



**ROHDE & SCHWARZ**

Test and Measurement  
Division

## Operating Manual

# SPECTRUM ANALYZER

## **R&S FSU3**

1129.9003.03

## **R&S FSU8**

1129.9003.08

## **R&S FSU26**

1129.9003.26

**Volume 2**

*This Operating Manual consists of 2 volumes*

Printed in the Federal  
Republic of Germany

Dear Customer,

throughout this operating manual, the abbreviation FSP is used for your Spectrum Analyzer R&S FSP.

## Tabbed Divider Overview

### Volume 1

#### Data Sheet

Safety Instructions  
Certificate of Quality  
EU Certificate of Conformity  
List of R&S Representatives

#### Manuals for Spectrum Analyzer FSU

##### Tabbed Divider

|    |             |                        |
|----|-------------|------------------------|
| 1  | Chapter 1:  | Putting into Operation |
| 2  | Chapter 2:  | Getting Started        |
| 3  | Chapter 3:  | Operation              |
| 4  | Chapter 4:  | Functional Description |
| 10 | Chapter 10: | Index                  |

### Volume 2

#### Data Sheet

Safety Instructions

#### Manuals for Spectrum Analyzer FSU

##### Tabbed Divider

|    |             |                                     |
|----|-------------|-------------------------------------|
| 5  | Chapter 5:  | Remote Control – Basics             |
| 6  | Chapter 6:  | Remote Control – Commands           |
| 7  | Chapter 7:  | Remote Control – Program Examples   |
| 8  | Chapter 8:  | Maintenance and Hardware Interfaces |
| 9  | Chapter 9:  | Error Messages                      |
| 10 | Chapter 10: | Index                               |











## Safety Instructions

This unit has been designed and tested in accordance with the EC Certificate of Conformity and has left the manufacturer's plant in a condition fully complying with safety standards.

To maintain this condition and to ensure safe operation, the user must observe all instructions and warnings given in this operating manual.

### Safety-related symbols used on equipment and documentation from R&S:

|  |   |   |   |   |  |   |   |
|--|---|---|---|---|--|---|---|
|  |  |  |  |  |  |  |  |
| Observe operating instructions   | Weight indication for units >18 kg  | PE terminal   | Ground terminal   | Danger! Shock hazard  | Warning! Hot surfaces  | Ground  | Attention! Electrostatic sensitive devices require special care                     |

1. The unit may be used only in the operating conditions and positions specified by the manufacturer. Unless otherwise agreed, the following applies to R&S products:  
IP degree of protection 2X, pollution severity 2 overvoltage category 2, only for indoor use, altitude max. 2000 m.  
The unit may be operated only from supply networks fused with max. 16 A.  
Unless specified otherwise in the data sheet, a tolerance of  $\pm 10\%$  shall apply to the nominal voltage and of  $\pm 5\%$  to the nominal frequency.
2. For measurements in circuits with voltages  $V_{\text{rms}} > 30 \text{ V}$ , suitable measures should be taken to avoid any hazards.  
(using, for example, appropriate measuring equipment, fusing, current limiting, electrical separation, insulation).
3. If the unit is to be permanently wired, the PE terminal of the unit must first be connected to the PE conductor on site before any other connections are made. Installation and cabling of the unit to be performed only by qualified technical personnel.
4. For permanently installed units without built-in fuses, circuit breakers or similar protective devices, the supply circuit must be fused such as to provide suitable protection for the users and equipment.
5. Prior to switching on the unit, it must be ensured that the nominal voltage set on the unit matches the nominal voltage of the AC supply network.  
If a different voltage is to be set, the power fuse of the unit may have to be changed accordingly.
6. Units of protection class I with disconnectible AC supply cable and appliance connector may be operated only from a power socket with earthing contact and with the PE conductor connected.
7. It is not permissible to interrupt the PE conductor intentionally, neither in the incoming cable nor on the unit itself as this may cause the unit to become electrically hazardous.  
Any extension lines or multiple socket outlets used must be checked for compliance with relevant safety standards at regular intervals.
8. If the unit has no power switch for disconnection from the AC supply, the plug of the connecting cable is regarded as the disconnecting device. In such cases it must be ensured that the power plug is easily reachable and accessible at all times (length of connecting cable approx. 2 m). Functional or electronic switches are not suitable for providing disconnection from the AC supply.  
If units without power switches are integrated in racks or systems, a disconnecting device must be provided at system level.
9. Applicable local or national safety regulations and rules for the prevention of accidents must be observed in all work performed.  
Prior to performing any work on the unit or opening the unit, the latter must be disconnected from the supply network.  
Any adjustments, replacements of parts, maintenance or repair may be carried out only by authorized R&S technical personnel.  
Only original parts may be used for replacing parts relevant to safety (eg power switches, power transformers, fuses). A safety test must be performed after each replacement of parts relevant to safety.  
(visual inspection, PE conductor test, insulation-resistance, leakage-current measurement, functional test).

continued overleaf

## Safety Instructions

10. Ensure that the connections with information technology equipment comply with IEC950 / EN60950.
11. Lithium batteries must not be exposed to high temperatures or fire.  
Keep batteries away from children.  
If the battery is replaced improperly, there is danger of explosion. Only replace the battery by R&S type (see spare part list).  
Lithium batteries are suitable for environmentally-friendly disposal or specialized recycling. Dispose them into appropriate containers, only.  
Do not short-circuit the battery.
12. Equipment returned or sent in for repair must be packed in the original packing or in packing with electrostatic and mechanical protection.
13. Electrostatics via the connectors may damage the equipment. For the safe handling and operation of the equipment, appropriate measures against electrostatics should be implemented.
14. The outside of the instrument is suitably cleaned using a soft, lint-free dustcloth. Never use solvents such as thinners, acetone and similar things, as they may damage the front panel labeling or plastic parts.
15. Any additional safety instructions given in this manual are also to be observed.

## Contents of Manuals for Spectrum Analyzer FSU

### Operating Manual FSU

The operating manual describes the following models and options of spectrum analyzer FSU:

- FSU3 20 Hz to 3.6 GHz
- FSU8 20 Hz to 8 GHz
- FSU26 20 Hz to 26.5 GHz
  
- Option FSU-B4 OCXO - reference oscillator
- Option FSP-B10 external generator control
- Option FSU-B16 LAN interface
- Option FSU-B18 removable hard drive
- Option FSU-B20 extended environmental spec
- Option FSU-B25 electronic attenuator

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 FSU via the menus and via remote control. Typical measurement tasks for the FSU 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:

- |                       |   |
|-----------------------|---|
| <b>The data sheet</b> | informs about guaranteed specifications and characteristics of the instrument.  |
| <b>Chapter 1</b>      | describes the control elements and connectors on the front and rear panel as well as all procedures required for putting the FSU into operation and integration into a test system.   |
| <b>Chapter 2</b>      | gives an introduction to typical measurement tasks of the FSU which are explained step by step.   |
| <b>Chapter 3</b>      | describes the operating principles, the structure of the graphical interface and offers a menu overview.  |
| <b>Chapter 4</b>      | forms a reference for manual control of the FSP 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. |
| <b>Chapter 5</b>      | describes the basics for programming the FSU, command processing and the status reporting system.   |
| <b>Chapter 6</b>      | 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.   |
| <b>Chapter 7</b>      | contains program examples for a number of typical applications of the FSU.  |
| <b>Chapter 8</b>      | describes preventive maintenance and the characteristics of the instrument's interfaces.  |
| <b>Chapter 8</b>      | gives a list of error messages that the FSU may generate.   |
| <b>Chapter 9</b>      | contains a list of error messages.  |
| <b>Chapter 10</b>     | 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 FSU by exchanging modules.



## Contents - Chapter 5 "Remote Control - "Basics"

|   |             |
|---|-------------|
| <b>5 Remote Control - Basics .....</b>                                  | <b>5.1</b>  |
| <b>Introduction .....</b>   | <b>5.1</b>  |
| <b>Getting Started .....</b>  | <b>5.2</b>  |
| <b>Starting Remote Control Operation .....</b>                          | <b>5.3</b>  |
| Display Contents during Remote Control .....                            | 5.3         |
| Remote Control via IEC/IEEE Bus.....                                    | 5.4         |
| Setting the Device Address .....  | 5.4         |
| Return to Manual Operation .....  | 5.4         |
| Remote Control via RS-232-Interface .....                               | 5.5         |
| Setting the Transmission Parameters .....                               | 5.5         |
| Return to Manual Operation .....  | 5.5         |
| Limitations .....   | 5.5         |
| Remote Control in a Network (RSIB Interface).....                       | 5.6         |
| Setting the Device Address .....  | 5.6         |
| Return to Manual Operation .....  | 5.6         |
| <b>Messages.....</b>  | <b>5.7</b>  |
| IEC/IEEE-Bus Interface Messages.....                                    | 5.7         |
| Device Messages (Commands and Device Responses) .....                   | 5.8         |
| <b>Structure and Syntax of the Device Messages .....</b>                | <b>5.9</b>  |
| SCPI Introduction.....  | 5.9         |
| Structure of a Command .....  | 5.9         |
| Structure of a Command Line.....  | 5.12        |
| Responses to Queries .....  | 5.12        |
| Parameters .....  | 5.13        |
| Overview of Syntax Elements.....  | 5.14        |
| <b>Instrument Model and Command Processing .....</b>                    | <b>5.15</b> |
| Input Unit .....  | 5.15        |
| Command Recognition .....   | 5.16        |
| Instrument Data Base and Instrument Hardware .....                      | 5.16        |
| Output Unit.....  | 5.17        |
| Command Sequence and Command Synchronization.....                       | 5.17        |
| <b>Status Reporting System .....</b>                                    | <b>5.18</b> |
| Structure of an SCPI Status Register .....                              | 5.18        |
| Overview of the Status Registers .....                                  | 5.20        |
| Description of the Status Registers .....                               | 5.21        |
| Status Byte (STB) and Service Request Enable Register (SRE) .....       | 5.21        |
| IST Flag and Parallel Poll Enable Register (PPE).....                   | 5.22        |
| Event-Status Register (ESR) and Event-Status-Enable Register (ESE)..... | 5.22        |
| STATus:OPERation Register .....   | 5.23        |
| STATus:QUEStionable Register .....                                      | 5.24        |
| STATus QUEStionable:ACPLimit Register .....                             | 5.25        |
| STATus QUEStionable:FREQuency Register.....                             | 5.26        |
| STATus QUEStionable:LIMit<1 2> Register .....                           | 5.27        |
| STATus QUEStionable:LMARgin<1 2> Register .....                         | 5.28        |
| STATus QUEStionable:POWEr Register .....                                | 5.29        |

---

|  |      |
|--|------|
| STATus-QUEStionable:SYNC Register .....                      | 5.30 |
| Application of the Status Reporting Systems.....             | 5.31 |
| Service Request, Making Use of the Hierarchy Structure ..... | 5.31 |
| Serial Poll .....  | 5.31 |
| Parallel Poll.....   | 5.32 |
| Query by Means of Commands.....                              | 5.32 |
| Error-Queue Query.....                                       | 5.32 |
| Resetting Values of the Status Reporting System.....         | 5.33 |

## 5 Remote Control - Basics

In this chapter you'll find:

- instructions on how to put the FSU 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 FSU.

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 FSU 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 FSU-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 standardized 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.

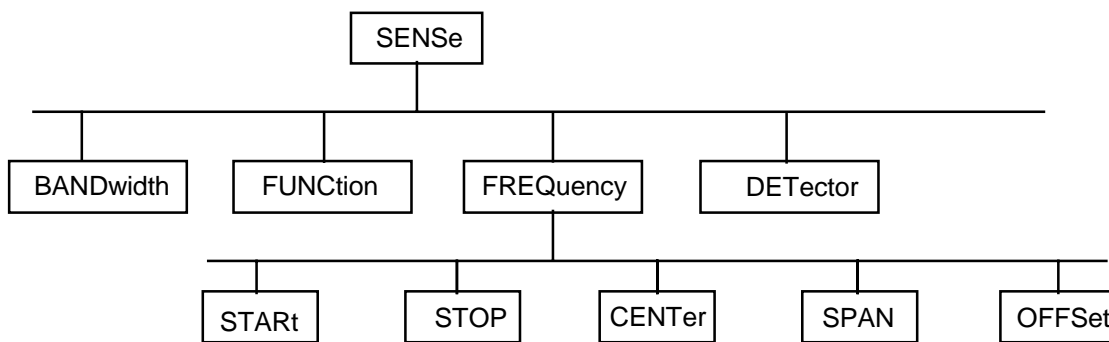


Fig. 5-1 Tree structure the SCPI command systems using the SENSE system by way of example

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.

- The requested parameter is transmitted without header.

Example:   INPut:COUPling?

Response: DC

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

Example:   SENSe:FREQUENCY:STOP? MAX

Response: 3.5E9

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

Example:   SENSe:FREQUENCY:CENTer?

Response: 1E6 for 1 MHz

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

Example:   SENSe:BANDwidth:AUTO?

Response: 1 for ON

- Text (character data) is returned in a short form (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). If 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 values special 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 responses.

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

**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 asterisk 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".

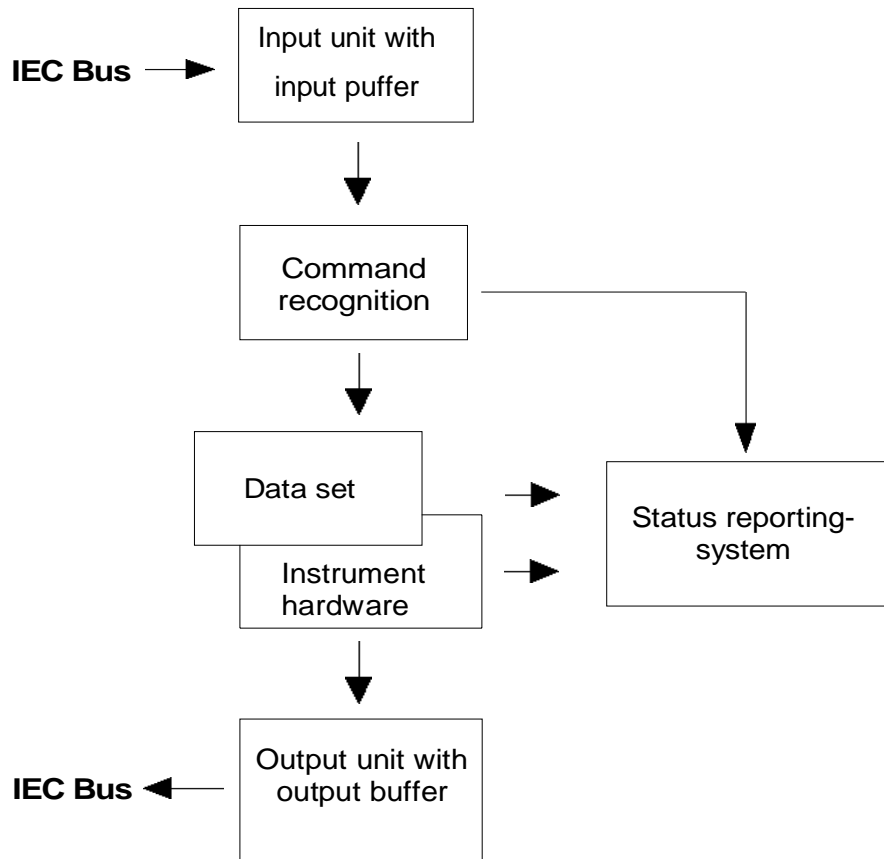


Fig. 5-2 Instrument model in the case of remote control by means of the IEC bus

### 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 operation-complete bit in the ESR | - Setting bit 0 in the ESE<br>- Setting bit 5 in the SRE<br>- 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.

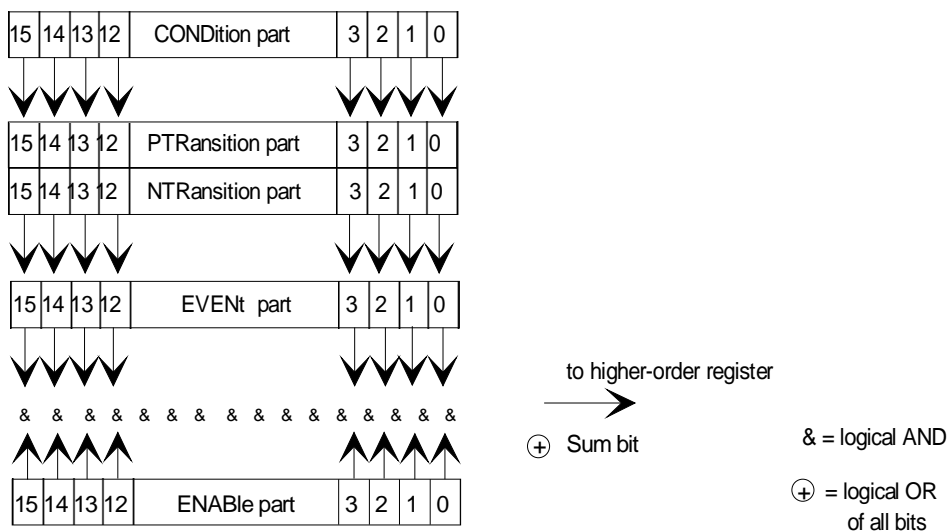


Fig. 5-3 The status-register model

|                         |  |
|-------------------------|--|
| <b>CONDition part</b>   | 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.   |
| <b>PTRansition part</b> | 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.<br>PTR bit =1: the EVENT bit is set.<br>PTR bit =0: the EVENT bit is not set.<br>This part can be written into and read at will. Its contents is not affected by reading.  |
| <b>NTRansition part</b> | 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.<br>NTR-Bit = 1: the EVENT bit is set.<br>NTR-Bit = 0: the EVENT bit is not set.<br>This part can be written into and read at will. Its contents is not affected by reading.<br><br>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.  |
| <b>EVENT part</b>       | 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.  |
| <b>ENABLE part</b>      | 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 '+').<br>ENABLE-Bit = 0: the associated EVENT bit does not contribute to the sum bit<br>ENABLE-Bit = 1: if the associated EVENT bit is "1", the sum bit is set to "1" as well.<br>This part can be written into and read by the user at will. Its contents is not affected by reading. |
| <b>Sum bit</b>          | 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.<br>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.  |
| <b>Note:</b>            | <i>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.</i>  |

# Overview of the Status Registers

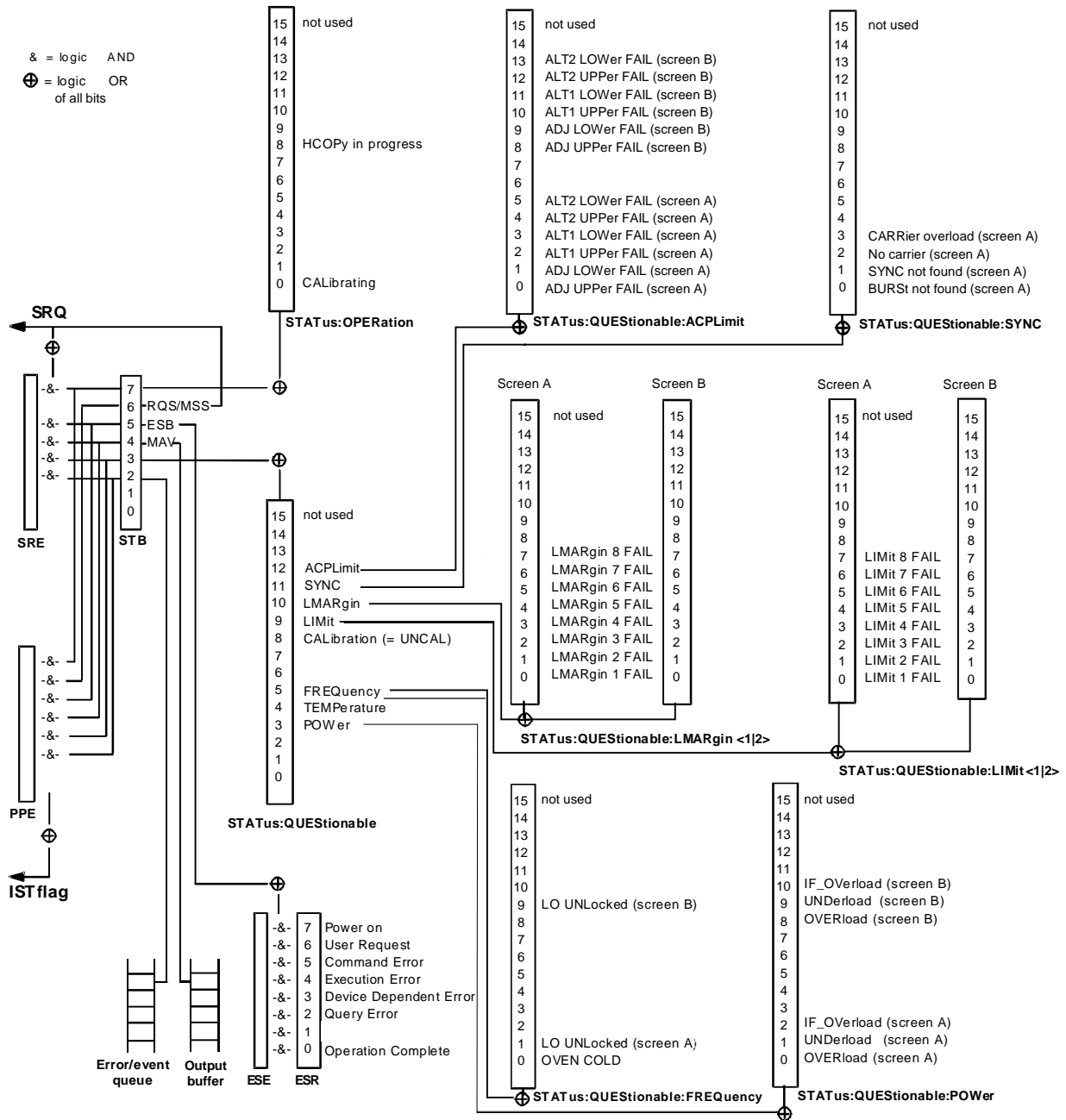


Fig. 5-4 Overview of the status registers

## 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       | <p><b>Error Queue not empty</b></p> <p>The bit is set when an entry is made in the error queue.<br/>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.</p> |
| 3       | <p><b>QUESTionable status sum bit</b></p> <p>The bit is set if an EVENT bit is set in the QUESTionable: status register and the associated ENABle bit is set to 1.<br/>A set bit indicates a questionable instrument status, which can be specified in greater detail by polling the QUESTionable status register.</p>  |
| 4       | <p><b>MAV bit</b> (message available)</p> <p>The bit is set if a message is available in the output buffer which can be read.<br/>This bit can be used to enable data to be automatically read from the instrument to the controller (cf. Chapter 7, program examples).</p>   |
| 5       | <p><b>ESB bit</b></p> <p>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.<br/>Setting of this bit implies an error or an event which can be specified in greater detail by polling the event status register.</p>  |
| 6       | <p><b>MSS bit</b> (master status summary bit)</p> <p>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.</p>   |
| 7       | <p><b>OPERation status register sum bit</b></p> <p>The bit is set if an EVENT bit is set in the OPERation-Status register and the associated ENABle bit is set to 1.<br/>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.</p>   |

### 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       | <b>Operation Complete</b><br>This bit is set on receipt of the command <b>*OPC</b> exactly when all previous commands have been executed.   |
| 1       | This bit is not used  |
| 2       | <b>Query Error</b><br>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       | <b>Device-dependent Error</b><br>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       | <b>Execution Error</b><br>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       | <b>Command Error</b><br>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       | <b>User Request</b><br>This bit is set on pressing the <i>LOCAL</i> key.  |
| 7       | <b>Power On</b> (supply voltage on)<br>This bit is set on switching on the instrument.  |



## 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 5-4 Meaning of the bits in the STATus.OPERation register

| Bit No. | Meaning  |
|---------|--|
| 0       | <b>CALibrating</b><br>This bit is set as long as the instrument is performing a calibration. |
| 1 to 7  | These bits are not used  |
| 8       | <b>HardCOPy in progress</b><br>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 5-5 Meaning of bits in STATus:QUEStionable register

| Bit No.  | Meaning   |
|----------|---|
| 0 to 2   | These bits are not used   |
| 3        | <b>POWER</b><br>This bit is set if a questionable power occurs (cf. also section "STATus:QUEStionable:POWER Register")  |
| 4        | <b>TEMPerature</b><br>This bit is set if a questionable temperature occurs.   |
| 5        | <b>FREQuency</b><br>The bit is set if a frequency is questionable (cf. section "STATus:QUEStionable:FREQuency Register")  |
| 6 to 7   | These bits are not used   |
| 8        | <b>CALibration</b><br>The bit is set if a measurement is performed uncalibrated ( $\hat{=}$ label "UNCAL")  |
| 9        | <b>LIMit</b> (device-specific)<br>This bit is set if a limit value is violated (see also section STATus:QUEStionable:LIMit Register)  |
| 10       | <b>LMARgin</b> (device-specific)<br>This bit is set if a margin is violated (see also section STATus:QUEStionable:LMARgin Register)   |
| 11       | <b>SYNC</b> (device-dependent)<br>This bit is set if, in measurements or premeasurements in GSM MS mode, synchronization to midamble fails or no burst is found.<br>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       | <b>ACPLimit</b> (device-specific)<br>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 5-6 Meaning of bits in STATUS:QUESTIONABLE:ACPLimit register

| Bit No. | Meaning   |
|---------|---|
| 0       | <b>ADJ UPPER FAIL(Screen A)</b><br>This bit is set if in screen A. the limit is exceeded in the upper adjacent channel        |
| 1       | <b>ADJ LOWER FAIL (Screen A)</b><br>This bit is set if in screen A the limit is exceeded in the lower adjacent channel.       |
| 2       | <b>ALT1 UPPER FAIL (Screen A)</b><br>This bit is set if in screen A the limit is exceeded in the upper 1st alternate channel. |
| 3       | <b>ALT1 LOWER FAIL (Screen A)</b><br>This bit is set if in screen A the limit is exceeded in the lower 1st alternate channel. |
| 4       | <b>ALT2 UPPER FAIL (Screen A)</b><br>This bit is set if in screen A the limit is exceeded in the upper 2nd alternate channel. |
| 5       | <b>ALT2 LOWER FAIL (Screen A)</b><br>This bit is set if in screen A the limit is exceeded in the lower 2nd alternate channel. |
| 6 to 7  | not used  |
| 8       | <b>ADJ UPPER FAIL (Screen B)</b><br>This bit is set if in screen B the limit is exceeded in the upper adjacent channel.       |
| 9       | <b>ADJ LOWER FAIL (Screen B)</b><br>This bit is set if in screen B the limit is exceeded in the lower adjacent channel.       |
| 10      | <b>ALT1 UPPER FAIL (Screen B)</b><br>This bit is set if in screen B the limit is exceeded in the upper 1st alternate channel. |
| 11      | <b>ALT1 LOWER FAIL (Screen B)</b><br>This bit is set if in screen B the limit is exceeded in the lower 1st alternate channel. |
| 12      | <b>ALT2 UPPER FAIL (Screen B)</b><br>This bit is set if in screen B the limit is exceeded in the upper 2nd alternate channel. |
| 13      | <b>ALT2 LOWER FAIL (Screen B)</b><br>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 about the reference and local oscillator. It can be queried with commands STATUS:QUESTIONABLE:FREQUENCY:CONDITION? and "STATUS:QUESTIONABLE:FREQUENCY[:EVENT]?".

Table 5-7 Meaning of bits in STATUS:QUESTIONABLE:FREQUENCY register

| Bit No.  | Meaning  |
|----------|--|
| 0        | <b>OVEN COLD</b><br>This bit is set if the reference oscillator has not yet attained its operating temperature. 'OCXO' will then be displayed. |
| 1        | <b>LO UNLocked (Screen A)</b><br>This bit is set if the local oscillator no longer locks. 'LOUNL' will then be displayed.                      |
| 2 to 8   | not used   |
| 9        | <b>LO UNLocked (Screen B)</b><br>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 5-8 Meaning of bits in STATUS:QUESTIONABLE:LIMit&lt;1|2&gt; register

| Bit No. | Meaning   |
|---------|---|
| 0       | <b>LIMit 1 FAIL</b><br>This bit is set if limit line 1 is violated. |
| 1       | <b>LIMit 2 FAIL</b><br>This bit is set if limit line 2 is violated. |
| 2       | <b>LIMit 3 FAIL</b><br>This bit is set if limit line 3 is violated. |
| 3       | <b>LIMit 4 FAIL</b><br>This bit is set if limit line 4 is violated. |
| 4       | <b>LIMit 5 FAIL</b><br>This bit is set if limit line 5 is violated. |
| 5       | <b>LIMit 6 FAIL</b><br>This bit is set if limit line 6 is violated. |
| 6       | <b>LIMit 7 FAIL</b><br>This bit is set if limit line 7 is violated. |
| 7       | <b>LIMit 8 FAIL</b><br>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 5-9 Meaning of bits in STATUS:QUESTIONABLE:LMARgin<1|2> register

| Bit No. | Meaning   |
|---------|---|
| 0       | <b>LMARgin 1 FAIL</b><br>This bit is set if limit margin 1 is violated. |
| 1       | <b>LMARgin 2 FAIL</b><br>This bit is set if limit margin 2 is violated. |
| 2       | <b>LMARgin 3 FAIL</b><br>This bit is set if limit margin 3 is violated. |
| 3       | <b>LMARgin 4 FAIL</b><br>This bit is set if limit margin 4 is violated. |
| 4       | <b>LMARgin 5 FAIL</b><br>This bit is set if limit margin 5 is violated. |
| 5       | <b>LMARgin 6 FAIL</b><br>This bit is set if limit margin 1 is violated. |
| 6       | <b>LMARgin 7 FAIL</b><br>This bit is set if limit margin 7 is violated. |
| 7       | <b>LMARgin 8 FAIL</b><br>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 5-10 Meaning of bits in STATUS:QUESTIONABLE:POWER register

| Bit No.  | Meaning  |
|----------|--|
| 0        | <b>OVERload</b> (Screen A)<br>This bit is set if the RF input is overloaded. 'OVLD' will then be displayed.    |
| 1        | <b>UNDERload</b> (Screen A)<br>This bit is set if the RF input is underloaded. 'UNLD' will then be displayed.  |
| 2        | <b>IF_OVERload</b> (Screen A)<br>This bit is set if the IF path is overloaded. 'IFOVL' will then be displayed. |
| 3 to 7   | not used   |
| 8        | <b>OVERload</b> (Screen B)<br>This bit is set if the RF input is overloaded. 'OVLD' will then be displayed.    |
| 9        | <b>UNDERload</b> (Screen B)<br>This bit is set if the RF input is underloaded. 'UNLD' will then be displayed.  |
| 10       | <b>IF_OVERload</b> (Screen B)<br>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 5-11 Meaning of bits in STATus:QUEStionable:SYNC register

| Bit No. | Meaning   |
|---------|---|
| 0       | <b>BURSt not found (screen A)</b><br>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       | <b>SYNC not found (screen A)</b><br>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       | <b>No carrier (screen A)</b><br>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       | <b>Carrier overload (screen A)</b><br>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 5-12 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 5-12 Resetting instrument functions

| Effect   | Switching on supply voltage |     | DCL,SDC<br>(Device Clear,<br>Selected Device<br>Clear) | *RST or<br>SYSTem:PRESet | STATus:PRESet | *CLS |
|--|-----------------------------|-----|--|--------------------------|---------------|------|
|  | Power-On-Status-Clear       |     |  |                          |               |      |
|  | 0                           | 1   |  |                          |               |      |
| 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.



## Contents - Chapter 6

### "Remote Control - Description of Commands"

|  |              |
|--|--------------|
| <b>6 Remote Control - Description of Commands</b> .....                              | <b>6.1</b>   |
| <b>Notation</b> .....  | <b>6.1</b>   |
| <b>Common Commands</b> .....   | <b>6.4</b>   |
| <b>ABORt Subsystem</b> .....   | <b>6.8</b>   |
| <b>CALCulate Subsystem</b> .....   | <b>6.8</b>   |
| CALCulate:DELTamarker Subsystem .....  | 6.9          |
| CALCulate:FEED Subsystem .....   | 6.17         |
| CALCulate:LIMit Subsystem .....  | 6.19         |
| CALCulate:LIMit:SPECtrum Subsystem .....   | 6.24         |
| CALCulate:LIMit:ACPowEr Subsystem .....  | 6.26         |
| CALCulate:LIMit:CONTRol Subsystem .....  | 6.37         |
| CALCulate:LIMit:LOWer Subsystem .....  | 6.39         |
| CALCulate:LIMit:UPPer Subsystem .....  | 6.42         |
| CALCulate:MARKer Subsystem .....   | 6.45         |
| CALCulate:MARKer:FUNCTion:ADEMod Subsystem .....                                     | 6.53         |
| CALCulate:MARKer:FUNCTion Subsystem .....  | 6.55         |
| CALCulate:MARKer:FUNCTion:POWer Subsystem .....                                      | 6.65         |
| CALCulate:MARKer:FUNCTion:STRack Subsystem .....                                     | 6.70         |
| CALCulate:MARKer:FUNCTion:SUMMary Subsystem .....                                    | 6.72         |
| CALCulate:MARKer:FUNCTion-Subsystem - WCDMA 3GP FDD BTS and MS<br>(FS-K72/K73) ..... | 6.84         |
| CALCulate:MATH Subsystem .....   | 6.87         |
| CALCulate:STATistics Subsystem .....   | 6.89         |
| CALCulate:THReshold Subsystem .....  | 6.93         |
| CALCulate:UNIT Subsystem .....   | 6.95         |
| <b>CALibration Subsystem</b> .....   | <b>6.96</b>  |
| <b>CONFigure – Subsystem</b> .....   | <b>6.98</b>  |
| CONFigure:BURSt - Subsystem .....  | 6.102        |
| CONFigure:SPECtrum - Subsystem .....   | 6.105        |
| CONFigure:SPURious - Subsystem .....   | 6.106        |
| CONFigure:WCDPower - Subsystem .....   | 6.107        |
| <b>DIAGnostic Subsystem</b> .....  | <b>6.114</b> |
| <b>DISPlay Subsystem</b> .....   | <b>6.117</b> |
| <b>FETCh - Subsystem</b> .....   | <b>6.125</b> |
| FETCh:BURSt - Subsystem .....  | 6.125        |
| FETCh:PTEMplate Subsystem.....   | 6.139        |

|   |              |
|---|--------------|
| FETCh:SPECtrum Subsystem .....  | 6.140        |
| <b>FORMat Subsystem .....</b>   | <b>6.143</b> |
| <b>HCOPy Subsystem .....</b>  | <b>6.144</b> |
| <b>INITiate Subsystem .....</b>   | <b>6.150</b> |
| <b>INPUt Subsystem .....</b>  | <b>6.152</b> |
| <b>INSTrument Subsystem .....</b>   | <b>6.156</b> |
| <b>MMEMory Subsystem .....</b>  | <b>6.158</b> |
| <b>READ - Subsystem .....</b>   | <b>6.171</b> |
| READ:AUTO - Subsystem .....   | 6.171        |
| READ:BURSt - Subsystem .....  | 6.173        |
| READ:SPECtrum Subsystem .....   | 6.187        |
| <b>SENSE Subsystem .....</b>  | <b>6.190</b> |
| [SENSE:]ADEMod - Subsystem .....  | 6.190        |
| SENSE:AVERAge Subsystem .....   | 6.204        |
| SENSE:BANDwidth Subsystem .....   | 6.206        |
| SENSE:CDPower Subsystem .....   | 6.211        |
| SENSE:CORRection Subsystem .....  | 6.216        |
| SENSE:DETEctor Subsystem .....  | 6.220        |
| SENSE:FREQUency Subsystem .....   | 6.221        |
| SENSE:LIST Subsystem .....  | 6.224        |
| SENSE:MPOWer Subsystem .....  | 6.230        |
| SENSE:POWer Subsystem .....   | 6.234        |
| SENSE:ROSCillator Subsystem .....   | 6.240        |
| SENSE:SWEEp Subsystem .....   | 6.241        |
| <b>SOURce Subsystem .....</b>   | <b>6.245</b> |
| SOURce:EXTernal Subsystem .....   | 6.246        |
| <b>STATus Subsystem .....</b>   | <b>6.250</b> |
| <b>SYSTEM Subsystem .....</b>   | <b>6.260</b> |
| <b>TRACe Subsystem .....</b>  | <b>6.271</b> |
| General Trace Commands .....  | 6.271        |
| Number and format of the measurement values for the different operating modes . | 6.273        |
| TRACe:IQ Subsystem .....  | 6.277        |
| <b>TRIGger Subsystem .....</b>  | <b>6.287</b> |
| <b>UNIT Subsystem .....</b>   | <b>6.291</b> |
| <b>Supported GPIB Commands of the HP 8590 Series .....</b>                      | <b>6.292</b> |
| Supported Command Subset .....  | 6.292        |

|   |              |
|---|--------------|
| Differences in Status Reporting.....  | 6-298        |
| <b>Differences in GPIB behavior between the FSP and the FSE families of instruments .....</b> | <b>6.299</b> |
| <b>Alphabetical List of Commands .....</b>  | <b>6.323</b> |
| <b>Table of Softkeys with IEC/IEEE-Bus Command Assignment .....</b>                           | <b>6.337</b> |
| FREQUENCY Key .....   | 6.337        |
| SPAN Key.....   | 6.338        |
| AMPT Key.....   | 6.339        |
| MKR Key.....  | 6.341        |
| MKR-> Key .....   | 6.342        |
| MKR FCTN Key.....   | 6.344        |
| BW Key.....   | 6.346        |
| SWEEP Key.....  | 6.347        |
| MEAS Key.....   | 6.348        |
| Taste TRIG .....  | 6.352        |
| TRACE Key .....   | 6.353        |
| LINES Key .....   | 6.355        |
| DISP Key .....  | 6.357        |
| FILE Key .....  | 6.358        |
| CAL Key.....  | 6.359        |
| SETUP Key.....  | 6.359        |
| HCOPY Key.....  | 6.361        |
| Hotkeys.....  | 6.362        |
| Hotkey NETWORK.....   | 6.363        |





## 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:

|                         |              |
|-------------------------|--------------|
| <code>SENSe</code>      | first level  |
| <code>:FREQuency</code> | second level |
| <code>:CENTer</code>    | 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-T Spectrum analysis - time domain only (zero span)
- MS GSM mobile station analysis (option FS-K5)
- FM FM demodulator (option FS-K7)
- 3G FDD WCDMA 3G FDD BTS and UE (option FS-K72 and K73)
- 3G FDD BTS WCDMA 3G FDD BTS (option FS-K72)
- 3G FDD UE WCDMA 3G FDD UE (option FS-K73)

**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, FSU-3, 123456/789, 1.03"

FSU-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        | FSU-B4  | OCXO                   |
| 3        |         | reserved               |
| 4        |         | reserved               |
| 5        |         | reserved               |
| 6        |         | reserved               |
| 7        |         | reserved               |
| 8        | FSU-B10 | Ext. Generator Control |
| 9 to 12  |         | reserved               |
| 14       | FSU-B16 | LAN Interface          |
| 15 to 22 |         | reserved               |
| 23       | FSU-B25 | Electronic Attenuator  |
| 24 to 29 |         | reserved               |
| 30       |         | reserved               |
| 31       |         | reserved               |
| 32       | FS-K7   | FM Demodulator         |
| 33 to 34 |         | reserved               |
| 35       | FS-K72  | WCDMA 3G FDD BTS       |
| 36       | FS-K73  | WCDMA 3G FDD UE        |
| 37...45  |         | reserved               |
| 46       |         | reserviert             |
| 47...50  |         | reserved               |

**Example:**

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

**\*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   | --<br>--   | --<br>-- | no query |

### ABORt

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

**Example:** "ABOR ; INIT : IMM"

**Characteristics:** \*RST value: 0  
SCPI: conforming

**Mode:** A, MS, FM

## CALCulate Subsystem

The CALCulate subsystem contains commands for converting instrument data, transforming and carrying out corrections. These functions are carried out subsequent to data acquisition, 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.

**Notes:** *All GSM measurements are performed in screen A. Therefore, commands carrying a numerical suffix selecting the screen should start either with the numerical suffix 1 (i.e. CALCulate1) or without a numerical suffix (i.e. CALCulate).*



### 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).

| COMMAND              | PARAMETERS        | UNIT              | COMMENT    |
|----------------------|-------------------|-------------------|------------|
| CALCulate<1 2>       |                   |                   |            |
| :DELTamarker<1 to 4> |                   |                   |            |
| [:STATe]             | <Boolean>         | --                |            |
| :MODE                | ABSolute RELative |                   |            |
| :AOFF                |                   |                   | no query   |
| :TRACe               | <numeric_value>   | --                |            |
| :X                   | <numeric_value>   | HZ   S   DBM   DB |            |
| :RELative?           | --                | --                | query only |
| :Y?                  | --                | --                | query only |
| :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   |
| :FUNCTion            |                   |                   |            |
| :FIXed               |                   |                   |            |
| [:STATe]             | <Boolean>         |                   |            |
| :RPOint              |                   |                   |            |
| :Y                   | <numeric_value>   | DBM               |            |
| :OFFSet              | <numeric_value>   | DB                |            |
| :X                   | <numeric_value>   | HZ   S            |            |
| :PNOise              |                   |                   |            |
| [:STATe]             | <Boolean>         |                   |            |
| :RESult?             | --                | --                | query only |

#### 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

**Mode:** A, MS, FM

**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

**Mode:** A, MS, FM

**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

**Mode:** A, MS, FM

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

**Mode:** A, MS, FM

**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 CCDF measurement = 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.

|                 |                        |  |
|-----------------|------------------------|--|
| <b>Example:</b> | "CALC:DELT:MOD REL"    | 'Switches the input for all delta markers to<br>'relative to marker 1.       |
|                 | "CALC:DELT2:X 10.7MHz" | 'Positions delta marker 2 in screen A<br>'10.7 MHz to the right of marker 1. |
|                 | "CALC2:DELT:X?"        | 'Outputs the absolute frequency/time of delta<br>'marker 1 in screen B       |
|                 | "CALC2:DELT:X:REL?"    | 'Outputs the relative frequency/time/level of<br>'delta marker 1 in screen B |

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

**Mode:** A, MS, FM

**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.

|                 |                     |  |
|-----------------|---------------------|--|
| <b>Example:</b> | "CALC:DELT3:X:REL?" | 'Outputs the frequency of delta marker 3 in<br>'screen B relative to marker 1 or relative to the<br>'reference position. |
|-----------------|---------------------|--|

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

**Mode:** A, MS, FM

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

This command queries the measured value of the selected delta marker in the indicated measurement window. The corresponding delta marker will be activated, if necessary. The output is always a relative value referred to marker 1 or to the reference position (reference fixed active).

To obtain a valid query result, a complete sweep with synchronization to the sweep end must be performed between the activation of the delta marker and the query of the y value. This is only possible in single sweep mode.

Depending on the unit defined with `CALC:UNIT` or on the activated measuring functions, the query result is output in the units below:

- `DBM | DBPW | DBUV | DBMV | DBUA`: Output unit DB
- `WATT | VOLT | AMPere`: Output unit W | V | A
- Statistics function (APD or CCDF) on: Dimensionless output
- Result display FM (FS-K7): Hz
- Result display RF POWER (FS-K7): dB
- Result display SPECTRUM (FS-K7): dB

**Example:**

```
"INIT:CONT OFF" 'Switches to single-sweep mode.
"CALC:DELT2 ON" 'Switches on delta marker 2 in screen A.
"INIT;*WAI" 'Starts a sweep and waits for its end.
"CALC:DELT2:Y?" 'Outputs measurement value of delta marker 2 in
'screen A.
```

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

**Mode:** A, MS, FM

**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

**Mode:** A, MS, FM

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

**Mode:** A, MS, FM

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

**Mode:** A, MS, FM

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

**Mode:** A, BTS, MS, FM

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

**Mode:** A, BTS, MS, FM

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

**Mode:** A, BTS, MS, FM

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

**Mode:** A, BTS , MS, FM

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

**Mode:** A, BTS , MS, FM

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.

**Mode:** A, MS

**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

**Mode:** A, MS

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

**Mode:** A, MS

**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

**Mode:** A, MS

**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

**Mode:** A, MS

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

This command switches on or off the phase-noise measurement with all active 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 measurement with fixed reference point).

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

**Note:** *This command is not available during GSM measurements.*

**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

**Mode:** A

**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.

**Note:** *This command is not available during GSM measurements.*

**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

**Mode:** A

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>:<br>FEED | <string>  |      | No query |

### CALCulate<1|2>:FEED <string>

This command selects the measured data that are to be displayed.

#### Parameters for option FS-K7 FM Demodulator:

<string>::=

|                          |   |
|--------------------------|---|
| 'XTIM:AM'                | Demodulated AM signal in level display. Equivalent to 'XTIM:RFPower'.       |
| 'XTIM:RFPower'           | Demodulated AM signal in level display.                                     |
| 'XTIM:FM'                | Demodulated FM signal.  |
| 'XTIM:SPECtrum'          | RF spectrum of FM signal determined from the measured data by means of FFT. |
| 'XTIM:AMSummary<1 to 3>' | AM summary marker, referred to trace 1 to 3.                                |
| 'XTIM:FMSummary<1 to 3>' | FM summary marker, referred to trace 1 to 3                                 |

#### Parameters for option FS-K72/K73 WCDMA 3G FDD BTS/UE:

The value in parentheses (CALC1) or (CALC2) indicates which command string is required in order to match the parameter selected (<string>).

<string>::=

|                         |  |
|-------------------------|--|
| 'XPOW:CDP'              | Bargraph result display of code domain power (absolute)(CALC1)             |
| 'XPOW:CDP:RATio'        | Bargraph result display of code domain power ratio (relative) (CALC1)      |
| 'XPOW:CDP:OVERview'     | Overview, screen A displays CDP Rel I, screen B CDP Q (option FS-K73 only) |
| 'XTIM:CDP:ERR'          | Bargraph result display of timing error                                    |
| 'XTIM:CDP:ERR:PHASe'    | Bargraph result display of phase error                                     |
| 'XTIM:CDP:ERR:SUMM'     | Display of results in tabular form (CALC2)                                 |
| 'XTIM:CDP:ERR:CTABle'   | Display of channel table (CALC1)   |
| 'XTIM:CDP:ERR:PCDomain' | Result display of peak code domain error (CALC2)                           |
| 'XTIM:CDP:MACCuracy'    | Result display of modulation accuracy (CALC2)                              |
| 'XTIM:CDP:PVSLOT'       | Result display of power versus slot (CALC2)                                |
| 'XTIM:CDP:PVSymbol'     | Result display of power versus symbol (CALC2)                              |

|                               |  |
|-------------------------------|--|
| 'XTIM:CDP:PVSymbol'           | Result display of power versus symbol<br>(CALC2) |
| 'XTIM:CDP:BSTream'            | Result display of bitstream (CALC2)              |
| 'XTIM:CDP:SYMB:CONStellation' | Result display of symbol constellation (CALC2)   |
| 'XTIM:CDP:SYMB:EVM'           | Result display of vector magnitude error (CALC2) |

**Example:** "CALC:FEED `XTIM:FM`" 'Selects the display of the FM signal

**Characteristics:** \*RST value: 'XTIM:OFF'  
SCPI: conforming

**Mode:** FM, 3G FDD

This command is only available with option FS-K7 (FM demodulator) or options FS-K72 (WCDMA 3G FDD BTS) and FS-K73 (WCDMA 3G FDD BTS)

## 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,<br>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.

**Note:** - This subsystem is not available for GSM MS measurements modulation accuracy (MAC) and phase frequency error (PFE) (option FS-K5).

- The names of the limit lines for GSM MS measurements are fixed. The names must be assigned by the user prior to their use:

```
CALCulate1:LIMit1:NAME 'xxxU_yz' or
CALCulate1:LIMit2:NAME 'xxxL_yz'

xxx = measurement          (PVT / CPW / MOD / TRA)
U   = upper limit line     (PVT / CPW / MOD / TRA)
L   = lower limit line     (PVT / CPW)
y   = modulation type      (_G = GMSK / _E = EDGE)
z   = for all measurements blank, only
      for PVT in multislot:
          active slots      (blank = 1 active slot
                             2     = 2 active slots
                             3     = 3 active slots
                             4     = 4 active slots)
```

```
Query:    CALC1:LIM1:FAIL?
          CALC1:LIM2:FAIL?
```

```
Example:
CPWU_G = upper limit line for Carrier Power measurement,
          Modulation type GMSK
PVTL_E3 = lower limit line for Power versus Time measurement,
          Modulation type EDGE, multislot: 3 active slots
```

| COMMAND        | PARAMETERS   | UNIT | COMMENT    |
|----------------|--|------|------------|
| CALCulate<1 2> |  |      |            |
| :LIMit<1 to 8> |  |      |            |
| :TRACe         | <numeric_value>  |      |            |
| :STATe         | <Boolean>  | --   |            |
| :UNIT          | DBM   DBPW   WATT  <br>DBUV   DBMV   VOLT  <br>DBUA   AMPere   DB  <br>DBUV_M   DBUA_M  <br>DEG   RAD   S   HZ   PCT  <br>UNITLESS |      |            |
| :FAIL?         |  | --   | query only |
| :CLEAr         |  |      |            |
| [:IMMediate]   | --   | --   | no query   |
| :COMMeNt       | <string>   | --   |            |
| :COPI          | 1 to 8   < name>   | --   |            |
| :NAME          | <string>   |      |            |
| :DELeTe        | --   |      |            |

**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

**Mode:** A, MS, FM

**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:**

|                                   |   |
|-----------------------------------|---|
| <code>"CALC:LIM:STAT ON"</code>   | 'Switches on the limit check for limit line 1 in screen A.  |
| <code>"CALC2:LIM:STAT OFF"</code> | 'Switches off the limit check for limit line 1 in screen B. |

**Characteristics:** \*RST value: OFF  
SCPI: conforming

**Mode:** A, BTS, MS, FM

**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 dB $\mu$ V.

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

**Mode:** A, MS, FM

**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:**

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

**Characteristics:** \*RST value: -  
SCPI: conforming

**Mode:** A, MS, FM

**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

**Mode:** A, MS, FM

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

**Mode:** A, MS, FM

**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

**Mode:** A, MS, FM

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

**Mode:** A, MS, FM

**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

**Mode:** A, MS, FM

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

**CALCulate:LIMit:SPECTrum Subsystem**

The CALCulate:LIMit:SPECTrum subsystem defines the limit check for the spectral measurements of the options WCDMA 3G FDD BTS and UE (options FS-K72 and K73).

| COMMAND   | PARAMETERS                              | UNIT | COMMENT               |
|---|---|------|-----------------------|
| CALCulate<1 2><br>LIMit<1...8><br>:ESpectrum<br>:MODE<br>:VALue<br>:RESTore | AUTO   MANual   USER<br><numeric_value> | DBM  | Option FS-K72, FS-K73 |

**CALCulate<1|2>:LIMit<1...8>:ESpectrum:MODE AUTO | MANual | USER**

This command enables or disables the automatic selection of the limit line for the spectrum emission mask measurement.

This command is only available in conjunction with the options FS-K72 (WCDMA 3G FDD BTS) and FS-K73 (WCDMA 3G FDD UE).

The numeric suffixes <1|2> or <1 to 8> are irrelevant for this command.

