: `"SYST:COMM:SER:BAUD 2400"`

Characteristics: *RST value: -- (no influence on this parameter, factory default 9600)
SCPI: conforming

SYSTem:COMMunicate:SERial[:RECeive]:BITS 7 | 8

This command defines the number of data bits per data word for the serial interface (COM).

Example: "SYST:COMM:SER:BITS 7"

Characteristics: *RST value: -- (no influence on this parameter, factory default 8)
SCPI: conforming

SYSTem:COMMunicate:SERial[:RECeive]:PARity[:TYPE] EVEN | ODD | NONE

This command defines the parity check for the serial interface (COM).

Possible values are:
EVEN even parity
ODD odd parity
NONE no parity check.

Example: "SYST:COMM:SER:PAR EVEN"

Characteristics: *RST value: -- (no influence on this parameter, factory default NONE)
SCPI: conforming

SYSTem:COMMunicate:SERial[:RECeive]:SBITs 1|2

This command defines the number of stop bits per data word for the serial interface (COM).

Example: "SYST:COMM:SER:SBITs 2"

Characteristics: *RST value: -- (no influence on this parameter, factory default 1)
SCPI: conforming

SYSTem:COMMunicate:SERial[:RECeive]:PACE XON | NONE

This command switches on or off the software handshake for the serial interface.

Example: "SYST:COMM:SER:PACE XON"

Characteristics: *RST value: -- (no influence on this parameter, factory default NONE)
SCPI: conforming

SYSTem:COMMunicate:PRINter:ENUMerate:FIRSt?

This command queries the name of the first printer (in the list of printers) available under Windows NT.

The names of other installed printers can be queried with command `SYSTem:COMMunicate:PRINter:ENUMerate:NEXT?`.

If no printer is configured an empty string is output.

Example: `"SYST:COMM:PRIN:ENUM:FIRS?"`

Characteristics: *RST value: NONE
SCPI: device-specific

SYSTem:COMMunicate:PRINter:ENUMerate:NEXT?

This command queries the name of the next printer installed under Windows NT.

The command
`SYSTem:COMMunicate:PRINter:ENUMerate:FIRSt?`
should be sent previously to return to the beginning of the printer list and query the name of the first printer.

The names of other printers can then be queried with NEXT?. After all available printer names have been output, an empty string enclosed by quotation marks (") is output for the next query. Further queries are answered by a Query Error.

Example: `"SYST:COMM:PRIN:ENUM:NEXT?"`

Characteristics: *RST value: NONE
SCPI: device-specific

SYSTem:COMMunicate:PRINter:SELect <1|2> <printer_name>

This command selects one of the printers configured under Windows NT including the associated output destination.

The specified printer name must be a string as returned by the commands
`SYSTem:COMMunicate :PRINter:ENUMerate:FIRSt?` or
`SYSTem:COMMunicate :PRINter:ENUMerate:NEXT?`

Note: *Command `HCOPy:DESTination` is used to select an output medium other than the default one.*

Example: `"SYST:COMM:PRIN:SEL 'LASER on LPT1'"`

Characteristics: *RST value: NONE
SCPI: device-specific

SYSTem:DATE 1980 to 2099, 1 to 12, 1 to 31

This command is used to enter the date for the internal calendar.

The sequence of entry is year, month, day.

Example: `" SYST:DATE 2000,6,1"`

Characteristics: *RST value: –
SCPI: conforming

SYSTem:DISPlay:FPANel ON | OFF

This command activates or deactivates the display of the front panel keys on the screen.

With the display activated, the instrument can be operated on the screen using the mouse by pressing the corresponding buttons. This may be useful if the instrument is operated in a detached station by means of a remote program such as PCANYWHERE.

Notes: *With the display of the front panel keys activated, the screen resolution of the unit is set to 1024x768. Thus, only a section of the whole screen is visible on the internal LCD display, which will be moved by mouse moves.*

For a full display of the user interface, an external monitor has to be connected to the rear panel.

When the front panel display is deactivated, the original screen resolution is restored.

Example: `"SYST:DISP:FPAN ON"`

Characteristics: *RST value: OFF
SCPI: device-specific

SYSTem:DISPlay:UPDate ON | OFF

This command switches on or off the update of all display elements during remote control.

Note: *The best performance is obtained when the display output is switched off during remote control.*

Example: `" SYST:DISP:UPD ON`

Characteristics: *RST value: OFF
SCPI: device specific

SYSTem:ERRor?

This command queries the earliest entry in the error queue, and deletes it after the readout.

Positive error numbers indicate device-specific errors, negative error numbers are error messages defined by SCPI (cf. Chapter 9). If the error queue is empty, the error number 0, "no error", is returned. This command is identical with the command `STATus:QUEue:NEXT?`. This command is a query and therefore has no *RST value.

Example: `"SYST:ERR?"`

Characteristics: *RST value: –
SCPI: conforming

SYSTem:ERRor:LIST?

This command reads all system messages and returns a list of comma separated strings. Each string corresponds to an entry in the table SYSTEM MESSAGES.

If the error list is empty, an empty string "" will be returned.

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

Example: `"SYST:ERR:LIST?"`

Characteristics: *RST value: –
SCPI: device specific

SYSTem:ERRor:CLEar:ALL

This command deletes all entries in the table SYSTEM MESSAGES.

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

Example: `"SYST:ERR:CLE:ALL?"`

Characteristics: *RST value: –
SCPI: device specific

SYSTem:FIRMware:UPDate <path>

This command starts a firmware update using the data set in the selected directory. Beforehand, the update files have to be stored in the following subdirectories using command `MMEM:DATA`:

Directory	Contents				
DISK1	_inst32i.ex_ data.tag os.dat	_isdel.exe data1.cab Setup.exe	_setup.dll id.txt Setup.ini	_sys1.cab lang.dat setup.ins	_user1.cab layout.bin setup.lid
DISK2	data2.cab				
DISK3	data3.cab				
DISK4	data4.cab				
DISK5	data5.cab				

Example:

```
"SYST:FIRM:UPD 'D:\USER\FWUPDATE'"
                              'Starts the firmware update
                              'from directory
                              'D:\USER\FWUPDATE using the '
                              'files of ubdirectories DISK1
                              'to DISK5
```

Characteristics: *RST value: –
SCPI: device specific

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

SYSTem:LANGuage 'SCPI' | '8566A' | '8566B' | '8568A' | '8568B' | '8594E'

This command activates the emulation of various spectrum analyzers. The analyzer default command set is SCPI.

The following remote-control languages are available:

- SCPI
- 8566A
- 8566B
- 8568A
- 8568B
- 8594E

Note:

- *When SCPI is selected, the 8566B/8568B/8594E command set is available in addition.*
- *When 8566A, 8566B, 8568A or 8568B is selected, both command sets A and B are available, as far as they are supported.*

On switching between remote-control languages, the following settings or changes will be made:

SCPI:

The instrument will perform a PRESET.

8566A/B, 8568A/B, 8594E:

The instrument will perform a PRESET.

The following instrument settings will then be changed:

Model	# of Trace Points	Start Freq.	Stop Freq.	Input Coupling
8566A/B	1001	2 GHz	22 GHz	DC (FSMR) AC (FSP)
8568A/B	1001	0 Hz	1.5 GHz	AC
8594E	625 (FSMR) 501 (FSP)	0 Hz	3 GHz	AC

Notes regarding switchover to 8566A/B and 8568A/B:

- *Commands IP and KST, too, will perform the settings for the "# of Trace Points", "Start Freq.", "Stop Freq." and "Input Coupling".*
- *Switchover of the "# of Trace Points" will not take place until the instrument is switched to the REMOTE mode. For manual operation (selected with LOCAL softkey), the number of sweep points (trace points) will always be set to 1251.*
- *In the remote mode, the screen area for the measurement will be reduced. The LOCAL softkey (lowermost softkey) will be shifted slightly towards the center of the screen.*

Example: `"SYST:LANG 'SCPI'"`

Characteristics: *RST value: 'SCPI'
SCPI: conforming

There is no query for this command.

SYSTem:PASSword[:CENable] 'password'

This command enables access to the service functions by means of the password.

Example: `"SYST:PASS 'XXXX'"`

Characteristics: *RST value: –
SCPI: conforming

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

SYSTem:PRESet

This command initiates an instrument reset.

The effect of this command corresponds to that of the *PRESET* key with manual control or to the *RST command.

Example: `"SYST:PRES"`

Characteristics: *RST value: –
SCPI: conforming

SYSTem:SET <block>

The query `SYSTem:SET?` causes the data of the current instrument setting to be transmitted to the control computer in binary format (SAVE function). The data can be read back into the instrument (RECALL function) by means of command `SYSTem:SET` <block>. Whilst the data records are stored on the instrument hard disk with SAVE/RECALL (`MMEMory:STORe` bzw. `MMEMory:LOAD`), it is possible to store the data in an external computer by means of `SYSTem:SET`.

The receive terminator has to be set to EOI to ensure reliable transfer of data (setting `SYST:COMM:GPIB:RTER EOI`).

Example: `"SYST:SET "`

Characteristics: *RST value: –
SCPI: conforming

SYSTem:SPEaker:VOLume 0 to 1

This command sets the volume of the built-in loudspeaker for demodulated signals. Minimum volume is set by 0 and maximum volume by 1.

The value 0 is the lowest volume, the value 1 the highest volume.

Example: `"SYST:SPE:VOL   0.5"`

Characteristics: *RST value: 0
SCPI: device-specific

SYSTem:TIME 0 to 23, 0 to 59, 0 to 59

This command sets the internal clock. The sequence of entry is hour, minute, second.

Example: `"SYST:TIME 12,30,30"`

Characteristics: *RST value: –
SCPI: conforming

SYSTem:VERSion?

This command queries the number of the SCPI version, which is relevant for the instrument.

Example: `"SYST:VERS?"`

Characteristics: *RST value: –
SCPI: conforming

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

TRACe Subsystem

The TRACe subsystem controls access to the instrument's internal trace memory.

<table>
<tr><th>COMMAND</th><th>PARAMETERS</th><th>UNIT</th><th>COMMENT</th></tr>
<tr><td>TRACe<1|2></td><td></td><td></td><td></td></tr>
<tr><td>[:DATA]</td><td>TRACE1|TRACE2|TRACE3|PWCDp,|
CTABle,
<block>|<numeric_value>...</td><td>-</td><td></td></tr>
<tr><td>:COPY</td><td>TRACE1|TRACE2|TRACE3,
TRACE1|TRACE2|TRACE3</td><td>-</td><td></td></tr>
<tr><td>:IQ</td><td></td><td></td><td></td></tr>
<tr><td>:AVERage</td><td></td><td></td><td></td></tr>
<tr><td>[:STATe]</td><td><Boolean></td><td></td><td></td></tr>
<tr><td>:COUNt</td><td><numeric_value></td><td>--</td><td></td></tr>
<tr><td>:DATA?</td><td></td><td>-- , --</td><td>query only</td></tr>
<tr><td>:SET</td><td>NORMal,
<numeric_value>,
<numeric_value>,
IMMediate | EXTernal,
IFPower | RFPower,
POSitive,
<numeric_value>,
<numeric_value></td><td>--,
HZ,
HZ,
--,
--,

--,
--</td><td></td></tr>
<tr><td>:SRATe</td><td></td><td></td><td></td></tr>
<tr><td>[:STATe] :POINts</td><td><numeric_value></td><td>HZ</td><td></td></tr>
</table>

General Trace Commands

TRACe<1|2>[:DATA] TRACE1| TRACE2| TRACE3, | PWCDp | CTABle, <block> | <numeric_value>

This command transfers trace data from the control computer to the instrument, the query reads trace data out of the instrument. The associated measurement window is selected with the numeric suffix of TRACe<1|2>.

Note:
If the FM demodulator is active, only the displayed trace data is read out and recalled. A portion of the measurement data that can be called by means of a marker, however, is calculated from the raw measurement data. These results are no longer available after recalling a trace; the associated queries generate a query error.

Example:
```
"TRAC TRACE1,"+A$   (A$: data list in the current format)
"TRAC? TRACE1"
```

Characteristics: *RST value: -
SCPI: conforming

Return values:

The returned values are scaled in the current level unit. Returned FM-modulated measurement values are scaled in Hz.

ASCII format (FORMat ASCII):

In ASCII format, a list of values separated by commas is returned (Comma Separated Values = CSV).

The number of measurement points is 625.

Binary format (FORMat REAL,32):

If the transmission takes place using the binary format (REAL,32), the data are transferred in block format (Definite Length Block Data according to IEEE 488.2). They are arranged in succeeding lists of I and Q data of 32 Bit IEEE 754 floating point numbers. General structure of return string:

#42500<meas value 1><meas value value2>...<meas value 625>

with

#4	digits of the subsequent number of data bytes (4 in the example)
2500	Number of subsequent data bytes (2500 in the example))
<meas value x>	4 byte floating point measurement values

Saving and recalling:

Saving and recalling trace data together with the device settings to/from the device-internal hard disk or to/from a floppy is controlled via the commands "`MMEMory:STORe:STATe`" and "`MMEMory:LOAD:STATe`" respectively. Trace data are selected with "`MMEMory:SELect[:ITEM]:ALL`" or "`MMEMory:SELect[:ITEM]:TRACe`". Trace data in ASCII format (ASCII FILE EXPORT) are exported with the command "`MMEM:STORe:TRACe`".

Transfer format:

The trace data are transferred in the current format (corresponding to the command FORMat ASCii|REAL). The device-internal trace memory is addressed using the trace names 'TRACE1' to 'TRACE3'.

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. In ASCII format, these data are values separated by commas. If the transfer takes place using the format real (REAL,32), the data are transferred in block format.

The parameter of the query is the trace name TRACE1 to TRACE3, it indicates which trace memory will be read out.

The command "`MMEMory:STORe:STATe`" or "`MMEMory:LOAD:STATe`" controls the storage or loading of measured data, including the device settings, on or from the internal hard disk or floppy disk. The trace data is selected via "`MMEMory:SELect[:ITEM]:ALL`" or "`MMEMory:SELect[:ITEM]:TRACe`". The trace data in ASCII format (ASCII FILE EXPORT) is exported via the "`MMEM:STORe:TRACe`" command.

Number and format of the measurement values for the different operating modes

The number of measurement values depends on the instrument setting:

SPECTRUM mode (span > 0 and zero span):

625 results are output in the unit selected for display.

Note: *With AUTO PEAK detector, only positive peak values can be read out.*
Trace data can be written into the instrument with logarithmic display only in dBm, with linear display only in volts.

FORMat REAL,32 is to be used as format for binary transmission, and FORMat ASCii for ASCII transmission.

TRACe:IQ Subsystem

The commands of this subsystem are used for collection and output of measured IQ data. A special memory is therefore available in the instrument with 512k words for the I and Q data. The measurement is always performed in the time domain (span = 0 Hz) at the selected center frequency. The number of samples to be collected can be set. The sample rate can be set in the range from 15.625 kHz to 32 MHz. Prior to being stored in memory or output via GPIB, the measurement data are corrected in terms of frequency response.

Depending on the sample rate, the following maximum bandwidths can be obtained during the measurement.

Sample rate	Max. bandwidth	Notes
32 MHz	9.6 MHz	
16 MHz	7.72 MHz	
8 MHz	4.8 MHz	Signals outside the given bandwidth are folded back into the useful band due to the anti-aliasing filter.
4 MHz	2.8 MHz	
2 MHz	1.6 MHz	max. bandwidth = 0.8 * sample rate for sample rate ≤ 2 MHz
1 MHz	800 kHz	
500 kHz	400 kHz	
250 kHz	200 kHz	
125 kHz	100 kHz	
62.5 kHz	50 kHz	
31.25 kHz	25 kHz	
15.625 kHz	12.5 kHz	

Due to the sampling concept (21.4 MHz IF, 32 MHz Sampling rate), the image frequency is suppressed only by the 10 MHz analog IF filter. When applying an input signal at the edge of the 10 MHz band (+5 MHz from center), the image frequency appears 800 kHz above the input signal.

$$f_{image} = 2 \cdot (f_{center} + 5.4\,\mathrm{MHz}) - f_{signal}$$

where

f_{image} = image frequency in MHz

f_{center} = center frequency in MHz

f_{signal} = frequency of the signal to be measured in MHz

For correct operation the RF input signal shall be limited in bandwidth. Signals more than 5.4 MHz above the center frequency will be mirrored into the 10 MHz pass band.

For additional bandwidth limitation of the measurement data the analog filters (RBW ≥ 300 kHz) are available.

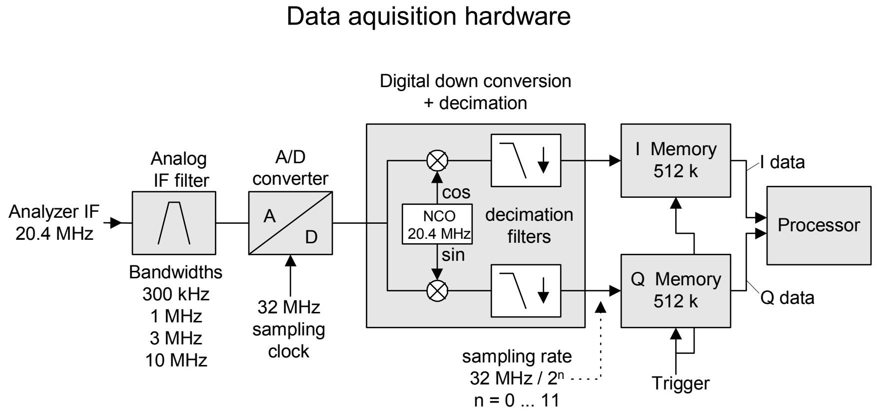


Fig. 6.1-1 Block diagram illustrating signal processing in analyzer

All trigger sources except for VIDeo can be used for triggering. The number of test points to be recorded prior to the trigger time can be selected for all of the available trigger sources except for FREE RUN, where this parameter is always to be assigned the value 0). Measurement results are output in the form of a list, with the Q values following immediately after the list of I values in the output buffer. The FORMAT command can be used to select between binary output (32 bit IEEE 754 floating-point values) and output in ASCII format.
The commands of this subsystem can be used in two ways:

1. Measurement and result query with one command:
   This method causes the least delay between measurement and output of the result data, but it requires the control computer to wait actively for the response data.
2. Setting up the instrument, start of the measurement via "`INIT`" and query of the result list at the end of the measurement:
   With this method the control computer can be used for other activities during the measurement. In this case the additional time needed for synchronization via service request must be taken into account.

TRACe<1|2>:IQ:DATA

This command starts a measurement with the settings defined via `TRACe:IQ:SET` and returns the list of measurement results immediately after they are corrected in terms of frequency response. The number of measurement results depends on the settings defined with `TRACe:IQ:SET`, the output format depends on the settings of the `FORMat` – subsystem.

Note: *The command requires that all response data are read out completely before the instrument accepts further commands.*

Parameter: none

Example: `"TRAC:IQ:STAT ON"` 'Enables acquisition of I/Q data

`"TRAC:IQ:SET NORM,10MHz,32MHz,EXT,POS,0,4096"`
'Measurement configuration:
'Filtertype:Normal
'RBW:10 MHz
'Sample Rate:32 MHz
'Trigger Source:External
'Trigger Slope:Positive
'Pretrigger Samples:0
'# of Samples:4096

`"FORMat REAL,32"` 'Selects format of response data

`"TRAC:IQ:DATA?"` 'Starts measurement and reads results

Return values:

The result values are scaled linear in unit *Volt* and correspond to the voltage at the RF input of the instrument.

ASCII Format (FORMat ASCII):

In this case the command returns a comma separated list of the measured voltage values in floating point format (Comma Separated Values = CSV). The number of values returned is 2 * number of samples, the first half being the I-values, the second half the Q-values.

Binary Format (FORMat REAL,32):

In this case the command returns binary data (Definite Length Block Data according to IEEE 488.2), with the lists of I- and Q-data being arranged one after the other in 32 Bit IEEE 754 floating point data. The scheme of the response string is as follows:

#44096<I-value1><I-value2>...<I-value512><Q-value1><Q-value2>...<Q-value512>

with

#4	digits of the subsequent number of data bytes (4 in the example)
4096	number of subsequent data bytes (*# of DataBytes*, 4096 in the example)
<I-value x>	4-Byte-Floating Point I-value
<Q-value y>	4-Byte-Floating Point Q-value

The number of I- and Q-data can be calculated as follows:

$$\#\ of\ I - Data \quad = \quad \#\ of\ Q - Data \quad = \quad \frac{\#\ of\ DataBytes}{8}$$

The offset of Q-data in the output buffer can be calculated as follows:

$$Q - Data - Offset \quad = \quad \frac{(\#\ of\ DataBytes)}{2} + LengthIndicatorDigits$$

with LengthIndicatorDigits being the number of digits of the length indicator including the '#'. In the example above (#44096...) this results in a value of 6 for LengthIndicatorDigits and the offset for the Q-data will result in 2048 + 6 = 2054.

Characteristics: *RST value: --

Note:
*Using the command with the *RST values for command TRAC:IQ:SET the following minimum buffer sizes for the response data are recommended:*
ASCII format:10 kBytes
Binary format:2 kBytes

SCPI: device specific

TRACe<1|2>:IQ:SET <filter type>,<rbw>,<sample rate>,<trigger source>,<trigger slope>, <pretrigger samples>,<# of samples>

This command defines the settings of the analyzer hardware for the measurement of I/Q data. This allows setting the bandwidth of the analog filters in front of the A/D converter as well as setting the sample rate, trigger conditions and the record length.

Note: *If this command is omitted, the current analyzer settings will be used for the corresponding parameters.*

Parameter:

<filter type>: NORMAL 'Selects the analog analyzer resolution filters as filter type. This is currently the only available filter type.

<rbw>: Bandwidth of the analog filters in front of the A/D converter.

Value range: 300 kHz – 10 MHzin steps of 1, 3, 10 for <filter type> = NORMal<sample rate>:Sampling rate for the data acquisition.

Value range: 15.625 kHz, 31.25 kHz, 62.5 kHz,
125 kHz, 250 kHz, 500 kHz,
1 MHz, 2 MHz, 4 MHz, 8 MHz, 16 MHz,
32 MHz for <filter type> = NORMal

<trigger mode>: Selection of the trigger source used for the measurement.

Values: IMMediate | EXTernal | IFPower | RFPower

Notes*:*
IFPower and RFPower are available as of model 03 of the detector board assembly.

After selecting IFPower and RFPower, the trigger threshold can be set with command TRIG:LEV:IFP or TRIG:LEV:RFP.

<trigger slope>: Used trigger slope.

Values: POSitive (currently the only value supported)

<pretrigger samples>: Number of measurement values to be recorded before the trigger point.

Range: -16744447 (= -(2^{24}-1-512k)) to 65023 (= 64*1024 – 512 - 1)

Note: *Negative values correspond to a trigger delay.*
For <trigger mode> = IMMediate the value must be 0.

<# of samples>: Number of measurement values to record.

Examples:

`"TRAC:IQ:SET NORM,10MHz,32MHz,EXT,POS,0,2048"`	'Reads 2048 I/Q-values starting at the 'trigger point. 'Filtertype: NORMAL (analog) 'RBW: 10 MHz 'Sample Rate:32 MHz 'Trigger: External 'Slope: Positive
`"TRAC:IQ:SET NORM,1MHz,4MHz,EXT,POS,1024,512"`	'Reads 512 I/Q-values from 1024 'measurement points before the 'trigger point. 'Filtertype: NORMAL (analog) 'RBW: 1 MHz 'Sample Rate:4 MHz 'Trigger: External 'Slope: Positive

Characteristics: *RST values: `NORM,3MHz,32MHz,IMM,POS,0,128`

Note:
For using these default settings with command TRAC:IQ:DATA? the following minimum buffer sizes for the response data are recommended:
ASCII format:10 kBytes
Binary format:2 kBytes

SCPI: device specific

This command sets the sampling rate for the I/Q data acquisition. Thus the sample rate can be modified without affecting the other settings.

Example: `"TRAC:IQ:SRAT 4MHZ"`

Characteristics: *RST value: 32 MHz
SCPI: device specific

TRACe<1|2>:IQ[:STATe] ON | OFF

This command switches the I/Q data acquisition on or off.

Note: *The I/Q data acquisition is not compatible with other measurement functions. Therefore all other measurement functions will be switched off as soon as the I/Q measurement function is switched on. Additionally a trace display is not possible in this operating mode. Therefore all traces are set to "BLANK". Finally split screen operation will automatically be stopped.*

Example: `TRAC:IQ ON` 'Switches on I/Q data acquisition

Characteristics: *RST value: OFF
SCPI: device specific

TRIGger Subsystem

The TRIGger subsystem is used to synchronize instrument actions with events. It is thus possible to control and synchronize the start of a sweep. An external trigger signal can be applied to the connector at the rear panel of the instrument. A distinction is made between TRIGger1 (screen A) and TRIGger2 (screen B).

COMMAND	PARAMETERS	UNIT	COMMENT
TRIGger<1|2>			
[:SEQuence]			
:SOURce	IMMediate | EXTernal | VIDeo | IFPower | AUDio | AF | AM | FM | PM		
:LEVel			
:AUDio	<numeric_value>	V	
:AM	<numeric_value>	DBM	
:FM	<numeric_value>	HZ	
:PM	<numeric_value>	RAD	
:VIDeo	<numeric_value>	PCT	
:HOLDoff			
[:TIME]	<numeric_value>	S	
:ADJUST		--	
:AUTO	POSitive|NEGative		
:SLOPe	POSitive|NEGativ		

TRIGger<1|2>[:SEQuence]:SOURce IMMediate | EXTernal | VIDeo | IFPower | AF | FM | AM | AUDio

This command selects the trigger source for the start of a sweep.

Parameter:

IMMediate = automatic triggering the next measurement at the end of the previous one.The value IMMediate corresponds to the FREE RUN setting.

EXTernal = the next measurement is triggered by the signal at the external trigger input.

VIDeo = the next measurement is triggered by the detection of a signal at the video filter output.

IFPower = the next measurement is triggered by the detectíon of a signal at the instrument IF (10 MHz bandwidth)

RFPower = the next measurement is triggered by the detectíon of a signal at the instrument RF (80 MHz bandwidth)

AF | FM = the next measurement is triggered by the detection of a FM modulated signal (AF is synonymous with FM)

AM = the next measurement is triggered by the detection of a audio signal after AM demodulation

PM = the next measurement is triggered by the detection of a audio signal after PM demodulation

AUDio = the next measurement is triggered by the detection of a signal at the Audio Input

Note: *To ensure successful triggering with trigger sources AF, AM, FM, and PM the measurement time should include at least 5 periods of the audio signal.*

Example: `"TRIG:SOUR EXT"` 'Selects the external trigger input as source of the trigger 'signal

Characteristics: *RST value: IMMediate
SCPI: conforming

TRIGger<1|2>[:SEQuence]:LEVel:AM -100 to +30dBm

The command sets the level when AM-modulated signals are used as a trigger source.

Note: *To ensure successful triggering with trigger sources AF, AM and FM, the measurement time should include at least 5 periods of the audio signal.*

Example: `"TRIG:LEV:AM 10 kHz"` 'Sets the AM trigger threshold to 10 kHz

Characteristics: *RST value: 0 Hz
SCPI: device-specific

TRIGger<1|2>[:SEQuence]:LEVel:AF -10 to +10MHz
TRIGger<1|2>[:SEQuence]:LEVel:FM -10 to +10MHz

The command sets the level when FM-modulated signals are used as a trigger source.

Note: *To ensure successful triggering with trigger sources AF, AM and FM, the measurement time should include at least 5 periods of the audio signal.*

Example: `"TRIG:LEV:FM 10 kHz"` 'Sets the FM trigger threshold to 10 kHz

Characteristics: *RST value: 0 Hz
SCPI: device-specific

TRIGger<1|2>[:SEQuence]:LEVel:AUDio -4 to +4 V

This command sets the trigger threshold for audio signals.

Note: For successful triggering, the audio signal has to be measured over at least five periods.

Example: `"TRIG:LEV:AUD 0.5 V"`'Sets the trigger threshold to 500 mV.

Characteristics: *RST value: 0 V
SCPI: device-specific

TRIGger<1|2>[:SEQuence]:LEVel:PM -1000...+1000RAD

The command sets the level when PM-modulated signals are used as a trigger source.

Note: *To ensure successful triggering with trigger sources AF, AM, FM and PM, the measurement time should include at least 5 periods of the audio signal..*

Example: `"TRIG:LEV:PM 1.2 RAD"` 'Sets the PM trigger threshold to 1.2 rad

Characteristics: *RST value: 0 Hz
SCPI: device-specific

TRIGger<1|2>[:SEQuence]:LEVel:VIDeo 0 to 100PCT

This command sets the level of the video trigger source.

Example: `"TRIG:LEV:VID 50PCT"`

Characteristics: *RST value: 50 PCT
SCPI: device-specific

This command defines the length of the trigger delay.

A negative delay time (pretrigger) can be set in the time domain (span < 0 Hz) only.

Example: `"TRIG:HOLD 500us"`

Characteristics: *RST value: 0s
SCPI: conforming

TRIGger<1|2>[:SEQuence]:SLOPe POSitive | NEGative

This command selects the slope of the trigger signal. The selected trigger slope applies to all trigger signal sources .

Example: `"TRIG:SLOP NEG"`

Characteristics: *RST value: POSitive
SCPI: conforming

UNIT Subsystem

The UNIT subsystem is used to switch the basic unit of setting parameters. A distinction is made between UNIT1 (screen A) and UNIT2 (screen B).

COMMAND	PARAMETERS	UNIT	COMMENT
UNIT<1|2>			
:POWer	DBM | V | A | W | DBPW | WATT | DBUV | DBMV | VOLT | DBUA | AMPere|		
:THD	DB | PCT		

UNIT<1|2>:POWer DBM | DBPW | WATT | DBUV | DBMV | VOLT | DBUA | AMPere | V | A | W

This command selects the default unit for the selected measurement window.

Example: `"UNIT:POW DBUV"` 'Sets the power unit for screen A to dBm.

Characteristics: *RST value: DBM
SCPI: conforming

UNIT<1|2>:THD DB | PCT

Selects the unit for THD measurements.

Example: `"UNIT:THD PCT"`

Characteristics: *RST value: DBM
SCPI: device-specific

IEC/IEEE-Bus Commands of HP Models 856xE, 8566A/B, 8568A/B and 8594E

Introduction

The R&S FSMR analyzer family supports a subset of the IEC/IEEE-bus commands of HP models 8560E, 8561E, 8562E, 8563E, 8564E, 8565E, 8566A, 8566B, 8568A, 8568B and 8594E.
Despite the differences in system architecture and device features, the supported commands have been implemented in a way to ensure a sufficiently high degree of correspondence with the original.
This includes the support of syntax rules for not only newer device families (B and E models) but for the previous A family as well.
In many cases the selection of commands supported by the R&S FSMR is sufficient to run an existing IEC/IEEE-bus program without adaptation.
The device model to be emulated is selected manually by means of the key sequence *SETUP - GENERAL SETUP - GPIB - GPIB LANGUAGE* via the IEC/IEEE bus using the *SYSTem:LANGuage* command.
To make it possible to also emulate device models that are not part of the selection list of the GPIB LANGUAGE softkey, the identification string received in response to the ID command can be modified (key sequence *SETUP - GENERAL SETUP - GPIB - ID STRING USER*). This allows any device model to be emulated whose command set is compatible with one of the supported device models.

Command Set of Models 8560E, 8561E, 8562E, 8563E, 8564E, 8565E, 8566A/B, 8568A/B and 8594E

As with the original units, the R&S FSMR includes the command set of the A models in the command set of the B models.

Command	Supported subset	Function	Corresponding HP-Models	Status
A1	A1	Clear/Write A	HP 8566A/ HP 8568A	available
A2	A2	Max Hold A	HP 8566A/ HP 8568A	available
A3	A3	View A	HP 8566A/ HP 8568A	available
A4	A4	Blank A	HP 8566A/ HP 8568A	available
ABORT [1)]	ABORT	Stop previous function	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
ADJALL	ADJALL	Adjust all	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available in V3.2x and above
ADJCRT [2)]	ADJCRT	Adjust CRT	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available in V3.2x and above
ADJIF [2)]	ADJIF	Auto adjust IF	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available in V3.2x and above

Command	Supported subset	Function	Corresponding HP-Models	Status
AMB	AMB ON|OFF AMB 1|0 AMB?	Trace A - B -> Trace A	HP 856xE / HP 8594E	available in V3.3x and above
AMBPL	AMBPL ON|OFF AMBPL 1|0 AMBPL?		HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
ANNOT	ANNOT ON|OFF ANNOT 1|0 ANNOT?	Annotation	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
APB	APB	Trace A + B -> Trace A	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available in V3.3x and above
AT	AT <numeric_value> DB | DM AT DN AT UP AT AUTO AT?	Attenuation	HP 8566A/ HP 8568A/ HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
AUNITS	AUNITS DBM | DBMV | DBUV AUNITS?	Amplitude Units	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
AUTOCPL	AUTOCPL	Coupling default	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available in V3.2x and above
AXB	AXB	Exchange trace A and B	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available in V3.2x and above
B1	B1	Clear/Write B	HP 8566A/ HP 8568A	available
B2	B2	Max Hold B	HP 8566A/ HP 8568A	available
B3	B3	View B	HP 8566A/ HP 8568A	available
B4	B4	Blank B	HP 8566A/ HP 8568A	available
BL	BL	Trace B - Display Line -> Trace B	HP 8566A/ HP 8568A	available in V3.3x and above
BML	BML	Trace B - Display Line -> Trace B	HP 856xE/ HP8594E	available in V3.3x and above
BTC	BTC	Transfer Trace B -> C	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available in V3.3x and above
BXC	BXC	Exchange Trace B and C	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available in V3.3x and above
BLANK	BLANK TRA|TRB|TRC	Blank Trace	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available

Command	Supported subset	Function	Corresponding HP-Models	Status
C1	C1	A-B off	HP 8566A/ HP 8568A	available
C2	C2	A-B -> A	HP 8566A/ HP 8568A	available
CA	CA	Couple Attenuation	HP 8566A/ HP 8568A	available
CAL 1)	CAL ALL CAL ON CAL OFF	Start analyzer self alignment	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
CF	CF <numeric_value> HZ|KHZ|MHZ|GHZ CF UP CF DN CF?	Center Frequency	HP 8566A/ HP 8568A/ HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
CHANPWR	CHANPWR TRA|TRB, <numeric_value>, ?	Channel Power Measurement	HP 856xE / HP 8594E	available in V3.4x and above
CHPWRBW	CHPWRBW <numeric_value> HZ|KHZ|MHZ|GHZ	Channel Power Bandwidth	HP 856xE / HP 8594E	available in V3.4x and above
CLRW	CLRW TRA|TRB|TRC	Clear/Write Trace	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
CLS 1)	CLS	Clear all status bits	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
CONTS	CONTS		HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
COUPLE	COUPLE AC|DC	Input coupling	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available in V3.2x and above
CR	CR	Couple RBW	HP 8566A/ HP 8568A	available
CS	CS	Couple Step Size	HP 8566A/ HP 8568A	available
CT	CT	Couple SWT	HP 8566A/ HP 8568A	available
CV	CV	Couple VBW	HP 8566A/ HP 8568A	available
D1 2)	D1	Display Size normal	HP 8566A/ HP 8568A	available in V3.3x and above
DEMOD 1)	DEMOD ON|OFF|AM|FM	AF Demodulator	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
DEMODAGC 2)	DEMODAGC ON|OFF|1|0 DEMODAGC?	Demodulation AGC	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available in V3.2x and above
DEMODT	DEMODT <numeric_value> S|MS|US|SC	Demodulation time	HP 856xE / HP 8566B /	available in V3.3x and above

Command	Supported subset	Function	Corresponding HP-Models	Status
	DEMODT UP|DN DEMODT?		HP 8568B / HP 8594E	
DET	DET POS|SMP|NEG DET?	Detector	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
DL	DL <numeric_value> DB|DM DL DN DL UP DL ON DL OFF DL?	Display Line	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
DLE	DLE ON|OFF	Display Line enable	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available in V3.3x and above
DONE	DONE DONE?	Done query	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
E1	E1	Peak Search	HP 8566A/ HP 8568A	available
E2	E2	Marker to Center Freq.	HP 8566A/ HP 8568A	available
E3	E3	Deltamarker Step Size	HP 8566A/ HP 8568A	available
E4	E4	Marker to Ref. Level	HP 8566A/ HP 8568A	available
ERR?	ERR?	Error queue query	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
EX	EX	Exchange trace A and B	HP 8566A / HP 8568A	available in V3.2x and above
FA	FA <numeric_value> HZ|KHZ|MHZ|GHZ FA UP FA DN FA?	Start Frequency	HP 8566A/ HP 8568A/ HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
FB	FB <numeric_value> HZ|KHZ|MHZ|GHZ FB UP FB DN FB?	Stop Frequency	HP 8566A/ HP 8568A/ HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
FOFFSET[1)]	FOFFSET <numeric_value> HZ|KHZ|MHZ|GHZ FOFFSET?	Frequency Offset	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
FREF	FREF INT|EXT	Reference Frequency	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available in V3.2x and above
FS	FS	Full Span	HP 8566A/ HP 8568A	available
GATE [1)]	GATE ON|OFF		HP 856xE / HP 8566B /	available

Command	Supported subset	Function	Corresponding HP-Models	Status
	GATE 1|0		HP 8568B / HP 8594E	
GATECTL [1)]	GATECTL EDGE|LEVEL GATECTL?		HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
GD [1)]	GD <numeric_value> US|MS|SC GD DN GD UP GD?		HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
GL [1)]	GL <numeric_value> US|MS|SC GL DN GL UP GL?		HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
GP [1)]	GP POS|NEG GP?		HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
GRAT [2)]	GRAT ON|OFF	Graticule	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available in V3.2x and above
I1	I1		HP 8566A/ HP 8568A	available
I2	I2		HP 8566A/ HP 8568A	available
ID	ID ID?	Identify	HP 8566A/ HP 8568A/ HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
INZ [1)]	INZ 75 INZ 50 INZ?	Input Impedance	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
IP	IP	Instrument preset	HP 8566A/ HP 8568A	available
KS=	KS= <numeric_value> HZ|KHZ|MHZ|GHZ KS= DN KS= UP KS=?	Marker Frequency Counter Resolution	HP 8566A/ HP 8568A	available
KS/	KS/	Manual Peaking	HP 8566A/ HP 8568A	available in V3.2x and above
KS(	KS(	Lock register	HP 8566A/ HP 8568A	available in V3.4x and above
KS)	KS)	Unlock register	HP 8566A/ HP 8568A	available in V3.4x and above
KS91	KS91	Read Amplitude Error	HP 8566A/ HP 8568A	available in V3.4x and above
KSA	KSA	Amplitude Units in dBm	HP 8566A/ HP 8568A	available
KSB	KSB	Amplitude Units in dBmV	HP 8566A/ HP 8568A	available
KSC	KSC	Amplitude Units in	HP 8566A/	available

Command	Supported subset	Function	Corresponding HP-Models	Status
		dBuV	HP 8568A	
KSD	KSD	Amplitude Units in V	HP 8566A/ HP 8568A	available
KSE	KSE <numeric_value>|<char data>@	Title mode	HP 8566A/ HP 8568A	available
KSG	KSG KSG ON KSG <numeric_value>	Video Averaging on	HP 8566A/ HP 8568A	available
KSH	KSH	Video Averaging Off	HP 8566A/ HP 8568A	available
KSK		Marker to Next Peak	HP 8566A/ HP 8568A	available
KSL		Marker Noise off	HP 8566A/ HP 8568A	available
KSM		Marker Noise on	HP 8566A/ HP 8568A	available
KSO	KSO	Deltamarker to span	HP 8566A/ HP 8568A	available in V3.2x and above
KSP	KSP <numeric_value>	HPIB address	HP 8566A/ HP 8568A	available
KSQ [2)]	KSQ	Band lock off	HP 8566A/ HP 8568A	available in V3.2x and above
KST	KST	Fast Preset	HP 8566A/ HP 8568A	available
KSV	KSV <numeric_value> HZ|KHZ|MHZ|GHZ KSV?	Frequency Offset	HP 8566A/ HP 8568A	available
KSW	KSW	Error Correction Routine	HP 8566A/ HP 8568A	available
KSX	KSX	Correction Values On	HP 8566A/ HP 8568A	available
KSY	KSY	Correction Values Off	HP 8566A/ HP 8568A	available
KSZ	KSZ <numeric_value> DB KSZ?	Reference Value Offset	HP 8566A/ HP 8568A	available
KSa	KSa	Normal Detection	HP 8566A/ HP 8568A	available
KSb	KSb	Pos Peak Detection	HP 8566A/ HP 8568A	available
KSd	KSd	Neg Peak Detection	HP 8566A/ HP 8568A	available
KSe	KSe	Sample Detection	HP 8566A/ HP 8568A	available
KSj	KSj	View Trace C	HP 8566A/ HP 8568A	available
KSk	KSk	Blank Trace C	HP 8566A/ HP 8568A	available
KSl	KSl	Transfer B to C	HP 8566A/ HP 8568A	available
KSm	KSm	Graticule off	HP 8566A/ HP 8568A	available

Command	Supported subset	Function	Corresponding HP-Models	Status
KSn	KSn	Grid on	HP 8566A/ HP 8568A	available in V3.2x and above
KSo	KSn	Character display off	HP 8566A/ HP 8568A	available in V3.2x and above
KSp	KSp	Character display on	HP 8566A/ HP 8568A	available in V3.2x and above
KSr	KSr	Create service request	HP 8566A/ HP 8568A	available in V3.2x and above
KSt [2)]	KSt	Band lock on	HP 8566A/ HP 8568A	available in V3.2x and above
KSv [2)]	KSv	Signal ident on	HP 8566A/ HP 8568A	available in V3.2x and above
L0	L0	Display line off	HP 8566A/ HP 8568A	available in V3.2x and above
LB	LB <numeric_value>|<char data>@	Label	HP 8566A/ HP 8568A	available in V3.2x and above
LF	LF	Low frequency band preset	HP 8566A/ HP 8568A	available in V3.2x and above
LG	LG <numeric_value> DB | DM LG?	Amplitude Scale Log	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
LL [2)]	LL	Plot command	HP 8566A/ HP 8568A	available in V3.2x and above
LN	LN	Amplitude Scale Lin	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
M1	M1	Marker Off	HP 8566A/ HP 8568A	available
M2	M2 M2 <numeric_value> HZ|KHZ|MHZ|GHZ M2 DN M2 UP M2?	Marker Normal	HP 8566A/ HP 8568A	available
M3	M3 M3 <numeric_value> HZ|KHZ|MHZ|GHZ M3 DN M3 UP M3?	Delta Marker	HP 8566A/ HP 8568A	available
M4	M4 <numeric_value> HZ|KHZ|MHZ|GHZ	Marker Zoom	HP 8566A/ HP 8568A	available
MA	MA	Marker Amplitude	HP 8566A/ HP 8568A	available
MC0	MC0	Marker Count off	HP 8566A/ HP 8568A	available
MC1	MC1	Marker Count on	HP 8566A/ HP 8568A	available
MF	MF MF?	Marker Frequency	HP 8566A/ HP 8568A/ HP 856xE / HP 8566B / HP 8568B /	available

Command	Supported subset	Function	Corresponding HP-Models	Status
			HP 8594E	
MINH[1)]	MINH TRC	Minimum Hold	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
MKA	MKA <numeric_value> MKA?	Marker Amplitude	HP 856xE / HP 8566B / HP 8568B / HP 8594E	MKA <numeric_value> available in V3.4x and above query always available
MKACT	MKACT 1 MKACT?	Select the active marker	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
MKBW [1)]	MKBW <numeric_value> MKBW ON MKBW OFF	N dB Down	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
MKD	MKD MKD <numeric_value> HZ|KHZ| MHZ|GHZ MKD DN MKD UP MKD ON MKD OFF MKD?	Delta Marker	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
MKDR	MKDR <numeric_value> HZ|KHZ| MHZ|GHZ| S|SC|MS|MSEC|USMKD R?	Delta Marker reverse	HP 856xE / HP 8566B / HP 8568B / HP 8594E	query available in V3.2x and above, completely available in V3.3x and above
MKF	MKF <numeric_value> HZ|KHZ| MHZ|GHZ MKF?	Set Marker Frequency	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
		Marker On		hidden
MKFC	MKFC ON|OFF	Frequency Counter on/off	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available in V3.2x and above
MKFCR [1)]	MKFCR <numeric_value>HZ|KHZ| MHZ|GHZ MKFCR DN MKFCR UP MKFCR?	Frequency Counter Resolution	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
MKMIN	MKMIN	Marker -> Min	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
MKN	MKN MKN <numeric_value> HZ|KHZ| MHZ|GHZ MKN DN MKN UP MKN ON MKN OFF MKN?	Normal Marker	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
MKNOISE	MKNOISE ON|OFF MKNOISE 1|0	Noise Measurement	HP 856xE / HP 8566B /	available