- Parameter:** AUTO The limit line depends on the channel power measured.
- MANUAL One of the four default limit lines is selected by means of the command CALC:LIM:ESP:VAL
- USER Query only, user-defined limit lines being enabled (see description of limit lines in the manual for the option)

**Example:** "INST BWCD" ' Switches the instrument to the WCDMA Downlink mode  
":CALC:LIM:ESP:MODE AUTO" Activates automatic limit line selection"

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

**Mode:** 3G FDD

**CALCulate<1|2>:LIMit<1...8>:ESpectrum:VALue <numeric\_value>**

This command switches over to manual limit line selection. The limit line is selected by entering the expected power. Depending on the value entered, one of four possible limit lines is activated:

| Specified value in dBm | Selected limit line | Return value |
|------------------------|---------------------|--------------|
| value ≥ 43             | "P ≥ 43"            | 43           |
| 39 ≤ value < 43        | "39 ≤ P < 43"       | 39           |
| 31 ≤ value < 39        | "31 ≤ P < 39"       | 31           |
| value < 31             | "P < 31"            | 0            |

This command is only available in conjunction with the options FS-K72 (WCDMA 3G FDD BTS) and FS-K73 (WCDMA 3G FDD UE).

The numeric suffixes <1|2> or <1 to 8> are irrelevant for this command.



**Example:** "INST BWCD" ' Switches the instrument to the WCDMA Downlink mode  
 ":CALC:LIM:ESP:VAL 39" Selects the limit line " $39 \leq P < 43$ "

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

**Mode:** 3G FDD

#### CALCulate<1|2>:LIMit<1...8>:ESPectrumRESTore

This command restores the standard limit lines for the spectrum emission mask measurement. All modifications made to the standard limit lines are lost and the default setting valid upon delivery is restored.

This command is only available in conjunction with the options FS-K72 (WCDMA 3G FDD BTS) and FS-K73 (WCDMA 3G FDD UE).

The numeric suffixes <1|2> or <1 to 8> are irrelevant for this command.

**Example:** "INST BWCD" ' Switches the instrument to the WCDMA Downlink mode  
 "CALC:LIM:ESP:REST" ' Sets the spectrum emission mask limit lines back to the default setting

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

**Mode:** 3G FDD

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><br>LIMit<1 to 8><br>:ACPower<br>[:STATe]<br>:ACHannel<br>[:RELative]<br>:STATe<br>:ABSolute<br>:STATe<br>:RESult?<br>:ALternate<1 2><br>[:RELative]<br>:STATe<br>:ABSolute<br>:STATe<br>:RESult? | <Boolean><br><br><numeric_value>, <numeric_value><br><Boolean><br><numeric_value>, <numeric_value><br><Boolean><br>--<br><br><numeric_value>, <numeric_value><br><Boolean><br><numeric_value>, <numeric_value><br><Boolean><br>-- | <br><br>DB, DB<br><br>DBM, DBM<br><br><br><br>DB, DB<br><br>DBM, DBM<br><br><br><br>DBM, DBM<br><br><br>-- | <br><br><br><br><br><br><br>query only<br><br><br><br><br><br><br><br><br><br><br>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

**Mode:** A

**CALCulate<1|2>:LIMit<1 to 8>:ACPpower: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:ACPpower: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

**Mode:** A

**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.

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

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

**Mode:** A

**CALCulate<1|2>:LIMit<1 to 8>:ACPpower:ACHannel:ABSolute** -200DBM to 200DBM, -200 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:ACPpower: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 compatibility 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

**Mode:** A

**CALCulate<1|2>:LIMit<1 to 8>:ACPpower: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:ACPpower: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.

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

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

**Mode:** A

**CALCulate<1|2>:LIMit<1 to 8>:ACPpower: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<br>'power in the lower and upper adjacent<br>'channel to 30 dB below the channel power. |
| "CALC:LIM:ACP:ACH:ABS -35DBM, -35DBM" | Sets the absolute limit value in screen A<br>'for the power in the lower and upper<br>'adjacent channel to -35 dB.                         |
| "CALC:LIM:ACP ON"                     | 'Switches on globally the limit check for the<br>'channel/adjacent channel measurement in<br>'screen A.                                    |
| "CALC:LIM:ACP:ACH:STAT ON"            | 'Switches on the limit check for the adjacent<br>'channels in screen A.  |
| "INIT;*WAI"                           | 'Starts a new measurement and waits for the<br>'sweep end.   |
| "CALC:LIM:ACP:ACH:RES?"               | 'Queries the limit check result in the adjacent<br>'channels in screen A.  |

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

**Mode:** A

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

**CALCulate<1|2>:LIMit<1 to 8>:ACPpower: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:ACPpower: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

**Mode:** A



**CALCulate<1|2>:LIMit<1 to 8>:ACPpower: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:ACPpower: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:ACPpower: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:**

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

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

**Mode:** A

**CALCulate<1|2>:LIMit<1 to 8>:ACPpower: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:ACPpower: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

**Mode:** A

**CALCulate<1|2>:LIMit<1 to 8>:ACPpower: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:ACPpower: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:ACPpower: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:**

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

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

**Mode:** A

**CALCulate<1|2>:LIMit<1 to 8>:ACPpower: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

**Mode:** A

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><br>:LIMit<1 to 8><br>:CONTrol<br>[:DATA]<br>:DOMain<br>:OFFSet<br>:MODE<br>:SHIFt | <numeric_value>,<numeric_value>..<br>FREQuency TIME<br><numeric_value><br>RELative ABSolute<br><numeric_value> | HZ   S<br><br>HZ   S<br><br>HZ   S |         |

**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

**Mode:** A, MS, FM

**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

**Mode:** A, MS, FM

**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` und S bei `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

**Mode:**            A, MS, FM

**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

**Mode:**            A, MS, FM

**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

**Mode:**            A, MS, FM

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

**CALCulate:LIMit:LOWer Subsystem**

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

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

**Mode:** A, MS, FM

**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

**Mode:**            A, MS, FM

**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

**Mode:**            A, MS, FM

**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

**Mode:**            A, MS, FM

**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

**Mode:**            A, MS, FM





**CALCulate:LIMit:UPPer Subsystem**

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

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

**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

**Mode:** A, MS, FM

**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:**

|                                       |  |
|---------------------------------------|--|
| <code>"CALC1:LIM4:UPP:STAT ON"</code> | 'Switches on limit line 4 (upper limit) in screen A. |
| <code>"CALC2:LIM4:UPP:STAT ON"</code> | 'Switches on limit line 4 (upper limit) in screen B. |

**Characteristics:** \*RST value: OFF  
SCPI: conforming

**Mode:** A, MS, FM

**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:**

|                                       |  |
|---------------------------------------|--|
| <code>"CALC:LIM2:UPP:OFFS 3dB"</code> | 'Shifts limit line 2 by 3 dB upwards in the corresponding measurement windows. |
|---------------------------------------|--|

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

**Mode:** A, MS, FM

**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:**

|  |   |
|--|---|
| <code>"CALC:LIM2:UPP:MARG 10dB"</code> | 'Defines the margin of limit line 2 to 10 dB below the limit value. |
|--|---|

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

**Mode:** A, MS, FM

**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

**Mode:** A, MS, FM

**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

**Mode:** A, MS, FM

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

**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

**Mode:** A, MS, FM

## 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>       | --                | no query   |
| :AOFF           |                 |                   |            |
| :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>       | --                | query only |
| :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                |            |

### 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

**Mode:** A, MS, FM

**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

**Mode:** A, MS, FM

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

**Mode:** A, MS, FM

**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

**Mode:** A, MS, FM

**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

**Mode:** A, MS, FM

**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

**Mode:** A, MS, FM

**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

**Mode:** A, MS, FM

**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.

**Note:** This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE) and power versus time (PVT).

**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

**Mode:** A, MS

**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.

**Note:** This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE) and power versus time (PVT).

**Example:**

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

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

**Mode:** A, MS

**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.

**Note:** This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE) and power versus time (PVT).

**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

**Mode:** A, MS

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

**Mode:** A-F, MS, FM

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

**Mode:** A, MS, FM

**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

**Mode:** A

**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 code: -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

**Mode:** A, MS, FM

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

**Mode:** A, MS, FM

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:RIGHT" '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

**Mode:** A, MS, FM

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

**Mode:** A, BTS; MS, FM

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

**Mode:** A, MS, FM

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

**Mode:** A, MS, FM

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

**Mode:** A, MS, FM

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

**Mode:** A, MS, FM

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

**Mode:** A, MS, FM

The numeric suffix in MARKer<1 to 4> is irrelevant.

**CALCulate:MARKer:FUNCTION:ADEMod Subsystem**

The CALCulate:MARKer:FUNCTION:ADEMod subsystem contains the marker functions for the Option FM Demodulator FS-K7.

| COMMAND  | PARAMETERS                   | UNIT | COMMENT   |
|--|------------------------------|------|---|
| CALCulate<1 2><br>:MARKer<br>:FUNCTION<br>:ADEMod<br>:FM<br>[:RESult<1 to 3>?]<br>:AFRequency<br>[:RESult<1 to 3>?]<br>:FERRor<br>[:RESult<1 to 3>?]<br>:CARRier<br>[:RESult<1 to 3>?] | PPEak   MPEak   MIDDLE   RMS |      | Option FM Demodulator<br>query only<br><br>query only<br><br>query only<br><br>query only |

**CALCulate<1|2>:MARKer<1 to 4>:FUNCTION:ADEMod:FM[:RESult<1 to 3>]?  
PPEak | MPEak | MIDDLE | RMS**

This command queries the results of FM modulation measurement. The numeric suffix marks the selected trace 1 to 3.

- PPEak Result of measurement with detector +PK
- MPEak Result of measurement with detector -PK
- MIDDLE Result of averaging  $\pm PK/2$
- RMS Result of rms measurement

**Example:** "CALC:MARK:FUNC:ADEM:FM? PPE" 'Queries the peak value.'

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

**Mode:** FM

This command is only available with Option FS-K7 (FM Demodulator).

**CALCulate<1|2>:MARKer<1 to 4>:FUNCTION:ADEMod:AFRequency[:RESult<1 to 3>]?**

This command queries the audio frequency with analog demodulation. The numeric suffix marks the selected trace 1 to 3.

**Example:** "CALC:MARK:FUNC:ADEM:AFR? " 'Queries the audio frequency'

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

**Mode:** FM

This command is only available with Option FS-K7 (FM Demodulator).

**CALCulate<1|2>:MARKer<1 to 4>:FUNCTion:ADEMod:FERRor[:RESult<1 to 3>]?**

This command queries the frequency error with FM demodulation. The numeric suffix marks the selected trace 1 to 3.

The offset thus determined differs from that calculated in the command [SENSe:]ADEMod:FM:OFFSet?, since, for determination of the frequency deviation, the modulation is removed by means of lowpass filtering, producing results that are different from those obtained by averaging with the SENSe:...command.

This command is only available for traces in the Result Display FM.

**Example:** "CALC:MARK:FUNC:ADEM:FERR? " 'Queries the frequency error of trace 1

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

**Mode:** FM

This command is only available with option FS-K7 (FM Demodulator).

**CALCulate<1|2>:MARKer<1 to 4>:FUNCTion:ADEMod:CARRier[:RESult<1 to 3>]?**

This command queries the carrier power.

With result display FM and SPECTRUM, the carrier power is determined from the current trace data (CLR/WRITE trace).

With result display RF Power, the carrier power is determined from trace 1 to 3 indicated in the numeric suffix.

**Example:** "CALC:MARK:FUNC:ADEM:CARR? " 'Queries the carrier power

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

**Mode:** FM

This command is only a query and therefore has no \*RST value. It is only available with option FS-K7 (FM demodulator).

**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><br>:MARKer<1 to 4><br>:FUNCTION<br>:FPEaks<br>[:IMMEDIATE]<br>:COUNT?<br>:X?<br>:Y?<br>:SORT<br>:NDBDown<br>:STATE<br>:RESULT?<br>:FREQUENCY?<br>:ZOOM<br>:NOISE<br>[:STATE]<br>:RESULT?<br>:DEMODulation<br>:SELECT<br>[:STATE]<br>:HOLDoff<br>:CONTinuous<br>:MDEPTH<br>[:STATE]<br>:RESULT?<br>:TOI<br>[:STATE]<br>:RESULT?<br>:CENTer<br>:CSTEP<br>:REFERENCE | <numeric_value><br>--<br>--<br>--<br>X   Y<br><numeric_value><br><Boolean><br>--<br>--<br><numeric_value><br><Boolean><br>--<br>AM FM<br><Boolean><br><numeric_value><br><Boolean><br><Boolean><br>--<br><Boolean><br>-- | --<br>--<br>--<br>--<br>DB<br>--<br>--<br>HZ<br>--<br>S<br>--<br>-- | query only<br>query only<br>query only<br>no query<br>query only<br>option audio demodulator<br>query only<br>query only<br>no query<br>no query<br>no query |

**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

**Mode:** A

#### 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:COUN?" ' queries the number of maxima found

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

**Mode:** A

#### 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:COUN?" ' queries the number of maxima found  
"CALC:MARK: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

**Mode:** A



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

**Mode:** A

**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

**Mode:** A

**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?`.

**Note:**

*This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE) and power versus time (PVT).*

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

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

**Mode:** A, MS

**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.

**Note:** This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE) and power versus time (PVT).

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

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

**Mode:** A, MS

**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.

**Note:** This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE) and power versus time (PVT).

**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

**Mode:** A, MS

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.

**Note:** This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE) and power versus time (PVT).

**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

**Mode:** A, MS

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

**Mode:** A-F

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?`.

**Note:** This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE) and power versus time (PVT).

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

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

**Mode:** A, MS

**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.

**Note:** This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE) and power versus time (PVT).

**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

**Mode:** A, MS

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

**Mode:** A, MS

**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

**Mode:** A, MS

**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

**Mode:** A, MS

**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

**Mode:** A, MS

**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 symmetrically to the carrier to the adjacent maxima of the trace.

If the position of delta marker 2 is changed, delta marker 3 is moved symmetrically 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 FSU 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.

|                 |                          |  |
|-----------------|--------------------------|--|
| <b>Example:</b> | "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

**Mode:** A, MS

**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.

|                 |                            |  |
|-----------------|----------------------------|--|
| <b>Example:</b> | "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

**Mode:** A, MS

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 separately 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.

**Note:** This command is not available during GSM measurements modulation accuracy (MAC), phase-frequency error (PFE), power vs. time (PVT) and carrier power (CPW).

**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

**Mode:** A, MS

**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.

**Note:** This command is not available during GSM measurements modulation accuracy (MAC), phase-frequency error (PFE), power vs. time (PVT) and carrier power (CPW).

**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

**Mode:** A, MS

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

**Mode:** A-F, MS

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

**Mode:** A-F, MS

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 the level of marker 2.

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

**Mode:** A, MS

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



**CALCulate:MARKer:FUNCTION:POWER Subsystem**

The CALCulate:MARKer:FUNCTION:POWER subsystem contains the commands for control of power measurement.

**Note :** The commands of this subsystem are not available during active GSM measurements.

| COMMAND   | PARAMETERS  | UNIT | COMMENT    |
|---|---|------|------------|
| CALCulate<1 2><br>:MARKer<br>:FUNCTION<br>:POWER<br>:SElect | ACPower   CPOWer   OBANdwidth  <br>OBWidth   CN   CN0   |      |            |
| :RESult?  | ACPower   CPOWer   OBANdwidth  <br>OBWidth   CN   CN0   |      | query only |
| :PHZ  | <Boolean>   |      |            |
| :PRESet   | <Boolean>   |      |            |
|   | NADC   TETRA   PDC   PHS  <br>CDPD  <br>FWCDma   RWCDma  <br>F8CDma   R8CDma  <br>F19Cdma   R19Cdma  <br>FW3Gppcdma   RW3Gppcdma  <br>D2CDma   S2CDma   M2CDma  <br>FIS95A   RIS95A  <br>FIS95C0   RIS95C0  <br>FIS95C1   RIS95C1  <br>FJ008   RJ008   TCDMa   NONE |      |            |
| [:STATe]  | OFF   |      | no query   |

**CALCulate<1|2>:MARKer<1 to 4>:FUNCTION:POWER:SElect** ACPower | CPOWer | OBANdwidth |  
OBWidth | CN | CN0

This command selects the indicated power measurement and switches it on 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.

The configuration of channel spacings and channel bandwidths is performed by means of subsystem SENSE:POWER:ACHannel.

It should be noted that selecting CPOWer causes the number of adjacent channels (command: [SENSE<1|2>:]POWER:ACHannel:ACPairs) to be set to 0. Selecting ACPower causes the number of adjacent channels to be set to 1, if the adjacent channel power measurement is not yet switched on.

In both cases the behaviour of FSU differs from that of the FSE family.

**Notes:** The measurement of the channel/adjacent channel power is performed on the trace which has been selected with SENSE:POWER:TRACE 1|2|3.

This command is not available during active GSM measurements.

The measurement of the occupied bandwidth is performed on the trace on which marker 1 is positioned. In order to evaluate another trace, marker 1 should be positioned on another trace with CALC:MARK:TRAC 1|2|3.

**Parameter:** ACPower adjacent channel power measurement  
CPOWer channel power measurement (same as adjacent channel power measurement with No. of Adj Channels = 0)  
OBANdwidth | OBWidth occupied bandwidth power measurement

**Example:** "CALC:MARK:FUNC:POW:SEL ACP" 'Switches on the adjacent channel power measurement in screen A.

**Characteristics:** \*RST value: -  
 SCPI: device-specific  
**Mode:** A-F

**CALCulate<1|2>:MARKer<1 to 4>:FUNCTION:POWER:RESult?ACPower | CPOWer | OBANdwidth | OBWidth | CN | CNO**

This command queries the results of the power measurement in the selected measurement window. The measurement is switched on first, if necessary.

The configuration of channel spacings and channel bandwidths is performed with subsystem `SENSe:POWer:ACHannel`.

To obtain a valid result, a complete sweep with synchronization to the sweep end must be performed before the query is executed. This is possible in single sweep mode only.

**Note:** *This command is not available during active GSM measurements.*

**Parameter:**

**ACPower:** adjacent channel power measurement

Results are output separated by commas in the following order:

1. Power of main channel
2. Power of lower adjacent channel
3. Power of upper adjacent channel
4. Power of lower alternate adjacent channel 1
5. Power of upper alternate adjacent channel 1
6. Power of lower alternate adjacent channel 2
7. Power of upper alternate adjacent channel 2

The number of results depends on the number of adjacent channels selected with command `SENSe:POWer:ACHannel:ACPairs`.

With logarithmic scaling (RANGE LOG), the power is output in dBm, with linear scaling (RANGE LIN dB or LIN %) in W. If `SENSe:POWer:ACHannel:MODE REL` is selected, adjacent channel power is output in dB.

**CPOWer** channel power measurement

With logarithmic scaling (RANGE LOG), the channel power is output in dBm, with linear scaling (RANGE LIN dB or LIN %) in W.

**OBANdwidth | OBWidth** occupied bandwidth power measurement

The return value is the occupied bandwidth in Hz.

**CN** Measurement of the carrier/noise ratio.

The return value is output in dB.

**CNO** Measurement of the carrier/noise ratio referred to a 1 Hz bandwidth.

The return value is output in dB/Hz.

**Example of channel/adjacent power 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 to adjacent channel to 30 kHz as well as between channel and alternate adjacent channel to 60 kHz and 2nd alternate adjacent channel to 90 kHz. |
| "SENS2:POW:ACH:SPAC:ALT1 100KHZ" | 'Sets the spacing between channel and alternate adjacent channel to 100 kHz as well as 2nd alternate adjacent channel to 150 kHz.   |
| "SENS2:POW:ACH:SPAC:ALT2 140KHZ" | 'Sets the spacing between channel and alternate adjacent channel 2 to 140 kHz.  |
| "SENS2:POW:ACH:MODE ABS"         | 'Switches on the measurement of absolute power values.  |
| "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? ACP"   | 'Queries the result of the adjacent channel power measurement in screen B.  |
|                                  | 'In case of relative measurement, the measured channel power can be defined as the reference power with command.  |
| "SENS2:POW:ACH:REF:AUTO ONCE".   |   |

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`.

**Example of occupied bandwidth measurement:**

|                                |  |
|--------------------------------|--|
| "SENS2:POW:BAND 90PCT"         | 'Sets the percentage of the power contained in the bandwidth under request to 90%. |
| "INIT:CONT OFF"                | 'Switches to single-sweep mode.  |
| "INIT;*WAI"                    | 'Starts a sweep and waits for the end.   |
| "CALC2:MARK:FUNC:POW:RES? OBW" | 'Queries the result of the occupied bandwidth in screen B.                         |

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

Mode: A-F

This command is only 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 bandwidth (ON).

The measurement results are output with `CALCulate:MARKer:FUNction:POWer:RESult?`

**Note:** This command is not available during active GSM measurements.

**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

**Mode:** A-F

**CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:POWER[:STATe] OFF**

This command switches off the power measurement in the selected measurement window.

**Note:** This command is not available during active GSM measurements.

**Example:** "CALC:MARK:FUNC:POW OFF" Switches off the power measurement in screen B.

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

**Mode:** A-F

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.

This command is not available during active GSM measurements.

**Example:** "CALC2:MARK:FUNC:POW:PRES NADC" 'Selects the standard setting for 'NADC in screen B

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

**Mode:** A-F

**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><br>:MARKer<br>:FUNCTion<br>:STRack<br>[:STATe]<br>:BANDwidth<br>:BWIDth<br>:THReshold<br>:TRACe | <Boolean><br><numeric_value><br><numeric_value><br><numeric_value><br><numeric_value> | <br>HZ<br>HZ<br>DBM |         |

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

This command switches the signal-track function on or off for the 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

**Mode:** A-F, MS

**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

**Mode:** A-F, MS

**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

**Mode:** A-F, MS

**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

**Mode:** A-F, MS

**CALCulate:MARKer:FUNCTion:SUMMry Subsystem**

This subsystem contains the commands for controlling the time domain power functions. These are provided in the marker subsystem for reasons of compatibility with the FSE family.

| COMMAND        | PARAMETERS  | UNIT           | COMMENT    |
|----------------|---|----------------|------------|
| CALCulate<1 2> |   |                |            |
| :MARKer        |   |                |            |
| :FUNCTion      |   |                |            |
| :SUMMry        |   |                |            |
| [: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>,<br><numeric_value>,<br><numeric_value>,<br><numeric_value> | S,<br>S,<br>S, | query only |



**CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMery[: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:SUMMery: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

**Mode:** A-T, MS

**CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMery: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

**Mode:** A-T, MS

**CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMery: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

**Mode:** A-T, MS

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<br>'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

**Mode:** A-T, MS

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<br>'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

**Mode:** A-T, MS

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

**Mode:** A-T, MS

**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

**Mode:** A-T, MS

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" 'Switches 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

**Mode:** A-T, MS

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 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

**Mode:** A-T, MS

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

**Mode:** A-T, MS

**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

**Mode:** A-T, MS

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

**Mode:** A-T, MS

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

**CALCulate<1|2>:MARKer<1 to 4>:FUNCTion:SUMMery: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:SUMMery: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

**Mode:** A-T, MS

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

**CALCulate<1|2>:MARKer<1 to 4>:FUNCTion:SUMMery: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

**Mode:** A, MS

**CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMery: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

**Mode:** A-T, MS

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

**CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:SUMMery: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<br>'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

**Mode:** A-T, MS

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

**Mode:** A-T, MS

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

**Mode:** A-T, MS

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

**Mode:** A-T, MS

**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.

**Note:** *This command is not available for GSM MS measurements modulation accuracy (MAC) and phase/frequency error (PFE).*

**Example:**

|                                |  |
|--------------------------------|--|
| "CALC:MARK:FUNC:SUMM:MODE REL" | 'Switches the time domain power measurement to relative. |
|--------------------------------|--|

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

**Mode:** A-T, MS

**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.

**Note:** This command is not available for GSM MS measurements modulation accuracy (MAC) and phase/frequency error (PFE).

**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

**Mode:** A-T, MS

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

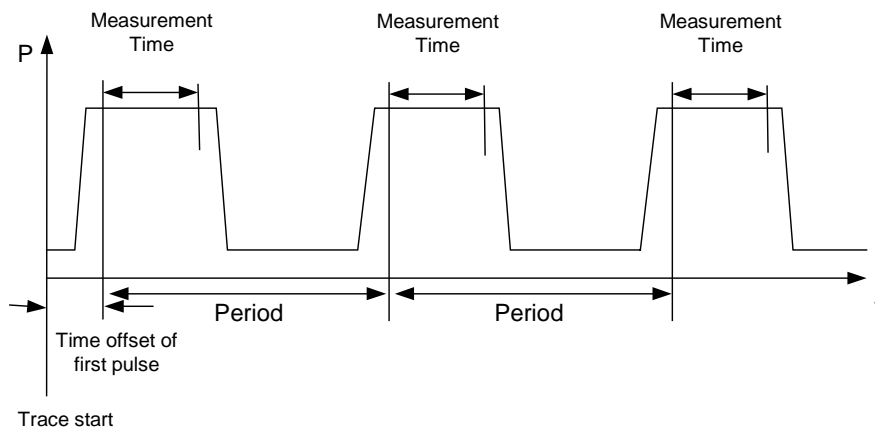
**Mode:** A-T, MS

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 $\mu$ s, a test time of 450 $\mu$ s and a period of 576.9 $\mu$ s |

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

**Mode:** A-Z

This command is only available from firmware 1.30 on.

**CALCulate:MARKer:FUNCTION-Subsystem - WCDMA 3GP FDD BTS and MS (FS-K72/K73)**

The measurement windows are selected by CALCulate1 (screen A) or CALCulate2 (screen B).

| Command  | Parameter   | Unit | Comment  |
|--|---|------|--|
| CALCulate<1 2><br>:MARKer<1 to 4><br>:FUNCTION<br>:CPICH<br>:PCCPch<br>:DPCCh<br>:WCDPower<br>[:BTS]<br>:RESult? | PTOTAL   FERRor   TFRame  <br>TOFFset   MACCuracy   PCDError  <br>EVMRms   EVMPeak   CERRor  <br>CSLot   SRATe   CHANnel  <br>CDPabsolute   CDPRelative  <br>IQOffset   IQIMbalance     |      | No query, FS-K72<br>No query, FS-K72<br>No query, FS-K73<br><br>Query only, FS-K72 |
| :MS<br>:RESult?  | PTOTAL   FERRor   TFRame  <br>PSYMBOL   MACCuracy   PCDError  <br>EVMRms   EVMPeak   CERRor  <br>CMApPping   SRATe   CHANnel  <br>CDPabsolute   CDPRelative  <br>IQOffset   IQIMbalance |      | Query only, FS-K73   |

**CALCulate<1|2>:MARKer<1>:FUNCTION:CPICH**

This command sets the marker to channel 0.

The numeric suffix in CALCulate that is required or permissible depends on the selected display mode for which the marker is to be valid and has to coincide with it:

CALCulate<1> for CDP absolute and relative

CALCulate2 for modulation accuracy, peak code domain error, power versus slot, bit stream, symbol constellation and EVM

**Example:** "CALC:MARK:FUNC:CPIC"

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

**Mode:** 3G FDD BTS

This command is an <Event> and therefore has no \*RST value and no query. Only the numeric suffix 1 is permissible in MARKer.

**CALCulate<1|2>:MARKer<1>:FUNCTION:PCCPch**

This command sets the marker to channel 1.

The numeric suffix in CALCulate that is required or permissible depends on the selected display mode for which the marker is to be valid and has to coincide with it:

CALCulate<1> for CDP absolute and relative

CALCulate2 for modulation accuracy, peak code domain error, power versus slot, bit stream, symbol constellation and EVM

**Example:** "CALC:MARK:FUNC:PCCP"

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

**Mode:** 3G FDD BTS

This command is an <Event> and therefore has no \*RST value and no query. Only the numeric suffix 1 is permissible in MARKer.

### CALCulate<1|2>:MARKer<1>:FUNCtion:DPCCh

This command sets marker 1 to channel 1.

The numeric suffix that is required or permissible depends on the selected display mode for which the marker is to be valid and must be appropriate for this mode.

CALCulate<1> for CDP absolute/relative

CALCulate2 for modulation accuracy, peak code domain error, power vs slot, bit stream, symbol constellation and EVM

**Example:** "CALC:MARK:FUNC:DPCC"

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

**Mode:** 3G FDD UE

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

### CALCulate<1|2>:MARKer<1 to 4>:FUNCtion:WCDPower[:BTS]:RESult? PTOTAL | FERRor | TFRame | TOFFset | MACCuracy | PCDError | EVMRms | EVMPeak | CERRor | CSLot | SRATe | CHANnel | CDPabsolute | CDPRelative | IQOFFset | IQIMbalance

This command queries the measured and calculated results of the WCDMA code domain power measurement (base station).

|             |                               |
|-------------|-------------------------------|
| PTOTAL      | Total power                   |
| FERRor      | Frequency error in Hz         |
| TFRame      | Trigger to frame              |
| TOFFset     | Timing offset                 |
| MACCuracy   | Modulation accuracy           |
| PCDError    | Peak code domain error        |
| EVMRms      | Error vector magnitude RMS    |
| EVMPeak     | Error vector magnitude Peak   |
| CERRor      | Chip rate error               |
| CSLot       | Channel slot number           |
| SRATe       | Symbol rate                   |
| CHANnel     | Channel number (Channel Code) |
| CDPabsolute | Channel power absolute        |
| CDPRelative | Channel power relative        |
| IQOFFset    | IQ offset                     |
| IQIMbalance | IQ imbalance                  |

**Example:** " :CALC:MARK:FUNC:WCDP:RES? PTOT " 'Queries the result of the total  
'power measurement

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

**Mode:** 3G FDD BTS

The numeric suffixes in CALCulate<1|2> and MARKer<1 to 4> are not significant.

**CALCulate<1|2>:MARKer<1 to 4>:FUNction:WCDPower:MS:RESult?** PTOTal | FERRor | TFRame | MACCuracy | PCDerror | EVMRms | EVMPeak | CERRor | SRATe | CHANnel | CDPabsolute | CDPRelative | IQOffset | IQImbalance | CMAPping | PSYMBOL

This command queries the measured and calculated results of the WCDMA code domain power measurement (mobile station).

|             |                               |
|-------------|-------------------------------|
| PTOTal      | Total power                   |
| FERRor      | Frequency error in Hz         |
| TFRame      | Trigger to frame              |
| MACCuracy   | Modulation accuracy           |
| PCDerror    | Peak code domain error        |
| EVMRms      | Error vector magnitude RMS    |
| EVMPeak     | Error vector magnitude Peak   |
| CERRor      | Chip rate error               |
| SRATe       | Symbol rate                   |
| CHANnel     | Channel number (Channel Code) |
| CDPabsolute | Channel power absolute        |
| CDPRelative | Channel power relative        |
| IQOffset    | IQ offset                     |
| IQImbalance | IQ imbalance                  |
| CMAPping    | Channel mapping               |
| PSYMBOL     | No of pilot symbols           |

**Example:** " :CALC:MARK:FUNC:WCDP:MS:RES? PTOT" 'Queries the result of the total power measurement

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

**Mode:** 3G FDD UE

The numeric suffixes in CALCulate<1|2> and MARKer<1 to 4> are not significant.

## 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><br>:MATH<br>[:EXPRession]<br>[:DEFine]<br>:POSition<br>:STATe<br>:MODE | <expr><br><numeric_value><br><Boolean><br>LINear   LOGarithmic | --<br>PCT<br>--<br>-- |         |

### 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

**Mode:** A, MS

### 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

**Mode:** A, MS

**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

**Mode:** A, MS

**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

**Mode:** A, MS



## 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

**Mode:** A

### 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

**Mode:** A

**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

**Mode:** A

**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:SCALE:AUTO ONCE;\*WAI" 'Adapts the level setting for statistical measurements.

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

**Mode:** A

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:SCALE:X:RLEV -60dBm"

**Characteristics:** \*RST value: -20dBm  
SCPI: device-specific

**Mode:** A

**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

**Mode:** A

**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

**Mode:** A

**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

**Mode:** A

**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

**Mode:** A

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

**Mode:** A

## 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><br>:DLINe<1 2> | <numeric_value> | DBM   DB  <br>DEG   RAD  <br>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

**Mode:** A

### 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

**Mode:** A

### 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

**Mode:** A, MS, FM

**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

**Mode:** A, MS, FM

**CALCulate<1|2>:FLINe<1|2> 0...f<sub>max</sub>**

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

**Mode:** A-F

**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

**Mode:** A-F

**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 auf OFF)  
SCPI: device-specific

**Mode:** A-Z

**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

**Mode:** A-Z

## CALCulate:UNIT Subsystem

The CALCulate:Unit subsystem defines the units for power measurement settings.

| COMMAND                           | PARAMETERS   | UNIT | COMMENT |
|-----------------------------------|--|------|---------|
| CALCulate<1 2><br>:UNIT<br>:POWER | DBM   V   A   W   DB  <br>PCT   UNITLESS  <br>DBPW   WATT  <br>DBUV   DBMV   VOLT  <br>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.

**Note:** This command is not available during active GSM measurements. 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

**Mode:** A

## 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

**Mode:** all

### 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

**Mode:** all

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 FSU – 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

**Mode:** all

**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

**Mode:** all

## CONFigure – Subsystem

The CONFigure subsystem contains commands for configuring complex measurement tasks, like those provided by the option GSM MS Analyzer (FS-K5). The CONFigure subsystem is closely linked to the functions of the FETCH and READ subsystems, where the measurement cycles are started and/or the results of the measurements are queried.

The purpose of the following commands is configuring the GSM MS Analyzer mode (Option FS-K5) for mobiles corresponding to the standards P-GSM, E-GSM, R-GSM, DCS1800 or PCS1900.

**Note:** Besides the notation *CONFigure:<command>* the instrument supports also the notation *CONFigure:MS:<command>* for reasons of compatibility with the FSE-family.

The CONFigure subsystem contains commands for configuring complex measurement tasks, like those provided by the options WCDMA 3G FDD BTS and UE (FS-K72/K73).

| COMMAND   | PARAMETERS  | UNIT | COMMENT      |
|-----------|---|------|--------------|
| CONFigure |   |      | Option FS-K5 |
| :CHANnel  |   |      |              |
| :SLOT     |   |      |              |
| :MULTi    | ACT1SYNC1   ACT2SYNC1  <br>ACT2SYNC2   ACT3SYNC1  <br>ACT3SYNC2   ACT3SYNC3  <br>ACT4SYNC1   ACT4SYNC2  <br>ACT4SYNC3   ACT4SYNC4  <br>ACT8SYNC1   ACT8SYNC2  <br>ACT8SYNC3   ACT8SYNC4  <br>ACT8SYNC5   ACT8SYNC6  <br>ACT8SYNC7   ACT8SYNC8 | --   |              |
| :TSC      | <numeric_value>   USER  | --   |              |
| :USER     | <string>  | --   |              |
| :PRATe    | 4   8   | --   |              |
| :RESTore  | --  | --   | no query     |
| :MTYPe    | GMSK   EDGE   |      |              |

**CONFigure:CHANnel:SLOT:MULTi** ACT1SYNC1 | ACT2SYNC1 | ACT2SYNC2 | ACT3SYNC1 | ACT3SYNC2 | ACT3SYNC3 | ACT4SYNC1 | ACT4SYNC2 | ACT4SYNC3 | ACT4SYNC4 | ACT8SYNC1 | ACT8SYNC2 | ACT8SYNC3 | ACT8SYNC4 | ACT8SYNC5 | ACT8SYNC6 | ACT8SYNC7 | ACT8SYNC8

This command defines the used slots of the mobile.

The multislot setting defines how many adjacent slots are active and which of the active slots should be used for synchronization.

The following combinations are possible:

|           |                |                                    |
|-----------|----------------|------------------------------------|
| ACT1SYNC1 | 1 active slot  | synchronization to 1st active slot |
| ACT2SYNC1 | 2 active slots | synchronization to 1st active slot |
| ACT2SYNC2 | 2 active slots | synchronization to 2nd active slot |
| ACT3SYNC1 | 3 active slots | synchronization to 1st active slot |
| ACT3SYNC2 | 3 active slots | synchronization to 2nd active slot |
| ACT3SYNC3 | 3 active slots | synchronization to 3rd active slot |
| ACT4SYNC1 | 4 active slots | synchronization to 1st active Slot |
| ACT4SYNC2 | 4 active slots | synchronization to 2nd active slot |
| ACT4SYNC3 | 4 active slots | synchronization to 3rd active slot |
| ACT4SYNC4 | 4 active slots | synchronization to 4th active slot |
| ACT8SYNC1 | 8 active slots | synchronization to 1st active slot |
| ACT8SYNC2 | 8 active slots | synchronization to 2nd active slot |
| ACT8SYNC3 | 8 active slots | synchronization to 3rd active slot |

|           |                |                                    |
|-----------|----------------|------------------------------------|
| ACT8SYNC4 | 8 active slots | synchronization to 4th active slot |
| ACT8SYNC5 | 8 active slots | synchronization to 5th active slot |
| ACT8SYNC6 | 8 active slots | synchronization to 6th active slot |
| ACT8SYNC7 | 8 active slots | synchronization to 7th active slot |
| ACT8SYNC8 | 8 active slots | synchronization to 8th active slot |

For the phase-frequency error, modulation accuracy and power vs. time measurement the midamble (trainingssequence) for the slot to synchronize must be set correctly!

The reference measurement of power vs. time measurement and the questionable signal power of the main measurement is related to the slot to synchronize. In the main measurement of power vs. time the slot to synchronize defines the synchronization point of the multislot signal on the screen. All results of the phase-frequency error and modulation accuracy measurement are related to the slot to synchronize.

In carrier power and modulation spectrum measurement the slot to synchronize is used to adjust the triggerdelay in order that the slot to synchronize is measured.

With the slot to synchronize it is therefore possible to investigate a certain slot of multislot signals.

This command is only available with the GSM MS Analyzer FS-K5 option.

**Parameter:** ACT1SYNC1 | ACT2SYNC1 | ACT2SYNC2 | ACT3SYNC1 | ACT3SYNC2 | ACT3SYNC3 | ACT4SYNC1 | ACT4SYNC2 | ACT4SYNC3 | ACT4SYNC4

**Example:** "INST MGSM" 'Switches the instrument to GSM MS mode  
"CONF:CHAN:SLOT:MULTI ACT3SYNC2" 'Selects the multislot configuration with  
'3 adjacent active slots and  
'synchronization on the 2<sup>nd</sup> (middle)

**Characteristics:** \*RST value: ACT1SYNC1 (one slot active)  
SCPI: device-specific

**Mode:** MS

### CONFigure:CHANnel:TSC <numeric\_value> | USER

This command selects the midamble used by the mobile. With selection USER, the user defined midamble set with command CONFigure:CHANnel:TSC:USER is used. It is only available in GSM MS mode (FS-K5).

**Note:** *The selected midamble is only significant for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE) and power versus time (PVT).*

**Parameter:** <numeric\_value> ::= 0 to 7 (training sequence for normal burst)  
USER (the TSC set with CONF:CHAN:TSC:USER is used)

**Example:** "INST MGSM" 'Switches the instrument to GSM MS mode  
"CONF:CHAN:TSC 3" 'Selects TSC 3

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

**Mode:** MS



**CONFigure:RESTore**

This command restores the GSM limit lines. All previous changes to the GSM limit lines are lost, and the default Limit Lines from the delivery state are restored.

This command is only available with GSM MS Analyzer FS-K5 option .

**Example:**           "INST MGSM"                                 'Switches the instrument to GSM MS mode  
                      "CONF:REST"                             Set the GSM limit lines to default

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

**Mode:**             A, MS

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

**CONFigure:MTYPE** GMSK | EDGE

This command selects modulation type GMSK or EDGE.

A running GSM measurement is aborted when the modulation type is changed. It has to be explicitly selected again by using one of the CONFigure commands.

**Example:**           "INST MGSM"                                 'Switches the instrument to GSM MS mode  
                      "CONF:MTYP EDGE"                         'Selects modulation type EDGE (8PSK)  
                      "CONF:BURS:MACC"                         'Selects the MAC measurement  
                      "SWE:COUN 20"                             'Sets the number of bursts  
                      "INIT:IMM;\*WAI"                            'Starts the measurement

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

**Mode:**             MS

**CONFigure:BURSt - Subsystem**

This subsystem provides the commands for configuring the measurements in the GSM MS mode (option FS-K5) which are performed on individual bursts:

- Carrier Power (CPW),
- Modulation Accuracy (MAC),
- Phase-Frequency Error (PFE),
- Power vs. Time (PVT).

| COMMAND      | PARAMETERS                    | UNIT | COMMENT      |
|--------------|-------------------------------|------|--------------|
| CONFigure    |                               |      | Option FS-K5 |
| :BURSt       |                               |      |              |
| :PFERror     |                               |      |              |
| [:IMMediate] |                               |      | no query     |
| :MACCuracy   |                               |      |              |
| [:IMMediate] |                               |      | no query     |
| :POWer       |                               |      |              |
| [:IMMediate] |                               |      | no query     |
| :PTEMplate   |                               |      |              |
| [:IMMediate] |                               |      | no query     |
| :SElect      | FULL   TOP   RISing   FALLing |      |              |

**CONFigure:BURSt:PFERror[:IMMediate]**

This command selects measurement of the phase and frequency error of the mobile (PFE).

When the measurement is started the analyzer is automatically set to single sweep.

This command is only available in GSM MS mode (FS-K5) and when modulation type GMSK is selected (CONFigure:MTYPE GMSK).

**Example:**

|                  |   |
|------------------|---|
| "INST MGSM"      | 'Switches the instrument to GSM MS mode |
| "CONF:MTYP GMSK" | 'Selects modulation type GMSK           |
| "CONF:BURS:PFER" | 'Selects the PFE measurement            |
| "SWE:COUN 20"    | 'Sets the number of bursts              |
| "INIT:IMM;*WAI"  | 'Executes the measurement               |

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

**Mode:** MS

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

**CONFigure:BURSt:MACCuracy[:IMMediate]**

This command selects measurement of the modulation accuracy of the mobile (MAC).  
When the measurement is started the analyzer is automatically set to single sweep.  
This command is only available in GSM MS mode (option FS-K5) and when modulation type EDGE (CONFigure:MTYPe EDGE) is selected.

**Example:**

|                  |   |
|------------------|---|
| "INST M GSM"     | 'Switches the instrument to GSM MS mode |
| "CONF:MTYP EDGE" | 'Selects modulation type EDGE (8PSK)    |
| "CONF:BURS:MACC" | 'Selects the MAC measurement            |
| "SWE:COUN 20"    | 'Sets the number of bursts              |
| "INIT:IMM;*WAI"  | 'Starts the measurement                 |

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

**Mode:** MS

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

**CONFigure:BURSt:POWER[:IMMediate]**

This command selects measurement of the carrier power of the mobile (CPW).  
When the measurement is started the analyzer is automatically set to single sweep.  
This command is only available in GSM MS mode (FS-K5).

**Example:**

|                 |   |
|-----------------|---|
| "INST M GSM"    | 'Switches the instrument to GSM MS mode |
| "CONF:BURS:POW" | 'Selects the CPW measurement            |
| "SWE:COUN 20"   | 'Sets the number of bursts              |
| "INIT:IMM;*WAI" | 'Executes the measurement               |

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

**Mode:** MS

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

**CONFigure:BURSt:PTEMplate[:IMMediate]**

This command selects measurement of power of the mobile vs. time (PVT).  
When the measurement is started the analyzer is automatically set to single sweep.  
This command is only available in GSM MS mode (FS-K5).

**Example:**

|                  |   |
|------------------|---|
| "INST M GSM"     | 'Switches the instrument to GSM MS mode |
| "CONF:BURS:PTEM" | 'Selects the PVT measurement            |
| "SWE:COUN 20"    | 'Sets the number of bursts              |
| "INIT:IMM;*WAI"  | 'Executes the measurement               |

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

**Mode:** MS

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

**CONFigure:BURSt:PTEMplate:SElect** FULL | TOP | RISing | FALLing

This command defines the burst section to be measured.

FULL : full burst  
RISing : rising edge  
FALLing : falling edge  
TOP : top high resolution, top of burst with smaller display range and therefore higher resolution on y axis (power axis)

This command is only available in GSM MS mode (FS-K5).

**Example:**

|                             |   |
|-----------------------------|---|
| "INST MGSM"                 | 'Switches the instrument to GSM MS mode |
| "CONF: BURS: PTEM"          | 'Selects the PVT measurement            |
| "CONF: BURS: PTEM: SEL TOP" | 'Selects the top high resolution mode   |
| "SWE: COUN 20"              | 'Sets the number of bursts              |
| "INIT: IMM; *WAI"           | 'Executes the measurement               |

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

**Mode:** MS



## CONFigure:SPECTrum - Subsystem

This subsystem provides the commands for configuring the measurements in their the GSM MS Analyzer mode (FS-K5) used to determine the power of the spectral contributions due to modulation and switching (modulation spectrum, transient spectrum).

| COMMAND      | PARAMETERS | UNIT | COMMENT      |
|--------------|------------|------|--------------|
| CONFigure    |            |      | Option FS-K5 |
| :SPECTrum    |            |      |              |
| :MODulation  |            |      |              |
| [:IMMEDIATE] | --         | --   | no query     |
| :SWITching   |            |      |              |
| [:IMMEDIATE] | --         | --   | no query     |

### CONFigure:SPECTrum:MODulation[:IMMEDIATE]

This command selects measurement of the spectrum due to modulation (MOD).

The overview measurement in the frequency domain is directly started with command `INITate[:IMMEDIATE]`, the list measurement in the time domain with command `READ:SPECTrum:MODulation[:ALL]?`.

When the measurement is started the analyzer is automatically set to single sweep. This command is only available in GSM MS mode (FS-K5).

**Example:**

|                 |   |
|-----------------|---|
| "INST MGSM"     | 'Switches the instrument to GSM MS mode |
| "CONF:SPEC:MOD" | 'Selects the MOD measurement            |
| "SWE:COUN 20"   | 'Sets the number of bursts              |
| "INIT:IMM;*WAI" | 'Executes the overview measurement      |

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

**Mode:** MS

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

### CONFigure:SPECTrum:SWITching[:IMMEDIATE]

This command selects measurement of the spectrum due to switching transients (TRA).

The overview measurement in the frequency domain is directly started with command `INITate[:IMMEDIATE]`, the list measurement in the time domain with command `READ:SPECTrum:MODulation[:ALL]?`.

When the measurement is started the analyzer is automatically set to single sweep. This command is only available in GSM MS mode (FS-K5).

**Example:**

|                  |   |
|------------------|---|
| "INST MGSM"      | 'Switches the instrument to GSM MS mode |
| "CONF:SPEC:SWIT" | 'Selects the TRA measurement            |
| "SWE:COUN 20"    | 'Sets the number of bursts              |
| "INIT:IMM;*WAI"  | 'Executes the overview measurement      |

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

**Mode:** MS

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

**CONFigure:SPURious - Subsystem**

This subsystem provides commands for configuring the measurements in the GSM MS (FS-K5) Analyzer mode used for measuring the power of spurious emissions (SPU).

| COMMAND                                | PARAMETERS | UNIT | COMMENT                      |
|--|------------|------|------------------------------|
| CONFigure<br>:SPURious<br>[:IMMEDIATE] | --         | --   | Option FS-K5<br><br>no query |

**CONFigure:SPURious[:IMMEDIATE]**

This command selects measurement of spurious emissions.  
When the measurement is started the analyzer is automatically set to single sweep.  
This command is only available in GSM MS mode (FS-K5).

**Example:**

```
"INST M GSM"      'Switches the instrument to GSM MS mode
"CONF : SPUR"     'Selects the SPU measurement
"SWE : COUN 20"   'Sets the number of bursts
"INIT : IMM ; *WAI" 'Executes the overview measurement
```

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

**Mode:** MS

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

### CONFigure:WCDPower - Subsystem

This subsystem provides the commands for configuring the Code Domain measurements (option FS-K72 or FS-K73).

| COMMAND  | PARAMETER   | UNIT | COMMENT       |
|--|---|------|---------------|
| CONFigure<br>:WCDPower<br>[:BTS]<br>:MEASurement   | POWer   ACLR   ESPectrum  <br>OBANdwidth   OBWidth   WCDPower<br>  FDOMain   TDOMain   CCDF                               |      | Option FS-K72 |
| :CTABLE<br>[:STATe]<br>:SElect<br>:NAME<br>:DATA<br>:<br>:COMment<br>:COPY<br>:DElete<br>:CATalog? | <Boolean><br><file_name><br><file_name><br>AUTO   <numeric_value>,<br>AUTO   <numeric_value>..<br><string><br><file_name> |      |               |
| :MS<br>:MEASurement  | POWer   ACLR   ESPectrum  <br>OBANdwidth   OBWidth   WCDPower<br>  FDOMain   TDOMain   CCDF                               |      | Option FS-K73 |
| :CTABLE<br>[:STATe]<br>:SElect<br>:NAME<br>:DATA<br>:<br>:COMment<br>:COPY<br>:DElete<br>:CATalog? | <Boolean><br><file_name><br><file_name><br><numeric_value>,<numeric_value>..<br><string><br><file_name>                   |      |               |

#### CONFigure:WCDPower[:BTS]:MEASurement POWer | ACLR | ESPectrum | OBANdwidth | OBWidth | WCDPower | FDOMain | TDOMain | CCDF

This command selects a predefined measurement of WCDMA base station tests (option FS-K72). The settings of the predefined measurements are described in detail in the operating manual of the option.

|                   |                      |  |
|-------------------|----------------------|--|
| <b>Parameter:</b> | POWer                | Channel power measurement with predefined settings   |
|                   | ACLR                 | Adjacent channel power measurement with predefined settings  |
|                   | ESPectrum            | Measurement of spectrum emission mask  |
|                   | OBANdwidth   OBWidth | Measurement of occupied power bandwidth  |
|                   | WCDPower             | Code domain power measurement. Same effect as command INSTRUMENT:SElect WCDPower, but setting of command INIT:CONT ON   OFF remains unchanged. |
|                   | FDOMain              | Overview measurement in the frequency domain with predefined settings  |
|                   | TDOMain              | Measurement of crest factor in the time domain with predefined settings  |
|                   | CCDF                 | Measurement of complementary cumulative distribution function  |

**Example:** "CONF:WCDP:MEAS ACLR" 'Selects adjacent channel power measurement'

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

**Mode:** 3G FDD BTS

**CONFigure:WCDPower[:BTS]:CTABLE:STATe] ON | OFF**

This command switches the channel table on or off. On switching on, the measured channel table is stored under the name RECENT and switched on. After the RECENT channel table is switched on, another channel table can be selected with the command CONF:WCDP:CTAB:SEL.

**Note:**

*The RECENT channel table must always be switched on first with the command CONF:WCDP:CTAB:STAT and then the required channel table can be selected with the command CONF:WCDP:CTAB:SEL.*

**Example:** "CONF:WCDP:CTAB ON" 'Switches the channel table on'

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

**Mode:** 3G FDD BTS

**CONFigure:WCDPower[:BTS]:CTABLE:SElect <file\_name>**

This command selects a predefined channel table file. Before using this command, the RECENT channel table must be switched on first with the command CONF:WCDP:CTAB.

**Example:** "CONF:WCDP:CTAB:SEL "CTAB\_1" 'Selects the predefined channel table file 'CTAB\_1'

**Characteristics:** \*RST value: "RECENT"  
SCPI: device-specific

**Mode:** 3G FDD BTS

**CONFigure:WCDPower[:BTS]:CTABLE:NAME <file\_name>**

This command selects an existing channel table or creates the name of a new channel table.

**Example:** "CONF:WCDP:CTAB:NAME "NEW\_TAB" 'Creates the new channel table file "NEW\_TAB"

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

**Mode:** 3G FDD BTS

**CONFigure:WCDPower[:BTS]:CTABLE:DATA 2..9, 0..511,0 | 1,<numeric\_value> | AUTO, 2 | 4 | 8 | 16,0 | 1,<numeric\_value>...**

This command defines the values of the selected channel table. Each line of the table consists of 8 values:

<code class>,<code number>,<use TFCI>,<timing offset | AUTO>,<pilot length>,<pitch>,<status>,<CDP relative [dB]>....