Command	Supported subset	Function	Corresponding HP-Models	Status
	MKNOISE?		HP 8568B / HP 8594E	
MKOFF	MKOFF MKOFF ALL	Marker off	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
MKP	MKP <numeric_value> MKP?	Marker position	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available in V3.4x and above
MKPK	MKPK MKPK HI MKPK NH MKPK NR MKPK NL	Marker Search	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
MKPT	MKPT MKPT HI MKPT NH MKPT NR MKPT NL	Marker Peak Threshold	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
MKPX	MKPX <numeric_value> DB MKPX DN MKPX UP MKPX?	Peak Excursion	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
MKRL	MKRL	Ref Level = Marker Level	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
MKSP	MKSP	Deltamarker to span	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available in V3.2x and above
MKSS	MKSS	CF Stepsize = Marker Freq	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
MKT	MKT <numeric_value> S | MS|US|SC MKT?	MKF = fstart + MKT/SWT*Span	HP 856xE / HP 8594E	available in V3.3x and above
MKTRACE	MKTRACE TRA|TRB|TRC	Marker to Trace	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
MKTRACK	MKTRACK ON|OFF MKTRACK 1|0 MKTRACK?	Signal Track	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
MKTYPE	MKTYPE AMP MKTYPE?	Marker type	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available in V3.4x and above
MOV	MOV TRA|TRB|TRC,TRA|TRB|TRC	Move Trace Contents	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
MT0	MT0	Marker Track Off	HP 8566A/ HP 8568A	available

Command	Supported subset	Function	Corresponding HP-Models	Status
MT1	MT1	Marker Track On	HP 8566A/ HP 8568A	available
MXMH	MXMH TRA|TRB	Maximum Hold	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
NORMALIZE	NORMALIZE	Normalize trace	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available in V3.2x and above
NRL [1)]	NRL <numeric_value> DB | DM NRL?	Normalized Reference Level	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
NRPOS	NRPOS <numeric_value> NRL?	Normalize position	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available in V3.2x and above
O1	O1	Format ASCII, Values 0 to 4095	HP 8566A/ HP 8568A	available
O2	O2	Format Binary, Values 0 to 4095	HP 8566A/ HP 8568A	available in V3.3x and above
O3	O3	Format ASCII	HP 8566A/ HP 8568A	available
OA	OA	Output All	HP 8566A/ HP 8568A	available
OL	OL <80 characters> OL?	Output Learn String	HP 8566A/ HP 8568A	available
OT	OT	Output Trace Annotations	HP 8566A/ HP 8568A	available
PA [2)]	PA <numeric_value>, <numeric_value	Plot command	HP 8566A/ HP 8568A	available in V3.2x and above
PD [2)]	PD <numeric_value>, <numeric_value	Plot command	HP 8566A/ HP 8568A	available in V3.2x and above
PLOTORG [2)]	PLOTORG DSP|GRT	Plot command	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available in V3.2x and above
PLOTSRC [2)]	PLOTSRC ANNT|GRT|TRB| TRA|ALLDSP|GRT	Plot command	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available in V3.2x and above
PP	PP	Preselector Peaking	HP 8566A/ HP 8568A	available
PRINT [1)]	PRINT PRINT 1|0	Hardcopy	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
PSDAC [2)]	PSDAC <numeric_value> PSDAC UP|DN	Preselector DAC value	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available in V3.2x and above
PSTATE [2)]	PSTATE ON|OFF|1|0	Protect State	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available in V3.2x and above

<table>
<tr><th>Command</th><th>Supported subset</th><th>Function</th><th>Corresponding HP-Models</th><th>Status</th></tr>
<tr><td>PU [2)]</td><td>PU</td><td>Pen Up</td><td>HP 8566A/
HP 8568A</td><td>available in V3.3x and above</td></tr>
<tr><td>R1</td><td>R1</td><td>Set Status Bit Enable</td><td>HP 8566A/
HP 8568A</td><td>available</td></tr>
<tr><td>R2</td><td>R2</td><td>Set Status Bit Enable</td><td>HP 8566A/
HP 8568A</td><td>available</td></tr>
<tr><td>R3</td><td>R3</td><td>Set Status Bit Enable</td><td>HP 8566A/
HP 8568A</td><td>available</td></tr>
<tr><td>R4</td><td>R4</td><td>Set Status Bit Enable</td><td>HP 8566A/
HP 8568A</td><td>available</td></tr>
<tr><td>RB</td><td>RB <numeric_value>
HZ|KHZ|MHZ|GHZ
RB DN
RB UP
RB AUTO
RB?</td><td>Resolution Bandwidth</td><td>HP 856xE /
HP 8566B /
HP 8568B /
HP 8594E</td><td>available</td></tr>
<tr><td>RBR</td><td>RBR <numeric_value>
RBR DN
RBR UP
RBR?</td><td>Resolution Bandwidth Ratio</td><td>HP 856xE /
HP 8566B /
HP 8568B /
HP 8594E</td><td>available in V3.2x and above</td></tr>
<tr><td>RC1...6</td><td>RC1...6</td><td>Recall Last State</td><td>HP 8566A/
HP 8568A</td><td>available</td></tr>
<tr><td>RCLS</td><td>RCLS <numeric_value></td><td>Recall State Register</td><td>HP 856xE /
HP 8566B /
HP 8568B /
HP 8594E</td><td>available</td></tr>
<tr><td>RCLT</td><td>RCLT TRA|TRB,<number></td><td>Recall Trace</td><td>HP856xE /
HP8594E</td><td>avalable in V3.3x and above</td></tr>
<tr><td>RESET</td><td>RESET</td><td>Instrument preset</td><td>HP 856xE /
HP 8566B /
HP 8568B /
HP 8594E</td><td>available</td></tr>
<tr><td>REV</td><td>REV
REV?</td><td>Firmware revision</td><td>HP 856xE /
HP 8566B /
HP 8568B /
HP 8594E</td><td>available</td></tr>
<tr><td>RL</td><td>RL <numeric_value> DB|DM
RL DN
RL UP
RL?</td><td>Reference Level</td><td>HP 856xE /
HP 8566B /
HP 8568B /
HP 8594E</td><td>available</td></tr>
<tr><td>RLCAL</td><td>RLCAL <numeric_value>
RL?</td><td>Reference Level Calibration</td><td>HP 856xE /
HP 8566B /
HP 8568B /
HP 8594E</td><td>available in V3.2x and above</td></tr>
<tr><td>RCLOSCAL</td><td>RCLOSCAL</td><td>Recall Open/Short Average</td><td>HP 856xE /
HP 8594E</td><td>available in V3.3x and above</td></tr>
<tr><td>RCLTHRU</td><td>RCLTHRU</td><td>Recall Thru</td><td>HP 856xE /
HP 8594E</td><td>available in V3.3x and above</td></tr>
<tr><td>RLPOS [1)]</td><td>RLPOS <numeric_value>
RLPOS DN
RLPOS UP
RLPOS?</td><td>Reference Level Position</td><td>HP 856xE /
HP 8566B /
HP 8568B /
HP 8594E</td><td>available</td></tr>
<tr><td>ROFFSET</td><td>ROFFSET <numeric_value> DB | DM
ROFFSET?</td><td>Reference Level Offset</td><td>HP 856xE /
HP 8566B /
HP 8568B /
HP 8594E</td><td>available</td></tr>
</table>

Command	**Supported subset**	**Function**	**Corresponding HP-Models**	**Status**
RQS	RQS	Service Request Bit mask	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
S1	S1	Continuous Sweep	HP 8566A/ HP 8568A	available
S2	S2	Single Sweep	HP 8566A/ HP 8568A	available
SAVES	SAVES <numeric_value>	Save State Register	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
SAVET	SAVET TRA|TRB,<number>	Save Trace	HP856xE / HP8594E	avalable in V3.3x and above
SMOOTH	SMOOTH TRA|TRB|TRC, <number of points>	Smooth Trace	HP 856xE / HP 8566B / HP 8568B / HP 8594E	avalable in V3.4x and above
SNGLS	SNGLS	Single Sweep	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
SQUELCH [2)]	SQUELCH <numeric_value> DM | DB SQUELCH UP|DN SQUELCH ON|OFF	Squelch	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available in V3.3x and above
SP	SP <numeric_value> HZ|KHZ| MHZ|GHZ SP DN SP UP SP?	Span	HP 8566A/ HP 8568A/ HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
SRCNORM [1)]	SRCNORM ON|OFF SRCNORM 1|0	Source Normalization	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
SRCPOFS [1)]	SRCPOFS <numeric_value> DB | DM SRCPOFS DN SRCPOFS UP SRCPOFS?	Source Power Offset	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
SRCPWR [1)]	SRCPWR <numeric_value> DB | DM SRCPWR DN SRCPWR UP SRCPWR ON SRCPWR OFF SRCPWR?	Source Power	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
SS	SS <numeric_value> HZ|KHZ|MHZ|GHZ SS DN SS UP SS AUTO SS?	CF Step Size	HP 8566A/ HP 8568A/ HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
ST	ST <numeric_value> US|MS|SC ST DN ST UP ST AUTO ST?	Sweep Time	HP 8566A/ HP 8568A/ HP 856xE / HP 8566B / HP 8568B /	available

Command	Supported subset	Function	Corresponding HP-Models	Status
			HP 8594E	
STB	STB	Status byte query	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
STOREOPEN	STOREOPEN	Store Open	HP 856xE / HP 8594E	available in V3.3x and above
STORESHORT	STORESHORT	Store Short	HP 856xE / HP 8594E	available in V3.3x and above
STORETHRU	STORETHRU	Store Thru	HP 856xE / HP 8594E	available in V3.3x and above
SV1...6	SV1...6	Save State	HP 8566A/ HP 8568A	available
SWPCPL 2)	SWPCPL SA | SR SWPCPL?	Sweep Couple	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available in V3.3x and above
SWPOUT 2)	SWPOUT FAV|FAVA|RAMP SWPOUT?	Sweep Output	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available in V3.2x and above
T0	T0	Threshold off	HP 8566A/ HP 8568A	available
T1	T1	Free Run Trigger	HP 8566A/ HP 8568A	available
T2 2)	T2	Line Trigger	HP 8566A/ HP 8568A	available
T3	T3	External Trigger	HP 8566A/ HP 8568A	available
T4	T4	Video Trigger	HP 8566A/ HP 8568A	available
TA	TA	Transfer A	HP 8566A/ HP 8568A	available
TB	TB	Transfer B	HP 8566A/ HP 8568A	available
TDF	TDF P TDF?	Trace Data Format	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
TH	TH <numeric_value> DB|DM TH DN TH UP TH ON TH OFF TH AUTO TH?	Threshold	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
THE	THE ON| OFF	Threshold Line enable	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available in V3.3x and above
TIMEDSP 1)	TIMEDSP ON|OFF TIMEDSP 1|0 TIMEDSP?	Time Display	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
TM	TM FREE|VID|EXT|LINE 2)	Trigger Mode	HP 856xE / HP 8566B /	available

Command	Supported subset	Function	Corresponding HP-Models	Status
	TM?		HP 8568B / HP 8594E	
TRA	TRA?	Transfer A	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
TRB	TRB?	Transfer B	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
TRSTAT	TRSTAT?	Trace State Query	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available in V3.3x and above
TS	TS	Take Sweep	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
UR [2]	UR	Plot Command	HP 8566A/ HP 8568A	available in V3.2x and above
VAVG	VAVG VAVG TRA|TRB|TRC	Video Averaging	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
VB	VB <numeric_value> HZ|KHZ|MHZ|GHZ VB DN VB UP VB AUTO VB?	Video Bandwidth	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
VBR [1]	VBR <numeric_value> VBR DN VBR UP VBR?	Video Bandwidth Ratio	HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
VIEW	VIEW TRA|TRB|TRC		HP 856xE / HP 8566B / HP 8568B / HP 8594E	available
VTL	VTL <numeric_value> DB|DM VTL DN VTL UP VTL?	Video Trigger Level	HP 856xE / HP 8594E	available in V3.3x and above

[1] HP 8594E only
[2] Command will be accepted without error message, but will be ignored

Special Features of the Syntax Parsing Algorithms for 8566A and 8568A Models

The command syntax is very different for models A and B. Different names are assigned to identical instrument functions, and the command structure likewise differs considerably between models A and models B.
The command structure for models A is as follows:
<command> ::=
<command code>[<SPC>][<data>|<step>][<SPC>][<delimiter>][<command code>]...<delimiter>

<data> ::= <value>[<SPC>][<units code>][<SPC>][<delimiter>][<SPC>][<data>]...
<step> ::= UP|DN

where
<command code> = see Table "Supported Commands"
<value> = integer or floating-point numerical value
<units code> = DM | -DM | DB | HZ | KZ | MZ | GZ | MV | UV | SC | MS | US
<delimiter> = <CR> | <LF> | <,> | <;> | <ETX>
<SPC> = 32_{10}
<ETX> = 3_{10}
Command sections given in [ ] are optional.

The R&S FSMR IEC/IEEE-bus hardware differs from that used in the HP analyzers. Therefore, the following constraint exists:
<LF>| <EOI> are still used as delimiters since the IEC/IEEE-bus hardware is able to identify them. The other delimiters are identified and evaluated during syntax analysis.

Special Behaviour of Commands

Command	Known Differences
ABORT	Does not automatically set the command complete bit (bit 4) in the status byte. An additional DONE is required for that purpose.
ANNOT	Only frequency axis annotation is affected.
AT	AT DN/UP: Step size
CAL	The CAL commands do not automatically set the command complete bit (bit 4) in the status byte. An additional DONE command is required for that purpose.
CF	Default value, range, step size
CR	Default ratio Span / RBW
CT	Formula for coupled sweeptime
CV	Default ratio RBW / VBW
DEMOD	on R&S FSMR: requires option FSP-B3
DET	DET? returns SAMP instead of SMP on the R&S FSMR. DET not automatically set the command complete bit (bit 4) in the status byte. An additional DONE is required for that purpose.
ERR?	Deletes the error bit in the status register but always returns a '0' in response.
FA	Default value, range, step size
FB	Default value, range, step size
ID	Query of instrument type. The instrument type entered with *SETUP - GENERAL SETUP - GPIB - ID STRING USER* will be returned.
M2	Default value, range, step size

Command	Known Differences
M3	Default value, range, step size
MKACT	Only marker 1 is supported as the active marker.
MKBW	Default value
MKPT	Step size
MKPX	Step size
NRL	
OL?	Storage of instrument settings: 80 characters are returned as information on the instrument settings. The contents of the 80 characters returned does not correspond to the original data contents of the 8566A / 8568A family.
OL	Readout of instrument settings: The 80 characters read by means of OL? are accepted as information on the corresponding instrument settings. The contents of the 80 characters read does not correspond to the original data contents of the 8566A / 8568A family.
RB	Default value, range, step size
RL	Default value, step size
RLPOS	Adapts the position of the reference level even if the tracking generator normalization is not active.
RQS	Supported bits: 1 (Units key pressed) 2 (End of Sweep) 3 (Device error) 4 (Command complete) 5 (Illegal command)
SRCNORM	
SRCPWR	
SP	Default value, range, step size
SS	Default value, range, step size
ST	Default value, range, step size
STB	The status bits are mapped as described with command RQS. *Note:* *Bit 2 and 4 are always set in parallel if "Command Complete" or "End of Sweep" are recognized. The* R&S FSMR *cannot distinguish between these conditions. Additionally these bits are not suitable for synchronization on the end of sweep in continuous sweep operation.*
TA	Output of 1001 trace points of trace A in O1 or O3 format.
TB	Output of 1001 trace points of trace B in O1 or O3 format.
TH	Default value
VB	Range
VBR	Default value

Model-Dependent Default Settings

When the IEC/IEEE-bus language is switched over to an 85xx model, the IEC/IEEE-bus address will automatically be switched over to 18 provided that the default address of the R&S FSMR (20) is still set. If a different value is set, this value will be maintained. Upon return to SCPI, this address will remain unchanged.

The following table shows the default settings obtained after a change of the IEC/IEEE-bus language and for the commands IP, KST and RESET:

Model	# of Trace Points	Start Freq.	Stop Freq.	Ref Level	Input Coupling
8566A/B	1001	2 GHz	22 GHz	0 dBm	DC (FSMR) AC (FSP)
8568A/B	1001	0 Hz	1.5 GHz	0 dBm	AC
8560E	601	0 Hz	2.9 GHz	0 dBm	AC
8561E	601	0 Hz	6.5 GHz	0 dBm	AC
8562E	601	0 Hz	13.2 GHz	0 dBm	AC
8563E	601	0 Hz	26.5 GHz	0 dBm	AC
8564E	601	0 Hz	40 GHz	0 dBm	AC
8565E	601	0 Hz	50 GHz	0 dBm	AC
8594E	401	0 Hz	3 GHz	0 dBm	AC

Notes regarding the set stop frequency:
The stop frequency given in the table may be limited to the corresponding frequency range of the R&S FSMR*.*
Command LF sets the stop frequency for 8566A/B to a maximum value of 2 GHz.

Note regarding the number of test points (trace points):
The # of trace points is switched over only upon transition to the REMOTE state.

Data Output Formats

In the case of the SCPI and IEEE488.2 standards, the output formats for numerical data are flexible to a large extent. The output format for the HP units, by contrast, is accurately defined with respect to the number of digits. The memory areas for reading instrument data have therefore been adapted accordingly in the remote-control programs for instruments of this series.

Therefore, in response to a query, the R&S FSMR returns data of the same structure as that used by the original instruments; this applies in particular to the number of characters returned.

Two formats are currently supported when trace data is output: Display Units (command O1) and physical values (command O2, O3 or TDF P). As to the "Display Units" format, the level data of the R&S FSMR is converted to match the value range and the resolution of the 8566/8568 series. Upon transition to the *REMOTE* state, the R&S FSMR is reconfigured such that the number of test points (trace points) corresponds to that of the 85xx families (1001 for 8566A/B and 8568A/B, 601 for 8560E to 8565E, 401 for 8594E).

IEC/IEEE-Bus Status Reporting

The assignment of status bits by commands R1, R2, R3, R4, RQS is supported starting at firmware version 1.80. The STB command and the serial poll respond with an 8-bit value having the following assignment:
The return value of a serial poll is to use the STB command in order to identify the reason for the service request. The bits returned by the STB command are mapped in the same way as for the RQS command.

Bit enabled by RQS
1 (Units key pressed)
2 (End of Sweep)
3 (Device Error)
4 (Command Complete)
5 (Illegal Command)
6 (Service Request)

Bits 0 and 7 are not used and always have the value 0.

It should be noted that the R&S FSMR will report any key pressed on the front panel (if bit 1 was enabled) rather than only the unit keys.
Additionally there is a difference in the handling of bit 6. This bit reflects the status of the SRQ line of the GPIB bus on the HP 8590 analyzers. With the R&S FSMR this is not possible. Therefore this bit will be set as soon as any of the bits 1 to 5 is set, but it will not be cleared on a serial poll.

Differences in GPIB behavior between the R&S FSMR and the FSE families of instruments

The following list of commands contains the differences in syntax and behavior between the GPIB command set of the R&S FSMR and the FSE families of instruments. Firmware options like FS-K5 or FSE-K10 are not described in this operating manual as the related commands are not available in the basic instrument. FSE alone in column "Devices" denotes the instrument families FSE, FSIQ, FSET and ESIB, unless otherwise noted in column "Notes".

Devices	**Command**	**Parameter**	Notes
R&S FSMR + FSE	*CAL?		R&S FSMR: executes total calibration FSE: executes short calibration
R&S FSMR + FSE	*CLS		
R&S FSMR + FSE	*ESE		
R&S FSMR + FSE	*ESR?		
R&S FSMR + FSE	*IDN?		model indicator and version index is different for R&S FSMR and FSE
R&S FSMR + FSE	*IST?		
R&S FSMR + FSE	*OPC?		
R&S FSMR + FSE	*OPT?		list of available options is slightly different for R&S FSMR and FSE, but equally available options have equal names
R&S FSMR + FSE	*PCB		
R&S FSMR + FSE	*PRE		
R&S FSMR + FSE	*PSC		
R&S FSMR + FSE	*RST		instrument settings are slightly different for R&S FSMR and FSE due to different instrument specs
R&S FSMR + FSE	*SRE		
R&S FSMR + FSE	*STB?		
R&S FSMR + FSE	*TRG		R&S FSMR starts measurement in active screen FSE: starts measurement in both screens (split screen mode)
R&S FSMR + FSE	*TST?		
R&S FSMR + FSE	*WAI		
R&S FSMR + FSE	ABORt		
R&S FSMR	CALCulate:STATistics:APD[:STATe]	ON | OFF	new function for R&S FSMR
R&S FSMR	CALCulate:STATistics:CCDF[:STATe]	ON | OFF	new function for R&S FSMR
R&S FSMR	CALCulate:STATistics:NSAMples	100 to 1E9	new function for R&S FSMR
R&S FSMR	CALCulate:STATistics:PRESet		new function for R&S FSMR
R&S FSMR	CALCulate:STATistics:Result<1...3>?	MEAN|PEAK|CFACtor| ALL	new function for R&S FSMR
R&S FSMR	CALCulate:STATistics:SCALe:AUTO	ONCE	new function for R&S FSMR
R&S FSMR	CALCulate:STATistics:X:RANGe	-10dB to 200dB	new function for R&S FSMR
R&S FSMR	CALCulate:STATistics:X:RLEVel	-130dBm to 30dBm	new function for R&S FSMR
R&S FSMR	CALCulate:STATistics:Y:LOWer	-1E-9 to 0.1	new function for R&S FSMR

Devices	**Command**	**Parameter**	Notes
R&S FSMR	CALCulate:STATistics:Y:UPPer	-1E-8 to 1.0	new function for R&S FSMR
FSE	CALCulate<1|2>:CTHReshold	MIN to MAX	not available in R&S FSMR
FSE	CALCulate<1|2>:CTHReshold:STATe	ON | OFF	not available in R&S FSMR
R&S FSMR	CALCulate<1|2>:DELTamarker<1...4>:AOFF		markers 2...4 are either normal or delta markers; marker 1 always serves as the reference marker for all deltamarkers
FSE	CALCulate<1|2>:DELTamarker<1...4>:AOFF		there are 4markers and 4 deltamarkers; the most recently used marker serves as the reference marker for all deltamarkers
R&S FSMR + FSE	CALCulate<1|2>:DELTamarker<1...4>:FUNCtion:FIXed:RPOint:X	<numeric_value>	R&S FSMR: marker 1 can be moved independently from the reference point FSE: the marker and the reference point are linked to each other
R&S FSMR + FSE	CALCulate<1|2>:DELTamarker<1...4>:FUNCtion:FIXed:RPOint:Y	<numeric_value>	R&S FSMR: marker 1 can be moved independently from the reference point; FSE: the marker and the reference point are linked to each other
R&S FSMR + FSE	CALCulate<1|2>:DELTamarker<1...4>:FUNCtion:FIXed:RPOint:Y: OFFSet	<numeric_value>	
R&S FSMR	CALCulate<1|2>:DELTamarker<1...4>:FUNCtion:FIXed:RPOint:MAX: PEAK		new function for R&S FSMR
R&S FSMR + FSE	CALCulate<1|2>:DELTamarker<1...4>:FUNCtion:FIXed[:STATe]	ON | OFF	
R&S FSMR + FSE	CALCulate<1|2>:DELTamarker<1...4>:FUNCtion:PNOise:RESult?		
R&S FSMR + FSE	CALCulate<1|2>:DELTamarker<1...4>:FUNCtion:PNOise[:STATe]	ON | OFF	
FSE	CALCulate<1|2>:DELTamarker<1...4>:MAXimum:APEak		not available for R&S FSMR
R&S FSMR + FSE	CALCulate<1|2>:DELTamarker<1...4>:MAXimum:LEFT		
R&S FSMR + FSE	CALCulate<1|2>:DELTamarker<1...4>:MAXimum:NEXT		
R&S FSMR + FSE	CALCulate<1|2>:DELTamarker<1...4>:MAXimum:RIGHt		
R&S FSMR + FSE	CALCulate<1|2>:DELTamarker<1...4>:MAXimum[:PEAK]		
R&S FSMR + FSE	CALCulate<1|2>:DELTamarker<1...4>:MINimum:LEFT		
R&S FSMR + FSE	CALCulate<1|2>:DELTamarker<1...4>:MINimum:NEXT		
R&S FSMR + FSE	CALCulate<1|2>:DELTamarker<1...4>:MINimum:RIGHt		
R&S FSMR + FSE	CALCulate<1|2>:DELTamarker<1...4>:MINimum[:PEAK]		
R&S FSMR + FSE	CALCulate<1|2>:DELTamarker<1...4>:MODE	ABSolute | RELative	
FSE	CALCulate<1|2>:DELTamarker<1...4>:STEP:AUTO	ON | OFF	not available for R&S FSMR
FSE	CALCulate<1|2>:DELTamarker<1...4>:STEP[:INCRement]	<numeric_value>	not available for R&S FSMR
R&S FSMR + FSE	CALCulate<1|2>:DELTamarker<1...4>:TRACe	1 to 3	R&S FSMR: 3 traces are available per screen; FSE: 4 traces are available in full screen mode and 2 traces per screen in split screen mode
R&S FSMR + FSE	CALCulate<1|2>:DELTamarker<1...4>:X	0 to MAX (frequency | sweep time)	unit 'SYM' is not available for R&S FSMR
R&S FSMR + FSE	CALCulate<1|2>:DELTamarker<1...4>:X:RELative		
R&S FSMR + FSE	CALCulate<1|2>:DELTamarker<1...4>:Y?		
R&S FSMR + FSE	CALCulate<1|2>:DELTamarker<1...4>[:STATe]	ON | OFF	
R&S FSMR + FSE	CALCulate<1|2>:DLINe<1|2>	MIN to MAX	

Devices	**Command**	**Parameter**	Notes
R&S FSMR + FSE	CALCulate<1|2>:DLINe<1|2>:STATe	ON | OFF	
FSE	CALCulate<1|2>:FEED	'XTIM:DDEM:MEAS'| 'XTIM:DDEM:REF' | 'XTIM:DDEM:ERR:MPH' | 'XTIM:DDEM:ERR:VECT' | 'XTIM:DDEM:SYMB' | 'XTIM:AM' | 'XTIM:FM' | 'XTIM:PM' | 'XTIM:AMSummary' | 'XTIM:FMSummary' |'XTIM:PMSummary' | 'TCAP'	not available for R&S FSMR
FSET	CALCulate<1|2>:FEED	'XTIM:DDEM:MEAS' | 'XTIM:DDEM:REF' | 'XTIM:DDEM:ERR:MPH' | 'XTIM:DDEM:ERR:VECT' | 'XTIM:DDEM:SYMB' | 'TCAP'	not available for R&S FSMR
R&S FSMR + FSE	CALCulate<1|2>:FLINe<1|2>	0 to fmax	
R&S FSMR + FSE	CALCulate<1|2>:FLINe<1|2>:STATe	ON | OFF	
FSE	CALCulate<1|2>:FORMat	MAGNitude | PHASe | UPHase | RIMag | FREQuency | IEYE | QEYE | TEYE | FEYE | COMP | CONS	not available for R&S FSMR
FSE	CALCulate<1|2>:FSK:DEViation:REFerence	<numeric value>	not available for R&S FSMR
FSE	CALCulate<1|2>:LIMit<1...8>:ACPower:ACHannel	0 to 100 DB, 0 to 100 DB	compatible to CALCulate<1|2>:LIMit<1...8>: ACPower:ACHannel [:RELative] of R&S FSMR not available for FSET
R&S FSMR	CALCulate<1|2>:LIMit<1...8>:ACPower:ACHannel:ABSolute	-200 to 200 DBM, -200 to 200 DBM	new function for R&S FSMR
R&S FSMR	CALCulate<1|2>:LIMit<1...8>:ACPower:ACHannel:ABSolute:STATe	ON | OFF	new function for R&S FSMR
R&S FSMR + FSE	CALCulate<1|2>:LIMit<1...8>:ACPower:ACHannel:RESult?		
FSE	CALCulate<1|2>:LIMit<1...8>:ACPower:ACHannel:STATe	ON | OFF	compatible to CALCulate<1|2>:LIMit<1...8>: ACPower:ACHannel[:RELative]:STATe of R&S FSMR not available for FSET
R&S FSMR	CALCulate<1|2>:LIMit<1...8>:ACPower:ACHannel[:RELative]	0 to 100 DB, 0 to 100 DB	compatible to CALCulate<1|2>:LIMit<1...8>: ACPower:ACHannel of FSE
R&S FSMR	CALCulate<1|2>:LIMit<1...8>:ACPower:ACHannel[:RELative]:STATe	ON | OFF	compatible to CALCulate<1|2>:LIMit<1...8>: ACPower:ACHannel:STATe of FSE
FSE	CALCulate<1|2>:LIMit<1...8>:ACPower:ALTernate<1|2>	0 to 100 DB, 0 to 100 DB	compatible to CALCulate<1|2>:LIMit<1...8>: ACPower:ALTernate<1|2> [:RELative] of R&S FSMR not available for FSET
R&S FSMR	CALCulate<1|2>:LIMit<1...8>:ACPower:ALTernate<1|2>:ABSolute	-200 to 200 DBM, -200 to 200 DBM	new function for R&S FSMR
R&S FSMR	CALCulate<1|2>:LIMit<1...8>:ACPower:ALTernate<1|2>:ABSolute:STATe	ON | OFF	new function for R&S FSMR
R&S FSMR + FSE	CALCulate<1|2>:LIMit<1...8>:ACPower:ALTernate<1|2>:RESult?		
FSE	CALCulate<1|2>:LIMit<1...8>:ACPower:ALTernate<1|2>:STATe	ON | OFF	compatible to CALCulate<1|2>:LIMit<1...8>: ACPower:ALTernate<1|2> [:RELative]:STATe of R&S FSMR not available for FSET
R&S FSMR	CALCulate<1|2>:LIMit<1...8>:ACPower:ALTernate<1|2>[:RELative]	0 to 100 DB, 0 to 100 DB	compatible to CALCulate<1|2>:LIMit<1...8>: ACPower:ALTernate<1|2> of FSE

<table>
<tr><th>Devices</th><th>Command</th><th>Parameter</th><th>Notes</th></tr>
<tr><td>R&S FSMR</td><td>CALCulate<1|2>:LIMit<1...8>:ACPower:ALTernate<1|2></td><td>ON | OFF</td><td>compatible to CALCulate<1|2>:LIMit<1...8>: ACPower:ALTernate<1|2>: STATe of FSE</td></tr>
<tr><td>R&S FSMR + FSE</td><td>CALCulate<1|2>:LIMit<1...8>:ACPower[:STATe]</td><td>ON | OFF</td><td></td></tr>
<tr><td>FSE</td><td>CALCulate<1|2>:LIMit<1...8>:BURSt:POWer?</td><td></td><td>not available for R&S FSMR, FSET and ESI</td></tr>
<tr><td>FSE</td><td>CALCulate<1|2>:LIMit<1...8>:BURSt:PTEMplate?</td><td></td><td>not available for R&S FSMR, FSET and ESI</td></tr>
<tr><td>FSE</td><td>CALCulate:LIMit:CATalog?</td><td></td><td>not available in R&S FSMR</td></tr>
<tr><td>R&S FSMR + FSE</td><td>CALCulate<1|2>:LIMit<1...8>:CLEar[:IMMediate]</td><td></td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>CALCulate<1|2>:LIMit<1...8>:COMMent</td><td><string></td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>CALCulate<1|2>:LIMit<1...8>:CONTrol:DOMain</td><td>FREQuency | TIME</td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>CALCulate<1|2>:LIMit<1...8>:CONTrol:MODE</td><td>RELative | ABSolute</td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>CALCulate<1|2>:LIMit<1...8>:CONTrol:OFFset</td><td><numeric value></td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>CALCulate<1|2>:LIMit<1...8>:CONTrol:SHIFt</td><td><numeric_value></td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>CALCulate<1|2>:LIMit<1...8>:CONTrol:SPACing</td><td>LINear | LOGarithmic</td><td></td></tr>
<tr><td>FSE</td><td>CALCulate<1|2>:LIMit<1...8>:CONTrol:UNIT[:TIME]</td><td>S | SYM</td><td>not available for R&S FSMR</td></tr>
<tr><td>R&S FSMR + FSE</td><td>CALCulate<1|2>:LIMit<1...8>:CONTrol[:DATA]</td><td><numeric value>, <numeric value></td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>CALCulate<1|2>:LIMit<1...8>:COPY</td><td>1 to 8|<name></td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>CALCulate<1|2>:LIMit<1...8>:DELete</td><td></td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>CALCulate<1|2>:LIMit<1...8>:FAIL?</td><td></td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>CALCulate<1|2>:LIMit<1...8>:LOWer:MARGin</td><td><numeric value></td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>CALCulate<1|2>:LIMit<1...8>:LOWer:MODE</td><td>RELative | ABSolute</td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>CALCulate<1|2>:LIMit<1...8>:LOWer:OFFset</td><td><numeric value></td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>CALCulate<1|2>:LIMit<1...8>:LOWer:SHIFt</td><td><numeric_value></td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>CALCulate<1|2>:LIMit<1...8>:LOWer:SPACing</td><td>LINear | LOGarithmic</td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>CALCulate<1|2>:LIMit<1...8>:LOWer:STATe</td><td>ON | OFF</td><td></td></tr>
<tr><td>R&S FSMR</td><td>CALCulate<1|2>:LIMit<1...8>:LOWer:THReshold</td><td><numeric value></td><td>new function for R&S FSMR</td></tr>
<tr><td>R&S FSMR + FSE</td><td>CALCulate<1|2>:LIMit<1...8>:LOWer[:DATA]</td><td><numeric value></td><td></td></tr>
<tr><td>FSE</td><td>CALCulate<1|2>:LIMit<1...8>:MARGin</td><td>0 to 100DB</td><td>not available for R&S FSMR, FSET and ESI</td></tr>
<tr><td>R&S FSMR + FSE</td><td>CALCulate<1|2>:LIMit<1...8>:NAME</td><td>1 to 8|<string></td><td></td></tr>
<tr><td>FSE</td><td>CALCulate<1|2>:LIMit<1...8>:SPECtrum:MODulation:EXCeptions?</td><td>ARFCn | TXBand | RXBand| COMBined | DCSRx1800</td><td>not available for R&S FSMR, FSET and ESI</td></tr>
<tr><td>FSE</td><td>CALCulate<1|2>:LIMit<1...8>:SPECtrum:MODulation:FAILs?</td><td>ARFCn | TXBand | RXBand| COMBined | DCSRx1800</td><td>not available for R&S FSMR, FSET and ESI</td></tr>
<tr><td>FSE</td><td>CALCulate<1|2>:LIMit<1...8>:SPECtrum:MODulation?</td><td>ARFCn | TXBand | RXBand| COMBined | DCSRx1800</td><td>not available for R&S FSMR, FSET and ESI</td></tr>
<tr><td>FSE</td><td>CALCulate<1|2>:LIMit<1...8>:SPECtrum:SWITching:FAILs?</td><td></td><td>not available for R&S FSMR, FSET and ESI</td></tr>
<tr><td>FSE</td><td>CALCulate<1|2>:LIMit<1...8>:SPECtrum:SWITching?</td><td></td><td>not available for R&S FSMR, FSET and ESI</td></tr>
<tr><td>FSE</td><td>CALCulate<1|2>:LIMit<1...8>:SPURious:FAILs?</td><td>TXBand | OTXBand| RXBand | IDLeband</td><td>not available for R&S FSMR, FSET and ESI</td></tr>
<tr><td>FSE</td><td>CALCulate<1|2>:LIMit<1...8>:SPURious?</td><td>TXBand | OTXBand| RXBand | IDLeband</td><td>not available for R&S FSMR, FSET and ESI</td></tr>
</table>

Devices	**Command**	**Parameter**	Notes
R&S FSMR + FSE	CALCulate<1|2>:LIMit<1...8>:STATe	ON | OFF	
R&S FSMR + FSE	CALCulate<1|2>:LIMit<1...8>:TRACe	1 to 3	R&S FSMR: 3 traces are available per screen FSE: 4 traces are available in full screen mode and 2 traces per screen in split screen mode
R&S FSMR	CALCulate<1|2>:LIMit<1...8>:UNIT	DBM | DBPW | WATT | DBUV | DBMV | VOLT | DBUA | AMPere | DB | DBUV_M | DBUA_M | DEG | RAD | S | HZ | PCT | UNITLESS	Available units are compatible to the FSE
FSE/ FSIQ	CALCulate<1|2>:LIMit<1...8>:UNIT	DBM | DBPW | WATT | DBUV | DBMV | VOLT | DBUA | AMPere | DB | DBUV_MHZ | DBMV_MHZ | DBUA_MHZ | |DBUV_M | DBUA_M | DBUV_MHZ | DBUA_MHZ | DEG | RAD | S | HZ | PCT | UNITLESS	only the following units are available for the R&S FSMR:DBM | DBPW | WATT | DBUV | DBMV | VOLT | DBUA | AMPere | DB | DBUV_M | DBUA_M | DEG | RAD | S | HZ | PCT | UNITLESS
FSET/ ESI	CALCulate<1|2>:LIMit<1...8>:UNIT	DBM | DBPW | WATT | DBUV | DBMV | VOLT | DBUA | AMPere | DB | DBUV_MHZ | DBMV_MHZ | DBUA_MHZ | |DBUV_M | DBUA_M | DBUV_MHZ | DBUA_MHZ | DEG | RAD | S | HZ | PCT | UNITLESS	only the following units are available for the R&S FSMR:DBM | DBPW | WATT | DBUV | DBMV | VOLT | DBUA | AMPere | DB | DBUV_M | DBUA_M | DEG | RAD | S | HZ | PCT | UNITLESS
R&S FSMR + FSE	CALCulate<1|2>:LIMit<1...8>:UPPer:MARGin	<numeric value>	
R&S FSMR + FSE	CALCulate<1|2>:LIMit<1...8>:UPPer:MODE	RELative | ABSolute	
R&S FSMR + FSE	CALCulate<1|2>:LIMit<1...8>:UPPer:OFFset	<numeric value>	
R&S FSMR + FSE	CALCulate<1|2>:LIMit<1...8>:UPPer:SHIFt	<numeric_value>	
R&S FSMR + FSE	CALCulate<1|2>:LIMit<1...8>:UPPer:SPACing	LINear | LOGarithmic	
R&S FSMR + FSE	CALCulate<1|2>:LIMit<1...8>:UPPer:STATe	ON | OFF	
R&S FSMR	CALCulate<1|2>:LIMit<1...8>:UPPer:THReshold	<numeric value>	new function for R&S FSMR
R&S FSMR + FSE	CALCulate<1|2>:LIMit<1...8>:UPPer[:DATA]	<numeric value>	
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:AOFF		
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:COUNt	ON | OFF	
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:COUNt:FREQuency?		
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:COUNt:RESolution	0.1 | 1 | 10 | 100 | 1000 | 10000 Hz	
FSE	CALCulate<1|2>:MARKer<1...4>:COUPled[STATe]	ON | OFF	not available for R&S FSMR
FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:ADEMod		not available for R&S FSMR and FSET
FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:ADEMod:AM[:RESult]?	PPEak | MPEak | MIDDle | RMS	not available for R&S FSMR and FSET
FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:ADEMod:CARRier		not available for R&S FSMR and FSET
FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:ADEMod:FERRor		not available for R&S FSMR and FSET
FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:ADEMod:FM	PPEak | MPEak | MIDDle | RMS | RDEV	not available for R&S FSMR and FSET
FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:ADEMod:PM	PPEak | MPEak | MIDDle | RMS	not available for R&S FSMR and FSET
FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:ADEMod:SINad:RESult?		not available for R&S FSMR and FSET
FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:ADEMod:SINad	ON | OFF	not available for R&S FSMR and FSET
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:CENTer		

<table>
<tr><th>Devices</th><th>Command</th><th>Parameter</th><th>Notes</th></tr>
<tr><td>R&S FSMR + FSE</td><td>CALCulate<1|2>:MARKer<1...4>:FUNCtion:CSTep</td><td></td><td></td></tr>
<tr><td>FSE</td><td>CALCulate<1|2>:MARKer<1...4>:FUNCtion:DDEMod:RESult?</td><td>MERM | MEPK | MEPS | PERM PEPK | PEPS | EVRM | EVPK | EVPS IQOF | IQIM |ADR | FERR | FEPK | RHO | DEV | FSRM | R&S FSMRK | R&S FSMRS | DTTS</td><td>not available for R&S FSMR</td></tr>
<tr><td>R&S FSMR</td><td>CALCulate<1|2>:MARKer<1...4>:FUNCtion:DEModulation: CONTinuous</td><td></td><td>new function for R&S FSMR</td></tr>
<tr><td>R&S FSMR + FSE</td><td>CALCulate<1|2>:MARKer<1...4>:FUNCtion:DEModulation:HOLDoff</td><td>10ms to 1000s</td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>CALCulate<1|2>:MARKer<1...4>:FUNCtion:DEModulation:SELect</td><td>AM | FM</td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>CALCulate<1|2>:MARKer<1...4>:FUNCtion:DEModulation[:STATe]</td><td>ON | OFF</td><td></td></tr>
<tr><td>R&S FSMR</td><td>CALCulate<1|2>:MARKer<1...4>:FUNCtion:FPEaks[:IMMediate]</td><td><numeric value></td><td>new function for R&S FSMR</td></tr>
<tr><td>R&S FSMR</td><td>CALCulate<1|2>:MARKer<1...4>:FUNCtion:FPEaks:COUNt?</td><td></td><td>new function for R&S FSMR</td></tr>
<tr><td>R&S FSMR</td><td>CALCulate<1|2>:MARKer<1...4>:FUNCtion:FPEaks:X?</td><td></td><td>new function for R&S FSMR</td></tr>
<tr><td>R&S FSMR</td><td>CALCulate<1|2>:MARKer<1...4>:FUNCtion:FPEaks:Y?</td><td></td><td>new function for R&S FSMR</td></tr>
<tr><td>R&S FSMR</td><td>CALCulate<1|2>:MARKer<1...4>:FUNCtion:FPEaks:SORT</td><td>X | Y</td><td>new function for R&S FSMR</td></tr>
<tr><td>R&S FSMR</td><td>CALCulate<1|2>:MARKer<1...4>:FUNCtion:MDEPth:RESult?</td><td></td><td>new function for R&S FSMR</td></tr>
<tr><td>R&S FSMR</td><td>CALCulate<1|2>:MARKer<1...4>:FUNCtion:MDEPth[:STATe]</td><td></td><td>new function for R&S FSMR</td></tr>
<tr><td>R&S FSMR</td><td>CALCulate<1|2>:MARKer<1...4>:FUNCtion:MSUMmary?</td><td><numeric value>, <numeric value>, <numeric value>, <numeric value></td><td>new function for R&S FSMR</td></tr>
<tr><td>FSE</td><td>CALCulate<1|2>:MARKer<1...4>:FUNCtion:MSTep</td><td></td><td>not available for R&S FSMR</td></tr>
<tr><td>R&S FSMR + FSE</td><td>CALCulate<1|2>:MARKer<1...4>:FUNCtion:NDBDown</td><td><numeric value></td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>CALCulate<1|2>:MARKer<1...4>:FUNCtion:NDBDown:FREQuency?</td><td></td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>CALCulate<1|2>:MARKer<1...4>:FUNCtion:NDBDown:RESult?</td><td></td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>CALCulate<1|2>:MARKer<1...4>:FUNCtion:NDBDown:STATe</td><td>ON | OFF</td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>CALCulate<1|2>:MARKer<1...4>:FUNCtion:NOISe:RESult?</td><td></td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>CALCulate<1|2>:MARKer<1...4>:FUNCtion:NOISe:STATe</td><td>ON | OFF</td><td></td></tr>
<tr><td>FSE</td><td>CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer:CFILter</td><td>ON | OFF</td><td>not available for R&S FSMR</td></tr>
<tr><td>R&S FSMR + FSE</td><td>CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer:PRESet</td><td>NADC | TETRA | PDC | PHS | CDPD | FWCDma | RWCDma | F8CDma | R8CDma | F19Cdma | R19Cdma | FW3Gppcdma| RW3Gppcdma | D2CDma | S2CDma | M2CDma | NONE</td><td>available standards are compatible to the FSE</td></tr>
<tr><td>R&S FSMR</td><td>CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer:RESult:PHZ</td><td>ON | OFF</td><td>new function for R&S FSMR</td></tr>
<tr><td>R&S FSMR + FSE</td><td>CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer:RESult?</td><td>ACPower | CPOWer | OBANdwidth | OBWidth | MCACpower</td><td>MCACpower is not available on the FSE
MCACpower, ACPower and CPOWer are not available on the FSET</td></tr>
<tr><td>R&S FSMR + FSE</td><td>CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer:SELect?</td><td>ACPower | CPOWer | OBANdwidth | OBWidth | CN | CN0 | MCACpower</td><td>MCACpower is not available on the FSE
MCACpower, ACPower and CPOWer are not available on the FSET</td></tr>
<tr><td>R&S FSMR + FSE</td><td>CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer[:STATe]</td><td>OFF</td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>CALCulate<1|2>:MARKer<1...4>:FUNCtion:REFerence</td><td></td><td></td></tr>
<tr><td>FSE</td><td>CALCulate<1|2>:MARKer<1...4>:FUNCtion:SFACtor</td><td>(60dB/3dB) | (60dB/6dB)</td><td>not available for R&S FSMR</td></tr>
<tr><td>FSE</td><td>CALCulate<1|2>:MARKer<1...4>:FUNCtion:SFACtor:FREQuency?</td><td></td><td>not available for R&S FSMR</td></tr>
<tr><td>FSE</td><td>CALCulate<1|2>:MARKer<1...4>:FUNCtion:SFACtor:RESult?</td><td></td><td>not available for R&S FSMR</td></tr>
<tr><td>FSE</td><td>CALCulate<1|2>:MARKer<1...4>:FUNCtion:SFACtor:STATe</td><td>ON | OFF</td><td>not available for R&S FSMR</td></tr>
<tr><td>FSE</td><td>CALCulate<1|2>:MARKer<1...4>:FUNCtion:STARt</td><td></td><td>not available for R&S FSMR</td></tr>
<tr><td>FSE</td><td>CALCulate<1|2>:MARKer<1...4>:FUNCtion:STOP</td><td></td><td>not available for R&S FSMR</td></tr>
</table>

Devices	Command	Parameter	Notes
R&S FSMR	CALCulate<1|2>:MARKer<1...4>:FUNCtion:STRack: BANDwidth|BWIDth	10 Hz to MAX(span)	new function for R&S FSMR. Replaces DISP:FLINE of the FSE.
R&S FSMR	CALCulate<1|2>:MARKer<1...4>:FUNCtion:STRack:THReshold	-330 to +30 dBm	new function for R&S FSMR
R&S FSMR	CALCulate<1|2>:MARKer<1...4>:FUNCtion:STRack:TRACe	1 to 3	new function for R&S FSMR
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:STRack[:STATe]	ON | OFF	
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:AOFF		
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:AVERage	ON | OFF	
FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:MAXimum: AVERage:RESult?		not available for R&S FSMR
FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:MAXimum: PHOLd:RESult?		not available for R&S FSMR
FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:MAXimum: RESult?		not available for R&S FSMR
FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:MAXimum [:STATe]	ON | OFF	not available for R&S FSMR
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:MEAN: AVERage:RESult?		
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:MEAN:PHOLd:R ESult?		
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:MEAN:RESult?		
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:MEAN[:STATe]	ON | OFF	
FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:MIDDle: AVERage:RESult?		not available for R&S FSMR
FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:MIDDle: PHOLd:RESult?		not available for R&S FSMR
FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:MIDDle: RESult?		not available for R&S FSMR
FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:MIDDle [:STATe]	ON | OFF	not available for R&S FSMR
R&S FSMR	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:MODE	ABSolute | RELative	new function for R&S FSMR
FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:MPEak: AVERage:RESult?		not available for R&S FSMR
FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:MPEak: PHOLd:RESult?		not available for R&S FSMR
FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:MPEak: RESult?		not available for R&S FSMR
FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:MPEak [:STATe]	ON | OFF	not available for R&S FSMR
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:PHOLd	ON | OFF	
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:PPEak: AVERage:RESult?		
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:PPEak:PHOLd:R ESult?		
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:PPEak:RESult?		
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:PPEak[:STATe]	ON | OFF	
R&S FSMR	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:REFerence: AUTO	ONCE	new function for R&S FSMR
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:RMS:AVERage:R ESult?		
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:RMS:PHOLd: RESult?		
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:RMS:RESult?		
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:RMS[:STATe]	ON | OFF	
R&S FSMR	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:SDEViation: RESult?		new function for R&S FSMR
R&S FSMR	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMarySDEViation: AVERage:RESult?		new function for R&S FSMR
R&S FSMR	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:SDEViation: PHOLd:RESult?		new function for R&S FSMR
R&S FSMR	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:SDEViation [:STATe]	ON | OFF	new function for R&S FSMR
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary[:STATe]	ON | OFF	

Devices	Command	Parameter	Notes
R&S FSMR	CALCulate<1|2>:MARKer<1...4>:FUNCtion:TOI:RESult?		new function for R&S FSMR
R&S FSMR	CALCulate<1|2>:MARKer<1...4>:FUNCtion:TOI[:STATe]	ON | OFF	new function for R&S FSMR
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:FUNCtion:ZOOM	<numeric value>	R&S FSMR: function uses always marker 1 as its reference marker; FSE: all available markers can be used as a reference marker
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:LOEXclude	ON | OFF	
FSE	CALCulate<1|2>:MARKer<1...4>:MAXimum:APEak		not available for R&S FSMR
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:MAXimum:LEFT		
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:MAXimum:NEXT		
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:MAXimum:RIGHt		
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:MAXimum[:PEAK]		
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:MINimum:LEFT		
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:MINimum:NEXT		
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:MINimum:RIGHt		
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:MINimum[:PEAK]		
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:PEXCursion	<numeric value>	
FSE	CALCulate<1|2>:MARKer<1...4>:READout	MPHase | RIMaginary	not available for R&S FSMR
FSE	CALCulate<1|2>:MARKer<1...4>:SCOupled[STATe]	ON | OFF	not available for R&S FSMR
FSE	CALCulate<1|2>:MARKer<1...4>:STEP:AUTO	ON | OFF	not available for R&S FSMR
FSE	CALCulate<1|2>:MARKer<1...4>:STEP[:INCRement]	<numeric_value>	not available for R&S FSMR
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:TRACe	1 to 3	R&S FSMR: 3 traces are available per screen FSE: 4 traces are available in full screen mode and 2 traces per screen in split screen mode
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:X	0 to MAX (frequency| sweep time)	additional unit SYM is available for FSE
R&S FSMR	CALCulate<1|2>:MARKer<1...4>:X:SLIMits:LEFT	0 to MAX (frequency|sweep time)	new function for R&S FSMR. Replaces DISP:FLIN and DISP:TLIN commands of the FSE
R&S FSMR	CALCulate<1|2>:MARKer<1...4>:X:SLIMits:RIGHt	0 to MAX (frequency|sweep time)	new function forR&S FSMR. Replaces DISP:FLIN and DISP:TLIN commands of the FSE
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:X:SLIMits[:STATe]	ON | OFF	
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>:Y?		
R&S FSMR	CALCulate<1|2>:MARKer<1...4>:Y:PERCent	<numeric_value>	new function for R&S FSMR
R&S FSMR + FSE	CALCulate<1|2>:MARKer<1...4>[:STATe]	ON | OFF	
R&S FSMR	CALCulate<1|2>:MATH:MODE	LINear | LOGarithmic	affects all traces on the R&S FSMR; therefore the numeric suffix :MATH<1...4> is not allowed for the R&S FSMR
FSE	CALCulate<1|2>:MATH<1...4>:MODE	LINear | LOGarithmic	for FSE, only the trace indicated by a numeric suffix is affected
R&S FSMR	CALCulate<1|2>:MATH:POS	-100PCT to 200PCT	new function for R&S FSMR; replacement for CALC:RLINe of the FSE

Devices	**Command**	**Parameter**	Notes
R&S FSMR + FSE	CALCulate<1|2>:MATH:STATe	ON | OFF	for R&S FSMR, traces can only be subtracted from trace 1; therefore there is no numeric suffix behind :MATH
R&S FSMR + FSE	CALCulate<1|2>:MATH[:EXPRession][:DEFine]	<expr>	for R&S FSMR, traces can only be subtracted from trace 1; therefore there is no numeric suffix behind :MATH and <expr> may only consist of (TRACE1-TRACE2) or (TRACE1-TRACE3)
FSE	CALCulate<1|2>:RLINe	MIN to MAX	not available for R&S FSMR (replaced by CALC:MATH:POS)
FSE	CALCulate<1|2>:RLINe:STATe	ON | OFF	not available for R&S FSMR (replaced by CALC:MATH:POS)
R&S FSMR + FSE	CALCulate<1|2>:THReshold	MIN to MAX	
R&S FSMR + FSE	CALCulate<1|2>:THReshold:STATe	ON | OFF	
FSE	CALCulate<1|2>:TLINe<1|2>	0 to 1000s	not available on the R&S FSMR; replaced by CALC:SLIMits:LEFT and CALC:SLIMits:RIGHt
FSE	CALCulate<1|2>:TLINe<1|2>:STATe	ON | OFF	not available on the R&S FSMR; replaced by CALC:SLIMits:LEFT and CALC:SLIMits:RIGHt
FSE	CALCulate<1|2>:UNIT:ANGLe	DEG | RAD	not available for R&S FSMR
R&S FSMR	CALCulate<1|2>:UNIT:POWer	DBM | V| A| W | DBPW | WATT | DBUV | DBMV | VOLT | DBUA | AMPere	available units are compatible to the FSE
FSET/ ESI	CALCulate<1|2>:UNIT:POWer	DBM | V | W | DB | PCT | UNITLESS | DBPW | WATT | DBUV | DBMV | VOLT | DBUA | AMPere | DBPT | DBUV_MHZ | DBMV_MHZ | DBUA_MHZ | DBUV_M | DBUA_M | DBUV_MMHZ | DBUA_MMHZ	the R&S FSMR supports the following units:DBM | V| A| W | DBPW | WATT | DBUV | DBMV | VOLT | DBUA | AMPere
FSE/ FSIQ	CALCulate<1|2>:UNIT:POWer	DBM | V | W | DB | PCT | UNITLESS | DBPW | WATT | DBUV | DBMV | VOLT | DBUA | AMPere | DBUV_MHZ | DBMV_MHZ | DBUA_MHZ | DBUV_M | DBUA_M | DBUV_MMHZ | DBUA_MMHZ	the R&S FSMR supports the following units:DBM | V| A| W | DBPW | WATT | DBUV | DBMV | VOLT | DBUA | AMPere
FSE	CALCulate<1|2>:X:UNIT:TIME	S | SYM	not available for R&S FSMR
R&S FSMR	CALibration:ABORt		new function for R&S FSMR
FSE	CALibration:BANDwidth | BWIDth[:RESolution]?		not available for R&S FSMR
FSE	CALibration:IQ?		not available for R&S FSMR
FSE	CALibration:LDETector?		not available for R&S FSMR
FSE	CALibration:LOSuppression?		not available for R&S FSMR
FSE	CALibration:PPEak?		not available for R&S FSMR
ESI	CALibration:PRESelector?		not available for R&S FSMR
R&S FSMR	CALibration:RESult?		new function for R&S FSMR
FSE	CALibration:SHORt?		not available for R&S FSMR
R&S FSMR + FSE	CALibration:STATe	ON | OFF	
R&S FSMR + FSE	CALibration[:ALL]?		
FSE	CONFigure:BURSt:PFERror:COUNt	1 to 1000	not available for R&S FSMR and FSET
FSE	CONFigure:BURSt:PFERror[IMMediate]		not available for R&S FSMR and FSET
FSE	CONFigure:BURSt:POWer:CONDition	NORMal | EXTReme	not available for R&S FSMR and FSET
FSE	CONFigure:BURSt:POWer:COUNt	1 to 1000	not available for R&S FSMR and FSET

Devices	Command	Parameter	Notes
FSE	CONFigure:BURSt:POWer[IMMediate]		not available for R&S FSMR and FSET
FSE	CONFigure:BURSt:PTEMplate:[IMMediate]		not available for R&S FSMR and FSET
FSE	CONFigure:BURSt:PTEMplate:COUNt	1 to 1000	not available for R&S FSMR and FSET
FSE	CONFigure:BURSt:PTEMplate:SELect	FULL | TOP | RISing | FALLing	not available for R&S FSMR and FSET
FSE	CONFigure:BURst:REFerence:AUTO	ON | OFF	not available for R&S FSMR and FSET
FSE	CONFigure:SPECtrum:MODulation:COUNt	1 to 1000	not available for R&S FSMR and FSET
FSE	CONFigure:SPECtrum:MODulation:RANGe	ARFCn | TXBand | RXBand | COMBined | DCSRx1800	not available for R&S FSMR and FSET
FSE	CONFigure:SPECtrum:MODulation:TGATe	ON | OFF	not available for R&S FSMR and FSET
FSE	CONFigure:SPECtrum:MODulation[:IMMediate]		not available for R&S FSMR and FSET
FSE	CONFigure:SPECtrum:SWITching:COUNt	1 to 1000	not available for R&S FSMR and FSET
FSE	CONFigure:SPECtrum:SWITching[:IMMediate]		not available for R&S FSMR and FSET
FSE	CONFigure:SPURious:ANTenna	CONDucted | RADiated	not available for R&S FSMR and FSET
FSE	CONFigure:SPURious:COUN:RXBandt	1 to 1000	not available for R&S FSMR and FSET
FSE	CONFigure:SPURious:COUNt	1 to 1000	not available for R&S FSMR and FSET
FSE	CONFigure:SPURious:RANGe	TXBand | OTXBand | RXBand | IDLeband | COMBined	not available for R&S FSMR and FSET
FSE	CONFigure:SPURious:STEP:COUNt?		not available for R&S FSMR and FSET
FSE	CONFigure:SPURious:STEP<1..26>	ON | OFF	not available for R&S FSMR and FSET
FSE	CONFigure:SPURious[:IMMediate]		not available for R&S FSMR and FSET
FSE	CONFigure[:BTS]:ARFCn	<numeric_value>	not available for R&S FSMR and FSET
FSE	CONFigure[:BTS]:ARFCn:AUTO	ONCE	not available for R&S FSMR and FSET
FSE	CONFigure[:BTS]:CHANnel:SFH	ON | OFF	not available for R&S FSMR and FSET
FSE	CONFigure[:BTS]:CHANnel:SLOT	0 to 7	not available for R&S FSMR and FSET
FSE	CONFigure[:BTS]:CHANnel:SLOT:AUTO	ONCE	not available for R&S FSMR and FSET
FSE	CONFigure[:BTS]:CHANnel:TSC	0 to 7	not available for R&S FSMR and FSET
FSE	CONFigure[:BTS]:CHANnel:TSC:AUTO	ON | OFF	not available for R&S FSMR and FSET
FSE	CONFigure[:BTS]:COSiting	ON | OFF	not available for R&S FSMR and FSET
FSE	CONFigure[:BTS]:LIMIt:FREQency	<numeric_value>	not available for R&S FSMR and FSET
FSE	CONFigure[:BTS]:LIMIt:PPEak	<numeric_value>	not available for R&S FSMR and FSET
FSE	CONFigure[:BTS]:LIMIt:PRMS	<numeric_value>	not available for R&S FSMR and FSET
FSE	CONFigure[:BTS]:LIMit:STANdard	ON | OFF	not available for R&S FSMR and FSET
FSE	CONFigure[:BTS]:NETWork:PHASe	1|2[,PLUS]	not available for R&S FSMR and FSET
FSE	CONFigure[:BTS]:NETWork[:TYPE]	PGSM |PGSM900 | EGSM |EGSM900 | DCS |GSM1800 | PCS | GSM1900 | RGSM | RGSM900	not available for R&S FSMR and FSET
FSE	CONFigure[:BTS]:POWer:CLASs	1 to 8 | 1 to 4 | M1 | M2 | M3	not available for R&S FSMR and FSET

Devices	**Command**	**Parameter**	Notes
FSE	CONFigure[:BTS]:POWer:COUPled	ON | OFF	not available for R&S FSMR and FSET
FSE	CONFigure[:BTS]:POWer:DYNamic	0 to 15	not available for R&S FSMR and FSET
FSE	CONFigure[:BTS]:POWer:EXPected	<numeric_value>	not available for R&S FSMR and FSET
FSE	CONFigure[:BTS]:POWer:LIMit	<numeric_value>	not available for R&S FSMR and FSET
FSE	CONFigure[:BTS]:POWer:SINGle:CLEar		not available for R&S FSMR and FSET
FSE	CONFigure[:BTS]:POWer:SINGle[:STATe]	ON | OFF	not available for R&S FSMR and FSET
FSE	CONFigure[:BTS]:POWer:STATic	0 to 6	not available for R&S FSMR and FSET
FSE	CONFigure[:BTS]:PRESet		not available for R&S FSMR and FSET
FSE	CONFigure[:BTS]:SWEeptime	STANdard | AUTO	not available for R&S FSMR and FSET
FSE	CONFigure[:BTS]:TXSupp	ON | OFF	not available for R&S FSMR and FSET
FSE	CONFigure[:BTS]MEASurement?		not available for R&S FSMR and FSET
FSE	CONFigure[:MS]:ARFCn	<numeric_value>	not available for R&S FSMR and FSET
FSE	CONFigure[:MS]:ARFCn:AUTO	ONCE	not available for R&S FSMR and FSET
FSE	CONFigure[:MS]:CHANnel:SFH	ON | OFF	not available for R&S FSMR and FSET
FSE	CONFigure[:MS]:CHANnel:TSC	0 to 7	not available for R&S FSMR and FSET
FSE	CONFigure[:MS]:LIMIt:FREQuency	<numeric_value>	not available for R&S FSMR and FSET
FSE	CONFigure[:MS]:LIMIt:PPEak	<numeric_value>	not available for R&S FSMR and FSET
FSE	CONFigure[:MS]:LIMIt:PRMS	<numeric_value>	not available for R&S FSMR and FSET
FSE	CONFigure[:MS]:LIMit:STANdard	ON | OFF	not available for R&S FSMR and FSET
FSE	CONFigure[:MS]:NETWork:PHASe	1|2[,PLUS]	not available for R&S FSMR and FSET
FSE	CONFigure[:MS]:NETWork[:TYPE]	PGSM |PGSM900 | EGSM |EGSM900 | DCS |GSM1800 | PCS | GSM1900 | RGSM | RGSM900	not available for R&S FSMR and FSET
FSE	CONFigure[:MS]:POWer:CLASs	<numeric_value>	not available for R&S FSMR and FSET
FSE	CONFigure[:MS]:POWer:COUPled	ON | OFF	not available for R&S FSMR and FSET
FSE	CONFigure[:MS]:POWer:EXPected	<numeric_value>	not available for R&S FSMR and FSET
FSE	CONFigure[:MS]:POWer:LEVel	0 to 31	not available for R&S FSMR and FSET
FSE	CONFigure[:MS]:POWer:LIMit	<numeric_value>	not available for R&S FSMR and FSET
FSE	CONFigure[:MS]:POWer:SINGle:CLEar		not available for R&S FSMR and FSET
FSE	CONFigure[:MS]:POWer:SINGle[:STATe]	ON | OFF	not available for R&S FSMR and FSET
FSE	CONFigure[:MS]:POWer:SMALl	ON | OFF	not available for R&S FSMR and FSET
FSE	CONFigure[:MS]:PRESet		not available for R&S FSMR and FSET
FSE	CONFigure[:MS]:SWEeptime	STANdard | AUTO	not available for R&S FSMR and FSET
FSE	CONFigure[:MS]:TXSupp	ON | OFF	not available for R&S FSMR and FSET
FSE	CONFigure[:MS]MEASurement?		not available for R&S FSMR and FSET
FSET	DIAGnostic:INFO:CCOunt:ATTenuation?		not available for R&S FSMR

Devices	Command	Parameter	Notes
FSE	DIAGnostic:INFO:CCOunt:ATTenuation<1 | 10>?		not available for R&S FSMR
FSIQ	DIAGnostic:INFO:CCOunt:ATTenuation<1 | 2 | 3>?		not available for R&S FSMR
ESI	DIAGnostic:INFO:CCOunt:ATTenuation<1|2|4>?		not available for R&S FSMR
FSE	DIAGnostic:INFO:CCOunt:PRESelector<1..6>?		not available for R&S FSMR
R&S FSMR	DIAGnostic:SERVice:CSOurce[:POWer]	<numeric_value>	new function for R&S FSMR
FSE	DIAGnostic:SERVice:FUNCtion	<numeric_value>, <numeric_value> to	not available for R&S FSMR. Replaced by DIAG:SERV:SFUNction
FSET	DIAGnostic:SERVice:HGENerator	OFF | 10 kHz | 100 kHz | BALanced	not available for R&S FSMR
R&S FSMR	DIAGnostic:SERVice:HWINfo?		new function for R&S FSMR
R&S FSMR + FSE	DIAGnostic:SERVice:INPut[:SELect]	CALibration | RF	
R&S FSMR	DIAGnostic:SERVice:INPut:PULSed[:STATe]	ON | OFF	new command for R&S FSMR
R&S FSMR	DIAGnostic:SERVice:INPut:PULSed:PRATe	<numeric value>	new command for R&S FSMR
R&S FSMR	DIAGnostic:SERVice:INPut:PULSed[:STATe]		new function for R&S FSMR
R&S FSMR	DIAGnostic:SERVice:INPut:PULSed:PRATe	<numeric_value>	new function for R&S FSMR
R&S FSMR + FSE	DIAGnostic:SERVice:NSOurce	ON | OFF	
R&S FSMR	DIAGnostic:SERVice:SFUNction	<string> to	replacement for DIAG:SERV:FUNC of R&S FSMR; necessary due to different parameter formats needed on the R&S FSMR
R&S FSMR	DIAGnostic:SERVice:STESt:RESult?		new function for R&S FSMR
R&S FSMR + FSE	DISPlay:ANNotation:FREQuency	ON | OFF	
	DISPlay:BARGraph:LEVel:LOWer		not available for R&S FSMR
	DISPlay:BARGraph:LEVel:UPPer		not available for R&S FSMR
R&S FSMR + FSE	DISPlay:CMAP<1...26>:DEFault<1|2>		larger selection of independently configurable items (1 to 26)
R&S FSMR + FSE	DISPlay:CMAP<1...26>:HSL	0 to 1,0 to 1,0 to 1	larger selection of independently configurable items (1 to 26)
R&S FSMR + FSE	DISPlay:CMAP<1...26>:PDEFined	<color>	larger selection of independently configurable items (1 to 26)
R&S FSMR + FSE	DISPlay:FORmat	SINGle | SPLit	
R&S FSMR + FSE	DISPlay:LOGO	ON | OFF	
FSE	DISPlay:PROGram[:MODE]	ON | OFF	not available for R&S FSMR
R&S FSMR + FSE	DISPlay:PSAVe:HOLDoff	0 to 60	
R&S FSMR + FSE	DISPlay:PSAVe[:STATe]	ON | OFF	
FSE	DISPlay[:WINDow<1|2>]:FEED	'AF' | 'VIDeo'	not available for R&S FSMR
FSE	DISPlay[:WINDow<1|2>]:MINFo	ON | OFF	not available for R&S FSMR
R&S FSMR	DISPlay[:WINDow<1|2>]:SELect		new function for R&S FSMR
R&S FSMR	DISPlay[:WINDow<1|2>]:SIZE	LARGe | SMALl	new function for R&S FSMR
R&S FSMR + FSE	DISPlay[:WINDow<1|2>]:TEXT:STATe	ON | OFF	
R&S FSMR + FSE	DISPlay[:WINDow<1|2>]:TEXT[:DATA]	<string>	
R&S FSMR + FSE	DISPlay[:WINDow<1|2>]:TIME	ON | OFF	
R&S FSMR + FSE	DISPlay[:WINDow<1|2>]:TRACe<1...3>:MODE	WRITe | VIEW | AVERage | MAXHold | MINHold	R&S FSMR: 3 traces are available per screen FSE: 4 traces are available in full screen mode and 2 traces per screen in split screen mode
FSE	DISPlay[:WINDow<1|2>]:TRACe<1...4>:EYE:COUNt	1 to Result Length	not available for R&S FSMR
FSE	DISPlay[:WINDow<1|2>]:TRACe<1...4>:MODE:ANALog	ON | OFF	not available for R&S FSMR
FSE	DISPlay[:WINDow<1|2>]:TRACe<1...4>:MODE:CWRite	ON | OFF	not available for R&S FSMR
FSE	DISPlay[:WINDow<1|2>]:TRACe<1...4>:MODE:HCONtinuous	ON | OFF	not available for R&S FSMR

Devices	Command	Parameter	Notes
FSE	DISPlay[:WINDow<1|2>]:TRACe<1...4>:SYMBol	DOTS | BARS | OFF	not available for R&S FSMR
FSE	DISPlay[:WINDow<1|2>]:TRACe<1...4>:X:SPACing	LINear | LOGarithmic	not available for R&S FSMR
FSE	DISPlay[:WINDow<1|2>]:TRACe<1...4>:X[:SCALe]:RVALue	<numeric value>	not available for R&S FSMR
FSE	DISPlay[:WINDow<1|2>]:TRACe<1...4>:X[:SCALe]:ZOOM	ON | OFF	not available for R&S FSMR
FSE	DISPlay[:WINDow<1|2>]:TRACe<1...4>:X[:SCALe]:ZOOM [:FREQuency]:CENTer	<numeric_value>	not available for R&S FSMR
FSE	DISPlay[:WINDow<1|2>]:TRACe<1...4>:X[:SCALe]:ZOOM [:FREQuency]:	<numeric_value>	not available for R&S FSMR
FSE	DISPlay[:WINDow<1|2>]:TRACe<1...4>:X[:SCALe]:ZOOM [:FREQuency]:	<numeric_value>	not available for R&S FSMR
R&S FSMR	DISPlay[:WINDow<1|2>]:TRACe<1...3>:Y:SPACing	LINear | LOGarithmic | LDB	R&S FSMR: TRACe<1...3> LDB is not available for FSE
FSE	DISPlay[:WINDow<1|2>]:TRACe<1...4>:Y:SPACing	LINear | LOGarithmic | PERCent	PERCent is not available for R&S FSMR FSE: TRACE<1...4>
R&S FSMR + FSE	DISPlay[:WINDow<1|2>]:TRACe<1...3>:Y[:SCALe]	10dB to 200dB	R&S FSMR: TRACe<1...3> FSE: TRACE<1...4>
FSET/ ESI	DISPlay[:WINDow<1|2>]:TRACe<1...4>:Y[:SCALe]:BOTTom	<numeric value>	not available for R&S FSMR
R&S FSMR + FSE	DISPlay[:WINDow<1|2>]:TRACe<1...3>:Y[:SCALe]:MODE	ABSolute | RELative	R&S FSMR: TRACe<1...3> FSE: TRACE<1...4>
FSE	DISPlay[:WINDow<1|2>]:TRACe<1...4>:Y[:SCALe]:PDIVision		not available for R&S FSMR
R&S FSMR + FSE	DISPlay[:WINDow<1|2>]:TRACe<1...3>:Y[:SCALe]:RLEVel	-130dBm to 30dBm	R&S FSMR: TRACe<1...3> FSE: TRACE<1...4>
R&S FSMR + FSE	DISPlay[:WINDow<1|2>]:TRACe<1...3>:Y[:SCALe]:RLEVel:OFFSet	-200dB to 200dB	R&S FSMR: TRACe<1...3> FSE: TRACE<1...4>
R&S FSMR + FSE	DISPlay[:WINDow<1|2>]:TRACe<1...3>:Y[:SCALe]:RPOSition	0 to 100 PCT	R&S FSMR: TRACe<1...3> FSE: TRACE<1...4>
R&S FSMR + FSE	DISPlay[:WINDow<1|2>]:TRACe<1...3>:Y[:SCALe]:RVALue	<numeric value>	R&S FSMR: TRACe<1...3> FSE: TRACE<1...4>
FSE	DISPlay[:WINDow<1|2>]:TRACe<1...4>:Y[:SCALe]:RVALue:AUTO	ON | OFF	not available for R&S FSMR
FSET/ ESI	DISPlay[:WINDow<1|2>]:TRACe<1...4>:Y[:SCALe]:TOP	<numeric value>	not available for R&S FSMR
R&S FSMR	DISPlay[:WINDow<1|2>]:TRACe<1...3>[:STATe]	ON | OFF	R&S FSMR: TRACe<1...3> FSE: TRACE<1...4>
FSE	FETCh:BURSt:FERRor:AVERage?		not available for R&S FSMR and FSET
FSE	FETCh:BURSt:FERRor:MAXimum?		not available for R&S FSMR and FSET
FSE	FETCh:BURSt:FERRor:STATus?		not available for R&S FSMR and FSET
FSE	FETCh:BURSt:PERRor:PEAK:AVERage?		not available for R&S FSMR and FSET
FSE	FETCh:BURSt:PERRor:PEAK:MAXimum?		not available for R&S FSMR and FSET
FSE	FETCh:BURSt:PERRor:PEAK:STATus?		not available for R&S FSMR and FSET
FSE	FETCh:BURSt:PERRor:RMS:AVERage?		not available for R&S FSMR and FSET
FSE	FETCh:BURSt:PERRor:RMS:MAXimum?		not available for R&S FSMR and FSET
FSE	FETCh:BURSt:PERRor:RMS:STATus?		not available for R&S FSMR and FSET
FSE	FETCh:BURSt:POWer[:IMMediate]?		not available for R&S FSMR and FSET
FSE	FETCh:MODulation[:ALL]?	ARFCn | TXBand | RXBand |COMBined | DCSRx1800	not available for R&S FSMR and FSET
FSE	FETCh:PTEMplate:REFerence?	TXBand	not available for R&S FSMR and FSET
FSE	FETCh:SPECtrum:MODulation:REFerence?	TXBand	not available for R&S FSMR and FSET
FSE	FETCh:SPECtrum:SWITching:REFerence?	TXBand	not available for R&S FSMR and FSET
FSE	FETCh:SPECtrum:SWITching[:ALL]?		not available for R&S FSMR and FSET
FSE	FETCh:SPURious:STEP?		not available for R&S FSMR and FSET

Devices	Command	Parameter	Notes
FSE	FETCh:SPURious[:ALL]?	TXBand OTXBand | RXBand | IDLeband	not available for R&S FSMR and FSET
FSE	FORMat:DEXPort:APPend[:STATe] ON|OFF[,32]		not available for R&S FSMR
R&S FSMR + FSE	FORMat:DEXPort:DSEParator	POINt|COMMa	
FSE	FORMat:DEXPort:HEADer[:STATe] ON|OFF[,32]		not available for R&S FSMR
R&S FSMR	FORMat[:DATA]	ASCii | REAL[,32]	
FSE	FORMat[:DATA]	ASCii | REAL | UINT [,32]	UINT is not available for R&S FSMR
R&S FSMR + FSE	HCOPy:ABORt		
R&S FSMR	HCOPy:CMAP:DEFault		new function for R&S FSMR
R&S FSMR	HCOPy:CMAP:HSL	<numeric value>, <numeric value>, <numeric value>	new function for R&S FSMR
R&S FSMR	HCOPy:CMAP:PDEFined	<char data>	new function for R&S FSMR
R&S FSMR	HCOPy:DESTination<1|2>	'MMEM' | 'SYST:COMM:PRIN' | 'SYST:COMM:CLIP'	
FSE/	HCOPy:DESTination<1|2>	'SYST:COMM:GPIB' |'SYST:COMM:SER1' | 'SYST:COMM:SER2' | 'SYST:COMM:CENT' | 'MMEM' | 'SYST:COMM:PRIN'|'SYST :COMM:CLIP'	SYST:COMM:GPIB/SER1/SER2 is not available for R&S FSMR
FSIQ/ ESI	HCOPy:DESTination<1|2>	''MMEM' | 'SYST:COMM:PRIN'| 'SYST:COMM:CLIP'	
R&S FSMR + FSE	HCOPy:DEVice:COLor	ON | OFF	
R&S FSMR	HCOPy:DEVice:LANGuage<1|2>	GDI | WMF | EWMF | BMP	
FSE/	HCOPy:DEVice:LANGuage<1|2>	HPGL | PCL4 | PCL5 | POSTscript | ESCP | WMF | PCX | HP7470 to	
FSIQ/ ESI	HCOPy:DEVice:LANGuage<1|2>	WMF | GDI | EWMF | BMP to	
FSE/	HCOPy:DEVice:PRESet<1|2>	ON | OFF	not available for R&S FSMR
FSE/	HCOPy:DEVice:RESolution<1|2>	150 | 300	not available for R&S FSMR
R&S FSMR + FSE	HCOPy:ITEM:ALL		
FSE	HCOPy:ITEM:FFEed<1|2>:STATe	ON | OFF	not available for R&S FSMR
FSE	HCOPy:ITEM:LABel:TEXT	<string>	not available for R&S FSMR
FSE	HCOPy:ITEM:PFEed<1|2>:STATe	ON | OFF	not available for R&S FSMR
R&S FSMR + FSE	HCOPy:ITEM:WINDow<1|2>:TABle:STATe	ON | OFF	
R&S FSMR + FSE	HCOPy:ITEM:WINDow<1|2>:TEXT	<string>	
FSE	HCOPy:ITEM:WINDow<1|2>:TRACe:CAINcrement	ON | OFF	not available for R&S FSMR
R&S FSMR + FSE	HCOPy:ITEM:WINDow<1|2>:TRACe:STATe	ON | OFF	
FSE	HCOPy:PAGE:DIMensions:FULL		not available for R&S FSMR
FSE	HCOPy:PAGE:DIMensions:QUADrant<1...4>		not available for R&S FSMR
R&S FSMR + FSE	HCOPy:PAGE:ORIentation<1|2>	LANDscape | PORTrait	
R&S FSMR + FSE	HCOPy[:IMMediate]		
FSET/ ESI	HOLD		not available for R&S FSMR
R&S FSMR + FSE	INITiate<1|2>:CONMeas	ON | OFF	
R&S FSMR + FSE	INITiate<1|2>:CONTinuous	ON | OFF	
R&S FSMR + FSE	INITiate<1|2>:DISPlay	ON | OFF	
R&S FSMR + FSE	INITiate<1|2>[:IMMediate]		
FSET	INPut:PRESelection:CATalog?		not available for R&S FSMR

Devices	Command	Parameter	Notes
FSET	INPut:PRESelection:USET:NAME	'name of user defined preselector set (to edit existing set or to create new set)'	not available for R&S FSMR
FSET	INPut:PRESelection:USET:CLEar		not available for R&S FSMR
FSET	INPut:PRESelection:USET:COMMent	'comment for preselector-set'	not available for R&S FSMR
FSET	INPut:PRESelection:USET:LRANge[:DATA]	<numeric value>, <numeric value>, <numeric_value>	not available for R&S FSMR
FSET	INPut:PRESelection:USET:MRANge[:DATA]	<numeric value>, <numeric value>, <numeric_value>	not available for R&S FSMR
R&S FSMR + FSE	INPut<1|2>:ATTenuation	0 to 70dB	
FSET	INPut<1|2>:ATTenuation	0 to 70 | 80dB	80 dB not available for R&S FSMR
R&S FSMR + FSE	INPut<1|2>:ATTenuation:AUTO	ON | OFF	
R&S FSMR + FSE	INPut<1|2>:ATTenuation:AUTO:MODE	NORMal | LNOise | LDIStorsion	not available for models 3 and 7; not available for R&S FSMR
FSET/ ESI	INPut<1|2>:ATTenuation:PROTection	ON | OFF	not available for R&S FSMR
R&S FSMR	INPut<1|2>:ATTenuation:PROTection:PRESet		new function for R&S FSMR
INPut<1|2>: PRESelection [:STATe]	INPut<1|2>:ATTenuation:PROTection:PRESet		new function for R&S FSMR
FSET	INPut<1|2>:ATTenuation:STEPsize	1dB | 10dB	not available for R&S FSMR
FSET	INPut<1|2>:BIMPedance	150OHM | 600OHM | 10kOHM	not available for R&S FSMR
FSET	INPut<1|2>:COUPling	AC | DC	only available for R&S FSMR models 3, 8, 26
R&S FSMR	INPut<1|2>:EATT	0 to 30dB	new function for R&S FSMR
R&S FSMR	INPut<1|2>:EATT:AUTO	ON | OFF	new function for R&S FSMR
R&S FSMR	INPut<1|2>:EATT:STATe	ON | OFF	new function for R&S FSMR
FSET	INPut<1|2>:GAIN	0 to 30dB	not available for R&S FSMR
FSET/ ESI	INPut<1|2>:GAIN:AUTO	ON | OFF	not available for R&S FSMR
R&S FSMR + FSE	INPut<1|2>:GAIN:STATe	ON | OFF	
R&S FSMR + FSE	INPut<1|2>:IMPedance	50 | 75	
FSE	INPut<1|2>:IMPedance:CORRection	RAM | RAZ	not available for R&S FSMR
FSET	INPut<1|2>:LISN:PEARth	GROunded | FLOating	not available for R&S FSMR
FSET	INPut<1|2>:LISN:PHASe	L1 | L2 | L3 | N	not available for R&S FSMR
FSET	INPut<1|2>:LISN[:TYPE]	TWOphase | FOURphase | OFF	not available for R&S FSMR
R&S FSMR	INPut<1|2>:MIXer:AUTO	ON | OFF	new function for FSU/FSQ
R&S FSMR	INPut<1|2>:MIXer[:POWer]	<numeric value>	new function for FSU/FSQ
R&S FSMR + FSE	INPut<1|2>:MIXer	<numeric value>	not available for R&S FSMR
R&S FSMR	INPut<1|2>:MIXer[:POWer]:AUTO	ON | OFF	new function for R&S FSMR
FSET	INPut<1|2>:PRESelection:COUPling	ON | OFF	not available for R&S FSMR
FSET	INPut<1|2>:PRESelection:COUPling:HIGH:FREQuency	5MHz to 500MHz	not available for R&S FSMR
FSET	INPut<1|2>:PRESelection:COUPling:HIGH:SET	'name of preselector set for high RBW'	not available for R&S FSMR
FSET	INPut<1|2>:PRESelection:COUPling:LOW:FREQuency	10Hz to 5MHz	not available for R&S FSMR
FSET	INPut<1|2>:PRESelection:COUPling:LOW:SET	''name of preselector set for low RBW'	not available for R&S FSMR
FSET	INPut<1|2>:PRESelection:COUPling:MID:SET	''name of preselector set for medium RBW'	not available for R&S FSMR
FSET	INPut<1|2>:PRESelection:FILTer:HPASS[:FREQuency]	100Hz to 5MHz	not available for R&S FSMR
FSET	INPut<1|2>:PRESelection:FILTer:LPASS[:FREQuency]	20KHz to 40MHz	not available for R&S FSMR
FSET	INPut<1|2>:PRESelection:FILTer[:STATe]	ON | OFF	not available for R&S FSMR
FSET	INPut<1|2>:PRESelection:SET	NARRow | NORMal | WIDE	not available for R&S FSMR
FSET	INPut<1|2>:PRESelection:USET[:SELect]	''name of user defined preselector set'	not available for R&S FSMR
FSET	INPut<1|2>:PRESelection[:STATe]	ON | OFF	not available for R&S FSMR
FSET	INPut<1|2>:TYPE	RF | BALanced	not available for R&S FSMR

Devices	Command	Parameter	Notes
ESI	INPut<1|2>:TYPE	INPUT1 | INPUT2	not available for R&S FSMR
FSE	INPut<1|2>:UPORt<1|2>:STATe	ON | OFF	not available for R&S FSMR
FSE	INPut<1|2>:UPORt<1|2>[:VALue]?		not available for R&S FSMR
ESI	INPut2:COUPling	AC | DC	not available for R&S FSMR
R&S FSMR	INSTrument:COUPle	NONE | RLEVel | CF_B | CF_A	available coupling modes between Screen A and Screen B have been changed between FSE and R&S FSMR
FSE	INSTrument:COUPle	NONE | MODE | X | Y | CONTrol | XY | XCONtrol | YCONtrol | ALL	Available coupling modes between screen A and screen B have been changed between FSE and R&S FSMR
R&S FSMR	INSTrument<1|2>:NSELect	1	currently only parameter value 1 available
ESI	INSTrument<1|2>:NSELect	1 to 3 | 6	4 parameter values are available
FSE/ FSIQ	INSTrument<1|2>:NSELect	1 to 5	5 parameter values are available
FSET	INSTrument<1|2>:NSELect	1 | 2 | 6	3 parameter values are available
R&S FSMR	INSTrument<1|2>[:SELect]	SANalyzer	Currently only SANalyzer available
FSE/ FSIQ	INSTrument<1|2>[:SELect]	SANalyzer | DDEMod | ADEMod | BGSM | MGSM	5 parameters are available.
ESI	INSTrument<1|2>[:SELect]	RECeiver | SANalyzer | DDEMod | ADEMod	4 parameters are available.
FSET	INSTrument<1|2>[:SELect]	ANalyzer | DDEMod | RECeiver	3 parameters are available.
R&S FSMR + FSE	MMEMory:CATalog?	string	
R&S FSMR + FSE	MMEMory:CDIRectory	directory name	
R&S FSMR + FSE	MMEMory:CLear:ALL		
R&S FSMR + FSE	MMEMory:CLear:STATe	1,path	
R&S FSMR + FSE	MMEMory:COMMent	<string>	
R&S FSMR + FSE	MMEMory:COPY	path\file, path\file	
R&S FSMR + FSE	MMEMory:DATA	filename [, <block data>]	
R&S FSMR + FSE	MMEMory:DELete	path\filename	
R&S FSMR + FSE	MMEMory:LOAD:AUTO	1,path	
R&S FSMR + FSE	MMEMory:LOAD:STATe	1,path	
R&S FSMR + FSE	MMEMory:MDIRectory	path	
R&S FSMR + FSE	MMEMory:MOVE	path	
R&S FSMR + FSE	MMEMory:MSIS	'A:' | 'D:'	R&S FSMR: valid drives are A: and D: FSE: valid drives are A: and C:
R&S FSMR + FSE	MMEMory:NAME	path\filename	
R&S FSMR + FSE	MMEMory:RDIRectory	directory	
R&S FSMR + FSE	MMEMory:SELect[:ITEM]:ALL		
FSE	MMEMory:SELect[:ITEM]:CSETup	ON | OFF	not available for R&S FSMR (default setting on the R&S FSMR)
FSE	MMEMory:SELect[:ITEM]:CVL:ALL	ON | OFF	not available for R&S FSMR and FSET
FSE	MMEMory:SELect[:ITEM]:CVL[:ACTive]	ON | OFF	not available for R&S FSMR and FSET

Devices	Command	Parameter	Notes
R&S FSMR + FSE	MMEMory:SELect[:ITEM]:DEFault		
FSE	MMEMory:SELect[:ITEM]:GSETup	ON | OFF	not available for R&S FSMR (default setting on the R&S FSMR)
FSE	MMEMory:SELect[:ITEM]:HCOPy	ON | OFF	not available for R&S FSMR (default setting on the R&S FSMR)
R&S FSMR + FSE	MMEMory:SELect[:ITEM]:HWSettings	ON | OFF	
R&S FSMR + FSE	MMEMory:SELect[:ITEM]:LINes:ALL	ON | OFF	
FSE	MMEMory:SELect[:ITEM]:LINes:ALL	ON | OFF	
FSE	MMEMory:SELect[:ITEM]:LINes[:ACTive]	ON | OFF	not available for R&S FSMR (default setting on the R&S FSMR)
FSE	MMEMory:SELect[:ITEM]:MACRos	ON | OFF	not available for R&S FSMR
R&S FSMR + FSE	MMEMory:SELect[:ITEM]:NONE		
R&S FSMR + FSE	MMEMory:SELect[:ITEM]:SCData	ON | OFF	
R&S FSMR	MMEMory:SELect[:ITEM]:TRACe[:ACTive]	ON | OFF	no numeric suffixes behind TRACe
FSE	MMEMory:SELect[:ITEM]:TRACe<1...4>	ON | OFF	numeric suffixes behind TRACe
FSE	MMEMory:SELect[:ITEM]:TRANsducer:ALL	ON | OFF	not available for R&S FSMR
FSE	MMEMory:SELect[:ITEM]:TRANsducer[:ACTive]	ON | OFF	not available for R&S FSMR
R&S FSMR + FSE	MMEMory:STORe:STATe	1,path	
R&S FSMR + FSE	MMEMory:STORe:TRACe	1 to 3,path	
FSE	OUTPut:AF:SENSitivity	<numeric_value>	not available for R&S FSMR and FSET
FSE	OUTPut:UPORt<1|2>:STATe	ON | OFF	not available for R&S FSMR
FSE	OUTPut:UPORt<1|2>[:VALue]	#B00000000 to #B11111111	not available for R&S FSMR
R&S FSMR + FSE	OUTPut<1|2>[:STATe]	ON | OFF	
FSE	READ:BURSt:FERRor:AVERage?		not available for R&S FSMR and FSET
FSE	READ:BURSt:FERRor:MAXimum?		not available for R&S FSMR and FSET
FSE	READ:BURSt:FERRor:STATus?		not available for R&S FSMR and FSET
FSE	READ:BURSt:PERRor:PEAK:AVERage?		not available for R&S FSMR and FSET
FSE	READ:BURSt:PERRor:PEAK:MAXimum?		not available for R&S FSMR and FSET
FSE	READ:BURSt:PERRor:PEAK:STATus?		not available for R&S FSMR and FSET
FSE	READ:BURSt:PERRor:RMS:AVERage?		not available for R&S FSMR and FSET
FSE	READ:BURSt:PERRor:RMS:MAXimum?		not available for R&S FSMR and FSET
FSE	READ:BURSt:PERRor:RMS:STATus?		not available for R&S FSMR and FSET
FSE	READ:BURSt:POWer:DYNamic?		not available for R&S FSMR and FSET
FSE	READ:BURSt:POWer:LEVel?		not available for R&S FSMR and FSET
FSE	READ:BURSt:POWer:STATic?		not available for R&S FSMR and FSET
FSE	READ:BURSt:POWer?		not available for R&S FSMR and FSET
FSE	READ:BURSt:REFerence[:IMMediate?]		not available for R&S FSMR and FSET
FSE	READ:SPECtrum:MODulation[:ALL]?		not available for R&S FSMR and FSET
FSE	READ:SPECtrum:SWITching[:ALL]?		not available for R&S FSMR and FSET