Code class: 2 to 9  
Code number: 0 to 511

use TFCI: 0: not used, 1: used  
 Timing offset: 0 to 38400, for code class 9, the step width is 512, else 256,  
 for AUTO, the timing offset is calculated by the instrument  
 Pilot length: code class 9:4  
 code class 8:2, 4, 8  
 code class 7:4, 8  
 code class 5/6:8  
 code class 2/3/4:16  
 Pitch: 0: normal channel, 1: pitch channel  
 Status: 0: not active, 1: active  
 CDP relative: for setting commands any value, for query CDP relative value

Channels PICH, CPICH and PCCPCH may only be defined once. If channel CPICH or PCCPCH is missing in the command, it is automatically added at the end of the table.

Prior to this command, the name of the channel table has to be defined with command  
 CONF:WCDP:CTAB:NAME.

**Example:** "CONF:WCDP:ctab:data 8,0,0,0,0,0,1,0.00,  
 8,1,0,0,0,0,1,0.00,7,1,0,256,8,0,1,0.00"  
 '2 channels are defined: CPICH, PCCPCH and a channel in code class 7

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

**Mode:** 3G FDD BTS

#### CONFigure:WCDPower[:BTS]:CTABLE:COMMENT <string>

This command defines a comment for the selected channel table.

Prior to this command, the name of the channel table has to be defined with command  
 CONF:WCDP:CTAB:NAME and the values of the table have to be defined with command  
 CONF:WCDP:CTAB:DATA.

**Example:** "CONF:WCDP:CTAB:COMM "Comment for table 1"

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

**Mode:** 3G FDD BTS

#### CONFigure:WCDPower[:BTS]:CTABLE:COPY <file\_name>

This command copies one channel table onto another one. The channel table to be copied is selected with command CONF:WCDP:CTAB:NAME.

The name of the channel table may consist of max 8 characters.

**Parameter:** <file\_name> ::= name of the new channel table'

**Example:** "CONF:WCDP:CTAB:COPY "CTAB\_2" 'Copies the currently selected channel  
 'table onto channel table 'CTAB\_2

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

**Mode:** 3G FDD BTS

This command is an <Event> and therefore has no \*RST value and no query.

**CONFigure:WCDPower[:BTS]:CTABLE:DELeTe**

This command deletes the selected channel table. The channel table to be deleted is selected with command CONF : WCDP : CTAB : NAME.

**Example:** " CONF : WCDP : CTAB : DEL 'Deletes the currently selected channel table

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

**Mode:** 3G FDD BTS

This command is an <Event> and therefore has no \*RST value and no query.

**CONFigure:WCDPower[:BTS]:CTABLE:CATalog?**

This command reads out the names of all channel tables stored on the hard disk.

Syntax of output format:

<Sum of file lengths of all subsequent files>,<free memory on hard disk>,  
<1st file name>,,<1st file length>,<2nd file name>,,<2nd file length>,.....,<nth file name>,  
<nth file length>

**Example:** " CONF : WCDP : CTAB : CAT ?

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

**Mode:** 33G FDD BTS

**:CONFigure:WCDPower[:BTS]:CTABLE:REStore**

This command restores all predefined channel tables.

**Example:** " : CONF : WCDP : CTAB : RESt

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

**Mode:** WCDP

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

**CONFigure:WCDPower:MS:MEASurement** Power | ACLR | ESPectrum | OBANdwidth | OBWidth | WCDPower | FDOMain | TDOMain | CCDF

This command selects the measured data of WCDMA mobile station tests (option FS-K73) that are to be displayed. The settings of the predefined measurements are described in detail in the operating manual of the option.

|                   |                      |  |
|-------------------|----------------------|--|
| <b>Parameter:</b> | POWER                | Channel power measurement with predefined settings   |
|                   | ACLR                 | Adjacent channel power measurement ( with predefined settings  |
|                   | ESPectrum            | Measurement of spectrum emission mask  |
|                   | OBANdwidth   OBWidth | Measurement of occupied power bandwidth  |
|                   | WCDPower             | Code domain power measurement. This selection has the same effect as command INSTRument : SElect WCDPower. |
|                   | FDOMain              | Overview measurement in the frequency domain with predefined settings                                      |
|                   | TDOMain              | Measurement of crest factor in the time domain with predefined settings                                    |

CCDF Measurement of complementary cumulative distribution function

**Example:** "CONF:WCDP:MS:MEAS ACLR" 'Selects adjacent channel power measurement

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

**Mode:** 3G FDD UE

### CONFigure:WCDPower:MS:CTABLE[:STATe] ON | OFF

This command switches the channel table on or off. On switching on, the measured channel table is stored under the name RECENT and switched on. After the RECENT channel table is switched on, another channel table can be selected with the command CONF:WCDP:MS:CTAB:SEL.

**Note:**

*The RECENT channel table must always be switched on first with the command CONF:WCDP:MS:CTAB:STAT and then the required channel table can be selected with the command CONF:WCDP:MS:CTAB:SEL.*

**Example:** "CONF:WCDP:MS:CTAB ON" 'Switches on the currently selected channel table'

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

**Mode:** 3G FDD UE

### CONFigure:WCDPower:MS:CTABLE:SElect <file\_name>

This command selects a predefined channel table file. Before using this command, the RECENT channel table must be switched on first with the command CONF:WCDP:MS:CTAB:STAT.

**Example:** "CONF:WCDP:MS:CTAB:SEL "CTAB\_1" 'Selects channel table 'CTAB\_1'

**Characteristics:** \*RST value: "RECENT"  
SCPI: device-specific

**Mode:** 3G FDD UE

### CONFigure:WCDPower:MS:CTABLE:NAME <file\_name>

This command selects an existing channel table or creates the name of a new channel table.

**Example:** "CONF:WCDP:MS:CTAB:NAME "NEW\_TAB" 'Creates the new channel table file "NEW\_TAB"

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

**Mode:** 3G FDD UE

### CONFigure:WCDPower:MS:CTABLE:DATA <numeric\_value>,<numeric\_value>...

This command defines the values of the selected channel table.

<pilot length>,<code class>,<number of active channels>,<CDP relative 1>,<CDP relative 2>,<CDP relative 3>,<CDP relative 4>,<CDP relative 5>,<CDP relative 6>

Pilot length: pilot length of channel DPCCH  
Code class: code class of channel 1. I-mapped  
Number of active channels: 0 to 6

CDP relative 1: measured value of channel 1, I-mapped, only when queried  
 CDP relative 2: measured value of channel 2, I-mapped, only when queried  
 CDP relative 3: measured value of channel 3, I-mapped, only when queried  
 CDP relative 4: measured value of channel 4, I-mapped, only when queried  
 CDP relative 5: measured value of channel 5, I-mapped, only when queried  
 CDP relative 6: measured value of channel 6, I-mapped, only when queried

Prior to this command, the name of the channel table has to be defined with command  
 CONF:WCDP:MS:CTAB:NAME.

**Example:** "CONF:WCDP:MS:CTAB:DATA 8,4,1"

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

**Mode:** 3G FDD UE

**CONFigure:WCDPower:MS:CTABLE:COMMeNT <string>**

This command defines a comment for the selected channel table.

Prior to this command, the name of the channel table has to be defined with command  
 CONF:WCDP:MS:CTAB:NAME and the values of the table have to be defined with command  
 CONF:WCDP:MS:CTAB:DATA .

**Example:** "CONF:WCDP:MS:CTAB:COMM "Comment for table 1"

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

**Mode:** 3G FDD UE

**CONFigure:WCDPower:MS:CTABLE:COpy <file\_name>**

This command copies one channel table onto another one. The channel table to be copied is  
 selected with command CONF:WCDP:MS:CTAB:NAME .

The name of the channel table may consist of max 8 characters.

**Parameter:** <file\_name> ::= name of the new channel table'

**Example:** "CONF:WCDP:MS:CTAB:COpy "CTAB\_2" 'Copies the currently selected  
 'channel table onto channel  
 'table 'CTAB\_2

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

**Mode:** 3G FDD UE

This command is an <Event> and therefore has no \*RST value and no query.

**CONFigure:WCDPower:MS:CTABLE:DELeTe**

This command deletes the selected channel table. The channel table to be deleted is selected with  
 command CONF:WCDP:MS:CTAB:NAME .

**Example:** "CONF:WCDP:MS:CTAB:DEL'Deletes the currently selected channel table

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

**Mode:** 3G FDD UE

This command is an <Event> and therefore has no \*RST value and no query.



**CONFigure:WCDPower:MS:CTABLE:CATalog?**

This command reads out the names of all channel tables stored on the hard disk.

Syntax of output format:

<Sum of file lengths of all subsequent files>,<free memory on hard disk>,  
<1st file name>,,<1st file length>,<2nd file name>,,<2nd file length>,....,<nth file name>,  
<nth file length>.

**Example:** "CONF:WCDP:MS:CTAB:CAT?"

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

**Mode:** 3G FDD UE

## 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><br>:SERVice<br>:INPut<br>[:SElect]<br>:PULSed<br>[:STATe]<br>:PRATe<br>:SFUNCTion<br>:NSOURce<br>:CSOURce<br>[:POWER]<br>:STEST<br>:RESult?<br>:HWINfo? | CALibration   RF<br><br><string><br><Boolean><br><br><br><br><br><numeric_value> | --<br><br><br><br><br><br><br><br><br>DBM | <br><br><br><br><br><br><br><br><br><br>no query<br><br><br>query only<br>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

**Mode:** all

### 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

**Mode:** all

### 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

**Mode:** all

#### 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

**Mode:** all

#### DIAGnostic<1|2>:SERVice:NSOource 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

**Mode:** all

#### 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

**Mode:** all

**DIAGnostic<1|2>:SERVice:STES: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

**Mode:** all

**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

**Mode:** all

## 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               |
|----------------|--|-----------|-----------------------|
| DISPlay        |  |           |                       |
| :FORMat        | SINGle SPLit   |           |                       |
| :ANNotation    |  |           |                       |
| :FREQuency     | <Boolean>  |           |                       |
| :LOGO          | <Boolean>  |           |                       |
| :PSAVe         |  |           |                       |
| [:STATe]       | <Boolean>  |           |                       |
| :HOLDoff       | 1 to 60  | --        |                       |
| :CMAP<1 to 26> |  |           |                       |
| :DEFault<1 2>  |  |           |                       |
| :HSL           | 0..1,0..1,0..1   |           |                       |
| :PDEFined      | BLACK   BLUE   BROWn   GREen  <br>CYAN   RED   MAGenta   YELLow  <br>WHITe   DGRAY   LGRAY   LBLUe  <br>LGREen   LCYan   LRED   LMAGenta |           | no query              |
| [:WINDow<1 2>] |  |           |                       |
| :SElect        |  |           |                       |
| :TEXT          |  |           |                       |
| [:DATA]        | <string>   |           |                       |
| :STATe         | <Boolean>  |           |                       |
| :TIME          | <Boolean>  |           |                       |
| :TRACe<1 to 3> |  |           |                       |
| :Y             |  |           |                       |
| [:SCALE]       | <numeric_value>  | DB        |                       |
| :MODE          | ABSolute   RELative  |           |                       |
| :RLEVel        | <numeric_value>  | DBM       |                       |
| :OFFSet        | <numeric_value>  | DB        |                       |
| :RVALue        | <numeric_value>  | DB        |                       |
| :RPOSition     | <numeric_value>  | PCT       | Option FM demodulator |
| :PDIVision     | <numeric_value>  | DBM DB HZ |                       |
| :SPACing       | LINear LOGarithmic   | --        |                       |
| :MODE          | WRITe VIEW AVERAge <br>MAXHold MINHold   | --        |                       |
| [: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.

**Note:** This command is not available during active GSM measurements. For GSM MS 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

**Mode:** A

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

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

**Mode:** all

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

**Mode:** all

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 querying 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.
  - This command is not available in GSM MS mode. In GSM MS mode, the display is always set to FULL SCREEN, which corresponds to SCREEN A and thus to WINDow1. WINDow1 is automatically selected when the GSM MS mode is activated with command INSTRument:SElect:MGSM.

**Example:** "DISP:WIND2:SEL 'Selects SCREEN B as active measurement window."

**Characteristics:** \*RST value: SCREEN A active  
 SCPI: device-specific

**Mode:** A

This command is an event and therefore has no query.

### 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

**Mode:** all



**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** A, MS

**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

**Mode:** A, MS

**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 0"

'Sets the power value assigned to the reference position to 0 dB.

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

**Modes:** A, MS

**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.

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)  
SCPI: conforming

**Mode:** A, MS

**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

**Mode:** FM

The numeric suffix in TRACE<1 to 3> is irrelevant. The command is only available with option FS-K7 (FM Demodulator).

**DISPlay[:WINDow<1|2>]:TRACe<1 to 3>:Y:SPACing** LINear | LOGarithmic

This command toggles between linear and logarithmic display in the selected measurement window..

The numeric suffix in TRACe<1 to 3> is irrelevant.

**Note:** This command is not available during active GSM measurements.

**Example:** "DISP:TRAC:Y:SPAC LIN"

**Characteristics:** \*RST value: LOGarithmic  
SCPI: conforming

**Mode:** A

**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<br>'trace 3 in screen A.    |
| "INIT; *WAI"                 | 'Starts the measurement and waits for the end of the<br>'16 sweeps. |

**Characteristics:** \*RST value: WRITE for TRACe1, STATe OFF for TRACe2/3  
SCPI: device-specific

**Mode:** all

**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

**Mode:** all

## FETCh - Subsystem

The FETCh subsystem contains commands for reading out results of complex measurement tasks like those provided by the GSM MS mode (FS-K5). The FETCh subsystem is closely linked to the functions of the CONFigure and READ subsystems, where the measurement sequences are configured, the measurements are started and their results are queried.

## FETCh:BURSt - Subsystem

This subsystem provides the commands for reading out results of measurements in GSM MS (option FS-K5) Analyzer mode, which are performed on individual bursts without starting the measurement by themselves:

- Phase-Frequency Error (PFE)
- Modulation Accuracy (MAC),
- Power vs Time (PVT),

| COMMAND      | PARAMETERS | UNIT | COMMENT      |
|--------------|------------|------|--------------|
| FETCh        |            |      | Option FS-K5 |
| :BURSt       |            |      |              |
| :PERRor      |            |      |              |
| :RMS         |            |      |              |
| :AVERage?    | --         | deg  | query only   |
| :MAXimum?    | --         | deg  | query only   |
| :PEAK        |            |      |              |
| :AVERage?    | --         | deg  | query only   |
| :MAXimum?    | --         | deg  | query only   |
| :FERRor      |            |      |              |
| :AVERage?    | --         | Hz   | query only   |
| :MAXimum?    | --         | Hz   | query only   |
| :IQOFFset    |            |      |              |
| :AVERage?    | --         | %    | query only   |
| :MAXimum?    | --         | %    | query only   |
| :IQIMbalance |            |      |              |
| :AVERage?    | --         | %    | query only   |
| :MAXimum?    | --         | %    | query only   |
| :PTEMplate   |            |      |              |
| :REFerence?  | --         | --   | query only   |
| :MACCuracy   |            |      |              |
| :RMS         |            |      |              |
| :AVERage?    | --         |      | query only   |
| :MAXimum?    | --         |      | query only   |
| :PEAK        |            |      |              |
| :AVERage?    | --         |      | query only   |
| :MAXimum?    | --         |      | query only   |
| :OSUPpress   |            |      |              |
| :AVERage?    | --         |      | query only   |
| :MAXimum?    | --         |      | query only   |
| :PERCentile  |            |      |              |
| :AVERage?    | --         |      | query only   |
| :MAXimum?    | --         |      | query only   |
| :FREQuency   |            |      |              |
| :AVERage?    | --         |      | query only   |
| :MAXimum?    | --         |      | query only   |
| :IQOFFset    |            |      |              |
| :AVERage?    | --         | %    | query only   |
| :MAXimum?    | --         | %    | query only   |
| :IQIMbalance |            |      |              |
| :AVERage?    | --         | %    | query only   |
| :MAXimum?    | --         | %    | query only   |

**FETCh:BURSt:PERRor:RMS:AVERage?**

This command reads out the average of the RMS measurement of the phase error taken over the selected number of bursts.

This command is only available in GSM MS mode (FS-K5) and when measurement of the phase/frequency error is selected (see :CONFIgure:BURSt:PFERror).

**Example:**

|                            |   |
|----------------------------|---|
| "INST MGSM"                | 'Switches the instrument to GSM MS mode |
| "CONF:MTYP GMSK"           | 'Selects the modulations type GMSK      |
| "CONF:BURS:PFER"           | 'Selects the PFE measurements           |
| "SWE:COUN 20"              | 'Sets the number of bursts              |
| "INIT:IMM;*WAI"            | 'Executes the measurement               |
| "FETC:BURS:PERR:RMS:AVER?" | 'Queries the result                     |

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

**Mode:** MS

If no measurement has been performed yet, a query error results.  
 This command is an event and therefore has no query and no \*RST value .

**FETCh:BURSt:PERRor:RMS:MAXimum?**

This command reads out the maximum of the RMS measurement of the phase error taken over the selected number of bursts.

This command is only available in GSM MS mode (FS-K5 ) and when measurement of the phase/frequency error is selected (see :CONFIgure:BURSt:PFERror).

**Example:**

|                           |  |
|---------------------------|--|
| "INST MGSM"               | 'Switches the instrument to GSM MS modeModus |
| "CONF:MTYP GMSK"          | 'Selects the modulation type GMSK            |
| "CONF:BURS:PFER"          | 'Selects the PFE measurements                |
| "SWE:COUN 20"             | 'Sets the number of bursts                   |
| "INIT:IMM;*WAI"           | 'Executes the measurement                    |
| "FETC:BURS:PERR:RMS:MAX?" | 'Queries the result                          |

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

**Mode:** MS

If no measurement has been performed yet, a query error results.  
 This command is an event and therefore has no query and no \*RST value .

**FETCh:BURSt:PERRor:PEAK:AVERAge?**

This command reads out the average of the PEAK measurement of the phase error taken over the selected number of bursts.

This command is only available in GSM MS mode (FS-K5) and when measurement of the phase/frequency error is selected (see :CONFIgure:BURSt:PFERror).

**Example:**

|                             |   |
|-----------------------------|---|
| "INST M GSM"                | 'Switches the instrument to GSM MS mode |
| "CONF:MTYP GMSK"            | 'Selects the modulation type GMSK       |
| "CONF:BURS:PFER"            | 'Selects the PFE measurement            |
| "SWE:COUN 20"               | 'Sets the number of bursts              |
| "INIT:IMM;*WAI"             | 'Executes the measurement               |
| "FETC:BURS:PERR:PEAK:AVER?" | 'Queries the result                     |

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

**Mode:** MS

If no measurement has been performed yet, a query error results.

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

**FETCh:BURSt:PERRor:PEAK:MAXimum?**

This command reads out the maximum of the PEAK measurement of the phase error taken over the selected number of bursts.

This command is only available in GSM MS mode (FS-K5) and when measurement of the phase/frequency error is selected (see :CONFIgure:BURSt:PFERror).

**Example:**

|                            |   |
|----------------------------|---|
| "INST M GSM"               | 'Switches the instrument to GSM MS mode |
| "CONF:MTYP GMSK"           | 'Selects the modulation type GMSK       |
| "CONF:BURS:PFER"           | 'Selects the PFE measurement            |
| "SWE:COUN 20"              | 'Sets the number of bursts              |
| "INIT:IMM;*WAI"            | 'Executes the measurement               |
| "FETC:BURS:PERR:PEAK:MAX?" | 'Queries the result                     |

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

**Mode:** MS

If no measurement has been performed yet, a query error results.

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

**FETCh:BURSt:FERRor:AVERage?**

This command reads out the average of the frequency error measurement taken over the selected number of bursts.

This command is only available in GSM MS mode (FS-K5) and when measurement of the phase/frequency error is selected (see :CONFIgure:BURSt:PFERror).

**Example:**

|                        |   |
|------------------------|---|
| "INST MGSM"            | 'Switches the instrument to GSM MS mode |
| "CONF:MTYP GMSK"       | 'Selects the modulation type GMSK       |
| "CONF:BURS:PFER"       | 'Selects the PFE measurement            |
| "SWE:COUN 20"          | 'Sets the number of bursts              |
| "INIT:IMM;*WAI"        | 'Executes the measurement               |
| "FETC:BURS:FERR:AVER?" | 'Queries the result                     |

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

**Mode:** MS

If no measurement has been performed yet, a query error results.  
 This command is an event and therefore has no query and no \*RST value .

**FETCh:BURSt:FERRor:MAXimum?**

This command reads out the maximum of the frequency error measurement taken over the selected number of bursts.

This command is only available in GSM MS mode (FS-K5) and when measurement of the phase/frequency error is selected (see :CONFIgure:BURSt:PFERror).

**Example:**

|                       |   |
|-----------------------|---|
| "INST MGSM"           | 'Switches the instrument to GSM MS mode |
| "CONF:MTYP GMSK"      | 'Selects the modulation type GMSK       |
| "CONF:BURS:PFER"      | 'Selects the PFE measurement            |
| "SWE:COUN 20"         | 'Sets the number of bursts              |
| "INIT:IMM;*WAI"       | 'Executes the measurement               |
| "FETC:BURS:FERR:MAX?" | 'Queries the result                     |

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

**Mode:** MS

If no measurement has been performed yet, a query error results.  
 This command is an event and therefore has no query and no \*RST value .

**FETCh:BURSt:IQOFfset:AVERage?**

This command reads out the average of the IQ DC offset measurement in % for the selected number of bursts.

It is only available in GSM MS mode (FS-K5) if phase/frequency error (PFE) measurement has been selected (s. CONFIgure:BURSt:PFERror).

**Example:**

|                        |  |
|------------------------|--|
| "INST MGSM"            | 'Switches the instrument to GSM MS mode          |
| "CONF:MTYP GMSK"       | 'Selects GMSK modulation                         |
| "CONF:BURS:PFER"       | 'Selects phase/frequency error (PFE) measurement |
| "SWE:COUN 20"          | 'Sets the number of bursts                       |
| "INIT:IMM;*WAI"        | 'Executes the measurement                        |
| "FETC:BURS:IQOF:AVER?" | Queries the result                               |



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

**Mode:** MS

If no measurement has been carried out yet, a query error is indicated. This command is a query and therefore has no \*RST value.

#### FETCh:BURSt:IQOFfset:MAXimum?

This command reads out the maximum of the IQ DC offset measurement in % for the selected number of bursts.

It is only available in GSM MS mode (FS-K5) if phase/frequency error (PFE) measurement has been selected (s. CONFigure:BURSt:PFERror).

**Example:**

|                       |  |
|-----------------------|--|
| "INST MGSM"           | 'Switches the instrument to GSM MS mode          |
| "CONF:MTYP GSMK"      | 'Selects GSMK modulation                         |
| "CONF:BURS:PFER"      | 'Selects phase/frequency error (PFE) measurement |
| "SWE:COUN 20"         | 'Sets the number of bursts                       |
| "INIT:IMM;*WAI"       | 'Executes the measurement                        |
| "FETC:BURS:IQOF:MAX?" | 'Queries the result                              |

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

**Mode:** MS

If no measurement has been carried out yet, a query error is indicated. This command is a query and therefore has no \*RST value.

#### FETCh:BURSt:IQIMbalance:AVERage?

This command reads out the average of the IQ imbalance measurement in % for the selected number of bursts.

It is only available in GSM MS mode (FS-K5) if phase/frequency error (PFE) measurement has been selected (s. CONFigure:BURSt:PFERror).

**Example:**

|                        |  |
|------------------------|--|
| "INST MGSM"            | 'Switches the instrument to GSM MS mode          |
| "CONF:MTYP GSMK"       | 'Selects GSMK modulation                         |
| "CONF:BURS:PFER"       | 'Selects phase/frequency error (PFE) measurement |
| "SWE:COUN 20"          | 'Sets the number of bursts                       |
| "INIT:IMM;*WAI"        | 'Executes the measurement                        |
| "FETC:BURS:IQIM:AVER?" | 'Queries the result                              |

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

**Mode:** MS

If no measurement has been carried out yet, a query error is indicated. This command is a query and therefore has no \*RST value.

**FETCh:BURSt:IQIMbalance:MAXimum?**

This command reads out the maximum of the IQ imbalance measurement in % for the selected number of bursts.

It is only available in GSM MS mode (FS-K5) if phase/frequency error (PFE) measurement has been selected (s. CONFigure:BURSt:PFERror).

|                 |                         |  |
|-----------------|-------------------------|--|
| <b>Example:</b> | " INST MGSM "           | 'Switches the instrument to GSM MS mode          |
|                 | " CONF:MTYP GMSK "      | 'Selects GMSK modulation                         |
|                 | " CONF:BURS:PFER "      | 'Selects phase/frequency error (PFE) measurement |
|                 | " SWE:COUN 20 "         | 'Sets the number of bursts                       |
|                 | " INIT:IMM;*WAI "       | 'Executes the measurement                        |
|                 | " FETC:BURS:IQIM:MAX? " | 'Queries the result                              |

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

**Mode:** MS

If no measurement has been carried out yet, a query error is indicated. This command is a query and therefore has no \*RST value.

**FETCh:BURSt:PTEMplate:REFeRence?**

This command reads out the results of the premeasurement of power vs. time (PVT).

The result is output as a list of partial result strings separated by ',' in the following (ASCII) format:

<Level1>,<Level2>,<RBW>

<Level1>: measured level

<Level2>: level corrected by means of the bandwidth

<RBW>: bandwidth

This command is only available in GSM MS mode (FS-K5) and when measurement of the power vs. time is selected (see :CONFigure:BURSt:PTEMplate).

|                 |                         |   |
|-----------------|-------------------------|---|
| <b>Example:</b> | " INST MGSM "           | 'Switches the instrument to GSM MS mode |
|                 | " CONF:MTYP GMSK "      | 'Selects the modulation type GMSK       |
|                 | " CONF:BURS:PTEM "      | 'Selects the PVT measurement            |
|                 | " READ:BURS:PTEM:REF? " | 'Executes the premeasurement            |
|                 | " FETC:BURS:PTEM:REF? " | 'Queries the result                     |

**Result:** 43.2,43.2,1000000

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

**Mode:** MS

If no measurement has been performed yet, a query error results.  
 This command is an event and therefore has no query and no \*RST value .

**FETCh:BURSt:MACCuracy:RMS:AVERage?**

This command reads out the average of the RMS-measurement of the error vector magnitude taken over the selected number of bursts.

This command is only available with GSM MS Analyzer (option FS-K5) and when measurement of the modulation accuracy is selected (CONFigure:BURSt:MACCuracy[:IMMEDIATE]).

**Example:**

|                            |  |
|----------------------------|--|
| "INST M GSM"               | 'Switches the instrument to GSM MS mode  |
| "CONF:MTYP EDGE"           | 'Selects the modulation type EDGE (8PSK) |
| "CONF:BURS:MACC"           | 'Selects the MAC measurement             |
| "SWE:COUN 20"              | 'Sets the number of bursts               |
| "INIT:IMM;*WAI"            | 'Starts the measurement                  |
| "FETC:BURS:MACC:RMS:AVER?" | 'Queries the result                      |

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

**Mode:** MS

If no measurement has been performed yet, a query error results.

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

**FETCh:BURSt:MACCuracy:RMS:MAXimum?**

This command reads out the maximum of the RMS-measurement of the error vector magnitude taken over the selected number of bursts.

This command is only available with GSM MS Analyzer (option FS-K5) and when measurement of the modulation accuracy is selected (see CONFigure:BURSt:MACCuracy[:IMMEDIATE]).

**Example:**

|                           |   |
|---------------------------|---|
| "INST M GSM"              | 'Switches the instrument to GSM MS mode |
| "CONF:MTYP EDGE"          | 'Selects modulation type EDGE (8PSK)    |
| "CONF:BURS:MACC"          | 'Selects the MAC measurement            |
| "SWE:COUN 20"             | 'Sets the number of bursts              |
| "INIT:IMM;*WAI"           | 'Starts the measurement                 |
| "FETC:BURS:MACC:RMS:MAX?" | 'Queries the result                     |

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

**Mode:** MS

If no measurement has been performed yet, a query error results.

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

**FETCh:BURSt:MACCuracy:PEAK:AVERage?**

This command reads out the average of the PEAK-measurement of the error vector magnitude taken over the selected number of bursts.

This command is only available with GSM MS Analyzer (option FS-K5) and when measurement of the modulation accuracy is selected (see `CONFigure:BURSt:MACCuracy[:IMMEDIATE]`).

**Example:**

|                             |   |
|-----------------------------|---|
| "INST M GSM"                | 'Switches the instrument to GSM MS mode |
| "CONF:MTYP EDGE"            | 'Selects modulation type EDGE (8PSK)    |
| "CONF:BURS:MACC"            | 'Selects the MAC measurement            |
| "SWE:COUN 20"               | 'Sets the number of bursts              |
| "INIT:IMM;*WAI"             | 'Starts the measurement                 |
| "FETC:BURS:MACC:PEAK:AVER?" | 'Queries the result                     |

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

**Mode:** MS

If no measurement has been performed yet, a query error results.

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

**FETCh:BURSt:MACCuracy:PEAK:MAXimum?**

This command reads out the maximum of the PEAK-measurement of the error vector magnitude taken over the selected number of bursts.

This command is only available with GSM MS Analyzer (option FS-K5) and when measurement of the modulation accuracy is selected (see CONFigure:BURSt:MACCuracy[:IMMEDIATE]).

**Example:**

|                            |   |
|----------------------------|---|
| "INST M GSM"               | 'Switches the instrument to GSM MS mode |
| "CONF:MTYP EDGE"           | 'Selects modulation type EDGE (8PSK)    |
| "CONF:BURS:MACC"           | 'Selects the MAC measurement            |
| "SWE:COUN 20"              | 'Sets the number of bursts              |
| "INIT:IMM;*WAI"            | 'Starts the measurement                 |
| "FETC:BURS:MACC:PEAK:MAX?" | 'Queries the result                     |

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

**Mode:** MS

If no measurement has been performed yet, a query error results.

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

**FETCh:BURSt:MACCuracy:OSUPpress:AVERage?**

This command reads out the average of the original offset suppression measurement taken over the selected number of bursts.

This command is only available with GSM MS Analyzer (option FS-K5) and when measurement of the modulation accuracy is selected (see CONFigure:BURSt:MACCuracy[:IMMEDIATE]).

**Example:**

|                             |   |
|-----------------------------|---|
| "INST M GSM"                | 'Switches the instrument to GSM MS mode |
| "CONF:MTYP EDGE"            | 'Selects modulation type EDGE (8PSK)    |
| "CONF:BURS:MACC"            | 'Selects the MAC measurement            |
| "SWE:COUN 20"               | 'Sets the number of bursts              |
| "INIT:IMM;*WAI"             | 'Starts the measurement                 |
| "FETC:BURS:MACC:OSUP:AVER?" | 'Queries the result                     |

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

**Mode:** MS

If no measurement has been performed yet, a query error results.

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

**FETCh:BURSt:MACCuracy:OSUPpress:MAXimum?**

This command reads out the maximum of the original offset suppression measurement taken over the selected number of bursts.

This command is only available with GSM MS Analyzer (option FS-K5) and when measurement of the modulation accuracy is selected (see `CONFigure:BURSt:MACCuracy[:IMMEDIATE]`).

**Example:**

|                            |   |
|----------------------------|---|
| "INST M GSM"               | 'Switches the instrument to GSM MS mode |
| "CONF:MTYP EDGE"           | 'Selects modulation type EDGE (8PSK)    |
| "CONF:BURS:MACC"           | 'Selects the MAC measurement            |
| "SWE:COUN 20"              | 'Sets the number of bursts              |
| "INIT:IMM;*WAI"            | 'Starts the measurement                 |
| "FETC:BURS:MACC:OSUP:MAX?" | 'Queries the result                     |

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

**Mode:** MS

If no measurement has been performed yet, a query error results.  
 This command is an event and therefore has no query and no \*RST value .

**FETCh:BURSt:MACCuracy:PERCentile:AVERage?**

This command reads out the average of the 95% percentile measurement taken over the selected number of bursts.

This command is only available with GSM MS Analyzer (option FS-K5) and when measurement of the modulation accuracy is selected (see `CONFigure:BURSt:MACCuracy[:IMMEDIATE]`).

**Example:**

|                             |   |
|-----------------------------|---|
| "INST M GSM"                | 'Switches the instrument to GSM MS mode |
| "CONF:MTYP EDGE"            | 'Selects modulation type EDGE (8PSK)    |
| "CONF:BURS:MACC"            | 'Selects the MAC measurement            |
| "SWE:COUN 20"               | 'Sets the number of bursts              |
| "INIT:IMM;*WAI"             | 'Starts the measurement                 |
| "FETC:BURS:MACC:PERC:AVER?" | 'Queries the result                     |

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

**Mode:** MS

If no measurement has been performed yet, a query error results.  
 This command is an event and therefore has no query and no \*RST value .

**FETCh:BURSt:MACCuracy:PERCentile:MAXimum?**

This command reads out the maximum of the 95% percentile measurement taken over the selected number of bursts.

This command is only available with GSM MS Analyzer (option FS-K5) and when measurement of the modulation accuracy is selected (see `CONFigure:BURSt:MACCuracy[:IMMEDIATE]`).

**Example:**

|                            |   |
|----------------------------|---|
| "INST M GSM"               | 'Switches the instrument to GSM MS mode |
| "CONF:MTYP EDGE"           | 'Selects modulation type EDGE (8PSK)    |
| "CONF:BURS:MACC"           | 'Selects the MAC measurement            |
| "SWE:COUN 20"              | 'Sets the number of bursts              |
| "INIT:IMM;*WAI"            | 'Starts the measurement                 |
| "FETC:BURS:MACC:PERC:MAX?" | 'Queries the result                     |

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

**Mode:** MS

If no measurement has been performed yet, a query error results.

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

**FETCh:BURSt:MACCuracy:FREQuency:AVERage?**

This command reads out the average of the frequency error measurement taken over the selected number of bursts.

This command is only available with GSM MS Analyzer (option FS-K5) and when measurement of the modulation accuracy is selected (see `CONFigure:BURSt:MACCuracy[:IMMEDIATE]`).

**Example:**

|                             |   |
|-----------------------------|---|
| "INST M GSM"                | 'Switches the instrument to GSM MS mode |
| "CONF:MTYP EDGE"            | 'Selects modulation type EDGE (8PSK)    |
| "CONF:BURS:MACC"            | 'Selects the MAC measurement            |
| "SWE:COUN 20"               | 'Sets the number of bursts              |
| "INIT:IMM;*WAI"             | 'Starts the measurement                 |
| "FETC:BURS:MACC:FREQ:AVER?" | 'Queries the result                     |

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

**Mode:** MS

If no measurement has been performed yet, a query error results.

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

**FETCh:BURSt:MACCuracy:FREQuency:MAXimum?**

This command reads out the maximum of the frequency error measurement taken over the selected number of bursts.

This command is only available with GSM MS Analyzer (option FS-K5) and when measurement of the modulation accuracy is selected (see CONFigure:BURSt:MACCuracy[:IMMEDIATE]).

**Example:**

|                            |   |
|----------------------------|---|
| "INST M GSM"               | 'Switches the instrument to GSM MS mode |
| "CONF:MTYP EDGE"           | 'Selects modulation type EDGE (8PSK)    |
| "CONF:BURS:MACC"           | 'Selects the MAC measurement            |
| "SWE:COUN 20"              | 'Sets the number of bursts              |
| "INIT:IMM;*WAI"            | 'Starts the measurement                 |
| "FETC:BURS:MACC:FREQ:MAX?" | 'Queries the result                     |

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

**Mode:** MS

If no measurement has been performed yet, a query error results.  
 This command is an event and therefore has no query and no \*RST value .

**FETCh:BURSt:MACCuracy:IQOffset:AVERage?**

This command reads out the average of the IQ DC offset measurement in % for the selected number of bursts.

It is only available in conjunction with the option GSM MS Analyzer FS-K5 if modulation accuracy measurement has been selected (CONFigure:BURSt:MACCuracy[:IMMEDIATE]).

**Example:**

|                             |  |
|-----------------------------|--|
| "INST M GSM"                | 'Switches the instrument to GSM MS mode        |
| "CONF:MTYP EDGE"            | 'Selects EDGE modulation (8PSK)                |
| "CONF:BURS:MACC"            | 'Selects modulation accuracy (MAC) measurement |
| "SWE:COUN 20"               | 'Sets the number of bursts                     |
| "INIT:IMM;*WAI"             | 'Executes the measurement                      |
| "FETC:BURS:MACC:IQOF:AVER?" | 'Queries the result                            |

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

**Mode:** MS

If no measurement has been carried out yet, a query error is indicated.  
 This command is a query and therefore has no \*RST value.



**FETCh:BURSt:MACCuracy:IQOffset:MAXimum?**

This command reads out the maximum of the IQ DC offset measurement in % for the selected number of bursts.

It is only available in conjunction with the option GSM MS Analyzer FS-K5 if modulation accuracy measurement has been selected (CONFigure:BURSt:MACCuracy[:IMMEDIATE]).

**Example:**

|                            |  |
|----------------------------|--|
| "INST M GSM"               | 'Switches the instrument to GSM MS mode        |
| "CONF:MTYP EDGE"           | 'Selects EDGE modulation (8PSK)                |
| "CONF:BURS:MACC"           | 'Selects modulation accuracy (MAC) measurement |
| "SWE:COUN 20"              | 'Sets the number of bursts                     |
| "INIT:IMM;*WAI"            | 'Executes the measurement                      |
| "FETC:BURS:MACC:IQOF:MAX?" | 'Queries the result                            |

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

**Mode:** MS

If no measurement has been carried out yet, a query error is indicated.  
This command is a query and therefore has no \*RST value.

**FETCh:BURSt:MACCuracy:IQIMbalance:AVERage?**

This command reads out the average of the IQ imbalance measurement in % for the selected number of bursts.

It is only available in conjunction with the option GSM MS Analyzer FS-K5 if modulation accuracy measurement has been selected (CONFigure:BURSt:MACCuracy[:IMMEDIATE]).

**Example:**

|                             |  |
|-----------------------------|--|
| "INST M GSM"                | 'Switches the instrument to GSM MS mode        |
| "CONF:MTYP EDGE"            | 'Selects EDGE modulation (8PSK)                |
| "CONF:BURS:MACC"            | 'Selects modulation accuracy (MAC) measurement |
| "SWE:COUN 20"               | 'Sets the number of bursts                     |
| "INIT:IMM;*WAI"             | 'Executes the measurement                      |
| "FETC:BURS:MACC:IQIM:AVER?" | 'Queries the result                            |

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

**Mode:** MS

If no measurement has been carried out yet, a query error is indicated.  
This command is a query and therefore has no \*RST value.

**FETCh:BURSt:MACCuracy:IQIMbalance:MAXimum?**

This command reads out the maximum of the IQ imbalance measurement in % for the selected number of bursts.

It is only available in conjunction with the option GSM MS Analyzer FS-K5 if modulation accuracy measurement has been selected (CONFigure:BURSt:MACCuracy[:IMMediate]).

**Example:**

|                            |  |
|----------------------------|--|
| "INST M GSM"               | 'Switches the instrument to GSM MS mode        |
| "CONF:MTYP EDGE"           | 'Selects EDGE modulation (8PSK)                |
| "CONF:BURS:MACC"           | 'Selects modulation accuracy (MAC) measurement |
| "SWE:COUN 20"              | 'Sets the number of bursts                     |
| "INIT:IMM;*WAI"            | 'Executes the measurement                      |
| "FETC:BURS:MACC:IQIM:MAX?" | 'Queries the result                            |

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

**Mode:** MS

If no measurement has been carried out yet, a query error is indicated.  
This command is a query and therefore has no \*RST value.

**FETCh:PTEMplate Subsystem**

**Note:** *This subsystem was taken over from application firmware FSE-K10 for reasons of compatibility. It is replaced by the command FETCh:BURSt:PTEMplate:REFErence?. See detailed description at command FETCh:BURSt:PTEMplate:REFErence?.*

| COMMAND                            | PARAMETERS | UNIT | COMMENT                        |
|------------------------------------|------------|------|--------------------------------|
| FETCh<br>:PTEMplate<br>:REFErence? | --         | --   | Option FS-K5<br><br>query only |

**FETCh:SPECTrum Subsystem**

This subsystem provides the commands for reading out results of measurements in the GSM MS (FS-K5) mode, used to measure the power of the spectral contributions due to modulation and switching without first restarting a new measurement.

Spectrum due to modulation(MOD)

Spectrum due to transient (TRA).

| COMMAND     | PARAMETERS | UNIT | COMMENT      |
|-------------|------------|------|--------------|
| FETCh       |            |      | Option FS-K5 |
| :SPECTrum   |            |      |              |
| :MODulation |            |      |              |
| [:ALL?]     | ARFCn      | --   | query only   |
| :REFerence? | --         | --   | query only   |
| :SWITChing  |            |      |              |
| [:ALL?]     | --         | --   | query only   |

**FETCh:SPECTrum:MODulation[:ALL]? ARFCn**

This command reads out the result of the measurement of the modulation spectrum of the mobile.

**Parameter:** ARFCn::= ARFCN ± 1.8 MHz

The result is output as a list of partial result strings separated by ',' in the following (ASCII) format:

<Index>,<Freq1>,<Freq2>,<Level>,<Limit>, <Abs/Rel>,<Status> [, <Index>,<Freq1>,<Freq2>,<Level>,<Limit>, <Abs/Rel>,<Status>]...

where the parts between '['...''] denote a partial result string that can be repeated n times.

- <Index>: 0, if the partial result string characterizes a measurement range current number <>0, if the partial result string characterizes a single limit excess.
- <Freq1>: Start frequency of the measurement range or frequency where the limit line is exceeded
- <Freq2>: Start frequency of the measurement range or frequency exceeding the measurement range. The value of <Freq2> is equal to the value of <Freq1>, if either the measurement is performed in the time domain or if the partial result string contains a limit excess.
- <Level>: Measured maximum level of the partial range or measured level at the test point.
- <Limit>: Limit in the partial range or at the test point
- <Abs/Rel>: ABS <Level> and <Limit> are in absolute units (dBm)  
REL <Level> and <Limit> are in relative units (dB)
- <Status>: Result of the limit check in character data form:  
PASSED no limit exceeded  
FAILED limit exceeded  
MARGIN margin exceeded

The frequencies <Freq1> and <Freq2> are always absolute i. e. not referred to the carrier frequency.

This command is only available with GSM MS Analyzer FS-K5 option and when modulation spectrum measurement is selected (see :CONFIGure:SPECTrum:MODulation).

**Example:**

|                        |  |
|------------------------|--|
| "INST M GSM"           | 'Switches the instrument to GSM MS mode  |
| "CONF:SPEC:MOD"        | 'Selects the MOD measurement   |
| "READ:SPEC:MOD:REF?"   | 'Executes the premeasurement and queries the result  |
| "READ:SPEC:MOD?"       | 'Executes the measurement in the time domain and queries the result                          |
| "FETC:SPEC:MOD? ARFCn" | 'Queries the result of the measurement in the time domain without starting a new measurement |

**Result:** 0,890E6,915E6,-87.4,-108.0,ABS,FAILED,  
1,893.2E6,893.2E6,-83.2,-108.0,ABS,FAILED,  
2,895.7E6,895.7E6,-87.4,-108.0,ABS,FAILED

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

**Mode:** MS

If no measurement has been performed yet, a query error results.  
This command is an event and therefore has no query and no \*RST value .

#### FETCh:SPECtrum:MODulation:REFerence?

This command reads out the results of the premeasurement of modulation due to spectrum measurement.

The result is output as a list of partial result strings separated by ',' in the following (ASCII) format:

<Level1>,<Level2>,<RBW>

<Level1>: measured level

<Level2>: level corrected by means of the bandwidth

<RBW>: bandwidth

This command is only available in GSM MS mode (FS-K5) and when the measurement of the modulation due to spectrum is selected (see :CONFigure:SPECtrum:MODulation).

**Example:**

|                      |  |
|----------------------|--|
| "INST M GSM"         | 'Switches the instrument to GSM MS mode                                      |
| "CONF:SPEC:MOD"      | 'Selects the MOD measurement   |
| "READ:SPEC:MOD:REF?" | 'Executes the premeasurement and queries the result                          |
| "FETC:SPEC:MOD:REF?" | 'Queries the result of the premeasurement without starting a new measurement |

**Result:** 43.2,43.2,1000000

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

**Mode:** MS

If no measurement has been performed yet, a query error results.  
This command is an event and therefore has no query and no \*RST value .

**FETCh:SPECTrum:SWITChing[:ALL]?**

This command reads out the result of the measurement of the transient spectrum of the mobile.

The result is output as a list of partial result strings separated by ',' as for the command FETCh:SPECTrum:MODulation[:ALL]?

This command is only available in GSM MS mode (FS-K5) and when modulation spectrum measurement is selected (see :CONFIgure:SPECTrum:MODulation).

|                 |                   |  |
|-----------------|-------------------|--|
| <b>Example:</b> | "INST MGSM"       | 'Switches the instrument to GSM MS mode    |
|                 | "CONF:SPEC:SWIT"  | 'Selects the TRA measurement               |
|                 | "READ:SPEC:SWIT?" | 'Executes the measurement in the time      |
|                 |                   | 'domain and queries the result             |
|                 | "FETC:SPEC:SWIT?" | 'Queries the result without starting a new |
|                 |                   | 'measurement                               |

|                |   |
|----------------|---|
| <b>Result:</b> | 0,833.4E6,833.4E6,37.4,-36.0,ABS,MARGIN,  |
|                | 1,834.0E6,834.0E6,-35.2,-36.0,ABS,FAILED, |
|                | 2,834.6E6,834.6E6,-74.3,-75.0,REL,FAILED  |
|                | 0,835.0E6,835.0E6,-65,0,-60.0,REL,PASSED  |

|                         |                       |
|-------------------------|-----------------------|
| <b>Characteristics:</b> | *RST value: --        |
|                         | SCPI: device-specific |

|              |    |
|--------------|----|
| <b>Mode:</b> | MS |
|--------------|----|

If no measurement has been performed yet, a query error results.

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

## FORMat Subsystem

The FORMat subsystem specifies the data format of the data transmitted from and to the instrument.

| COMMAND                                      | PARAMETERS   | UNIT | COMMENT |
|--|--|------|---------|
| FORMat<br>[:DATA]<br>:DEXPort<br>:DSEParator | ASCIi REAL UINT[,<numeric_value>]<br><br>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

**Mode:**                all

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

**Mode:**                all

## 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  <br>CYAN   RED   MAGenta   YELLow  <br>WHITe   DGRAY   LGRAY   LBLUe  <br>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

**Mode:** all

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 : DEF 2 " 'selects OPTIMIZED COLOR SET for the color settings of a hardcopy.

**Characteristics:** \*RST value: --  
SCPI: conforming

**Modes:** all

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

This command is available from firmware version 1.40 or higher.



**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:** "HCOPY:CMAP2:HSL 0.3,0.8,1.0" ' changes the grid color

**Characteristics:** \*RST value: --  
SCPI: conforming

**Modes:** all

The values set are not changed by \*RST.

This command is available from firmware version 1.40 or higher.



**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

**Mode:** all

**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:MME' ). 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:MME' ) 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:MME' ).

**Example:** "HCOP:DEV:LANG WMF"

**Characteristics:** \*RST value: -  
SCPI: conforming

**Mode:** all

**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

**Mode:** all

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:** "HCOPY:ITEM:ALL"

**Characteristics:** \*RST value: OFF  
SCPI: conforming

**Mode:** all

The hardcopy output is always provided with comments, title, time and date. As an alternative to the whole screen, only traces (commands 'HCOPY:DEVICE:WINDOW:TRACE:STATE ON') or tables (command 'HCOPY:DEVICE: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:** "HCOPY:ITEM:WIND:TABLE:STAT ON"

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

**Mode:** all

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:** "HCOPY:ITEM:WIND2:TEXT 'comment' "

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

**Mode:** all

**HCOPY:ITEM:WINDOW<1|2>:TRACE:STATE ON | OFF**

This command selects the output of the currently displayed trace.

**Example:** "HCOPY:ITEM:WIND:TRACE:STAT ON"

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

**Mode:** all

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" (HCOPY:DEST 'SYST:COMM:PRIN') has been selected.*

**Example:** "HCOPY:PAGE:ORI LAND"

**Characteristics:** \*RST value: -  
SCPI: conforming

**Mode:** all

## 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><br>: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

**Mode:** all

### 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

**Mode:** A

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

**Mode:** all

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

**Mode:** A, MS

## 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        | <Boolean>       | --   |                      |
| :RESet       |                 |      | no query             |
| :EATT        | <numeric_value> | DB   | Only with option B25 |
| :AUTO        | <Boolean>       | --   | Only with option B25 |
| :STATe       | <Boolean>       | --   | Only with option B25 |
| :IMPedance   | 50   75         | OHM  |                      |
| :MIXer       | <numeric_value> | DBM  |                      |
| :GAIN        |                 |      |                      |
| :STATe       | <Boolean>       |      | Only with option B25 |

### 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

**Mode:** all

### INPut<1|2>:ATTenuation:AUTO ON | OFF

This command automatically couples the input attenuation to the reference level (state ON) or switches the input attenuation to manual entry (state OFF). The minimum input attenuation set with the coupling switched on is 10 dB (with electronic attenuator option: 5 dB).

**Example:** "INP:ATT:AUTO ON" ' Couples the attenuation set on the attenuator to the 'reference level.

**Characteristics:** \*RST value: ON  
SCPI: conforming

**Mode:** all



**INPut<1|2>:ATTenuation:PROTection:RESet**

The FSU 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

**Mode:** all

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

**Mode:** A

**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

**Mode:** all

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

**Mode:** all

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

**Mode:** all

The command is only available with the option electronic attenuator B25.

**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  $\Omega$  should be selected, if the 50  $\Omega$  input impedance is transformed to a higher impedance using a 75  $\Omega$  adapter of the RAZ type (= 25  $\Omega$  in series to the input impedance of the instrument). The correction value in this case is 1.76 dB = 10 log ( 75 $\Omega$  / 50 $\Omega$ ).

**Example:** "INP:IMP 75"

**Characteristics:** \*RST value: 50  $\Omega$   
 SCPI: conforming

**Mode:** all

**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

**Modes:** A, MS

The command is only available with the option electronic attenuator B25.

**INPut<1|2>:MIXer[:POWER] <numeric value>**

This command defines the desired power at the input mixer of the analyzer. On any change to the reference level the RF attenuation will be adjusted in a way that makes the difference between reference level and RF attenuation come as close to the desired mixer level as possible.

**Example:** "INP:MIX -30"

**Characteristics:** \*RST value: -25 dBm  
SCPI: device-specific

**Mode:** A

**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

**Mode:** A

## INSTRUMENT Subsystem

The INSTRUMENT subsystem selects the operating mode of the unit either via text parameters or fixed numbers.

| COMMAND  | PARAMETERS   | UNIT | COMMENT  |
|--|--|------|----------|
| INSTRUMENT<br>[:SElect]<br><br>:NSElect<br>:COUple | SANalyzer   ADEMod   MGSM<br>WCDPower   BWCDpower  <br>MWCDpower<br><br><numeric_value><br>NONE   RLEVel   CF_B   CF_A |      | no query |

### INSTRUMENT[:SElect] SANalyzer | ADEMod| MSGM | WCDPower|BWCDpower | MWCDpower

This command switches between the operating modes by means of text parameters.

**Notes on GSM MS mode:**

- After switchover to the GSM MS mode, a measurement has to be selected by means of a CONFIGURE command.
- After switchover to the GSM MS mode, the modulation mode (GMSK or EDGE) selected last is active.
- If the analyzer is set to external trigger when the GSM MS mode is activated (by INST :SEL MSGM), the 'Extern' GSM trigger is used; if it is set to RF power trigger, the 'RF Power' GSM trigger is used, otherwise the 'IF Power' GSM trigger (default).
- Upon switchover from GSM MS mode to analyzer mode, the GSM MS trigger setting is maintained, i.e. IF power if 'IF Power' was set before, RF power if 'RF Power' was set before, and external trigger if 'Extern' was set before.