Devices	**Command**	**Parameter**	Notes
FSE	READ:SPURious:STEP?		not available for R&S FSMR and FSET
FSE	READ:SPURious[:ALL]?		not available for R&S FSMR and FSET
FSE	[SENSe<1|2>:]ADEMod:AF:COUPling	AC | DC	not available for R&S FSMR and FSET
FSE	[SENSe<1|2>:]ADEMod:RTIMe	ON | OFF	not available for R&S FSMR and FSET
FSE	[SENSe<1|2>:]ADEMod:SBANd	NORMal | INVerse	not available for R&S FSMR and FSET
FSE	[SENSe<1|2>:]ADEMod:SQUelch:LEVel	30 to 150 dBm	not available for R&S FSMR and FSET
FSE	[SENSe<1|2>:]ADEMod:SQUelch[:STATe]	ON | OFF	not available for R&S FSMR and FSET
FSET	[SENSe<1|2>:]AM:RANGe[:UPPer]	3PCT | 10 PCT | 100PCT	not available for R&S FSMR
FSE	[SENSe<1|2>:]AVERage:AUTO	ON | OFF	not available for R&S FSMR
R&S FSMR + FSE	[SENSe<1|2>:]AVERage:COUNt	0 to 32767	
FSE	[SENSe<1|2>:]AVERage:COUNt	0 to 32767	
R&S FSMR	[SENSe<1|2>:]AVERage:TYPE	VIDeo | LINear	command is used to select logarithmic or linear averaging on the R&S FSMR; therefore parameters are incompatible to the FSE
FSE	[SENSe<1|2>:]AVERage:TYPE	MAXimum | MINimum | SCALar	command is used to select logarithmic or linear averaging on the R&S FSMR; therefore parameters are incompatible to the FSE
R&S FSMR + FSE	[SENSe<1|2>:]AVERage[:STATe<1...3>]	ON | OFF	
FSE	[SENSe<1|2>:]BANDwidth|BWIDth:DEMod	<numeric_value>	not available for R&S FSMR and FSET
R&S FSMR	[SENSe<1|2>:]BANDwidth|BWIDth:PLL	WIDE | NORMal | NARRow	new function for R&S FSMR
FSE	[SENSe<1|2>:]BANDwidth|BWIDth:PLL	AUTO | HIGH | MEDium | LOW	not available for R&S FSMR
R&S FSMR	[SENSe<1|2>:]BANDwidth|BWIDth:PLL	AUTO | HIGH | MEDium | NARRow	new function for R&S FSMR
R&S FSMR + FSE	[SENSe<1|2>:]BANDwidth|BWIDth:VIDeo	1Hz to 10MHz	R&S FSMR
FSET	[SENSe<1|2>:]BANDwidth|BWIDth:VIDeo	1Hz to 500MHz	
R&S FSMR + FSE	[SENSe<1|2>:]BANDwidth|BWIDth:VIDeo:AUTO	ON | OFF	
FSET	[SENSe<1|2>:]BANDwidth|BWIDth:VIDeo:EXTernal[:STATe]	ON | OFF	not available for R&S FSMR
R&S FSMR	[SENSe<1|2>:]BANDwidth|BWIDth:VIDeo:RATio	0.0001 to 1	only numeric values available. Parameter ranges differ between R&S FSMR and FSE
FSE	[SENSe<1|2>:]BANDwidth|BWIDth:VIDeo:RATio	0.001 to 1000 | SINe | PULSe | NOISe	also text parameters are available. Parameter ranges differ between R&S FSMR and FSE not available for FSET
R&S FSMR + FSE	[SENSe<1|2>:]BANDwidth|BWIDth[:RESolution]	10Hz to 10MHz (anal. filter) 1Hz to 10MHz (FFT filter)	FSE: 10Hz to 10MHz (models 20) 1Hz to 10MHz (models 30)
FSET	[SENSe<1|2>:]BANDwidth|BWIDth[:RESolution]	10 Hz to 500MHz	
R&S FSMR + FSE	[SENSe<1|2>:]BANDwidth|BWIDth[:RESolution]:AUTO	ON | OFF	
FSE	[SENSe<1|2>:]BANDwidth|BWIDth[:RESolution]:MODE	ANALog | DIGital	not available for R&S FSMR and FSET
R&S FSMR + FSE	[SENSe<1|2>:]BANDwidth|BWIDth[:RESolution]:MODE:FFT	ON | OFF	old command that is still supported, but has been replaced on the R&S FSMR by [SENSe<1|2>:]BANDwidth|BWIDth[:RESolution]:TYPE
R&S FSMR + FSE	[SENSe<1|2>:]BANDwidth|BWIDth[:RESolution]:RATio	0.0001 to 1	
R&S FSMR	[SENSe<1|2>:]BANDwidth|BWIDth[:RESolution]:TYPE	NORMal | FFT | CFILter | RRC	new function for R&S FSMR

Devices	**Command**	**Parameter**	Notes
R&S FSMR	[SENSe<1|2>:]BANDwidth|BWIDth:VIDeo:TYPE	LINear | LOGarithmic	new function for R&S FSMR
R&S FSMR + FSE	[SENSe<1|2>:]CORRection:COLLect[:ACQuire]	THRough | OPEN	
FSE	[SENSe<1|2>:]CORRection:CVL:BAND	A|Q|U|V|E|W|F|D|G|Y|J	not available for R&S FSMR and FSET
FSE	[SENSe<1|2>:]CORRection:CVL:BIAS	<numeric_value>	not available for R&S FSMR and FSET
FSE	[SENSe<1|2>:]CORRection:CVL:CATalog?		not available for R&S FSMR and FSET
FSE	[SENSe<1|2>:]CORRection:CVL:CLEar		not available for R&S FSMR and FSET
FSE	[SENSe<1|2>:]CORRection:CVL:COMMent	<string>	not available for R&S FSMR and FSET
FSE	[SENSe<1|2>:]CORRection:CVL:DATA	<freq>,<level> to	not available for R&S FSMR and FSET
FSE	[SENSe<1|2>:]CORRection:CVL:MIXer	<string>	not available for R&S FSMR and FSET
FSE	[SENSe<1|2>:]CORRection:CVL:PORTs	2 | 3	not available for R&S FSMR and FSET
FSE	[SENSe<1|2>:]CORRection:CVL:SELect	<file_name>	not available for R&S FSMR and FSET
FSE	[SENSe<1|2>:]CORRection:CVL:SNUMber	<string>	not available for R&S FSMR and FSET
FSE	[SENSe<1|2>:]CORRection:CVL:TYPE	ODD | EVEN | EODD	not available for R&S FSMR and FSET
FSE/ FSIQ	[SENSe<1|2>:]CORRection:LOSS:INPut[:MAGNitude]	<numeric_value>	not available for R&S FSMR
R&S FSMR + FSE	[SENSe<1|2>:]CORRection:METHod	TRANsmission | REFLexion	
R&S FSMR + FSE	[SENSe<1|2>:]CORRection:RECall		
FSE	[SENSe<1|2>:]CORRection:RXGain:INPut[:MAGNitude]	<numeric_value>	not available for R&S FSMR, FSET and ESI
R&S FSMR + FSE	[SENSe<1|2>:]CORRection[:STATe]	ON | OFF	
R&S FSMR + FSE	[SENSe<1|2>:]CORRection:TRANsducer:ACTive?		
R&S FSMR + FSE	[SENSe<1|2>:]CORRection:TRANsducer:CATalog?		
R&S FSMR + FSE	[SENSe<1|2>:]CORRection:TRANsducer:COMMent	<string>	
R&S FSMR + FSE	[SENSe<1|2>:]CORRection:TRANsducer:DATA	<freq>,<level> to	
R&S FSMR + FSE	[SENSe<1|2>:]CORRection:TRANsducer:DELete		
R&S FSMR + FSE	[SENSe<1|2>:]CORRection:TRANsducer:SCALing	LINear|LOGarithmic	
R&S FSMR + FSE	[SENSe<1|2>:]CORRection:TRANsducer:SELect	<name>	
R&S FSMR + FSE	[SENSe<1|2>:]CORRection:TRANsducer:UNIT	<string>	
R&S FSMR + FSE	[SENSe<1|2>:]CORRection:TRANsducer[:STATe]	ON | OFF	
FSE	[SENSe<1|2>:]CORRection:TSET:ACTive?		not available for R&S FSMR
FSE	[SENSe<1|2>:]CORRection:TSET:BREak	ON | OFF	not available for R&S FSMR
FSE	[SENSe<1|2>:]CORRection:TSET:CATalog?		not available for R&S FSMR
FSE	[SENSe<1|2>:]CORRection:TSET:COMMent	<string>	not available for R&S FSMR
FSE	[SENSe<1|2>:]CORRection:TSET:DELete		not available for R&S FSMR
FSE	[SENSe<1|2>:]CORRection:TSET:RANGe<1...10>	<freq>,<freq>,<name> to	not available for R&S FSMR
FSE	[SENSe<1|2>:]CORRection:TSET:SELect	<name>	not available for R&S FSMR
FSE	[SENSe<1|2>:]CORRection:TSET:UNIT	<string>	not available for R&S FSMR
FSE	[SENSe<1|2>:]CORRection:TSET[:STATe]	ON | OFF	not available for R&S FSMR
R&S FSMR + FSE	[SENSe<1|2>:]CORRection:YIG:TEMPerature:AUTO	ON | OFF	new function for R&S FSMR
FSE	[SENSe<1|2>:]DDEMod:FILTer:ALPHa	0.2 to 1	not available for R&S FSMR

Devices	**Command**	**Parameter**	Notes
FSE	[SENSe<1|2>:]DDEMod:FILTer:MEASurement	OFF | RCOSine | RRCosine | GAUSsian | B22 | B25 | B44 | QFM | QFR | QRM | QRR | A25Fm | EMES | EREF	not available for R&S FSMR
FSE	[SENSe<1|2>:]DDEMod:FILTer:REFerence	RCOSine | RRCosine | GAUSsian | B22 | B25 | B44 | QFM | QFR | QRM | QRR | A25Fm | EMES | EREF	not available for R&S FSMR
FSE	[SENSe<1|2>:]DDEMod:FORMat	QPSK | PSK | MSK |QAM | FSK	not available for R&S FSMR
FSE	[SENSe<1|2>:]DDEMod:FSK:NSTate	2 | 4	not available for R&S FSMR
FSE	[SENSe<1|2>:]DDEMod:MSK:FORMat	TYPE1 | TYPE2 | NORMal | DIFFerential	not available for R&S FSMR
FSE	[SENSe<1|2>:]DDEMod:NORMalize	ON | OFF	not available for R&S FSMR
FSE	[SENSe<1|2>:]DDEMod:PRATe	1 | 2 | 4 | 8 | 16	not available for R&S FSMR
FSE/ ESI	[SENSe<1|2>:]DDEMod:PRESet	GSM | EDGe | NADC | TETRa | DCS1800 | PCS1900 | PHS | PDCup | PDCDown | APCO25CQPSK | APCO25C4FM | CDPD | DECT | CT2 | ERMes | MODacom | PWT | TFTS | F16 | F322 | F324 | F64 | FQCDma | RQCDma | FNADc | RNADc | BPSK18 | GMSK18 | QPSK18 | GMSK36	not available for R&S FSMR
FSIQ	[SENSe<1|2>:]DDEMod:PRESet	GSM | EDGe | NADC | TETRa | PHS | PDCup | PDCDown | APCO25CQPSK | APCO25C4FM | CDPD | DECT | CT2 | ERMes | MODacom | PWT | TFTS | F16 | F322 | F324 | F64 | FWCDma | RWCDma | FW3Gppcdma | RW3Gppcdma | BPSK18 | GMSK18 | QPSK18 | GMSK36	not available for R&S FSMR
FSET	[SENSe<1|2>:]DDEMod:PRESet	GSM | EDGe | NADC | TETRa | DCS1800 | PCS1900 | PHS | PDCup | PDCDown | APCO25CQPSK | APCO25C4FM | CDPD | DECT | CT2 | ERMes | MODacom | PWT | TFTS | F16 | F322 | F324 | F64 | FQCDma | RQCDma | FNADc | RNADc | BPSK18 | GMSK18 | QPSK18 | GMSK36	not available for R&S FSMR
FSE	[SENSe<1|2>:]DDEMod:PSK:FORMat	NORMal | DIFFerential | N3Pi8	not available for R&S FSMR
FSE	[SENSe<1|2>:]DDEMod:PSK:NSTate	2 | 8	not available for R&S FSMR
FSE	[SENSe<1|2>:]DDEMod:QAM:NSTate	16	not available for R&S FSMR
FSE	[SENSe<1|2>:]DDEMod:QPSK:FORMat	NORMal | DIFFerential | OFFSet | DPI4	not available for R&S FSMR
FSE	[SENSe<1|2>:]DDEMod:SBANd	NORMal | INVerse	not available for R&S FSMR
FSE	[SENSe<1|2>:]DDEMod:SEARch:PULSe:STATe	ON | OFF	not available for R&S FSMR
FSE	[SENSe<1|2>:]DDEMod:SEARch:SYNC:CATalog?		not available for R&S FSMR
FSE	[SENSe<1|2>:]DDEMod:SEARch:SYNC:COMMent	<string>	not available for R&S FSMR
FSE	[SENSe<1|2>:]DDEMod:SEARch:SYNC:DATA	<string>	not available for R&S FSMR
FSE	[SENSe<1|2>:]DDEMod:SEARch:SYNC:NAME	<string>	not available for R&S FSMR
FSE	[SENSe<1|2>:]DDEMod:SEARch:SYNC:OFFSet	<numeric_value>	not available for R&S FSMR
FSE	[SENSe<1|2>:]DDEMod:SEARch:SYNC:PATTern	<string>	not available for R&S FSMR
FSE	[SENSe<1|2>:]DDEMod:SEARch:SYNC:SELect	<string>	not available for R&S FSMR
FSE	[SENSe<1|2>:]DDEMod:SEARch:SYNC:STATe	ON | OFF	not available for R&S FSMR
FSE	[SENSe<1|2>:]DDEMod:SEARch:TIME	100 to 1600	not available for R&S FSMR

Devices	**Command**	**Parameter**	Notes
FSE	[SENSe<1|2>:]DDEMod:SRATe	160 Hz to 1,6 MHz	not available for R&S FSMR
FSIQ	[SENSe<1|2>:]DDEMod:SRATe	160 Hz to 7 MHz	not available for R&S FSMR
	[SENSe<1|2>:]DDEMod:TIME	1 to Frame Length	not available for R&S FSMR
FSET	[SENSe<1|2>:]DEMod	OFF | AM | AMVideo | FM | PM	not available for R&S FSMR
ESI	[SENSe<1|2>:]DEMod	OFF | AM | FM	not available for R&S FSMR
FSET	[SENSe<1|2>:]DEMod:FILTer:HPASs:FREQuency	0 Hz | 10 Hz | 100 Hz | 1 kHZ	not available for R&S FSMR
FSET	[SENSe<1|2>:]DEMod:FILTer[:LPASs]:AUTO	ON | OFF	not available for R&S FSMR
FSET	[SENSe<1|2>:]DEMod:FILTer[:LPASs]:FREQuency	<numeric_value>	not available for R&S FSMR
FSE	[SENSe<1|2>:]DETector<1...4>:CMEM[:STATe]	ON | OFF	not available for R&S FSMR
R&S FSMR	[SENSe<1|2>:]DETector<1...3>[:FUNCtion]	APEak |NEGative | POSitive | SAMPle | RMS | AVERage | QPEak	R&S FSMR: number of traces restricted to 3; detector settings correspond to selected screen FSE: Qpeak not available
ESI	[SENSe<1|2>:]DETector<1..4>[:FUNCtion]	APEak |NEGative | POSitive | SAMPle | RMS | AVERage | QPEak	
R&S FSMR + FSE	[SENSe<1|2>:]DETector<1...3>[:FUNCtion]:AUTO	ON | OFF	number of traces restricted to 3
FSET	[SENSe<1|2>:]DETector<1...4>:PSTRetch:AUTO	ON | OFF	not available for R&S FSMR
FSET	[SENSe<1|2>:]DETecto<1...4>r:PSTRetch[:STATe]	ON | OFF	not available for R&S FSMR
ESI	[SENSe<1|2>:]DETector<1...4>:RECeiver[:FUNCtion]	POSitive |NEGative| RMS | AVERage | QPEak	not available for R&S FSMR
FSET	[SENSe<1|2>:]DETector<1...4>:RECeiver[:FUNCtion]	POSitive | NEGative | RMS | AVERage	not available for R&S FSMR
FSE	[SENSe<1|2>:]FILTer:CCITt[:STATe]	ON | OFF	not available for R&S FSMR and FSET
FSE	[SENSe<1|2>:]FILTer:CMESsage[:STATe]	ON | OFF	not available for R&S FSMR and FSET
FSE	[SENSe<1|2>:]FILTer:DEMPhasis:LINK	DISPlay | AUDio	not available for R&S FSMR and FSET
FSE	[SENSe<1|2>:]FILTer:DEMPhasis:TCONstant	<numeric_value>	not available for R&S FSMR and FSET
FSE	[SENSe<1|2>:]FILTer:DEMPhasis[:STATe]	ON | OFF	not available for R&S FSMR and FSET
FSE	[SENSe<1|2>:]FILTer:HPASs:FREQuency	30 Hz | 300 HZ	not available for R&S FSMR and FSET
FSET	[SENSe<1|2>:]FILTer:HPASs:FREQuency	10 kHz | 1 kHz | 100 Hz	not available for R&S FSMR
FSE	[SENSe<1|2>:]FILTer:HPASs[:STATe]	ON | OFF	not available for R&S FSMR
FSE	[SENSe<1|2>:]FILTer:LPASs:FREQuency	3 kHz| 15 kHz	not available for R&S FSMR and FSET
FSE	[SENSe<1|2>:]FILTer:LPASs[:STATe]	ON | OFF	not available for R&S FSMR and FSET
FSET	[SENSe<1|2>:]FILTer:NOTCh[:STATe]	ON | OFF	not available for R&S FSMR
FSET	[SENSe<1|2>:]FM[:DEViation]:RANGe:UPPer	ON | OFF	not available for R&S FSMR
FSET	[SENSe<1|2>:]FM[:DEViation]:RANGe[:UPPer]	<numeric_value>	not available for R&S FSMR
R&S FSMR + FSE	[SENSe<1|2>:]FREQuency:CENTer	0 to f_{max}	frequency ranges are different for R&S FSMR and FSE
FSE	[SENSe<1|2>:]FREQuency:CENTer:LINK	STARt | STOP | SPAN	not available for R&S FSMR
R&S FSMR + FSE	[SENSe<1|2>:]FREQuency:CENTer:STEP	0 to f_{max}	frequency ranges are different for R&S FSMR and FSE
R&S FSMR + FSE	[SENSe<1|2>:]FREQuency:CENTer:STEP:LINK	SPAN | RBW | OFF	
R&S FSMR + FSE	[SENSe<1|2>:]FREQuency:CENTer:STEP:LINK:FACTor	1 to 100 PCT	
R&S FSMR + FSE	[SENSe<1|2>:]FREQuency:MODE	CW|FIXed | SWEep	
R&S FSMR + FSE	[SENSe<1|2>:]FREQuency:OFFSet	<numeric_value>	
FSET	[SENSe<1|2>:]FREQuency:RANGe	2 GHz | 22 GHz	not available for R&S FSMR
R&S FSMR + FSE	[SENSe<1|2>:]FREQuency:SPAN	0 to f_{max}	frequency ranges are different for R&S FSMR and FSE
R&S FSMR + FSE	[SENSe<1|2>:]FREQuency:SPAN:FULL		
FSE	[SENSe<1|2>:]FREQuency:SPAN:LINK	CENTer | STOP | SPAN	not available for R&S FSMR
R&S FSMR + FSE	[SENSe<1|2>:]FREQuency:STARt	0 to f_{max}	frequency ranges are different for R&S FSMR and FSE

Devices	Command	Parameter	Notes
FSET	[SENSe<1|2>:]FREQuency:STARt:FLINe[:STATe]	ON | OFF	not available for R&S FSMR. Replaced by CALC:MARK:FUNC:SLIMits
FSE	[SENSe<1|2>:]FREQuency:STARt:LINK	CENTer | STOP | SPAN	not available for R&S FSMR
R&S FSMR + FSE	[SENSe<1|2>:]FREQuency:STOP	0 to f_{max}	frequency ranges are different for R&S FSMR and FSE
FSET	[SENSe<1|2>:]FREQuency:STOP:FLINe[:STATe]	ON | OFF	not available for R&S FSMR; replaced by CALC:MARK:FUNC:SLIMits.
FSE	[SENSe<1|2>:]FREQuency:STOP:LINK	CENTer | STARt | SPAN	not available for R&S FSMR
FSET/ ESI	[SENSe<1|2>:]FREQuency[:CW|:FIXed]	f_{min} to f_{max}	not available for R&S FSMR
FSET/ ESI	[SENSe<1|2>:]FREQuency[:CW|:FIXed]:STEP	f_{min} to f_{max}	not available for R&S FSMR
R&S FSMR	[SENSe<1|2>:]LIST:POWer:RESult?		new function for R&S FSMR
R&S FSMR	[SENSe<1|2>:]LIST:POWer[:SEQuence]	<analyzer freq>, <ref level>,<rf att>,<el att>, <filter type>,<rbw>,<vbw>, <meas time>, <trigger level>,...	new function for R&S FSMR
R&S FSMR	[SENSe<1|2>:]LIST:POWer:SET	<PEAK meas>, <RMS meas>, <AVG meas>, <trigger mode>, <trigger slope>, <trigger offset>, <gate length>	new function for R&S FSMR
R&S FSMR	[SENSe<1|2>:]LIST:POWer:STATe	ON | OFF	new function for R&S FSMR
FSE	[SENSe<1|2>:]MIXer:BIAS	<numeric_value>	not available for R&S FSMR
FSE	[SENSe<1|2>:]MIXer:BIAS:LIMit:MIN	<numeric_value>	not available for R&S FSMR
FSE	[SENSe<1|2>:]MIXer:BIAS:LIMit[:MAX]	<numeric_value>	not available for R&S FSMR
FSE	[SENSe<1|2>:]MIXer:BLOCk	ON | OFF	not available for R&S FSMR
FSE	[SENSe<1|2>:]MIXer:HARMonic	<numeric_value>	not available for R&S FSMR
FSE	[SENSe<1|2>:]MIXer:HARMonic:BAND	A | Q | U | V | E | W | F | D | G | Y | J	not available for R&S FSMR
FSE	[SENSe<1|2>:]MIXer:HARMonic:TYPE	ODD | EVEN | EODD	not available for R&S FSMR
FSE	[SENSe<1|2>:]MIXer:LOSS:HIGH	<numeric_value>	not available for R&S FSMR
FSE	[SENSe<1|2>:]MIXer:LOSS:TABLE	<file_name>	not available for R&S FSMR
FSE	[SENSe<1|2>:]MIXer:LOSS[:LOW]	<numeric_value>	not available for R&S FSMR
FSE	[SENSe<1|2>:]MIXer:PORTs	2 | 3	not available for R&S FSMR
FSE	[SENSe<1|2>:]MIXer:SIGNal	2 | 3	not available for R&S FSMR
FSE	[SENSe<1|2>:]MIXer:THReshold	0.1 to 100 dB	not available for R&S FSMR
FSE	[SENSe<1|2>:]MIXer[:STATe]	ON | OFF	not available for R&S FSMR
R&S FSMR	[SENSe<1|2>:]MPOWer[:SEQuence]	<analyzer freq>, <rbw>,<meas time>, <trigger source>, <trigger level>, <trigger offset>, <type of meas>, <# of meas>	new function for R&S FSMR
R&S FSMR	[SENSe<1|2>:]MPOWer:RESult[:LIST]?		new function for R&S FSMR
R&S FSMR	[SENSe<1|2>:]MPOWer:RESult:MIN?		new function for R&S FSMR
FSE	[SENSe<1|2>:]MSUMmary:AHOLd[:STATe]	ON | OFF	not available for R&S FSMR and FSET
FSE	[SENSe<1|2>:]MSUMmary:MODE	ABSolute | RELative	not available for R&S FSMR and FSET
FSE	[SENSe<1|2>:]MSUMmary:MTIMe	0.1S | 1S	not available for R&S FSMR and FSET
FSE	[SENSe<1|2>:]MSUMmary:REFerence	<numeric_value>	not available for R&S FSMR and FSET
FSE	[SENSe<1|2>:]MSUMmary:REFerence:AUTO	ONCE	not available for R&S FSMR and FSET
FSE	[SENSe<1|2>:]MSUMmary:RUNit	PCT | DB	not available for R&S FSMR and FSET
FSET	[SENSe<1|2>:]PM[:DEViation]:RANGe[:UPPer]	<numeric_value>	not available for R&S FSMR
R&S FSMR + FSE	[SENSe<1|2>:]POWer:ACHannel:ACPairs	0 to 3	R&S FSMR: new parameter value 0 for channel power measurement

<table>
<tr><th>Devices</th><th>Command</th><th>Parameter</th><th>Notes</th></tr>
<tr><td>R&S FSMR + FSE</td><td>[SENSe<1|2>:]POWer:ACHannel:BANDwidth|BWIDth:ACHannel</td><td>100 to 1000MHz</td><td>R&S FSMR: parameter range starts at 100Hz
FSE: parameter range starts at 0 Hz</td></tr>
<tr><td>R&S FSMR + FSE</td><td>[SENSe<1|2>:]POWer:ACHannel:BANDwidth|BWIDth:ALTernate<1|2></td><td>100 to 1000MHz</td><td>R&S FSMR: parameter range starts at 100Hz
FSE: parameter range starts at 0 Hz</td></tr>
<tr><td>R&S FSMR + FSE</td><td>[SENSe<1|2>:]POWer:ACHannel:BANDwidth|BWIDth[:CHANnel]</td><td>100 to 1000MHz</td><td>R&S FSMR: parameter range starts at 100Hz
FSE: parameter range starts at 0 Hz</td></tr>
<tr><td>R&S FSMR + FSE</td><td>[SENSe<1|2>:]POWer:ACHannel:MODE</td><td>ABSolute | RELative</td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>[SENSe<1|2>:]POWer:ACHannel:PRESet</td><td>ACPower | CPOWer | OBANdwidth | OBWidth | CN | CN0 | MCACpower</td><td>MCACpower not available for FSE</td></tr>
<tr><td>R&S FSMR</td><td>[SENSe<1|2>:]POWer:ACHannel:PRESet:RLEVel</td><td></td><td>new function for R&S FSMR</td></tr>
<tr><td>R&S FSMR + FSE</td><td>[SENSe<1|2>:]POWer:ACHannel:REFerence:AUTO</td><td>ONCE</td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>[SENSe<1|2>:]POWer:ACHannel:SPACing[:ACHannel]</td><td>100Hz to 2000MHz</td><td>different parameter range</td></tr>
<tr><td>R&S FSMR</td><td>[SENSe<1|2>:]POWer:CHannel:SPACing:CHANnel</td><td>100Hz to 2000MHz</td><td>new function for R&S FSMR</td></tr>
<tr><td>FSE</td><td>[SENSe<1|2>:]POWer:ACHannel:SPACing[:UPPer]</td><td>0 to 1000MHz</td><td>not available for R&S FSMR and FSET</td></tr>
<tr><td>R&S FSMR + FSE</td><td>[SENSe<1|2>:]POWer:ACHannel:SPACing:ALTernate<1|2></td><td>100Hz to 2000MHz</td><td>different parameter range</td></tr>
<tr><td>R&S FSMR</td><td>[SENSe<1|2>:]POWer:ACHannel:TXCHannel:COUNt</td><td>1 | 2 | 3 | 4</td><td>new function for R&S FSMR</td></tr>
<tr><td>R&S FSMR</td><td>[SENSe<1|2>:]POWer:ACHannel:REFerence:TXCHannel:AUTO</td><td>MINimum | MAXimum | LHIGhest</td><td>new function for R&S FSMR</td></tr>
<tr><td>R&S FSMR</td><td>[SENSe<1|2>:]POWer:ACHannel:REFerence:TXCHannel:MANual</td><td>1 | 2 | 3 | 4</td><td>new function for R&S FSMR</td></tr>
<tr><td>R&S FSMR + FSE</td><td>[SENSe<1|2>:]POWer:BANDwidth|BWIDth</td><td>10 to 99.9PCT</td><td>different parameter range</td></tr>
<tr><td>R&S FSMR</td><td>[SENSe<1|2>:]POWer:HSPeed</td><td>ON | OFF</td><td>new function for R&S FSMR</td></tr>
<tr><td>R&S FSMR</td><td>[SENSe<1|2>:]POWer:NCORrection</td><td>ON | OFF</td><td>new function for R&S FSMR</td></tr>
<tr><td>R&S FSMR</td><td>[SENSe<1|2>:]POWer:TRACe</td><td>1 to 3</td><td>new function for R&S FSMR</td></tr>
<tr><td>R&S FSMR + FSE</td><td>[SENSe<1|2>:]ROSCillator:[INTernal:]TUNe</td><td>0 to 4095</td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>[SENSe<1|2>:]ROSCillator:[INTernal:]TUNe:SAVe</td><td></td><td></td></tr>
<tr><td>FSE</td><td>[SENSe<1|2>:]ROSCillator:EXTernal:FREQuency</td><td>1MHz to 16MHz</td><td>not available for R&S FSMR</td></tr>
<tr><td>R&S FSMR + FSE</td><td>[SENSe<1|2>:]ROSCillator:SOURce</td><td>INTernal | EXTernal</td><td></td></tr>
<tr><td>FSET/ ESI</td><td>[SENSe<1|2>:]SCAN<:RANGes[COUNt]</td><td>1 to 10</td><td>not available for R&S FSMR</td></tr>
<tr><td>FSE/ ESI</td><td>[SENSe<1|2>:]SCAN<1...10>:BANDwidth:RESolution</td><td>f_{min} to f_{max}</td><td>not available for R&S FSMR</td></tr>
<tr><td>FSET/ ESI</td><td>[SENSe<1|2>:]SCAN<1...10>:INPut:ATTenuation</td><td>dB_{min} to dB_{max}</td><td>not available for R&S FSMR</td></tr>
<tr><td>FSET/ ESI</td><td>[SENSe<1|2>:]SCAN<1...10>:INPut:ATTenuation:AUTO</td><td>ON | OFF</td><td>not available for R&S FSMR</td></tr>
<tr><td>FSET</td><td>[SENSe<1|2>:]SCAN<1...10>:INPut:BIMPedance</td><td>150OHM | 600OHM | 10kOHM</td><td>not available for R&S FSMR</td></tr>
<tr><td>FSET</td><td>[SENSe<1|2>:]SCAN<1...10>:INPut:GAIN</td><td>0dB to 30dB</td><td>not available for R&S FSMR</td></tr>
<tr><td>FSET/ ESI</td><td>[SENSe<1|2>:]SCAN<1...10>:INPut:GAIN:AUTO</td><td>ON | OFF</td><td>not available for R&S FSMR</td></tr>
<tr><td>ESI</td><td>[SENSe<1|2>:]SCAN<1...10>:INPut:GAIN:STATe</td><td>ON | OFF</td><td>not available for R&S FSMR</td></tr>
<tr><td>ESI</td><td>[SENSe<1|2>:]SCAN<1...10>:INPut:TYPE</td><td>INPUT1 | INPUT2</td><td>not available for R&S FSMR</td></tr>
<tr><td>FSET</td><td>[SENSe<1|2>:]SCAN<1...10>:INPut:TYPE</td><td>RF | BALanced</td><td>not available for R&S FSMR</td></tr>
<tr><td>FSET/ ESI</td><td>[SENSe<1|2>:]SCAN<1...10>:STARt</td><td>f_{min} to f_{max}</td><td>not available for R&S FSMR</td></tr>
<tr><td>FSET/ ESI</td><td>[SENSe<1|2>:]SCAN<1...10>:STEP</td><td>f_{min} to f_{max}</td><td>not available for R&S FSMR</td></tr>
<tr><td>FSET/ ESI</td><td>[SENSe<1|2>:]SCAN<1...10>:STOP</td><td>f_{min} to f_{max}</td><td>not available for R&S FSMR</td></tr>
<tr><td>FSET/ ESI</td><td>[SENSe<1|2>:]SCAN<1...10>:TIME</td><td>100 µs to 100 s</td><td>not available for R&S FSMR</td></tr>
<tr><td>R&S FSMR + FSE</td><td>[SENSe<1|2>:]SWEep:COUNt</td><td>0 to 32767</td><td></td></tr>
</table>

Devices	Command	Parameter	Notes
R&S FSMR + FSE	[SENSe<1|2>:]SWEep:EGATe	ON | OFF	
R&S FSMR + FSE	[SENSe<1|2>:]SWEep:EGATe:HOLDoff	0 to 100s	
R&S FSMR + FSE	[SENSe<1|2>:]SWEep:EGATe:LENGth	0 to 100s	
FSE	[SENSe<1|2>:]SWEep:EGATe:LENGth	0 to 100s	
FSE	[SENSe<1|2>:]SWEep:EGATe:LEVel	-5V to +5V	not availabe for R&S FSMR
R&S FSMR + FSE	[SENSe<1|2>:]SWEep:EGATe:POLarity	POSitive | NEGative	
R&S FSMR + FSE	[SENSe<1|2>:]SWEep:EGATe:SOURce	EXTernal | IFPower | RFPower	
R&S FSMR + FSE	[SENSe<1|2>:]SWEep:EGATe:TYPE	LEVel | EDGE	
FSE	[SENSe<1|2>:]SWEep:GAP	ON | OFF	not available for R&S FSMR
FSE	[SENSe<1|2>:]SWEep:GAP:LENGth	0 to 100s	not available for R&S FSMR
FSE	[SENSe<1|2>:]SWEep:GAP:PRETrigger	0 to 100s	not available for R&S FSMR
FSE	[SENSe<1|2>:]SWEep:GAP:TRGTogap	0 to 100s	not available for R&S FSMR
R&S FSMR	[SENSe<1|2>:]SWEep:POINts	<numeric value>	not available for FSE
FSET/ ESI	[SENSe<1|2>:]SWEep:SPACing	LINear | LOGarithmic | AUTO	not available for R&S FSMR
FSE/ FSIQ	[SENSe<1|2>:]SWEep:SPACing	LINear | LOGarithmic	not available for R&S FSMR
R&S FSMR + FSE	[SENSe<1|2>:]SWEep:TIME	2.5ms to 1000s | 1μs to 16000s	different parameter ranges for R&S FSMR and FSE
R&S FSMR + FSE	[SENSe<1|2>:]SWEep:TIME:AUTO	ON | OFF	
FSE	[SENSe<1|2>:]TCAPture:LENGth	1024 | 2048 | 4096 | 8192 | 16384	not available for R&S FSMR
FSE	[SENSe<1|2>:]TV:PSOFfset	0 to 6.5 MHz	not available for R&S FSMR and FSET
R&S FSMR	[SENSe<1|2>:]TV:CCVS	INTernal | EXTernal	new function for R&S FSMR
R&S FSMR + FSE	[SENSe<1|2>:]TV[:STATe]	ON | OFF	
R&S FSMR + FSE	SOURce:AM:STATe	ON | OFF	
R&S FSMR + FSE	SOURce:DM:STATe	ON | OFF	
R&S FSMR	SOURce:EXTernal[:STATe]	ON | OFF	new command for R&S FSMR
R&S FSMR	SOURce:EXTernal:FREQuency:OFFset	<numeric_value>	new command for R&S FSMR
R&S FSMR	SOURce:EXTernal:FREQuency[:FACTor]:NUMerator	<numeric_value>	new command for R&S FSMR
R&S FSMR	SOURce:EXTernal:FREQuency[:FACTor]:DENominator	<numeric_value>	new command for R&S FSMR
R&S FSMR	SOURce:EXTernal:FREQuency:SWEep[:STATe]	ON | OFF	new command for R&S FSMR
R&S FSMR	SOURce:EXTernal:POWer[:LEVel]	<numeric_value>	new command for R&S FSMR
R&S FSMR + FSE	SOURce:FM:STATe	ON | OFF	
R&S FSMR + FSE	SOURce:FREQuency:OFFSet	-150Hz to 150MHz	different value ranges for R&S FSMR and FSE
FSE	SOURce:POWer:ALC:SOURce	INTernal | EXTernal	not available for R&S FSMR and FSET
R&S FSMR + FSE	SOURce:POWer[:LEVel][:IMMediate]:OFFSet	-200dB to +200dB	
R&S FSMR + FSE	SOURce:POWer[:LEVel][:IMMediate][:AMPLitude]	-30dBm to 0dBm	different value ranges for R&S FSMR and FSE
R&S FSMR + FSE	STATus:OPERation:CONDition?		
FSE	STATus:OPERation:CONDition?		
R&S FSMR + FSE	STATus:OPERation:ENABle	0 to 65535	
R&S FSMR + FSE	STATus:OPERation:NTRansition	0 to 65535	
R&S FSMR + FSE	STATus:OPERation:PTRansition	0 to 65535	

<table>
<tr><th>Devices</th><th>Command</th><th>Parameter</th><th>Notes</th></tr>
<tr><td>R&S FSMR + FSE</td><td>STATus:OPERation[:EVENt?]</td><td></td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>STATus:PRESet</td><td></td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>STATus:QUEStionable:ACPLimit:CONDition?</td><td></td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>STATus:QUEStionable:ACPLimit:ENABle</td><td>0 to 65535</td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>STATus:QUEStionable:ACPLimit:NTRansition</td><td>0 to 65535</td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>STATus:QUEStionable:ACPLimit:PTRansition</td><td>0 to 65535</td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>STATus:QUEStionable:ACPLimit[:EVENt]?</td><td></td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>STATus:QUEStionable:CONDition?</td><td></td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>STATus:QUEStionable:ENABle</td><td>0 to 65535</td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>STATus:QUEStionable:FREQuency:CONDition?</td><td></td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>STATus:QUEStionable:FREQuency:ENABle</td><td>0 to 65535</td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>STATus:QUEStionable:FREQuency:NTRansition</td><td>0 to 65535</td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>STATus:QUEStionable:FREQuency:PTRansition</td><td>0 to 65535</td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>STATus:QUEStionable:FREQuency[:EVENt]?</td><td></td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>STATus:QUEStionable:LIMit<1|2>:CONDition?</td><td></td><td>R&S FSMR: individual registers for screen A and B</td></tr>
<tr><td>R&S FSMR + FSE</td><td>STATus:QUEStionable:LIMit<1|2>:ENABle</td><td>0 to 65535</td><td>R&S FSMR: individual registers for screen A and B</td></tr>
<tr><td>R&S FSMR + FSE</td><td>STATus:QUEStionable:LIMit<1|2>:NTRansition</td><td>0 to 65535</td><td>R&S FSMR: individual registers for screen A and B</td></tr>
<tr><td>R&S FSMR + FSE</td><td>STATus:QUEStionable:LIMit<1|2>:PTRansition</td><td>0 to 65535</td><td>R&S FSMR: individual registers for screen A and B</td></tr>
<tr><td>R&S FSMR + FSE</td><td>STATus:QUEStionable:LIMit<1|2>[:EVENt]?</td><td></td><td>R&S FSMR: individual registers for screen A and B</td></tr>
<tr><td>R&S FSMR + FSE</td><td>STATus:QUEStionable:LMARgin<1|2>:CONDition?</td><td></td><td>R&S FSMR: individual registers for screen A and B</td></tr>
<tr><td>R&S FSMR + FSE</td><td>STATus:QUEStionable:LMARgin<1|2>:ENABle</td><td>0 to 65535</td><td>R&S FSMR: individual registers for screen A and B</td></tr>
<tr><td>R&S FSMR + FSE</td><td>STATus:QUEStionable:LMARgin<1|2>:NTRansition</td><td>0 to 65535</td><td>R&S FSMR: individual registers for screen A and B</td></tr>
<tr><td>R&S FSMR + FSE</td><td>STATus:QUEStionable:LMARgin<1|2>:PTRansition</td><td>0 to 65535</td><td>R&S FSMR: individual registers for screen A and B</td></tr>
<tr><td>R&S FSMR + FSE</td><td>STATus:QUEStionable:LMARgin<1|2>[:EVENt]?</td><td></td><td>R&S FSMR: individual registers for screen A and B</td></tr>
<tr><td>R&S FSMR + FSE</td><td>STATus:QUEStionable:NTRansition</td><td>0 to 65535</td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>STATus:QUEStionable:POWer:CONDition?</td><td></td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>STATus:QUEStionable:POWer:ENABle</td><td>0 to 65535</td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>STATus:QUEStionable:POWer:NTRansition</td><td>0 to 65535</td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>STATus:QUEStionable:POWer:PTRansition</td><td>0 to 65535</td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>STATus:QUEStionable:POWer[:EVENt]?</td><td></td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>STATus:QUEStionable:PTRansition</td><td>0 to 65535</td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>STATus:QUEStionable:SYNC:CONDition?</td><td></td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>STATus:QUEStionable:SYNC:ENABle</td><td>0 to 65535</td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>STATus:QUEStionable:SYNC:NTRansition</td><td>0 to 65535</td><td></td></tr>
<tr><td>R&S FSMR + FSE</td><td>STATus:QUEStionable:SYNC:PTRansition</td><td>0 to 65535</td><td></td></tr>
</table>

Devices	**Command**	**Parameter**	Notes
R&S FSMR + FSE	STATus:QUEStionable:SYNC[:EVENt]?		
FSE	STATus:QUEStionable:TRANsducer:CONDition?		not available for R&S FSMR
FSE	STATus:QUEStionable:TRANsducer:ENABle	0 to 65535	not available for R&S FSMR
FSE	STATus:QUEStionable:TRANsducer:NTRansition	0 to 65535	not available for R&S FSMR
FSE	STATus:QUEStionable:TRANsducer:PTRansition	0 to 65535	not available for R&S FSMR
FSE	STATus:QUEStionable:TRANsducer[:EVENt]?		not available for R&S FSMR
R&S FSMR + FSE	STATus:QUEStionable[:EVENt]?		
R&S FSMR + FSE	STATus:QUEue[:NEXT?]		
FSE	SYSTem:BINFo?		not available for R&S FSMR
R&S FSMR	SYSTem:COMMunicate:GPIB:RDEVice:GENerator<1|2>:ADDRess	0 to 30	new command for R&S FSMR
FSE	SYSTem:COMMunicate:GPIB:RDEVice<1|2>:ADDRess	0 to 30	not available for R&S FSMR
R&S FSMR + FSE	SYSTem:COMMunicate:GPIB[:SELF]:ADDRess	0 to 30	
R&S FSMR + FSE	SYSTem:COMMunicate:GPIB[:SELF]:RTERminator	LFEOI | EOI	
R&S FSMR + FSE	SYSTem:COMMunicate:PRINter:ENUMerate:FIRSt?		
R&S FSMR + FSE	SYSTem:COMMunicate:PRINter:ENUMerate:NEXT?		
R&S FSMR	SYSTem:COMMunicate:PRINter:SELect<1|2>	<printer_name>	numeric suffix behind SELect
FSIQ/ ESI	SYSTem:COMMunicate:PRINter<1|2>:SELect	<printer_name>	numeric suffix behind PRINters
R&S FSMR	SYSTem:COMMunicate:RDEVice:GENerator<1|2>:LINK	GPIB | TTL	new function for R&S FSMR
R&S FSMR	SYSTem:COMMunicate:RDEVice:GENerator<1|2>:TYPE	<name>	new function for R&S FSMR
R&S FSMR + FSE	SYSTem:COMMunicate:SERial:CONTrol:DTR	IBFull | OFF	only SERial1 available for R&S FSMR
R&S FSMR + FSE	SYSTem:COMMunicate:SERial:CONTrol:RTS	IBFull | OFF	only SERial1 available for R&S FSMR
R&S FSMR + FSE	SYSTem:COMMunicate:SERial[:RECeive]:BAUD	110 | 300 | 600 | 1200 | 2400 | 9600 | 19200	only SERial1 available for R&S FSMR
R&S FSMR + FSE	SYSTem:COMMunicate:SERial[:RECeive]:BITS	7 | 8	only SERial1 available for R&S FSMR
R&S FSMR + FSE	SYSTem:COMMunicate:SERial[:RECeive]:PACE	XON | NONE	only SERial1 available for R&S FSMR
R&S FSMR + FSE	SYSTem:COMMunicate:SERial[:RECeive]:PARity[:TYPE]	EVEN | ODD | NONE	only SERial1 available for R&S FSMR
R&S FSMR + FSE	SYSTem:COMMunicate:SERial[:RECeive]:SBITs	1 | 2	only SERial1 available for R&S FSMR
R&S FSMR + FSE	SYSTem:DATE	1980 to 2099, 1 to 12, 1 to 31	
R&S FSMR	SYSTem:DISPlay:FPANel	ON | OFF	new function for R&S FSMR
R&S FSMR + FSE	SYSTem:DISPlay:UPDate	ON | OFF	
R&S FSMR + FSE	SYSTem:ERRor[:NEXT]?		new function for R&S FSMR, but compatible to SYSTem:ERRor? on the FSE
R&S FSMR	SYSTem:ERRor:LIST?		new function for R&S FSMR
R&S FSMR	SYSTem:ERRor:CLEar:ALL		new command for R&S FSMR
R&S FSMR + FSE	SYSTem:FIRMware:UPDate	<path>	
R&S FSMR	SYSTem:LANGuage	'SCPI' | '8560E' | '8561E' | '8562E' | '8563E' | '8564E' | '8565E' | '8566A' | '8566B' | '8568A' | '8568B' | '8594E'	new command for R&S FSMR
R&S FSMR + FSE	SYSTem:PASSword[:CENable]	'pass word	
R&S FSMR + FSE	SYSTem:PRESet		
ESI/ FSIQ	SYSTem:PRESet:COMPatible	FSE | OFF	not available for R&S FSMR
R&S FSMR + FSE	SYSTem:SET		
R&S FSMR + FSE	SYSTem:SPEaker:VOLume	0 to 1	