**Parameter:**

|                      |   |
|----------------------|---|
| SANalyzer:           | Spectrum analysis                                 |
| ADEMod               | FM demodulator                                    |
| MGSM:                | GSM MS analyzer                                   |
| WCDPower   BWCDpower | Wideband Code Domain measurements, base station   |
| MWCDpower            | Wideband Code Domain measurements, mobile station |

**Example:** "INST SAN" 'Switches the instrument to SPECTRUM.

**Characteristics:** \*RST value: SANalyzer  
SCPI: conforming

**Note:**  
Setting WCDPower always switches the operating mode to Continuous Sweep (INIT:CONT ON).

**Mode:** all

Changeover to MGSM is only possible with GSM MS Analyzer FS-K5 option installed.

Changeover to WCDPower and BWCDpower is only possible with WCDMA FDD BTS (FS-K72) option installed.

Changeover to MWCDpower is only possible with WCDMA FDD BTS (FS-K73) option installed.

Changeover to ADEMod is only possible with FM Demodulator FS-K7 option installed.

**INSTRUMENT:NSElect** <numeric value>

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

|                   |    |                   |
|-------------------|----|-------------------|
| <b>Parameter:</b> | 1: | Spectrum analysis |
|                   | 3: | FM demodulator    |
|                   | 5: | GSM MS analyzer   |
|                   | 8: | 3G FDD FWD        |
|                   | 9: | 3G FDD UE         |

**Example:** "INST:NSEL 1" 'Switches the instrument to *SPECTRUM*.

**Characteristics:** \*RST value: 1  
SCPI: conforming

**Mode:** all

Changeover to 3 is only possible with FM Demodulator FS-K7 option installed.

Changeover to 5 is only possible with GSM MS Analyzer FS-K5 option installed.

Changeover to 8 is only possible with 3G FDD BTS option installed.

Changeover to 9 is only possible with 3G FDD UE option installed.

**INSTRUMENT:COUPlE** NONE | RLEVeI | CF\_B | CF\_A

In operating mode *SPECTRUM* this command selects the parameter coupling between the two measurement windows screen A and B.

|                   |        |   |
|-------------------|--------|---|
| <b>Parameter:</b> | NONE   | No coupling. The two measurement windows are operated like two independent "virtual" devices. |
|                   | RLEVeI | 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

**Mode:** A

## 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                   |
|-------------|-----------------------------|------|---------------------------|
| MMEMemory   |                             |      |                           |
| :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? 'D:\USER\DATA' 'Returns the contents of the '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".

**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

**Operating mode:** all

**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

**Mode:** all

**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

**Mode:** all

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

**Mode:** all

**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

**Mode:** all

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

**Mode:** all

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

**MMEMemory: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<br>.TS2 |
| Correction data for source calibration (only with Tracking Generator Option B9 or Ext. Generator Control B10) | .TC1<br>.TC2 |
| Correction data for source calibration (only with Option Ext. Generator Control B10)                          |              |
| 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:** "MME:LOAD:STAT 1, 'A:TEST' "

**Characteristics:** \*RST value: -  
SCPI: conforming

**Mode:** all

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

**Mode:** all

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

**Mode:** all

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

**Mode:** all

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

**Mode:** all

**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

**Mode:** all

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

**Mode:** all

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

**Mode:** all

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

**Mode:** all

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

**Mode:** all

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

**Mode:** all

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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Modes:** all

This command is only available in conjunction with option external generator control B10.

**MMEMory:SElect[:ITEM]:TRANsducer[:ACTive] ON | OFF**

This command includes the active transducer factors and set in the list of data subsets of a device setting to be stored/loaded.

**Example:** "MMEM:SEL:TRAN ON"

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

**Modes:** all

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

**Modes:** all

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

**Mode:** all

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

**Mode:** all

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

**Mode:** all

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

**MMEMemory:COMMeNT** <string>

This command defines a comment ( max. 60 characters) for a device setting to be stored.

**Example:** "MMEMemory:COMM 'Setup for GSM measurement' "

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

**Mode:** all

## READ - Subsystem

The READ subsystem contains commands for starting complex measurement tasks such as those provided in the GSM MS mode (FS-K5), and for querying the results subsequently. The READ subsystem is closely linked to the functions of the CONFIGure and FETCh subsystems, where the measurement sequences are configured or the results are queried without restarting a new measurement.

## READ:AUTO - Subsystem

This subsystem contains commands for starting automatic measurement routines for the GSM MS mode (FS-K5). The analyzer will automatically being adjusted to the input signal.

| COMMAND                    | PARAMETERS | UNIT | COMMENT                    |
|----------------------------|------------|------|----------------------------|
| READ<br>:AUTO<br>:LEVTime? | --         |      | Option FS-K5<br>query only |

### READ:AUTO:LEVTime?

This command starts a measurement sequence which automatically adjusts the level and trigger timing of the input signal to the analyzer.

Preconditions are a correct setting of center frequency and a correct choice of the to be used GSM trigger source to be utilized. (Refer to command TRIG:SEQ:SYNC:ADJ, for the time between trigger and begin of slot 0s should be used)

The result is read out as a list of partial ASCII result strings separated by ',' in the following format:  
<status>,<signal power>,<time from trigger to begin of slot>,<trigger level>,<reserved>

|   |              |                  |  |
|---|--------------|------------------|--|
| <status>:                               | status:      | PASSED<br>FAILED | measurement successful, result figures are valid<br>measurement failed, result figures are invalid<br>error (e.g. no carrier) can be read out of the status reporting system |
| <signal power>                          | signal power | dBm              | (reference level is automatically set 3 dB above the signal power)   |
| <time trigger to virtual begin of slot> | s            |                  | correction value for the time offset between the currently active GSM trigger and beginning of the slot.   |
| <trigger level>                         |              | dBm/V            | trigger level of the currently active GSM trigger, for IF/RF the units are dBm, for external trigger the unit is Volts   |
| <reserved>                              |              |                  | always 0, for future use   |

After the automatic sequence a GSM measurement must be selected again with the command CONFIGure.

The premeasurement for power vs. time is executed implicitly within the sequence.

For modulation spectrum measurement the premeasurement must be executed again.

This command is only available in GSM MS mode (FS-K5).

|                 |                        |   |
|-----------------|------------------------|---|
| <b>Example:</b> | "INST MGSM"            | 'Switches the instrument to GSM MS mode |
|                 | "CONF:MTYP GMSK"       | 'Selects modulation type GMSK           |
|                 | "FREQ:CENT 890.2E6"    | 'Sets the center frequency              |
|                 | "TRIG:SYNC:ADJ:EXT 0s" | 'Selects GSM external trigger           |

"READ:AUTO:LEVTime?" 'Executes the measurement and queries the  
'result

Result: PASSED,8.3,6.15E-005,1.4,0

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

**Mode:** MS

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

### READ:BURSt - Subsystem

This subsystem provides the commands for starting measurements in the GSM MS Analyzer mode (option FS-K5), which are performed on individual bursts and for reading out the results subsequently:

- Phase-Frequency Error (PFE)
- Modulation Accuracy (MAC)
- Power vs. Time (PVT)

| COMMAND       | PARAMETERS | UNIT | COMMENT      |
|---------------|------------|------|--------------|
| READ          |            |      | Option FS-K5 |
| :BURSt        |            |      |              |
| :PERRor       |            |      |              |
| :RMS          |            |      |              |
| :AVERage?     | --         | deg  | query only   |
| :MAXimum?     | --         | deg  | query only   |
| :PEAK         |            |      |              |
| :AVERage?     | --         | deg  | query only   |
| :MAXimum?     | --         | deg  | query only   |
| :FERRor       |            |      |              |
| :AVERage?     | --         | Hz   | query only   |
| :MAXimum?     |            | Hz   | query only   |
| :IQOFfset     | --         |      |              |
| :AVERage?     | --         | %    | query only   |
| :MAXimum?     |            | %    | query only   |
| :IQIMbalance  | --         |      |              |
| :AVERage?     | --         | %    | query only   |
| :MAXimum?     | --         | %    | query only   |
| :PTEMplate    |            |      |              |
| :REFerence    |            |      |              |
| [:IMMEDIATE?] | --         | --   | query only   |
| :REFerence    | --         |      |              |
| [:IMMEDIATE?] | --         | --   | query only   |
| :MACCuracy    |            |      |              |
| :RMS          |            |      |              |
| :AVERage?     | --         | %    | query only   |
| :MAXimum?     | --         | %    | query only   |
| :PEAK         |            |      |              |
| :AVERage?     | --         | %    | query only   |
| :MAXimum?     | --         | %    | query only   |
| :OSUPpress    |            |      |              |
| :AVERage?     | --         | dB   | query only   |
| :MAXimum?     | --         | dB   | query only   |
| :PERCentile   |            |      |              |
| :AVERage?     | --         | %    | query only   |
| :MAXimum?     | --         | %    | query only   |
| :FREQuency    |            |      |              |
| :AVERage?     | --         | Hz   | query only   |
| :MAXimum?     | --         | Hz   | query only   |
| :IQOFfset     |            |      |              |
| :AVERage?     | --         | %    | query only   |
| :MAXimum?     | --         | %    | query only   |
| :IQIMbalance  |            |      |              |
| :AVERage?     | --         | %    | query only   |
| :MAXimum?     | --         | %    | query only   |

**READ:BURSt:PERRor:RMS:AVERage?**

This command starts the measurement of the phase and frequency error (PFE) of the mobile and reads out the average of the RMS measurement of the phase error taken over the selected number of bursts.

When the measurement is started the analyzer is automatically set to single sweep.

Further results of the PFE measurement can then be queried without restart of the measurement via the :FETCh:BURSt subsystem.

An ongoing measurement can be aborted via the command ABORt .

This command is only available in GSM MS mode (FS-K5) and when measurement of the phase/frequency error is selected (see :CONFIgure:BURSt:PFERror).

**Example:**

|                            |  |
|----------------------------|--|
| "INST MGSM"                | 'Switches the instrument to GSM MS mode          |
| "CONF:MTYP GMSK"           | 'Selects modulation type GMSK                    |
| "CONF:BURS:PFER"           | 'Selects the PFE measurement                     |
| "SWE:COUN 20"              | 'Sets the number of bursts                       |
| "READ:BURS:PERR:RMS:AVER?" | 'Executes the measurement and queries the result |

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

**Mode:** MS

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

**READ:BURSt:PERRor:RMS:MAXimum?**

This command starts the measurement of the phase and frequency error (PFE) of the mobile and reads out the maximum of the RMS measurement of the phase error taken over the selected number of bursts.

When the measurement is started the analyzer is automatically set to single sweep.

Further results of the PFE measurement can then be queried without restart of the measurement via the :FETCh:BURSt subsystem.

An ongoing measurement can be aborted via the command ABORt .

This command is only available in GSM MS mode (FS-K5) and when measurement of the phase/frequency error is selected (see :CONFIgure:BURSt:PFERror).

**Example:**

|                           |  |
|---------------------------|--|
| "INST MGSM"               | 'Switches the instrument to GSM MS mode          |
| "CONF:MTYP GMSK"          | 'Selects modulation type GMSK                    |
| "CONF:BURS:PFER"          | 'Selects the PFE measurement                     |
| "SWE:COUN 20"             | 'Sets the number of bursts                       |
| "READ:BURS:PERR:RMS:MAX?" | 'Executes the measurement and queries the result |

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

**Mode:** MS

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

**READ:BURSt:PERRor:PEAK:AVERage?**

This command starts the measurement of the phase and frequency error (PFE) of the mobile and reads out the average of the PEAK measurement of the phase error taken over the selected number of bursts.

When the measurement is started the analyzer is automatically set to single sweep.

Further results of the PFE measurement can then be queried without restart of the measurement via the :FETCh:BURSt subsystem.

An ongoing measurement can be aborted via the command ABORt .

This command is only available in GSM MS mode (FS-K5) and when measurement of the phase/frequency error is selected (see :CONFIgure:BURSt:PFERror) .

|                 |                             |  |
|-----------------|-----------------------------|--|
| <b>Example:</b> | "INST MGSM"                 | 'Switches the instrument to GSM MS mode          |
|                 | "CONF:MTYP GMSK"            | 'Selects modulation type GMSK                    |
|                 | "CONF:BURS:PFER"            | 'Selects the PFE measurement                     |
|                 | "SWE:COUN 20"               | 'Sets the number of bursts                       |
|                 | "READ:BURS:PERR:PEAK:AVER?" | 'Executes the measurement and queries the result |

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

**Mode:** MS

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

**READ:BURSt:PERRor:PEAK:MAXimum?**

This command starts the measurement of the phase and frequency error (PFE) of the mobile and reads out the maximum of the PEAK-measurement of the phase error taken over the selected number of bursts.

When the measurement is started the analyzer automatically is set to single sweep.

Further results of the PFE measurement can be then queried without restart of the measurement via the :FETCh:BURSt subsystem.

An ongoing measurement can be aborted via the command ABORt .

This command is only available in GSM MS mode (FS-K5) and when measurement of the phase/frequency error is selected (see :CONFIgure:BURSt:PFERror)

|                 |                            |  |
|-----------------|----------------------------|--|
| <b>Example:</b> | "INST MGSM"                | 'Switches the instrument to GSM MS mode          |
|                 | "CONF:MTYP GMSK"           | 'Selects modulation type GMSK                    |
|                 | "CONF:BURS:PFER"           | 'Selects the PFE measurement                     |
|                 | "SWE:COUN 20"              | 'Sets the number of bursts                       |
|                 | "READ:BURS:PERR:PEAK:MAX?" | 'Executes the measurement and queries the result |

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

**Mode:** MS

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

**READ:BURSt:FERRor:AVERage?**

This command starts the measurement of the phase and frequency error (PFE) of the mobile and reads out the average of the measurement of the frequency error taken over the selected number of bursts.

When the measurement is started the analyzer is automatically set to single sweep.

Further results of the PFE measurement can then be queried without restart of the measurement via the :FETCh:BURSt subsystem.

An ongoing measurement can be aborted via the command ABORt .

This command is only available in GSM MS mode (FS-K5) and when measurement of the phase/frequency error is selected (see :CONFIgure:BURSt:PFERror) .

|                 |                        |  |
|-----------------|------------------------|--|
| <b>Example:</b> | "INST MGSM"            | 'Switches the instrument to GSM MS mode          |
|                 | "CONF:MTYP GMSK"       | 'Selects modulation type GMSK                    |
|                 | "CONF:BURS:PFER"       | 'Selects the PFE measurement                     |
|                 | "SWE:COUN 20"          | 'Sets the number of bursts                       |
|                 | "READ:BURS:FERR:AVER?" | 'Executes the measurement and queries the result |

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

**Mode:** MS

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

**READ:BURSt:FERRor:MAXimum?**

This command starts the measurement of the phase and frequency error (PFE) of the mobile and reads out the average of the measurement of the frequency error taken over the selected number of bursts.

When the measurement is started the analyzer is automatically set to single sweep.

Further results of the PFE measurement can then be queried without restart of the measurement via the :FETCh:BURSt subsystem.

An ongoing measurement can be aborted via the command ABORt .

This command is only available in GSM MS mode (FS-K5) and when measurement of the phase/frequency error is selected (see :CONFIgure:BURSt:PFERror) .

|                 |                       |  |
|-----------------|-----------------------|--|
| <b>Example:</b> | "INST MGSM"           | 'Switches the instrument to GSM MS mode          |
|                 | "CONF:MTYP GMSK"      | 'Selects modulation type GMSK                    |
|                 | "CONF:BURS:PFER"      | 'Selects the PFE measurement                     |
|                 | "SWE:COUN 20"         | 'Sets the number of bursts                       |
|                 | "READ:BURS:FERR:MAX?" | 'Executes the measurement and queries the result |

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

**Mode:** MS

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



**READ:BURSt:IQOFset:AVERage?**

This command triggers the measurement of the phase/frequency error (PFE) of the mobile and reads out the average of the IQ DC offset measurement in % for the selected number of bursts. The start of the measurement automatically activates the single sweep mode.

Further results of the PFE measurement can then be queried via the `FETCH:BURSt` subsystem without restarting the measurement.

An ongoing measurement can be aborted by means of the `ABORT` command.

This command is only available in GSM MS mode (FS-K5) if phase/frequency error (PFE) measurement has been selected (s. `CONFigure:BURSt:PFERror`).

|                 |                        |  |
|-----------------|------------------------|--|
| <b>Example:</b> | "INST MGSM"            | 'Switches the instrument to GSM MS mode          |
|                 | "CONF:MTYP GSMK"       | 'Selects GSMK modulation                         |
|                 | "CONF:BURS:PFER"       | 'Selects phase/frequency error (PFE) measurement |
|                 | "SWE:COUN 20"          | 'Sets the number of bursts                       |
|                 | "READ:BURS:IQOF:AVER?" | Executes the measurement and queries the result  |

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

Mode: MS

If no measurement has been carried out yet, a query error is indicated.

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

**READ:BURSt:IQOFset:MAXimum?**

This command triggers the measurement of the phase/frequency error (PFE) of the mobile and reads out the maximum of the IQ DC offset measurement in % for the selected number of bursts. The start of the measurement automatically activates the single sweep mode.

Further results of the PFE measurement can then be queried via the `FETCH:BURSt` subsystem without restarting the measurement.

An ongoing measurement can be aborted by means of the `ABORT` command.

This command is only available in GSM MS mode (FS-K5) if phase/frequency error (PFE) measurement has been selected (s. `CONFigure:BURSt:PFERror`).

|                 |                       |  |
|-----------------|-----------------------|--|
| <b>Example:</b> | "INST MGSM"           | 'Switches the instrument to GSM MS mode          |
|                 | "CONF:MTYP GSMK"      | 'Selects GSMK modulation                         |
|                 | "CONF:BURS:PFER"      | 'Selects phase/frequency error (PFE) measurement |
|                 | "SWE:COUN 20"         | 'Sets the number of bursts                       |
|                 | "READ:BURS:IQOF:MAX?" | Executes the measurement and queries the result  |

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

Mode: MS

If no measurement has been carried out yet, a query error is indicated.

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

**READ:BURSt:IQIMbalance:AVERAge?**

This command triggers the measurement of the phase/frequency error (PFE) of the mobile and reads out the average of the IQ imbalance measurement in % for the selected number of bursts. The start of the measurement automatically activates the single sweep mode.

Further results of the PFE measurement can then be queried via the `FETCh:BURSt` subsystem without restarting the measurement.

An ongoing measurement can be aborted by means of the `ABORt` command.

This command is only available in GSM MS mode (FS-K5) if phase/frequency error (PFE) measurement has been selected (s. `CONFIgure:BURSt:PFERror`).

**Example:**

|                        |  |
|------------------------|--|
| "INST MGSM"            | 'Switches the instrument to GSM MS mode          |
| "CONF:MTYP GSMK"       | 'Selects GSMK modulation                         |
| "CONF:BURS:PFER"       | 'Selects phase/frequency error (PFE) measurement |
| "SWE:COUN 20"          | 'Sets the number of bursts                       |
| "READ:BURS:IQIM:AVER?" | Executes the measurement and queries the result  |

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

**Mode:** MS

If no measurement has been carried out yet, a query error is indicated. This command is a query and therefore has no \*RST value.

**READ:BURSt:IQIMbalance:MAXimum?**

This command triggers the measurement of the phase/frequency error (PFE) of the mobile and reads out the maximum of the IQ imbalance measurement in % for the selected number of bursts. The start of the measurement automatically activates the single sweep mode.

Further results of the PFE measurement can then be queried via the `FETCh:BURSt` subsystem without restarting the measurement.

An ongoing measurement can be aborted by means of the `ABORt` command.

This command is only available in GSM MS mode (FS-K5) if phase/frequency error (PFE) measurement has been selected (s. `CONFIgure:BURSt:PFERror`).

**Example:**

|                       |  |
|-----------------------|--|
| "INST MGSM"           | 'Switches the instrument to GSM MS mode          |
| "CONF:MTYP GSMK"      | 'Selects GSMK modulation                         |
| "CONF:BURS:PFER"      | 'Selects phase/frequency error (PFE) measurement |
| "SWE:COUN 20"         | 'Sets the number of bursts                       |
| "READ:BURS:IQIM:MAX?" | Executes the measurement and queries the result  |

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

**Mode:** MS

If no measurement has been carried out yet, a query error is indicated. This command is a query and therefore has no \*RST value.

**READ:BURSt:PTEMplate:REFerence[:IMMediate]?**

This command starts the premeasurement of power vs. time and reads out the results.

The result is output as a list of partial result strings separated by ',' in the following (ASCII) format:

<Level1>,<Level2>,<RBW>

<Level1>: measured level

<Level2>: level corrected by means of the bandwidth

<RBW>: bandwidth

This command is only available in GSM MS mode (FS-K5) and when measurement of the power vs. time is selected (see :CONFIgure:BURSt:PTEMplate).

**Example:**

|                       |  |
|-----------------------|--|
| "INST MGSM"           | 'Switches the instrument to GSM MS mode          |
| "CONF:MTYP GMSK"      | 'Selects modulation type GMSK                    |
| "CONF:BURS:PTEM"      | 'Selects the PVT measurement                     |
| "READ:BURS:PTEM:REF?" | 'Executes the measurement and queries the result |

Result: 43.2,43.2,600000

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

**Mode:** MS

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

**READ:BURSt:REFerence[:IMMediate]?**

This command starts the premeasurement of power vs. time and returns the measured level in dBm.

This command is only available in GSM MS mode (FS-K5) and when measurement of the power vs. time is selected (see :CONFIgure:BURSt:PTEMplate).

**Note:** *This command has been included only for reasons of compatibility with FSE-K10. Instead of this command, the command READ:BURSt:PTEMplate:REFerence[:IMMediate]? should be used, whose output format conforms to that of the premeasurement query commands. For a detailed description see command READ:BURSt:PTEMplate:REFerence[:IMMediate]?*

**Example:**

|                  |   |
|------------------|---|
| "INST MGSM"      | 'Switches the instrument to GSM MS mode             |
| "CONF:MTYP GMSK" | 'Selects the modulation type GMSK                   |
| "CONF:BURS:PTEM" | 'Selects the PVT measurement                        |
| "READ:BURS:REF?" | 'Executes the premeasurement and queries the result |

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

**Mode:** MS

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

**READ:BURSt:MACCuracy:RMS:AVERAge?**

This command starts the measurement of the modulation accuracy of the mobile and reads out the average of the RMS-measurement of the error vector magnitude taken over the selected number of bursts.

When the measurement is started the analyzer is automatically set to single sweep.

Further results of the modulation accuracy measurement can be then queried without restart of the measurement via the :FETCh:BURSt-subsystem.

An ongoing measurement can be aborted via the command ABORt .

This command is only available with GSM MS Analyzer (option FS-K5) and when measurement of the modulation accuracy is selected (CONFIgure:BURSt:MACCuracy[:IMMediate]).

**Example:**

|                            |  |
|----------------------------|--|
| "INST M GSM"               | 'Switches the instrument to GSM MS mode          |
| "CONF:MTYP EDGE"           | 'Selects the modulation type EDGE (8PSK)         |
| "CONF:BURS:MACC"           | 'Selects the MAC measurement                     |
| "SWE:COUN 20"              | 'Sets the number of bursts                       |
| "READ:BURS:MACC:RMS:AVER?" | 'Starts the measurement and reads out the result |

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

**Mode:** MS

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

**READ:BURSt:MACCuracy:RMS:MAXimum?**

This command starts the measurement of the modulation accuracy of the mobile and reads out the maximum of the RMS-measurement of the error vector magnitude taken over the selected number of bursts.

When the measurement is started the analyzer is automatically set to single sweep.

Further results of the modulation accuracy measurement can be then queried without restart of the measurement via the :FETCh:BURSt-subsystem.

An ongoing measurement can be aborted via the command ABORt .

This command is only available with GSM MS Analyzer (option FS-K5) and when measurement of the modulation accuracy is selected (CONFIgure:BURSt:MACCuracy[:IMMediate]).

**Example:**

|                           |  |
|---------------------------|--|
| "INST M GSM"              | 'Switches the instrument to GSM MS mode          |
| "CONF:MTYP EDGE"          | 'Selects the modulation type EDGE (8PSK)         |
| "CONF:BURS:MACC"          | 'Selects the MAC measurement                     |
| "SWE:COUN 20"             | 'Sets the number of bursts                       |
| "READ:BURS:MACC:RMS:MAX?" | 'Starts the measurement and reads out the result |

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

**Mode:** MS

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

**READ:BURSt:MACCuracy:PEAK:AVERage?**

This command starts the measurement of the modulation accuracy of the mobile and reads out the average of the PEAK-measurement of the error vector magnitude taken over the selected number of bursts.

When the measurement is started the analyzer is automatically set to single sweep.

Further results of the modulation accuracy measurement can be then queried without restart of the measurement via the :FETCh:BURSt-subsystem.

An ongoing measurement can be aborted via the command ABORt .

This command is only available with GSM MS Analyzer (option FS-K5) and when measurement of the modulation accuracy is selected (CONFIgure:BURSt:MACCuracy[:IMMEDIATE]).

**Example:**

|                             |  |
|-----------------------------|--|
| "INST M GSM"                | 'Switches the instrument to GSM MS mode          |
| "CONF:MTYP EDGE"            | 'Selects the modulation type EDGE (8PSK)         |
| "CONF:BURS:MACC"            | 'Selects the MAC measurement                     |
| "SWE:COUN 20"               | 'Sets the number of bursts                       |
| "READ:BURS:MACC:PEAK:AVER?" | 'Starts the measurement and reads out the result |

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

**Mode:** MS

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

**READ:BURSt:MACCuracy:PEAK:MAXimum?**

This command starts the measurement of the modulation accuracy of the mobile and reads out the maximum of the PEAK-measurement of the error vector magnitude taken over the selected number of bursts.

When the measurement is started the analyzer is automatically set to single sweep. Further results of the modulation accuracy measurement can be then queried without restart of the measurement via the :FETCh:BURSt-subsystem.

An ongoing measurement can be aborted via the command ABORt .

This command is only available with GSM MS Analyzer (option FS-K5) and when measurement of the modulation accuracy is selected (CONFIgure:BURSt:MACCuracy[:IMMEDIATE]).

**Example:**

|                            |  |
|----------------------------|--|
| "INST M GSM"               | 'Switches the instrument to GSM MS mode          |
| "CONF:MTYP EDGE"           | 'Selects the modulation type EDGE (8PSK)         |
| "CONF:BURS:MACC"           | 'Selects the MAC measurement                     |
| "SWE:COUN 20"              | 'Sets the number of bursts                       |
| "READ:BURS:MACC:PEAK:MAX?" | 'Starts the measurement and reads out the result |

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

**Mode:** MS

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

**READ:BURSt:MACCuracy:OSUPpress:AVERAge?**

This command starts the measurement of the modulation accuracy of the mobile and reads out the average of the original offset suppression measurement taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the modulation accuracy measurement can be then queried without restart of the measurement via the :FETCh:BURSt-subsystem.

An ongoing measurement can be aborted via the command ABORt .

This command is only available with GSM MS Analyzer (option FS-K5) and when measurement of the modulation accuracy is selected (CONFIgure:BURSt:MACCuracy[:IMMEDIATE]).

**Example:**

|                              |  |
|------------------------------|--|
| "INST M GSM "                | 'Switches the instrument to GSM MS mode          |
| "CONF:MTYP EDGE "            | 'Selects the modulation type EDGE (8PSK)         |
| "CONF:BURS:MACC "            | 'Selects the MAC measurement                     |
| "SWE:COUN 20 "               | 'Sets the number of bursts                       |
| "READ:BURS:MACC:OSUP:AVER? " | 'Starts the measurement and reads out the result |

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

**Mode:** MS

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

**READ:BURSt:MACCuracy:OSUPpress:MAXimum?**

This command starts the measurement of the modulation accuracy of the mobile and reads out the maximum of the original offset suppression measurement taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the modulation accuracy measurement can be then queried without restart of the measurement via the :FETCh:BURSt-subsystem.

An ongoing measurement can be aborted via the command ABORt .

This command is only available with GSM MS Analyzer (option FS-K5) and when measurement of the modulation accuracy is selected (CONFIgure:BURSt:MACCuracy[:IMMEDIATE]).

**Example:**

|                             |  |
|-----------------------------|--|
| "INST M GSM "               | 'Switches the instrument to GSM MS mode          |
| "CONF:MTYP EDGE "           | 'Selects the modulation type EDGE (8PSK)         |
| "CONF:BURS:MACC "           | 'Selects the MAC measurement                     |
| "SWE:COUN 20 "              | 'Sets the number of bursts                       |
| "READ:BURS:MACC:OSUP:MAX? " | 'Starts the measurement and reads out the result |

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

**Mode:** MS

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

**READ:BURSt:MACCuracy:PERCentile:AVERage?**

This command starts the measurement of the modulation accuracy of the mobile and reads out the average of the 95% percentile measurement taken over the selected number of bursts.

When the measurement is started the analyzer is automatically set to single sweep.

Further results of the modulation accuracy measurement can be then queried without restart of the measurement via the :FETCh:BURSt-subsystem.

An ongoing measurement can be aborted via the command ABORt .

This command is only available with GSM MS Analyzer (option FS-K5) and when measurement of the modulation accuracy is selected (CONFIgure:BURSt:MACCuracy[:IMMEDIATE]).

**Example:**

|                              |  |
|------------------------------|--|
| "INST M GSM "                | 'Switches the instrument to GSM MS mode          |
| "CONF:MTYP EDGE "            | 'Selects the modulation type EDGE (8PSK)         |
| "CONF:BURS:MACC "            | 'Selects the MAC measurement                     |
| "SWE:COUN 20 "               | 'Sets the number of bursts                       |
| "READ:BURS:MACC:PERC:AVER? " | 'Starts the measurement and reads out the result |

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

**Mode:** MS

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

**READ:BURSt:MACCuracy:PERCentile:MAXimum?**

This command starts the measurement of the modulation accuracy of the mobile and reads out the maximum of the 95% percentile measurement taken over the selected number of bursts.

When the measurement is started the analyzer is automatically set to single sweep.

Further results of the modulation accuracy measurement can be then queried without restart of the measurement via the :FETCh:BURSt-subsystem.

An ongoing measurement can be aborted via the command ABORt .

This command is only available with GSM MS Analyzer (option FS-K5) and when measurement of the modulation accuracy is selected (CONFIgure:BURSt:MACCuracy[:IMMEDIATE]).

**Example:**

|                             |  |
|-----------------------------|--|
| "INST M GSM "               | 'Switches the instrument to GSM MS mode          |
| "CONF:MTYP EDGE "           | 'Selects the modulation type EDGE (8PSK)         |
| "CONF:BURS:MACC "           | 'Selects the MAC measurement                     |
| "SWE:COUN 20 "              | 'Sets the number of bursts                       |
| "READ:BURS:MACC:PERC:MAX? " | 'Starts the measurement and reads out the result |

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

**Mode:** MS

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

**READ:BURSt:MACCuracy:FREQuency:AVERage?**

This command starts the measurement of the modulation accuracy of the mobile and reads out the average of the frequency error measurement taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the modulation accuracy measurement can be then queried without restart of the measurement via the :FETCh:BURSt-subsystem.

An ongoing measurement can be aborted via the command ABORt .

This command is only available with GSM MS Analyzer (option FS-K5) and when measurement of the modulation accuracy is selected (CONFIgure:BURSt:MACCuracy[:IMMediate]).

**Example:**

|                              |  |
|------------------------------|--|
| "INST MGSM "                 | 'Switches the instrument to GSM MS mode          |
| "CONF:MTYP EDGE "            | 'Selects the modulation type EDGE (8PSK)         |
| "CONF:BURS:MACC "            | 'Selects the MAC measurement                     |
| "SWE:COUN 20 "               | 'Sets the number of bursts                       |
| "READ:BURS:MACC:FREQ:AVER? " | 'Starts the measurement and reads out the result |

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

**Mode:** MS

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

**READ:BURSt:MACCuracy:FREQuency:MAXimum?**

This command starts the measurement of the modulation accuracy of the mobile and reads out the maximum of the frequency error measurement taken over the selected number of bursts. When the measurement is started the analyzer is automatically set to single sweep. Further results of the modulation accuracy measurement can be then queried without restart of the measurement via the :FETCh:BURSt-subsystem.

An ongoing measurement can be aborted via the command ABORt .

This command is only available with GSM MS Analyzer (option FS-K5) and when measurement of the modulation accuracy is selected (CONFIgure:BURSt:MACCuracy[:IMMediate]).

**Example:**

|                             |   |
|-----------------------------|---|
| "INST MGSM "                | 'Switches the instrument to GSM MS mode           |
| "CONF:MTYP EDGE "           | 'Selects the modulation type EDGE (8PSK)          |
| "CONF:BURS:MACC "           | 'Selects the MAC measurement                      |
| "SWE:COUN 20 "              | 'Sets the number of bursts                        |
| "READ:BURS:MACC:FREQ:MAX? " | 'Starts the measurement and reads out the result. |

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

**Mode:** MS

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



**READ:BURSt:MACCuracy:IQOFset:AVERage?**

This command triggers the measurement of the modulation accuracy of the mobile and reads out the average of the IQ DC offset measurement in % for the selected number of bursts.

The start of the measurement automatically activates the single sweep mode.

Further results of the modulation accuracy measurement can then be queried via the `FETCh:BURSt` subsystem without restarting the measurement.

An ongoing measurement can be aborted by means of the `ABORt` command.

This command is only available in conjunction with the option GSM MS Analyzer FS-K5 if modulation accuracy measurement has been selected (`CONFigure:BURSt:MACCuracy[:IMMEDIATE]`).

**Example:**

|                             |  |
|-----------------------------|--|
| "INST MGSM"                 | 'Switches the instrument to GSM MS mode          |
| "CONF:MTYP EDGE"            | 'Selects EDGE modulation (8PSK)                  |
| "CONF:BURS:MACC"            | 'Selects modulation accuracy (MAC) measurement   |
| "SWE:COUN 20"               | 'Sets the number of bursts                       |
| "READ:BURS:MACC:IQOF:AVER?" | 'Executes the measurement and queries the result |

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

**Mode:** MS

If no measurement has been carried out yet, a query error is indicated.

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

**READ:BURSt:MACCuracy:IQOFset:MAXimum?**

This command triggers the measurement of the modulation accuracy of the mobile and reads out the maximum of the IQ DC offset measurement in % for the selected number of bursts.

The start of the measurement automatically activates the single sweep mode.

Further results of the modulation accuracy measurement can then be queried via the `FETCh:BURSt` subsystem without restarting the measurement.

An ongoing measurement can be aborted by means of the `ABORt` command.

This command is only available in conjunction with the option GSM MS Analyzer FS-K5 if modulation accuracy measurement has been selected (`CONFigure:BURSt:MACCuracy[:IMMEDIATE]`).

**Example:**

|                            |  |
|----------------------------|--|
| "INST MGSM"                | 'Switches the instrument to GSM MS mode          |
| "CONF:MTYP EDGE"           | 'Selects EDGE modulation (8PSK)                  |
| "CONF:BURS:MACC"           | 'Selects modulation accuracy (MAC) measurement   |
| "SWE:COUN 20"              | 'Sets the number of bursts                       |
| "READ:BURS:MACC:IQOF:MAX?" | 'Executes the measurement and queries the result |

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

**Mode:** MS

If no measurement has been carried out yet, a query error is indicated.

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

**FETCh:BURSt:MACCuracy:IQIMbalance:AVERage?**

This command triggers the measurement of the modulation accuracy of the mobile and reads out the average of the IQ imbalance measurement in % for the selected number of bursts.

The start of the measurement automatically activates the single sweep mode.

Further results of the modulation accuracy measurement can then be queried via the FETCh:BURSt subsystem without restarting the measurement.

An ongoing measurement can be aborted by means of the ABORt command.

This command is only available in conjunction with the option GSM MS Analyzer FS-K5 if modulation accuracy measurement has been selected (CONFIgure:BURSt:MACCuracy[:IMMediate]).

**Example:**

|                             |  |
|-----------------------------|--|
| "INST MGSM"                 | 'Switches the instrument to GSM MS mode          |
| "CONF:MTYP EDGE"            | 'Selects EDGE modulation (8PSK)                  |
| "CONF:BURS:MACC"            | 'Selects modulation accuracy (MAC) measurement   |
| "SWE:COUN 20"               | 'Sets the number of bursts                       |
| "READ:BURS:MACC:IQIM:AVER?" | 'Executes the measurement and queries the result |

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

**Mode:** MS

If no measurement has been carried out yet, a query error is indicated.

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

**FETCh:BURSt:MACCuracy:IQIMbalance:MAXimum?**

This command triggers the measurement of the modulation accuracy of the mobile and reads out the maximum of the IQ imbalance measurement in % for the selected number of bursts.

The start of the measurement automatically activates the single sweep mode.

Further results of the modulation accuracy measurement can then be queried via the FETCh:BURSt subsystem without restarting the measurement.

An ongoing measurement can be aborted by means of the ABORt command.

This command is only available in conjunction with the option GSM MS Analyzer FS-K5 if modulation accuracy measurement has been selected (CONFIgure:BURSt:MACCuracy[:IMMediate]).

**Example:**

|                            |  |
|----------------------------|--|
| "INST MGSM"                | 'Switches the instrument to GSM MS mode          |
| "CONF:MTYP EDGE"           | 'Selects EDGE modulation (8PSK)                  |
| "CONF:BURS:MACC"           | 'Selects modulation accuracy (MAC) measurement   |
| "SWE:COUN 20"              | 'Sets the number of bursts                       |
| "READ:BURS:MACC:IQIM:MAX?" | 'Executes the measurement and queries the result |

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

**Mode:** MS

If no measurement has been carried out yet, a query error is indicated.

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

## READ:SPECTrum Subsystem

This subsystem provides the commands for starting measurements in the GSM MS mode (FS-K5), which are used to measure the power of the spectral components due to modulation and switching, and for reading out the results subsequently.

Measurement of spectrum due to modulation (MOD)

Measurement of spectrum due to transients (TRA)

| COMMAND       | PARAMETERS | UNIT | COMMENT      |
|---------------|------------|------|--------------|
| READ          |            |      | Option FS-K5 |
| :SPECTrum     |            |      |              |
| :MODulation   |            |      |              |
| [:ALL?]       | --         | --   | query only   |
| :REFerence    |            |      |              |
| [:IMMEDIATE?] | --         | --   | query only   |
| :SWITChing    |            |      |              |
| [:ALL?]       | --         | --   | query only   |

### READ:SPECTrum:MODulation[:ALL]?

This command starts the measurement of the modulation spectrum of the mobile and reads out the result. The measurement is performed in the frequency range  $ARFCN \pm 1.8$  MHz.

The result is read out as a list of partial ASCII result strings separated by ',' in the following format:

```
<Index>,<Freq1>,<Freq2>,<Level>,<Limit>,<Abs/Rel>,<Status> [,
<Index>,<Freq1>,<Freq2>,<Level>,<Limit>,<Abs/Rel>,<Status>]...
```

where the part set in '['...]' characterizes a partial result string which can be repeated n times.

<Index>:           0,           if the partial result string characterizes a measurement range.  
                  current number <>0,  
                  if the partial result string characterizes a single limit excess.

<Freq1>:           Start frequency of the measurement range or frequency where the limit is exceeded.

<Freq2>:           Stop frequency of the measurement range or frequency where the measured range is exceeded. The value of <Freq2> is equal to the value of <Freq1>, if either the measurement is performed in the time domain or the partial result string contains a limit excess.

<Level>:           Measured maximum level of the partial range or measured level at the test point.

<Limit>:           Limit in the partial range or at the test point.

<Abs/Rel>:         ABS <Level> and <Limit> are in absolute units (dBm)  
                  REL <Level> and <Limit> are in relative units (dB)

<Status>:         Result of the limit check in character data form:  
                  PASSED no limit exceeded  
                  FAILED limit exceeded  
                  MARGIN margin exceeded

The frequencies <Freq1> and <Freq2> are always absolute and not referred to the carrier frequency.

An ongoing measurement can be aborted via the command `ABORT`.

This command is only available with GSM MS Analyzer FS-K5 option and when modulation spectrum measurement is selected (see `:CONFIGure:SPECTrum:MODulation`).

**Example:**

|                      |  |
|----------------------|--|
| "INST MGSM"          | 'Switches the instrument to GSM MS mode                              |
| "CONF:SPEC:MOD"      | 'Selects the MOD measurement   |
| "READ:SPEC:MOD:REF?" | 'Executes the premeasurement and queries the result.                 |
| "READ:SPEC:MOD?"     | 'Executes the measurement in the time domain and queries the result. |

**Result:** 0,890E6,915E6,-87.4,-108.0,ABS,FAILED,  
1,893.2E6,893.2E6,-83.2,-108.0,ABS,FAILED,  
2,895.7E6,895.7E6,-87.4,-108.0,ABS,FAILED

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

**Mode:** MS

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

#### **READ:SPECTrum:MODulation:REFerence[:IMMediate]?**

This command starts the premeasurement of the modulation due to spectrum measurement and reads out the result.

The result is output as a list of partial result strings separated by ',' in the following (ASCII) format:

<Level1>,<Level2>,<RBW>

<Level1>: measured level

<Level2>: level corrected by means of the bandwidth

<RBW>: bandwidth

This command is only available in GSM MS mode (FS-K5) and when measurement of the modulation due to spectrum is selected (see :CONFIgure:SPECTrum:MODulation).

**Example:**

|                      |  |
|----------------------|--|
| "INST MGSM"          | 'Switches the instrument to GSM MS mode              |
| "CONF:SPEC:MOD"      | 'Selects the MOD measurement                         |
| "READ:SPEC:MOD:REF?" | 'Executes the premeasurement and queries the result. |

**Result:** 35.2,43.2,30000

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

**Mode:** MS

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

**READ:SPECTrum:SWITching[:ALL]?**

This command starts the measurement of the transient spectrum of the mobile and reads out the result.

The result is read out as a list of partial ASCII result strings separated by ',' in the format used for READ:SPECTrum:MODulation[:ALL]?

An ongoing measurement can be aborted via the command `ABORT`.

This command is only available in GSM MS Analyzer mode (FS-K5) and when the spectrum due to switching measurement is selected (see `:CONFigure:SPECTrum:SWITChing`)

|                 |                   |  |
|-----------------|-------------------|--|
| <b>Example:</b> | "INST MGSM"       | 'Switches the instrument to GSM MS mode                              |
|                 | "CONF:SPEC:SWIT"  | 'Selects the TRA measurement   |
|                 | "READ:SPEC:SWIT?" | 'Executes the measurement in the time domain and queries the result. |

|                |   |
|----------------|---|
| <b>Result:</b> | 0,833.4E6,833.4E6,37.4,-36.0,ABS,MARGIN,  |
|                | 1,834.0E6,834.0E6,-35.2,-36.0,ABS,FAILED, |
|                | 2,834.6E6,834.6E6,-74.3,-75.0,REL,FAILED  |
|                | 0,835.0E6,835.0E6,-65,0,-60.0,REL,PASSED  |

|                         |                       |
|-------------------------|-----------------------|
| <b>Characteristics:</b> | *RST value: --        |
|                         | SCPI: device-specific |

|              |    |
|--------------|----|
| <b>Mode:</b> | MS |
|--------------|----|

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

## 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

The purpose of the commands defined below is to set up the instrument for the measurement of FM and AM modulated signals in a way that allows to obtain as many measurement results as possible with a single shot measurement.

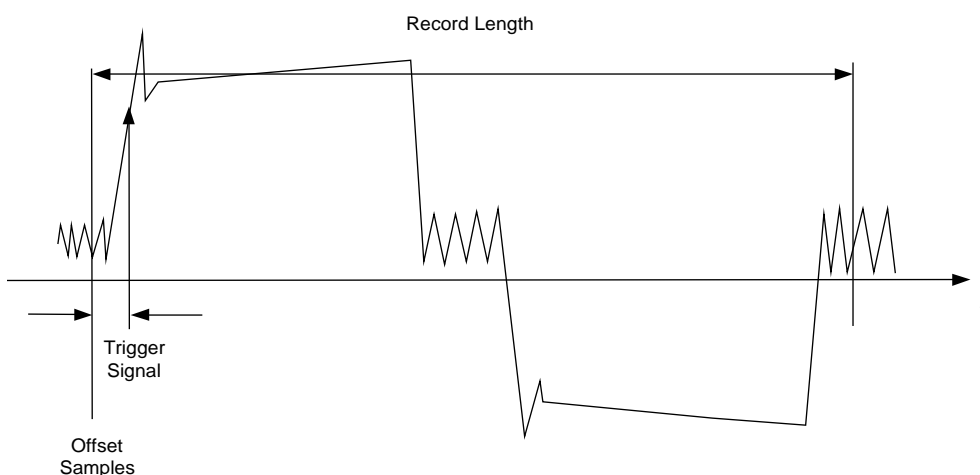
For that purpose the instrument has been equipped with a demodulator that is capable of performing both FM and AM demodulation at a time. Additionally maximum, minimum and average or current values can be obtained in parallel over a selected number of measurements. In order to make it suitable for burst signals the demodulator can be configured in terms of pretrigger time, sample rate and record length.

**Note:** Demodulation will be performed offline, that means, on signals previously stored into memory. The I/Q memory available for that purpose is 2 x 512 k samples. The sample rate can be selected in the range of 15.625 kHz to 32 MHz

### Example:

For a Bluetooth signal, the signal schematic under request is described in the following diagram:

Frequency versus time:



Measurement results of interest are:

- FM Offset
- FM Deviation (maximum and minimum) for signal modulated with '1'-values only
- FM Deviation (maximum and minimum) for signal modulated with '0'-values only
- AM Modulation Depth for positive and negative burst ramp.

These values can be obtained by external computations on the frequency or amplitude versus time data. For that purpose the FSP will deliver the following results:

- Demodulated FM signal (current values, averaged, maxhold, minhold selectable)
- Demodulated AM component of the signal (current values, averaged, maxhold, minhold selectable)
- FM Offset (current value or averaged selectable)

Therefore parameters to be set up on the analyzer are:

- types of demodulation to measure simultaneously (AM/FM)
- sample rate
- record length
- trigger source (free Run/external)
- pretrigger samples
- # of measurements to use for average/maxhold/minhold

Additionally for each demodulation type the required result values need to be configured. The FSP is capable to perform two modulation types at a time with a maximum of 3 different result types per demodulation. Possible selections for the result types are

- WRITeThe current measurement results will be obtained
- AVERAgeThe measurement results will be averaged over the given # of measurements
- MAXHoldThe maximum result values will be obtained over the given # of measurements
- MINHoldThe minimum result values will be obtained over the given # of measurements

The commands defined below will be used in the following way:

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 FSP is performing the measurement.

**Note:** *Analog demodulation is only available for screen A. Therefore the command sequence "SENSe2..." is not available for the commands of the SENSe:ADEMod subsystem.*

| COMMAND                 | PARAMETERS  | UNIT                                  | COMMENT               |
|-------------------------|---|---------------------------------------|-----------------------|
| [SENSe<1 2>]<br>:ADEMod |   |                                       | Option FM Demodulator |
| :AF                     |   |                                       |                       |
| :COUPling               | AC   DC   |                                       |                       |
| :BANDwidth              |   |                                       |                       |
| :DEModulation           | <numeric_value>   | HZ                                    |                       |
| :BWIDth                 |   |                                       |                       |
| :DEModulation           | <numeric_value>   | HZ                                    |                       |
| :MTIME                  | <numeric_value>   | S                                     |                       |
| :RELEngth?              |   |                                       | query only            |
| [:STATE]                | <Boolean>   |                                       |                       |
| :SET                    | <numeric_value>,<br><numeric_value>,<br>IMMediate   EXTErnal,<br>POSitive   NEGative,<br><numeric_value>,<br><numeric_value>  | HZ,<br>--,<br>--,<br>--,<br>--,<br>-- |                       |
| :SRATE?                 |   |                                       | query only            |
| :AM                     |   |                                       |                       |
| [:TYPE]                 | WRITE   AVERAge   MAXHold  <br>MINHold   OFF,<br>WRITE   AVERAge   MAXHold  <br>MINHold   OFF,<br>WRITE   AVERAge   MAXHold  <br>MINHold   OFF                      |                                       |                       |
| :RESult?                | WRITE   AVERAge   MAXHold  <br>MINHold   OFF  |                                       |                       |
| :FM                     |   |                                       |                       |
| [:TYPE]                 | WRITE   AVERAge   MAXHold  <br>MINHold   OFF,<br>WRITE   AVERAge   MAXHold  <br>MINHold   OFF,<br>WRITE   AVERAge   MAXHold  <br>MINHold   OFF                      |                                       |                       |
| :RESult?                | WRITE   AVERAge   MAXHold  <br>MINHold   OFF  |                                       |                       |
| :OFFSet?                | IMMediate   AVERAge   |                                       |                       |
| :SPECtrum               |   |                                       |                       |
| :BANDwidth              |   |                                       |                       |
| [:RESolution]           | <numeric_value>   | HZ                                    |                       |
| :BWIDth                 |   |                                       |                       |
| [:RESolution]           | <numeric_value>   | HZ                                    |                       |
| :SPAN                   | <numeric_value>   | HZ                                    |                       |
| [:TYPE]                 | WRITE   AVERAge   MAXHold  <br>MINHold   VIEW   OFF,<br>WRITE   AVERAge   MAXHold  <br>MINHold   VIEW   OFF,<br>WRITE   AVERAge   MAXHold  <br>MINHold   VIEW   OFF |                                       |                       |
| :RESult?                | WRITE   AVERAge   MAXHold  <br>MINHold  |                                       |                       |
| :ZOOM                   |   |                                       |                       |
| [:STATE]                | <Boolean>   |                                       |                       |
| :START                  | <numeric_value>   | S                                     |                       |



**[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

**Mode:** A

This command is only available with option FS-K7 (FM Demodulator).

**[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

**Mode:** FM

This command is only available with option FS-K7 (FM Demodulator).

**[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  $\mu$ s.

**Characteristics:** \*RST value: 62.625us  
SCPI: device-specific

**Mode:** FM

This command is only available with option FS-K7 (FM Demodulator).

**[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

**Mode:** FM

This command is only available with option FS-K7 (FM Demodulator).

**[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. The detector will be set to SAMPLE, the demodulator itself will be set up according to the parameters of command [SENSe:]ADEMod:SET.

**Note:**

*The measurement is always performed in Screen A. Split Screen operation will be switched off as soon as the Demodulator is activated.*

**Example:** "ADEM ON" 'Switches the AM/FM demodulator on with the parameters set by [SENSe:]ADEMod:SET.

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

**Mode:** FM

This command is only available with option FS-K7 (FM Demodulator).

**[SENSe:]ADEMod:SET <sample rate>,<record length>,<trigger source>,<trigger slope>,<offset samples>,<# of meas>**

This command configures the AM/FM demodulator of the instrument.

**Parameters:**

- <sample rate>: The frequency at which measurement values are taken from the A/D-converter and stored in I/Q memory.  
Valid 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 with <filter type> = NORMal
- <record length>: Number of samples to be stored in I/Q memory.  
Valid range: 1 to 130560 (128 \* 1024 - 512)
- <trigger source>: Selection of the trigger source to use for the demodulator.  
Valid values: IMMEDIATE | EXTERNAL | IFPOWER | RFPower | AF | AM | FM
- <trigger slope>: Used slope of the trigger signal.  
Valid values: POSITIVE | NEGATIVE  
The value indicated here will be ignored for <trigger source> = IMMEDIATE.
- <offset samples>: Number of samples to be used as an offset to the trigger signal.  
Valid range: -65024 to 130559 (= -64 \* 1024 + 512 to 128 \* 1024 - 513)  
The value indicated here will be ignored for <trigger source> = IMMEDIATE.

<# of meas>: Number of repetitions of the measurement to be executed. The value indicated here is especially necessary for the average/maxhold/minhold function.

Valid range: 0 to 32767

**Examples:** ADEM:SET 8MHz,32000,EXT,POS,-500,30 'Executes a measurement at  
 sample rate= 8 MHz  
 record length= 32000  
 trigger source = EXTernal  
 trigger slope = POSitive  
 offset samples = -500 (= 500  
 samples before trigger  
 occurred)  
 # of meas = 30

**Characteristics:** \*RST values: sample rate= 8 MHz  
 record length= 501  
 trigger source = IMMEDIATE  
 trigger slope = POSitive  
 offset samples = 0  
 # of meas = 0

SCPI: device-specific

**Mode:** FM

This command is only available with option FS-K7 (FM Demodulator).

#### [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

**Mode:** FM

This command is only available with option FS-K7 (FM Demodulator).

[SENSe:]ADEMod:AM[:TYPE] <result type 1>,<result type 2>,<result type 3>

This command selects the result types to be created in parallel by AM demodulation.

**Parameters:** <result type 1/2/3>:

|         |   |
|---------|---|
| WRITe   | The current measurement results will be obtained  |
| AVERAge | The measurement results will be averaged over the given # of measurements                                   |
| MAXHold | The maximum result values will be obtained over the given # of measurements                                 |
| MINHold | The minimum result values will be obtained over the given # of measurements                                 |
| VIEW    | The measurement results are frozen and displayed, i.e. they are not calculated for subsequent measurements. |
| OFF     | The result type will not be used.   |

**Notes:**

*Each value besides OFF can only be assigned to one result type at a time.  
Setting all result types to OFF will deactivate the AM demodulator.*

**Examples:**

|                        |  |
|------------------------|--|
| ADEM:AM AVER,MAXH,MINH | 'Creates average, max hold and min hold values at a time |
| ADEM:AM WRIT,OFF,OFF   | 'Creates only the current measurement values             |
| ADEM:AM OFF,OFF,OFF    | 'Switches FM demodulation off                            |

**Characteristics:** \*RST values: WRITe,OFF,OFF  
SCPI: device-specific

**Mode:** A

This command is only available with option FS-K7 (FM Demodulator).

[SENSe:]ADEMod:AM:RESult? <result type>

This command reads the result data obtained by AM demodulation depending on the type indicated as a parameter. The data format of the output data block is defined by the FORMat command.

**Note:** *It is not possible to read out trace data when result type VIEW is selected.*

**Parameters:** <result type>:

|         |   |
|---------|---|
| WRITe   | The current measurement results will be obtained                            |
| AVERAge | The measurement results will be averaged over the given # of measurements   |
| MAXHold | The maximum result values will be obtained over the given # of measurements |
| MINHold | The minimum result values will be obtained over the given # of measurements |

**Notes:**

*The result type indicated must be one of those configured by [SENSe:]ADEMod:AM[:TYPE].  
Otherwise a query error will be generated.*

**Return Values:**

**ASCII Format (FORMat ASCII):**

In this case the command will yield a list of comma separated values (CSV) of the measured values in floating point format. The output unit is dBm *with logarithmic display* and V *with linear display*.

**Binary Format (FORMat REAL,32):**

In this case the command will yield binary data (Definite Length Block Data according to IEEE 488.2), each measurement value being formatted in 32 Bit IEEE 754 Floating-Point-Format. The schematics of the result string will be as follows:

```
#41024<value1><value2>...<value n>
with
#4      number of digits (= 4 in the example) of the following number of data bytes
1024    number of following data bytes (= 1024 in the example)
<value x> 4-Byte-Floating Point Value
```

**Examples:**

|                                     |                                 |
|-------------------------------------|---------------------------------|
| ADEM:SET 8MHZ,32000,EXT,POS,-500,30 | 'Sets up demodulator parameters |
| ADEM:FM AVER,MAXH,MINH              | 'Sets up FM results to measure  |
| ADEM:AM WRIT,OFF,OFF                | 'Sets up AM results to measure  |
| ADEM ON                             | 'Switches on demodulator        |
| INIT;*WAI                           | 'Starts measurement and waits   |
|                                     | 'for sync                       |
| FORM ASC                            | 'Selects output format          |
| ADEM:FM:RES? AVER                   | 'Reads FM average results       |
| ADEM:FM:RES? MAXH                   | 'Reads FM max hold results      |
| ADEM:FM:RES? MINH                   | 'Reads FM min hold results      |
| ADEM:AM:RES? WRIT                   | 'Reads AM current results       |

**Characteristics:** \*RST values: -  
SCPI: device-specific

**Mode:** FM

This command is only available with option FS-K7 (FM Demodulator).

**[SENSe:]ADEMod:FM[:TYPE]** <result type 1>,<result type 2>,<result type 3>

This command selects the result types to be created in parallel by FM demodulation.

**Parameters:**

|                            |   |
|----------------------------|---|
| <result type 1/2/3>: WRITe | The current measurement results will be obtained  |
| AVERAge                    | The measurement results will be averaged over the given # of measurements                                   |
| MAXHold                    | The maximum result values will be obtained over the given # of measurements                                 |
| MINHold                    | The minimum result values will be obtained over the given # of measurements                                 |
| VIEW                       | The measurement results are frozen and displayed, i.e. they are not calculated for subsequent measurements. |
| OFF                        | The result type will not be used.   |

**Notes:**

*Each value besides OFF can only be assigned to one result type at a time.  
Setting all result types to OFF will deactivate the FM demodulator.*

**Examples:**

|                       |  |
|-----------------------|--|
| ADEM:FMAVER,MAXH,MINH | 'Creates average, max hold and min hold values |
|                       | 'at a time                                     |
| ADEM:FMWRIT,OFF,OFF   | 'Only creates the current measurement values   |
| ADEM:FMOFF,OFF,OFF    | 'Switches FM demodulation off                  |

**Characteristics:** \*RST values: WRITe,OFF,OFF  
SCPI: device-specific

**Mode:** FM

This command is only available with option FS-K7 (FM Demodulator).

#### [SENSe:]ADEMod:FM:RESult? <result type>

This command reads the result data obtained by FM demodulation depending on the type indicated as a parameter. The data format of the output data block is defined by the FORMat command.

**Note:** *It is not possible to read out trace data when result type VIEW is selected.*

**Parameters:** <result type>: WRITe The current measurement results will be obtained  
AVERage The measurement results will be averaged over the given # of measurements  
MAXHold The maximum result values will be obtained over the given # of measurements  
MINHold The minimum result values will be obtained over the given # of measurements

#### Notes:

*The result type indicated must be one of those configured by [SENSe:]ADEMod:FM[:TYPE]. Otherwise a query error will be generated.*

#### Return Values

##### ASCII Format (FORMat ASCII):

In this case the command will yield a list of comma separated values (CSV) of the measured values in floating point format. The output unit is Hz.

##### Binary Format (FORMat REAL,32):

In this case the command will yield binary data (Definite Length Block Data according to IEEE 488.2), each measurement value being formatted in 32 Bit IEEE 754 Floating-Point-Format. The schematics of the result string will be as follows:

```
#41024<value1><value2>...<value n>
with
#4      number of digits (= 4 in the example) of the following number of data bytes
1024   number of following data bytes (= 1024 in the example)
<value x> 4-Byte-Floating Point Value
```

**Examples:**

|                                     |  |
|-------------------------------------|--|
| ADEM:SET 8MHz,32000,EXT,POS,-500,30 | 'Sets up demodulator parameters            |
| ADEM:FM AVER,MAXH,MINH              | 'Sets up FM results to measure             |
| ADEM:AM WRIT,OFF,OFF                | 'Sets up SPEC results to measure           |
| ADEM ON                             | 'Switches on demodulator                   |
| INIT;*WAI                           | 'Starts measurement and waits<br>'for sync |
| FORM ASC                            | 'Selects output format                     |
| ADEM:FM:RES? AVER                   | 'Reads FM average results                  |
| ADEM:FM:RES? MAXH                   | 'Reads FM max hold results                 |
| ADEM:FM:RES? MINH                   | 'Reads FM min hold results                 |
| ADEM:AM:RES? WRIT                   | 'Reads AM current results                  |

**Characteristics:** \*RST values: -  
SCPI: device-specific

**Mode:** FM

This command is only available with option FS-K7 (FM Demodulator).

**[SENSe:]ADEMod:FM:OFFSet? <result type>**

This command calculates the FM offset of the currently available measurement data set. If averaging has been activated before acquiring the data set (using [SENSe:]ADEMod:FM[:TYPE]), the averaged FM offset over several measurements can be obtained as well by setting <result type> = AVERage.

The offset thus determined differs from that calculated in the command CALC:MARK:FUNC:ADEM:FERR?, since using that command, for determination of the frequency deviation, the modulation is removed by means of lowpass filtering, producing results that are different from those obtained by averaging.

**Parameters:** <result type> IMMEDIATE The current measurement results will be used for calculating the FM offset  
 AVERage The measurement results that were averaged over the given # of measurements will be used for calculating the FM offset

**Note:**

*If no average measurement was active during the last measurement sequence only the command [SENSe:]ADEMod:FM:OFFSet? IMMEDIATE will return a valid result (data to calculate the offset are taken from the last measured data set).*

*[SENSe:]ADEMod:FM:OFFSet? AVERage will cause a query error in this case.*

**Examples:**

|                                     |  |
|-------------------------------------|--|
| ADEM:SET 8MHz,32000,EXT,POS,-500,30 | 'Sets up demodulator parameters to execute 30 measurements |
| ADEM:FM AVER,OFF,OFF                | 'Sets up FM results to do averaging                        |
| ADEM:AM OFF,OFF,OFF                 | 'Sets up AM results to off                                 |
| ADEM ON                             | 'Switches on demodulator                                   |
| INIT;*WAI                           | 'Starts measurement and waits for sync                     |
| ADEM:FM:OFFS? IMM                   | 'Reads FM offset of last measurement of the sequence of 30 |
| ADEM:FM:OFFS? AVER                  | 'Reads FM offset averaged over 30 measurements             |

**Characteristics:** \*RST values: -  
 SCPI: device-specific

**Mode:** FM

This command is only available with option FS-K7 (FM Demodulator).

**[SENSe:]ADEMod:SPECTrum:BANDwidth|BWIDth[:RESolution]** 1 Hz to 10 MHz

This command sets the resolution bandwidth for displaying the RF spectrum that was determined from the analog demodulation data.

The recording time required is calculated from the given measurement time and the sampling rate indirectly set via `FREQ:SPAN`. If the available recording time is not sufficient for the given bandwidth, the recording time is set to its maximum and the resolution bandwidth is enlarged to the resulting bandwidth.

**Example:**           `"ADEM:BAND:RES 61.2kHz"`           'Sets the resolution bandwidth to 61.2 kHz.

**Characteristics:** \*RST value: 61.2 kHz  
SCPI: device-specific

**Mode:**            FM

This command is only available with option FS-K7 (FM Demodulator).

**[SENSe:]ADEMod:SPECTrum:SPAN <numeric\_value>**

This command sets the frequency range for displaying the RF spectrum that was determined from the FM demodulation data.

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:SPEC:SPAN 5 MHz"`           'Sets the frequency range to 5 MHz.

**Characteristics:** \*RST value: 5 MHz  
SCPI: device-specific

**Mode:**            FM

This command is only available with option FS-K7 (FM Demodulator).



**[SENSe:]ADEMod:SPECTrum[:TYPE]** <result type 1>,<result type 2>,<result type 3>

This command selects the result types to be created in parallel by the RF SPECTrum measurement with active analog demodulation.

|                    |                             |   |
|--------------------|-----------------------------|---|
| <b>Parameters:</b> | <result type 1/2/3>.: WRITe | The current measurement results will be obtained  |
|                    | AVERAge                     | The measurement results will be averaged over the given # of measurements                                   |
|                    | MAXHold                     | The maximum result values will be obtained over the given # of measurements                                 |
|                    | MINHold                     | The minimum result values will be obtained over the given # of measurements                                 |
|                    | VIEW                        | The measurement results are frozen and displayed, i.e. they are not calculated for subsequent measurements. |
|                    | OFF                         | The result type will not be used.   |

**Notes:**

*Each value besides OFF can only be assigned to one result type at a time.*

|                  |                          |  |
|------------------|--------------------------|--|
| <b>Examples:</b> | ADEM:SPEC AVER,MAXH,MINH | 'Creates average, max hold and min hold values at a time |
|                  | ADEM:SPEC WRIT,OFF,OFF   | 'Only creates the current measurement values             |
|                  | ADEM:SPEC OFF,OFF,OFF    | 'Switches FM demodulation off                            |

**Characteristics:** \*RST values: OFF,OFF,OFF  
SCPI: device-specific

**Mode:** FM

This command is only available with option FS-K7 (FM Demodulator).

**[SENSe:]ADEMod:SPECTrum:RESult?** <result type>

This command reads the result data obtained by RF SPECTrum measurement depending on the type indicated as a parameter. The data format of the output data block is defined by the FORMat command.

**Note:** *It is not possible to read out trace data when result type VIEW is selected.*

|                    |                       |   |
|--------------------|-----------------------|---|
| <b>Parameters:</b> | <result type>.: WRITe | The current measurement results will be obtained                            |
|                    | AVERAge               | The measurement results will be averaged over the given # of measurements   |
|                    | MAXHold               | The maximum result values will be obtained over the given # of measurements |
|                    | MINHold               | The minimum result values will be obtained over the given # of measurements |

**Notes:**

*The result type indicated must be one of those configured by [SENSe:]ADEMod:SPEC[:TYPE]. Otherwise a query error will be generated.*

**Return Values:****ASCII Format (FORMat ASCII):**

In this case the command will yield a list of comma separated values (CSV) of the measured values in floating point format. The output unit is dBm.

**Binary Format (FORMat REAL,32):**

In this case the command will yield binary data (Definite Length Block Data according to IEEE 488.2), each measurement value being formatted in 32 Bit IEEE 754 Floating-Point-Format. The schematics of the result string will be as follows:

#41024<value1><value2>...<value n>

with

#4            number of digits (= 4 in the example) of the following number of data bytes

1024         number of following data bytes (= 1024 in the example)

<value x>    4-Byte-Floating Point Value

|                  |  |   |
|------------------|--|---|
| <b>Examples:</b> | ADEM:SET 8MHz, 32000, EXT, POS, -500, 30 | 'Sets up demodulator parameters             |
|                  | ADEM:SPEC AVER, MAXH, MINH               | 'Sets up RF spectrum results<br>'to measure |
|                  | ADEM:SPEC WRIT, OFF, OFF                 | 'Sets up AM results to measure              |
|                  | ADEM ON                                  | 'Switches on demodulator                    |
|                  | INIT; *WAI                               | 'Starts measurement and waits<br>'for sync  |
|                  | FORM ASC                                 | 'Selects output format                      |
|                  | ADEM:SPEC:RES? AVER                      | 'Reads RF spectrum average<br>'results      |
|                  | ADEM:SPEC:RES? MAXH                      | 'Reads RF spectrum max hold<br>'results     |
|                  | ADEM:SPEC:RES? MINH                      | 'Reads RF spectrum min hold<br>'results     |
|                  | ADEM:SPEC:RES? WRIT                      | 'Reads spectrum current results             |

**Characteristics:** \*RST values: -  
SCPI: device-specific

**Mode:** FM

This command is only available with option FS-K7 (FM Demodulator).

**[SENSe<1|2>:]ADEMod:ZOOM[:STATe>] ON | OFF**

The command enables or disables the zoom function for the FM-demodulator measurement data. Depending on the selected measurement time and the demodulation bandwidth, the number of recorded test points may be greater than that shown on the display.

With the zoom function enabled, exactly 625 test points of the result memory are displayed from the time defined with [SENS:]ADEM:ZOOM:START.

**Example:** "ADEM:ZOOM ON" 'Switches on the zoom function

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

**Mode:** FM

This command is only available with option FS-K7 (FM demodulator) installed

**[SENSe<1|2>:]ADEMod:ZOOM:STARt** 0s to measurement time

The command selects the start time for the display of individual measured values of the FM demodulator. The maximum possible value depends on the measurement time, which is set in the instrument and can be queried with command [SENSe]:ADEMod:MTIME?.

If the zoom function is activated, 625 test points are displayed from the specified start time.

**Example:** "ADEM:ZOOM ON" 'Switches on the zoom function  
"ADEM:ZOOM:STAR 500us" 'Sets the starting point of the display to 500 µs.

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

**Mode:** FM

This command is only available with option FS-K7 (FM demodulator) installed

## 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>]<br>:AVERage<br>:COUNT<br>[:STATe<1 to 3>]<br>:TYPE | <numeric_value><br><Boolean><br>VIDeo   LINear | --<br>--<br>-- |         |

### [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

**Mode:** all

### [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

**Mode:** all

**[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

**Mode:** A, MS

## 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>]<br>:BANDwidth |                              |      |                       |
| [:RESolution]              | <numeric_value>              | HZ   |                       |
| :AUTO                      | <Boolean>                    | --   |                       |
| :RATio                     | <numeric_value>              | --   |                       |
| :TYPE                      | NORMal   FFT   CFILter   RRC | --   |                       |
| :VIDeo                     | <numeric_value>              | HZ   |                       |
| :AUTO                      | <Boolean>                    | --   |                       |
| :RATio                     | <numeric_value>              | --   |                       |
| :TYPE                      | LINear   LOGarithmic         | --   |                       |
| :DEMod                     | numeric_value>               | HZ   | Option FM demodulator |
| :BWIDth                    |                              |      |                       |
| [:RESolution]              | <numeric_value>              | HZ   |                       |
| :AUTO                      | <Boolean>                    | --   |                       |
| :RATio                     | <numeric_value>              | --   |                       |
| :TYPE                      | NORMal   FFT   CFILter   RRC | --   |                       |
| :VIDeo                     | <numeric_value>              | HZ   |                       |
| :AUTO                      | <Boolean>                    | --   |                       |
| :RATio                     | <numeric_value>              | --   |                       |
| :TYPE                      | LINear   LOGarithmic         | --   |                       |
| :DEMod                     | <numeric_value>              | HZ   | Option FM demodulator |

### [SENSe<1|2>]:BANDwidth|BWIDth[:RESolution] 10 Hz to 50 MHz

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 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.

**Note:** This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE) and power versus time (PVT). During these measurements the bandwidth is selected due to GSM standard.

**Example:** "BAND 1MHz" 'Sets the resolution bandwidth to 1 MHz

**Characteristics:** \*RST value: - (AUTO is set to ON)  
SCPI: conforming

**Mode:** all

#### [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.

**Note:** This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE) and power versus time (PVT).

**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

**Mode:** A-F, FM

#### [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

**Mode:** A, MS

**[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.

- This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE), power versus time (PVT) and carrier power (CPW).

**Example:** "BAND:TYPE NORM"

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

**Mode:** all

**[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.

**Note:** This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE) and power versus time (PVT).

**Example:** "BAND:VID 10kHz"

**Characteristics:** \*RST value: - (AUTO is set to ON)  
SCPI: conforming

**Mode:** A, MS

**[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.

**Note:** This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE) and power versus time (PVT).

**Example:** "BAND:VID:AUTO OFF"

**Characteristics:** \*RST value: ON  
SCPI: conforming

**Mode:** A, MS



**[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.

**Note:** *This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE) and power versus time (PVT).*

**Example:** "BAND:VID:RAT 3" 'Sets the coupling of video bandwidth to video bandwidth = 3\*resolution bandwidth

**Characteristics:** \*RST value: 3  
SCPI: conforming

**Mode:** A, MS

**[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  $\leq 100$  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

**Mode:** A

This command is available from firmware version 1.40 or higher.

[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: 5 MHz  
SCPI: device specific

**Mode:** FM

This command is only available with option FS-K7 (FM Demodulator).

## SENSe:CDPower Subsystem

This subsystem controls the parameters for the Code Domain Power measurement in operating mode WCDMA FDD BTS and MS (FS-K72/K73). The suffix in SENSe<1|2> is not significant in this subsystem and will be ignored.

| Command                  | Parameter                              | Unit | Comment                 |
|--------------------------|--|------|-------------------------|
| [SENSe<1 2>]<br>:CDPower |  |      | option FS-K72 or FS-K73 |
| :PRESet                  |  |      |                         |
| :MPERiod                 | 1   2   4   8   12   16   20   24      | --   |                         |
| :AUTO                    | <Boolean>                              | --   |                         |
| :PNOFset                 | <numeric_value>                        |      |                         |
| :ICTReshold              | <numeric_value>                        | DB   |                         |
| :SBANd                   | NORMal   INVerse                       |      | option FS-K73 only      |
| :LEVel                   |  |      |                         |
| :ADJust                  |  |      |                         |
| :LCODE                   |  |      | option FS-K73 only      |
| [:VALue]                 | <hex>                                  | --   |                         |
| :TYPE                    | LONG   SHORt                           | --   |                         |
| :CODE                    | <numeric_value>                        | --   |                         |
| :SLOT                    | <numeric_value>                        | --   |                         |
| :MAPPing                 | I   Q                                  | --   | option FS-K72 only      |
| :SFACtor                 | 4   8   16   32   64   128   256   512 | --   | option FS-K72 only      |
| :NORMalize               | <Boolean>                              | --   |                         |
| :QINVert                 | <Boolean>                              | --   |                         |
| :PREFERENCE              | TOTal   CPICh                          | --   |                         |
| :STYPe                   | CPICh   SCHannel                       | --   |                         |
| :ANTenna                 | OFF   <numeric_value>                  | --   |                         |
| :BASE                    | SLOT   FRAMe                           |      | option FS-K73 only      |

### [SENSe<1|2>]:CDPower:PRESet

This command is for CDP presetting.

Inactive Channel Threshold      -23 dB  
 Limits                              set to standard  
 Result display                      3G FDD

**Example:**                    " :CDP:PRESet "

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

**Mode:**                        3G FDD

This command is an <Event> and therefore has no \*RST value and no query.

### [SENSe<1|2>]:CDPower:MPERiod 1 | 2 | 4 | 8 | 12 | 16 | 20 | 24

This command sets the demodulation length in number of chips. The automatic determination of the demodulation length is switched off at the same time.

**Example:**                    " :CDP:MPER 16 "                    "Sets demodulation length 16 chips

**Characteristics:** \*RST value: 8  
 SCPI:                        device-specific

**Mode:**                        3G FDD

**[SENSe<1|2>:]CDPower:MPERiod:AUTO ON | OFF**

This command activates (ON) the automatic determination of the optimum demodulation length. The demodulator calculates the signal/noise ratio of the WCDMA signal, and automatically selects a suitable setting.

**Example:** " :CDP:MPER:AUTO ON " 'Switches on the automatic determination of the demodulation length

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

**Mode:** 3G FDD

**[SENSe<1|2>:]CDPower:PNOffset <numeric\_value>**

This command sets the nominal offset value of the base station (in chips).

**Example:** " :CDP:PNOF 5 " 'Sets the PN offset to 5 chips

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

**Mode:** 3G FDD

**[SENSe<1|2>:]CDPower:ICTReshold -50 to 10dB**

This command sets the threshold value in the Code Domain Power diagram from which a channel is treated as active. The level entered refers to the total signal power.

**Example:** " :CDP:ICTR -10DB " 'Sets the threshold value to -10 dB

**Characteristics:** \*RST value: -20dB (FS-K72)  
SCPI: device-specific

**Mode:** 3G FDD

**[SENSe<1|2>:]CDPower:SBAND NORMal | INVerse**

This command is for interchanging the left and the right sideband.

**Example:** " :CDP:SBAN INV " 'Interchanges the sidebands

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

**Mode:** 3G FDD

**[SENSe<1|2>:]CDPower:LEVel:ADJust**

This command is used for setting automatically the RF attenuation and IF gain to the level of the applied signal. The instrument is to be switched to the *ATTEN MANUAL* mode so as to set the RF attenuation and IF gain separately to optimum values. This mode is maintained after changing from code-domain power measurements to the analyzer or vector analyzer modes.

**Example:** " :CDP:LEV:ADJ " 'Automatically sets the level

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

**Mode:** 3G FDD

This command is an <Event> and therefore has no \*RST value and no query.

**[SENSe<1|2>:]CDPower:LCODE[:VALue] <hex>**

This command sets the long code (scrambling code) in hexadecimal format.

**Example:**           ":CDP:LCOD #H3B"           'Sets the long code to 3B Hex

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

**Mode:**           3G FDD

**[SENSe<1|2>:]CDPower:LCODE:TYPE LONG | SHORT**

This command switches the scrambling code between long and short.

**Example:**           ":CDP:LCOD:TYPE SHOR" 'Switches to short scrambling code

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

**Mode:**           3G FDD UE

**[SENSe<1|2>:]CDPower:CODE 0 to 511**

This command sets the code number. The code number refers to code class 9. .

**Example:**           ":CDP:CODE 30" 'Selects code number 30

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

**Mode:**           3G FDD

**[SENSe<1|2>:]CDPower:SLOT 0 to 14**

This command sets the slot number.

**Example:**           ":CDP:SLOT 3" 'Selects slot number 3

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

**Mode:**           3G FDD

**[SENSe<1|2>:]CDPower:MAPPING I | Q**

This command defines the mapping of the CDP signal.

**Example:**           ":SENS:CDP:MAPP I" 'Selects I-mapping

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

**Mode:**           3G FDD UE

**[SENSe<1|2>:]CDPower:SFACTOR 4 | 8 | 16 | 32 | 64 | 128 | 256 | 512**

This command defines the spreading factor.

**Note:**

Setting 512 is not possible for mobile station tests (FS-K73).

**Example:** " :CDP:SFACTOR 16 " 'Selects spreading factor 16

**Characteristics:** \*RST value: 512 (FS-K72)  
\*RST value: 256 (FS-K73)  
SCPI: device-specific

**Mode:** 3G FDD

**[SENSe<1|2>:]CDPower:NORMALize ON | OFF**

This command switches normalization of the unit circle with the IQ offset on or off.

**Example:** " :CDP:NORM OFF " 'Switches normalization off

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

**Mode:** 3G FDD

**[SENSe<1|2>:]CDPower:QINVert ON | OFF**

This command inverts the Q component of the signal.

**Example:** " :CDP:QINV ON " 'Switches on inversion of Q component

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

**Mode:** 3G FDD

**[SENSe<1|2>:]CDPower:PREference TOTAL | CPICH**

This command switches between the use of total power or CPICH power as reference for the relative CDP measurement values.

**Example:** " :CDP:REF CPIC " 'Selects CPICH as reference for the relative CDP measurement values

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

**Mode:** 3G FDD BTS

**:[SENSe<1|2>:]CDPower:STYPe CPICH | SCHannel**

This command selects the type of synchronization. With CPICH, the CPICH is used for synchronization and must, therefore, be contained in the signal. With SCH, synchronization is carried out without using the CPICH (necessary for test model 4 without CPICH).

**Example:** " :CDP:STYP SCH " 'Synchronization without CPICH

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

**Mode:** 3G FDD

**:[SENSe<1|2>:]CDPower:ANTenna** OFF | <numeric\_value>

This command enables or disables antenna diversity and selects the antenna to be used. With OFF, the FS-K72 assumes that antenna diversity is not enabled. With 1/2, the special characteristics of the signals of antenna 1 or 2 are taken into account.

**Example:** " :CDP:ANT 1 " 'The characteristics of antenna 1 are taken into account

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

Mode: 3G FDD BTS

**:[SENSe<1|2>:]CDPower:BASE** SLOT | FRAME

With FS-K73 this command defines whether the CDP measurements are to be based on the entire frame or only one slot.

Bei FS-K72 ist dieser Befehl nicht verfügbar.

**Beispiel:** " :CDP:BASE SLOT " 'Die Analyse erfolgt Slot-basiert.

**Eigenschaften:** \*RST-Wert: SLOT  
SCPI: gerätespezifisch

**Betriebsart:** 3G FDD UE

**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).

**Note:** The commands of this subsystem are not available during GSM measurements.

| COMMAND                     | PARAMETERS               | UNIT    | COMMENT                    |
|-----------------------------|--------------------------|---------|----------------------------|
| [SENSe<1 2>]<br>:CORRection |                          |         | Ttracking generator option |
| :METHod                     | TRANsmission   REFLexion |         |                            |
| :COLLect<br>[:ACQuire]      | THRough   OPEN           |         | no query                   |
| [:STATe]                    | <Boolean>                |         |                            |
| :RECall                     |                          |         | no query                   |
| :TRANsducer                 |                          |         |                            |
| :SELEct                     | <name>                   |         |                            |
| :UNIT                       | <string>                 |         |                            |
| :SCALing                    | LINear LOGarithmic       |         |                            |
| :COMMeNT                    | <string>                 |         |                            |
| :DATA                       | <freq> , <level> ..      | HZ , -- |                            |
| [:STATe]                    | <Boolean>                |         |                            |
| :DELEte                     | --                       | --      | no query                   |
| :VIEW                       | <Boolean>                |         |                            |

**[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[:ACQuire]).

**Example:** "CORR ON " 'Activates normalization in screen A.

**Characteristics:** \*RST value: OFF  
SCPI: conforming

**Mode:** A

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

**Mode:** A

This command is only valid in conjunction with the ext. generator control option (B10).



**[SENSe<1|2>:]CORREction:COLLect[:ACQuire] THROugh | OPEN**

When the tracking generator is active, this command determines the type of result acquisition for the normalization reference measurement and starts the measurement selected:

THROugh "TRANsmission" mode: calibration with direct connection between tracking generator and device input.

"REFLection" mode: calibration with short circuit at the input

OPEN only valid in "REFLection" mode: calibration with open input

It is only valid in conjunction with the ext. generator control option (B10).

**Example:** "INIT:CONT OFF" 'Selects single sweep operation

"CORR:COLL THR;\*WAI" 'Starts the measurement of reference data using  
'direct connection between generator and device  
'input and waits for the sweep end.

**Characteristics:** \*RST value: --  
SCPI: conforming

**Mode:** A

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

**[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

**Mode:** A

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

**Modes:** A

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

**Modes:** A

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

**Modes:** A

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

**Modes:** A

This command is available from firmware version 1.40 or higher.

**[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

**Modes:**            A

This command is available from firmware version 1.40 or higher.

**[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

**Modes:**            A

This command is available from firmware version 1.40 or higher.

**[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

**Modes:**            A

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

This command is available from firmware version 1.40 or higher.

**:[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

**Mode:**            A

This command is available from firmware version 1.40 or higher.

## 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>]<br>:DETECTOR<1..3><br>[:FUNCTION]<br><br>:AUTO | APEAK   NEGATIVE   POSITIVE  <br>SAMPLE   RMS   AVERAGE   QPEAK<br><Boolean><br>POSITIVE NEGATIVE  RMS <br>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.

**Note:** APEAK and QPEAK are not available during GSM measurements modulation accuracy (MAC), phase-frequency error (PFE) and power vs. time (PVT).

**Example:** "DET POS" 'Sets the detector in screen A to "positive peak".

**Characteristics:** \*RST value: APEAK  
SCPI: conforming

**Mode:** A, MS

**[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

**Mode:** A, MS

## 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>]<br>: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

**Mode:** all

### [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

**Mode:** all

### [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.

**Note:** This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE) and power versus time (PVT).

**Example:** "FREQ:CENT:STEP:LINK SPAN"

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

**Mode:** A, MS

**[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).

**Note:** This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE) and power versus time (PVT).

**Example:** "FREQ:CENT:STEP:LINK:FACT 20PCT"

**Characteristics:** \*RST value: - (AUTO 0.1 × SPAN is switched on)  
SCPI: device-specific

**Mode:** A, MS

**[SENSe<1|2>:]FREQUENCY:SPAN** 0 to  $f_{\max}$ 

This command defines the frequency span in the analyzer mode.

**Note:** This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE) and power versus time (PVT).

**Example:** "FREQ:SPAN 10MHz"

**Characteristics:** \*RST value:  $f_{\max}$  with  $f_{\max}$  = maximum frequency  
SCPI: conforming

**Mode:** A, MS

**[SENSe<1|2>:]FREQUENCY:SPAN:FULL**

This command sets the frequency span in the analyzer mode to its maximum.

**Note:** This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE), power versus time (PVT) and carrier power (CPW).

**Example:** "FREQ:SPAN:FULL"

**Characteristics:** \*RST value: -  
SCPI: conforming

**Mode:** A, MS

**[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).

**Note:** This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE), power versus time (PVT) and carrier power (CPW).

**Example:** "FREQ:STAR 20MHz"

**Characteristics:** \*RST value: 0  
SCPI: conforming

**Mode:** A-F, MS

**[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).

**Note:** This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE), power versus time (PVT) and carrier power (CPW).

**Example:** "FREQ:STOP 2000MHz"

**Characteristics:** \*RST value:  $f_{max}$   
SCPI: conforming

**Mode:** A-F, MS

**[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.

**Note:** This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE), power versus time (PVT), carrier power (CPW) and spurious (SPU).

**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

**Mode:** A, MS, FM

## 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 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.*

*The commands of this subsystem are not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE) and power versus time (PVT).*



| COMMAND  | PARAMETER  | UNIT  | COMMENT    |
|--|--|---|------------|
| [SENSe<1 2>]<br>:LIST<br>:POWer<br>:RESult?<br>[:SEQuence] | <numeric_value>,<br><numeric_value>,<br><numeric_value>,<br><numeric_value>   OFF,<br>NORMal   CFILter   RRC,<br><numeric_value>,<br><numeric_value>,<br><numeric_value>,<br><numeric_value> | HZ,<br>DBM,<br>DB,<br>DB,<br>--,<br>HZ,<br>HZ,<br>S,<br>PCT DBM | Query only |
| :SET   | ...<br><Boolean>,<br><Boolean>,<br><Boolean>,<br>IMMediate   EXTernal   VIDeo   IFPower,<br>POSitive NEGative,<br><numeric_value>,<br><numeric_value>  | --,<br>--,<br>--,<br>--,<br>--,<br>S,<br>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
- <filter type>: If option B25 is missing, OFF is to be used.  
NORMal: normal resolution filter  
CFILter: channel filter. These are especially steep-edged

|                  |   |
|------------------|---|
|                  | filters, which are used for example in Fast ACP 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<br>Range of values: 10 Hz to 10 MHz in 1, 3, 10 steps for <filter type> = NORMal.                                |
| <vbw>:           | Video bandwidth<br>Range of values: 1 Hz to 10 MHz in 1, 3, 10 steps.<br>The value is ignored for <filter type> = CFILter or RRC      |
| <meas time>:     | Measurement time<br>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.
- This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE) and power versus time (PVT).

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

**Mode:** A-F, A-T, MS

[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   IFFPower  |  |
| <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"

**Note:** This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE) and power versus time (PVT).

**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

**Mode:** A-F, A-T, MS

**[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.

**Note:** *This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE) and power versus time (PVT).*

**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

**Mode:** A-F, A-T, MS

**[SENSe<1|2>:]LIST:POWer:STATe OFF**

This command deactivates the list measurement.

**Note:** *This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE) and power versus time (PVT).*

**Example:** "SENSe:LIST:POWer:STATe OFF"

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

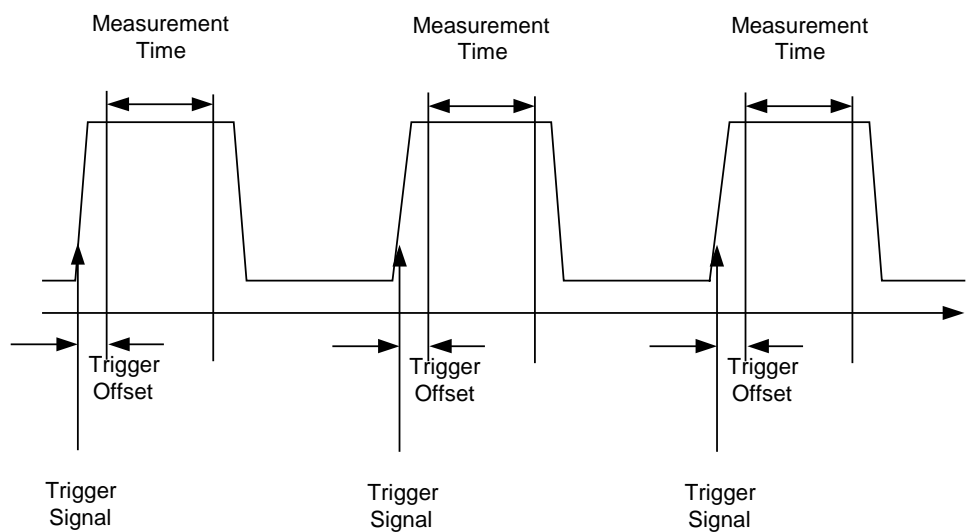
**Mode:** A-F, A-T, MS

## 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>]<br>:MPOWer<br>[:SEQuence]<br><br><br><br>:RESult<br>[:LIST]?<br>:MIN? | <numeric_value>,<br><numeric_value>,<br><numeric_value>,<br>EXTernal   VIDeo,<br><numeric_value>,<br><numeric_value>,<br>MEAN   PEAK,<br><numeric_value> | HZ,<br>HZ,<br>S,<br>--,<br>PCT,<br>S,<br>--,<br>-- | Query only<br>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

**Note:** *This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE) and power versus time (PVT).*

**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  $\mu$ s  
Trigger source = VIDEO  
Trigger threshold = 50%  
Trigger offset = 5  $\mu$ s  
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

**Mode:** A-F, A-T, MS



**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.

**Note:** *This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE) and power versus time (PVT).*

**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

**Mode:** A-F, A-T, MS

**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.

**Note:** *This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE) and power versus time (PVT).*

**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

**Mode:** A-F, A-T, MS

**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).

**Note:** The commands of this subsystem are not available during GSM measurements.

| COMMAND  | PARAMETERS  | UNIT                 | COMMENT  |
|--|---|----------------------|----------|
| [SENSe<1 2>]<br>:POWER<br>:ACHannel<br>:SPACing<br>[:CHANnel]<br>:ALTernate<1 2> | <br><br><br><numeric_value><br><numeric_value>            | <br><br><br>HZ<br>HZ |          |
| :ACPairs   | 0   1   2   3   |                      |          |
| :BANDwidth<br>[:CHANnel]<br>:ACHannel<br>:ALTernate<1 2>                         | <br><numeric_value><br><numeric_value><br><numeric_value> | <br>HZ<br>HZ<br>HZ   |          |
| :BWIDth<br>[:CHANnel]<br>:ACHannel<br>:ALTernate<1 2>                            | <br><numeric_value><br><numeric_value><br><numeric_value> | <br>HZ<br>HZ<br>HZ   |          |
| :MODE  | ABSolute   RELative                                       |                      |          |
| :REFerence<br>:AUTO  | ONCE  |                      | no query |
| :PRESet  | ACPPower   CPOWer   OBANdwidth  <br>OBWidth   CN   CN0    |                      |          |
| :RLEVel  |   |                      |          |
| :BANDwidth   | <numeric_value>   | PCT                  |          |
| :BWIDth  | <numeric_value>   | PCT                  |          |
| :HSPEED  | <Boolean>   |                      |          |
| :NCORrection   | <Boolean>   |                      |          |
| :TRACe   | <numeric_value>   | --                   |          |

**[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

**Mode:** A-F

**[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

**Mode:** A-F

**[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

**Mode:** A-F

**[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 `SENSe: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

**Mode:** A-F

[SENSe<1|2>:]POWer:ACHannel:BAWIDth|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

**Mode:** A-F

[SENSe<1|2>:]POWer:ACHannel:BAWIDth|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

**Mode:** A-F

[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 SENS: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

**Mode:** A-F

**[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

**Mode:** A-F

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

**[SENSe<1|2>:]POWer:ACHannel:PRESet ACPower | CPOWer | OBANdwidth|OBWidth| CN | CNO**

This command adapts the frequency span, the bandwidths and the detector to the number of channels, channel bandwidths and channel spacings of the active power measurement and switches on the adjacent channel power measurement, if required.

To ensure that the results are valid, a complete sweep including synchronization to the sweep end must be performed after the configuration. Synchronization is only possible in single sweep mode.

The results are queried with CALCulate:MARKer:FUNction:POWer:RESult?.

The command is only available in the frequency domain (span > 0).

**Example:** "POW:ACH:PRESet ACP" 'Sets the frequency range, bandwidths and  
'detector suitable for ACP measurement in  
'screen A.  
"INIT:CONT OFF" 'Switches to single-sweep mode.  
"INIT;\*WAI" 'Starts a sweep and waits for the end.  
"CALC:MARK:FUNC:POW:RES? ACP" 'Queries the result of the adjacent channel  
'power measurement.

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

**Mode:** A-F

**[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:PRESet:RLEV;\*WAI" 'Adapts the reference level to the measured  
'channel power.

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

**Mode:** A-F

**[SENSe<1|2>:]POWer: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

**Mode:** A-F

**[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  $\sqrt{\cos}$  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

**Mode:** A-F

**[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

**Mode:** A

This command is available from firmware version 1.40 or higher.

**[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

**Mode:** A

## 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>]<br>:ROSCillator<br>:SOURce<br>[:INTernal]<br>:TUNe<br>:SAVe | INTernal   EXTernal<br><br><numeric_value> | --   | 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

**Mode:** all

### [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

**Mode:** all

### [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

**Mode:** all



## 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>]<br>:SWEEp |                             |      |         |
| :TIME                  | <numeric_value>             | S    |         |
| :AUTO                  | <Boolean>                   | --   |         |
| :COUNT                 | <numeric_value>             | --   |         |
| :EGATE                 | <Boolean>                   | --   |         |
| :TYPE                  | LEVE 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) | 1 $\mu$ s 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  $\mu$ s to 16000s with span = 0).

If SWEEp:TIME is directly programmed, automatic coupling to resolution bandwidth and video bandwidth is switched off.

**Note:** This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE), power versus time (PVT) and carrier power (CPW).

**Example:** "SWE:TIME 10s"

**Characteristics:** \*RST value - (AUTO is set to ON)  
SCPI: conforming

**Mode:** A, MS, FM

**[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.

**Note:** This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE), power versus time (PVT) and carrier power (CPW).

**Example:** "SWE:TIME:AUTO ON" 'Switches on the coupling to frequency span and bandwidths.

**Characteristics:** \*RST value: ON  
SCPI: conforming

**Mode:** A, MS

**[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

**Mode:** A, MS, FM

**[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.

**Note:** This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE), power versus time (PVT), carrier power (CPW), spectrum due to switching (TRA) and spurious emissions (SPU).

**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 $\mu$ s.        |
| "SWE:EGAT:LEN 500US"  | 'Sets the gate opening time to 500 $\mu$ s. |
| "INIT;*WAI"           | 'Starts a sweep and waits for its end.      |

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

**Mode:** A, MS

**[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.

**Note:** This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE), power versus time (PVT), carrier power (CPW), spectrum due to switching (TRA) and spurious emissions (SPU).

**Example:** "SWE:EGAT:TYPE EDGE"

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

**Mode:** A, MS

**[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.

**Note:** This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE), power versus time (PVT), carrier power (CPW), spectrum due to switching (TRA) and spurious emissions (SPU).

**Example:** "SWE:EGAT:POL POS"

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

**Mode:** A, MS

**[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.

**Note:** This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE), power versus time (PVT), carrier power (CPW), spectrum due to switching (TRA) and spurious emissions (SPU).

**Example:** "SWE:EGAT:HOLD 100us"

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

**Mode:** A, MS

**[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.

**Note:** This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE), power versus time (PVT), carrier power (CPW), spectrum due to switching (TRA) and spurious emissions (SPU).

**Example:** "SWE:EGAT:LENG 10ms"

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

**Mode:** A, MS

**[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:**

*This command is not available for GSM MS measurements modulation accuracy (MAC), phase/frequency error (PFE), power versus time (PVT ), carrier power (CPW), spectrum due to switching (TRA) and spurious emissions (SPU).*

**Example:** "SWE:EGAT:SOUR IFP" 'Switches the gate source to IF power.

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

**Mode:** A

**[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

**Modes:** A

## **SOURce Subsystem**

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).

## 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><br>:EXTernal<1 2><br>[:STATe]<br>:FREQuency<br>:OFFSet<br>[:FACTor]<br>:NUMerator<br>:DENominator<br>:SWEep<br>[:STATe]<br>:POWer<br>[:LEVel]<br>:ROSCillator<br>[:SOURce] | <Boolean><br><br><numeric_value><br><br><numeric_value><br><numeric_value><br><br><Boolean><br><br><numeric_value><br><br>INTernal   EXTernal | <br><br><br>HZ<br><br><br><br><br><br>DBM | <br><br><br><br><br><br><br><br><br><br><br>Ext. generator option |

### 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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all



**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

**Mode:** all

This command is available from firmware version 1.40 or higher.

## 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<br>:QUEue<br>[:NEXT?] | --<br>--   | --<br>-- |         |

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**STATus:QUEStionable:SYNC[:EVENT]?**

This command queries the contents of the EVENT section of the STATus:QUEStionable:SYNC register. Readout deletes the contents of the EVENT section.

**Example:** "STAT:QUES:SYNC?"

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

**Modes:** all

**STATus:QUEStionable:SYNC:CONDition?**

This command queries the contents of the CONDition section of the STATus:QUEStionable:SYNC register. Readout does not delete the contents of the CONDition section.

**Example:** "STAT:QUES:SYNC:COND?"

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

**Modes:** all

**STATus:QUEStionable:SYNC:ENABle 0 to 65535**

This command sets the bits of the ENABle section of the STATus:QUEStionable: SYNC register. The ENABle register selectively enables the individual events of the associated EVENT section for the sum bit in the status byte.

**Example:** "STAT:QUES:SYNC:ENAB 65535"

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

**Modes:** all



**STATus:QUEStionable:SYNC:PTRansition** 0 to 65535

This command sets the edge detectors of all bits of the STATus:QUEStionable: SYNC register from 0 to 1 for the transitions of the CONDition bit.

**Example:** "STAT:QUES:SYNC:PTR 65535"

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

**Modes:** all

**STATus:QUEStionable:SYNC:NTRansition** 0 to 65535

This command sets the edge detectors of all bits of the STATus:QUEStionable: SYNC register from 1 to 0 for the transitions of the CONDition bit.

**Example:** "STAT:QUES:SYNC:NTR 65535"

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

**Modes:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

# 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 |
| :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>            |      |                           |
| :DATE           | <num>, <num>, <num>       | --   |                           |
| :DISPlay        |                           |      |                           |
| :FPANel         | <Boolean>                 |      |                           |
| :UPDate         | <Boolean>                 |      |                           |
| :ERRor?         | --                        | --   | query only                |
| :FIRMware       |                           |      |                           |
| :UPDate         | <string>                  |      | no query                  |
| :FIRMware       |                           |      |                           |
| :UPDate         | <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: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

**Mode:** all

**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

**Mode:** all

**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

**Operating mode:** all



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 <sup>2)</sup>      | +11 <sup>2)</sup>       |
| SMR20B11 <sup>1)</sup> | TTL            | 10 MHz             | 20 GHz             | -130 <sup>2)</sup>      | +13 <sup>2)</sup>       |
| SMR27                  | TTL            | 1 GHz              | 27 GHz             | -130 <sup>2)</sup>      | +11 <sup>2)</sup>       |
| SMR27B11 <sup>1)</sup> | TTL            | 10 MHz             | 27 GHz             | -130 <sup>2)</sup>      | +12 <sup>2)</sup>       |
| SMR30                  | TTL            | 1 GHz              | 30 GHz             | -130 <sup>2)</sup>      | +11 <sup>2)</sup>       |
| SMR30B11 <sup>1)</sup> | TTL            | 10 MHz             | 30 GHz             | -130 <sup>2)</sup>      | +12 <sup>2)</sup>       |
| SMR40                  | TTL            | 1 GHz              | 40 GHz             | -130 <sup>2)</sup>      | +9 <sup>2)</sup>        |
| SMR40B11 <sup>1)</sup> | TTL            | 10 MHz             | 40 GHz             | -130 <sup>2)</sup>      | +12 <sup>2)</sup>       |
| SMR60                  | TTL            | 1 GHz              | 60 GHz             | -130 <sup>2)</sup>      | +9 <sup>2)</sup>        |
| SMR60B11 <sup>1)</sup> | TTL            | 10 MHz             | 60 GHz             | -130 <sup>2)</sup>      | +12 <sup>2)</sup>       |
| SMP02                  | TTL            | 10 MHz             | 20 GHz             | -130 <sup>3)</sup>      | +17 <sup>3)</sup>       |
| SMP03                  | TTL            | 10 MHz             | 27 GHz             | -130 <sup>3)</sup>      | +13 <sup>3)</sup>       |
| SMP04                  | TTL            | 10 MHz             | 40 GHz             | -130 <sup>3)</sup>      | +12 <sup>3)</sup>       |
| SMP22                  | TTL            | 10 MHz             | 20 GHz             | -130 <sup>3)</sup>      | +20 <sup>3)</sup>       |
| 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                     |

<sup>1)</sup> Requires mounting of option SMR-B11.

<sup>2)</sup> 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.

<sup>3)</sup> 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                      |
| 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

**Mode:** all

**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

**Mode:** all



**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Operating mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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_<br>data.tag<br>os.dat | _isdel.exe<br>data1.cab<br>Setup.exe | _setup.dll<br>id.txt<br>Setup.ini | _sys1.cab<br>lang.dat<br>setup.ins | _user1.cab<br>layout.bin<br>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

**Mode:** all

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

**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

**Mode:** all

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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

**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

**Mode:** all

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.

| COMMAND               | PARAMETERS   | UNIT  | COMMENT    |
|-----------------------|--|---|------------|
| TRACe<1 2><br>[:DATA] | TRACE1 TRACE2 TRACE3 PWCDp, <br>CTABLE,<br><block> <numeric_value>...  | -   |            |
| :COPY                 | TRACE1 TRACE2 TRACE3,<br>TRACE1 TRACE2 TRACE3  | -   |            |
| :IQ                   |  |   |            |
| :AVERage<br>[:STATe]  | <Boolean>  |   |            |
| :COUNT                | <numeric_value>  | --  |            |
| :DATA?                |  |   |            |
| :MEMory?              | <numeric_value>, <numeric_value>   | --, --  | query only |
| :SET                  | NORMal,<br><numeric_value>,<br><numeric_value>,<br>IMMediate   EXTernal,<br>IFPower   RFPower,<br>POSitive,<br><numeric_value>,<br><numeric_value> | --,<br>HZ,<br>HZ,<br>--,<br>--,<br>--,<br>--,<br>-- | query only |
| :SRATe<br>[:STATe]    | <numeric_value>  | HZ  |            |
| :ONLine<br>[:STATe]   | <Boolean>  |   |            |
| :SFACtor              | <Boolean>  |   |            |
| :I?                   |  |   | query only |
| :Q?                   |  |   | query only |

### 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 (option FS-K7) 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

**Mode:** all

**Return values:**

The returned values are scaled in the current level unit. Returned FM-modulated measurement values (activated option FS-K7) 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.



## 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.

### GSM MS Analyzer:

### WCDMA 3G FDD: Code Domain Power, base station (FS-K72) and mobile station tests (FS-K73)

Depending on the display mode selected, TRACE1/2, CTABLE or PWCDp can be output. PWCDp is only available in conjunction with FS-K72, base station tests.

**CTable** can be set only if CODE PWR ABSOLUTE / RELATIVE , CHANNEL TABLE is selected for Trace 1. The same data as for TRACE1 are output. In addition, the pilot length is output as the 6th value for FS-K72 (0 as the 6<sup>th</sup> value for FS-K73) and active/inactive (1/0) as the 7th value for both options.

FS-K72: Seven values are transmitted for each assigned channel:  
<class>,<channel number>,<absolute level>,<relative level>,  
<timing offset>,<pilot length>,<active/inactive>,...

FS-K73: Six values are transmitted for each assigned channel:  
<class>,<channel number>,<absolute level>,<relative level>,  
<IQ mapping>, 0, <active/inactive>,...

The pilot length is specified in symbols.

**PWCDp** can be set only for base station tests (FS-K72), if CODE PWR ABSOLUTE / RELATIVE , CHANNEL TABLE is selected for Trace 1. The pilot length is transmitted in addition to the same five values as transmitted for TRACE1. The pilot length is specified in symbols.

Six values are transmitted for each assigned channel:  
< class>,<channel number>,<absolute level>,<relative level>,<timing offset>,  
<pilot length>,...