Devices	**Command**	**Parameter**	Notes
R&S FSMR + FSE	SYSTem:TIME	0 to 23, 0 to 59, 0 to 59	
R&S FSMR + FSE	SYSTem:VERSion?		
R&S FSMR + FSE	TRACe:COPY	TRACE1 | TRACE2 | TRACE3 , TRACE1 | TRACE2 | TRACE3	only TRACE1...TRACE3 available for R&S FSMR
FSET/ ESI	TRACe:FEED:CONTrol<1...4>	ALWays | NEVer	not available for R&S FSMR
R&S FSMR + FSE	TRACe[:DATA]	TRACE1 | TRACE2 | TRACE3 , <block> | <numeric_value>	only TRACE1...TRACE3 available for R&S FSMR
FSET/ ESI	TRACe[:DATA]	TRACE1| TRACE2| TRACE3| TRACE4| SINGle| SCAN| STATus, <block> | <numeric_value>	
R&S FSMR	TRACe:IQ:DATA?		new function for R&S FSMR
R&S FSMR			new function for R&S FSMR
R&S FSMR	TRACe:IQ:SET	<filter type>, <rbw>, <sample rate>, <trigger source>, <trigger slope>, <pretrigger samples>, <# of samples>	new function for R&S FSMR
R&S FSMR	TRACe:IQ:AVERage[:STATe]	ON | OFF	new function for R&S FSMR
R&S FSMR	TRACe:IQ:AVERage:COUNt	<numeric value>	new function for R&S FSMR
R&S FSMR	TRACe:IQ:SRATe	16kHz to 32MHz	new function for R&S FSMR
R&S FSMR	TRACe:IQ[:STATe]	ON | OFF	new function for R&S FSMR
R&S FSMR + FSE	TRIGger<1|2>[:SEQuence]:HOLDoff	0 to 100s	
FSE	TRIGger<1|2>[:SEQuence]:LEVel:AF	-120 to +120PCT	not available for R&S FSMR
FSE	TRIGger<1|2>[:SEQuence]:LEVel:VIDeo	0 to 100PCT	not available for R&S FSMR; replaced by TRIGger:SEQuence:SOURce :VIDeo
FSE	TRIGger<1|2>[:SEQuence]:LEVel[:EXTernal]	-5.0 to +5.0V	not available for R&S FSMR
R&S FSMR	TRIGger<1|2>[:SEQuence]:LEVel:IFPower	<numeric value>	new command for R&S FSMR
R&S FSMR + FSE	TRIGger<1|2>[:SEQuence]:SLOPe	POSitive | NEGative	
R&S FSMR	TRIGger<1|2>[:SEQuence]:SOURce	IMMediate | LINE | EXTernal | VIDeo | IFPower	
FSE/ ESI	TRIGger<1|2>[:SEQuence]:SOURce	IMMediate | LINE | EXTernal | VIDeo | RFPower | TV | AF	
FSIQ	TRIGger<1|2>[:SEQuence]:SOURce	IMMediate | LINE | EXTernal | VIDeo | RFPower | AF	
FSET	TRIGger<1|2>[:SEQuence]:SOURce	IMMediate | LINE | EXTernal | VIDeo	
R&S FSMR + FSE	TRIGger<1|2>[:SEQuence]:SOURce:VIDeo:FORMat:LPFrame	525 | 625	requires option B6 on FSP
R&S FSMR + FSE	TRIGger<1|2>[:SEQuence]:SOURce:VIDeo:FIELd:SELect	ALL|ODD|EVEN	requires option B6 on FSP
R&S FSMR + FSE	TRIGger<1|2>[:SEQuence]:SOURce:VIDeo:LINE:NUMBer	<numeric value>	requires option B6 on FSP
R&S FSMR + FSE	TRIGger<1|2>[:SEQuence]:SOURce:VIDeo:SSIGnal:POLarity	NEGative | POSitive	requires option B6 on FSP
FSE/ ESI	TRIGger<1|2>[:SEQuence]:SYNChronize:ADJust:FRAMe	0 to 100s	not available for R&S FSMR
FSE	TRIGger<1|2>[:SEQuence]:SYNChronize:ADJust:FRAMe:AUTO	ONCE	not available for R&S FSMR and FSET
FSE	TRIGger<1|2>[:SEQuence]:SYNChronize:ADJust:SLOT	0 to 100s	not available for R&S FSMR and FSET
FSE	TRIGger<1|2>[:SEQuence]:SYNChronize:ADJust:SLOT:AUTO	ONCE	not available for R&S FSMR and FSET
FSE	TRIGger<1|2>[:SEQuence]:SYNChronize:SOURce	FRAMe | TSC	not available for R&S FSMR and FSET

<table>
<tr><th>Devices</th><th>Command</th><th>Parameter</th><th>Notes</th></tr>
<tr><td>R&S FSMR</td><td>UNIT<1|2>:POWer</td><td>DBM | DBPW | WATT | DBUV | DBMV | VOLT | DBUA | AMP | V | A | W</td><td>available units are compatible to the FSE.</td></tr>
<tr><td>FSE/ FSIQ</td><td>UNIT<1|2>:POWer</td><td>DBM | DBPW | WATT | DBUV | DBMV | VOLT | DBUA | AMP | DB | PCT | UNITLESS | DBUV_MHZ | DBMV_MHZ | DBUA_MHZ | DBUV_M | DBIA_M | DBUV_MMHZ | DBUA_MMHZ</td><td>for R&S FSMR, the following units apply:DBM | DBPW | WATT | DBUV | DBMV | VOLT | DBUA | AMP | V | A | W</td></tr>
<tr><td>FSET/ ESI</td><td>UNIT<1|2>:POWer</td><td>DBM | DBPW | DBPT | WATT | DBUV | DBMV | VOLT | DBUA | AMPere | V | W | DB | PCT | UNITLESS | DBUV_MHZ | DBMV_MHZ | DBUA_MHZ | DBUV_M | DBIA_M | DBUV_MMHZ | DBUA_MMHZ</td><td>for R&S FSMR, the following units apply:DBM | DBPW | WATT | DBUV | DBMV | VOLT | DBUA | AMP | V | A | W</td></tr>
<tr><td>FSE</td><td>UNIT<1|2>:PROBe</td><td>ON | OFF</td><td>not available for R&S FSMR</td></tr>
</table>

Table of Softkeys with IEC/IEEE-Bus Command Assignment

FREQUENCY Key

FREQ

- CENTER — `[SENSe:]FREQuency:CENTer <num_value>`
- CF-SREPSIZE
  - 0.1 * SPAN — `[SENSe:]FREQuency:CENTer:STEP:LINK SPAN;` `[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor 10PCT`
  - 0.5 * SPAN — `[SENSe:]FREQuency:CENTer:STEP:LINK SPAN;` `[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor 50PCT`
  - X * SPAN — `[SENSe:]FREQuency:CENTer:STEP:LINK SPAN;` `[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor <num_value>`
  - 0.1 * RBW — `[SENSe:]FREQuency:CENTer:STEP:LINK RBW;` `[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor 10PCT`
  - 0.5 * RBW — `[SENSe:]FREQuency:CENTer:STEP:LINK RBW;` `[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor 50PCT`
  - X * RBW — `[SENSe:]FREQuency:CENTer:STEP:LINK RBW;` `[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor <num_value>`
  - = CENTER — no corresponding IEC/IEEE-bus command
  - = MARKER — no corresponding IEC/IEEE-bus command
  - MANUAL — `[SENSe:]FREQuency:CENTer:STEP <num_value>`
- START — `[SENSe:]FREQuency:STARt <num_value>`
- STOP — `[SENSe:]FREQuency:STOP <num_value>`
- FREQUENCY OFFSET — `[SENSe:]FREQuency:OFFSet <num_value>`
- SIGNAL TRACK
  - TRACK ON OFF — `CALCulate<1|2>:MARKer<1...4>:FUNCtion:STRack[:STATe] ON | OFF`
  - TRACK BW — `CALCulate<1|2>:MARKer<1...4>:FUNCtion:STRack:BANDwidth <num_value>`
  - TRACK THRESHOLD — `CALCulate<1|2>:MARKer<1...4>:FUNCtion:STRack:THReshold <num_value>`
  - SELECT TRACE — `CALCulate<1|2>:MARKer<1...4>:FUNCtion:STRack:TRACe 1 | 2 | 3`

SPAN Key

SPAN	
SPAN MANUAL	`[SENSe:]FREQuency:SPAN <num_value>`
SWEEPTIME MANUAL	`[SENSe:]SWEeptime <num_value>`
FULL SPAN	`[SENSe:]FREQuency:SPAN:FULL`

ZERO SPAN	`[SENSe:]FREQuency:SPAN 0HZ`
	or
	`[SENSe:]FREQuency:MODE CW | FIXed`

LAST SPAN	no corresponding IEC/IEEE-bus command

AMPT Key

AMPT

REF LEVEL
DISPlay[:WINDow<1|2>]:TRACe<1...3>:Y[:SCALe]:RLEVel <num_value>

RANGE LOG 100 dB
DISPlay[:WINDow<1|2>]:TRACe<1...3>:Y:SPACing LOGarithmic;
DISPlay[:WINDow<1|2>]:TRACe<1...3>:Y[:SCALe] 100 dB

RANGE LOG MANUAL
DISPlay[:WINDow<1|2>]:TRACe<1...3>:Y:SPACing LOGarithmic;
DISPlay[:WINDow<1|2>]:TRACe<1...3>:Y[:SCALe] <num_value>

RANGE LINEAR
DISPlay[:WINDow<1|2>]:TRACe<1...3>:Y:SPACing LINear

RANGE LINEAR %
DISPlay[:WINDow<1|2>]:TRACe<1...3>:Y:SPACing LINear %

RANGE LINEAR dB
DISPlay[:WINDow<1|2>]:TRACe<1...3>:Y:SPACing LINear dB

UNIT

dBm
CALCulate<1|2>:UNIT:POWer DBM

dBmV
CALCulate<1|2>:UNIT:POWer DBMV

dBµV
CALCulate<1|2>:UNIT:POWer DBUV

dBµA
CALCulate<1|2>:UNIT:POWer DBUA

dBpW
CALCulate<1|2>:UNIT:POWer DBPW

VOLT
CALCulate<1|2>:UNIT:POWer VOLT

AMPERE
CALCulate<1|2>:UNIT:POWer AMPere

WATT
CALCulate<1|2>:UNIT:POWer WATT

RF ATTEN MANUAL
INPut:ATTenuation <num_value>

RF ATTEN AUTO
INPut:ATTenuation:AUTO ON

MIXER

MIXER LVL AUTO
INPut<1|2>:MIXer:AUTO ON

MIXER LVL MANUAL
INPut<1|2>[:POWer]:MIXer <num_value>

MIXER LOW NOISE
INPut:ATTenuation:MODE NORMal|LNOIse

REF LEVEL POSITION
DISPlay[:WINDow<1|2>]:TRACe<1...3>:Y[:SCALe]:RPOSition <num_value>

REF LEVEL OFFSET	DISPlay[:WINDow<1|2>]:TRACe<1...3>:Y[:SCALe]:RLEVel:OFFSet <num_value>
GRID ABS/REL	DISPlay[:WINDow<1|2>]:TRACe<1...3>:Y[:SCALe]:MODE ABSolute|RELative
EL ATTEN AUTO	INPut:EATT:AUTO ON (with option B25 only)
EL ATTEN MANUAL	INPut:EATT <num_value> (with option B25 only)
EL ATTEN OFF	INPut:EATT:STATe OFF (with option B25 only)
RF INPUT 50Ω 75Ω	INPut:IMPedance 50 | 75

MKR Key

MKR

Softkey	Command

MARKER 1..4	`CALCulate<1|2>:MARKer<1...4>[:STATe] ON | OFF;`
	`CALCulate<1|2>:MARKer<1...4>:X <numeric value>;`
	`CALCulate<1|2>:MARKer<1...4>:Y?`
	`CALCulate<1|2>:DELTamarker1[:STATe] ON | OFF;`
	`CALCulate<1|2>:DELTamarker<1...4>:X <numeric value>;`
	`CALCulate<1|2>:DELTamarker<1...4>:Y?`

MARKER NORM DELTA	`CALCulate<1|2>:DELTamarker<1...4>[:STATe] ON | OFF;`
SIGNAL COUNT	`CALCulate<1|2>:MARKer<1...4>:COUNt ON | OFF;` `CALCulate<1|2>:MARKer<1...4>:COUNt:FREQuency?`
REFERENCE FIXED	
REF FXD FREQUENCY	`CALCulate<1|2>:DELTamarker<1...4>:FUNCtion:FIXed[:STATe] ON | OFF`
REF POINT LEVEL	`CALCulate<1|2>:DELTamarker<1..4>:FUNCtion:FIXed:RPOint:Y <num_value>`
REF POINT LVL OFFSET	`CALCulate<1|2>:DELTamarker<1..4>:FUNCtion:FIXed:RPOint:Y:OFFSet <num_value>`
REF POINT FREQUENCY	`CALCulate<1|2>:DELTamarker<1..4>:FUNCtion:FIXed:RPOint:X <num_value>`
or: REF POINT TIME	`CALCulate<1|2>:DELTamarker<1..4>:FUNCtion:FIXed:RPOint:X <num_value>`
PEAK SEARCH	`CALCulate<1|2>:DELTamarker<1..4>:FUNCtion:FIXed:RPOint: MAX`
MARKER ZOOM	`CALCulate<1|2>:MARKer<1...4>:FUNCtion:ZOOM <num_value>`
ALL MARKER OFF	`CALCulate<1|2>:MARKer<1...4>:AOFF` `CALCulate<1|2>:DELTamarker<1...4>:AOFF`
MKR-> TRACE	`CALCulate<1|2>:MARKer<1...4>:TRACe <num_value>` `CALCulate<1|2>:DELTamarker<1...4>:TRACe <num_value>`
CNT RESOL ...	`CALCulate<1|2>:MARKer<1...4>:COUNt:RESolution <numeric value>`

MKR-> Key

MKR->

SELECT MARKER
no corresponding IEC/IEEE-bus command

PEAK
CALCulate<1|2>:MARKer<1...4>:MAXimum[:PEAK]
CALCulate<1|2>:DELTamarker<1...4>:MAXimum[:PEAK]

CENTER = MKR FREQ
CALCulate<1|2>:MARKer<1...4>:FUNCtion:CENTer

REF LEVEL = MKR LVL
CALCulate<1|2>:MARKer<1...4>:FUNCtion:REFerence

NEXT PEAK
CALCulate<1|2>:MARKer<1...4>:MAXimum:NEXT
CALCulate<1|2>:DELTamarker<1...4>:MAXimum:NEXT

NEXT PEAK RIGHT
CALCulate<1|2>:MARKer<1...4>:MAXimum:RIGHt
CALCulate<1|2>:DELTamarker<1...4>:MAXimum:LEFT

NEXT PEAK LEFT
CALCulate<1|2>:MARKer<1...4>:MAXimum:NEXT
CALCulate<1|2>:DELTamarker<1...4>:MAXimum:NEXT

SEARCH LIMITS

- **LEFT LIMIT**
  CALCulate<1|2>:MARKer<1...4>:X:SLIMits[:STATe] ON | OFF
  CALCulate<1|2>:MARKer<1...4>:X:SLIMits:LEFT <num_value>
- **RIGHT LIMIT**
  CALCulate<1|2>:MARKer<1...4>:X:SLIMits[:STATe] ON | OFF
  CALCulate<1|2>:MARKer<1...4>:X:SLIMits:RIGHt <num_value>
- **THRESHOLD**
  CALCulate<1|2>:THReshold[:STATe] ON | OFF
  CALCulate<1|2>:THReshold <num_value>
- **SEARCH LIM OFF**
  CALCulate<1|2>:MARKer<1...4>:X:SLIMits[:STATe] OFF
  CALCulate<1|2>:THReshold[:STATe] ON | OFF

MKR-> TRACE
CALCulate<1|2>:MARKer<1...4>:TRACe <numeric value>
CALCulate<1|2>:DELTamarker<1...4>:TRACe <numeric value>

MKR-> CF STEPSIZE
CALCulate<1|2>:MARKer<1...4>:FUNCtion:CSTep

MIN
CALCulate<1|2>:MARKer<1...4>:MINimum[:PEAK]
CALCulate<1|2>:DELTamarker<1...4>:MINimum[:PEAK]

NEXT MIN
CALCulate<1|2>:MARKer<1...4>:MINimum:NEXT
CALCulate<1|2>:DELTamarker<1...4>:MINimum:NEXT

PEAK EXCURSION
CALCulate<1|2>:MARKer<1...4>:PEXCursion <num_value>

NEXT MODE
see above

EXCLUDE LO
CALCulate<1|2>:MARKer<1...4>:LOEXclude ON | OFF

MKR FCTN Key

MKR FUNC

SELECT MARKER

no corresponding IEC/IEEE-bus command

PEAK

```
CALCulate<1|2>:MARKer<1...4>:MAXimum[:PEAK]
CALCulate<1|2>:DELTamarker<1...4>:MAXimum[:PEAK]
```

NOISE MEAS

```
CALCulate<1|2>:MARKer<1...4>:FUNCtion:NOISe[:STATe] ON | OFF;
CALCulate<1|2>:MARKer<1...4>:FUNCtion:NOISe:RESult?
```

PHASE NOISE

- **PH NOISE ON OFF**

```
CALCulate<1|2>:DELTamarker<1...4>:FUNCtion:PNOise[:STATe] ON | OFF
CALCulate<1|2>:DELTamarker<1...4>:FUNCtion:PNOise:RESult?
```

- **REF POINT LEVEL**

```
CALCulate<1|2>:DELTamarker<1..4>:FUNCtion:FIXed:RPOint:Y <num_value>
```

- **REF POINT LVL OFFSET**

```
CALCulate<1|2>:DELTamarker<1..4>:FUNCtion:FIXed:RPOint:Y:OFFSet <num_value>
```

- **REF POINT FREQUENCY**

```
CALCulate<1|2>:DELTamarker<1..4>:FUNCtion:FIXed:RPOint:X <num_value>
```

- **PEAK SEARCH**

```
CALCulate<1|2>:DELTamarker<1..4>:FUNCtion:FIXed:RPOint: MAX
```

N dB DOWN

```
CALCulate<1|2>:MARKer<1...4>:FUNCtion:NDBDown[:STATe] ON | OFF
CALCulate<1|2>:MARKer<1...4>:FUNCtion:NDBDown <num_value>
CALCulate<1|2>:MARKer<1...4>:FUNCtion:NDBDown:RESult?
CALCulate<1|2>:MARKer<1...4>:FUNCtion:NDBDown:FREQuency
```

PEAK LIST

- **NEW SEARCH**

```
INIT;*WAI;
CALCulate<1|2>:MARKer<1...4>:FUNCtion:FPEaks 10;
CALCulate<1|2>:MARKer<1...4>:FUNCtion:FPEaks:COUNt?;
CALCulate<1|2>:MARKer<1...4>:FUNCtion:FPEaks:Y?;
CALCulate<1|2>:MARKer<1...4>:FUNCtion:FPEaks:X?;
```

- **SORT MODE FREQ LEVEL**

```
CALCulate<1|2>:MARKer<1...4>:FUNCtion:FPEaks:SORT X | Y
```

- **PEAK EXCURSION**

```
CALCulate<1|2>:MARKer<1...4>:PEXCursion <num_value>
```

- **LEFT LIMIT**

```
CALCulate<1|2>:MARKer<1...4>:X:SLIMits[:STATe] ON | OFF
CALCulate<1|2>:MARKer<1...4>:X:SLIMits:LEFT <num_value>
```

- **RIGHT LIMIT**

```
CALCulate<1|2>:MARKer<1...4>:X:SLIMits[:STATe] ON | OFF
CALCulate<1|2>:MARKer<1...4>:X:SLIMits:RIGHt <num_value>
```

- **THRESHOLD**

```
CALCulate<1|2>:THReshold[:STATe] ON | OFF
CALCulate<1|2>:THReshold <num_value>
```

- **PEAK LIST OFF**

Softkey	IEC/IEEE-bus command
MARKER DEMOD	
MKR DEMOD ON/OFF	`CALCulate<1|2>:MARKer<1...4>:FUNCtion:DEModulation[:STATe] ON | OFF`
AM	`CALCulate<1|2>:MARKer<1...4>:FUNCtion:DEModulation:SELect AM`
FM	`CALCulate<1|2>:MARKer<1...4>:FUNCtion:DEModulation:SELect FM`
MKR STOP TIME	`CALCulate<1|2>:MARKer<1..4>:FUNCtion:DEModulation:HOLDoff <num_value>`
MKR-> TRACE	`CALCulate<1|2>:MARKer<1...4>:TRACe <numeric value>` `CALCulate<1|2>:DELTamarker<1...4>:TRACe <numeric value>`

BW Key

BW

RES BW MANUAL	[SENSe:]BANDwidth|BWIDth:AUTO OFF [SENSe:]BANDwidth|BWIDth[:RESolution] <num_value>
VIDEO BW MANUAL	[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO OFF [SENSe:]BANDwidth|BWIDth:VIDeo <num_value>
SWEEP TIME MANUAL	[SENSe:]SWEep:TIME:AUTO OFF [SENSe:]SWEep:TIME <num_value>
RES BW AUTO	[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO ON
VIDEO BW AUTO	[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO ON
SWEEP TIME AUTO	[SENSe:]SWEep:TIME:AUTO ON
COUPLING RATIO	--
RBW / VBW SINE [1/3]	[SENSe:]BANDwidth|BWIDth:VIDeo:RATio 3
RBW / VBW PULSE [.1]	[SENSe:]BANDwidth|BWIDth:VIDeo:RATio 10
RBW / VBW NOISE [10]	[SENSe:]BANDwidth|BWIDth:VIDeo:RATio 0.1
RBW / VBW MANUAL	[SENSe:]BANDwidth|BWIDth:VIDeo:RATio <num_value>
SPAN / RBW AUTO [50]	[SENSe:]BANDwidth|BWIDth[:RESolution]:RATio 0.02
SPAN / RBW MANUAL	[SENSe:]BANDwidth|BWIDth[:RESolution]:RATio <num_value>
COUPLING DEFAULT	[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO ON; [SENSe:]BANDwidth|BWIDth:VIDeo:AUTO ON; [SENSe:]SWEep:TIME:AUTO ON
FILTER TYPE	[SENSe:]BANDwidth|BWIDth[:RESolution]:TYPE NORMal | FFT | CFILter | RRC
MAIN PLL BANDWIDTH	[SENSe:]BANDwidth|BWIDth:PLL AUTO | HIGH | MEDium | LOW
VBW MODE LIN LOG	[SENSe:]BANDwidth|BWIDth:VIDeo:TYPE LINear | LOGarithmic

SWEEP Key

SWEEP

CONTINUOUS SWEEP	INITiate:CONTinuous ON
SINGLE SWEEP	INITiate:CONTinuous OFF; INITiate:IMMediate
CONTINUE SGL SWEEP	INITiate:CONMeasure
SWEEP TIME MANUAL	[SENSe:]SWEep:TIME <num_value>
SWEEP TIME AUTO	[SENSe:]SWEep:TIME:AUTO ON | OFF
SWEEP COUNT	[SENSe:]SWEep:COUNt <num_value>
SWEEP POINTS	[SENSe:]SWEep:POINts <num_value>
SGL SWEEP DISP OFF	INITiate:DISPlay OFF INITiate:IMMediate

MEAS Key

MEAS

TIME DOM POWER

```
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:RMS[:STATe] ON
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:PPEak[:STATe] (
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:MEAN[:STATe] ON
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:SDEViation [:STATe] ON
```

POWER ON OFF

```
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:RMS[:STATe] ON|OFF
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:PPEak[:STATe] ON|OFF
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:MEAN[:STATe] ON|OFF
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:SDEViation [:STATe] ON|OFF
```

PEAK

```
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:PPEak[:STATe] ON | OFF
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:PPEak:RESult?
```

RMS

```
CALCulate<1|2>:MARKer<1..4>:FUNCtion:SUMMary:RMS[:STATe] ON | OFF
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:RMS:RESult?
```

MEAN

```
CALCulate<1|2>:MARKer<1..4>:FUNCtion:SUMMary:MEAN[:STATe] ON | OFF
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:MEAN:RESult?
```

STANDARD DEVIATION

```
CALCulate<1|2>:MARKer<1..4>:FUNCtion:SUMMary:SDEViation [:STATe] ON|OFF
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:SDEViation:RESult?
```

LIMITS ON OFF

```
CALCulate<1|2>:MARKer<1...4>:SLIMits ON | OFF
```

START LIMIT

```
CALCulate<1|2>:MARKer<1...4>:SLIMits:LEFT <num_value>
```

STOP LIMIT

```
CALCulate<1|2>:MARKer<1...4>:SLIMits:RIGHt <num_value>
```

SET REFERENCE

```
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:REFerence:AUTO ONCE
```

POWER ABS REL

```
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:MODE ABS | REL
```

MAX HOLD ON OFF

```
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:PHOLd ON | OFF
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:PPEak:PHOLd:RESult?
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:RMS:PHOLd:RESult?
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMar:MEAN:PHOLd:RESult?
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:SDEViation:PHOLd:RESult?
```

AVERAGE ON OFF

```
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:AVERage ON | OFF
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:PPEak:AVERage:RESult?
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:RMS:AVERage:RESult?
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMar:MEAN:AVERage:RESult?
CALCulate<1|2>:MARKer<1...4>:FUNCtion:SUMMary:SDEViation:AVERage:RES?
```

NUMBER OF SWEEPS

```
[SENSe:]SWEep:COUNt <num_value>
```

CHAN PWR ACP

```
--
```

CP / ACP ON OFF

```
CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer:SELect CPOWer | ACPower;
CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer:RESult? CPOWer | ACPower;
CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer[:STATe] OFF
```

CP / ACP STANDARD

```
CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer:PRESet <standard>
```

CP / ACP CONFIG

```
--
```

NO. OF ADJ CHAN

```
[SENSe:]POWer:ACHannel:ACPairs <num_value>
```

CHANNEL BANDWIDTH

```
[SENSe:]POWer:ACHannel:BANDwidth|BWIDth[:CHANnel] <num_value>
[SENSe:]POWer:ACHannel:BANDwidth|BWIDth:ACHannel <num_value>
[SENSe:]POWer:ACHannel:BANDwidth|BWIDth:ALTernate<1|2> <num_value>
```

CHANNEL SPACING

```
[SENSe:]POWer:ACHannel:SPACing:ACHannel <num_value>
[SENSe:]POWer:ACHannel:SPACing:ALTernate<1|2> <num_value>
```

ACP REF SETTINGS

```
[SENSe:]POWer:ACHannel:REFerence:TXCHannel:MAN 1
[SENSe:]POWer:ACHannel:REFerence:TXCHannel:Auto MIN
```

CP/ACP ABS/REL

```
[SENSe:]POWer:ACHannel:MODE ABSolute|RELative
```

CHAN PWR /HZ

```
CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer:RESult:PHZ ON | OFF
```

ADJUST SETTINGS

```
[SENSe:]POWer:ACHannel:PRESet ACPower|CPOWer|OBANdwidth|OBWidth
```

ACP LIMIT CHECK

```
CALCulate<1|2>:LIMit<1...8>:ACPower[:STATe] ON | OFF
CALCulate<1|2>:LIMit<1...8>:ACPower:ACHannel:RESult?
CALCulate<1|2>:LIMit<1...8>:ACPower:ALTernate<1|2>:RESult?
```

Softkey	Command
EDIT ACP LIMITS	CALCulate<1|2>:LIMit<1...8>:ACPower[:STATe] ON | OFF CALCulate<1|2>:LIMit<1...8>:ACPower:ACHannel[:RELative]:STATe ON | OFF CALCulate<1|2>:LIMit<1...8>:ACPower:ACHannel[:RELative] <num_val>,<num_val> CALCulate<1|2>:LIMit<1...8>:ACPower:ACHannel:ABSolute:STATe ON | OFF CALCulate<1|2>:LIMit<1...8>:ACPower:ACHannel:ABSolute <num_value>,<num_value> CALCulate<1|2>:LIMit<1...8>:ACPower:ALTernate[:RELative]:STATe ON | OFF CALCulate<1|2>:LIMit<1...8>:ACPower:ALTernate[:RELative] <num_value>,<num_value> CALCulate<1|2>:LIMit<1...8>:ACPower:ALTernate:ABSolute:STATe ON | OFF CALCulate<1|2>:LIMit<1...8>:ACPower:ALTernate:ABSolute <num_value>,<num_value>
SELECT TRACE	[SENSe:]POWer:TRACe 1|2|3
SET CP REFERENCE	[SENSe:]POWer:ACHannel:REFerence:AUTO ONCE
SWEEP TIME	[SENSe:]SWEep:TIME <num_value>
FAST ACP ON OFF	[SENSe:]POWer:HSPeed ON | OFF
NOISE CORR ON OFF	[SENSe:]POWer:NCORrection ON | OFF
FULL SIZE DIAGRAM	
ADJUST REF LVL	[SENSe:]POWer:ACHannel:PRESet:RLEVel
MULT CARR ACP	--
CP / ACP ON OFF	CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer:SELect CPOWer | ACPower; CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer:RESult? CPOWer | ACPower; CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer[:STATe] OFF
CP / ACP STANDARD	CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer:PRESet <standard>
CP / ACP CONFIG	--
NO. OF ADJ CHAN	[SENSe:]POWer:ACHannel:ACPairs <num_value>
NO. OF TX CHAN	[SENSe:]POWer:ACHannel:TXCHannel:COUNt <num_value>
CHANNEL BANDWIDTH	[SENSe:]POWer:ACHannel:BANDwidth|BWIDth[:CHANnel] <num_value> [SENSe:]POWer:ACHannel:BANDwidth|BWIDth:ACHannel <num_value> [SENSe:]POWer:ACHannel:BANDwidth|BWIDth:ALTernate <1|2> <num_value>
CHANNEL SPACING	[SENSe:]POWer:ACHannel:SPACing:CHANnel <num_value> [SENSe:]POWer:ACHannel:SPACing:ACHannel <num_value> [SENSe:]POWer:ACHannel:SPACing:ALTernate<1|2> <num_value>

Softkey	Command
ACP REF SETTINGS	[SENSe:]POWer:ACHannel:REFerence:TXCHannel:MAN 1 [SENSe:]POWer:ACHannel:REFerence:TXCHannel:Auto MIN
CP/ACP ABS/REL	[SENSe:]POWer:ACHannel:MODE ABSolute|RELative
CHAN PWR /HZ	CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer:RESult:PHZ ON | OFF
ADJUST SETTINGS	[SENSe:]POWer:ACHannel:PRESet ACPower|CPOWer|MCACpower|OBANdwidth|OBWidth
ACP LIMIT CHECK	CALCulate<1|2>:LIMit<1...8>:ACPower[:STATe] ON | OFF CALCulate<1|2>:LIMit<1...8>:ACPower:ACHannel:RESult? CALCulate<1|2>:LIMit<1...8>:ACPower:ALTernate<1|2>:RESult?
EDIT ACP LIMITS	CALCulate<1|2>:LIMit<1...8>:ACPower[:STATe] ON | OFF CALCulate<1|2>:LIMit<1...8>:ACPower:ACHannel[:RELative]:STATe ON | OFF CALCulate<1|2>:LIMit<1...8>:ACPower:ACHannel[:RELative] <num_val>,<num_val> CALCulate<1|2>:LIMit<1...8>:ACPower:ACHannel:ABSolute:STATe ON | OFF CALCulate<1|2>:LIMit<1...8>:ACPower:ACHannel:ABSolute <num_value>,<num_value> CALCulate<1|2>:LIMit<1...8>:ACPower:ALTernate[:RELative]:STATe ON | OFF CALCulate<1|2>:LIMit<1...8>:ACPower:ALTernate[:RELative] <num_value>,<num_value> CALCulate<1|2>:LIMit<1...8>:ACPower:ALTernate:ABSolute:STATe ON | OFF CALCulate<1|2>:LIMit<1...8>:ACPower:ALTernate:ABSolute <num_value>,<num_value>
SELECT TRACE	[SENSe:]POWer:TRACe 1|2|3
SET CP REFERENCE	[SENSe:]POWer:ACHannel:REFerence:AUTO ONCE
SWEEP TIME	[SENSe:]SWEep:TIME <num_value>
FAST ACP ON OFF	[SENSe:]POWer:HSPeed ON | OFF
NOISE CORR ON OFF	[SENSe:]POWer:NCORrection ON | OFF
FULL SIZE DIAGRAM	
ADJUST REF LVL	[SENSe:]POWer:ACHannel:PRESet:RLEVel
OCCUPIED PWR BANDW	
OCCUP BW ON OFF	CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer:SELect OBANdwidth | OBWidth CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer:RESult? OBANdwidth| OBWidth CALCulate<1|2>:MARKer<1...4>:FUNCtion:POWer[:STATe] OFF
% POWER BANDWIDTH	[SENSe:]POWer:BANDwidth|BWIDth <num_value>
CHANNEL BANDWIDTH	[SENSe:]POWer:ACHannel:BANDwidth|BWIDth <num_value>

NOISE CORR ON OFF	[SENSe:]POWer:NCORrection ON | OFF
ADJUST REF LVL	[SENSe:]POWer:ACHannel:PRESet:RLEVel
ADJUST SETTINGS	[SENSe:]POWer:PRESet ACPower|CPOWer|OBANdwidth|OBWidth
ADJUST REV LVL	[SENSe:]POWer:PRESet ACPower:RLEVel

Softkey	Command
SIGNAL STATISTIC	
APD ON OFF	CALCulate:STATistics:APD[:STATe] ON | OFF CALCulate:STATistics:RESult<1...3>? MEAN | PEAK | CFACtor | ALL
CCDF ON OFF	CALCulate:STATistics:CCDF[:STATe] ON | OFF CALCulate:STATistics:RESult<1...3>? MEAN | PEAK | CFACtor | ALL
PERCENT MARKER	CALC:MARK:Y:PERC 0...100%
RES BW	[SENSe:]BANDwidth[:RESolution]:AUTO OFF [SENSe:]BANDwidth[:RESolution] <num_value>
NO OF SAMPLES	CALCulate:STATistics:NSAMples <num_value>
SCALING	--
X-AXIS REF LEVEL	CALCulate:STATistics:X:RLEVel <num_value>
X-AXIS RANGE	CALCulate:STATistics:X:RANGe <num_value>
Y-AXIS MAX VALUE	CALCulate:STATistics:Y:UPPER <num_value>
Y-AXIS MIN VALUE	CALCulate:STATistics:Y:LOWer <num_value>
ADJUST SETTINGS	CALCulate:STATistics:SCALe:AUTO ONCE
DEFAULT SETTINGS	CALCulate:STATistics:PRESet
ADJUST SETTINGS	CALCulate:STATistics:SCALe:AUTO ONCE
SINGLE MEAS	INITiate:CONTinuous OFF; INITiate:IMMediate
COUNT MEAS	INITiate:CONTinuous ON; INITiate:IMMediate
C/N	
C/N	CALCulate:MARKer:FUNCtion:POWer:SELect CN CALCulate:MARKer:FUNCtion:POWer:RESult? CN
C/No	CALCulate:MARKer:FUNCtion:POWer:SELect CN0 CALCulate:MARKer:FUNCtion:POWer:RESult? CN0 CALCulate:MARKer:FUNCtion:POWer OFF
CHANNEL BANDWIDTH	[SENSe:]POWer:ACHannel:BANDwidth|BWIDth <num_value>
ADJUST SETTINGS	[SENSe:]POWer:ACHannel:PRESet CN | CN0
MODULATION DEPTH	CALCulate<1|2>:MARKer<1...4>:FUNCtion:MDEPth[:STATe] ON | OFF CALCulate<1|2>:MARKer<1...4>:FUNCtion:MDEPth:RESult?
TOI	CALCulate<1|2>:MARKer<1...4>:FUNCtion:TOI[:STATe] ON | OFF CALCulate<1|2>:MARKer<1...4>:FUNCtion:TOI:RESult?
SELECT MARKER	no corresponding IEC/IEEE-bus command

TRIG Key

TRIG

Softkey	Command
FREE RUN	TRIGger[:SEQuence]:SOURce IMMediate
VIDEO	TRIGger[:SEQuence]:SOURce VIDeo TRIGger[:SEQuence]:LEVel:VIDeo <numeric value>
EXTERN	TRIGger[:SEQuence]:SOURce EXTernal [SENSe:]SWEep:EGATe:SOURce EXTernal
IF POWER	TRIGger[:SEQuence]:SOURce IFPower TRIGger[:SEQuence]:LEVel:IFPower <numeric value> [SENSe:]SWEep:EGATe:SOURce IFPower
TRIGGER OFFSET	TRIGger[:SEQuence]:HOLDoff <num_value>
POLARITY POS/NEG	TRIGger[:SEQuence]:SLOPe POSitive | NEGative or [SENSe:]SWEep:EGATe:POLarity POSitive | NEGative
GATED TRIGGER	[SENSe:]SWEep:EGATe ON | OFF [SENSe:]SWEep:EGATe:SOURce IFPower | EXTernal
GATE SETTINGS	--
GATE MODE LEVEL/EDGE	[SENSe:]SWEep:EGATe:TYPE LEVel | EDGE
POLARITY POS/NEG	[SENSe:]SWEep:EGATe:POLarity POSitive | NEGative
GATE DELAY	[SENSe:]SWEep:EGATe:HOLDoff <num_value>
GATE LENGTH	[SENSe:]SWEep:EGATe:LENGth <num_value>
SWEEP TIME	--
PRINT SCREEN	--

TRACE Key

Softkey	Command
TRACE	
SELECT TRACE	--
CLEAR/ WRITE	`DISPlay[:WINDow<1|2>]:TRACe<1...3>:MODE WRITe`
MAX HOLD	`DISPlay[:WINDow<1|2>]:TRACe<1...3>:MODE MAXHold`

AVERAGE	`DISPlay[:WINDow<1|2>]:TRACe<1...3>:MODE AVERage`
	or:
	`[SENSe:]AVERage[:STATe<1...3>] ON`

VIEW	`DISPlay[:WINDow<1|2>]:TRACe<1...3>:MODE VIEW`
BLANK	`DISPlay[:WINDow<1|2>]:TRACe<1...3>[:STATe] OFF`

SWEEP COUNT	`[SENSe:]SWEep:COUNt <num_value>`
	or:
	`[SENSe:]AVERage:COUNt <num_value>`

DETECTOR	--
AUTO SELECT	`[SENSe:]DETector[:FUNCtion]:AUTO ON | OFF`
DETECTOR AUTOPEAK	`[SENSe:]DETector[:FUNCtion] APEak`
DETECTOR MAX PEAK	`[SENSe:]DETector[:FUNCtion] POSitive`
DETECTOR MIN PEAK	`[SENSe:]DETector[:FUNCtion] NEGative`
DETECTOR SAMPLE	`[SENSe:]DETector[:FUNCtion] SAMPle`
DETECTOR RMS	`[SENSe:]DETector[:FUNCtion] RMS`
DETECTOR AVERAGE	`[SENSe:]DETector[:FUNCtion] AVERage`
DETECTOR QPK	`[SENSe:]DETector[:FUNCtion] QPEak`
TRACE MATH	--
T1-T2->T1	`CALCulate<1|2>:MATH:STATe ON` `CALCulate<1|2>:MATH[:EXPRession][:DEFine] (TRACE1 - TRACE2)`
T1-T3->T1	`CALCulate<1|2>:MATH:STATe ON` `CALCulate<1|2>:MATH[:EXPRession][:DEFine] (TRACE1 - TRACE3)`
TRACE POSITION	`CALCulate<1|2>:MATH:POSition <num_value>`

TRACE MATH OFF

```
CALCulate<1|2>:MATH:STATe OFF
```

MIN HOLD

```
DISPlay[:WINDow<1|2>]:TRACe<1...3>:MODE MINHold
```

AVG MODE LOG LIN

```
CALCulate<1|2>:MATH:MODE  LINear | LOGarithmic
or:
[SENSe:]AVERage:TYPE VIDeo | LINear
```

ASCII FILE EXPORT

```
FORMat[:DATA] ASCii
MMEMory:STORe<1|2>:TRACe 1,'TRACE.DAT'
```

DECIM SEP . ,

```
FORMat:DEXPort:DSEParator POINt | COMMa
```

COPY TRACE

```
TRACe:COPY      TRACE1|TRACE2|TRACE3,TRACE1|TRACE2|TRACE3
```

LINES Key

LINES

SELECT LIMIT LINE

selection:
```
CALCulate<1|2>:LIMit<1...8>:NAME <string>;
CALCulate<1|2>:LIMit<1...8>:UPPer:STATe   ON | OFF
CALCulate<1|2>:LIMit<1...8>:LOWer:STATe ON | OFF
```
limit check:
```
CALCulate<1|2>:LIMit<1...8>:STATe ON | OFF
INITiate[:IMMediate]; WAI*
CALCulate<1|2>:LIMit<1...8>:FAIL?
```
trace assignment:
```
CALCulate<1|2>:LIMit<1...8>:TRACe 1|2|3
```

NEW LIMIT LINE

NAME

name:
```
CALCulate<1|2>:LIMit<1...8>:NAME <string>;
```
domain:
```
CALCulate<1|2>:LIMit<1...8>:CONTrol:DOMain   FREQuency|TIME
```
scaling:
```
CALCulate<1|2>:LIMit<1...8>:CONTrol:MODE   RELative | ABSolute
CALCulate<1|2>:LIMit<1...8>:UPPer:MODE   RELative | ABSolute
CALCulate<1|2>:LIMit<1...8>:LOWer:MODE   RELative | ABSolute
```
unit:
```
CALCulate<1|2>:LIMit<1...8>:UNIT   DBM| DBPW| WATT| DBUV|
VOLT|DBUA|AMPere| DB| DBUV_MHZ| DBUA_MHZ| DEG| RAD| S| HZ| PCT
```
margin:
```
CALCulate<1|2>:LIMit<1...8>:UPPer:MARGin <num_value>
CALCulate<1|2>:LIMit<1...8>:LOWer:MARGin <num_value>
```
threshold for relative y-scaling:
```
CALCulate<1|2>:LIMit<1...8>:UPPer:THReshold <num_value>
CALCulate<1|2>:LIMit<1...8>:LOWer:THReshold <num_value>
```
comment:
```
CALCulate<1|2>:LIMit<1...8>:COMMent <string>
```

VALUES

```
CALCulate<1|2>:LIMit<1...8>:CONTrol[:DATA]
                               <num_value>, <num_value>..
CALCulate<1|2>:LIMit<1...8>:UPPer[:DATA]
                               <num_value>, <num_value>..
CALCulate<1|2>:LIMit<1...8>:LOWer[:DATA]
                                <num_value>,<num_value>..
```

INSERT VALUE

no corresponding IEC/IEEE-bus command

DELETE VALUE

no corresponding IEC/IEEE-bus command

SHIFT X LIMIT LINE

```
CALCulate<1|2>:LIMit<1...8>:CONTrol:SHIFt <num_value>
```

SHIFT Y LIMIT LINE

```
CALCulate<1|2>:LIMit<1...8>:UPPer:SHIFt <num_value>
CALCulate<1|2>:LIMit<1...8>:LOWer:SHIFt <num_value>
```

SAVE LIMIT LINE

automatically executed during IEC/IEEE-bus operation

EDIT LIMIT LINE

s. EDIT LIMIT LINE

COPY LIMIT LINE

```
CALCulate<1|2>:LIMit<1...8>:COPY 1...8 | <name>
```

DELETE LIMIT LINE	CALCulate<1|2>:LIMit<1...8>:DELete
X OFFSET	CALCulate<1|2>:LIMit<1...8>:CONTrol:OFFset <num_value>
Y OFFSET	CALCulate<1|2>:LIMit<1...8>:UPPer:OFFset <num_value> CALCulate<1|2>:LIMit<1...8>:LOWer:OFFset <num_value>
DISPLAY LINES	
DISPLAY LINE 1	CALCulate<1|2>:DLINe1:STATe ON|OFF CALCulate<1|2>:DLINe1 –30 dBm
DISPLAY LINE 2	CALCulate<1|2>:DLINe2:STATe ON|OFF CALCulate<1|2>:DLINe2 –30 dBm
FREQUENCY LINE 1	CALCulate<1|2>:FLINe1:STATe ON|OFF CALCulate<1|2>:FLINe1 0 HZ
FREQUENCY LINE 2	CALCulate<1|2>:FLINe2:STATe ON|OFF CALCulate<1|2>:FLINe2 3 GHZ
TIME LINE 1	CALCulate<1|2>:TLINe1:STATe ON|OFF CALCulate<1|2>:TLINe1 0 S
TIME LINE 2	CALCulate<1|2>:TLINe2:STATe ON|OFF CALCulate<1|2>:TLINe2 2.5 MS

Taste DISP

DISP

FULL SCREEN	DISPlay:FORmat SINGle DISPlay[:WINDow<1|2>]:SELect
SPLIT SCREEN	DISPlay:FORmat SPLit
REF LEVEL COUPLED	INSTrument:COUPle RLEVel | NONE
CENTER B = MARKER A	INSTrument:COUPle CF_B | NONE
CENTER A = MARKER B	INSTrument:COUPle CF_A | NONE
CONFIG DISPLAY	--
SCREEN TITLE	DISPlay[:WINDow<1|2>]:TEXT[:DATA] <string> DISPlay[:WINDow<1|2>]:TEXT:STATe ON | OFF
TIME/DATE ON OFF	DISPlay[:WINDow<1|2>]:TIME ON | OFF
LOGO ON/OFF	DISPlay:LOGO ON|OFF
ANNOTATION ON/OFF	DISPlay:ANNotation:FREQuency ON|OFF
DATAENTRY OPAQUE	no corresponding IEC/IEEE-bus command
DEFAULT COLORS 1	DISPlay:CMAP<1...13>:DEFault1
DEFAULT COLORS 2	DISPlay:CMAP<1...13>:DEFault2
DISPLAY PWR SAVE	DISPlay:PSAVe[:STATe] ON | OFF DISPlay:PSAVe:HOLDoff <num_value>
SELECT OBJECT	--
BRIGHTNESS	DISPlay:CMAP:HSL <hue>,<sat>,<lum>
TINT	DISPlay:CMAP<1...13>:HSL <hue>,<sat>,<lum>
SATURATION	DISPlay:CMAP<1...13>:HSL <hue>,<sat>,<lum>
PREDEFINED COLORS	DISPlay:CMAP<1...13>:PDEFined BLACk| BLUE| BROWn| GREen| MAGenta| YELLow| WHITe| DGRAy| LGRAy| LBLUe| LGREen| LCYan| LRED| MAGenta

Taste FILE

Softkey	IEC/IEEE-bus command
FILE	
SAVE	MMEMory:STORe:STATe 1,<file_name>
RECALL	MMEMory:LOAD:STATe 1,<file_name>
EDIT PATH	--
EDIT COMMENT	MMEMory:COMMent <string>
ITEMS TO SAVE/RCL	
SELECT ITEMS	MMEMory:SELect[:ITEM]:HWSettings ON|OFF MMEMory:SELect[:ITEM]:TRACe[:ACTive] ON|OFF MMEMory:SELect[:ITEM]:LINes:ALL ON|OFF MMEMory:SELect[:ITEM]:NONE
DEFAULT CONFIG	MMEMory:SELect[:ITEM]:DEFault
DISABLE ALL ITEMS	MMEMory:SELect[:ITEM]:NONE
ENABLE ALL ITEMS	MMEMory:SELect[:ITEM]:ALL
DATA SET LIST	--
DATA SET CLEAR	MMEMory:CLEar:STATe 1,<file_name>
STARTUP RECALL	MMEMory:LOAD:AUTO 1,<file_name>
FILE MANAGER	
EDIT PATH	MMEMory:MSIS <device> MMEMory:CDIRectory <directory_name>
NEW FOLDER	MMEMory:MDIRectory <directory_name>
COPY	MMEMory:COPY <file_source>,<file_destination>
RENAME	MMEMory:MOVE <file_source>,<file_destination>
CUT	MMEMory:DELete <file_name> MMEMory:RDIRectory <directory_name>
PASTE	no corresponding IEC/IEEE-bus command
DELETE	MMEMory:DELete <file_name> MMEMory:RDIRectory <directory_name>

SORT MODE	no corresponding IEC/IEEE-bus command
2 FILE LISTS	no corresponding IEC/IEEE-bus command
FORMAT DISK	`MMEMory:INITialize <msus>`
ASCII FILE EXPORT	`FORMat[:DATA] ASCii` `MMEMory:STORe<1|2>:TRACe 1,'TRACE.DAT'`
DECIM SEP . ,	`FORMat:DEXPort:DSEParator POINt | COMMa`
DATA SET CLEAR ALL	`MMEMory:CLEar:ALL`

Taste CAL

CAL

CAL TOTAL	CALibration[:ALL]?
CAL ABORT	CALibration:ABORt
CAL CORR ON OFF	CALibration:STATe ON | OFF
CAL RESULTS	CALibration:RESults?