The pilot length is specified in bit.

### TRACE1/TRACE2:

The following measured values are transferred depending on the display mode:

#### CODE PWR ABSOLUTE / RELATIVE , CHANNEL TABLE (TRACE1)

Each channel is defined by the class, the channel number, the absolute level, the relative level and the timing offset (base station, FS-K72) or I/Q mapping (mobile station, FS-K73). The class denotes the spreading factor of the channel.

For base station tests, class 8 corresponds to the highest spreading factor (512, symbol rate 7.5 kps). For mobile station tests, class 9 corresponds to the highest

spreading factor (256, symbol rate 7.5 ksps). Class 2 corresponds to the lowest admissible spreading factor (4, symbol rate 960 ksps).

Five values are transmitted for each assigned channel.

FS-K72:

< class>,<channel number>,<absolute level>,<relative level>,<timing offset>

For CODE PWR ABSOLUTE / RELATIVE, the channels are output according to their code numbers, i.e. in the order in which they would appear on the screen.

For CHANNEL TABLE, the channels are sorted in ascending order according to code classes, i.e. the codes not assigned appear at the end of the list.

The absolute level is specified in dBm, the relative level in dB referred to CPICH.

The timing offset is specified in chip.

FS-K73:

<class>,<channel number>,<absolute level>,<relative level>,<I/Q mapping>,...

For CODE PWR ABSOLUTE / RELATIVE, the channels are output according to their code numbers, i.e. in the order in which they would appear on the screen.

For CHANNEL TABLE, the channels are sorted in ascending order according to code classes, i.e. the codes not assigned appear at the end of the list.

The absolute level is specified in dBm, the relative level in dB referred to the total power of the signal.

The values output for I/Q mapping are:1: I-mapped; 0: Q-mapped (FS-K73)

The example shows the results of a query for three assigned channels with the following configuration:

Base station tests (FS-K72):

1<sup>st</sup> channel: spreading factor 512, channel number 7, timing offset 0

2<sup>nd</sup> channel: spreading factor 4, channel number 2, timing offset 256 chips

3<sup>rd</sup> channel: spreading factor 128, channel number 127, timing offset 2560 chips

This yields the following result: 9,7,-40,-20,0,2,2,-40,-20,256,7,127,-40,-20,2560

The channels come in the same order as in the CDP diagram, i.e. depending on their position in the code domain of spreading factor 512.

Mobile station tests (FS-K73):

1<sup>st</sup> channel: spreading factor 256, channel number 7, I-mapped

2<sup>nd</sup> channel: spreading factor 4, channel number 2, I-mapped

3<sup>rd</sup> channel: spreading factor 128, channel number 127, Q-mapped

## RESULT SUMMARY (TRACE2)

The results of the RESULT SUMMARY are output in the following order:

<modulation accuracy>,<peak CDE>,<carr freq Error>,<chip rate error>,<total power>,<trg to frame>,<EVM peak channel>,<EVM mean channel>,<class>,<channel number>,<power abs. channel>,<power rel. channel>,<timing offset (FS-K72 / I/Q-mapping (FS-K73))>,<pilot length (FS-K73)>,<IQ offset>,<IQ imbalance>

EVM peak channel, EVM mean channel and modulation accuracy are specified in %, and peak CDE in dB.

The Carr Freq Error is specified in Hz, and the Chip Rate Error in ppm.

Total power and power abs. channel are specified in dBm, and power rel. channel is given in dB referred to the CPICH (FS-K72) or referred to the total power of the signal (FS-K73).

The timing offset is specified in chip, and Trg to Frame in  $\mu$ s.

### POWER VS SLOT (TRACE2)

FS-K72:

16 pairs of values (for 16 slots) consisting of CPICH slot number and level value are transmitted:

<slot number>, <level value in dB>,<slot number>,<level value in dB>.....

FS-K73:

15 pairs of values (for 15 slots) consisting of slot number and level value are transmitted:

<slot number>, <level value in dB>,<slot number>,<level value in dB>.....

### SYMBOL EVM (TRACE2)

The number of level values depends on the spreading factor:

|                      |            |
|----------------------|------------|
| Spreading factor 512 | 5 values   |
| Spreading factor 256 | 10 values  |
| Spreading factor 128 | 20 values  |
| Spreading factor 64  | 40 values  |
| Spreading factor 32  | 80 values  |
| Spreading factor 16  | 160 values |
| Spreading factor 8   | 320 values |
| Spreading factor 4   | 640 values |

### PK CODE DOMAIN ERR und MODULATION ACCURACY (TRACE2)

15 pairs of slot and level values are always transferred.

PK CODE DOMAIN ERR: <slot number>, <level value in dB>.....

MODULATION ACCURACY: <slot number>, <level value in %>, .....

### SYMBOL CONST (TRACE2)

The number of level values depends on the spreading factor:

|                      |            |
|----------------------|------------|
| Spreading factor 512 | 5 values   |
| Spreading factor 256 | 10 values  |
| Spreading factor 128 | 20 values  |
| Spreading factor 64  | 40 values  |
| Spreading factor 32  | 80 values  |
| Spreading factor 16  | 160 values |
| Spreading factor 8   | 320 values |
| Spreading factor 4   | 640 values |

### Bit stream (TRACE2)

The bit stream of a slot is output. One value per bit is output (range of values: 0,1). The number of symbols is not constant and may differ from sweep to sweep. Specific symbols in the bit stream can be invalid (FS-K72: depending on channel type and symbol rate / FS-K73: for channels not assigned). The associated invalid bits are identified by "9".

Example of bit stream trace FS-K72: 1,0,0,9,0,1 / FS-K73: 0,1,0,0,1,1,0 (channels assigned) und 9,9,9,9,9,9,9,9,9 (channels not assigned)

**TRACe:COPY** TRACe:COPY TRACE1| TRACE2| TRACE3,  
TRACE1| TRACE2| TRACE3|

This command copies data from one trace to another. The second operand describes the source, the first operand the destination of the data to be copied. The associated measurement window is selected with the numeric suffix of TRACe<1|2>.

**Example:** "TRAC:COPY TRACE1 ,TRACE2 "

**Characteristics:** \*RST value:  
SCPI: conforming

**Mode:** A, MS

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

## 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.

**Note:** The commands of this subsystem are not available during GSM measurements.

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.

The image frequency in MHz is calculated as follows:

$$f_{\text{image}} = 2 \cdot (f_{\text{center}} + 5.4 \text{ MHz}) - f_{\text{signal}}$$

where

$f_{\text{image}}$  = image frequency in MHz

$f_{\text{center}}$  = center frequency in MHz

$f_{\text{signal}}$  = 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.

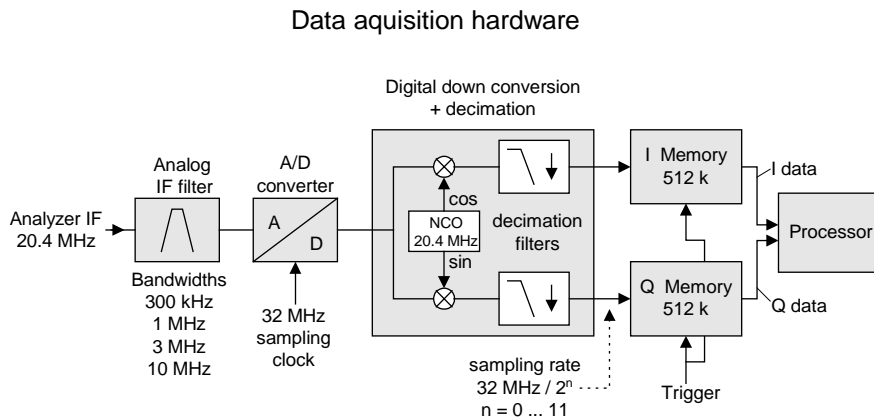
For additional bandwidth limitation of the measurement data the analog filters (RBW ≥ 300 kHz) are available.

The block diagram below shows the analyzer hardware from the IF section to the processor. The IF filter is the resolution filter of the spectrum analyzer with bandwidths selectable from 300 kHz to 10 MHz. The A/D converter samples the IF signal (20.4 MHz) at a rate of 32 MHz.

The digital signal is down-converted to the complex baseband, lowpass-filtered, and the sampling rate is reduced, i.e. the output sampling rate is set between 15.625 kHz and 32 MHz by dividing the original

sampling rate by powers of 2. This avoids unnecessary oversampling at narrower bandwidths, which saves processing time and increases the maximum recording time.

The I/Q data are written to separate memories of 512k-Worte words each. The memories are hardware-triggered.



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:AVERAge[:STATe] ON|OFF**

The command enables averaging of the recorded I/Q data provided that I/Q data acquisition was previously enabled with `TRAC:IQ ON` and the sampling rate was set to 32 MHz.

**Note:**

*Averaging is not supported at sampling rates <> 32 MHz or for a trigger offset < 0.*

**Example:**

```
TRAC:IQ ON           'Switches on acquisition of I/Q data.
TRAC:IQ:SYNC ON     'Switches on synchronization of the aquisition of I/Q
                    'measurement data with the trigger time.
TRAC:IQ:SET NORM,10MHz,32MHz,EXT,POS,0,2048
                    ' Reads 2048 I/Q values starting at
                    'the time of trigger.
                    'Filter type:   NORMAL (analogue)
                    'RBW:          10 MHz
                    'Sample Rate:  32 MHz
                    'Trigger:     external
                    'Slope:       positive
TRAC:IQ:AVER ON     'Enables averaging of the I/Q measurement data.
TRAC:IQ:AVER:COUN 10 'Selects averaging over 10 data sets..
TRAC:IQ:DATA?      'Starts the measurement and reads out the averaged
                    'data.
```

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

**Mode:** A-Z

This command is only available from firmware version 1.32 or higher.

**TRACe<1|2>:IQ:AVERAge:COUNT 0 .. 32767**

This command defines the number of I/Q data sets that are to serve as a basis for averaging.

**Example:**

```
TRAC:IQ ON           'Switches on acquisition of I/Q data.
TRAC:IQ:SYNC ON     'Switches on synchronization of the aquisition of I/Q
                    'measurement data with the trigger time.
TRAC:IQ:SET NORM,10MHz,32MHz,EXT,POS,0,2048
                    'Reads 2048 I/Q values from the
                    'moment of triggering.
                    'Filter type:   NORMAL (analogue)
                    'RBW:          10 MHz
                    'Sample Rate:  32 MHz
                    'Trigger:     external
                    'Slope:       positive
TRAC:IQ:AVER ON     'Enables averaging of the I/Q measurement data
TRAC:IQ:AVER:COUN 10
                    'Selects averaging over 10 data sets
TRAC:IQ:DATA?      'Starts the measurement and reads out the averaged
                    'data.
```

**Characteristics:** \*RST value: 0  
SCPI: conforming

**Mode:** all

This command is only available from firmware version 1.32 or higher.

**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

|                 |   |   |
|-----------------|---|---|
| <b>Example:</b> | "TRAC:IQ:STAT ON"                             | 'Enables acquisition of I/Q data  |
|                 | "TRAC:IQ:SET NORM,10MHz,32MHz,EXT,POS,0,4096" | 'Measurement configuration:<br>'Filtertype:Normal<br>'RBW:10 MHz<br>'Sample Rate:32 MHz<br>'Trigger Source:External<br>'Trigger Slope:Positive<br>'Pretrigger Samples:0<br>'# 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 ( <i># of DataBytes</i> , 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:

$$\# \text{ of } I\text{-Data} = \# \text{ of } Q\text{-Data} = \frac{\# \text{ of } DataBytes}{8}$$

The offset of Q-data in the output buffer can be calculated as follows:

$$Q\text{-Data-Offset} = \frac{(\# \text{ of } DataBytes)}{2} + LengthIndicatorDigits$$

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

**Mode:** A-T

**TRACe<1|2>:IQ:DATA:MEMory? <offset samples>,<# of samples>**

This command permits the readout of previously acquired (and frequency response corrected) I/Q data from the memory, with indication of the offset related to the start of measurement and with indication of the number of measurement values. Therefore a previously acquired data set can be read out in smaller portions. The maximum amount of available data depends on the settings of command TRACe:IQ:SET, the output format on the settings in the FORMat – subsystem.

**Note:** The command requires that all response data are read out completely before the instrument accepts further commands.

If there are not I/Q data available in memory because the corresponding measurement had not been started, the command will cause a Query Error.

**Parameter:** <offset samples> Offset of the values to be read related to the start of the acquired data.  
Value range: 0 to <# of samples> - 1, with <# of samples> being the value indicated with command TRACe:IQ:SET.

<# of samples> Number of measurement values to be read.  
Value range: 1 to <# of samples> - <offset samples> with <# of samples> being the value indicated with command TRACe:IQ:SET.

**Examples:**

```
"TRAC:IQ:STAT ON"           'Enable acquisition of I/Q data
"TRAC:IQ:SET NORM,10MHz,32MHz,EXT,POS,100,4096"
                               'Configure measurement:
                               'Filter type:Normal
                               'RBW:10 MHz
                               'Sample Rate:32 MHz
                               'Trigger Source:External
                               'Trigger Slope:Positive
                               'Pretrigger Samples:100
                               '# of Samples:4096
"INIT;*WAI" 'Start measurement and wait for sync
"FORMatREAL,32"           'Determine output format
'Read results:
"TRAC:IQ:DATA:MEM? 0,2048" 'Reads 2048 I/Q data starting at the
                              'beginning of data acquisition
"TRAC:IQ:DATA:MEM? 2048,1024" 'Reads 1024 I/Q data from half of the
                              'recorded data
"TRAC:IQ:DATA:MEM? 100,512" 'Reads 512 I/Q data starting at the
                              'trigger point
                              '(<Pretrigger Samples> was 100)
```

**Return values:**

The result values are scaled linear in unit *Volt* and correspond to the voltage at the RF input of the instrument.

The format of the output buffer corresponds to the command TRACe: IQ:DATA?

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

**Mode:** A-T

**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 MHz in 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.

Value range: 1 to 523776 (=  $512*1024 - 512$ )

**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

**Mode:** A-T

**TRACe<1|2>:IQ:SRATe** 15.625kHz to 32MHz

This command sets the sampling rate for the I/Q data acquisition. Thus the sample rate can be modified without affecting the other settings.

**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

**Example:** "TRAC:IQ:SRAT 4MHZ"

**Characteristics:** \*RST value: 32 MHz  
SCPI: device specific

**Mode:** A-T

**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

**Mode:** A-T

**TRACe<1|2>:IQ:SYNChronize[:STATe] ON|OFF**

If this command is switched on, the start of I/Q measured-data acquisition will be synchronized with the trigger time. For this command to operate, I/Q measured-data acquisition must be switched on before with `TRAC:IQ ON`, and the sampling rate for the signal measured must be 32 MHz.

Synchronization ensures that measured-data acquisition is phase-locked to the trigger signal. Phase synchronism is necessary for I/Q averaging to function properly.

**Note:**

*This function is not supported with sampling rates <> 32 MHz.*

**Example:**

```

TRAC:IQ ON           'Switch on I/Q measured-data acquisition
TRAC:IQ:SYNC ON     'Switch on synchronization of I/Q measured-data
                    'acquisition with trigger time
TRAC:IQ:SET NORM,10MHz,32MHz,EXT,POS,0,2048
                    2048 I/Q values are to be read
                    starting from the trigger time.
                    Filter type:NORMAL (analog)
                    RBW:10 MHz
                    Sampling rate:32 MHz
                    Trigger:external
                    Trigger edge:positive
TRAC:IQ:AVER ON     'Switch on averaging of the I/Q measurement data
TRAC:IQ:AVER:COUN 10
                    'Selects averaging over 10 data sets
TRAC:IQ:DATA?      'Start measurement and read averaged data

```

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

**Operating mode:** A-Z

This command is available only from firmware version 1.40.

**TRACe<1|2>:IQ:ONLine[:STATe] ON|OFF**

This command enables/disables the online output of I/Q measurement data via the optional LVDS interface (B17) on the rear panel of the instrument. As a precondition the I/Q data acquisition must be switched on in advance via command `TRAC:IQ ON`. The settings required for the I/Q data acquisition are configured using the command `TRAC:IQ:SET`.

Single shot measurements (default setting) or continuous measurement data output can be selected using `INIT:CONT OFF` or `INIT:CONT ON` respectively. Single shot measurements are started with `TRAC:IQ:DATA?` or `INIT`.

The format of the output data is described in detail in chapter "Option FSP-B17 – IQ Online Interface" in the manual operation part of this manual.

Please note the following restrictions for sampling rates > 2 MHz:

- ▶ The internal correction of the frequency response of the decimation filters is not available for sampling rates > 2 MHz.
- ▶ For single shot measurements additional measurement data are acquired that exceed the settings of the `TRAC:IQ:SET` command. The number of samples (each I and Q) acquired before the trigger event and after the specified number of samples is indicated in the following table:

| Sampling rate | Additional samples before the trigger event | Additional samples after the specified # of samples |
|---------------|---|---|
| ≤ 2 MHz       | 0   | 0   |
| 4 MHz         | 15  | 31  |
| 8 MHz         | 14  | 29  |
| 16 MHz        | 68  | 137   |
| 32 MHz        | 70  | 141   |

**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:**

|                             |   |
|-----------------------------|---|
| <code>TRAC:IQ ON</code>     | 'Switches the I/Q data acquisition on.          |
| <code>TRAC:IQ:ONL ON</code> | 'Switches the online output of the I/Q data on. |
| <code>INIT:CONT ON</code>   | 'Selects continuous measurement data output.    |

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

**Mode:** A-T

**TRACe<1|2>:IQ:ONLine:SFACtor:I?**  
**TRACe<1|2>:IQ:ONLine:SFACtor:Q?**

The query command reads the scaling factors valid for the current device setup for the measured I/Q data. The scaling factors differ for the I and the Q data depending on the device setup selected.

The I/Q data, which is output via the LVDS interface of option B17 (value<sub>LVDS</sub>), consists of the raw data from the A/D converter. The physical measurement data value<sub>Volt</sub> in volts is calculated from the read values of the LVDS interface value<sub>LVDS</sub> via the scaling factor Sfact according to the following formulae for the I and the Q path:

```

if (ValueLVDS[I] < 4096)
    ValueVolt[I] = ValueLVDS[I] * SFact[I]
else
    ValueVolt[I] = (ValueLVDS[I] - 8192) * SFact[I]

if (ValueLVDS[Q] < 4096)
    ValueVolt[Q] = ValueLVDS[Q] * SFact[Q]
else
    ValueVolt[Q] = (ValueLVDS[Q] - 8192) * SFact[Q]

```

**Example:**

```

TRAC: IQ ON           'Switches on acquisition of I/Q data.
TRAC: IQ:ONL ON      Switches on the online output of I/Q measurement
                      data.
TRAC: IQ:ONL:SFAC:I? 'Reads out the currently valid scaling factor for
                      'I data
TRAC: IQ:ONL:SFAC:Q? 'Reads out the currently valid scaling factor for
                      'Q data

```

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

**Mode:** A-Z

## 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><br>[:SEQuence]<br>:SOURce | IMMediate   EXTernal   VIDeo  <br>IFPower   RFPower   AF   AM  <br>FM |      | AF only with option FS-K7   |
| :LEVel                                 |   |      |                             |
| :AM                                    | <numeric_value>   | DBM  | Option FS-K7 FM Demodulator |
| :FM                                    | <numeric_value>   | HZ   | Option FS-K7 FM Demodulator |
| :HOLDoff                               | <numeric_value>   | PCT  |                             |
| :SLOPe                                 | POSitive NEGative   | S    |                             |
| :SYNChronize                           |   | --   |                             |
| :ADJust                                |   |      | Option FS-K5                |
| :EXTernal                              | <numeric_value>   | s    |                             |
| :IFPower                               | <numeric_value>   | s    |                             |
| :RFPower                               | <numeric_value>   | s    |                             |

**TRIGger<1|2>[:SEQuence]:SOURce** IMMediate | EXTernal | VIDeo | IFPower | AF | FM | AM

This command selects the trigger source for the start of a sweep.

**Note:** This command is not available during GSM measurements. The trigger source selection has to be done with the command TRIGger<1|2>[:SEQuence]:SYNChronize:ADJust..

The selection RFPower or TV is only available with option FSP-B6 (TV and RF Trigger).

The selection AF, AM or FM is only available with option FS-K7 (FM Demodulator).

**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 (not available for FM DEMOD mode).
- IFPower = the next measurement is triggered by the detection of a signal at the instrument IF (10 MHz bandwidth)
- RFPower = the next measurement is triggered by the detection of a signal at the instrument RF (80 MHz bandwidth)
- TV = the next measurement is triggered by the detection of a TV signal according to the settings of the TRIGger:SEQuence:VIDeo-subsystem (not available for FM DEMOD mode)

**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:SOUR EXT" 'Selects the external trigger input as source of the trigger signal

**Characteristics:** \*RST value: IMMEDIATE  
SCPI: conforming

**Mode:** A, FM

**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

**Mode:** FM

This command is only available with option FS-K7 (FM Demodulator) installed.

**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

**Mode:** FM

This command is only available with option FS-K7 (FM Demodulator) installed.

**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

**Mode:** all, except for FM



**TRIGger<1|2>[:SEQuence]:HOLDoff** -100 to 100s

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

**Mode:** all

**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

**Mode:** all

**TRIGger<1|2>[:SEQuence]:SYNChronize:ADJust:EXTernal** -460µs to 100s

This command is a combination of 2 commands:

For one, the 'Extern' GSM trigger is selected. For all GSM measurements requiring a trigger signal and for which an external trigger is possible, the EXTernal trigger setting is used. If an external trigger is not possible, the IMMEDIATE trigger setting is used (see manual of option).

For another, the correction value for the time offset of the external trigger from the beginning of the first active slot is defined (see manual of option).

This correction value is needed in order to establish an exact time reference between the trigger event and the beginning of the slot if there is no midamble triggering. The correction value for the DUT in question can be determined in the GENERAL SETTINGS menu with the TRIGGER OFFSET softkey.

This command is available only if GSM MS Analyzer (FS-K5) application firmware is installed.

**Note:** - If the analyzer is set to external trigger when the GSM MS mode is activated (using INST:SEL MGSM), the GSM trigger 'Extern' is used. If it is set to RF power, the GSM trigger 'RF Power' is used; otherwise the GSM trigger 'IF Power' (default).

- When the instrument switches over from GSM MS mode to analyzer mode, the GSM MS trigger setting is maintained, i.e. IF power, RF power, or external trigger.

**Example:** "INST MGSM" 'Switches the instrument to GSM MS mode  
"TRIG:SYNC:ADJ:EXT 200us" 'Selects 'Extern' GSM trigger and a GSM  
'trigger offset of 200 µs between the  
'external trigger and the beginning of the slot.

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

**Mode:** MS

**TRIGger<1|2>[:SEQuence]:SYNChronize:ADJust:IFPower** -460µs to 100s

This command is a combination of 2 commands:

For one, the 'IF Power' GSM trigger is selected. For all GSM measurements for which an IF power trigger is possible, the `IFPower` trigger setting is used. If an IF power trigger is not possible, the `IMMEDIATE` trigger setting is used (see manual of option).

For another, the correction value for the time offset of the IF power trigger from the beginning of the first active slot is defined (see manual of option). This correction value is needed in order to establish an exact time reference between the trigger event and the beginning of the slot if there is no midamble triggering. The correction value for the DUT in question can be determined in the `GENERAL SETTINGS` menu with the `TRIGGER OFFSET` softkey.

This command is available only if GSM MS Analyzer application firmware (FS-K5) is installed.

**Note:** When entering the option GSM MS Analyzer (with `INST:SEL MGSM`), the following GSM Trigger selection is made:

If the Analyzer trigger source is 'IF POWER trigger' the GSM trigger 'IF POWER' is selected.

If the Analyzer trigger source is 'Extern trigger' the GSM trigger 'Extern' is selected.

If the Analyzer trigger source is 'RF POWER trigger' the GSM trigger 'RF POWER' is selected.

Otherwise the (default) GSM Trigger 'IF POWER' is selected.

When switching from GSM MS mode to Analyzer mode, the GSM MS trigger setting is maintained, i.e. IF power if 'IF Power' was set before, RF power if 'RF Power' was set before and external trigger, if 'Extern' was set before.

**Example:**

|                                       |  |
|---------------------------------------|--|
| <code>"INST MGSM"</code>              | 'Switches the instrument to GSM MS mode  |
| <code>"TRIG:SYNC:ADJ:IFP 20us"</code> | 'Selects 'IF Power' GSM trigger and a GSM trigger offset of 20 µs between the IF power trigger and the beginning of the slot |

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

**Mode:** MS

**TRIGger[:SEQuence]:SYNChronize:ADJust:RFPower** -460µs to 100s

This command is a combination of 2 commands:

For one, the 'RF Power' GSM trigger is selected. For all GSM measurements for which an RF power trigger is possible, the `RFPower` trigger setting is used. If an RF power trigger is not possible, the `IMMEDIATE` trigger setting is used (see table of triggers in FS-K5 manual)

For another, the correction value for the time offset of the RF power trigger from the beginning of the first active slot is defined. This correction value is needed in order to establish an exact time reference between the trigger event and the beginning of the slot if there is no midamble triggering. The correction value for the DUT in question can be determined in the `GENERAL SETTINGS` menu of option FS-K5 with the `TRIGGER OFFSET` softkey.

This command is available only if GSM MS Analyzer application firmware (FS-K5) is installed and if the option FSP-B6 (TV and RF Trigger) is available.

**Note:** When entering the option GSM MS Analyzer (with `INST:SEL MGSM`), the following GSM Trigger selection is made:

If the Analyzer trigger source is 'IF POWER trigger' the GSM trigger 'IF POWER' is selected.

If the Analyzer trigger source is 'Extern trigger' the GSM trigger 'Extern' is selected.

If the Analyzer trigger source is 'RF POWER trigger' the GSM trigger 'RF POWER' is selected.

Otherwise the (default) GSM Trigger 'IF POWER' is selected. When switching from GSM MS mode to Analyzer mode, the GSM MS trigger setting is maintained, i.e. IF power if 'IF Power' was set before, RF power if 'RF Power' was set before and external trigger, if 'Extern' was set before.

**Example:**

|                                       |  |
|---------------------------------------|--|
| <code>"INST MGSM"</code>              | 'Switches the instrument to GSM MS mode  |
| <code>"TRIG:SYNC:ADJ:RFP 20us"</code> | 'Selects 'RF Power' GSM trigger and a GSM trigger offset of 20 µs between the RF power trigger and the beginning of the slot |

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

**Mode:** MS

## 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><br>:POWer | DBM   V   A   W  <br>DBPW   WATT  <br>DBUV   DBMV   VOLT  <br>DBUA   AMPere |      |         |

**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.

**Note:** This command is not available in GSM MS mode. In GSM MS mode, the unit is fixed, i.e. dBm (for power measurements) or deg (for phase error measurements).

**Example:** "UNIT:POW DBUV" 'Sets the power unit for screen A to dBm.

**Characteristics:** \*RST value: DBM  
SCPI: conforming

**Mode:** A

## Supported GPIB Commands of the HP 8590 Series

The FSU analyzer family has the capability to support a subset of the HP 8590 GPIB command set. Due to the differences in system architecture and features this can only be a limited support that comes to its limits where the corresponding parameters differ in their value ranges or default values or where hardware dependencies have to be taken into account. Nevertheless in many cases the subset supported by the FSU will make the adaption of existing GPIB programs for use with the FSU easier.

### Supported Command Subset

| Function Category        | Function                   | HP 8590 Command | Supported Subset  | Known differences   |
|--------------------------|----------------------------|-----------------|---|---|
| <b>Amplitude</b>         |                            |                 |   |   |
|                          | Attenuation                | AT              | AT <numeric_value> DB<br>AT DN<br>AT UP<br>AT AUTO<br>AT?                                 | AT DN/UP:<br>Stepsize if option FSU-B25 is present.<br>AT AUTO:<br>Dependency calculation                           |
|                          | Amplitude Units            | AUNITS          | AUNITS DBM   DBMV   DBUV<br>AUNITS?   |   |
|                          | Input Impedance            | INZ             | INZ 75<br>INZ 50<br>INZ?  |   |
|                          | Amplitude Scale Log        | LG              | LG <numeric_value> DB<br>LG?  |   |
|                          | Amplitude Scale Lin        | LN              | LN  |   |
|                          | Reference Level            | RL              | RL <numeric_value> DB DM<br>RL DN<br>RL UP<br>RL?   | Stepsize and default value  |
|                          | Reference Level Position   | RLPOS           | RLPOS <numeric_value><br>RLPOS DN<br>RLPOS UP<br>RLPOS?                                   | On the FSU this function affects the Reference Level Position also if tracking generator normalization is inactive. |
|                          | Reference Level Offset     | ROFFSET         | ROFFSET <numeric_value><br>DB<br>ROFFSET?   |   |
| <b>Auxiliary Control</b> |                            |                 |   |   |
|                          | AF Demodulator             | DEMOD           | DEMOD ON OFF AM FM  |   |
|                          | Normalized Reference Level | NRL             | NRL <numeric_value> DB<br>NRL?  | requires Option FSU-B10   |
|                          | Source Normalization       | SRCNORM         | SRCNORM ON OFF<br>SRCNORM 1 0   | requires Option FSU-B10   |
|                          | Source Power Offset        | SRCPOFS         | SRCPOFS <numeric_value><br>DB<br>SRCPOFS DN<br>SRCPOFS UP<br>SRCPOFS?                     | requires Option FSU-B10   |
|                          | Source Power               | SRCPWR          | SRCPWR <numeric_value> DB<br>SRCPWR DN<br>SRCPWR UP<br>SRCPWR ON<br>SRCPWR OFF<br>SRCPWR? | requires Option FSU-B10   |

| Function Category    | Function                      | HP 8590 Command | Supported Subset  | Known differences   |
|----------------------|-------------------------------|-----------------|---|---|
| <b>Bandwidth</b>     |                               |                 |   |   |
|                      | Resolution Bandwidth          | RB              | RB <numeric_value><br>HZ KHZ MHZ GHZ<br>RB DN<br>RB UP<br>RB AUTO<br>RB?        | Value range.<br>Formula for dependent parameters (video bandwidth, sweep time).   |
|                      | Video Bandwidth               | VB              | VB <numeric_value><br>HZ KHZ MHZ GHZ<br>VB DN<br>VB UP<br>VB AUTO<br>VB?        | Value range.<br>Formula for dependent parameters (sweep time).  |
|                      | Video Bandwidth Ratio         | VBR             | VBR <numeric_value><br>VBR DN<br>VBR UP<br>VBR?                                 | Default value.  |
| <b>Calibration</b>   |                               |                 |   |   |
|                      | Start analyzer self alignment | CAL             | CAL ALL<br>CAL ON<br>CAL OFF  | The CAL commands do not automatically set the command complete bit (Bit 4) in the status byte. An additional DONE is required for that purpose. |
| <b>Configuration</b> |                               |                 |   |   |
|                      | Time Display                  | TIMEDSP         | TIMEDSP ON OFF<br>TIMEDSP 1 0<br>TIMEDSP?                                       |   |
| <b>Display</b>       |                               |                 |   |   |
|                      | Annotation                    | ANNOT           | ANNOT ON OFF<br>ANNOT 1 0<br>ANNOT?   | Only frequency axis annotation is affected.   |
|                      | Threshold                     | TH              | TH <numeric_value> DB DM<br>TH DN<br>TH UP<br>TH ON<br>TH OFF<br>TH AUTO<br>TH? | Default value is different.<br>Threshold line has no effect on trace data (TH AUTO is always active).   |
| <b>Frequency</b>     |                               |                 |   |   |
|                      | Center Frequency              | CF              | CF <numeric_value><br>HZ KHZ MHZ GHZ<br>CF UP<br>CF DN<br>CF?                   | Default value.<br>Range.<br>Stepsize.   |
|                      | Start Frequency               | FA              | FA <numeric_value><br>HZ KHZ MHZ GHZ<br>FA UP<br>FA DN<br>FA?                   | Range.<br>Stepsize.   |
|                      | Stop Frequency                | FB              | FB <numeric_value><br>HZ KHZ MHZ GHZ<br>FB UP<br>FB DN<br>FB?                   | Default value.<br>Range.<br>Stepsize.   |
|                      | Frequency Offset              | FOFFSET         | FOFFSET <numeric_value><br>HZ KHZ MHZ GHZ<br>FOFFSET?                           |   |

| Function Category  | Function                     | HP 8590 Command | Supported Subset   | Known differences   |
|--------------------|------------------------------|-----------------|--|---|
|                    | CF Step Size                 | SS              | SS <numeric_value><br>HZ KHZ MHZ GHZ<br>SS DN<br>SS UP<br>SS AUTO<br>SS?       | Stepsize.   |
| <b>Information</b> |                              |                 |  |   |
|                    | Clear all status bits        | CLS             | CLS  |   |
|                    | Service Request Bit mask     | RQS             | RQS  | Bits supported:<br>1 (Units key pressed)<br>2 (End of Sweep)<br>3 (Device error)<br>4 (Command complete)<br>5 (Illegal command)   |
|                    | Status byte query            | STB             | STB  | Status bits will be mapped as stated under RQS<br><br><i>Note:</i><br><i>Bit 2 and 4 will always be set together if "Command complete" or "End of Sweep" is detected. The FSU cannot distinguish between these two conditions. Additionally these bits cannot be used for synchronisation on the sweep end in continuous sweep mode.</i><br><br>The status byte obtained by a serial poll will always be conforming to IEEE 488.2 / SCPI. |
| <b>Marker</b>      |                              |                 |  |   |
|                    | Marker Frequency Query       | MF              | MF<br>MF?  |   |
|                    | Set Marker Frequency         | MKF             | MKF <numeric_value> HZ KHZ <br>MHZ GHZ<br>MKF?                                 |   |
|                    | Marker Amplitude             | MKA             | MKA?   |   |
|                    | Select the active marker     | MKACT           | MKACT 1<br>MKACT?  | Only marker 1 is supported as the active marker.  |
|                    | N dB Down                    | MKBW            | MKBW <numeric_value><br>MKBW ON<br>MKBW OFF                                    | Different default value.  |
|                    | Center Freq = Marker Freq    | MKCF            | MKCF   |   |
|                    | Delta Marker                 | MKD             | MKD <numeric_value>HZ KHZ <br>MHZ GHZ<br>MKD DN<br>MKD UP<br>MKD ON<br>MKD OFF | Only Deltamarker 1 is supported.<br>Different default value.<br>Different stepsize.   |
|                    | Frequency Counter            | MKFC            | MKFC ON OFF<br>MKFC 1 0  |   |
|                    | Frequency Counter Resolution | MKFCR           | MKFCR <numeric_value><br>HZ KHZ <br>MHZ GHZ<br>MKFCR DN<br>MKFCR UP<br>MKFCR?  |   |

| Function Category     | Function                  | HP 8590 Command | Supported Subset  | Known differences  |
|-----------------------|---------------------------|-----------------|---|--|
|                       | Marker -> Min             | MKMIN           | MKMIN   |  |
|                       | Normal Marker             | MKN             | MKN <numeric_value> HZ KHZ <br>MHZ GHZ<br><br>MKN DN<br>MKN UP<br>MKN ON<br>MKN OFF<br>MKN? |  |
|                       | Noise Measurement         | MKNOISE         | MKNOISE ON OFF<br>MKNOISE 1 0<br>MKNOISE?   |  |
|                       | Marker off                | MKOFF           | MKOFF<br>MKOFF ALL  |  |
|                       | Marker Search             | MKPK            | MKPK<br>MKPK HI<br>MKPK NH<br>MKPK NR<br>MKPK NL  |  |
|                       | Peak Excursion            | MKPX            | MKPX <numeric_value> DB<br>MKPX DN<br>MKPX UP<br>MKPX?                                      | Different stepsize.  |
|                       | Ref Level = Marker Level  | MKRL            | MKRL  |  |
|                       | CF Stepsize = Marker Freq | MKSS            | MKSS  |  |
|                       | Marker to Trace           | MKTRACE         | MKTRACE TRA TRB TRC   |  |
|                       | Signal Track              | MKTRACK         | MKTRACK ON OFF<br>MKTRACK 1 0<br>MKTRACK?   |  |
| <b>Preset</b>         |                           |                 |   |  |
|                       | Instrument preset         | IP              | IP  | Does not reset the status reporting information.*RST   |
| <b>Printer</b>        |                           |                 |   |  |
|                       | Hardcopy                  | PRINT           | PRINT   |  |
| <b>Program Flow</b>   |                           |                 |   |  |
|                       | Stop previous function    | ABORT           | ABORT   | Does not automatically set the command complete bit (Bit 4) in the status byte. An additional DONE is required for that purpose. |
| <b>Recall or Save</b> |                           |                 |   |  |
|                       | Recall analyzer state     | RCLS            | RCLS <numeric_value>  |  |
|                       | Save analyzer state       | SAVES           | SAVES <numeric_value>   |  |

| Function Category            | Function  | HP 8590 Command | Supported Subset  | Known differences  |
|------------------------------|---|-----------------|---|--|
| <b>Span</b>                  |   |                 |   |  |
|                              | Full Span                                       | FS              | FS  | Full span value.   |
|                              | Frequency Span value                            | SP              | SP <numeric_value><br>SP DN<br>SP UP<br>SP?                     | Default value.<br>Stepsize.<br>Formula for dependent values (Resolution Bandwidth, Video Bandwidth, Sweeptime) |
| <b>Sweep</b>                 |   |                 |   |  |
|                              | Continuous Sweep Mode                           | CONTS           | CONTS   |  |
|                              | Single Sweep                                    | SNGLS           | SNGLS   |  |
|                              | Gated Sweep On/Off                              | GATE            | GATE ON OFF<br>GATE 1 0   |  |
|                              | Gate Mode<br>Edge/Level                         | GATECTL         | GATECTL EDGE LEVEL<br>GATECTL?                                  |  |
|                              | Gate delay                                      | GD              | GD <numeric_value> US MS SC<br>GD DN<br>GD UP<br>GD?            |  |
|                              | Gate length                                     | GL              | GL <numeric_value> US MS SC<br>GL DN<br>GL UP<br>GL?            |  |
|                              | Gate polarity                                   | GP              | GP POS NEG<br>GP?   |  |
|                              | Sweep time value                                | ST              | ST <numeric_value> US MS SC<br>ST DN<br>ST UP<br>ST AUTO<br>ST? | SWE:TIME<br>Valid values.<br>Range.<br>Stepsize  |
| <b>Synchroni-<br/>zation</b> |   |                 |   |  |
|                              | Synchronization on end of all previous commands | DONE            | DONE<br>DONE?   |  |
|                              | Start and complete a Full Sweep                 | TS              | TS  | Only available in single sweep mode  |



| Function Category | Function                         | HP 8590 Command | Supported Subset   | Known differences   |
|-------------------|----------------------------------|-----------------|--|---|
| <b>Trace</b>      |                                  |                 |  |   |
|                   | Trace difference w. display line | AMBPL           | AMBPL ON OFF<br>AMBPL 1 0<br>AMBPL?                                  |   |
|                   | Trace Position (Display Line)    | DL              | DL <numeric_value> DB DM<br>DL DN<br>DL UP<br>DL ON<br>DL OFF<br>DL? | The display line function is only supported in terms of trace position on the screen and video trigger level.<br><br>The general display line function does not exist on the FSU.<br><br>ON/OFF are accepted, but ignored; the line is automatically switched on/off with AMBPL ON/OFF.<br><br>Its default position is different. |
|                   | Trace Blank                      | BLANK           | BLANK TRA TRB TRC  |   |
|                   | Trace Copy                       | MOV             | MOV<br>TRA TRB TRC,TRA TRB TRC                                       |   |
|                   | Trace Clear/Write                | CLRW            | CLRW TRA TRB TRC   |   |
|                   | Detector selection               | DET             | DET POS SMP NEG<br>DET?  | DET? returns SAMP instead of SMP on the FSU.<br><br>DET not automatically set the command complete bit (Bit 4) in the status byte. An additional DONE is required for that purpose.   |
|                   | Trace Max Hold                   | MXMH            | MXMH TRA TRB   |   |
|                   | Trace Min Hold                   | MINH            | MINH TRC   |   |
|                   | Video Averaging                  | VAVG            | VAVG TRA TRB TRC   |   |
|                   | Trace View                       | VIEW            | VIEW TRA TRB TRC   |   |
| <b>Trigger</b>    |                                  |                 |  |   |
|                   | Trigger Mode                     | TM              | TM FREE VID EXT<br>TM?   |   |
|                   | Start new sweep                  | TS              | TS   |   |

## Differences in Status Reporting

The major difference in status reporting between the FSU and the HP 8590 analyzers is that the FSU has a hierarchical status reporting system conforming to IEEE 488.2/SCPI, whereas the HP 8590 series has a very simple status reporting system that consists simply of the bit patterns in the status byte.

As described above, for the RQS and STB command the bit mapping of the HP 8590 analyzers is supported as described in the table below. For the status byte returned by a serial poll the bit mapping is different on the FSU. In detail this means that all of the bits enabled by the RQS command will be mapped onto **bit 5** of the Service Request Status Byte of the FSU.

This mechanism makes sure that a Service Request is generated as soon as one of the conditions enabled becomes true.

What the Service Request Routine should do rather than evaluating 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    | Bit set in the status byte on serial poll |
|-----------------------|---|
| 1 (Units key pressed) | 5 (Event Status Register Summary Bit)     |
| 2 (End of Sweep)      | 5 (Event Status Register Summary Bit)     |
| 3 (Device Error)      | 5 (Event Status Register Summary Bit)     |
| 4 (Command Complete)  | 5 (Event Status Register Summary Bit)     |
| 5 (Illegal Command)   | 5 (Event Status Register Summary Bit)     |

What needs to be noted is that the FSU will notify any key pressed on the frontpanel rather than only the unit keys if bit 1 is set by the RQS command.

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 FSU 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 FSP 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 FSP and the FSE families of instruments. FSE alone in column "Devices" denotes the instrument families FSE, FSIQ, FSET and ESIB, unless otherwise noted in column "Notes".

| Devices   | Command                                | Parameter              | Notes   |
|-----------|--|------------------------|---|
| FSU + FSE | *CAL?                                  |                        | FSU: executes total calibration<br>FSE: executes short calibration  |
| FSU + FSE | *CLS                                   |                        |   |
| FSU + FSE | *ESE                                   |                        |   |
| FSU + FSE | *ESR?                                  |                        |   |
| FSU + FSE | *IDN?                                  |                        | model indicator and version index is different for FSU and FSE  |
| FSU + FSE | *IST?                                  |                        |   |
| FSU + FSE | *OPC?                                  |                        |   |
| FSU + FSE | *OPT?                                  |                        | list of available options is slightly different for FSU and FSE, but equally available options have equal names           |
| FSU + FSE | *PCB                                   |                        |   |
| FSU + FSE | *PRE                                   |                        |   |
| FSU + FSE | *PSC                                   |                        |   |
| FSU + FSE | *RST                                   |                        | instrument settings are slightly different for FSU and FSE due to different instrument specs                              |
| FSU + FSE | *SRE                                   |                        |   |
| FSU + FSE | *STB?                                  |                        |   |
| FSU + FSE | *TRG                                   |                        | FSU starts measurement in active screen<br>FSE: starts measurement in both screens (split screen mode)                    |
| FSU + FSE | *TST?                                  |                        |   |
| FSU + FSE | *WAI                                   |                        |   |
| FSU + FSE | ABORT                                  |                        |   |
| FSE       | CALCulate:LiMit:CATalog?               |                        | not available in FSU  |
| FSU       | CALCulate:STATistics:APD[:STATe]       | ON   OFF               | new function for FSU  |
| FSU       | CALCulate:STATistics:CCDF[:STATe]      | ON   OFF               | new function for FSU  |
| FSU       | CALCulate:STATistics:NSAMples          | 100 to 1E9             | new function for FSU  |
| FSU       | CALCulate:STATistics:PRESet            |                        | new function for FSU  |
| FSU       | CALCulate:STATistics:Result<1...3>?    | MEAN PEAK CFACtor  ALL | new function for FSU  |
| FSU       | CALCulate:STATistics:SCALE:AUTO        | ONCE                   | new function for FSU  |
| FSU       | CALCulate:STATistics:X:RANGE           | -10dB to 200dB         | new function for FSU  |
| FSU       | CALCulate:STATistics:X:RLEVel          | -130dBm to 30dBm       | new function for FSU  |
| FSU       | CALCulate:STATistics:Y:LOWer           | -1E-9 to 0.1           | new function for FSU  |
| FSU       | CALCulate:STATistics:Y:UPPer           | -1E-8 to 1.0           | new function for FSU  |
| FSE       | CALCulate<1 2>:CTHReshold              | MIN to MAX             | not available in FSU  |
| FSE       | CALCulate<1 2>:CTHReshold:STATe        | ON   OFF               | not available in FSU  |
| FSU       | 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 4 markers and 4 deltamarkers; the most recently used marker serves as the reference marker for all deltamarkers |

| Devices   | Command  | Parameter  | Notes   |
|-----------|--|--|---|
| FSU + FSE | CALCulate<1 2>:DELTamarker<1...4>:FUNctioN:FIXed:RPOint:X        | <numeric_value>  | FSU: marker 1 can be moved independently from the reference point<br>FSE: the marker and the reference point are linked to each other   |
| FSU + FSE | CALCulate<1 2>:DELTamarker<1...4>:FUNctioN:FIXed:RPOint:Y        | <numeric_value>  | FSU: marker 1 can be moved independently from the reference point;<br>FSE: the marker and the reference point are linked to each other  |
| FSU + FSE | CALCulate<1 2>:DELTamarker<1...4>:FUNctioN:FIXed:RPOint:Y:OFFSet | <numeric_value>  |   |
| FSU       | CALCulate<1 2>:DELTamarker<1...4>:FUNctioN:FIXed:RPOint:MAX:PEAK |  | new function for FSU  |
| FSU + FSE | CALCulate<1 2>:DELTamarker<1...4>:FUNctioN:FIXed[:STATe]         | ON   OFF   |   |
| FSU + FSE | CALCulate<1 2>:DELTamarker<1...4>:FUNctioN:PNOise:RESult?        |  |   |
| FSU + FSE | CALCulate<1 2>:DELTamarker<1...4>:FUNctioN:PNOise[:STATe]        | ON   OFF   |   |
| FSE       | CALCulate<1 2>:DELTamarker<1...4>:MAXimum:APEak                  |  | not available for FSU   |
| FSU + FSE | CALCulate<1 2>:DELTamarker<1...4>:MAXimum:LEFT                   |  |   |
| FSU + FSE | CALCulate<1 2>:DELTamarker<1...4>:MAXimum:NEXT                   |  |   |
| FSU + FSE | CALCulate<1 2>:DELTamarker<1...4>:MAXimum:RIGHT                  |  |   |
| FSU + FSE | CALCulate<1 2>:DELTamarker<1...4>:MAXimum[:PEAK]                 |  |   |
| FSU + FSE | CALCulate<1 2>:DELTamarker<1...4>:MINimum:LEFT                   |  |   |
| FSU + FSE | CALCulate<1 2>:DELTamarker<1...4>:MINimum:NEXT                   |  |   |
| FSU + FSE | CALCulate<1 2>:DELTamarker<1...4>:MINimum:RIGHT                  |  |   |
| FSU + FSE | CALCulate<1 2>:DELTamarker<1...4>:MINimum[:PEAK]                 |  |   |
| FSU + FSE | CALCulate<1 2>:DELTamarker<1...4>:MODE                           | ABSolute   RELative  |   |
| FSE       | CALCulate<1 2>:DELTamarker<1...4>:STEP:AUTO                      | ON   OFF   | not available for FSU   |
| FSE       | CALCulate<1 2>:DELTamarker<1...4>:STEP[:INCRement]               | <numeric_value>  | not available for FSU   |
| FSU + FSE | CALCulate<1 2>:DELTamarker<1...4>:TRACe                          | 1 to 3   | FSU: 3 traces are available per screen;<br>FSE: 4 traces are available in full screen mode and 2 traces per screen in split screen mode |
| FSU + FSE | CALCulate<1 2>:DELTamarker<1...4>:X                              | 0 to MAX (frequency   sweep time)  | unit 'SYM' is not available for FSU   |
| FSU + FSE | CALCulate<1 2>:DELTamarker<1...4>:X:RELative                     |  |   |
| FSU + FSE | CALCulate<1 2>:DELTamarker<1...4>:Y?                             |  |   |
| FSU + FSE | CALCulate<1 2>:DELTamarker<1...4>[:STATe]                        | ON   OFF   |   |
| FSU + FSE | CALCulate<1 2>:DLINe<1 2>  | MIN to MAX   |   |
| FSU + FSE | CALCulate<1 2>:DLINe<1 2>:STATe                                  | ON   OFF   |   |
| FSE       | CALCulate<1 2>:FEED  | 'XTIM:DDEM:MEAS'  <br>'XTIM:DDEM:REF'  <br>'XTIM:DDEM:ERR:MPH'  <br>'XTIM:DDEM:ERR:VECT'  <br>'XTIM:DDEM:SYMB'  <br>'XTIM:AM'   'XTIM:FM'  <br>'XTIM:PM'  <br>'XTIM:AMSummary'  <br>'XTIM:FMSummary'  <br>'XTIM:PMSummary'  <br>'TCAP' | not available for FSU   |
| FSET      | CALCulate<1 2>:FEED  | 'XTIM:DDEM:MEAS'  <br>'XTIM:DDEM:REF'  <br>'XTIM:DDEM:ERR:MPH'  <br>'XTIM:DDEM:ERR:VECT'  <br>'XTIM:DDEM:SYMB'  <br>'TCAP'   | not available for FSU   |
| FSU + FSE | CALCulate<1 2>:FLINe<1 2>  | 0 to fmax  |   |
| FSU + FSE | CALCulate<1 2>:FLINe<1 2>:STATe                                  | ON   OFF   |   |
| FSE       | CALCulate<1 2>:FORMat  | MAGNitude   PHASe  <br>UPHase   RIMag  <br>FREQuency   IEYE   QEYE  <br>TEYE   FEYE   COMP  <br>CONS   | not available for FSU   |
| FSE       | CALCulate<1 2>:FSK:DEVIation:REFerence                           | <numeric value>  | not available for FSU   |