SETUP Key

Softkey	Command
REFERENCE INT/EXT	`[SENSe:]ROSCillator:SOURce INTernal|EXTernal`
NOISE SCR ON OFF	`DIAGnostic:SERVice:NSOurce ON | OFF <num_value>`
PREAMP ON OFF	`INPut:GAIN: [STATe]e ON | OFF <num_value>` (with option Electronic Attenuator - B25 only)
SIGNAL SOURCE	
YIG FILTER ON OFF	
TRANSDUCER	--
TRANSDUCER FACTOR	`CORRection:TRANsmission:SELect <name>` `CORRection:TRANsmission ON | OFF`
EDIT TRD FACTOR	`CORRection:TRANmission:COMMunicate <string>` `CORRection:TRANmission:SCALE LIN|LOG`
NEW FACTOR	
TRD FACTOR NAME	--
TRD FACTOR UNIT	--
TRD FACTOR VALUES	--
INSERT LINE	--
DELETE LINE	--
SAVE TRD FACTOR	--
DELETE	`CORRection:TRANsmission DELete`
PAGE UP	--
PAGE DOWN	--
GENERAL SETUP	--
GPIB	--
GPIB ADDRESS	`SYSTem:COMMunicate:GPIB[:SELF]:ADDRess 0...30`
ID STRING FACTORY	--
LD STRING USER	--
GPIB LANGUAGE	`SYSTem: LANGuage "SCPI" | "8560E" | "8561E" | "8562E" | "8563E" | "8564E" | "8566A" | "8566B" | "8568A" | "8568B" | "8594E"`

Softkey	Command
COM INTERFACE	SYSTem:COMMunicate:SERial[:RECeive:]BAUD <num_value> SYSTem:COMMunicate:SERial[:RECeive]:BITS 7 | 8 SYSTem:COMMunicate:SERial:RECeive:PARity[:TYPE] EVEN | ODD | NONE SYSTem:COMMunicate:SERial[:RECeive]:SBITs 1|2 SYSTem:COMMunicate:SERial:CONTrol:DTR IBFull | OFF SYSTem:COMMunicate:SERial:CONTrol:RTS IBFull | OFF SYSTem:COMMunicate:SERial[:RECeive]:PACE XON | NONE
TIME+DATE	SYSTem:TIME 0...23, 0...59, 0...59 SYSTem:DATE <num>,<num>,<num>
CONFIGURE NETWORK	With option LAN-Interface B16 only --
NETWORK LOGIN	With option LAN-Interface B16 only --
OPTIONS	--
INSTALL OPTION	--
REMOVE OPTION	--
SOFT FRONTPANEL	SYSTem:DISPlay:FPANel ON | OFF
SYSTEM INFO	--
HARDWARE INFO	DIAGnostic:SERVice:HWINfo?
STATISTICS	--
SYSTEM MESSAGES	SYSTem:ERRor? SYSTem:ERRor:LIST?
CLEAR ALL MESSAGES	SYSTem:ERRor?
SERVICE	--
INPUT RF	DIAGnostic:SERVice:INPut[:SELect] RF
INPUT CAL	DIAGnostic:SERVice:INPut[:SELect] CALibration DIAGnostic:SERVice:CSOurce[:POWer] <num_value>
SELFTEST	*TST?
SELFTEST RESULTS	DIAGnostic:SERVice:STESt:RESult?
ENTER PASSWORD	SYSTem:PASSword[:CENable] <string>
CAL GEN 128 MHz	DIAGnostic:SERVice:INPut:PULSed OFF
CAL GEN COMB	DIAGnostic:SERVice:INPut:PULSed ON DIAGnostic:SERVice:INPut:PULSed:PRATe 128 MHz
SERVICE FUNCTION	DIAGnostic:SERVice:SFUNction <string>
FIRMWARE UPDATE	--
RESTORE FIRMWARE	--

HCOPY Key

Softkey	IEC/IEEE-bus command
HCOPY	
PRINT SCREEN	HCOPy:ITEM:ALL HCOPy:IMMediate for printout into file add MMEMory:NAME <file_name>
PRINT TRACE	HCOPy:ITEM:WINDow<1|2>:TRACe:STATe ON | OFF HCOPy:IMMediate for printout into file add MMEMory:NAME <file_name>
PRINT TABLE	HCOPy:ITEM:WINDow<1|2>:TABle:STATe ON | OFF HCOPy:IMMediate for printout into file add MMEMory:NAME <file_name>
HARDCOPY ABORT	HCOPy:ABORt
DEVICE SETUP DEVICE2 1 2	SYSTem:COMMunicate:PRINter:ENUMerate:FIRSt? SYSTem:COMMunicate:PRINter:ENUMerate:NEXT? SYSTem:COMMunicate:PRINter:SELect <string> HCOPy:DESTination <string> HCOPy:DEVice:LANGuage GDI | WMF | EWMF | BMP HCOPy:PAGE:ORIentation<1|2> LANDscape | PORTrait
COLOR	HCOPy:DEVice:COLor ON | OFF HCOPy:CMAP:DEFault1
COMMENT	HCOPy:ITEM:WINDow:TEXT <string>
INSTALL PRINTER	

Hotkeys

SPECTRUM	`INSTrument[:SELect] SANalyzer` `INSTrument:NSELect 1`	
NETWORK	With option tracking generator B9 or option ext. Generator control B10 --	
SCREEN A/B	FULL SCREEN:	Selection of the active window: `DISPlay[:WINDow<1|2>` The window valid for the setting is selected by the numeric. suffix in the command, eg SENSe<1|2>
	SPLIT SCREEN:	The two measurement windows are active. The window valid for the setting is selected by the numeric suffix in the command, eg `SENSe<1|2>`

Hotkey NETWORK

Softkey	IEC/IEEE-bus command
NETWORK	with option internal tracking generator B9 or option external generator control FSP-B10 only: --
SOURCE ON / OFF	OUTPut:STATe ON | OFF
SOURCE POWER	SOURce:POWer <num_value>
POWER OFFSET	SOURce:POWer:OFFSet <num_value>
SOURCE CAL	with option internal tracking generator B9 or option external generator control FSP-B10 only:
CAL TRANS	[SENSe:]CORRection:METHod TRANsmission [SENSe:]CORRection:COLLect[:ACQuire] THRough
CAL REFL SHORT	[SENSe:]CORRection:METHod REFLexion [SENSe:]CORRection:COLLect[:ACQuire] THRough
CAL REFL OPEN	[SENSe:]CORRection:METHod REFLexion [SENSe:]CORRection:COLLect[:ACQuire] OPEN
NORMALIZE	[SENSe:]CORRection[:STATe] ON | OFF
REF VALUE POSITION	DISP:WIND:TRAC:Y:RPOS <num_value>
REF VALUE	DISP:WIND:TRAC:Y:RVAL <num_value>
RECALL	[SENSe:]CORRection:RECall
FREQUENCY OFFSET	with option internal tracking generator B9 only: SOURce:FREQuency:OFFSet <num_value>
MODULATION	with option internal tracking generator B9 only:
EXT AM	SOURce:AM:STATe ON|OFF
EXT FM	SOURce:FM:STATe ON|OFF SOURce:FM:DEViation <num_value>
EXT I/Q	SOURce:DM:STATe ON|OFF
MODULATION OFF	--
EXT SOURCE	with option external generator control FSP-B10 only:
EXT SRC ON / OFF	SOURce:EXTernal[:STATe] ON | OFF
SELECT GENERATOR	SYSTem:COMMunicate:RDEVice:GENerator:TYPE 'SME02' SYSTem:COMMunicate:RDEVice:GENerator:LINK TTL SYSTem:COMMunicate:GPIB:RDEVice:GENerator:ADDRess 28
FREQUENCY SWEEP	SOURce:EXTernal:POWer –30dBm SOURce:EXTernal:FREQuency:NUMerator 4 SOURce:EXTernal:FREQuency:DENominator 3 SOURce:EXTernal:FREQuency:OFFSet 100MHZ

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7 Remote Control - Programming Examples

The following programming examples have a hierarchical structure, i.e. subsequent examples are based on previous ones. It is thus possible to compile very easily an operational program from the modules of the given examples.

Basic Steps of IEC/IEEE-Bus Programming

The examples explain the programming of the instrument and can serve as a basis to solve more complex programming tasks.

VISUAL BASIC has been used as programming language. However, the programs can be translated into other languages.

Including IEC-Bus Library for VisualBasic

Programming hints:

- **Output of texts using the "Print" function**

  The following programming examples are based on the assumption that all subroutines are part of a form (file extension: .FRM). In this case the syntax
  `Print "Text"`
  is allowed.

  If however the subroutines are stored as a so-called module (file extension: .BAS), the print instruction should be preceded by the name of a form which has the required print method. If, for example, there is a form with the name "Main", the associated print instruction is as follows:
  `Main.Print "Text"`.

- **Access to functions of GPIB.DLL**

  To create Visual Basic control applications, the file GPIB.BAS (as from VB 6.0 VBIB-32.BAS) is added to a project so that the functions of the RSIB.DLL can be called. In addition, the file NIGLOBAL.BAS is added to the project. This file contains constants and definitions for the processing of errors, timeout values, etc.

- **Declaration of DLL functions as procedures**

  Since the functions all return an integer value, the functions in the file GPIB.BAS are all declared as follows:

  ```
  Declare Function xxx Lib "gpib.dll" ( ... ) As Integer
  ```

  The function value with the status variables `ibsta` should be allocated a variable when it is called up. Since this value is also returned via a reference parameter of the functions, the functions can be declared as procedures as follows:

  ```
  Declare Sub xxx Lib "rsib.dll" ( ... )
  ```

- **Generating a response buffer**

  Since the DLL returns zero-terminated strings in case of responses, a string of sufficient length should be generated prior to calling the functions `ibrd()` and `ilrd()`, since Visual Basic prefixes a length value to the strings which is not updated by the DLL.
  The following two possibilities are available to generate a length value for a string:

  - **`Dim Rd as String * 100`**
  - **`Dim Rd as String`**
    `Rd = Space$(100)`

Initialization and Default Status

Variables used by all subroutines should be stored at the beginning of every program.
Then the IEC/IEEE bus as well as the settings of the instrument are brought into a defined default status at the beginning of every program. Subroutines "`InitController`" and "`InitDevice`" are used to this effect.

Creating Global Variables

Global variables are placed in so-called "modules" (file extension: .BAS) in Visual Basic. Therefore, at least one module (e.g. "GLOBALS.BAS) should be created which contains the variables used by all subroutines, such as the device addresses used by the IEC/IEEE-bus driver.
The file should contain the following instructions for the programming examples below:

```
Global analyzer As Integer
Global boardId As Integer
```

Initiate Controller

```
REM ------------ Initiate controller ---------------------------------------
Public SUB InitController()

iecaddress% = 20                          'IEC/IEEE-bus address of the
                                          'instrument
CALL IBFIND("GPIB0", boardId%)            'Open port to the controller
CALL IBFIND("DEV1", analyzer%)            'Open port to the instrument
CALL IBPAD(analyzer%, iecaddress%)        'Inform controller on instrument
                                          'address
CALL IBTMO(analyzer%, 11)                 'Response time to 1 sec
END SUB
REM ***************************************************************************
```

Initiate Instrument

The IEC-bus status registers and instrument settings of the instrument are brought to the default status.

```
REM ------------ Initiate instrument --------------------------------------
Public SUB InitDevice()

CALL IBWRT(analyzer%, "*CLS")            'Reset status registers
CALL IBWRT(analyzer%, "*RST")            'Reset instrument
END SUB
REM*************************************************************************
```

Switching the Display On/Off

In the default status, all remote control commands are executed with the display switched off to achieve maximum measurement speed. During the generation of remote control programs, however, the display is often needed to check the settings programmed as well as the test results.
The functions shown below are examples of how the display can be switched on or off by remote control::

```
REM ------------ Switch display on --------------
Public SUB DisplayOn()
CALL IBWRT(analyzer%, "SYST:DISP:UPD ON")    'Switch display on
END SUB
REM*************************************************************************

REM ------------ Switch display off --------------
Public SUB DisplayOff()
CALL IBWRT(analyzer%, "SYST:DISP:UPD OFF")   'Switch display off
END SUB
REM*************************************************************************
```

Configuring Power Save Function (Display Permanently Switched Off)

The results on the screen are often not required during IEC/IEEE-bus operation. Although the command "`SYSTem:DISPlay:UPDate OFF`" switches off the display of results, which brings considerable advantages in terms of speed in the remote control mode, the display itself and in particular the backlighting remain switched on.

To switch the display off use the power save function, the response time having to be set in minutes prior to activation.

Note: *The display is switched on as soon as a key is pressed on the instrument front panel.*

```
REM --------- Configure power save function ------------------------------
Public SUB PowerSave()

CALL IBWRT(analyzer%, "SYSTem:PSAVe:HOLDoff 1") 'Set holdoff to 1 minute
CALL IBWRT(analyzer%, "SYSTem:PSAVe ON")        'Power save function on
END SUB
REM************************************************************************
```

Transmission of Simple Instrument Setting Commands

Center frequency, span, and reference level of the instrument are set in this example.

```
REM -------- Instrument setting commands ---------------------------------
PUBLIC SUB SimpleSettings()

CALL IBWRT(analyzer%, "FREQUENCY:CENTER 128MHz")  'Center frequency 128 MHz
CALL IBWRT(analyzer%, "FREQUENCY:SPAN 10MHZ")     'Span 10 MHz
CALL IBWRT(analyzer%, "DISPLAY:TRACE:Y:RLEVEL -10dBm")
                                                  'Reference level -10dBm
END SUB
REM ***********************************************************************
```

Return to Manual Control

```
REM -------- Switch instrument over to manual control --------------------
CALL IBLOC(analyzer%)                'Set instrument to Local state
REM ***********************************************************************
```

Reading Out Instrument Settings

The settings made in the above example are read out using the abbreviated commands.

```
REM --------- Reading out instrument settings ----------------------------
PUBLIC SUB ReadSettings()

CFfrequency$ = SPACE$(20)            'Provide text variables (20 characters)
CALL IBWRT(analyzer%, "FREQ:CENT?")  'Request center frequency
CALL IBRD(analyzer%, CFfrequency$)   'Read value

CFspan$ = SPACE$(20)                 'Provide text variables (20 characters)
CALL IBWRT(analyzer%, "FREQ:SPAN?")  'Query span
CALL IBRD(analyzer%, CFspan$)        'Read value

RLevel$ = SPACE$(20)                 'Provide text variables (20 characters)
CALL IBWRT(analyzer%, "DISP:TRAC:Y:RLEV?")
                                     'Query reference level
CALL IBRD(analyzer%, RLevel$)        'Read value

REM ---------------- Display values on the screen -------------------------
PRINT "Center frequency: "; CFfrequency$,
PRINT "Span:             "; CFspan$,
PRINT "Reference level:  "; RLevel$,
REM*************************************************************************
```

Positioning Markers and Displaying Values

```
REM -------------- Examples of marker functions ----------------------------
PUBLIC SUB ReadMarker()

CALL IBWRT(analyzer%, "CALC:MARKER ON;MARKER:MAX")
                        'Activate marker1 and start peak search
MKmark$ = SPACE$(30)     'Provide text variables (30 characters)
CALL IBWRT(analyzer%, "CALC:MARK:X?;Y?")     'Query frequency and level
CALL IBRD(analyzer%, MKmark$)                'Read value

REM --------------- Display values on the screen --------------------------
PRINT "Center frequency / level "; MKmark$,
REM **********************************************************************
```

Command Synchronization

The possibilities for synchronization implemented in the following example are described in Chapter 5, Section "Command Order and Command Synchronization".

```
REM -------- Examples of command synchronization --------------------------
PUBLIC SUB SweepSync()


REM The command INITiate[:IMMediate] starts a single sweep if the command
REM INIT:CONT OFF was previously sent. It has to be ensured that the next
REM command is only executed when the entire sweep is complete.
CALL IBWRT(analyzer%, "INIT:CONT OFF")

REM -------- First possibility: Use of *WAI ------------------------------
CALL IBWRT(analyzer%, "ABOR;INIT:IMM; *WAI")

REM -------- Second possibility: Use of *OPC? ----------------------------
OpcOk$ = SPACE$(2)                  'Space for *OPC? - Provide response
CALL IBWRT(analyzer%, "ABOR;INIT:IMM; *OPC?")
REM -------- The controller can operate other instruments -------------
CALL IBRD(analyzer%, OpcOk$)                  'Wait for "1" from *OPC?

REM -------- Third possibility: Use of *OPC -----------------------------
REM In order to be able to use the service request function in conjunction
REM with a National Instruments GPIB driver, the setting "Disable
REM Auto Serial Poll" must be changed to "yes" by means of IBCONF!
CALL IBWRT(analyzer%, "*SRE 32")      'Permit service request for ESR
CALL IBWRT(analyzer%, "*ESE 1")       'Set event enable bit for
                                      'operation complete bit
CALL IBWRT(analyzer%, "ABOR;INIT:IMM; *OPC") 'Start sweep and
                                             'synchronize to OPC
CALL WaitSRQ(boardID%,result%)        'Wait for service request
REM Continue main program.
END SUB
REM **************************************************************************
```

Service Request

The service request routine requires an extended initialization of the instrument in which the relevant bits of the transition and enable registers are set.
In order to use the service request function in conjunction with a National Instruments GPIB driver, the setting "Disable Auto Serial Poll" must be changed to "yes" by means of IBCONF.

Initiate Service Request

```
REM ---- Example of initialization of the SRQ in the case of errors --------
PUBLIC SUB SetupSRQ()

CALL IBWRT(analyzer%, "*CLS")                        'Reset status reporting system
CALL IBWRT(analyzer%,"*SRE 168")                     'Permit service request for
                                                     'STAT:OPER,STAT:QUES and ESR
                                                     'register
CALL IBWRT(analyzer%,"*ESE 60")                      'Set event enable bit for
                                                     'command, execution, device-
                                                     'dependent and query error
CALL IBWRT(analyzer%,"STAT:OPER:ENAB 32767")         'Set OPERation enable bit for
                                                     'all events
CALL IBWRT(analyzer%,"STAT:OPER:PTR 32767")          'Set appropriate OPERation
                                                     'Ptransition bits
CALL IBWRT(analyzer%,"STAT:QUES:ENAB 32767")         'Set questionable enable bits
                                                     'for all events
CALL IBWRT(analyzer%,"STAT:QUES:PTR 32767")          'Set appropriate questionable
                                                     'Ptransition bits
END SUB
REM ***********************************************************************
```

Waiting for the Arrival of a Service Request

There are basically two methods of waiting for the arrival of a service request:

1. **Blocking (user inputs not possible):**
   This method is appropriate if the waiting time until the event to be signalled by an SRQ is short (shorter than the selected timeout), if no response to user inputs is required during the waiting time, and if – as the main criterion – the event is absolutely certain to occur.
   Reason:
   From the time the WaitSRQ() function is called until the occurrence of the expected event, it does not allow the program to respond to mouse clicks or key entries during the waiting time. Moreover, it causes program abort if the SRQ event does not occur within the predefined timeout period. The method is, therefore, in many cases not suitable for waiting for measurement results, especially with triggered measurements.

   The following function calls are required:

```
CALL WaitSRQ(boardID%,result%)       'Wait for service request
                                     'User inputs are not possible
                                     'during the waiting time!
IF (result% = 1) THEN CALL Srq       'If SRQ is recognized =>
                                     'subroutine for evaluation
```

2. **Non-blocking (user inputs possible):**
   This method is recommended if the waiting time until the event to be signalled by an SRQ is long (longer than the selected timeout), and user inputs should be possible during the waiting time, or if the event is not certain to occur. This method is, therefore, the preferable choice for waiting for the end of measurements, i.e. the output of results, especially in the case of triggered measurements.

   The method necessitates a waiting loop that checks the status of the SRQ line at regular intervals and returns control to the operating system during the time the expected event has not yet occurred. In this way, the system can respond to user inputs (mouse clicks, key entries) during the waiting time.

   It is advisable to employ the Hold() auxiliary function, which returns control to the operating system for a selectable waiting time (see section "Waiting Without Blocking the Keyboard or Mouse"), so enabling user inputs during the waiting time.

```
 result% = 0
 For i = 1 To 10                      'Abort after max. 10 loop
                                      'iterations
   CALL TestSRQ(boardID%,result%)     'Check service request line
   If (result% <> 0) Then
       CALL Srq                       'If SRQ is recognized =>
                                        'subroutine for evaluation
   Else
       Call Hold(20)                  'Call hold function with
                                      '20 ms waiting time.
                                      'User inputs are possible.
   Endif
Next i
If result% = 0 Then
  PRINT "Timeout Error; Program aborted"' Output error message
  STOP                                    'Stop software
Endif
```

Waiting Without Blocking the Keyboard and Mouse

A frequent problem with remote control programs using Visual Basic is to insert waiting times without blocking the keyboard and the mouse.

If the program is to respond to user inputs also during a waiting time, control over the program events during this time must be returned to the operating system. In Visual Basic, this is done by calling the *DoEvents* function. This function causes keyboard- or mouse-triggered events to be executed by the associated elements. For example, it allows the operation of buttons and input fields while the user waits for an instrument setting to be completed.

The following programming example describes the *Hold()* function, which returns control to the operating system for the period of the waiting time selectable in milliseconds.

```
Rem **********************************************************************
Rem The waiting function below expects the transfer of the desired
Rem waiting time in milliseconds. The keyboard and the mouse remain
Rem operative during the waiting period, thus allowing desired elements
Rem to be controlled

Rem **********************************************************************
Public Sub Hold(delayTime As Single)

    Start = Timer       'Save timer count on calling the function

    Do While Timer < Start + delayTime / 1000   'Check timer count

      DoEvents          'Return control to operating system
                        'to enable control of desired elements as long as
                        'timer has not elapsed

    Loop

End Sub

Rem **********************************************************************
```

The waiting procedure is activated simply by calling *Hold(<Waiting time in milliseconds>)*.

Service Request Routine

A service request is processed in the service request routine.
Note: the variables userN% and userM% must be pre-assigned usefully!

```
REM ------------ Service request routine --------------------------------
Public SUB Srq()

ON ERROR GOTO noDevice                              'No user existing
CALL IBRSP(analyzer%, STB%)                         'Serial poll, read status byte
IF STB% > 0 THEN                                    'This instrument has bits set
                                                    'in the STB
     SRQFOUND% = 1
     IF (STB% AND 16)  > 0 THEN CALL Outputqueue
     IF (STB% AND 4)   > 0 THEN CALL ErrorQueueHandler
     IF (STB% AND 8)   > 0 THEN CALL Questionablestatus
     IF (STB% AND 128) > 0 THEN CALL Operationstatus
     IF (STB% AND 32)  > 0 THEN CALL Esrread
  END IF
noDevice:
END SUB                                                'End of SRQ routine
REM ***********************************************************************
```

Reading out the status event registers, the output buffer and the error/event queue is effected in subroutines.

Reading Out the Output Buffer

```
REM -------- Subroutine for the individual STB bits -----------------------
Public SUB Outputqueue()                            'Reading the output buffer

result$ = SPACE$(100)                               'Make space for response
CALL IBRD(analyzer%, result$)
PRINT "Contents of Output Queue : "; result$
END SUB
REM ***********************************************************************
```

Reading Out Error Messages

```
REM -------- Subroutine for reading the error queue -----------------------
Public SUB ErrorQueueHandler()
ERROR$ = SPACE$(100)                    'Make space for error variable
CALL IBWRT(analyzer%, "SYSTEM:ERROR?")
CALL IBRD(analyzer%, ERROR$)
PRINT "Error Description : "; ERROR$
END SUB
REM ***********************************************************************
```

Evaluation of SCPI Status Registers

```
REM ------ Subroutine for evaluating Questionable Status Register ---------
Public SUB Questionablestatus()
Ques$ = SPACE$(20)                  'Preallocate blanks to text variable
CALL IBWRT(analyzer%, "STATus:QUEStionable:EVENt?")
CALL IBRD(analyzer%, Ques$)
PRINT "Questionable Status: "; Ques$
END SUB
REM ***********************************************************************

REM ------ Subroutine for evaluating Operation Status Register ------------
Public SUB Operationstatus()
Oper$ = SPACE$(20)                  'Preallocate blanks to text variable
CALL IBWRT(analyzer%, "STATus:OPERation:EVENt?")
CALL IBRD(analyzer%, Oper$)
PRINT "Operation Status: "; Oper$
END SUB
REM ***********************************************************************
```

Evaluation of Event Status Register

```
REM ------ Subroutine for evaluating the Event Status Register ------------
Public SUB Esrread()
Esr$ = SPACE$(20)              'Preallocate blanks to text variable
CALL IBWRT(analyzer%, "*ESR?")                               'Read ESR
CALL IBRD(analyzer%, Esr$)
IF (VAL(Esr$) AND 1) > 0 THEN PRINT "Operation complete"
IF (VAL(Esr$) AND 2) > 0 THEN PRINT "Request Control"
IF (VAL(Esr$) AND 4) > 0 THEN PRINT "Query Error"
IF (VAL(Esr$) AND 8) > 0 THEN PRINT "Device dependent error"
IF (VAL(Esr$) AND 16) > 0 THEN
    PRINT "Execution Error; Program aborted"'  Output error message
    STOP                                       'Stop software
    END IF
IF (VAL(Esr$) AND 32) > 0 THEN
    PRINT "Command Error; Program aborted"'    Output error message
    STOP                                       'Stop software
    END IF
IF (VAL(Esr$) AND 64) > 0 THEN PRINT "User request"
IF (VAL(Esr$) AND 128) > 0 THEN PRINT "Power on"
END SUB
REM **********************************************************************
```

More Complex Programming Examples

Default Setting of the R&S FSMR

The following settings are an example of how to modify the default setting of the R&S FSMR.
It should be noted that only some settings are necessary depending on the example of application. In particular, the settings for resolution bandwidth, video bandwidth and sweep time are often not needed since these parameters are automatically calculated in the default setting on modifying the frequency range (span). The insertion loss is also automatically calculated depending on the reference level. The level detectors are coupled to the selected trace mode in the default setting.
The settings which are automatically calculated in the default setting are marked by (*) in the following programming example.

Setting the IEC/IEEE Bus Status Register

```
REM ************************************************************************
Public Sub SetupStatusReg()

'--------- IEEE 488.2 status register -------------------------------------
CALL IBWRT(analyzer%,"*CLS")                'Reset Status Registers
CALL IBWRT(analyzer%,"*SRE 168")            'Enable service request
                                            'for STAT:OPER-,STAT:QUES- and
                                            'ESR registers
CALL IBWRT(analyzer%,"*ESE 61")             'Set Event Enable bit for:
                                            'Operation Complete
                                            'Command-, Execution-,Device
                                            'Dependent- and Query Error
'--------- SCPI status register -------------------------------------------
CALL IBWRT(analyzer%,"STAT:OPER:ENAB 0")    'Disable OPERation Status Reg
CALL IBWRT(analyzer%,"STAT:QUES:ENAB 0")    'Disable Questionable Status
                                            'Register
End Sub
REM ************************************************************************
```

Default Setting for Measurements

```
REM ************************************************************************
Public Sub SetupInstrument()

'-------------------- R&S FSMR default setting -----------------------------
-----
CALL SetupStatusReg                             'Set status registers
CALL IBWRT(analyzer%,"*RST")                    'Reset instrument
CALL IBWRT(analyzer%,"SYST:DISP:UPD ON")        'ON: display on
                                                'OFF: off(improved
                                                '       performance)
CALL IBWRT(analyzer%,"DISP:FORM SINGle")        'Full screen
CALL IBWRT(analyzer%,"DISP:WIND1:SEL")          'Active screen A
CALL IBWRT(analyzer%,"INIT:CONT OFF")           'Single sweep
'--------- Set frequency ----------------------------------------------------
CALL IBWRT(analyzer%,"FREQUENCY:CENTER 100MHz")          'Center frequency
CALL IBWRT(analyzer%,"FREQ:SPAN 1 MHz")                  'Span
'--------- Set level --------------------------------------------------------
CALL IBWRT(analyzer%,"DISP:WIND:TRAC:Y:RLEV -20dBm")     'Reference level
CALL IBWRT(analyzer%,"INP:ATT 10dB")                     'Input attenuation (*)
'--------- Scale y axis -----------------------------------------------------
CALL IBWRT(analyzer%,"DISP:WIND:TRAC:Y:SPAC LOG")        'Log level axis
CALL IBWRT(analyzer%,"DISP:WIND:TRAC:Y:SCAL 100dB")      'Level range
CALL IBWRT(analyzer%,"DISP:WIND:TRAC:Y:SCAL:MODE ABS")   'Absolute scaling
CALL IBWRT(analyzer%,"CALC:UNIT:POW DBM")                'Unit of y axis
'--------- Trace and detector settings --------------------------------------
CALL IBWRT(analyzer%,"DISP:WIND:TRAC1:MODE AVER")        'Trace1 average
CALL IBWRT(analyzer%,"AVER:TYPE VID")                    'Average mode video;
                                                         '"LIN" for linear
CALL IBWRT(analyzer%,"SWE:COUN 10")                      'Sweep count
CALL IBWRT(analyzer%,"DISP:WIND:TRAC2:STAT OFF")         'Trace2 blank
CALL IBWRT(analyzer%,"DISP:WIND:TRAC3:STAT OFF")         'Trace3 blank
CALL IBWRT(analyzer%,"CALC:MATH:STAT OFF")               'Trace mathematics off
CALL IBWRT(analyzer%,"DETECTOR1 RMS")                    'Detector Trace1   (*)
CALL IBWRT(analyzer%,"DET2:AUTO ON")                     'Detector Trace2   (*)
CALL IBWRT(analyzer%,"DET3:AUTO ON")                     'Detector Trace3   (*)
'--------- Band width and sweep time ----------------------------------------
CALL IBWRT(analyzer%,"BAND:RES 100KHz")                  'Resolution BW (*)
CALL IBWRT(analyzer%,"BAND:VID 1MHz")                    'Video bandwidth   (*)
CALL IBWRT(analyzer%,"SWE:TIM 100ms")                    'Sweep time        (*)
END SUB
REM ************************************************************************
```

Using Marker and Delta Marker

Marker Search Functions, Limitation of Search Range

The example below is based on an AM-modulated signal at 100 MHz with the following characteristics:

- Carrier signal level: –30 dBm
- AF frequency: 100 kHz
- Modulation depth: 50 %

Marker 1 and delta marker 2 are set one after the other to the highest maxima of the measurement curve and then the frequency and level are read out. The default setting of the R&S FSMR can be used for the following measurements (SetupInstrument).

```
REM ************************************************************************
Public Sub MarkerSearch()

result$ = Space$(100)
CALL SetupInstrument                            'Default setting
'--------- Peak search without search limit --------------------------------
CALL IBWRT(analyzer%,"INIT:CONT OFF")           'Switch to single sweep
CALL IBWRT(analyzer%,"CALC:MARK:PEXC 6DB")      'Define peak excursion
CALL IBWRT(analyzer%,"CALC:MARK:STAT ON")       'Switch on Marker 1
CALL IBWRT(analyzer%,"CALC:MARK:TRAC 1")        'Assign Marker 1 to Trace 1
CALL IBWRT(analyzer%,"INIT;*WAI")               'Perform sweep with sync
CALL IBWRT(analyzer%,"CALC:MARK:MAX;X?;Y?")     'Marker to peak; read out
CALL IBRD(analyzer%, result$)                   'frequency and level
Print "Marker 1: ";result$
CALL IBWRT(analyzer%,"CALC:DELT2:STAT ON;MAX;MAX:LEFT")
                                                'Switch on delta marker 2
                                                'Peak and then Next Peak Left
CALL IBWRT(analyzer%,"CALC:DELT:MODE ABS")      'Delta marker2 frequency output
                                                'absolute
CALL IBWRT(analyzer%,"CALC:DELT2:X?;Y?")        'Delta marker 2 - read out
                                                'frequency and level
CALL IBRD(analyzer%, result$)
Print "Delta 2: ";result$

'--------- Peak search with search limit in x direction --------------------
CALL IBWRT(analyzer%,"CALC:MARK:X:SLIM:STAT ON;LEFT 0Hz;RIGHt 100.05MHz")
                                                'Search limit on and set below
                                                'LF on the right side
CALL IBWRT(analyzer%,"CALC:DELT3:STAT ON;MAX;MAX:RIGHt")
                                                'Delta marker 3 on
                                                'Peak and then Next Peak Right
CALL IBWRT(analyzer%,"CALC:DELT3:X?;Y?")        'Delta marker 3; Read out
                                                'frequency and level, both must
CALL IBRD(analyzer%, result$)                   'have the value 0
Print "Delta 3: ";result$
```

```
'--------- Peak search with search limit in y direction --------------------

CALL IBWRT(analyzer%,"CALC:THR:STAT ON")
CALL IBWRT(analyzer%,"CALC:THR -35DBM")      'Threshold on and set above LF

CALL IBWRT(analyzer%,"CALC:DELT3:STAT ON;MAX;MAX:NEXT")
                                             'Delta marker 3 on
                                             'Peak and then Next Peak
                                             ' => is not found

CALL IBWRT(analyzer%,"CALC:DELT3:X:REL?;:CALC:DELT3:Y?")
CALL IBRD(analyzer%, result$)                'Delta marker 3; read out
                                             'frequency and level, both must
                                             'have the value 0

Print "Delta 3: ";result$


'---- Set center frequency and reference level by means of markers ---------

CALL IBWRT(analyzer%,"CALC:MARK2:FUNC:CENT") 'Delta marker 2 -> Marker and
                                             'center frequency = Marker 2

CALL IBWRT(analyzer%,"CALC:MARK2:FUNC:REF")  'Ref level = Marker 2

Call ibwrt(analyzer%,"INIT;*WAI")            'Perform sweep with sync

END SUB

REM ***********************************************************************
```

Measuring Spurious Emissions

In transmission measurements, it is often necessary to search a large frequency range for unwanted spurious emissions.

This can be done by means of the R&S FSMR's LIST PEAKS function, which finds up to 50 peaks in a preselected frequency range and outputs them as a list. The search range can be defined both in terms of frequency and level, and the number of peaks to be found is selectable as well.

In the following example, the 10 highest peaks are to be found in a preselected frequency range. Only signals >-60 dBm in a range ± 400 kHz about the center frequency are of interest, so the search range is limited accordingly. The signals found are output in the order of ascending frequency.

```
REM ***************************************************************************
Public Sub SpuriousSearch()

powerlist$ = Space$(1000)
freqlist$ = Space$(1000)
count$ = Space$(30)
'--------- R&S FSMR default setting ----------------------------------------
CALL SetupInstrument                            'Default setting
CALL IBWRT(analyzer%,"INIT:CONT OFF")           'Default setting
'--------- Definition of search range ---------------------------------
CALL IBWRT(analyzer%,"CALC:MARK:X:SLIM:STAT ON")
CALL IBWRT(analyzer%,"CALC:MARK:X:SLIM:LEFT 99.6MHz;RIGHt 100.4MHz")
                                                'Activate search limit and
                                                'set to ±400 kHz about
                                                'center frequency
CALL IBWRT(analyzer%,"CALC:THR:STAT ON")
CALL IBWRT(analyzer%,"CALC:THR -60DBM")         'Activate threshold and
                                                'set to -60 dBm
'--------- Activate search for spurious -------------------------------------
CALL IBWRT(analyzer%,"CALC:MARK:FUNC:FPE:SORT X")        'Sort according to
                                                         'frequency
CALL IBWRT(analyzer%,"INIT;*WAI")               'Perform sweep with sync
CALL IBWRT(analyzer%,"CALC:MARK:FUNC:FPE 10")            'Search for
                                                         '10 highest peaks
CALL IBWRT(analyzer%,"CALC:MARK:FUNC:FPE:COUN?")         'Call number of
                                                         'peaks, check it,
CALL IBRD(analyzer%, count$)                       'and read it in
CALL IBWRT(analyzer%,"CALC:MARK:FUNC:FPE:X?")      'Query and read
CALL IBRD(analyzer%, freqlist$)                    'frequency list
CALL IBWRT(analyzer%,"CALC:MARK:FUNC:FPE:Y?")      'Query and read
CALL IBRD(analyzer%, powerlist$)                   'level list
Print "# of spurious: ";count$                  'Output number of results
Print "Frequencies: ";freqlist$                 'Output frequency list
Print "Power: ";powerlist$                      'Output level list
END SUB
REM ***************************************************************************
```

Frequency Counting

The following example is based on a signal with a level of –30 dBm at 100 MHz. The default setting of the R&S FSMR can also be used for this measurement (SetupInstrument). The objective of frequency counting is to determine the exact frequency of the signal at 100 MHz.

```
REM ***************************************************************************
Public Sub MarkerCount()

result$ = Space$(100)
CALL SetupInstrument                                'Default setting
'--------- Measure signal frequency with frequency counter -----------------
CALL IBWRT(analyzer%,"INIT:CONT OFF")               'Single sweep on
CALL IBWRT(analyzer%,"CALC:MARK:PEXC 6DB")          'Peak excursion
CALL IBWRT(analyzer%,"CALC:MARK:STAT ON")           'Marker 1 on
CALL IBWRT(analyzer%,"CALC:MARK:TRAC 1")            'Assign marker 1 to trace 1
CALL IBWRT(analyzer%,"CALC:MARK:X 100MHz")          'Set marker 1 to 100 MHz
CALL IBWRT(analyzer%,"CALC:MARK:COUNT:RES 1HZ")     'Frequency counter 1 Hz
CALL IBWRT(analyzer%,"CALC:MARK:COUNT ON")          'frequency counter on
CALL IBWRT(analyzer%,"INIT;*WAI")                   'Perform sweep with sync
CALL IBWRT(analyzer%,"CALC:MARK:COUNT:FREQ?")       'Query measured frequency
CALL IBRD(analyzer%, result$)                       'and read it out
Print "Marker Count Freq: ";result$
END SUB
REM ***************************************************************************
```

Operation with Fixed Reference Point (Reference Fixed)

The following example is based on a signal with a level of –20 dBm at 100 MHz. The harmonics of the signal lie at 200 MHz, 300 MHz, etc. In the presence of high-quality signal sources these harmonics may be outside the dynamic range of the R&S FSMR. In order to measure harmonic suppression, however, the level must be set to higher sensitivity for measuring the harmonics; the carrier has to be suppressed by a notch filter to avoid overloading the R&S FSMR RF input.

In the following example, two measurements are therefore performed with different level settings, first with a high reference level at the carrier frequency and then with a low reference level at the frequency of the 3rd harmonic.

The default setting of the R&S FSMR for measurements (SetupInstrument) is used as starting point and adaptations are then made for the measurement.

```
REM ************************************************************************
Public Sub RefFixed()

result$ = Space$(100)
CALL SetupInstrument                                  'Default setting
'--------------- Measure the reference point -------------------------------
CALL IBWRT(analyzer%,"INIT:CONT OFF")                 'Single sweep
CALL IBWRT(analyzer%,"CALC:MARK:PEXC 6DB")            'Peak Excursion
CALL IBWRT(analyzer%,"CALC:MARK:STAT ON")             'Marker1 on
CALL IBWRT(analyzer%,"CALC:MARK:TRAC 1")              'Assign Marker 1 to Trace 1
CALL IBWRT(analyzer%,"INIT;*WAI")                     'Perform sweep with sync
CALL IBWRT(analyzer%,"CALC:MARK:MAX")                 'Set Marker1 to 100 MHz
CALL IBWRT(analyzer%,"CALC:DELT:FUNC:FIX ON")         'Reference fixed
'-----Setting frequency, level and bandwidth for harmonic measurement ----
CALL IBWRT(analyzer%,"FREQ:CENT 400MHz;Span 1MHz" )'Set freq. of 3rd harmonic
CALL IBWRT(analyzer%,"BAND:RES 1kHz")                   'and appropriate RBW
CALL IBWRT(analyzer%,"SWEEP:TIME:AUTO ON")              'Couple sweep time
CALL IBWRT(analyzer%,"INP:ATT:AUTO ON")                 'Optimize level
CALL IBWRT(analyzer%,"DISP:WIND:TRAC:Y:RLEV -50dBm")
CALL IBWRT(analyzer%,"INIT;*WAI")                     'Perform sweep with sync
CALL IBWRT(analyzer%,"CALC:DELT:MODE REL")            'Delta marker frequency
                                                      'relative
CALL IBWRT(analyzer%,"CALC:DELT:MAX;X?;Y?")           'Read out delta marker
Call ibrd(analyzer%, result$)                         'Read out frequency and level
Print "Deltamarker 1: "; result$
END SUB
REM ************************************************************************
```

Phase and Phase Noise Measurement

During phase noise measurement the noise power referred to 1 Hz is brought into proportion to the power of an adjacent carrier signal. The spacing often used between the measured frequency and the carrier frequency is 10 kHz.

For the noise measurement the measured absolute level is referred to a bandwidth of 1 Hz.

The following example is again based on a signal with a level of –30 dBm at 100 MHz. Two markers are used to determine the noise and the phase noise at an offset of 10 kHz from the carrier signal.

```
REM ************************************************************************
Public Sub Noise()

result$ = Space$(100)
'--------- R&S FSMR default setting ---------------------------------------
----
CALL SetupStatusReg                             'Configure status register
CALL IBWRT(analyzer%,"*RST")                    'Reset instrument
CALL IBWRT(analyzer%,"INIT:CONT OFF")           'Single sweep
'--------- Set frequency --------------------------------------------------
CALL IBWRT(analyzer%,"FREQUENCY:CENTER 100MHz")        'Center frequency
CALL IBWRT(analyzer%,"FREQ:SPAN 100 kHz")              'Span
'--------- Set level ------------------------------------------------------
CALL IBWRT(analyzer%,"DISP:WIND:TRAC:Y:RLEV -20dBm")   'Reference level
CALL IBWRT(analyzer%,"INIT;*WAI")                 'Perform sweep with sync
'--------- Set reference point --------------------------------------------
CALL IBWRT(analyzer%,"CALC:MARK:PEXC 6DB")        'Peak excursion
CALL IBWRT(analyzer%,"CALC:MARK:STAT ON")         'Marker 1 on
CALL IBWRT(analyzer%,"CALC:MARK:TRAC 1")          'Assign marker1 to trace1
CALL IBWRT(analyzer%,"CALC:MARK:MAX")             'Set marker1 to 100 MHz
CALL IBWRT(analyzer%,"CALC:DELT:FUNC:PNO ON")     'Define phase noise
                                                  'reference point
'--------- Measure phase noise --------------------------------------------
CALL IBWRT(analyzer%,"CALC:DELT:X 10kHz")         'Set delta marker
CALL IBWRT(analyzer%,"CALC:DELT:FUNC:PNO:RES?")'Read out result of
Call ibrd(analyzer%, result$)                     'phase noise meas.
Print "Phase Noise [dBc/Hz]: "; result$
'--------- Measure noise --------------------------------------------------
CALL IBWRT(analyzer%,"CALC:MARK:X 99.96MHz")      'Set Marker 1
CALL IBWRT(analyzer%,"CALC:MARK:FUNC:NOIS:RES?")'Read out result
Call ibrd(analyzer%, result$)
Print "Noise [dBm/Hz]: "; result$
END SUB
REM ************************************************************************
```

Shape Factor Measurement (using n dB down)

The n-dB-down function of the R&S FSMR is used twice to determine the shape factor of a filter (ratio of bandwidths at 60 dB and 3 dB below the filter maximum).

The following example is again based on a signal with a level of –30 dBm at 100 MHz. The shape factor is determined for the 30 kHz resolution bandwidth. The default setting of the R&S FSMR is used for measurements (SetupInstrument).

```
REM ***************************************************************************
Public Sub ShapeFactor()

result$ = Space$(100)
'--------- R&S FSMR default setting ----------------------------------------
-
CALL SetupInstrument                                 'Default setting
CALL IBWRT(analyzer%,"INIT:CONT OFF")                'Single sweep
'--------- Set frequency ---------------------------------------------------
CALL IBWRT(analyzer%,"FREQ:SPAN 1MHz")               'Span
CALL IBWRT(analyzer%,"BAND:RES 30kHz")               'Resolution bandwidth
CALL IBWRT(analyzer%,"INIT;*WAI")                    'Perform sweep with sync
'--------- Measure 60 dB value ---------------------------------------------
CALL IBWRT(analyzer%,"CALC:MARK:PEXC 6DB")           'Peak excursion
CALL IBWRT(analyzer%,"CALC:MARK:STAT ON")            'Marker1 on
CALL IBWRT(analyzer%,"CALC:MARK:TRAC 1")             'Assign marker1 to trace1
CALL IBWRT(analyzer%,"CALC:MARK:MAX")                'Set marker1 to 100 MHz
CALL IBWRT(analyzer%,"CALC:MARK:FUNC:NDBD 60dB")'Read out bandwidth measured
CALL IBWRT(analyzer%,"CALC:MARK:FUNC:NDBD:RES?")'at 60 dB
CALL IBRD(analyzer%,result$)
result60 = Val(result$)
'--------- Measure 3 dB Down value  ----------------------------------------
CALL IBWRT(analyzer%,"CALC:MARK:FUNC:NDBD 3dB")'Read out bandwidth measured
CALL IBWRT(analyzer%,"CALC:MARK:FUNC:NDBD:RES?")'at 60 dB
CALL IBRD(analyzer%,result$)
result3 = Val(result$)
'--------- Read out shape factor--------------------------------------------
Print "Shapefaktor 60dB/3dB: ";result60/result3
END SUB
REM ***************************************************************************
```

Measuring the Third Order Intercept Point

The third order intercept point (TOI) is the (virtual) level of two adjacent useful signals at which the intermodulation products of third order have the same level as the useful signals.

The intermodulation product at f_{S2} is obtained by mixing the first harmonic of the useful signal P_{N2} with signal P_{N1}, the intermodulation product at f_{S1} by mixing the first harmonic of the useful signal P_{N1} with signal P_{N2}.

$f_{s1} = 2 \times f_{n1} - f_{n2}$ (1)

$f_{s2} = 2 \times f_{n2} - f_{n1}$ (2)

The following example is based on two adjacent signals with a level of –30 dBm at 100 MHz and 110 MHz. The intermodulation products lie at 90 MHz and 120 MHz according to the above formula. The frequency is set so that the examined mixture products are displayed in the diagram. Otherwise, the default setting of the R&S FSMR is used for measurements (SetupInstrument).

```
REM ************************************************************************
Public Sub TOI()

result$ = Space$(100)
'--------- R&S FSMR default setting ----------------------------------------
----
CALL SetupStatusReg                         'Set status registers
CALL IBWRT(analyzer%,"*RST")                'Reset instrument
CALL IBWRT(analyzer%,"INIT:CONT OFF")       'Single sweep
CALL IBWRT(analyzer%,"SYST:DISP:UPD ON")    'ON: display on
                                            'OFF: off
'--------- Set frequency ---------------------------------------------------
CALL IBWRT(analyzer%,"FREQ:STARt 85MHz;STOP 125 MHz")  'Span
'--------- Set level -------------------------------------------------------
CALL IBWRT(analyzer%,"DISP:WIND:TRAC:Y:RLEV -20dBm")   'Reference level
CALL IBWRT(analyzer%,"INIT;*WAI")              'Perform sweep with sync
'--------- TOI measurement -------------------------------------------------
CALL IBWRT(analyzer%,"CALC:MARK:PEXC 6DB")     'Peak excursion
CALL IBWRT(analyzer%,"CALC:MARK:FUNC:TOI ON")  'Switch on TOI measurement
CALL IBWRT(analyzer%,"CALC:MARK:FUNC:TOI:RES?") 'and read out results
CALL IBRD(analyzer%,result$)
'--------- Read out result ------------------------------------------------
Print "TOI [dBm]: ";result$
END SUB
REM ************************************************************************
```

Measuring the AM Modulation Depth

The example below is based on an AM-modulated signal at 100 MHz with the following characteristics:

- Carrier signal level: –30 dBm
- AF frequency: 100 kHz
- Modulation depth: 50 %

The default setting of the analyzer for measurements can be used for the measurements described below (SetupInstrument).

```
REM ************************************************************************
Public Sub AMMod()

result$ = Space$(100)
CALL SetupInstrument                            'Default setting
'--------- Peak search -------------------------------------------------------
CALL IBWRT(analyzer%,"INIT:CONT OFF")           'Single sweep
CALL IBWRT(analyzer%,"INIT;*WAI")               'Perform sweep with sync
CALL IBWRT(analyzer%,"CALC:MARK:PEXC 6DB")      'Peak excursion
CALL IBWRT(analyzer%,"CALC:MARK:STAT ON")       'Marker 1 on
CALL IBWRT(analyzer%,"CALC:MARK:TRAC 1")        'Assign marker1 to trace1
'--------- Measure modulation depth-------------------------------------------
CALL IBWRT(analyzer%,"CALC:MARK:MAX;FUNC:MDEP ON") 'Marker to Peak;
CALL IBWRT(analyzer%,"CALC:MARK:FUNC:MDEP:RES?")   'Measure mod. depth
CALL IBRD(analyzer%, result$)                      'Read out result
'--------- Read out result ---------------------------------------------------
Print "AM Mod Depth [%]: ";result$
END SUB
REM ************************************************************************
```

Limit Lines and Limit Test

The example below shows the definition and use of a new limit line 5 for trace 1 on screen A and trace 2 on screen B with the following characteristics:

- Upper limit line
- Absolute x axis in the frequency range
- 5 reference values: 120 MHz / -70 dB, 126 MHz/-40 dB, 127 MHz/-40 dB, 128 MHz/-10 dB, 129 MHz/-40 dB, 130 MHz/-40 dB, 136 MHz / -70 dB
- Relative y axis with unit dB
- Absolute threshold at -75 dBm
- No margin

The signal of the integrated calibration source (128 MHz, -30 dBm) is used to check the limit test.

```
REM ************************************************************************
Public Sub LimitLine()

result$ = Space$(100)
'--------- R&S FSMR default setting -----------------------------------------
----
CALL SetupInstrument                                 'Default setting
CALL IBWRT(analyzer%,"FREQUENCY:CENTER 128MHz;Span 10MHz")'Span
Call ibwrt(analyzer%,"Diag:Serv:Inp Cal;CSO -30dBm")  'Cal signal on
'--------- Definition of limit lines ----------------------------------------
CALL IBWRT(analyzer%,"CALC:LIM5:NAME 'TEST1'")        'Define name
CALL IBWRT(analyzer%,"CALC:LIM5:COMM 'Upper limit'")  'Define comment
CALL IBWRT(analyzer%,"CALC1:LIM5:TRAC 1")       'Assign trace in screen A
CALL IBWRT(analyzer%,"CALC2:LIM5:TRAC 2")       'Assign trace in screen B
CALL IBWRT(analyzer%,"CALC:LIM5:CONT:DOM FREQ")'Define x axis range
CALL IBWRT(analyzer%,"CALC:LIM5:CONT:MODE ABS")'Define x axis scaling
CALL IBWRT(analyzer%,"CALC:LIM5:UNIT DB")       'Define y axis unit
CALL IBWRT(analyzer%,"CALC:LIM5:UPP:MODE REL")  'Define y axis scaling
'--------- Definition of data points and threshold -------------------------
xlimit$ = "CALC:LIM5:CONT 120MHZ,126MHZ,127MHZ,128MHZ,129MHZ,130MHz,136MHz"
CALL IBWRT(analyzer%, xlimit$)                  'Set values for x axis
CALL IBWRT(analyzer%,"CALC:LIM5:UPP –70,-40,-40,-20,-40,-40,-70")
                                                'Set values for y axis


CALL IBWRT(analyzer%,"CALC:LIM5:UPP:THR -75DBM") 'Set y threshold (only
                                                 'possible for relative
                                                 'y axis)
'---------------------------------------------------------------------------
'A margin or an x /y offset can be defined here.

'----------- Activate and evaluate the limit line in screen A -------------
CALL IBWRT(analyzer%,"CALC1:LIM5:UPP:STAT ON")  'Activate line 5 in screen A
CALL IBWRT(analyzer%,"CALC1:LIM5:STAT ON")      'Activate limit check in
                                                'screen A
CALL IBWRT(analyzer%,"INIT;*WAI")               'Perform sweep with sync
```

```
CALL IBWRT(analyzer%,"CALC1:LIM5:FAIL?")        'Query result of limit
                                                'check
CALL IBRD(analyzer%, result$)                   'Result: 1 (= FAIL)
'--------- Read out result -----------------------------------------------------
Print "Limit Result Line 5: ";result$

'------ Evaluate limit line in screen A by means of status register -------
CALL IBWRT(analyzer%,"*CLS")                   'Reset status register
'--------- Measure --------------------------------------------------------------
CALL IBWRT(analyzer%,"INIT;*OPC")              'Perform sweep with sync
CALL WaitSRQ(boardID%,status%)                 'Wait for service request
'--------- Read out result -----------------------------------------------------
IF (status% = 1) THEN
   CALL IBWRT(analyzer%,"STAT:QUES:LIM1:COND?") 'Read out STAT:QUES:LIMit
   CALL IBRD(analyzer%, result$)                'register
   IF ((Val(result$) And 16) <> 0) THEN
      Print "Limit5 failed"
   ELSE
      Print "Limit5 passed"
   END IF
END IF
END SUB
REM ***********************************************************************
```

Measuring the Channel and Adjacent Channel Power

In the following example, the channel and adjacent channel power is first measured on a signal with a level of 0 dBm at 800 MHz to IS95. Then the channel and adjacent channel power is measured on a GSM signal at 935.2 MHz with fast ACP measurement (FAST ACP).

In addition, the limit test is activated.

```
REM ************************************************************************
Public Sub ACP()

result$ = Space$(100)
'--------- R&S FSMR default setting ----------------------------------------
----
CALL SetupStatusReg                           'Set status register
CALL IBWRT(analyzer%,"*RST")                  'Reset instrument
CALL IBWRT(analyzer%,"INIT:CONT OFF")         'Single sweep
CALL IBWRT(analyzer%,"SYST:DISP:UPD ON")      'ON: display on
                                              'OFF: off
'--------- Set frequency ---------------------------------------------------
CALL IBWRT(analyzer%,"FREQ:CENT 800MHz")        'Set frequency
'--------- Set level -------------------------------------------------------
CALL IBWRT(analyzer%,"DISP:WIND:TRAC:Y:RLEV 10dBm")    'Reference level

'--------- Example 1: Configure CP/ACP for CDMA  ---------------------------
CALL IBWRT(analyzer%,"CALC2:MARK:FUNC:POW:SEL ACP")    'ACP measurement on
CALL IBWRT(analyzer%,"CALC:MARK:FUNC:POW:PRES F8CDMA") 'Select CDMA800 FWD
CALL IBWRT(analyzer%,"SENS:POW:ACH:ACP 2")      'Select 2 adjacent channels
CALL IBWRT(analyzer%,"SENS:POW:ACH:PRES ACP")   'Optimize settings
CALL IBWRT(analyzer%,"SENS:POW:ACH:PRES:RLEV")  'Optimize reference level
CALL IBWRT(analyzer%,"SENS:POW:ACH:MODE ABS")   'Absolute measurement
CALL IBWRT(analyzer%,"SENS:POW:HSP ON")         'Fast ACP measurement
'--------- Perform measurement and query results --------------------------
CALL IBWRT(analyzer%,"INIT;*WAI")               'Perform sweep with sync
CALL IBWRT(analyzer%,"CALC2:MARK:FUNC:POW:RES? ACP")   'Query result
CALL IBRD(analyzer%, result$)
'--------- Read out result -------------------------------------------------
Print "Result (CP, ACP low, ACP up, Alt low, Alt up): "
Print result$
```

```
'--------- Example 2: Configure CP/ACP manually for GSM -------------------
result$ = Space$(100)
CALL IBWRT(analyzer%,"FREQ:CENT 935.2MHz")     'Set frequency
CALL IBWRT(analyzer%,"CALC:MARK:FUNC:POW:SEL ACP")  'ACP measurement on
CALL IBWRT(analyzer%,"SENS:POW:ACH:ACP 1")          '1 adjacent channel
CALL IBWRT(analyzer%,"SENS:POW:ACH:BAND 200KHZ")    'Channel bandw. 200 kHz
CALL IBWRT(analyzer%,"SENS:POW:ACH:BAND:ACH 200KHZ")'Adjacent channel band-
                                                    'width 200 kHz
CALL IBWRT(analyzer%,"SENS:POW:ACH:SPAC 200KHZ")    'Channel spacing 200 kHz
CALL IBWRT(analyzer%,"SENS:POW:ACH:PRES ACP")  'Optimize settings
CALL IBWRT(analyzer%,"SENS:POW:ACH:PRES:RLEV") 'Optimize reference level
CALL IBWRT(analyzer%,"SENS:POW:ACH:MODE ABS")  'Absolute measurement
'--------- Start measurement and query result ------------------------------
CALL IBWRT(analyzer%,"INIT;*WAI")              'Perform sweep with sync
CALL IBWRT(analyzer%,"CALC:MARK:FUNC:POW:RES? ACP")   'Query result
CALL IBRD(analyzer%, result$)
'--------- Read out result -------------------------------------------------
Print "Result (CP, ACP low, ACP up): "
Print result$
'--------- Active limit check ----------------------------------------------
result$ = Space$(100)
CALL IBWRT(analyzer%,"CALC:LIM:ACP:ACH 30DB, 30DB")   'Set relative limit
CALL IBWRT(analyzer%,"CALC:LIM:ACP:ACH:ABS -35DBM,-35DBM")
                                                      'Set absolute limit
CALL IBWRT(analyzer%,"CALC:LIM:ACP:ACH:STAT ON")      'Rel. limit check on
CALL IBWRT(analyzer%,"CALC:LIM:ACP:ACH:ABS:STAT ON")  'Abs. limit check on
CALL IBWRT(analyzer%,"CALC:LIM:ACP ON")               'Limit check on
'--------- Start measurement and query result ------------------------------
CALL IBWRT(analyzer%,"INIT;*WAI")                     'Perform sweep with
sync
CALL IBWRT(analyzer%,"CALC:LIM:ACP:ACH:RES?")         'Query result of
CALL IBRD(analyzer%, result$)                         'limit check
'--------- Read out result -------------------------------------------------
Print "Result Limit Check: ";result$
END SUB
REM ***********************************************************************
```

Occupied Bandwidth Measurement

In the following example, the bandwidth is to be found in which 95% of the power of a GSM signal is contained. Signal frequency is 935,2 MHz; channel bandwidth is 200 kHz.

```
REM ************************************************************************
Public Sub OBW()

result$ = Space$(100)
'--------- R&S FSMR default setting ----------------------------------------
-----
CALL SetupStatusReg                             'Set status register
CALL IBWRT(analyzer%,"*RST")                    'Reset instrument
CALL IBWRT(analyzer%,"INIT:CONT OFF")           'Single sweep
CALL IBWRT(analyzer%,"SYST:DISP:UPD ON")        'ON: display on
                                                'OFF: off
'--------- Configure R&S FSMR for OBW for GSM  -----------------------------
CALL IBWRT(analyzer%,"FREQ:CENT 935.2MHz")            'Set frequency
CALL IBWRT(analyzer%,"CALC:MARK:FUNC:POW:SEL OBW")  'OBW measurement on
CALL IBWRT(analyzer%,"SENS:POW:ACH:BAND 200KHZ")    'Channel bandw. 200 kHz
CALL IBWRT(analyzer%,"SENS:POW:BWID 95PCT")     'Percentage of power
CALL IBWRT(analyzer%,"SENS:POW:ACH:PRES OBW")   'Set frequency and
CALL IBWRT(analyzer%,"SENS:POW:ACH:PRES:RLEV")  'optimize reference level
CALL IBWRT(analyzer%,"SENS:POW:NCOR OFF")       'Noise correction
                                                'OFF: switch off
                                                'ON:  switch on
'--------- Perform measurement and query results ---------------------------
CALL IBWRT(analyzer%,"INIT;*WAI")               'Perform sweep with sync
CALL IBWRT(analyzer%,"CALC:MARK:FUNC:POW:RES? OBW")   'Query result
CALL IBRD(analyzer%, result$)
Print result$
END SUB
REM ************************************************************************
```

Time Domain Power Measurement

In the following example, the mean carrier power of a signal with 300 kHz bandwidth at 100 MHz is to be determined. In addition, the peak power, the rms value and the standard deviation are measured. To do this, the time-domain-power measurement functions are used.

```
REM ************************************************************************
Public Sub TimeDomainPower()

result$ = Space$(100)
'--------- R&S FSMR default setting ----------------------------------------
----
CALL SetupStatusReg                          'Set status register
CALL IBWRT(analyzer%,"*RST")                 'Reset instrument
CALL IBWRT(analyzer%,"INIT:CONT OFF")        'Single sweep
CALL IBWRT(analyzer%,"SYST:DISP:UPD ON")     'ON: display on
                                             'OFF: off
'--------- Configure R&S FSMR for time domain power measurement ------------
CALL IBWRT(analyzer%,"FREQ:CENT 100MHz;SPAN 0Hz")   'Set frequency
CALL IBWRT(analyzer%,"BAND:RES 300kHz")             'Resolution bandwidth
CALL IBWRT(analyzer%,"SWE:TIME 200US")              'Sweep time
CALL IBWRT(analyzer%,"CALC:MARK:FUNC:SUMM:PPE ON")  'Peak measurement on
CALL IBWRT(analyzer%,"CALC:MARK:FUNC:SUMM:MEAN ON") 'Mean measurement on
CALL IBWRT(analyzer%,"CALC:MARK:FUNC:SUMM:RMS ON")  'RMS measurement on
CALL IBWRT(analyzer%,"CALC:MARK:FUNC:SUMM:SDEV ON") 'Standard deviation on
'------------------- Perform measurement and query results ----------------
CALL IBWRT(analyzer%,"INIT;*WAI")                   'Perform sweep with sync
                                                    'Query results:
query$ =           " CALC:MARK:FUNC:SUMM:PPE:RES?;"  'Peak measurement
query$ = query$ + ":CALC:MARK:FUNC:SUMM:MEAN:RES?;" 'Mean measurement
query$ = query$ + ":CALC:MARK:FUNC:SUMM:RMS:RES?;"  'RMS measurement
query$ = query$ + ":CALC:MARK:FUNC:SUMM:SDEV:RES?"  'Standard deviation
Call IBWRT(analyzer%, query$)
CALL IBRD(analyzer%, result$)
Print result$
END SUB
REM ************************************************************************
```

Fast Power Measurement on Power Ramps

A frequent task in mobile radio tests is measurement of a DUT at various power control levels at the highest possible speed. The R&S FSMR offers two test functions for this task, which can be used depending on the signal characteristics.

In the following, the two methods are presented by means of two examples.

Power Measurement with Multi-Summary Marker

The multi-summary marker function is suitable for measuring the power of a sequence of pulses with the following characteristics:

- The pulses occur at identical time intervals, which is typical of GSM transmission in slots, for example.
- The level of the first signal is reliably above threshold.
- The subsequent pulses may have any levels.

The function uses the first pulse as a trigger signal. The power of the subsequent pulses is determined exclusively via the timing pattern selected for the pulse sequence. The function is, therefore, suitable for adjustments where the DUT output power varies considerably and is not reliably above the trigger threshold.

The measurement accuracy is determined by the ratio of pulse duration to total measurement time; this should not be below 1:50.

The function always uses TRACE 1 of the selected screen.

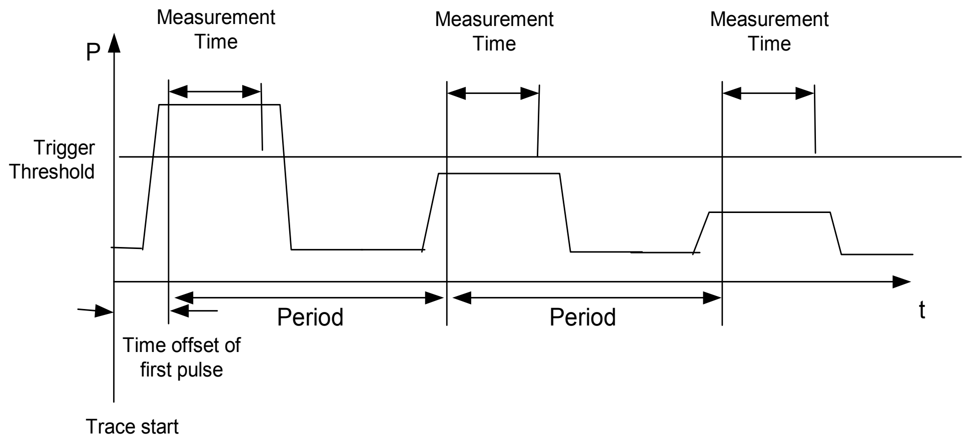


Fig. 7-1 Block diagram illustrating signal processing in analyzer

In the example below, a sequence of 8 pulses is measured with an offset of 50 µs of the first pulse, 450 µs measurement time/pulse and 576.9 µs pulse period.

```
REM ************************************************************************
Public Sub MultiSumMarker()

result$ = Space$(200)
'--------- R&S FSMR default setting--------------------------------------
CALL SetupStatusReg                          'Configure status register
CALL IBWRT(analyzer%,"*RST")                 'Reset instrument
CALL IBWRT(analyzer%,"INIT:CONT OFF")        'Single sweep mode
CALL IBWRT(analyzer%,"SYST:DISP:UPD ON")     'ON:  switch display on
                                             'OFF: switch display off
'--------- Configure R&S FSMR for power measurement in time domain ---------
-----
CALL IBWRT(analyzer%,"FREQ:CENT 935.2MHz;SPAN 0Hz")   'Frequency setting
CALL IBWRT(analyzer%,"DISP:WIND:TRAC:Y:RLEV 10dBm")   'Set reference level
                                                      'to 10 dB
CALL IBWRT(analyzer%,"INP:ATT 30 dB")           'Set input attenuation
                                                'to 30 dB
CALL IBWRT(analyzer%,"BAND:RES 1MHz;VID 3MHz")  'Bandwidth setting
CALL IBWRT(analyzer%,"DET RMS")                 'Select RMS detector
CALL IBWRT(analyzer%,"TRIG:SOUR VID")           'Trigger source: video
CALL IBWRT(analyzer%,"TRIG:LEV:VID 50 PCT")     'Trigger threshold: 50%
CALL IBWRT(analyzer%,"SWE:TIME 50ms")           'Sweep time ≥ 1 frame
'--------- Perform measurement and query results --------------------------
CALL IBWRT(analyzer%,"INIT;*WAI")            'Perform sweep with sync
                                             'Query results:
cmd$ = "CALC:MARK:FUNC:MSUM? "
cmd$ = cmd$ + "50US,"           'Offset of first pulse
cmd$ = cmd$ + "450US,"          'Measurement time
cmd$ = cmd$ + "576.9US,"        'Pulse period
cmd$ = cmd$ + "8"               'Number of bursts
CALL IBWRT(analyzer%,cmd$)
CALL IBRD(analyzer%, result$)                'Read results
Print result$
END SUB
REM ************************************************************************
```

Multi-Burst Power Measurement

The multi-burst power measurement function is suitable for measuring the power of a sequence of pulses with the following characteristics:

- The pulses occur at variable time intervals.
- The levels of all pulses of the sequence are reliably above the trigger threshold, or an external trigger signal is used.

The function requires one trigger event per pulse. This means that if the video trigger or the IF power trigger is used, the levels of all pulses must be above the trigger threshold.

The function is, therefore, particularly suitable for re-measuring DUTs already adjusted and whose output power is within the specified range. The measurement is optimized for minimum overhead relative to the actual measurement time.

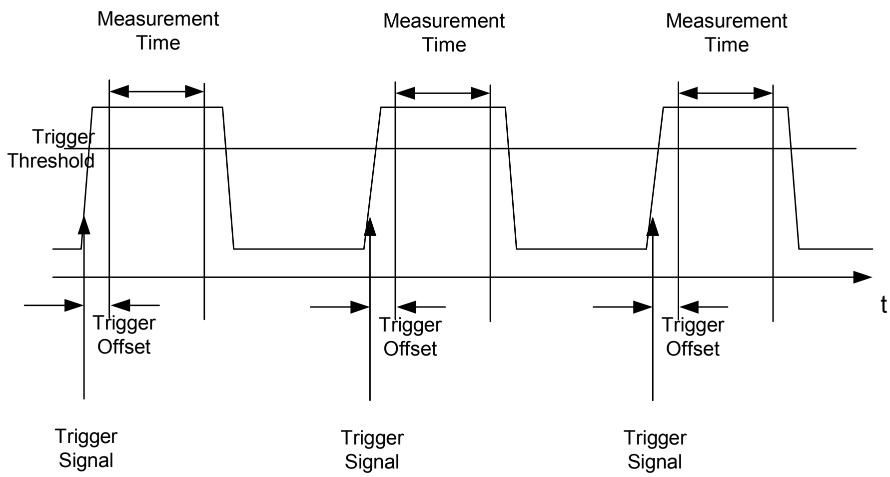


Fig. 7-2 Block diagram illustrating signal processing in analyzer

Either the root-mean-square power or the peak power is measured, depending on whether the RMS detector or the PEAK detector is selected. The function always uses TRACE 1 of the selected screen.

The following parameters are to be set for this measurement:

- Analyzer frequency
- Resolution bandwidth
- Measurement time per single pulse
- Trigger source
- Trigger threshold
- Trigger offset
- Type of power measurement (PEAK, MEAN)
- Number of pulses to be measured

During the measurement, each pulse is mapped into a pixel of the screen, i.e. any change of the trace can be detected only at the left-hand edge of the screen. Maximum measurement speed is as usual achieved with the display switched off.

In the example below, a GSM pulse sequence of 8 pulses is measured with 5 µs trigger offset, 434 µs measurement time/pulse, video trigger with 50% trigger threshold, and peak detection:

```
REM ************************************************************************
Public Sub MultiBurstPower()

result$ = Space$(200)
'--------- R&S FSMR default setting ----------------------------------------
-----
CALL SetupStatusReg                             'Configure status register
CALL IBWRT(analyzer%,"*RST")                    'Reset instrument
CALL IBWRT(analyzer%,"INIT:CONT OFF")           'Single sweep mode
CALL IBWRT(analyzer%,"SYST:DISP:UPD OFF")       'OFF: display off
'--------- Perform measurement and query results ---------------------
cmd$ = "MPOW? "
cmd$ = cmd$ + "935.2 MHZ,"      'Center frequency
cmd$ = cmd$ + "1MHZ,"           'Resolution bandwidth
cmd$ = cmd$ + "434US,"          'Measurement time
cmd$ = cmd$ + "VID,"            'Trigger source
cmd$ = cmd$ + "50PCT,"          'Trigger threshold
cmd$ = cmd$ + "1US,"            'Trigger offset, must be > 125 ns
cmd$ = cmd$ + "PEAK,"           'Peak detector
cmd$ = cmd$ + "8"               'Number of bursts
CALL IBWRT(analyzer%, cmd$)
CALL IBRD(analyzer%, result$)                   'Read results
Print result$
END SUB
REM ************************************************************************
```

Fast Level Measurement Using Frequency Lists

A typical task for the R&S FSMR is power measurement at a number of frequency points, e.g. at multiples of the fundamental (harmonics measurement), or at frequencies defined by a mobile radio standard (e.g. spectrum due to transients at ± 200 kHz, ± 400 kHz, etc about the carrier frequency of a GSM signal). In many cases, different level and/or bandwidth settings are required for the different frequency points to match the channel spacing and meet the requirements of dynamic range.

Especially for this application, the R&S FSMR offers a number of remote-control functions (commands available in SENSe:LIST subsystem) that allow level measurement based on a frequency list with different instrument settings assigned to different frequencies. Not only the frequency list can be programmed, but also the measurement types (PEAK, RMS, AVG) to be performed simultaneously can be selected.

The example below describes a harmonics measurement on a dual-band amplifier. The harmonics level in general decreases as the frequency increases. To boost measurement sensitivity, therefore, the reference level is lowered by 10 dB from the third harmonic.

The following settings are used:

Reference level:	10.00 dBm up to 2nd harmonic, 0 dBm from 3rd harmonic
RF attenuation:	20 dB
Electronic attenuation:	0 dB
RBW:	1 MHz
VBW:	3 MHz
Filter type:	NORMal
Measurement time:	300 µs
Trigger delay:	100 µs
Trigger:	video, 45 %

Frequency	**Type**
935.2 MHz	GSM 900 fundamental
1805.2 MHz	GSM 1800 fundamental
1870.4 MHz	GSM 900 2nd harmonic
2805.6 MHz	GSM 900 3rd harmonic
3610.4 MHz	GSM 1800 2nd harmonic
3740.8 MHz	GSM 900 4th harmonic
5815.6 MHz	GSM 1800 3rd Harmonic

The frequencies are selected in ascending order to minimize system-inherent waiting times resulting from frequency changes.

At each frequency point the peak power and the rms power are measured. The peak power and the rms power values are stored alternately in the results memory.

```
REM ************************************************************************
Public Sub FrequencyList()

result$ = Space$(500)
'--------- R&S FSMR default setting -----------------------------------------
---
CALL SetupStatusReg                          'Configure status register
CALL IBWRT(analyzer%,"*RST")                 'Reset instrument
CALL IBWRT(analyzer%,"INIT:CONT OFF")        'Single sweep mode
CALL IBWRT(analyzer%,"SYST:DISP:UPD OFF")    'Display off
'---------Configure R&S FSMR for power measurement based on frequency list -
-----
Call IBWRT(analyzer%, "TRIG:LEV:VID 45PCT")  'Video trigger threshold
Call IBWRT(analyzer%, "LIST:POWer:SET ON,ON,OFF,VID,POS,100us,0")
'--------- Perform measurement and query results ----------------------------
cmd$ = "LIST:POWer? "
cmd$ = cmd$ + "935.2MHZ,10dBm,20dB,OFF,NORM,1MHz,3MHz,300us,0,"
cmd$ = cmd$ + "1805.2MHZ,10dBm,20dB,OFF,NORM,1MHz,3MHz,300us,0,"
cmd$ = cmd$ + "1870.4MHZ,10dBm,20dB,OFF,NORM,1MHz,3MHz,300us,0,"
cmd$ = cmd$ + "2805.6MHZ,0dBm,20dB,OFF,NORM,1MHz,3MHz,300us,0,"
cmd$ = cmd$ + "3610.4MHz,10dBm,20dB,OFF,NORM,1MHz,3MHz,300us,0,"
cmd$ = cmd$ + "3740.8MHz,0dBm,20dB,OFF,NORM,1MHz,3MHz,300us,0,"
cmd$ = cmd$ + "5815.6MHz,0dBm,20dB,OFF,NORM,1MHz,3MHz,300us,0"
Call IBWRT(analyzer%, cmd$)
Call IBRD(analyzer%, result$)
Print result$
END SUB
REM ************************************************************************
```

Level Correction of Transducers (Definition of Transducer Factors)

In more complex test systems, the frequency response of the test setup must be taken into account in all power measurements to avoid any measurement errors being introduced from sources other than the DUT.

The R&S FSMR offers the possibility of defining a frequency-dependent attenuation correction factor (transducer factor).

In the example below, a factor with the following characteristics is defined:

Name:	Transtest
Unit:	dB
Scaling:	lin
Comment:	simulated cable correction

Frequency	Level
10 MHz	0 dB
100 MHz	3 dB
1 GHz	7 dB
3 GHz	10 dB

The factor is defined and can be activated as required.

```
REM ************************************************************************
Public Sub TransducerFactor()

'--------- Define transducer factor ---------------------------------------
CALL IBWRT(analyzer%,"CORR:TRAN:SEL 'TRANSTEST'")
                                            'Define "Transtest"
                                            'transducer factor
CALL IBWRT(analyzer%,"CORR:TRAN:UNIT 'DB'") 'Unit 'dB'
CALL IBWRT(analyzer%,"CORR:TRAN:SCAL LIN")  'Linear frequency axis
CALL IBWRT(analyzer%,"CORR:TRAN:COMM 'Simulated cable correction'")
cmd$ = "CORR:TRAN:DATA "                   'Enter frequency and level
cmd$ = cmd$ + "10MHz, 0,"                  'values. Level values without
cmd$ = cmd$ + "100MHz, 3,"                 'unit!
cmd$ = cmd$ + "1GHz, 7,"
cmd$ = cmd$ + "3GHz, 10"
CALL IBWRT(analyzer%,cmd$)                 'Enter frequency and level values
'--------- Activate transducer ------------------------------------------
CALL IBWRT(analyzer%,"CORR:TRAN:STAT ON")  'Activate transducer factor
END SUB
REM ************************************************************************
```

Reading Trace Data

In the following example, the trace data recorded together at the default setting is read out and displayed on the screen in the form of a list. Reading is performed consecutively in the binary format and in the ASCII format, at span > 0 and also at span = 0.

In the binary format the message header is evaluated with the length information and used to calculate the x axis values.

In the ASCII format only the list of level values is output.

The binary data is read out in 3 steps:

1. Reading the number of digits of the length information
2. Reading the length information
3. Reading trace data

This procedure is necessary with programming languages that support only structures with similar data types (arrays) (such as Visual Basic) since the data types of header and data differ in binary data.

```
REM ***********************************************************************
Public Sub ReadTrace()

'--------- Define variables ----------------------------------------------
Dim traceData(1250) As Single                 'Buffer for floating point
                                              'binary data
Dim digits As Byte                            'Number of digits of
                                              'length information
Dim traceBytes As Integer                     'Length of trace data in bytes
Dim traceValues As Integer                    'Number of values in buffer
asciiResult$ = Space$(25000)                  'Buffer for ASCII trace data
result$ = Space$(100)                         'Buffer for simple results
startFreq$ = Space$(100)                      'Buffer for start frequency
span$ = Space$(100)                           'Buffer for span
'--------- R&S FSMR default setting ---------------------------------------
---
CALL SetupInstrument                          'Default setting
CALL IBWRT(analyzer%,"INIT:CONT OFF")         'Single sweep
CALL IBWRT(analyzer%,"INIT;*WAI")             'Perform sweep with sync
'--------- Define span for read out --------------------------------------
Call ibwrt(analyzer%,"FREQ:STARt?")           'Read out start frequency
Call ibrd(analyzer%,startFreq$)
startFreq = Val(startFreq$)
Call ibwrt(analyzer%,"FREQ:SPAN?")            'Read out span
Call ibrd(analyzer%,span$)
span = Val(span$)
```

```
'--------- Read out in binary format ---------------------------------------
Call ibwrt(analyzer%, "FORMAT REAL,32")       'Select binary format
Call ibwrt(analyzer%, "TRAC1? TRACE1")        'Read out trace 1
Call ilrd(analyzer%, result$, 2)              'Read out and store
digits = Val(Mid$(result$, 2, 1))             'number of digits of
                                              'length information
result$ = Space$(100)                         'Initialize buffer again
Call ilrd(analyzer%, result$, digits)         'Read out
traceBytes = Val(Left$(result$, digits))      'and store length information
Call ibrd32(analyzer%, traceData(0), traceBytes) 'Read trace data into buffer
Call ilrd(analyzer%, result$, 1)              'Read the terminator <NL>
'--------- Read out binary data as pairs of frequency/level values ---------
traceValues = traceBytes/4                    'Single precision = 4 bytes
stepsize = span/traceValues                   'Calculate frequency step width
For i = 0 To traceValues - 1
  Print "Value["; i; "] = "; startFreq+stepsize*i; ", "; traceData(i)
Next i
'--------- Time domain default setting -------------------------------------
Call ibwrt(analyzer%,"FREQ:SPAN 0Hz")         Switchover to time domain
CALL IBWRT(analyzer%,"INIT;*WAI")             'Perform sweep with sync
'--------- Read out in ASCII format ----------------------------------------
Call ibwrt(analyzer%,"FORMAT ASCII")          'Select ASCII format
CALL ibwrt(analyzer%,"TRAC1? TRACE1")         'Read out Trace 1
CALL ibrd(analyzer%, asciiResult$)
Print "Contents of Trace1: ",asciiResult$     'Output
END SUB
REM ***********************************************************************
```

Measuring the Magnitude and Phase of a Signal (I/Q Data Acquisition)

Due to the R&S FSMR's internal architecture, it is capable of measuring and outputting the magnitude and phase of a signal in addition to its power values. This opens up a variety of possibilities for more in-depth analysis (FFT, demodulation, etc).

I/Q data is stored in memory areas each containing 128 k words. Hardware triggering controls the memory.

Data aquisition hardware

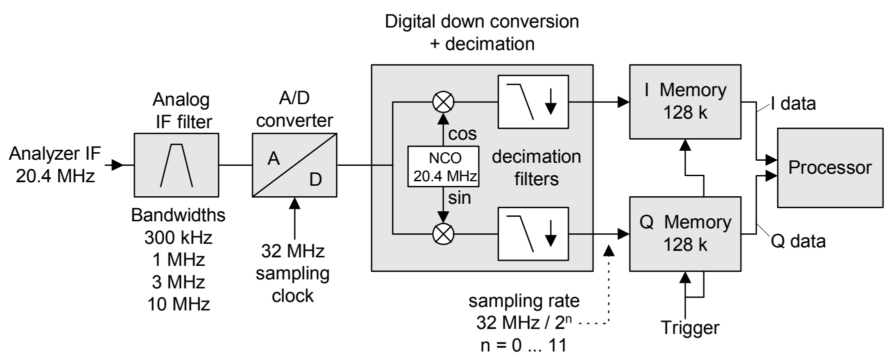


Fig. 7-3 Block diagram illustrating signal processing in the analyzer

The following maximum bandwidths are possible in this measurement depending on the selected sampling rate:

Sampling rate	Max. bandwidth	Remarks
32 MHz	9.6 MHz	
16 MHz	7.72 MHz	
8 MHz	4.8 MHz	Signals outside the specified bandwidth may be deconvoluted to the useful band due to the characteristics of the anti-aliasing filter.
4 MHz	2.8 MHz	
2 MHz	1.6 MHz	
1 MHz	800 kHz	
500 kHz	400 kHz	
250 kHz	200 kHz	
125 kHz	100 kHz	
62.5 kHz	50 kHz	
31.25 kHz	25 kHz	
15.625 kHz	12.5 kHz	

Due to the instrument's sampling concept (21.4 MHz IF, 32 MHz sampling rate), the image frequency is band-limited only by the analog 10 MHz filter. For an input signal at the limit of the 10 MHz band (+ 5 MHz above center frequency), an image-frequency signal 800 kHz above the input signal would be obtained.
The image frequency in MHz is calculated as follows:

$$f_{image} = 2 \cdot (f_{center} + 5.4\,\mathrm{MHz}) - f_{signal}$$

where
f_{image} = image frequency in MHz

f_{center} = center frequency in MHz
f_{signal} = frequency in MHz of signal measured
For correct measurements, the RF input signal must be band-limited. Signals spaced more than 5.4 MHz from the center frequency are reflected into the passband of the 10 MHz filter.

Analog prefilters (bandwidth ≥300 kHz) are available to provide additional band-limiting of the signal measured.

The following example shows the steps necessary to collect data at a predefined sampling rate and read it from the I/Q memory.

Data is output in the form of voltage values referred to the analyzer input. Data can be read in binary or ASCII format.

In binary format, the length information carried in the message header is evaluated and used for calculating the x axis values.

In ASCII format, only a list of voltage values is output.

Binary data is read in three steps:

1. The number of digits carrying the length information is read.
2. The length information itself is read.
3. The trace data is read.

This procedure is necessary with programming languages like Visual Basic which support only structures of identical data types (arrays), whereas the binary data format uses different data types in the header and the data section.

```
REM ************************************************************************
Public Sub ReadIQData()

'--------- Create variables ---------------------------------------------
Dim IData(131072) As Single                'Buffer for floating-point
                                           'I data (= 128*1024 bytes)
Dim QData(131072) As Single                'Buffer for floating-point
                                           'Q data (= 128*1024 bytes)
                                           'Note:
                                           'Visual Basic cannot read in
                                           'data volumes larger than
                                           '128k words!
Dim digits As Byte                         'No. of digits as length
Dim IQBytes As Long                        'Length of trace data in bytes
Dim IQValues As Long                       'No. of meas. values in buffer
asciiResult$ = Space$(6553600)             'Buffer for ASCII I/Q data
                                           '(= 25*2*1024 bytes)
result$ = Space$(100)                      'Buffer for simple results
'--------- Default setting --------------------------------------
CALL SetupInstrument                       'Default setting
CALL IBWRT(analyzer%,"TRAC:IQ:STAT ON")    'Activate I/Q data
                                           'acquisition mode; must be
                                           'done before TRAC:IQ:SET !
```

```
'Select number of test points (= 128 * 1024 – 512) at RBW 10 MHz,
'sample rate 32 MHz, trigger free run, pos. trigger edge and 0 s trigger
'delay.

CALL IBWRT(analyzer%,"TRAC:IQ:SET NORM,10MHz,32MHz,IMM,POS,0,130560")

'--------- Read-out in binary format---------------------------------------

Call ibwrt(analyzer%, "FORMAT REAL,32")          'Set binary format

Call ibwrt(analyzer%, "TRAC:IQ:DATA?")           'Measure + read out I/Q data

Call ilrd(analyzer%, result$, 2)                 'Read and store length for
digits = Val(Mid$(result$, 2, 1))                'number of digits
result$ = Space$(100)                            'Re-initialize buffer

Call ilrd(analyzer%, result$, digits)            'Read and store length
IQBytes = Val(Left$(result$, digits))            '

IQBytes = IQBytes / 2                            'Divide no. per buffer in
half

Call ibrd32(analyzer%, IData(0), IQBytes)     'Read I data in buffer

Call ibrd32(analyzer%, QData(0), IQBytes)     'Read Q data in buffer

Call ilrd(analyzer%, result$, 1)              'Read in end character <NL>

'--------- Output of binary data as frequency/level pair ------------------

IQValues = IQBytes/4                             'Single Precision = 4 Bytes

For i = 0 To IQValues - 1

  Print "I-Value["; i; "] = "; IData(i)

  Print "Q-Value["; i; "] = "; QData(i)

Next i

'--------- Auslesen im ASCII-Format ---------------------------------------

Call ibwrt(analyzer%,"FORMAT ASCII")             'Set ASCII format

Call ibwrt(analyzer%, "TRAC:IQ:DATA?")           'Re-measure and read out
                                                 'I/Q data

CALL ibrd(analyzer%, asciiResult$)

CALL IBWRT(analyzer%,"TRAC:IQ:STAT OFF")         'Stop I/Q data aquisition
                                                 'mode if no further
                                                 'measurements are to be
                                                 'done


END SUB

REM ***********************************************************************
```

Averaging I/Q Data

The R&S FSMR has averaging capability also for I/Q measurements, i.e. I/Q data can be averaged over several test runs. This is subject to the following conditions:

1. An external trigger signal must be available for data measurement, and the trigger signal must be phase-locked to the signal measured.
2. The same reference-frequency signal must be used for the DUT and the R&S FSMR.
3. The sampling rate must be 32 MHz, since only with this sampling frequency will the measurement be performed phase-synchronous with the trigger signal.