## Comparison of FSU and FSE Commands

FSU

| Devices   | Command   | Parameter                           | Notes   |
|-----------|---|-------------------------------------|---|
| FSE       | CALCulate<1 2>:LIMit<1...8>:ACPoweR:ACHannel                      | 0 to 100 DB,<br>0 to 100 DB         | compatible to<br>CALCulate<1 2>:LIMit<1...8>:<br>ACPoweR:ACHannel<br>[:RELative] of FSU<br>not available for FSET             |
| FSU       | CALCulate<1 2>:LIMit<1...8>:ACPoweR:ACHannel:ABSolute             | -200 to 200 DBM,<br>-200 to 200 DBM | new function for FSU  |
| FSU       | CALCulate<1 2>:LIMit<1...8>:ACPoweR:ACHannel:ABSolute:STATe       | ON   OFF                            | new function for FSU  |
| FSU + FSE | CALCulate<1 2>:LIMit<1...8>:ACPoweR:ACHannel:RESUlt?              |                                     |   |
| FSE       | CALCulate<1 2>:LIMit<1...8>:ACPoweR:ACHannel:STATe                | ON   OFF                            | compatible to<br>CALCulate<1 2>:LIMit<1...8>:<br>ACPoweR:ACHannel[:RELativ<br>e]:STATe of FSU<br>not available for FSET       |
| FSU       | CALCulate<1 2>:LIMit<1...8>:ACPoweR:ACHannel[:RELative]           | 0 to 100 DB,<br>0 to 100 DB         | compatible to<br>CALCulate<1 2>:LIMit<1...8>:<br>ACPoweR:ACHannel of FSE  |
| FSU       | CALCulate<1 2>:LIMit<1...8>:ACPoweR:ACHannel[:RELative]:STATe     | ON   OFF                            | compatible to<br>CALCulate<1 2>:LIMit<1...8>:<br>ACPoweR:ACHannel:STATe<br>of FSE   |
| FSE       | CALCulate<1 2>:LIMit<1...8>:ACPoweR:ALTernate<1 2>                | 0 to 100 DB,<br>0 to 100 DB         | compatible to<br>CALCulate<1 2>:LIMit<1...8>:<br>ACPoweR:ALTernate<1 2><br>[:RELative] of FSU<br>not available for FSET       |
| FSU       | CALCulate<1 2>:LIMit<1...8>:ACPoweR:ALTernate<1 2>:ABSolute       | -200 to 200 DBM,<br>-200 to 200 DBM | new function for FSU  |
| FSU       | CALCulate<1 2>:LIMit<1...8>:ACPoweR:ALTernate<1 2>:ABSolute:STATe | ON   OFF                            | new function for FSU  |
| FSU + 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<br>CALCulate<1 2>:LIMit<1...8>:<br>ACPoweR:ALTernate<1 2><br>[:RELative]:STATe of FSU<br>not available for FSET |
| FSU       | CALCulate<1 2>:LIMit<1...8>:ACPoweR:ALTernate<1 2>[:RELative]     | 0 to 100 DB,<br>0 to 100 DB         | compatible to<br>CALCulate<1 2>:LIMit<1...8>:<br>ACPoweR:ALTernate<1 2> of<br>FSE   |
| FSU       | CALCulate<1 2>:LIMit<1...8>:ACPoweR:ALTernate<1 2>                | ON   OFF                            | compatible to<br>CALCulate<1 2>:LIMit<1...8>:<br>ACPoweR:ALTernate<1 2>:<br>STATe of FSE                                      |
| FSU + FSE | CALCulate<1 2>:LIMit<1...8>:ACPoweR[:STATe]                       | ON   OFF                            |   |
| FSE       | CALCulate<1 2>:LIMit<1...8>:BURSt:POWeR?                          |                                     | not available for FSU, FSET<br>and ESI  |
| FSE       | CALCulate<1 2>:LIMit<1...8>:BURSt:PTEMplate?                      |                                     | not available for FSU, FSET<br>and ESI  |
| FSU + FSE | CALCulate<1 2>:LIMit<1...8>:CLEar[:IMMediate]                     |                                     |   |
| FSU + FSE | CALCulate<1 2>:LIMit<1...8>:COMMeNt                               | <string>                            |   |
| FSU + FSE | CALCulate<1 2>:LIMit<1...8>:CONTRol:DOMain                        | FREQuency   TIME                    |   |
| FSU + FSE | CALCulate<1 2>:LIMit<1...8>:CONTRol:MODE                          | RELative   ABSolute                 |   |
| FSU + FSE | CALCulate<1 2>:LIMit<1...8>:CONTRol:OFFset                        | <numeric value>                     |   |
| FSU + FSE | CALCulate<1 2>:LIMit<1...8>:CONTRol:SHIFt                         | <numeric_value>                     |   |
| FSE       | CALCulate<1 2>:LIMit<1...8>:CONTRol:SPACing                       | LINear   LOGarithmic                | not available for FSU   |
| FSE       | CALCulate<1 2>:LIMit<1...8>:CONTRol:UNIT[:TIME]                   | S   SYM                             | not available for FSU   |
| FSU + FSE | CALCulate<1 2>:LIMit<1...8>:CONTRol[:DATA]                        | <numeric value>, <numeric<br>value> |   |
| FSU + FSE | CALCulate<1 2>:LIMit<1...8>:COPY                                  | 1 to 8 <name>                       |   |
| FSU + FSE | CALCulate<1 2>:LIMit<1...8>:DELeTe                                |                                     |   |
| FSU + FSE | CALCulate<1 2>:LIMit<1...8>:FAIL?                                 |                                     |   |
| FSU + FSE | CALCulate<1 2>:LIMit<1...8>:LOWer:MARGin                          | <numeric value>                     |   |
| FSU + FSE | CALCulate<1 2>:LIMit<1...8>:LOWer:MODE                            | RELative   ABSolute                 |   |
| FSU + FSE | CALCulate<1 2>:LIMit<1...8>:LOWer:OFFset                          | <numeric value>                     |   |
| FSU + FSE | CALCulate<1 2>:LIMit<1...8>:LOWer:SHIFt                           | <numeric_value>                     |   |
| FSE       | CALCulate<1 2>:LIMit<1...8>:LOWer:SPACing                         | LINear   LOGarithmic                | not available for FSU   |
| FSU + FSE | CALCulate<1 2>:LIMit<1...8>:LOWer:STATe                           | ON   OFF                            |   |
| FSU       | CALCulate<1 2>:LIMit<1...8>:LOWer:THReshold                       | <numeric value>                     | new function for FSU  |

| Devices   | Command   | Parameter   | Notes  |
|-----------|---|---|--|
| FSU + FSE | CALCulate<1 2>:LIMit<1...8>:LOWer[:DATA]                    | <numeric value>   |  |
| FSE       | CALCulate<1 2>:LIMit<1...8>:MARGin                          | 0 to 100DB  | not available for FSU, FSET and ESI  |
| FSU + FSE | CALCulate<1 2>:LIMit<1...8>:NAME                            | 1 to 8 <string>   |  |
| FSE       | CALCulate<1 2>:LIMit<1...8>:SPECTrum:MODulation:EXCeptions? | ARFCn   TXBand   RXBand  COMBined   DCSRx1800   | not available for FSU, FSET and ESI  |
| FSE       | CALCulate<1 2>:LIMit<1...8>:SPECTrum:MODulation:FAILs?      | ARFCn   TXBand   RXBand  COMBined   DCSRx1800   | not available for FSU, FSET and ESI  |
| FSE       | CALCulate<1 2>:LIMit<1...8>:SPECTrum:MODulation?            | ARFCn   TXBand   RXBand  COMBined   DCSRx1800   | not available for FSU, FSET and ESI  |
| FSE       | CALCulate<1 2>:LIMit<1...8>:SPECTrum:SWITChing:FAILs?       |   | not available for FSU, FSET and ESI  |
| FSE       | CALCulate<1 2>:LIMit<1...8>:SPECTrum:SWITChing?             |   | not available for FSU, FSET and ESI  |
| FSE       | CALCulate<1 2>:LIMit<1...8>:SPURious:FAILs?                 | TXBand   OTXBand  RXBand   IDLeband   | not available for FSU, FSET and ESI  |
| FSE       | CALCulate<1 2>:LIMit<1...8>:SPURious?                       | TXBand   OTXBand  RXBand   IDLeband   | not available for FSU, FSET and ESI  |
| FSU + FSE | CALCulate<1 2>:LIMit<1...8>:STATe                           | ON   OFF  |  |
| FSU + FSE | CALCulate<1 2>:LIMit<1...8>:TRACe                           | 1 to 3  | FSU: 3 traces are available per screen<br>FSE: 4 traces are available in full screen mode and 2 traces per screen in split screen mode                                 |
| FSU       | 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 FSU: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 FSU:DBM   DBPW   WATT   DBUV   DBMV   VOLT   DBUA   AMPere   DB   DBUV_M   DBUA_M   DEG   RAD   S   HZ   PCT   UNITLESS |
| FSU + FSE | CALCulate<1 2>:LIMit<1...8>:UPPer:MARGin                    | <numeric value>   |  |
| FSU + FSE | CALCulate<1 2>:LIMit<1...8>:UPPer:MODE                      | RELative   ABSolute   |  |
| FSU + FSE | CALCulate<1 2>:LIMit<1...8>:UPPer:OFFset                    | <numeric value>   |  |
| FSU + FSE | CALCulate<1 2>:LIMit<1...8>:UPPer:SHIFt                     | <numeric_value>   |  |
| FSE       | CALCulate<1 2>:LIMit<1...8>:UPPer:SPACing                   | LINear   LOGarithmic  | not available for FSU  |
| FSU + FSE | CALCulate<1 2>:LIMit<1...8>:UPPer:STATe                     | ON   OFF  |  |
| FSU       | CALCulate<1 2>:LIMit<1...8>:UPPer:THReshold                 | <numeric value>   | new function for FSU   |
| FSU + FSE | CALCulate<1 2>:LIMit<1...8>:UPPer[:DATA]                    | <numeric value>   |  |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:AOFF                           |   |  |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:COUNT                          | ON   OFF  |  |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:COUNT:FREQuency?               |   |  |
| FSU + 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 FSU  |
| FSE       | CALCulate<1 2>:MARKer<1...4>:FUNCTion:ADEMod                |   | not available for FSU and FSET   |
| FSE       | CALCulate<1 2>:MARKer<1...4>:FUNCTion:ADEMod:AM[:RESult]?   | PPEak   MPEak   MIDDLE   RMS  | not available for FSU and FSET   |
| FSE       | CALCulate<1 2>:MARKer<1...4>:FUNCTion:ADEMod:CARRier        |   | not available for FSU and FSET   |

## Comparison of FSU and FSE Commands

FSU

| Devices   | Command   | Parameter   | Notes   |
|-----------|---|---|---|
| FSE       | CALCulate<1 2>:MARKer<1...4>:FUNctIon:ADEMod:FERRor           |   | not available for FSU and FSET  |
| FSE       | CALCulate<1 2>:MARKer<1...4>:FUNctIon:ADEMod:FM               | PPEak   MPEak   MIDDLE   RMS   RDEV   | not available for FSU and FSET  |
| FSE       | CALCulate<1 2>:MARKer<1...4>:FUNctIon:ADEMod:PM               | PPEak   MPEak   MIDDLE   RMS  | not available for FSU and FSET  |
| FSE       | CALCulate<1 2>:MARKer<1...4>:FUNctIon:ADEMod:SINad:RESult?    |   | not available for FSU and FSET  |
| FSE       | CALCulate<1 2>:MARKer<1...4>:FUNctIon:ADEMod:SINad            | ON   OFF  | not available for FSU and FSET  |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:FUNctIon:CENTer                  |   |   |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:FUNctIon:CSTep                   |   |   |
| FSE       | CALCulate<1 2>:MARKer<1...4>:FUNctIon:DDEMod:RESult?          | MERM   MEPK   MEPS   PERM PEPK   PEPS   EVRM   EVPK   EVPS   IQOF   IQIM  ADR   FERR   FEPK   RHO   DEV   FSRM   FSUK   FSUS   DTTS                 | not available for FSU   |
| FSU       | CALCulate<1 2>:MARKer<1...4>:FUNctIon:DEModulation:CONTInuous |   | new function for FSU  |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:FUNctIon:DEModulation:HOLDoff    | 10ms to 1000s   |   |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:FUNctIon:DEModulation:SElect     | AM   FM   |   |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:FUNctIon:DEModulation[:STATe]    | ON   OFF  |   |
| FSU       | CALCulate<1 2>:MARKer<1...4>:FUNctIon:FPEaks[:IMMediate]      | <numeric value>   | new function for FSU  |
| FSU       | CALCulate<1 2>:MARKer<1...4>:FUNctIon:FPEaks:COUNT?           |   | new function for FSU  |
| FSU       | CALCulate<1 2>:MARKer<1...4>:FUNctIon:FPEaks:X?               |   | new function for FSU  |
| FSU       | CALCulate<1 2>:MARKer<1...4>:FUNctIon:FPEaks:Y?               |   | new function for FSU  |
| FSU       | CALCulate<1 2>:MARKer<1...4>:FUNctIon:FPEaks:SORT             | X   Y   | new function for FSU  |
| FSU       | CALCulate<1 2>:MARKer<1...4>:FUNctIon:MDEPth:RESult?          |   | new function for FSU  |
| FSU       | CALCulate<1 2>:MARKer<1...4>:FUNctIon:MDEPth[:STATe]          |   | new function for FSU  |
| FSU       | CALCulate<1 2>:MARKer<1...4>:FUNctIon:MSUMmary?               | <numeric value>, <numeric value>, <numeric value>, <numeric value>  | new function for FSU  |
| FSE       | CALCulate<1 2>:MARKer<1...4>:FUNctIon:MSTep                   |   | not available for FSU   |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:FUNctIon:NDBDown                 | <numeric value>   |   |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:FUNctIon:NDBDown:FREQuency?      |   |   |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:FUNctIon:NDBDown:RESult?         |   |   |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:FUNctIon:NDBDown:STATe           | ON   OFF  |   |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:FUNctIon:NOISe:RESult?           |   |   |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:FUNctIon:NOISe:STATe             | ON   OFF  |   |
| FSE       | CALCulate<1 2>:MARKer<1...4>:FUNctIon:POWer:CFILter           | ON   OFF  | not available for FSU   |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:FUNctIon:POWer:PRESet            | NADC   TETRA   PDC   PHS   CDPD   FWCDma   RWCDma   F8CDma   R8CDma   F19CDma   R19CDma   FW3Gppcdma   RW3Gppcdma   D2CDma   S2CDma   M2CDma   NONE | available standards are compatible to the FSE   |
| FSU       | CALCulate<1 2>:MARKer<1...4>:FUNctIon:POWer:RESult:PHZ        | ON   OFF  | new function for FSU  |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:FUNctIon:POWer:RESult?           | ACPower   CPOWer   OBANdwidth   OBWidth   | CN and CN0 are not available on the FSU<br>ACPower and CPOWer are not available on the FSET |
| FSU       | CALCulate<1 2>:MARKer<1...4>:FUNctIon:POWer:SElect?           | ACPower   CPOWer   OBANdwidth   OBWidth   | CN and CN0 are not available on the FSU   |
| FSE       | CALCulate<1 2>:MARKer<1...4>:FUNctIon:POWer:SElect?           | ACPower   CPOWer   OBANdwidth   OBWidth   CN   CN0  | CN and CN0 are not available on the FSU and FSET  |
| FSET      | CALCulate<1 2>:MARKer<1...4>:FUNctIon:POWer:SElect?           | OBANdwidth   OBWidth  |   |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:FUNctIon:POWer[:STATe]           | OFF   |   |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:FUNctIon:REFerence               |   |   |
| FSE       | CALCulate<1 2>:MARKer<1...4>:FUNctIon:SFACTor                 | (60dB/3dB)   (60dB/6dB)   | not available for FSU   |
| FSE       | CALCulate<1 2>:MARKer<1...4>:FUNctIon:SFACTor:FREQuency?      |   | not available for FSU   |
| FSE       | CALCulate<1 2>:MARKer<1...4>:FUNctIon:SFACTor:RESult?         |   | not available for FSU   |
| FSE       | CALCulate<1 2>:MARKer<1...4>:FUNctIon:SFACTor:STATe           | ON   OFF  | not available for FSU   |
| FSE       | CALCulate<1 2>:MARKer<1...4>:FUNctIon:STARt                   |   | not available for FSU   |

| Devices   | Command   | Parameter           | Notes   |
|-----------|---|---------------------|---|
| FSE       | CALCulate<1 2>:MARKer<1...4>:FUNction:STOP                                  |                     | not available for FSU   |
| FSU       | CALCulate<1 2>:MARKer<1...4>:FUNction:STRack:<br>BANDwidth BWIDth           | 10 Hz to MAX(span)  | new function for FSU.<br>Replaces DISP:FLINE of the FSE.  |
| FSU       | CALCulate<1 2>:MARKer<1...4>:FUNction:STRack:THReshold                      | -330 to +30 dBm     | new function for FSU  |
| FSU       | CALCulate<1 2>:MARKer<1...4>:FUNction:STRack:TRACe                          | 1 to 3              | new function for FSU  |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:FUNction:STRack[:STATe]                        | ON   OFF            |   |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:FUNction:SUMMary:AOFF                          |                     |   |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:FUNction:SUMMary:AVERAge                       | ON   OFF            |   |
| FSE       | CALCulate<1 2>:MARKer<1...4>:FUNction:SUMMary:MAXimum:<br>AVERAge:RESult?   |                     | not available for FSU   |
| FSE       | CALCulate<1 2>:MARKer<1...4>:FUNction:SUMMary:MAXimum:<br>PHOLd:RESult?     |                     | not available for FSU   |
| FSE       | CALCulate<1 2>:MARKer<1...4>:FUNction:SUMMary:MAXimum:<br>RESult?           |                     | not available for FSU   |
| FSE       | CALCulate<1 2>:MARKer<1...4>:FUNction:SUMMary:MAXimum<br>[:STATe]           | ON   OFF            | not available for FSU   |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:FUNction:SUMMary:MEAN:<br>AVERAge:RESult?      |                     |   |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:FUNction:SUMMary:MEAN:PHOLd:R<br>ESult?        |                     |   |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:FUNction:SUMMary:MEAN:RESult?                  |                     |   |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:FUNction:SUMMary:MEAN[:STATe]                  | ON   OFF            |   |
| FSE       | CALCulate<1 2>:MARKer<1...4>:FUNction:SUMMary:MIDDLE:<br>AVERAge:RESult?    |                     | not available for FSU   |
| FSE       | CALCulate<1 2>:MARKer<1...4>:FUNction:SUMMary:MIDDLE:<br>PHOLd:RESult?      |                     | not available for FSU   |
| FSE       | CALCulate<1 2>:MARKer<1...4>:FUNction:SUMMary:MIDDLE: RESult?               |                     | not available for FSU   |
| FSE       | CALCulate<1 2>:MARKer<1...4>:FUNction:SUMMary:MIDDLE [:STATe]               | ON   OFF            | not available for FSU   |
| FSU       | CALCulate<1 2>:MARKer<1...4>:FUNction:SUMMary:MODE                          | ABSolute   RELative | new function for FSU  |
| FSE       | CALCulate<1 2>:MARKer<1...4>:FUNction:SUMMary:MPEak:<br>AVERAge:RESult?     |                     | not available for FSU   |
| FSE       | CALCulate<1 2>:MARKer<1...4>:FUNction:SUMMary:MPEak:<br>PHOLd:RESult?       |                     | not available for FSU   |
| FSE       | CALCulate<1 2>:MARKer<1...4>:FUNction:SUMMary:MPEak: RESult?                |                     | not available for FSU   |
| FSE       | CALCulate<1 2>:MARKer<1...4>:FUNction:SUMMary:MPEak [:STATe]                | ON   OFF            | not available for FSU   |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:FUNction:SUMMary:PHOLd                         | ON   OFF            |   |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:FUNction:SUMMary:PPEak:<br>AVERAge:RESult?     |                     |   |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:FUNction:SUMMary:PPEak:PHOLd:R<br>ESult?       |                     |   |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:FUNction:SUMMary:PPEak:RESult?                 |                     |   |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:FUNction:SUMMary:PPEak[:STATe]                 | ON   OFF            |   |
| FSU       | CALCulate<1 2>:MARKer<1...4>:FUNction:SUMMary:REFERence:<br>AUTO            | ONCE                | new function for FSU  |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:FUNction:SUMMary:RMS:AVERAge:R<br>ESult?       |                     |   |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:FUNction:SUMMary:RMS:PHOLd:<br>RESult?         |                     |   |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:FUNction:SUMMary:RMS:RESult?                   |                     |   |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:FUNction:SUMMary:RMS[:STATe]                   | ON   OFF            |   |
| FSU       | CALCulate<1 2>:MARKer<1...4>:FUNction:SUMMary:SDEVIation:<br>RESult?        |                     | new function for FSU  |
| FSU       | CALCulate<1 2>:MARKer<1...4>:FUNction:SUMMarySDEVIation:<br>AVERAge:RESult? |                     | new function for FSU  |
| FSU       | CALCulate<1 2>:MARKer<1...4>:FUNction:SUMMary:SDEVIation:<br>PHOLd:RESult?  |                     | new function for FSU  |
| FSU       | CALCulate<1 2>:MARKer<1...4>:FUNction:SUMMary:SDEVIation<br>[:STATe]        | ON   OFF            | new function for FSU  |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:FUNction:SUMMary[:STATe]                       | ON   OFF            |   |
| FSU       | CALCulate<1 2>:MARKer<1...4>:FUNction:TOI:RESult?                           |                     | new function for FSU  |
| FSU       | CALCulate<1 2>:MARKer<1...4>:FUNction:TOI[:STATe]                           | ON   OFF            | new function for FSU  |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:FUNction:ZOOM                                  | <numeric value>     | FSU: function uses always<br>marker 1 as its reference<br>marker;<br>FSE: all available markers<br>can be used as a reference<br>marker |



## Comparison of FSU and FSE Commands

FSU

| Devices   | Command  | Parameter                       | Notes  |
|-----------|--|---------------------------------|--|
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:LOEXclude         | ON   OFF                        |  |
| FSE       | CALCulate<1 2>:MARKer<1...4>:MAXimum:APEak     |                                 | not available for FSU  |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:MAXimum:LEFT      |                                 |  |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:MAXimum:NEXT      |                                 |  |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:MAXimum:RIGHT     |                                 |  |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:MAXimum[:PEAK]    |                                 |  |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:MINimum:LEFT      |                                 |  |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:MINimum:NEXT      |                                 |  |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:MINimum:RIGHT     |                                 |  |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:MINimum[:PEAK]    |                                 |  |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:PEXCursion        | <numeric value>                 |  |
| FSE       | CALCulate<1 2>:MARKer<1...4>:READout           | MPHase   RIMaginary             | not available for FSU  |
| FSE       | CALCulate<1 2>:MARKer<1...4>:SCOupled[STATe]   | ON   OFF                        | not available for FSU  |
| FSE       | CALCulate<1 2>:MARKer<1...4>:STEP:AUTO         | ON   OFF                        | not available for FSU  |
| FSE       | CALCulate<1 2>:MARKer<1...4>:STEP[:INCRement]  | <numeric_value>                 | not available for FSU  |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:TRACe             | 1 to 3                          | FSU: 3 traces are available per screen<br>FSE: 4 traces are available in full screen mode and 2 traces per screen in split screen mode                                   |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:X                 | 0 to MAX (frequency sweep time) | additional unit SYM is available for FSE   |
| FSU       | CALCulate<1 2>:MARKer<1...4>:X:SLIMits:LEFT    | 0 to MAX (frequency sweep time) | new function for FSU. Replaces DISP:FLIN and DISP:TLIN commands of the FSE   |
| FSU       | CALCulate<1 2>:MARKer<1...4>:X:SLIMits:RIGHT   | 0 to MAX (frequency sweep time) | new function for FSU. Replaces DISP:FLIN and DISP:TLIN commands of the FSE   |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:X:SLIMits[:STATe] | ON   OFF                        |  |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>:Y?                |                                 |  |
| FSU       | CALCulate<1 2>:MARKer<1...4>:Y:PERCent         | <numeric_value>                 | new function for FSU   |
| FSU + FSE | CALCulate<1 2>:MARKer<1...4>[:STATe]           | ON   OFF                        |  |
| FSU       | CALCulate<1 2>:MATH:MODE                       | LINear   LOGarithmic            | affects all traces on the FSU; therefore the numeric suffix :MATH<1...4> is not allowed for the FSU  |
| FSE       | CALCulate<1 2>:MATH<1...4>:MODE                | LINear   LOGarithmic            | for FSE, only the trace indicated by a numeric suffix is affected  |
| FSU       | CALCulate<1 2>:MATH:POS                        | -100PCT to 200PCT               | new function for FSU; replacement for CALC:RLINe of the FSE  |
| FSU + FSE | CALCulate<1 2>:MATH:STATe                      | ON   OFF                        | for FSU, traces can only be subtracted from trace 1; therefore there is no numeric suffix behind :MATH   |
| FSU + FSE | CALCulate<1 2>:MATH[:EXPRession][:DEFine]      | <expr>                          | for FSU, 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 FSU (replaced by CALC:MATH:POS)  |
| FSE       | CALCulate<1 2>:RLINe:STATe                     | ON   OFF                        | not available for FSU (replaced by CALC:MATH:POS)  |
| FSU + FSE | CALCulate<1 2>:THReshold                       | MIN to MAX                      |  |
| FSU + FSE | CALCulate<1 2>:THReshold:STATe                 | ON   OFF                        |  |
| FSE       | CALCulate<1 2>:TLINe<1 2>                      | 0 to 1000s                      | not available on the FSU; replaced by CALC:SLIMits:LEFT and CALC:SLIMits:RIGHT   |

| Devices      | Command                                      | Parameter  | Notes   |
|--------------|--|--|---|
| FSE          | CALCulate<1 2>:TLINe<1 2>:STATe              | ON   OFF   | not available on the FSU; replaced by CALC:SLIMits:LEFT and CALC:SLIMits:RIGHT                          |
| FSE          | CALCulate<1 2>:UNIT:ANGLE                    | DEG   RAD  | not available for FSU   |
| FSU          | CALCulate<1 2>:UNIT:POWER                    | DBM   V   A   W   DBPW   WATT   DBUV   DBMV   VOLT   DBUA   AMPere   | available units are compatible to the FSE   |
| FSET/<br>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 FSU supports the following units:DBM   V   A   W   DBPW   WATT   DBUV   DBMV   VOLT   DBUA   AMPere |
| FSE/<br>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 FSU 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 FSU   |
| FSU          | CALibration:ABORt                            |  | new function for FSU  |
| FSE          | CALibration:BANDwidth   BWIDth[:RESolution]? |  | not available for FSU   |
| FSE          | CALibration:IQ?                              |  | not available for FSU   |
| FSE          | CALibration:LDETEctor?                       |  | not available for FSU   |
| FSE          | CALibration:LOSuppression?                   |  | not available for FSU   |
| FSE          | CALibration:PPEak?                           |  | not available for FSU   |
| ESI          | CALibration:PRESelector?                     |  | not available for FSU   |
| FSU          | CALibration:RESult?                          |  | new function for FSU  |
| FSE          | CALibration:SHORt?                           |  | not available for FSU   |
| FSU + FSE    | CALibration:STATe                            | ON   OFF   |   |
| FSU + FSE    | CALibration[:ALL]?                           |  |   |
| FSE          | CONFigure:BURSt:PFERror:COUNT                | 1 to 1000  | not available for FSU and FSET  |
| FSE          | CONFigure:BURSt:PFERror[IMMediate]           |  | not available for FSU and FSET  |
| FSE          | CONFigure:BURSt:POWER:CONDition              | NORMal   EXTReme   | not available for FSU and FSET  |
| FSE          | CONFigure:BURSt:POWER:COUNT                  | 1 to 1000  | not available for FSU and FSET  |
| FSE          | CONFigure:BURSt:POWER[IMMediate]             |  | not available for FSU and FSET  |
| FSE          | CONFigure:BURSt:PTEMplate[:IMMediate]        |  | not available for FSU and FSET  |
| FSE          | CONFigure:BURSt:PTEMplate:COUNT              | 1 to 1000  | not available for FSU and FSET  |
| FSE          | CONFigure:BURSt:PTEMplate:SELEct             | FULL   TOP   RISing   FALLing  | not available for FSU and FSET  |
| FSE          | CONFigure:BURSt:REFerence:AUTO               | ON   OFF   | not available for FSU and FSET  |
| FSE          | CONFigure:SPECTrum:MODulation:COUNT          | 1 to 1000  | not available for FSU and FSET  |
| FSE          | CONFigure:SPECTrum:MODulation:RANGE          | ARFCn   TXBand   RXBand   COMBined   DCSRx1800   | not available for FSU and FSET  |
| FSE          | CONFigure:SPECTrum:MODulation:TGATE          | ON   OFF   | not available for FSU and FSET  |
| FSE          | CONFigure:SPECTrum:MODulation[:IMMediate]    |  | not available for FSU and FSET  |
| FSE          | CONFigure:SPECTrum:SWITching:COUNT           | 1 to 1000  | not available for FSU and FSET  |
| FSE          | CONFigure:SPECTrum:SWITching[:IMMediate]     |  | not available for FSU and FSET  |
| FSE          | CONFigure:SPURious:ANTenna                   | CONDucted   RADiated   | not available for FSU and FSET  |

## Comparison of FSU and FSE Commands

FSU

| Devices | Command                              | Parameter  | Notes                          |
|---------|--------------------------------------|--|--------------------------------|
| FSE     | CONFigure:SPURious:COUN:RXBandt      | 1 to 1000  | not available for FSU and FSET |
| FSE     | CONFigure:SPURious:COUNT             | 1 to 1000  | not available for FSU and FSET |
| FSE     | CONFigure:SPURious:RANGe             | TXBand   OTXBand   RXBand   IDLeband   COMBined                                  | not available for FSU and FSET |
| FSE     | CONFigure:SPURious:STEP:COUNT?       |  | not available for FSU and FSET |
| FSE     | CONFigure:SPURious:STEP<1..26>       | ON   OFF   | not available for FSU and FSET |
| FSE     | CONFigure:SPURious[:IMMediate]       |  | not available for FSU and FSET |
| FSE     | CONFigure[:BTS]:ARFCn                | <numeric_value>  | not available for FSU and FSET |
| FSE     | CONFigure[:BTS]:ARFCn:AUTO           | ONCE   | not available for FSU and FSET |
| FSE     | CONFigure[:BTS]:CHANnel:SFH          | ON   OFF   | not available for FSU and FSET |
| FSE     | CONFigure[:BTS]:CHANnel:SLOT         | 0 to 7   | not available for FSU and FSET |
| FSE     | CONFigure[:BTS]:CHANnel:SLOT:AUTO    | ONCE   | not available for FSU and FSET |
| FSE     | CONFigure[:BTS]:CHANnel:TSC          | 0 to 7   | not available for FSU and FSET |
| FSE     | CONFigure[:BTS]:CHANnel:TSC:AUTO     | ON   OFF   | not available for FSU and FSET |
| FSE     | CONFigure[:BTS]:COSiting             | ON   OFF   | not available for FSU and FSET |
| FSE     | CONFigure[:BTS]:LIMit:FREQency       | <numeric_value>  | not available for FSU and FSET |
| FSE     | CONFigure[:BTS]:LIMit:PPEak          | <numeric_value>  | not available for FSU and FSET |
| FSE     | CONFigure[:BTS]:LIMit:PRMS           | <numeric_value>  | not available for FSU and FSET |
| FSE     | CONFigure[:BTS]:LIMit:STANdard       | ON   OFF   | not available for FSU and FSET |
| FSE     | CONFigure[:BTS]:NETWork:PHASe        | 1 2[,PLUS]   | not available for FSU and FSET |
| FSE     | CONFigure[:BTS]:NETWork[:TYPE]       | PGSM   PGSM900   EGSM   EGSM900   DCS   GSM1800   PCS   GSM1900   RGSM   RGSM900 | not available for FSU and FSET |
| FSE     | CONFigure[:BTS]:POWer:CLASs          | 1 to 8   1 to 4   M1   M2   M3   | not available for FSU and FSET |
| FSE     | CONFigure[:BTS]:POWer:COUPled        | ON   OFF   | not available for FSU and FSET |
| FSE     | CONFigure[:BTS]:POWer:DYNamic        | 0 to 15  | not available for FSU and FSET |
| FSE     | CONFigure[:BTS]:POWer:EXPEcted       | <numeric_value>  | not available for FSU and FSET |
| FSE     | CONFigure[:BTS]:POWer:LIMit          | <numeric_value>  | not available for FSU and FSET |
| FSE     | CONFigure[:BTS]:POWer:SINGle:CLEar   |  | not available for FSU and FSET |
| FSE     | CONFigure[:BTS]:POWer:SINGle[:STATe] | ON   OFF   | not available for FSU and FSET |
| FSE     | CONFigure[:BTS]:POWer:STATic         | 0 to 6   | not available for FSU and FSET |
| FSE     | CONFigure[:BTS]:PRESet               |  | not available for FSU and FSET |
| FSE     | CONFigure[:BTS]:SWEeptime            | STANdard   AUTO  | not available for FSU and FSET |
| FSE     | CONFigure[:BTS]:TXSupp               | ON   OFF   | not available for FSU and FSET |
| FSE     | CONFigure[:BTS]:MEASurement?         |  | not available for FSU and FSET |
| FSE     | CONFigure[:MS]:ARFCn                 | <numeric_value>  | not available for FSU and FSET |

| Devices   | Command  | Parameter   | Notes   |
|-----------|--|---|---|
| FSE       | CONFigure[:MS]:ARFCn:AUTO                      | ONCE  | not available for FSU and FSET  |
| FSE       | CONFigure[:MS]:CHANnel:SFH                     | ON   OFF  | not available for FSU and FSET  |
| FSE       | CONFigure[:MS]:CHANnel:TSC                     | 0 to 7  | not available for FSU and FSET  |
| FSE       | CONFigure[:MS]:LIMIt:FREQuency                 | <numeric_value>   | not available for FSU and FSET  |
| FSE       | CONFigure[:MS]:LIMIt:PPEak                     | <numeric_value>   | not available for FSU and FSET  |
| FSE       | CONFigure[:MS]:LIMIt:PRMS                      | <numeric_value>   | not available for FSU and FSET  |
| FSE       | CONFigure[:MS]:LIMIt:STANdard                  | ON   OFF  | not available for FSU and FSET  |
| FSE       | CONFigure[:MS]:NETWork:PHASe                   | 1 2[.PLUS]  | not available for FSU and FSET  |
| FSE       | CONFigure[:MS]:NETWork[:TYPE]                  | PGSM  PGSM900   EGSM  EGSM900   DCS  GSM1800   PCS   GSM1900   RGSM   RGSM900 | not available for FSU and FSET  |
| FSE       | CONFigure[:MS]:POWer:CLASs                     | <numeric_value>   | not available for FSU and FSET  |
| FSE       | CONFigure[:MS]:POWer:COUPled                   | ON   OFF  | not available for FSU and FSET  |
| FSE       | CONFigure[:MS]:POWer:EXPEcted                  | <numeric_value>   | not available for FSU and FSET  |
| FSE       | CONFigure[:MS]:POWer:LEVel                     | 0 to 31   | not available for FSU and FSET  |
| FSE       | CONFigure[:MS]:POWer:LIMIt                     | <numeric_value>   | not available for FSU and FSET  |
| FSE       | CONFigure[:MS]:POWer:SINGLE:CLEar              |   | not available for FSU and FSET  |
| FSE       | CONFigure[:MS]:POWer:SINGLE:STATe]             | ON   OFF  | not available for FSU and FSET  |
| FSE       | CONFigure[:MS]:POWer:SMALI                     | ON   OFF  | not available for FSU and FSET  |
| FSE       | CONFigure[:MS]:PRESet                          |   | not available for FSU and FSET  |
| FSE       | CONFigure[:MS]:SWEeptime                       | STANdard   AUTO   | not available for FSU and FSET  |
| FSE       | CONFigure[:MS]:TXSupp                          | ON   OFF  | not available for FSU and FSET  |
| FSE       | CONFigure[:MS]MEASurement?                     |   | not available for FSU and FSET  |
| FSET      | DIAGnostic:INFO:CCOunt:ATTenuation?            |   | not available for FSU   |
| FSE       | DIAGnostic:INFO:CCOunt:ATTenuation<1   10>?    |   | not available for FSU   |
| FSIQ      | DIAGnostic:INFO:CCOunt:ATTenuation<1   2   3>? |   | not available for FSU   |
| ESI       | DIAGnostic:INFO:CCOunt:ATTenuation<1 2 4>?     |   | not available for FSU   |
| FSE       | DIAGnostic:INFO:CCOunt:PRESelector<1..6>?      |   | not available for FSU   |
| FSU       | DIAGnostic:SERVice:CSOource[:POWer]            | <numeric_value>   | new function for FSU  |
| FSE       | DIAGnostic:SERVice:FUNCTion                    | <numeric_value>, <numeric_value> to   | not available for FSU. Replaced by DIAG:SERV:SFUNCTion  |
| FSET      | DIAGnostic:SERVice:HGENerator                  | OFF   10 kHz   100 kHz   BALanced   | not available for FSU   |
| FSU       | DIAGnostic:SERVice:HWINfo?                     |   | new function for FSU  |
| FSU + FSE | DIAGnostic:SERVice:INPut[:SElect]              | CALibration   RF  |   |
| FSU       | DIAGnostic:SERVice:INPut:PULSed[:STATe]        | ON   OFF  | new command for FSU   |
| FSU       | DIAGnostic:SERVice:INPut:PULSed:PRATe          | <numeric value>   | new command for FSU   |
| FSU       | DIAGnostic:SERVice:INPut:PULSed[:STATe]        |   | new function for FSU  |
| FSU       | DIAGnostic:SERVice:INPut:PULSed:PRATe          | <numeric_value>   | new function for FSU  |
| FSU + FSE | DIAGnostic:SERVice:NSOource                    | ON   OFF  |   |
| FSU       | DIAGnostic:SERVice:SFUNCTion                   | <string> to   | replacement for DIAG:SERV:FUNC of FSU; necessary due to different parameter formats needed on the FSU |
| FSU       | DIAGnostic:SERVice:STESt:RESUlt?               |   | new function for FSU  |

## Comparison of FSU and FSE Commands

FSU

| Devices   | Command  | Parameter                                  | Notes  |
|-----------|--|--|--|
| FSU + FSE | DISPlay:ANNotation:FREQuency   | ON   OFF                                   |  |
|           | DISPlay:BARGraph:LEVel:LOWer   |  | not available for FSU  |
|           | DISPlay:BARGraph:LEVel:UPPer   |  | not available for FSU  |
| FSU + FSE | DISPlay:CMAP<1...26>:DEFault<1 2>                                    |  | larger selection of independently configurable items (1 to 26)   |
| FSU + FSE | DISPlay:CMAP<1...26>:HSL   | 0 to 1,0 to 1,0 to 1                       | larger selection of independently configurable items (1 to 26)   |
| FSU + FSE | DISPlay:CMAP<1...26>:PDEFined  | <color>                                    | larger selection of independently configurable items (1 to 26)   |
| FSU + FSE | DISPlay:FORmat   | SINGLE   SPLit                             |  |
| FSU + FSE | DISPlay:LOGO   | ON   OFF                                   |  |
| FSE       | DISPlay:PROGram[:MODE]   | ON   OFF                                   | not available for FSU  |
| FSU + FSE | DISPlay:PSAVe:HOLDoff  | 0 to 60                                    |  |
| FSU + FSE | DISPlay:PSAVe[:STATe]  | ON   OFF                                   |  |
| FSE       | DISPlay[:WINDow<1 2>]:FEED   | 'AF'   'VIDeo'                             | not available for FSU  |
| FSE       | DISPlay[:WINDow<1 2>]:MINFo  | ON   OFF                                   | not available for FSU  |
| FSU       | DISPlay[:WINDow<1 2>]:SELEct   |  | new function for FSU   |
| FSU       | DISPlay[:WINDow<1 2>]:SIZE   | LARGE   SMALL                              | new function for FSU   |
| FSU + FSE | DISPlay[:WINDow<1 2>]:TEXT:STATe                                     | ON   OFF                                   |  |
| FSU + FSE | DISPlay[:WINDow<1 2>]:TEXT[:DATA]                                    | <string>                                   |  |
| FSU + FSE | DISPlay[:WINDow<1 2>]:TIME   | ON   OFF                                   |  |
| FSU + FSE | DISPlay[:WINDow<1 2>]:TRACe<1...3>:MODE                              | WRITE   VIEW   AVERage   MAXHold   MINHold | FSU: 3 traces are available per screen<br>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 FSU  |
| FSE       | DISPlay[:WINDow<1 2>]:TRACe<1...4>:MODE:ANALog                       | ON   OFF                                   | not available for FSU  |
| FSE       | DISPlay[:WINDow<1 2>]:TRACe<1...4>:MODE:CWRite                       | ON   OFF                                   | not available for FSU  |
| FSE       | DISPlay[:WINDow<1 2>]:TRACe<1...4>:MODE:HCONTinuous                  | ON   OFF                                   | not available for FSU  |
| FSE       | DISPlay[:WINDow<1 2>]:TRACe<1...4>:SYMBOL                            | DOTS   BARS   OFF                          | not available for FSU  |
| FSE       | DISPlay[:WINDow<1 2>]:TRACe<1...4>:X:SPACing                         | LINear   LOGarithmic                       | not available for FSU  |
| FSE       | DISPlay[:WINDow<1 2>]:TRACe<1...4>:X[:SCALE]:RVALue                  | <numeric value>                            | not available for FSU  |
| FSE       | DISPlay[:WINDow<1 2>]:TRACe<1...4>:X[:SCALE]:ZOOM                    | ON   OFF                                   | not available for FSU  |
| FSE       | DISPlay[:WINDow<1 2>]:TRACe<1...4>:X[:SCALE]:ZOOM[:FREQuency]:CENTER | <numeric_value>                            | not available for FSU  |
| FSE       | DISPlay[:WINDow<1 2>]:TRACe<1...4>:X[:SCALE]:ZOOM[:FREQuency]:       | <numeric_value>                            | not available for FSU  |
| FSE       | DISPlay[:WINDow<1 2>]:TRACe<1...4>:X[:SCALE]:ZOOM[:FREQuency]:       | <numeric_value>                            | not available for FSU  |
| FSU       | DISPlay[:WINDow<1 2>]:TRACe<1...3>:Y:SPACing                         | LINear   LOGarithmic                       | FSU: TRACe<1...3>  |
| FSE       | DISPlay[:WINDow<1 2>]:TRACe<1...4>:Y:SPACing                         | LINear   LOGarithmic   PERCent             | PERCent is not available for FSU + FSE: TRACe<1...4>   |
| FSU + FSE | DISPlay[:WINDow<1 2>]:TRACe<1...3>:Y[:SCALE]                         | 10dB to 200dB                              | FSU: TRACe<1...3><br>FSE: TRACe<1...4>   |
| FSET/ESI  | DISPlay[:WINDow<1 2>]:TRACe<1...4>:Y[:SCALE]:BOTTom                  | <numeric value>                            | not available for FSU  |
| FSU + FSE | DISPlay[:WINDow<1 2>]:TRACe<1...3>:Y[:SCALE]:MODE                    | ABSolute   RELative                        | FSU: TRACe<1...3><br>FSE: TRACe<1...4>   |
| FSE       | DISPlay[:WINDow<1 2>]:TRACe<1...4>:Y[:SCALE]:PDIVision               |  | not available for FSU  |
| FSU + FSE | DISPlay[:WINDow<1 2>]:TRACe<1...3>:Y[:SCALE]:RLEVel                  | -130dBm to 30dBm                           | FSU: TRACe<1...3><br>FSE: TRACe<1...4>   |
| FSU + FSE | DISPlay[:WINDow<1 2>]:TRACe<1...3>:Y[:SCALE]:RLEVel:OFFSet           | -200dB to 200dB                            | FSU: TRACe<1...3><br>FSE: TRACe<1...4>   |
| FSU + FSE | DISPlay[:WINDow<1 2>]:TRACe<1...3>:Y[:SCALE]:RPOSITION               | 0 to 100 PCT                               | FSU: TRACe<1...3><br>FSE: TRACe<1...4>   |
| FSU + FSE | DISPlay[:WINDow<1 2>]:TRACe<1...3>:Y[:SCALE]:RVALue                  | <numeric value>                            | FSU: TRACe<1...3><br>FSE: TRACe<1...4>   |
| FSE       | DISPlay[:WINDow<1 2>]:TRACe<1...4>:Y[:SCALE]:RVALue:AUTO             | ON   OFF                                   | not available for FSU  |
| FSET/ESI  | DISPlay[:WINDow<1 2>]:TRACe<1...4>:Y[:SCALE]:TOP                     | <numeric value>                            | not available for FSU  |

| Devices      | Command                                    | Parameter  | Notes   |
|--------------|--|--|---|
| FSU          | DISPlay[:WINDow<1 2>]:TRACe<1...3>[:STATe] | ON   OFF   | FSU: TRACe<1...3><br>FSE: TRACE<1...4>                |
| FSE          | FETCh:BURSt:FERRor:AVERAge?                |  | not available for FSU and FSET                        |
| FSE          | FETCh:BURSt:FERRor:MAXimum?                |  | not available for FSU and FSET                        |
| FSE          | FETCh:BURSt:FERRor:STATus?                 |  | not available for FSU and FSET                        |
| FSE          | FETCh:BURSt:PERRor:PEAK:AVERAge?           |  | not available for FSU and FSET                        |
| FSE          | FETCh:BURSt:PERRor:PEAK:MAXimum?           |  | not available for FSU and FSET                        |
| FSE          | FETCh:BURSt:PERRor:PEAK:STATus?            |  | not available for FSU and FSET                        |
| FSE          | FETCh:BURSt:PERRor:RMS:AVERAge?            |  | not available for FSU and FSET                        |
| FSE          | FETCh:BURSt:PERRor:RMS:MAXimum?            |  | not available for FSU and FSET                        |
| FSE          | FETCh:BURSt:PERRor:RMS:STATus?             |  | not available for FSU and FSET                        |
| FSE          | FETCh:BURSt:POWER[:IMMediate]?             |  | not available for FSU and FSET                        |
| FSE          | FETCh:MODulation[:ALL]?                    | ARFCn   TXBand   RXBand   COMBined   DCSRx1800   | not available for FSU and FSET                        |
| FSE          | FETCh:PTEmplate:REFEreNce?                 | TXBand   | not available for FSU and FSET                        |
| FSE          | FETCh:SPECTrum:MODulation:REFEreNce?       | TXBand   | not available for FSU and FSET                        |
| FSE          | FETCh:SPECTrum:SWITChing:REFEreNce?        | TXBand   | not available for FSU and FSET                        |
| FSE          | FETCh:SPECTrum:SWITChing[:ALL]?            |  | not available for FSU and FSET                        |
| FSE          | FETCh:SPURious:STEP?                       |  | not available for FSU and FSET                        |
| FSE          | FETCh:SPURious[:ALL]?                      | TXBand OTXBand   RXBand   IDLeband   | not available for FSU and FSET                        |
| FSE          | FORMat:DEXPort:APPend[:STATe] ON OFF[,32]  |  | not available for FSU                                 |
| FSU + FSE    | FORMat:DEXPort:DSEParator                  | POINT COMMa  |   |
| FSE          | FORMat:DEXPort:HEADer[:STATe] ON OFF[,32]  |  | not available for FSU                                 |
| FSU          | FORMat[:DATA]                              | AScii   REAL[,32]  |   |
| FSE          | FORMat[:DATA]                              | AScii   REAL   UINT [,32]  | UINT is not available for FSU                         |
| FSU + FSE    | HCOPy:ABORt                                |  |   |
| FSU          | HCOPy:CMAP:DEFault                         |  | new function for FSU                                  |
| FSU          | HCOPy:CMAP:HSL                             | <numeric value>,<br><numeric value>,<br><numeric value>  | new function for FSU                                  |
| FSU          | HCOPy:CMAP:PDEFined                        | <char data>  | new function for FSU                                  |
| FSU          | HCOPy:DEStination<1 2>                     | 'MMEM'  <br>'SYST:COMM:PRIN'  <br>'SYST:COMM:CLIP'   |   |
| FSE/         | HCOPy:DEStination<1 2>                     | 'SYST:COMM:GPIB'  <br>'SYST:COMM:SER1'  <br>'SYST:COMM:SER2'  <br>'SYST:COMM:CENt'  <br>'MMEM'  <br>'SYST:COMM:PRIN' SYST<br>:COMM:CLIP' | SYST:COMM:GPIB/SER1/SE<br>R2 is not available for FSU |
| FSIQ/<br>ESI | HCOPy:DEStination<1 2>                     | 'MMEM'  <br>'SYST:COMM:PRIN' <br>'SYST:COMM:CLIP'  |   |
| FSU + FSE    | HCOPy:DEVice:COLor                         | ON   OFF   |   |
| FSU          | HCOPy:DEVice:LANGuage<1 2>                 | GDI   WMF   EWMF   BMP   |   |
| FSE/         | HCOPy:DEVice:LANGuage<1 2>                 | HPGL   PCL4   PCL5  <br>POSTscript   ESCP   WMF<br>  PCX   HP7470 to   |   |
| FSIQ/<br>ESI | HCOPy:DEVice:LANGuage<1 2>                 | WMF   GDI   EWMF   BMP<br>to   |   |
| FSE/         | HCOPy:DEVice:PRESet<1 2>                   | ON   OFF   | not available for FSU                                 |