If all of the above conditions are fulfilled, no phase shift will occur between consecutive test runs. Phase shift may invalidate the measured average so that in extreme cases a value of 0 is obtained.

The default setting of the instrument for data measurement without averaging has to be changed as follows:

```
'--------- R&S FSMR default setting ----------------------------------------
--
CALL SetupInstrument                         'Default setting
CALL IBWRT(analyzer%,"TRAC:IQ:STAT ON")      'Activate I/Q data acquisition
                                             'mode; this must be
                                             'done before TRAC:IQ:SET!
'Select max. number of test points (= 128 * 1024 – 512) at 10 MHz RBW,
'32 MHz sampling rate, external trigger, pos. trigger edge and 0 s trigger
'delay.
CALL IBWRT(analyzer%,"TRAC:IQ:SET NORM,10MHz,32MHz,EXT,POS,0,130560")
CALL IBWRT(analyzer%,"TRAC:IQ:AVER ON")      'Switch on I/Q averaging
CALL IBWRT(analyzer%,"TRAC:IQ:AVER:COUN 10") 'Set 10 test runs
'--------- Read data in binary format ---------------------------------------
...
```

Storing and Loading Device Settings

Storing Instrument Settings

In the following example, the settings/measurement data to be stored are determined; only the hardware settings are stored. The selection commands for the other settings are indicated with the status OFF for the sake of completeness.

```
REM ************************************************************************
Public Sub StoreSettings()

'This subroutine selects the settings to be stored and creates
'the data set "TEST1" in directory D:\USER\DATA. It uses
'the default setting and resets the instrument after storage
'of the setting.
'--------- R&S FSMR default setting ----------------------------------------
-----
Call SetupInstrument
CALL IBWRT(analyzer%,"INIT:CONT OFF")        'Single sweep
CALL IBWRT(analyzer%,"INIT;*WAI")            'Perform sweep with sync
'--------- Select items to be stored ---------------------------------------
CALL IBWRT(analyzer%,"MMEM:SEL:HWS ON")      'Save hardware settings
CALL IBWRT(analyzer%,"MMEM:SEL:TRAC OFF")    'No storing of traces
CALL IBWRT(analyzer%,"MMEM:SEL:LIN:ALL OFF") 'Save only active limit lines
'--------- Define comment --------------------------------------------------
CALL IBWRT(analyzer%,"MMEM:COMM 'Test Setup'")
'--------- Store selected items --------------------------------------------
CALL IBWRT(analyzer%,"MMEM:STOR:STAT 1,'D:\USER\DATA\TEST1'")
'--------- Reset instrument ------------------------------------------------
CALL IBWRT(analyzer%,"*RST")
END SUB
REM ************************************************************************
```

Loading Device Settings

In the following example, data set TEST1 stored under D:\USER\DATA is reloaded into the instrument:

```
REM ************************************************************************
Public Sub LoadSettings()

'This subroutine loads data set "TEST1" in directory D:\USER\DATA.
'--------- Default setting of status register ------------------------------
Call SetupStatusReg                             'Configure status register
'--------- Load data set ---------------------------------------------------
CALL IBWRT(analyzer%,"MMEM:LOAD:STAT 1,'D:\USER\DATA\TEST1'")
'----Start measurement using the data set loaded ---------------------------
CALL IBWRT(analyzer%,"DISP:TRAC1:MODE WRITE")   'Set trace to Clr/Write
CALL IBWRT(analyzer%,"INIT;*WAI")               'Start the sweep
END SUB
REM ************************************************************************
```

Setting the Data Set for Startup Recall

In the following example, the R&S FSMR is first reset. Then the data set TEST1 stored under D:\USER\DATA is selected for the STARTUP RECALL function, i.e. the data set is set for every *RST, PRESET and every device startup. For illustration, the command *RST is executed again.

```
REM ************************************************************************
Public Sub StartupRecallSettings()
'--------- Reset R&S FSMR --------------------------------------------------
-----
CALL IBWRT(analyzer%,"*RST")
'--------- Default setting of status register ------------------------------
Call SetupStatusReg                             'Configure status register
'--------- Select startup recall data set-----------------------------------
CALL IBWRT(analyzer%,"MMEM:LOAD:AUTO 1,'D:\USER\DATA\TEST1'")
'--------- Activate startup recall data set --------------------------------
CALL IBWRT(analyzer%,"*RST")
END SUB
REM ************************************************************************
```

Reading and Writing Files

Reading a File from the Instrument

In the following example, file TEST1.SET stored under D:\USER\DATA is read from the instrument and stored in the controller.

```
REM ************************************************************************
Public Sub ReadFile()
'--------- Generate variables ---------------------------------------------
Dim digits As Byte                            'Number of digits of
                                              'length information
Dim fileBytes As Long                         'Length of file with trace data
                                              'in bytes
result$ = Space$(100)                         'Buffer for simple results
'--------- Default setting of status register -----------------------------
Call SetupStatusReg                           'Configure status register
'--------- Read out file --------------------------------------------------
Call ibwrt(analyzer%, "MMEM:DATA? 'D:\USER\DATA\TEST1.SET'")
                                              'Select file
Call ilrd(analyzer%, result$, 2)              'Read and store number of
digits = Val(Mid$(result$, 2, 1))             'digits of length information
Call ilrd(analyzer%, result$, digits)         'Read and store length
fileBytes = Val(Left$(result$, digits))       'information
FileBuffer$ = Space$(fileBytes)               'Buffer for file
Call ilrd(analyzer%, FileBuffer, fileBytes)   'Read file into buffer
Call ilrd(analyzer%, result$, 1)              'Read terminator <NL>
'--------- Store file to controller --------------------------------------
Open "TEST1.SET" For Output As #1
Print #1, FileBuffer;                         ' ; to avoid linefeed at
                                              '   end of file
Close #1
END SUB
REM ************************************************************************
```

Creating a File on the Instrument

In the following example, the TEST1.SET file available on the controller is stored in the instrument under D:\USER\DATA\DUPLICAT.SET.

```
REM ************************************************************************
Public Sub WriteFile()
'--------- Generate variables ----------------------------------------------
FileBuffer$ = Space$(100000)                 'Buffer for file
Dim digits As Long                           'Number of digits of
                                             'length information
Dim fileBytes As Long                        'Length of file in bytes
fileSize$ = Space$(100)                      'Length of file as a string
result$ = Space$(100)                        'Buffer for simple results
'--------- Default setting of status register ------------------------------
Call SetupStatusReg                          'Configure status register
'--------- Prepare the definite length block data --------------------------
fileBytes = FileLen("H:\work\vb\test1.set")  'Determine length of file
fileSize$ = Str$(fileBytes)
digits = Len(fileSize$) - 1                  'Determine number of digits of
fileSize$ = Right$(fileSize$, digits)        'length information
FileBuffer$ = "#" + Right$(Str$(digits), 1) + fileSize$
                                             'Store length information in
                                             'file buffer
'--------- Read file from controller ---------------------------------------
Open "H:\work\vb\TEST1.SET" For Binary As #1
FileBuffer$ = FileBuffer$ + Left$(Input(fileBytes, #1), fileBytes)
Close #1
'--------- Write file ------------------------------------------------------
-
Call ibwrt(analyzer%, "SYST:COMM:GPIB:RTER EOI")      'Set receive
                                                      'terminator on the
                                                      'instrument
Call ibwrt(analyzer%, "MMEM:DATA 'D:\USER\DATA\DUPLICAT.SET'," +
           FileBuffer$)                               'Select file
END SUB
REM ************************************************************************
```

Configuring and Starting a Printout

The following example shows the configuration of the output format and output device for printing out the measurement screen.
Proceed in the following order:

1. Set the measurement required for the printout
2. Query available output devices
3. Select an output device
4. Select the output interface
5. Configure the output format
6. Start printout with synchronization to the end

It is assumed that the setting required is a signal with a power of –20 dBm at 100 MHz and that the printer required is the No. 6 of the printers available. The data is first output on the selected printer, then to a file.

```
REM ************************************************************************
Public Sub HCopy()

DIM Devices(100) as string                          'Buffer for printer name
FOR i = 0 TO 49
  Devices$(i) = Space$(50)                          'Preallocate buffer for
                                                    'printer name
NEXT i
'--------- R&S FSMR default setting ----------------------------------------
-----
CALL SetupStatusReg                              'Configure status register
CALL IBWRT(analyzer%,"*RST")                     'Reset instrument
CALL IBWRT(analyzer%,"INIT:CONT OFF")            'Single sweep
CALL IBWRT(analyzer%,"SYST:DISP:UPD ON")         'Display on
'--------- Configure measurement -------------------------------------------
CALL IBWRT(analyzer%,"FREQ:CENT 100MHz;SPAN 10MHz")    'Set frequency
CALL IBWRT(analyzer%,"DISP:WIND:TRAC:Y:RLEV -10dBm")   'Reference level
CALL IBWRT(analyzer%,"INIT;*WAI")                      'Perform measurement
'--------- Query regarding available output devices ------------------------
CALL IBWRT(analyzer%,"SYST:COMM:PRIN:ENUM:FIRSt?")     'Read out first output
CALL IBRD(analyzer%,Devices$(0))                       'device and indicate
PRINT "Printer 0: "+Devices$(0)                        'name
For i = 1 to 99
  CALL IBWRT(analyzer%,"SYST:COMM:PRIN:ENUM:NEXT?")    'Read out the next
  CALL IBRD(analyzer%,Devices$(i))                     'printer name
  IF Left$(Devices$(i),2) = "''" THEN GOTO SelectDevice 'Abort at end of
                                                        'list
  PRINT "Printer"+Str$(i)+": " Devices$(i)             'Indicate printer name
NEXT i
```

```
SelectDevice:
'------------ Select device, printer language and output interface ---------
CALL IBWRT(analyzer%,"SYST:COMM:PRIN:SEL "+ Devices(6))'Select printer #6
8 CALL IBWRT(analyzer%,"HCOP:DEST 'SYST:COMM:PRIN'")  'Configuration:
                                                      '"Output to
                                                      'printer interface"
CALL IBWRT(analyzer%,"HCOP:DEV:LANG GDI")           'Output language 'GDI'
'----- Select orientation (portrait/landscape) and colour/BW ---------------
CALL IBWRT(analyzer%,"HCOP:PAGE:ORI PORTrait")      'Portrait
CALL IBWRT(analyzer%,"HCOP:DEV:COL OFF")            'Black and white
'----- Configure and start print out ---------------------------------------
 CALL IBWRT (analyzer%,"HCOP:ITEM:ALL")       'Select complete screen
'CALL IBWRT (analyzer%,"HCOP:ITEM:WIND1:TRAC:STAT ON")  'alternative: only
'CALL IBWRT (analyzer%,"HCOP:ITEM:WIND2:TRAC:STAT ON")  'traces in
                                                        'screen A/B
CALL IBWRT (analyzer%,"*CLS")                 'Reset status registers
CALL IBWRT (analyzer%,"HCOP:IMMediate;*OPC")  'Start print out
CALL WaitSRQ(boardID%,result%)                'Wait for service request
IF (result% = 1) THEN CALL Srq                'If SRQ is recognized =>
                                              'Subroutine for evaluation
'---- Print out into file in WMF format (BMP format) -----------------------
CALL IBWRT(analyzer%,"HCOP:DEST 'MMEM'")      'Configuration:
                                              '"Print to file"
 CALL IBWRT(analyzer%,"HCOP:DEV:LANG WMF")    'File format WMF
'CALL IBWRT(analyzer%,"HCOP:DEV:LANG BMP")    'File format BMP
CALL IBWRT(analyzer%,"MMEM:NAME 'D:\USER\DATA\PRINT1.WMF'") 'Determine
                                                            'file name
CALL IBWRT (analyzer%,"*CLS")                 'Reset status registers
CALL IBWRT (analyzer%,"HCOP:IMMediate;*OPC")  'Start print out
CALL WaitSRQ(boardID%,result%)                'Wait for service request
IF (result% = 1) THEN CALL Srq                'If SRQ is recognized  =>
                                              'Subroutines for evaluation
END SUB
REM ***********************************************************************
```

Contents - Chapter 8 "Maintenance and Instrument Interfaces"

8 Maintenance and Instrument Interfaces

The R&S FSMR following chapter contains information on the maintenance of the R&S FSMR and on the instrument interfaces.

Please follow the instructions in the service manual when exchanging modules or ordering spares. The order no. for spare parts can be found in the service manual.

The address of our support center and a list of all Rohde & Schwarz service centers can be found at the beginning of this manual.

The service manual includes further information particularly on troubleshooting, repair, exchange of modules (including battery exchange, adjustment of the OCXO oscillator) and calibration.

Maintenance

Mechanical and Electrical Maintenance

The R&S FSMR does not require any special maintenance. Remove any contamination on the instrument by means of a soft cloth. Make sure that the air vents are not obstructed.

Storing and Packing

The R&S FSMR can be stored at a temperature of –5°C to +60°C. When stored for an extended period of time the instrument should be protected against dust.

The original packing should be used, particularly the protective covers at the front and rear, when the instrument is to be transported or dispatched. If the original packing is no longer available, use a sturdy cardboard box of suitable size and carefully wrap the instrument to protect it against mechanical damage.

List of Power Cables Available

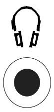
Table 8-1 List of power cables available

Stock No.	**Earthed-contact connector**	**Preferably used in**
DS 006.7013	BS1363: 1967' complying with IEC 83: 1975 standard B2	Great Britain
DS 006.7020	Type 12 complying with SEV-regulation 1011.1059, standard sheet S 24 507	Switzerland
DS 006.7036	Type 498/13 complying with US-regulation UL 498, or with IEC 83	USA/Canada
DS 006.7107	Type SAA3 10 A, 250 V, complying with AS C112-1964 Ap.	Australia
DS 0025.2365 DS 0099.1456	DIN 49 441, 10 A, 250 V, angular DIN 49 441, 10 A, 250 V, straight	Europe (except Switzerland)

Instrument Interfaces

AF Output

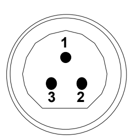
A miniature telephone jack can be used at the AF OUTPUT connector to connect an external loudspeaker, a headphone set or, e.g., a LF voltmeter. The internal resistance is 10 ohms and the output voltage can be controlled with the volume controller on the left side to the connector. When a jack is plugged in, the internal loudspeaker is automatically turned off.



Probe Connector (PROBE POWER)

To allow the connection of probes, the R&S FSMR provides the PROBE POWER power connector. It delivers the power supply voltages +15 V and -12,6 V and ground.

The connector is also suited for powering the high-impedance probes from Hewlett Packard.

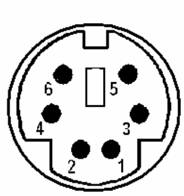


Pin	Signal
1	GND
2	-12.6 V; max 150 mA
3	+15 V; max 150 mA

Fig. 8-1 Pin assignments of PROBE POWER connector

External Keyboard (KEYBOARD)

A 6-pin PS/2 connector is provided on the front panel to allow connecting an external keyboard. The PSP-Z1 keyboard (Order No. 1091.4000.02, German) or the PSP-Z2 (Order No. 1091.4100.02, English) is recommended (Order No. 1009.5001.31). Also they include a trackball for mouse control. However, any other multifunction keyboard may also be used.



Pin	Signal
1	KEYBOARDDATA
2	MOUSEDATA
3	GND
4	5V, KEYBOARD
5	KEYBOARDCLK
6	MOUSECLK

Fig 8-2 Pin assignments of the KEYBOARD connector.

IEC Bus Interface

The standard instrument is equipped with an IEC/IEEE Bus connector. An IEEE 488 interface connector is located on the rear panel of the R&S FSMR. An external controller for remote control of the instrument can be connected via the IEEE 488 interface connector using a shielded cable.

Interface Characteristics

- 8-bit parallel data transfer
- bi-directional data transfer
- three-line handshake
- high data transfer rate of max. 350 kbyte/s
- up to 15 instruments can be connected
- maximal length of the interconnecting cables 15 m (single connection, 2m)
- wired-OR connection if several instruments are connected in parallel.

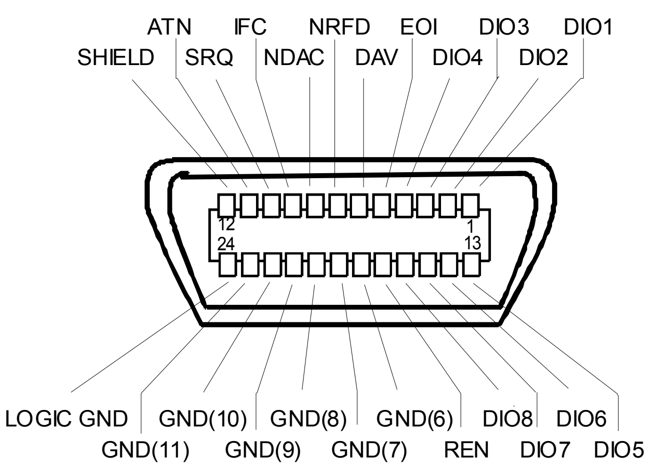


Fig. 8-3 Pin assignment of IEC-Bus interface

Bus Lines

1. **Data bus with 8 lines DIO 1 to DIO 8.**
   The transmission is bit-parallel and byte-serial in the ASCII/ISO code. DIO1 is the least significant, DIO8 the most significant bit.

2. **Control bus with 5 lines.**
   IFC (Interface Clear),
   active low resets the interfaces of the devices connected to the default setting.

   ATN (Attention),
   active low signals the transmission of interface messages
   inactive high signals the transmission of device messages.

   SRQ (Service Request),
   active low enables a device connected to send a service request to the controller.

REN (Remote Enable),
active low permits the switch over to remote control.

EOI (End or Identify),
has two functions in connection with ATN:
active low marks the end of data transmission when ATN=high
active low triggers a parallel poll when ATN=low.

3. Handshake bus with three lines.
DAV (Data Valid),
active low signals a valid data byte on the data bus.

NRFD (Not Ready For Data),
active low signals that one of the devices connected is not ready for data transfer .

NDAC (Not Data Accepted),
active low as long as the device connected is accepting the data present on the data bus.

Interface Functions

Instruments which can be remote controlled via the IEC bus can be equipped with different interface functions. Table 8-2 lists the interface functions appropriate for the instrument.

Table 8-2 Interface functions

Control character	**Interface function**
SH1	Handshake source function (source handshake), full capability
AH1	Handshake sink function (acceptor handshake), full capability
L4	Listener function, full capability, unaddress if MTA.
T6	Talker function, full capability, ability to respond to serial poll, unaddress if MLA
SR1	Service request function (Service Request), full capability
PP1	Parallel poll function, full capability
RL1	Remote/Local switch over function, full capability
DC1	Reset function (Device Clear), full capability
DT1	Trigger function (Device Trigger), full capability
C0	No controller function

IEC Bus Messages

The messages transferred via the data lines of the IEC bus can be divided into two groups:

– **interface messages** and
– **instrument messages.**

Interface Messages

Interface messages are transferred on the data lines of the IEC Bus when the "ATN" control line is active (LOW). They are used for communication between controller and instruments and can only be sent by the controller which currently has control of the IEC Bus.

Universal Commands

The universal commands are encoded 10 - 1F hex. They affect all instruments connected to the bus without addressing.

Table 8-3 Universal Commands

Command	**QuickBASIC command**	**Effect on the instrument**
DCL (Device Clear)	IBCMD (controller%, CHR$(20))	Aborts the processing of the commands just received and sets the command processing software to a defined initial state. Does not change the instrument settings.
IFC (Interface Clear)	IBSIC (controller%)	Resets the interfaces to the default setting.
LLO (Local Lockout)	IBCMD (controller%, CHR$(17))	The LOC/IEC ADDR key is disabled.
SPE (Serial Poll Enable)	IBCMD (controller%, CHR$(24))	Ready for serial poll.
SPD (Serial Poll Disable)	IBCMD (controller%, CHR$(25))	End of serial poll.
PPU (Parallel Poll Unconfigure)	IBCMD (controller%, CHR$(21))	End of the parallel-poll state.

Addressed Commands

The addressed commands are encoded 00 - 0F hex. They are only effective for instruments addressed as listeners.

Table 8-4 Addressed Commands

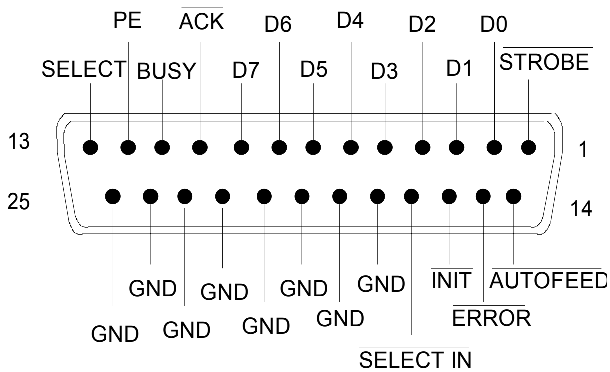
Command	**QuickBASIC command**	**Effect on the instrument**
SDC (Selected Device Clear)	IBCLR (device%)	Aborts the processing of the commands just received and sets the command processing software to a defined initial state. Does not change the instrument setting.
GTL (Go to Local)	IBLOC (device%)	Transition to the "Local" state (manual control).
PPC (Parallel Poll Configure)	IBPPC (device%, data%)	Configure instrument for parallel poll. Additionally, the QuickBASIC command executes PPE/PPD.

Instrument Messages

Instrument messages are transferred on the data lines of the IEC bus when the "ATN" control line is not active. ASCII code is used.
Structure and syntax of the instrument messages are described in Chapter 5. The commands are listed and explained in detail in Chapter 6.

Printer Interface (LPT)

The 25-pin LPT connector on the rear panel of the Fig. 8-4 is provided for the connection of a printer. The LPT interface is compatible with the CENTRONICS printer interface.



Pin	Signal	Input (I) Output (O)	Description
1	STROBE	O	Pulse for transmitting a data byte, min. 1µs pulse width (active LOW)
2	D0	O	Data Line 0
3	D1	O	Data Line 1
4	D2	O	Data Line 2
5	D3	O	Data Line 3
6	D4	O	Data Line 4
7	D5	O	Data Line 5
8	D6	O	Data Line 6
9	D7	O	Data Line 7
10	ACK	I	Indicates that the printer is ready to receive the next byte. (active LOW)
11	BUSY	I	Signal is active when the printer cannot accept data. (active HIGH)
12	PE	I	Signal is active when the paper tray is empty. (active HIGH)
13	SELECT	I	Signal is active when the printer is selected. (active HIGH)
14	AUTOFEED	O	When signal is active, the printer automatically performs a linefeed after each line. (active LOW)
15	ERROR	I	This signal is high when the printer has no paper, is not selected or has an error status. (active LOW)
16	INIT	O	Initialize the printer. (active LOW)
17	SELECT IN	O	If signal is active, the codes DC1/DC3 are ignored by the printer. (active LOW).
18 - 25	GND		Ground connection.

Fig. 8-4 Pin assignments for the LPT connector.

RS-232-C Interface (COM)

The standard R&S FSMR is equipped with a serial interfaces (RS-232-C; COM connector at the rear of the instrument). The interface can be set up and activated manually in the *SETUP-GENERAL SETUP* menu in the *COM PORT*table (Selection *OWNER = INSTRUMENT*).

Interface Characteristics

- Serial data transmission in asynchronous mode
- Bi-directional data transfer via two separate lines
- Transmission rate selectable from 110 to 19200 baud
- Logic '0' signal from +3 V to +15 V
- Logic '1' signal from -15 V to -3 V
- An external instrument (controller) can be connected.

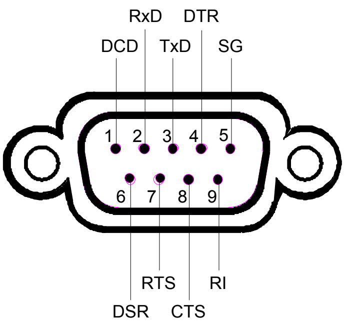


Fig. 8-5 Pin assignment of the RS-232-C interface

Signal Lines

DCD (Data Carrier Detect),
Not used in R&S FSMR*.*
Input; active LOW.
Using this signal, the local terminal recognizes that the modem of the remote station receives valid signals with sufficient level. DCD is used to disable the receiver in the local terminal and prevent reading of false data if the modem cannot interpret the signals of the remote station.

RxD (Receive Data)
Input, LOW = logic '1', HIGH = logic '0'.
Data line, local terminal receives data from remote station.

TxD (Transmit Data)
Output, LOW = logic '1', HIGH = logic '0'.
Data line, local terminal transmits data to remote station.

DTR (Data Terminal Ready),
Output, active LOW,
Indicates that the local terminal is ready to receive data.

GND
Interface ground, connected to instrument ground

DSR (Data Set Ready),
Input, active LOW,
Indicates that the remote station is ready to receive data.

RTS (Request To Send),
Output, active LOW.
Indicates that the local terminal wants to transmit data.

CTS (Clear To Send),
Input, active LOW.
Used to tell the local terminal that the remote station is ready to receive data.

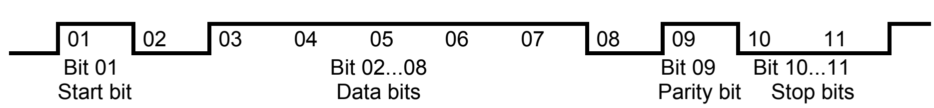
RI (Ring Indicator),
Not used in R&S FSMR.
Input, active LOW.
Used by a modem to indicate that a remote station wants to establish a connection.

Transmission Parameters

To ensure error-free data transmission, the parameters of the instrument and the controller must have the same settings. The parameters are defined in the *SETUP-GENERAL SETUP* menu.

Transmission rate (baud rate)	the following transmission rates can be set in the instrument: 110, 300, 600, 1200, 2400, 4800, 9600, 19200.
Data bits	Data transmission is in 7- or 8-bit ASCII code. The first bit transmitted is the LSB (least significant bit).
Start bit	Each data byte starts with a start bit. The falling edge of the start bit indicates the beginning of the data byte.
Parity bit	In order to detect errors, a parity bit may be transmitted. No parity, even parity or odd parity may be selected. In addition, the parity bit can be set to logic '0' or to logic '1'.
Stop bits	The transmission of a data byte is terminated by 1, 1,5 or 2 stop bits.

Example:
Transmission of character 'A' (41 hex) in 7-bit ASCII code,
with even parity and 2 stop bits:



Control Characters

For interface control, several strings are defined and control characters are reserved which are based upon IEC Bus control.

Table 8-5 Control strings or control characters of the RS-232 interface

Control string or character	Function
'@REM'	Switch over to remote
'@LOC'	Switch over to local
'@SRQ'	Service Request SRQ (SRQ is sent by the instrument)
'@GET'	Group Execute Trigger (GET)
'@DCL'	Reset instrument (Device Clear DCL)
<Ctrl Q> 11 Hex	Enables character output / XON
<Ctrl S> 13 Hex	Inhibits character output / XOFF
0D Hex, 0A Hex	Terminator <CR>, <LF>

Handshake

Software handshake

In the software handshake mode of operation, the data transfer is controlled using the two control characters XON / XOFF.

The instrument uses the control character XON to indicate that it is ready to receive data. If the receive buffer is full, it sends the XOFF character via the interface to the controller. The controller then interrupts the data output until it receives another XON from the instrument. The controller indicates to the instrument that it is ready to receive data in the same way.

Cable required for software handshake

The connection of the instrument with a controller for software handshake is made by crossing the data lines. The following wiring diagram applies to a controller with a 9-pin or 25-pin configuration.

Instrument 9-pin		Controller 9-pin
1		1
2	------------RxD / TxD---------------	3
3	------------TxD / RxD---------------	2
4		6
5	------------GND / GND-------------	5
6		4
7		8
8		7
9		9

Instrument 9-pin		Controller 25-pin
1		8
2	------------RxD / TxD---------------	2
3	------------TxD / RxD---------------	3
4		6
5	------------GND / GND-------------	7
6		20
7		5
8		4
9		22

Fig. 8-6 Wiring of the data lines for software handshake

Hardware handshake

For hardware handshake, the instrument indicates that it is ready to receive data via the lines DTR and RTS. A logic '0' on both lines means 'ready' and a logic '1' means 'not ready'. The RTS line is always active (logic '0') as long as the serial interface is switched on. The DTR line thus controls the readiness of the instrument to receive data.

The readiness of the remote station to receive data is reported to the instrument via the CTS and DSR line. A logic '0' on both lines activates the data output and a logic '1' on both lines stops the data output of the instrument. The data output takes place via the TxD line.

Cable for hardware handshake

The connection of the instrument to a controller is made with a so-called zero modem cable. Here, the data, control and acknowledge lines must be crossed. The following wiring diagram applies to a controller with a 9-pin or 25-pin configuration.

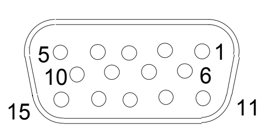
Instrument 9-pin		Controller 9-pin
1		1
2	------------RxD / TxD---------------	3
3	------------TxD / RxD---------------	2
4	------------DTR /DSR--------------	6
5	------------GND / GND-------------	5
6	------------DSR / DTR--------------	4
7	------------RTS / CTS--------------	8
8	------------CTS / RTS--------------	7
9		9

Instrument 9-pin		Controller 25-pin
1		8
2	------------RxD / TxD---------------	2
3	------------TxD / RxD---------------	3
4	------------DTR /DSR--------------	6
5	------------GND / GND-------------	7
6	------------DSR / DTR--------------	20
7	------------RTS / CTS--------------	5
8	------------CTS / RTS--------------	4
9		22

Fig. 8-7 Wiring of the data, control and acknowledge lines for hardware handshake

The configuration of the user ports takes place in the *SETUP* menu (SETUP key) in the *GENERAL SETUP* sub-menu.

Monitor Connector (MONITOR)



Pin	Signal	Pin	Signal	Pin	Signal
1	R	6	GND	11	(NC)
2	G	7	GND	12	(NC)
3	B	8	GND	13	HSYNC
4	(NC)	9	GND	14	VSYNC
5	GND	10	GND	15	(NC)

Fig. 8-8 Pin assignments of the MONITOR connector.

Noise Source Control (NOISE SOURCE)

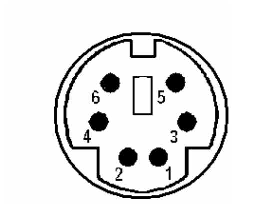
Using the NOISE SOURCE connector, an external noise source can be switched on/off, in order, e.g., to measure the noise figure of units under test (UUTs). Usual noise sources require a +28 V signal to be turned on. At 0 V, they are turned off. These supply voltages are delivered by the connector. Maximum current is 100 mA..

External Trigger Input (EXT TRIG/GATE)

The EXT TRIG/GATE connector is used for controlling the measurement via an external signal. The trigger voltages are TTL level (Low < 0.7 V, High > 1.4 V), typ. input impedance is 10 kOhm

Mouse Connector (MOUSE)

A PS/2 connector is provided at the rear panel to connect a PS/2 mouse:

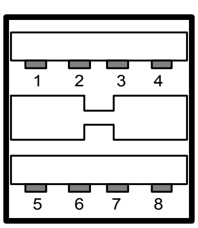


Pin	Signal
1	MOUSEDATA
2	KEYBOARDDATA
3	MOUSEGND
4	MOUSEVD5
5	MOUSECLK
6	KEYBOARDCLK

Fig 8-9 Pin assignments for the MOUSE connector.

USB Connector (USB •⭠)

A USB connector is provided at the rear panel of the R&S FSMR. This USB connector is used to connect two USB devices (USB 1.1):



Pin	Signal
1	+ 5 V USB0
2	USBDATA0 -
3	USBDATA0 +
4	GND
5	+ 5 V USB1
6	USBDATA1 -
7	USBDATA1 +
8	GND

Fig. 8-10 USB connector assignment

***Note**: Passive USB connection cables should not be longer than 1 m.*

Reference Output/Input (REF IN and REF OUT)

For operation with an external reference, the internal reference oscillator is then synchronized to the 10-MHz reference applied to the connector. The necessary level is > 0 dBm.

The internal 10 MHz reference signal is also available at the REF OUT connector and thus provides the capability of, e.g., synchronization of external instruments to the R&S FSMR. The output level is 0 dBm.

Selection between internal and external reference is possible in the *SETUP* menu.

IF Output 20.4 MHz (20.4 MHz OUT)

The 20.4 MHz IF signal of the R&S FSMR is available at the 20.4 MHz OUT BNC connector. The bandwidth corresponds to the selected bandwidth for a resolution bandwidth between 100 kHz and 10 MHz. For a resolution bandwidth below 100 kHz, the bandwidth of the output is 2.6 times the resolution bandwidth with a minimum of 2.6 kHz.

The signal level at the IF output is 0 dBm for resolution bandwidth ≥ 100 kHz, and –10 dBm for resolution bandwidth < 100 kHz (mixer level ≥ 60 dBm) .

IEC 2 Interface (Option B16)

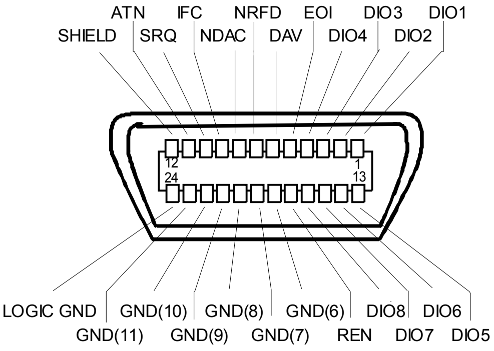
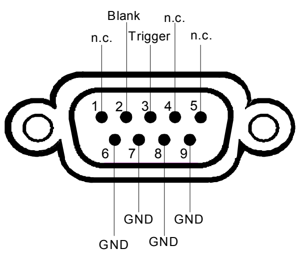


Fig. 8-11 Pin assignment of IEC 2 interface

AUX CONTROL Interface (Option FSP-B10)

The voltage levels are of the TTL type (low < 0.4 V,high > 2 V).



Pin	Signal	Description
1	n.c.	not connected
2	BLANK	Return signalling from the signal generator indicating that frequency setting is completed
3	TRIGGER	Trigger signal for switching to the next frequency
6...9	GND	Ground

Fig. 8-12 Pin assignment of AUX CONTROL connector

LAN Interface

The the LAN interface allows the instrument to be connected to local networks. The pin assignment of the RJ45 connector supports double-paired category 5 UTP/STP cables in star configuration. (UTP means unshielded twisted pair, and STP stands for shielded twisted pair).

Contents - Chapter 9 "Error Messages"

9 Error Messages

9 Error Messages

Error messages are entered in the error/event queue of the status reporting system in the remote control mode and can be queried with the command `SYSTem:ERRor?`. The answer format of R&S FSMR to the command is as follows:

<error code>, "<error text with queue query>;
<remote control command concerned>"

The indication of the remote control command with prefixed semicolon is optional.

Example:

The command "`TEST:COMMAND`" generates the following answer to the query `SYSTem:ERRor?` :

-113,"Undefined header;TEST:COMMAND"

The subsequent list contains the description of error texts displayed on the instrument.

Distinction is made between error messages defined by SCPI, which are marked by negative error codes, and the device-specific error messages for which positive error codes are used.

The right-hand column in the following tables contains the error text in bold which is entered in the error/event queue and can be read out by means of query `SYSTem:ERRor?`. A short explanation of the error cause is given below. The left-hand column contains the associated error code.

SCPI-Specific Error Messages

No Error

Error code	**Error text in the case of queue poll** Error explanation
0	**No error** This message is output if the error queue does not contain any entries.

Command Error - Faulty command; sets bit 5 in the ESR register.

Error code	**Error text in the case of queue poll** Error explanation
-100	**Command Error** The command is faulty or invalid.
-101	**Invalid Character** The command contains an invalid sign. Example: A header contains an ampersand, "`SENSe&`".
-102	**Syntax error** The command is invalid. Example: The command contains block data the instrument does not accept.
-103	**Invalid separator** The command contains an imallowed sign instead of a separator. Example: A semicolon is missing after the command.
-104	**Data type error** The command contains an invalid value indication. Example: ON is indicated instead of a numeric value for frequency setting.
-105	**GET not allowed** A Group Execute Trigger (GET) is within a command line.
-108	**Parameter not allowed** The command contains too many parameters. Example: Command `SENSe:FREQuency:CENTer` permits only one frequency indication.

Continuation: Command Error

Error code	**Error text in the case of queue poll** Error explanation
-109	**Missing parameter** The command contains too few parameters. Example: The command `SENSe:FREQuency:CENTer` requires a frequency indication.
-110	**Command header error** The header of the command is faulty.
-111	**Header separator error** The header contains an imallowed separator. Example: the header is not followed by a "White Space", "`*ESE255`"
-112	**Program mnemonic too long** The header contains more than 12 characters.
-113	**Undefined header** The header is not defined for the instrument. Example: `*XYZ` is undefined for every instrument.
-114	**Header suffix out of range** The header contains an imallowed numeric suffix. Example: `SENSe3` does not exist in the instrument.
-120	**Numeric data error** The command contains a faulty numeric parameter.
-121	**Invalid character in number** A number contains an invalid character. Example: An "A" in a decimal number or a "9" in an octal number.
-123	**Exponent too large** The absolute value of the exponent is greater than 32000.
-124	**Too many digits** The number includes too many digits.
-128	**Numeric data not allowed** The command includes a number which is not allowed at this position. Example: The command `INPut:COUPling` requires indication of a text parameter.
-130	**Suffix error** The command contains a faulty suffix.
-131	**Invalid suffix** The suffix is invalid for this instrument. Example: nHz is not defined.
-134	**Suffix too long** The suffix contains more than 12 characters.
-138	**Suffix not allowed** A suffix is not allowed for this command or at this position of the command. Example: The command `*RCL` does not permit a suffix to be indicated.
-140	**Character data error** The command contains a faulty text parameter
-141	**Invalid character data** The text parameter either contains an invalid character or it is invalid for this command. Example: Write error with parameter indication;`INPut:COUPling XC.`

Continuation: Command Error

Error code	**Error text in the case of queue poll** Error explanation
-144	**Character data too long** The text parameter contains more than 12 characters.
-148	**Character data not allowed** The text parameter is not allowed for this command or at this position of the command. Example: The command `*RCL` requires a number to be indicated.
-150	**String data error** The command contains a faulty string.
-151	**Invalid string data** The command contains a faulty string. Example: An END message has been received prior to the terminating apostrophe.
-158	**String data not allowed** The command contains a valid string at a position which is not allowed. Example: A text parameter is set in quotation marks, `INPut:COUPling "DC"`
-160	**Block data error** The command contains faulty block data.
-161	**Invalid block data** The command contains faulty block data. Example: An END message was received prior to reception of the expected number of data.
-168	**Block data not allowed** The command contains valid block data at an imallowed position. Example: The command `*RCL` requires a number to be indicated.
-170	**Expression error** The command contains an invalid mathematical expression.
-171	**Invalid expression** The command contains an invalid mathematical expression. Example: The expression contains mismatching parentheses.
-178	**Expression data not allowed** The command contains a mathematical expression at an imallowed position.

Execution Error - Error on execution of a command; sets bit 4 in the ESR register

Error code	**Error text in the case of queue poll** Error explanation
-200	**Execution error** Error on execution of the command.
-201	**Invalid while in local** The command is not executable while the device is in local due to a hard local control. Example: The device receives a command which would change the rotary knob state, but the device is in local so the command can not be executed.
-202	**Settings lost due to rtl** A setting associated with hard local control was lost when the device changed to LOCS from REMS or to LWLS from RWLS.
-210	**Trigger error** Error on triggering the device.
-211	**Trigger ignored** The trigger (GET, *TRG or trigger signal) was ignored because of device timing considerations. Example: The device was not ready to respond.
-212	**Arm ignored** An arming signal was ignored by the device.
-213	**Init ignored** Measurement initialisation was ignored as another measurement was already in progress.
-214	**Trigger deadlock** The trigger source for the initiation of measurement is set to GET and subsequent measurement is received. The measurement cannot be started until a GET is received, but the GET would cause an interrupted-error)
-215	**Arm deadlock** The trigger source for the initiation of measurement is set to GET and subsequent measurement is received. The measurement cannot be started until a GET is received, but the GET would cause an interrupted-error.
-220	**Parameter error** The command contains a faulty or invalid parameter.
-221	**Settings conflict** There is a conflict between setting of parameter value and instrument state.
-222	**Data out of range** The parameter value lies out of the allowed range of the instrument.
-223	**Too much data** The command contains too many data. Example: The instrument does not have sufficient storage space.
-224	**Illegal parameter value** The parameter value is invalid. Example: The text parameter is invalid , `TRIGger:SWEep:SOURce TASTe`

Continuation: Execution Error

Error code	**Error text in the case of queue poll** Error explanation
-230	**Data corrupt or stale** The data are incomplete or invalid. Example: The instrument has aborted a measurement.
-231	**Data questionable** The measurement accuracy is suspect.
-240	**Hardware error** The command cannot be executed due to problems with the instrument hardware.
-241	**Hardware missing** Hardware is missing. Example: An option is not fitted.
-250	**Mass storage error** A mass storage error occured.
-251	**Missing mass storage** The mass storage is missing. Example: An option is not installed.
-252	**Missing media** The media is missing. Example: There is no floppy in the floppy disk drive.
-253	**Corrupt media** The media is corrupt. Example: The floppy is bad or has the wrong format.
-254	**Media full** The media is full. Example: There is no room on the floppy.
-255	**Directory full** The media directory is full.
-256	**File name not found** The file name cannot be found on the media.
-257	**File name error** The file name is wrong. Example: An attempt is made to copy to a duplicate file name.
-258	**Media protected** The media is protected. Example: The write-protect tab on the floppy is present.
-260	**Expression error** The expression contains an error.

Device Specific Error; sets bit 3 in the ESR register

Error code	**Error test in the case of queue poll** Error explanation
-300	**Device-specific error** R&S FSMR-specific error not defined in greater detail.
-310	**System error** This error message suggests an error within the instrument. Please inform the R&S Service.
-313	**Calibration memory lost** Loss of the non-volatile data stored using the *CAL? command. This error occurs when the correction data recording has failed.
-330	**Self-test failed** The selftest could not be executed.
-350	**Queue overflow** This error code is entered in the queue instead of the actual error code if the queue is full. It indicates that an error has occurred but not been accepted. The queue can accept 5 entries.

Query Error - Error in data request; sets bit 2 in the ESR register

Error code	**Error text in the case of queue poll** Error explanation
-400	**Query error** General error occurring when data are requested by a query.
-410	**Query INTERRUPTED** The query has been interrupted. Example: After a query, the instrument receives new data before the response has been sent completely.
-420	**Query UNTERMINATED** The query is incomplete. Example: The instrument is addressed as a talker and receives incomplete data.
-430	**Query DEADLOCKED** The query cannot be processed. Example: The input and output buffers are full, the instrument cannot continue operation.
-440	**Query UNTERMINATED after indefinite response** A query is in the same command line after a query which requests an indefinite response.

Device-Specific Messages

Error code	Error text in the case of queue poll Error explanation
1036	**MS: The correction table based amplifier gain exceeds the amplifier range for CALAMP1 and CALAMP2 on IF board** This message is output when the setting range of the calibration amplifier is not sufficient for the required correction. The error occurs only with modules which are not correcty adjusted or defective.
1052	**Frontend LO is Unlocked** This message is output when the phase regulation of the local oscillator fails in the RF frontend.
1060	**Trigger-Block Gate Delay Error- gate length < Gate Delay** This message is output when the gate signal length is not sufficient for the pull-in delay with a predefined gate delay.
1064	**Tracking LO is Unlocked** This message is output when the phase regulation of the local oscillator fails on the tracking generator module.

Error code	Error text in the case of queue poll Error explanation
2022	**OPTIONS.INI invalid** This message is output when an error has been recognized in the file OPTIONS.INI which contains the clearing codes for retrofitable firmware applications. If this file is not correctly recognized, all firmware applications are blocked for this instrument.
2028	**Hardcopy not possible during measurement sequence** This message is output when a printout is started during scan sequences that cannot be interrupted. Such sequences are for example: • Recording the system error correction data (calibration) • Instrument selftest In such cases a synchronization to the end of the scan sequence should be performed prior to starting the printout.
2033	**Printer Not Available** This message is output when the selected printer is not included in the list of available output devices. A possible cause is that the required printer driver is missing or incorrectly installed.
2034	**CPU Temperature is too high** This message is output when the temperature of the processor exceeds 70 °C.

10 Index

Note: *All softkeys are listed alphabetically under keyword "Softkey" with their names. The page numbers 4.xxx refer to the detailed description of the softkeys in chapter 4. Generally, the number of the page in chapter 6 containing the equivalent remote control command is given in addition.*
A list of softkeys and equivalent remote control commands or command sequences is given in chapter 6, section "Table of Softkeys with IEC/IEEE-Bus Command Assignment".
Chapter 6 also contains an alphabetical list of all remote control commands.

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