## Comparison of FSU and FSE Commands

FSU

| Devices                         | Command                                  | Parameter  | Notes                       |
|---------------------------------|--|--|-----------------------------|
| FSE/                            | HCOPY:DEvice:RESolution<1 2>             | 150   300  | not available for FSU       |
| FSU + FSE                       | HCOPY:ITEM:ALL                           |  |                             |
| FSE                             | HCOPY:ITEM:FFEEed<1 2>:STATe             | ON   OFF   | not available for FSU       |
| FSE                             | HCOPY:ITEM:LABel:TEXT                    | <string>   | not available for FSU       |
| FSE                             | HCOPY:ITEM:PFEEed<1 2>:STATe             | ON   OFF   | not available for FSU       |
| FSU + FSE                       | HCOPY:ITEM:WINDow<1 2>:TABle:STATe       | ON   OFF   |                             |
| FSU + FSE                       | HCOPY:ITEM:WINDow<1 2>:TEXT              | <string>   |                             |
| FSE                             | HCOPY:ITEM:WINDow<1 2>:TRACe:CAINcrement | ON   OFF   | not available for FSU       |
| FSU + FSE                       | HCOPY:ITEM:WINDow<1 2>:TRACe:STATe       | ON   OFF   |                             |
| FSE                             | HCOPY:PAGE:DIMensions:FULL               |  | not available for FSU       |
| FSE                             | HCOPY:PAGE:DIMensions:QUADrant<1...4>    |  | not available for FSU       |
| FSU + FSE                       | HCOPY:PAGE:ORientation<1 2>              | LANDscape   PORTRait   |                             |
| FSU + FSE                       | HCOPY:[IMMediate]                        |  |                             |
| FSET/<br>ESI                    | HOLD                                     |  | not available for FSU       |
| FSU + FSE                       | INITiate<1 2>:CONMeas                    | ON   OFF   |                             |
| FSU + FSE                       | INITiate<1 2>:CONTInuous                 | ON   OFF   |                             |
| FSU + FSE                       | INITiate<1 2>:DISPlay                    | ON   OFF   |                             |
| FSU + FSE                       | INITiate<1 2>:[IMMediate]                |  |                             |
| FSET                            | INPut:PRESElection:CATalog?              |  | not available for FSU       |
| FSET                            | INPut:PRESElection:USET:NAME             | 'name of user defined preselector set (to edit existing set or to create new set)' | not available for FSU       |
| FSET                            | INPut:PRESElection:USET:CLEar            |  | not available for FSU       |
| FSET                            | INPut:PRESElection:USET:COMMENT          | 'comment for preselector-set'  | not available for FSU       |
| FSET                            | INPut:PRESElection:USET:LRANge[.DATA]    | <numeric value>, <numeric value>, <numeric_value>                                  | not available for FSU       |
| FSET                            | INPut:PRESElection:USET:MRANge[.DATA]    | <numeric value>, <numeric value>, <numeric_value>                                  | not available for FSU       |
| FSU + FSE                       | INPut<1 2>:ATTenuation                   | 0 to 70dB  |                             |
| FSET                            | INPut<1 2>:ATTenuation                   | 0 to 70   80dB   | 80 dB not available for FSU |
| FSU + FSE                       | INPut<1 2>:ATTenuation:AUTO              | ON   OFF   |                             |
| FSE                             | INPut<1 2>:ATTenuation:AUTO:MODE         | NORMal   LNOise   LDISTorsion  | not available for FSU       |
| FSET/<br>ESI                    | INPut<1 2>:ATTenuation:PROTEction        | ON   OFF   | not available for FSU       |
| FSU                             | INPut<1 2>:ATTenuation:PROTEction:PRESet |  | new function for FSU        |
| INPut<1 2>:PRESElection[.STATe] | INPut<1 2>:ATTenuation:PROTEction:PRESet |  | new function for FSU        |
| FSET                            | INPut<1 2>:ATTenuation:STEPsize          | 1dB   10dB   | not available for FSU       |
| FSET                            | INPut<1 2>:BIMPedance                    | 150OHM   600OHM   10kOHM   | not available for FSU       |
| FSET                            | INPut<1 2>:COUPling                      | AC   DC  | not available for FSU       |
| FSU                             | INPut<1 2>:EATT                          | 0 to 30dB  | new function for FSU        |
| FSU                             | INPut<1 2>:EATT:AUTO                     | ON   OFF   | new function for FSU        |
| FSU                             | INPut<1 2>:EATT:STATe                    | ON   OFF   | new function for FSU        |
| FSET                            | INPut<1 2>:GAIN                          | 0 to 30dB  | not available for FSU       |
| FSET/<br>ESI                    | INPut<1 2>:GAIN:AUTO                     | ON   OFF   | not available for FSU       |
| FSU + FSE                       | INPut<1 2>:GAIN:STATe                    | ON   OFF   |                             |
| FSU + FSE                       | INPut<1 2>:IMPedance                     | 50   75  |                             |
| FSE                             | INPut<1 2>:IMPedance:CORRection          | RAM   RAZ  | not available for FSU       |
| FSET                            | INPut<1 2>:LISN:PEARth                   | GROunded   FLOating  | not available for FSU       |
| FSET                            | INPut<1 2>:LISN:PHASe                    | L1   L2   L3   N   | not available for FSU       |
| FSET                            | INPut<1 2>:LISN[:TYPE]                   | TWOphase   FOURphase   OFF   | not available for FSU       |
| FSU                             | INPut<1 2>:MIXer:AUTO                    | ON   OFF   | new function for FSU        |
| FSU                             | INPut<1 2>:MIXer[:POWer]                 | <numeric value>  | new function for FSU        |
| FSU + FSE                       | INPut<1 2>:MIXer                         | <numeric value>  | not available for FSU       |
| FSU                             | INPut<1 2>:MIXer[:POWer]:AUTO            | ON   OFF   | new function for FSU        |
| FSET                            | INPut<1 2>:PRESElection:COUPling         | ON   OFF   | not available for FSU       |

| Devices      | Command  | Parameter  | Notes  |
|--------------|--|--|--|
| FSET         | INPut<1 2>:PRESelection:COUPling:HIGH:FREQuency  | 5MHz to 500MHz   | not available for FSU  |
| FSET         | INPut<1 2>:PRESelection:COUPling:HIGH:SET        | 'name of preselector set for high RBW'                         | not available for FSU  |
| FSET         | INPut<1 2>:PRESelection:COUPling:LOW:FREQuency   | 10Hz to 5MHz   | not available for FSU  |
| FSET         | INPut<1 2>:PRESelection:COUPling:LOW:SET         | "name of preselector set for low RBW"                          | not available for FSU  |
| FSET         | INPut<1 2>:PRESelection:COUPling:MID:SET         | "name of preselector set for medium RBW"                       | not available for FSU  |
| FSET         | INPut<1 2>:PRESelection:FILTer:HPASS[:FREQuency] | 100Hz to 5MHz  | not available for FSU  |
| FSET         | INPut<1 2>:PRESelection:FILTer:LPASS[:FREQuency] | 20KHz to 40MHz   | not available for FSU  |
| FSET         | INPut<1 2>:PRESelection:FILTer[:STATe]           | ON   OFF   | not available for FSU  |
| FSET         | INPut<1 2>:PRESelection:SET                      | NARRow   NORMAl   WIDE   | not available for FSU  |
| FSET         | INPut<1 2>:PRESelection:USET[:SElect]            | "name of user defined preselector set"                         | not available for FSU  |
| FSET         | INPut<1 2>:PRESelection[:STATe]                  | ON   OFF   | not available for FSU  |
| FSET         | INPut<1 2>:TYPE                                  | RF   BALanced  | not available for FSU  |
| ESI          | INPut<1 2>:TYPE                                  | INPUT1   INPUT2  | not available for FSU  |
| FSE          | INPut<1 2>:UPORt<1 2>:STATe                      | ON   OFF   | not available for FSU  |
| FSE          | INPut<1 2>:UPORt<1 2>[:VALue]?                   |  | not available for FSU  |
| ESI          | INPut2:COUPling                                  | AC   DC  | not available for FSU  |
| FSU          | INSTRument:COUPlE                                | NONE   RLEVel   CF_B   CF_A                                    | available coupling modes between Screen A and Screen B have been changed between FSE and FSU |
| 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 FSU |
| FSU          | 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/<br>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   |
| FSU          | INSTRument<1 2>[:SElect]                         | SANalyzer  | Currently only SANalyzer available   |
| FSE/<br>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.  |
| FSU + FSE    | MMEMory:CATalog?                                 | string   |  |
| FSU + FSE    | MMEMory:CDIRectory                               | directory name   |  |
| FSU + FSE    | MMEMory:CLear:ALL                                |  |  |
| FSU + FSE    | MMEMory:CLear:STATe                              | 1,path   |  |
| FSU + FSE    | MMEMory:COMMent                                  | <string>   |  |
| FSU + FSE    | MMEMory:COpy                                     | path\file, path\file   |  |
| FSU + FSE    | MMEMory:DATA                                     | filename<br>[, <block data>]                                   |  |
| FSU + FSE    | MMEMory:DELeTe                                   | path\filename  |  |
| FSU + FSE    | MMEMory:LOAD:AUTO                                | 1,path   |  |
| FSU + FSE    | MMEMory:LOAD:STATe                               | 1,path   |  |
| FSU + FSE    | MMEMory:MDIRectory                               | path   |  |
| FSU + FSE    | MMEMory:MOVE                                     | path   |  |
| FSU + FSE    | MMEMory:MSIS                                     | 'A:'   'D:'  | FSU:<br>valid drives are A: and D:<br>FSE:<br>valid drives are A: and C:                     |
| FSU + FSE    | MMEMory:NAME                                     | path\filename  |  |
| FSU + FSE    | MMEMory:RDIRectory                               | directory  |  |
| FSU + FSE    | MMEMory:SElect[:ITEM]:ALL                        |  |  |
| FSE          | MMEMory:SElect[:ITEM]:CSETup                     | ON   OFF   | not available for FSU (default setting on the FSU)   |



## Comparison of FSU and FSE Commands

FSU

| Devices   | Command                                   | Parameter                | Notes  |
|-----------|---|--------------------------|--|
| FSE       | MMEMory:SElect[:ITEM]:CVL:ALL             | ON   OFF                 | not available for FSU and FSET                     |
| FSE       | MMEMory:SElect[:ITEM]:CVL[:ACTive]        | ON   OFF                 | not available for FSU and FSET                     |
| FSU + FSE | MMEMory:SElect[:ITEM]:DEFault             |                          |  |
| FSE       | MMEMory:SElect[:ITEM]:GSETup              | ON   OFF                 | not available for FSU (default setting on the FSU) |
| FSE       | MMEMory:SElect[:ITEM]:HCOPy               | ON   OFF                 | not available for FSU (default setting on the FSU) |
| FSU + FSE | MMEMory:SElect[:ITEM]:HWSettings          | ON   OFF                 |  |
| FSU + 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 FSU (default setting on the FSU) |
| FSE       | MMEMory:SElect[:ITEM]:MACROs              | ON   OFF                 | not available for FSU                              |
| FSU + FSE | MMEMory:SElect[:ITEM]:NONE                |                          |  |
| FSU + FSE | MMEMory:SElect[:ITEM]:SCData              | ON   OFF                 |  |
| FSU       | 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 FSU                              |
| FSE       | MMEMory:SElect[:ITEM]:TRANsducer[:ACTive] | ON   OFF                 | not available for FSU                              |
| FSU + FSE | MMEMory:STORe:STATe                       | 1,path                   |  |
| FSU + FSE | MMEMory:STORe:TRACe                       | 1 to 3,path              |  |
| FSE       | OUTPut:AF:SENSitivity                     | <numeric_value>          | not available for FSU and FSET                     |
| FSE       | OUTPut:UPORt<1 2>:STATe                   | ON   OFF                 | not available for FSU                              |
| FSE       | OUTPut:UPORt<1 2>[:VALue]                 | #B00000000 to #B11111111 | not available for FSU                              |
| FSU + FSE | OUTPut<1 2>[:STATe]                       | ON   OFF                 |  |
| FSE       | READ:BURSt:FERRor:AVERAge?                |                          | not available for FSU and FSET                     |
| FSE       | READ:BURSt:FERRor:MAXimum?                |                          | not available for FSU and FSET                     |
| FSE       | READ:BURSt:FERRor:STATus?                 |                          | not available for FSU and FSET                     |
| FSE       | READ:BURSt:PERRor:PEAK:AVERAge?           |                          | not available for FSU and FSET                     |
| FSE       | READ:BURSt:PERRor:PEAK:MAXimum?           |                          | not available for FSU and FSET                     |
| FSE       | READ:BURSt:PERRor:PEAK:STATus?            |                          | not available for FSU and FSET                     |
| FSE       | READ:BURSt:PERRor:RMS:AVERAge?            |                          | not available for FSU and FSET                     |
| FSE       | READ:BURSt:PERRor:RMS:MAXimum?            |                          | not available for FSU and FSET                     |
| FSE       | READ:BURSt:PERRor:RMS:STATus?             |                          | not available for FSU and FSET                     |
| FSE       | READ:BURSt:POWer:DYNamic?                 |                          | not available for FSU and FSET                     |
| FSE       | READ:BURSt:POWer:LEVel?                   |                          | not available for FSU and FSET                     |
| FSE       | READ:BURSt:POWer:STATic?                  |                          | not available for FSU and FSET                     |
| FSE       | READ:BURSt:POWer?                         |                          | not available for FSU and FSET                     |
| FSE       | READ:BURSt:REFerence[:IMMediate?]         |                          | not available for FSU and FSET                     |
| FSE       | READ:SPECTrum:MODulation[:ALL]?           |                          | not available for FSU and FSET                     |
| FSE       | READ:SPECTrum:SWITChing[:ALL]?            |                          | not available for FSU and FSET                     |
| FSE       | READ:SPURious:STEP?                       |                          | not available for FSU and FSET                     |
| FSE       | READ:SPURious[:ALL]?                      |                          | not available for FSU and FSET                     |
| FSE       | [SENSe<1 2>:]ADEMod:AF:COUPling           | AC   DC                  | not available for FSU and FSET                     |

| Devices   | Command  | Parameter   | Notes  |
|-----------|--|---|--|
| FSE       | [SENSe<1 2>:]ADEMod:RTIME                            | ON   OFF  | not available for FSU and FSET   |
| FSE       | [SENSe<1 2>:]ADEMod:SBAND                            | NORMal   INVerse  | not available for FSU and FSET   |
| FSE       | [SENSe<1 2>:]ADEMod:SQUelch:LEVel                    | 30 to 150 dBm   | not available for FSU and FSET   |
| FSE       | [SENSe<1 2>:]ADEMod:SQUelch[:STATe]                  | ON   OFF  | not available for FSU and FSET   |
| FSET      | [SENSe<1 2>:]AM:RANGE[:UPPer]                        | 3PCT   10 PCT   100PCT                                    | not available for FSU  |
| FSE       | [SENSe<1 2>:]AVERage:AUTO                            | ON   OFF  | not available for FSU  |
| FSU + FSE | [SENSe<1 2>:]AVERage:COUNt                           | 0 to 32767  |  |
| FSE       | [SENSe<1 2>:]AVERage:COUNt                           | 0 to 32767  |  |
| FSU       | [SENSe<1 2>:]AVERage:TYPE                            | VIDeo   LINear  | command is used to select logarithmic or linear averaging on the FSU; 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 FSU; therefore parameters are incompatible to the FSE   |
| FSU + FSE | [SENSe<1 2>:]AVERage[:STATe<1...3>]                  | ON   OFF  |  |
| FSE       | [SENSe<1 2>:]BANDwidth BWIDth:DEMod                  | <numeric_value>   | not available for FSU and FSET   |
| FSU       | [SENSe<1 2>:]BANDwidth BWIDth:PLL                    | WIDE   NORMal   NARRow                                    | new function for FSU   |
| FSE       | [SENSe<1 2>:]BANDwidth BWIDth:PLL                    | AUTO   HIGH   MEDium   LOW                                | not available for FSU  |
| FSU       | [SENSe<1 2>:]BANDwidth BWIDth:PLL                    | AUTO   HIGH   MEDium   NARRow                             | new function for FSU   |
| FSU + FSE | [SENSe<1 2>:]BANDwidth BWIDth:VIDeo                  | 1Hz to 10MHz  | FSU  |
| FSET      | [SENSe<1 2>:]BANDwidth BWIDth:VIDeo                  | 1Hz to 500MHz   |  |
| FSU + FSE | [SENSe<1 2>:]BANDwidth BWIDth:VIDeo:AUTO             | ON   OFF  |  |
| FSET      | [SENSe<1 2>:]BANDwidth BWIDth:VIDeo:EXTernal[:STATe] | ON   OFF  | not available for FSU  |
| FSU       | [SENSe<1 2>:]BANDwidth BWIDth:VIDeo:RATio            | 0.0001 to 1   | only numeric values available. Parameter ranges differ between FSU 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 FSU and FSE not available for FSET                   |
| FSU + FSE | [SENSe<1 2>:]BANDwidth BWIDth[:RESolution]           | 10Hz to 10MHz (anal. filter)<br>1Hz to 10MHz (FFT filter) | FSE: 10Hz to 10MHz (models 20)<br>1Hz to 10MHz (models 30)   |
| FSET      | [SENSe<1 2>:]BANDwidth BWIDth[:RESolution]           | 10 Hz to 500MHz   |  |
| FSU + FSE | [SENSe<1 2>:]BANDwidth BWIDth[:RESolution]:AUTO      | ON   OFF  |  |
| FSE       | [SENSe<1 2>:]BANDwidth BWIDth[:RESolution]:MODE      | ANALog   DIGital  | not available for FSU and FSET   |
| FSU + FSE | [SENSe<1 2>:]BANDwidth BWIDth[:RESolution]:MODE:FFT  | ON   OFF  | old command that is still supported, but has been replaced on the FSU by [SENSe<1 2>:]BANDwidth BWIDth[:RESolution]:TYPE |
| FSU + FSE | [SENSe<1 2>:]BANDwidth BWIDth[:RESolution]:RATio     | 0.0001 to 1   |  |
| FSU       | [SENSe<1 2>:]BANDwidth BWIDth[:RESolution]:TYPE      | NORMal   FFT   CFILter   RRC                              | new function for FSU   |
| FSU       | [SENSe<1 2>:]BANDwidth BWIDth:VIDeo:TYPE             | LINear   LOGarithmic                                      | new function for FSU   |
| FSU + FSE | [SENSe<1 2>:]CORRection:COLlect[:ACQuire]            | THRough   OPEN  |  |
| FSE       | [SENSe<1 2>:]CORRection:CVL:RAND                     | A Q U V E W F D G Y J                                     | not available for FSU and FSET   |
| FSE       | [SENSe<1 2>:]CORRection:CVL:BIAS                     | <numeric_value>   | not available for FSU and FSET   |
| FSE       | [SENSe<1 2>:]CORRection:CVL:CATalog?                 |   | not available for FSU and FSET   |
| FSE       | [SENSe<1 2>:]CORRection:CVL:CLEar                    |   | not available for FSU and FSET   |
| FSE       | [SENSe<1 2>:]CORRection:CVL:COMMENT                  | <string>  | not available for FSU and FSET   |
| FSE       | [SENSe<1 2>:]CORRection:CVL:DATA                     | <freq>, <level> to  | not available for FSU and FSET   |

## Comparison of FSU and FSE Commands

FSU

| Devices      | Command  | Parameter   | Notes                                  |
|--------------|--|---|--|
| FSE          | [SENSe<1 2>:]CORRection:CVL:MiXer                | <string>  | not available for FSU and FSET         |
| FSE          | [SENSe<1 2>:]CORRection:CVL:PORTs                | 2   3   | not available for FSU and FSET         |
| FSE          | [SENSe<1 2>:]CORRection:CVL:SElect               | <file_name>   | not available for FSU and FSET         |
| FSE          | [SENSe<1 2>:]CORRection:CVL:SNUMber              | <string>  | not available for FSU and FSET         |
| FSE          | [SENSe<1 2>:]CORRection:CVL:TYPE                 | ODD   EVEN   EODD   | not available for FSU and FSET         |
| FSE/<br>FSIQ | [SENSe<1 2>:]CORRection:LOSS:INPut[:MAGNitude]   | <numeric_value>   | not available for FSU                  |
| FSU + FSE    | [SENSe<1 2>:]CORRection:METhod                   | TRANsmiSSion  <br>REFLExion   |  |
| FSU + FSE    | [SENSe<1 2>:]CORRection:RECall                   |   |  |
| FSE          | [SENSe<1 2>:]CORRection:RXGain:INPut[:MAGNitude] | <numeric_value>   | not available for FSU, FSET<br>and ESI |
| FSU + FSE    | [SENSe<1 2>:]CORRection[:STATe]                  | ON   OFF  |  |
| FSE          | [SENSe<1 2>:]CORRection:TRANsducer:ACTive?       |   | not available for FSU                  |
| FSE          | [SENSe<1 2>:]CORRection:TRANsducer:CATalog?      |   | not available for FSU                  |
| FSE          | [SENSe<1 2>:]CORRection:TRANsducer:COMMeNt       | <string>  | not available for FSU                  |
| FSE          | [SENSe<1 2>:]CORRection:TRANsducer:DATA          | <freq>, <level> to  | not available for FSU                  |
| FSE          | [SENSe<1 2>:]CORRection:TRANsducer:DElete        |   | not available for FSU                  |
| FSE          | [SENSe<1 2>:]CORRection:TRANsducer:SCALing       | LiNear LOGarithmic  | not available for FSU                  |
| FSE          | [SENSe<1 2>:]CORRection:TRANsducer:SElect        | <name>  | not available for FSU                  |
| FSE          | [SENSe<1 2>:]CORRection:TRANsducer:UNIT          | <string>  | not available for                      |
| FSE          | [SENSe<1 2>:]CORRection:TRANsducer[:STATe]       | ON   OFF  | not available for FSU                  |
| FSE          | [SENSe<1 2>:]CORRection:TSET:ACTive?             |   | not available for FSU                  |
| FSE          | [SENSe<1 2>:]CORRection:TSET:BREak               | ON   OFF  | not available for FSU                  |
| FSE          | [SENSe<1 2>:]CORRection:TSET:CATalog?            |   | not available for FSU                  |
| FSE          | [SENSe<1 2>:]CORRection:TSET:COMMeNt             | <string>  | not available for FSU                  |
| FSE          | [SENSe<1 2>:]CORRection:TSET:DElete              |   | not available for FSU                  |
| FSE          | [SENSe<1 2>:]CORRection:TSET:RANGe<1...10>       | <freq>, <freq>, <name> to   | not available for FSU                  |
| FSE          | [SENSe<1 2>:]CORRection:TSET:SElect              | <name>  | not available for FSU                  |
| FSE          | [SENSe<1 2>:]CORRection:TSET:UNIT                | <string>  | not available for FSU                  |
| FSE          | [SENSe<1 2>:]CORRection:TSET[:STATe]             | ON   OFF  | not available for FSU                  |
| FSE          | [SENSe<1 2>:]DDEMod:FiLTer:ALPHa                 | 0.2 to 1  | not available for FSU                  |
| FSE          | [SENSe<1 2>:]DDEMod:FiLTer:MEASurement           | OFF   RCOsine  <br>RRCosine   GAUSSian  <br>B22   B25   B44   QFM  <br>QFR   QRM   QRR   A25Fm<br>  EMES   EREF   | not available for FSU                  |
| FSE          | [SENSe<1 2>:]DDEMod:FiLTer:REFerence             | RCOsine   RRCosine  <br>GAUSSian   B22   B25  <br>B44   QFM   QFR   QRM  <br>QRR   A25Fm   EMES  <br>EREF   | not available for FSU                  |
| FSE          | [SENSe<1 2>:]DDEMod:FORMat                       | QPSK   PSK   MSK   QAM  <br>FSK   | not available for FSU                  |
| FSE          | [SENSe<1 2>:]DDEMod:FSK:NSTate                   | 2   4   | not available for FSU                  |
| FSE          | [SENSe<1 2>:]DDEMod:MSK:FORMat                   | TYPE1   TYPE2   NORMAl<br>  DiFFerential  | not available for FSU                  |
| FSE          | [SENSe<1 2>:]DDEMod:NORMAlize                    | ON   OFF  | not available for FSU                  |
| FSE          | [SENSe<1 2>:]DDEMod:PRATe                        | 1   2   4   8   16  | not available for FSU                  |
| FSE/<br>ESI  | [SENSe<1 2>:]DDEMod:PRESet                       | GSM   EDGe   NADC  <br>TETRA   DCS1800  <br>PCS1900   PHS   PDCup  <br>PDCDown  <br>APCO25CQPSK  <br>APCO25C4FM   CDPD  <br>DECT   CT2   ERMes  <br>MODacom   PWT   TFTS  <br>F16   F322   F324   F64  <br>FQCDma   RQCDma  <br>FNADc   RNADc   BPSK18<br>  GMSK18   QPSK18  <br>GMSK36 | not available for FSU                  |

| Devices   | Command  | Parameter   | Notes  |
|-----------|--|---|--|
| 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 FSU  |
| 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 FSU  |
| FSE       | [SENSe<1 2>:]DDEMod:PSK:FORMat                   | NORMal   DIFFerential   N3Pi8   | not available for FSU  |
| FSE       | [SENSe<1 2>:]DDEMod:PSK:NSTate                   | 2   8   | not available for FSU  |
| FSE       | [SENSe<1 2>:]DDEMod:QAM:NSTate                   | 16  | not available for FSU  |
| FSE       | [SENSe<1 2>:]DDEMod:QPSK:FORMat                  | NORMal   DIFFerential   OFFSet   DPI4   | not available for FSU  |
| FSE       | [SENSe<1 2>:]DDEMod:SBANd                        | NORMal   INVerse  | not available for FSU  |
| FSE       | [SENSe<1 2>:]DDEMod:SEARch:PULSe:STATe           | ON   OFF  | not available for FSU  |
| FSE       | [SENSe<1 2>:]DDEMod:SEARch:SYNC:CATalog?         |   | not available for FSU  |
| FSE       | [SENSe<1 2>:]DDEMod:SEARch:SYNC:COMMENT          | <string>  | not available for FSU  |
| FSE       | [SENSe<1 2>:]DDEMod:SEARch:SYNC:DATA             | <string>  | not available for FSU  |
| FSE       | [SENSe<1 2>:]DDEMod:SEARch:SYNC:NAME             | <string>  | not available for FSU  |
| FSE       | [SENSe<1 2>:]DDEMod:SEARch:SYNC:OFFSet           | <numeric_value>   | not available for FSU  |
| FSE       | [SENSe<1 2>:]DDEMod:SEARch:SYNC:PATtern          | <string>  | not available for FSU  |
| FSE       | [SENSe<1 2>:]DDEMod:SEARch:SYNC:SElect           | <string>  | not available for FSU  |
| FSE       | [SENSe<1 2>:]DDEMod:SEARch:SYNC:STATe            | ON   OFF  | not available for FSU  |
| FSE       | [SENSe<1 2>:]DDEMod:SEARch:TIME                  | 100 to 1600   | not available for FSU  |
| FSE       | [SENSe<1 2>:]DDEMod:SRATe                        | 160 Hz to 1,6 MHz   | not available for FSU  |
| FSIQ      | [SENSe<1 2>:]DDEMod:SRATe                        | 160 Hz to 7 MHz   | not available for FSU  |
|           | [SENSe<1 2>:]DDEMod:TIME                         | 1 to Frame Length   | not available for FSU  |
| FSET      | [SENSe<1 2>:]DEMod                               | OFF   AM   AMVideO   FM   PM  | not available for FSU  |
| ESI       | [SENSe<1 2>:]DEMod                               | OFF   AM   FM   | not available for FSU  |
| FSET      | [SENSe<1 2>:]DEMod:FILTER:HPASs:FREQuency        | 0 Hz   10 Hz   100 Hz   1 kHz   | not available for FSU  |
| FSET      | [SENSe<1 2>:]DEMod:FILTER[:LPASs]:AUTO           | ON   OFF  | not available for FSU  |
| FSET      | [SENSe<1 2>:]DEMod:FILTER[:LPASs]:FREQuency      | <numeric_value>   | not available for FSU  |
| FSE       | [SENSe<1 2>:]DETEctor<1...4>:CMEM[:STATe]        | ON   OFF  | not available for FSU  |
| FSU       | [SENSe<1 2>:]DETEctor<1...3>[:FUNCTION]          | APEak   NEGative   POSitive   SAMPlE   RMS   AVERAge   QPEak  | FSU: number of traces restricted to 3; detector settings correspond to selected screen<br>FSE: Qpeak not available |
| ESI       | [SENSe<1 2>:]DETEctor<1...4>[:FUNCTION]          | APEak   NEGative   POSitive   SAMPlE   RMS   AVERAge   QPEak  |  |
| FSU + 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 FSU  |
| FSET      | [SENSe<1 2>:]DETEctor<1...4>:PSTRetch[:STATe]    | ON   OFF  | not available for FSU  |
| ESI       | [SENSe<1 2>:]DETEctor<1...4>:RECEiver[:FUNCTION] | POSitive   NEGative   RMS   AVERAge   QPEak   | not available for FSU  |
| FSET      | [SENSe<1 2>:]DETEctor<1...4>:RECEiver[:FUNCTION] | POSitive   NEGative   RMS   AVERAge   | not available for FSU  |

## Comparison of FSU and FSE Commands

FSU

| Devices   | Command  | Parameter   | Notes  |
|-----------|--|---|--|
| FSE       | [SENSe<1 2>:]FILTer:CCITf[:STATe]              | ON   OFF  | not available for FSU and FSET                             |
| FSE       | [SENSe<1 2>:]FILTer:CMESsage[:STATe]           | ON   OFF  | not available for FSU and FSET                             |
| FSE       | [SENSe<1 2>:]FILTer:DEMPHasis:LINK             | DISPlay   AUDio   | not available for FSU and FSET                             |
| FSE       | [SENSe<1 2>:]FILTer:DEMPHasis:TCONstant        | <numeric_value>   | not available for FSU and FSET                             |
| FSE       | [SENSe<1 2>:]FILTer:DEMPHasis[:STATe]          | ON   OFF  | not available for FSU and FSET                             |
| FSE       | [SENSe<1 2>:]FILTer:HPASs:FREQUency            | 30 Hz   300 HZ  | not available for FSU and FSET                             |
| FSET      | [SENSe<1 2>:]FILTer:HPASs:FREQUency            | 10 kHz   1 kHz   100 Hz   | not available for FSU                                      |
| FSE       | [SENSe<1 2>:]FILTer:HPASs[:STATe]              | ON   OFF  | not available for FSU                                      |
| FSE       | [SENSe<1 2>:]FILTer:LPASs:FREQUency            | 3 kHz   15 kHz  | not available for FSU and FSET                             |
| FSE       | [SENSe<1 2>:]FILTer:LPASs[:STATe]              | ON   OFF  | not available for FSU and FSET                             |
| FSET      | [SENSe<1 2>:]FILTer:NOTCh[:STATe]              | ON   OFF  | not available for FSU                                      |
| FSET      | [SENSe<1 2>:]FM[:DEVIation]:RANGe:UPPer        | ON   OFF  | not available for FSU                                      |
| FSET      | [SENSe<1 2>:]FM[:DEVIation]:RANGe[:UPPer]      | <numeric_value>   | not available for FSU                                      |
| FSU + FSE | [SENSe<1 2>:]FREQUency:CENTer                  | 0 to $f_{max}$  | frequency ranges are different for FSU and FSE             |
| FSE       | [SENSe<1 2>:]FREQUency:CENTer:LINK             | START   STOP   SPAN   | not available for FSU                                      |
| FSU + FSE | [SENSe<1 2>:]FREQUency:CENTer:STEP             | 0 to $f_{max}$  | frequency ranges are different for FSU and FSE             |
| FSU + FSE | [SENSe<1 2>:]FREQUency:CENTer:STEP:LINK        | SPAN   RBW   OFF  |  |
| FSU + FSE | [SENSe<1 2>:]FREQUency:CENTer:STEP:LINK:FACTor | 1 to 100 PCT  |  |
| FSU + FSE | [SENSe<1 2>:]FREQUency:MODE                    | CW FIXed   SWEep  |  |
| FSU + FSE | [SENSe<1 2>:]FREQUency:OFFSet                  | <numeric_value>   |  |
| FSET      | [SENSe<1 2>:]FREQUency:RANGe                   | 2 GHz   22 GHz  | not available for FSU                                      |
| FSU + FSE | [SENSe<1 2>:]FREQUency:SPAN                    | 0 to $f_{max}$  | frequency ranges are different for FSU and FSE             |
| FSU + FSE | [SENSe<1 2>:]FREQUency:SPAN:FULL               |   |  |
| FSE       | [SENSe<1 2>:]FREQUency:SPAN:LINK               | CENTer   STOP   SPAN  | not available for FSU                                      |
| FSU + FSE | [SENSe<1 2>:]FREQUency:START                   | 0 to $f_{max}$  | frequency ranges are different for FSU and FSE             |
| FSET      | [SENSe<1 2>:]FREQUency:START:FLINe[:STATe]     | ON   OFF  | not available for FSU. Replaced by CALC:MARK:FUNC:SLIMits  |
| FSE       | [SENSe<1 2>:]FREQUency:START:LINK              | CENTer   STOP   SPAN  | not available for FSU                                      |
| FSU + FSE | [SENSe<1 2>:]FREQUency:STOP                    | 0 to $f_{max}$  | frequency ranges are different for FSU and FSE             |
| FSET      | [SENSe<1 2>:]FREQUency:STOP:FLINe[:STATe]      | ON   OFF  | not available for FSU; replaced by CALC:MARK:FUNC:SLIMits. |
| FSE       | [SENSe<1 2>:]FREQUency:STOP:LINK               | CENTer   START   SPAN   | not available for FSU                                      |
| FSET/ESI  | [SENSe<1 2>:]FREQUency[:CW]:FIXed]             | $f_{min}$ to $f_{max}$  | not available for FSU                                      |
| FSET/ESI  | [SENSe<1 2>:]FREQUency[:CW]:FIXed:STEP         | $f_{min}$ to $f_{max}$  | not available for FSU                                      |
| FSU       | [SENSe<1 2>:]LIST:POWer:RESult?                |   | new function for FSU                                       |
| FSU       | [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 FSU                                       |
| FSU       | [SENSe<1 2>:]LIST:POWer:SET                    | <PEAK meas>, <RMS meas>, <AVG meas>, <trigger mode>, <trigger slope>, <trigger offset>, <gate length>           | new function for FSU                                       |
| FSU       | [SENSe<1 2>:]LIST:POWer:STATe                  | ON   OFF  | new function for FSU                                       |
| FSE       | [SENSe<1 2>:]MIXer:BIAS                        | <numeric_value>   | not available for FSU                                      |
| FSE       | [SENSe<1 2>:]MIXer:BIAS:LIMIT:MIN              | <numeric_value>   | not available for FSU                                      |
| FSE       | [SENSe<1 2>:]MIXer:BIAS:LIMIT[:MAX]            | <numeric_value>   | not available for FSU                                      |
| FSE       | [SENSe<1 2>:]MIXer:BLOCK                       | ON   OFF  | not available for FSU                                      |

| Devices   | Command   | Parameter   | Notes   |
|-----------|---|---|---|
| FSE       | [SENSe<1 2>:]MIXer:HARMonic                                 | <numeric_value>   | not available for FSU   |
| FSE       | [SENSe<1 2>:]MIXer:HARMonic:BAND                            | A   Q   U   V   E   W   F   D   G   Y   J   | not available for FSU   |
| FSE       | [SENSe<1 2>:]MIXer:HARMonic:TYPE                            | ODD   EVEN   EODD   | not available for FSU   |
| FSE       | [SENSe<1 2>:]MIXer:LOSS:HIGH                                | <numeric_value>   | not available for FSU   |
| FSE       | [SENSe<1 2>:]MIXer:LOSS:TABLE                               | <file_name>   | not available for FSU   |
| FSE       | [SENSe<1 2>:]MIXer:LOSS[:LOW]                               | <numeric_value>   | not available for FSU   |
| FSE       | [SENSe<1 2>:]MIXer:PORTs                                    | 2   3   | not available for FSU   |
| FSE       | [SENSe<1 2>:]MIXer:SIGNal                                   | 2   3   | not available for FSU   |
| FSE       | [SENSe<1 2>:]MIXer:THReshold                                | 0.1 to 100 dB   | not available for FSU   |
| FSE       | [SENSe<1 2>:]MIXer[:STATe]                                  | ON   OFF  | not available for FSU   |
| FSU       | [SENSe<1 2>:]MPOWer[:SEQuence]                              | <analyzer freq>, <rbw>, <meas time>, <trigger source>, <trigger level>, <trigger offset>, <type of meas>, <# of meas> | new function for FSU  |
| FSU       | [SENSe<1 2>:]MPOWer:RESult[:LIST]?                          |   | new function for FSU  |
| FSU       | [SENSe<1 2>:]MPOWer:RESult:MIN?                             |   | new function for FSU  |
| FSE       | [SENSe<1 2>:]MSUMmary:AHOLd[:STATe]                         | ON   OFF  | not available for FSU and FSET  |
| FSE       | [SENSe<1 2>:]MSUMmary:MODE                                  | ABSolute   RELative   | not available for FSU and FSET  |
| FSE       | [SENSe<1 2>:]MSUMmary:MTIME                                 | 0.1S   1S   | not available for FSU and FSET  |
| FSE       | [SENSe<1 2>:]MSUMmary:REFerence                             | <numeric_value>   | not available for FSU and FSET  |
| FSE       | [SENSe<1 2>:]MSUMmary:REFerence:AUTO                        | ONCE  | not available for FSU and FSET  |
| FSE       | [SENSe<1 2>:]MSUMmary:RUNit                                 | PCT   DB  | not available for FSU and FSET  |
| FSET      | [SENSe<1 2>:]PM[:DEVIation]:RANGe[:UPPer]                   | <numeric_value>   | not available for FSU   |
| FSU + FSE | [SENSe<1 2>:]POWer:ACHannel:ACPairs                         | 0 to 3  | FSU: new parameter value 0 for channel power measurement                    |
| FSU + FSE | [SENSe<1 2>:]POWer:ACHannel:BANDwidth BWIDth:ACHannel       | 100 to 1000MHz  | FSU: parameter range starts at 100Hz<br>FSE: parameter range starts at 0 Hz |
| FSU + FSE | [SENSe<1 2>:]POWer:ACHannel:BANDwidth BWIDth:ALTErnate<1 2> | 100 to 1000MHz  | FSU: parameter range starts at 100Hz<br>FSE: parameter range starts at 0 Hz |
| FSU + FSE | [SENSe<1 2>:]POWer:ACHannel:BANDwidth BWIDth[:CHANnel]      | 100 to 1000MHz  | FSU: parameter range starts at 100Hz<br>FSE: parameter range starts at 0 Hz |
| FSU + FSE | [SENSe<1 2>:]POWer:ACHannel:MODE                            | ABSolute   RELative   |   |
| FSU + FSE | [SENSe<1 2>:]POWer:ACHannel:PRESet                          | ACPowEr   CPowEr   OBANdwidth   OBWIDth   CN   CNO  |   |
| FSU       | [SENSe<1 2>:]POWer:ACHannel:PRESet:RLEVel                   |   | new function for FSU  |
| FSU + FSE | [SENSe<1 2>:]POWer:ACHannel:REFerence:AUTO                  | ONCE  |   |
| FSU + FSE | [SENSe<1 2>:]POWer:ACHannel:SPACing[:ACHannel]              | 100Hz to 2000MHz  | different parameter range   |
| FSE       | [SENSe<1 2>:]POWer:ACHannel:SPACing[:UPPer]                 | 0 to 1000MHz  | not available for FSU and FSET  |
| FSU + FSE | [SENSe<1 2>:]POWer:ACHannel:SPACing:ALTErnate<1 2>          | 100Hz to 2000MHz  | different parameter range   |
| FSU + FSE | [SENSe<1 2>:]POWer:BANDwidth BWIDth                         | 10 to 99.9PCT   | different parameter range   |
| FSU       | [SENSe<1 2>:]POWer:HSPeEd                                   | ON   OFF  | new function for FSU  |
| FSU       | [SENSe<1 2>:]POWer:NCORrection                              | ON   OFF  | new function for FSU  |
| FSU       | [SENSe<1 2>:]POWer:TRACe                                    | 1 to 3  | new function for FSU  |
| FSU + FSE | [SENSe<1 2>:]ROSCillator[:INTernal]:JTUNE                   | 0 to 4095   |   |
| FSU + FSE | [SENSe<1 2>:]ROSCillator[:INTernal]:JTUNE:SAVe              |   |   |
| FSE       | [SENSe<1 2>:]ROSCillator:EXTernal:FREQuency                 | 1MHz to 16MHz   | not available for FSU   |
| FSU + FSE | [SENSe<1 2>:]ROSCillator:SOURce                             | INTernal   EXTernal   |   |
| FSET/ESI  | [SENSe<1 2>:]SCAN<:RANGes[COUNt]                            | 1 to 10   | not available for FSU   |

## Comparison of FSU and FSE Commands

FSU

| Devices   | Command  | Parameter                              | Notes                                      |
|-----------|--|--|--|
| FSE/ESI   | [SENSe<1 2>:]SCAN<1...10>:BANDwidth:RESolution   | $f_{min}$ to $f_{max}$                 | not available for FSU                      |
| FSET/ESI  | [SENSe<1 2>:]SCAN<1...10>:INPut:ATTenuation      | dB <sub>min</sub> to dB <sub>max</sub> | not available for FSU                      |
| FSET/ESI  | [SENSe<1 2>:]SCAN<1...10>:INPut:ATTenuation:AUTO | ON   OFF                               | not available for FSU                      |
| FSET      | [SENSe<1 2>:]SCAN<1...10>:INPut:BIMPedance       | 150OHM   600OHM   10kOHM               | not available for FSU                      |
| FSET      | [SENSe<1 2>:]SCAN<1...10>:INPut:GAIN             | 0dB to 30dB                            | not available for FSU                      |
| FSET/ESI  | [SENSe<1 2>:]SCAN<1...10>:INPut:GAIN:AUTO        | ON   OFF                               | not available for FSU                      |
| ESI       | [SENSe<1 2>:]SCAN<1...10>:INPut:GAIN:STATe       | ON   OFF                               | not available for FSU                      |
| ESI       | [SENSe<1 2>:]SCAN<1...10>:INPut:TYPE             | INPUT1   INPUT2                        | not available for FSU                      |
| FSET      | [SENSe<1 2>:]SCAN<1...10>:INPut:TYPE             | RF   BALanced                          | not available for FSU                      |
| FSET/ESI  | [SENSe<1 2>:]SCAN<1...10>:START                  | $f_{min}$ to $f_{max}$                 | not available for FSU                      |
| FSET/ESI  | [SENSe<1 2>:]SCAN<1...10>:STEP                   | $f_{min}$ to $f_{max}$                 | not available for FSU                      |
| FSET/ESI  | [SENSe<1 2>:]SCAN<1...10>:STOP                   | $f_{min}$ to $f_{max}$                 | not available for FSU                      |
| FSET/ESI  | [SENSe<1 2>:]SCAN<1...10>:TIME                   | 100 $\mu$ s to 100 s                   | not available for FSU                      |
| FSU + FSE | [SENSe<1 2>:]SWEep:COUNt                         | 0 to 32767                             |  |
| FSU + FSE | [SENSe<1 2>:]SWEep:EGATe                         | ON   OFF                               |  |
| FSU + FSE | [SENSe<1 2>:]SWEep:EGATe:HOLDoff                 | 0 to 100s                              |  |
| FSU + 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 available for FSU                      |
| FSU + FSE | [SENSe<1 2>:]SWEep:EGATe:POLarity                | POSITive   NEGative                    |  |
| FSU + FSE | [SENSe<1 2>:]SWEep:EGATe:SOURce                  | EXTernal   IFPower   RFPower           |  |
| FSU + FSE | [SENSe<1 2>:]SWEep:EGATe:TYPE                    | LEVel   EDGE                           |  |
| FSE       | [SENSe<1 2>:]SWEep:GAP                           | ON   OFF                               | not available for FSU                      |
| FSE       | [SENSe<1 2>:]SWEep:GAP:LENGth                    | 0 to 100s                              | not available for FSU                      |
| FSE       | [SENSe<1 2>:]SWEep:GAP:PRETrigger                | 0 to 100s                              | not available for FSU                      |
| FSE       | [SENSe<1 2>:]SWEep:GAP:TRGTogap                  | 0 to 100s                              | not available for FSU                      |
| FSP       | [SENSe<1 2>:]SWEep:POINts                        | <numeric value>                        | not available for FSE                      |
| FSET/ESI  | [SENSe<1 2>:]SWEep:SPACing                       | LINear   LOGarithmic   AUTO            | not available for FSU                      |
| FSE/FSIQ  | [SENSe<1 2>:]SWEep:SPACing                       | LINear   LOGarithmic                   | not available for FSU                      |
| FSU + FSE | [SENSe<1 2>:]SWEep:TIME                          | 2.5ms to 1000s   1 $\mu$ s to 16000s   | different parameter ranges for FSU and FSE |
| FSU + FSE | [SENSe<1 2>:]SWEep:TIME:AUTO                     | ON   OFF                               |  |
| FSE       | [SENSe<1 2>:]TCAPture:LENGth                     | 1024   2048   4096   8192   16384      | not available for FSU                      |
| FSE       | [SENSe<1 2>:]TV:PSOFFset                         | 0 to 6.5 MHz                           | not available for FSU and FSET             |
| FSU       | [SENSe<1 2>:]TV:CCVS                             | INTernal   EXTernal                    | new function for FSU                       |
| FSU + FSE | [SENSe<1 2>:]TV[:STATe]                          | ON   OFF                               |  |
| FSU + FSE | SOURce:AM:STATe                                  | ON   OFF                               |  |
| FSU + FSE | SOURce:DM:STATe                                  | ON   OFF                               |  |
| FSU       | SOURce:EXTernal[:STATe]                          | ON   OFF                               | new command for FSU                        |
| FSU       | SOURce:EXTernal:FREQuency:OFFset                 | <numeric_value>                        | new command for FSU                        |
| FSU       | SOURce:EXTernal:FREQuency[:FACtor]:NUMerator     | <numeric_value>                        | new command for FSU                        |
| FSU       | SOURce:EXTernal:FREQuency[:FACtor]:DENominator   | <numeric_value>                        | new command for FSU                        |
| FSU       | SOURce:EXTernal:FREQuency:SWEep[:STATe]          | ON   OFF                               | new command for FSU                        |
| FSU       | SOURce:EXTernal:POWEr[:LEVel]                    | <numeric_value>                        | new command for FSU                        |
| FSU + FSE | SOURce:FM:STATe                                  | ON   OFF                               |  |
| FSU + FSE | SOURce:FREQuency:OFFSet                          | -150Hz to 150MHz                       | different value ranges for FSU and FSE     |
| FSE       | SOURce:POWEr:ALC:SOURce                          | INTernal   EXTernal                    | not available for FSU and FSET             |
| FSU + FSE | SOURce:POWEr[:LEVel][:IMMediate]:OFFSet          | -200dB to +200dB                       |  |
| FSU + FSE | SOURce:POWEr[:LEVel][:IMMediate][:AMPLitude]     | -30dBm to 0dBm                         | different value ranges for FSU and FSE     |

| Devices   | Command  | Parameter   | Notes  |
|-----------|--|-------------|--|
| FSU + FSE | STATus:OPERation:CONDition?                            |             |  |
| FSE       | STATus:OPERation:CONDition?                            |             |  |
| FSU + FSE | STATus:OPERation:ENABle                                | 0 to 65535  |  |
| FSU + FSE | STATus:OPERation:NTRansition                           | 0 to 65535  |  |
| FSU + FSE | STATus:OPERation:PTRansition                           | 0 to 65535  |  |
| FSU + FSE | STATus:OPERation[:EVENT?]                              |             |  |
| FSU + FSE | STATus:PRESet  |             |  |
| FSU + FSE | STATus:QUEStionable:ACPLimit:CONDition?                |             |  |
| FSU + FSE | STATus:QUEStionable:ACPLimit:ENABle                    | 0 to 65535  |  |
| FSU + FSE | STATus:QUEStionable:ACPLimit:NTRansition               | 0 to 65535  |  |
| FSU + FSE | STATus:QUEStionable:ACPLimit:PTRansition               | 0 to 65535  |  |
| FSU + FSE | STATus:QUEStionable:ACPLimit[:EVENT?]                  |             |  |
| FSU + FSE | STATus:QUEStionable:CONDition?                         |             |  |
| FSU + FSE | STATus:QUEStionable:ENABle                             | 0 to 65535  |  |
| FSU + FSE | STATus:QUEStionable:FREQuency:CONDition?               |             |  |
| FSU + FSE | STATus:QUEStionable:FREQuency:ENABle                   | 0 to 65535  |  |
| FSU + FSE | STATus:QUEStionable:FREQuency:NTRansition              | 0 to 65535  |  |
| FSU + FSE | STATus:QUEStionable:FREQuency:PTRansition              | 0 to 65535  |  |
| FSU + FSE | STATus:QUEStionable:FREQuency[:EVENT?]                 |             |  |
| FSU + FSE | STATus:QUEStionable:LIMit<1 2>:CONDition?              |             | FSU: individual registers for screen A and B |
| FSU + FSE | STATus:QUEStionable:LIMit<1 2>:ENABle                  | 0 to 65535  | FSU: individual registers for screen A and B |
| FSU + FSE | STATus:QUEStionable:LIMit<1 2>:NTRansition             | 0 to 65535  | FSU: individual registers for screen A and B |
| FSU + FSE | STATus:QUEStionable:LIMit<1 2>:PTRansition             | 0 to 65535  | FSU: individual registers for screen A and B |
| FSU + FSE | STATus:QUEStionable:LIMit<1 2>[:EVENT?]                |             | FSU: individual registers for screen A and B |
| FSU + FSE | STATus:QUEStionable:LMARgin<1 2>:CONDition?            |             | FSU: individual registers for screen A and B |
| FSU + FSE | STATus:QUEStionable:LMARgin<1 2>:ENABle                | 0 to 65535  | FSU: individual registers for screen A and B |
| FSU + FSE | STATus:QUEStionable:LMARgin<1 2>:NTRansition           | 0 to 65535  | FSU: individual registers for screen A and B |
| FSU + FSE | STATus:QUEStionable:LMARgin<1 2>:PTRansition           | 0 to 65535  | FSU: individual registers for screen A and B |
| FSU + FSE | STATus:QUEStionable:LMARgin<1 2>[:EVENT?]              |             | FSU: individual registers for screen A and B |
| FSU + FSE | STATus:QUEStionable:NTRansition                        | 0 to 65535  |  |
| FSU + FSE | STATus:QUEStionable:POWer:CONDition?                   |             |  |
| FSU + FSE | STATus:QUEStionable:POWer:ENABle                       | 0 to 65535  |  |
| FSU + FSE | STATus:QUEStionable:POWer:NTRansition                  | 0 to 65535  |  |
| FSU + FSE | STATus:QUEStionable:POWer:PTRansition                  | 0 to 65535  |  |
| FSU + FSE | STATus:QUEStionable:POWer[:EVENT?]                     |             |  |
| FSU + FSE | STATus:QUEStionable:PTRansition                        | 0 to 65535  |  |
| FSU + FSE | STATus:QUEStionable:SYNC:CONDition?                    |             |  |
| FSU + FSE | STATus:QUEStionable:SYNC:ENABle                        | 0 to 65535  |  |
| FSU + FSE | STATus:QUEStionable:SYNC:NTRansition                   | 0 to 65535  |  |
| FSU + FSE | STATus:QUEStionable:SYNC:PTRansition                   | 0 to 65535  |  |
| FSU + FSE | STATus:QUEStionable:SYNC[:EVENT?]                      |             |  |
| FSE       | STATus:QUEStionable:TRANsducer:CONDition?              |             | not available for FSU                        |
| FSE       | STATus:QUEStionable:TRANsducer:ENABle                  | 0 to 65535  | not available for FSU                        |
| FSE       | STATus:QUEStionable:TRANsducer:NTRansition             | 0 to 65535  | not available for FSU                        |
| FSE       | STATus:QUEStionable:TRANsducer:PTRansition             | 0 to 65535  | not available for FSU                        |
| FSE       | STATus:QUEStionable:TRANsducer[:EVENT?]                |             | not available for FSU                        |
| FSU + FSE | STATus:QUEStionable[:EVENT?]                           |             |  |
| FSU + FSE | STATus:QUEue[:NEXT?]                                   |             |  |
| FSE       | SYSTem:BINFo?  |             | not available for FSU                        |
| FSU       | SYSTem:COMMunicate:GPIB:RDEvice:GENerator<1 2>:ADDRess | 0 to 30     | new command for FSU                          |
| FSE       | SYSTem:COMMunicate:GPIB:RDEvice<1 2>:ADDRess           | 0 to 30     | not available for FSU                        |
| FSU + FSE | SYSTem:COMMunicate:GPIB[:SELF]:ADDRess                 | 0 to 30     |  |
| FSU + FSE | SYSTem:COMMunicate:GPIB[:SELF]:RTERminator             | LFE0I   EOI |  |
| FSU + FSE | SYSTem:COMMunicate:PRINter:ENUMerate:FIRSt?            |             |  |



## Comparison of FSU and FSE Commands

FSU

| Devices      | Command   | Parameter  | Notes  |
|--------------|---|--|--|
| FSU + FSE    | SYSTem:COMMunicate:PRINter:ENUMerate:NEXT?        |  |  |
| FSU          | SYSTem:COMMunicate:PRINter:SElect<1 2>            | <printer_name>   | numeric suffix behind SElect                                     |
| FSIQ/<br>ESI | SYSTem:COMMunicate:PRINter<1 2>:SElect            | <printer_name>   | numeric suffix behind PRINters                                   |
| FSU          | SYSTem:COMMunicate:RDEvice:GENerator<1 2>:LINK    | GPIO   TTL   | new function for FSU   |
| FSU          | SYSTem:COMMunicate:RDEvice:GENerator<1 2>:TYPE    | <name>   | new function for FSU   |
| FSU + FSE    | SYSTem:COMMunicate:SERial:CONTRol:DTR             | IBFull   OFF   | only SERial1 available for FSU                                   |
| FSU + FSE    | SYSTem:COMMunicate:SERial:CONTRol:RTS             | IBFull   OFF   | only SERial1 available for FSU                                   |
| FSU + FSE    | SYSTem:COMMunicate:SERial[:RECeive]:BAUD          | 110   300   600   1200   2400   9600   19200   | only SERial1 available for FSU                                   |
| FSU + FSE    | SYSTem:COMMunicate:SERial[:RECeive]:BITS          | 7   8  | only SERial1 available for FSU                                   |
| FSU + FSE    | SYSTem:COMMunicate:SERial[:RECeive]:PACE          | XON   NONE   | only SERial1 available for FSU                                   |
| FSU + FSE    | SYSTem:COMMunicate:SERial[:RECeive]:PARity[:TYPE] | EVEN   ODD   NONE  | only SERial1 available for FSU                                   |
| FSU + FSE    | SYSTem:COMMunicate:SERial[:RECeive]:SBITs         | 1   2  | only SERial1 available for FSU                                   |
| FSU + FSE    | SYSTem:DATE                                       | 1980 to 2099, 1 to 12, 1 to 31   |  |
| FSU          | SYSTem:DISPlay:FPANel                             | ON   OFF   | new function for FSU   |
| FSU + FSE    | SYSTem:DISPlay:UPDate                             | ON   OFF   |  |
| FSU + FSE    | SYSTem:ERRor[:NEXT]?                              |  | new function for FSU, but compatible to SYSTem:ERRor? on the FSE |
| FSU          | SYSTem:ERRor:LIST?                                |  | new function for FSU   |
| FSU          | SYSTem:ERRor:CLEar:ALL                            |  | new command for FSU  |
| FSU + FSE    | SYSTem:PASSword[:CENable]                         | 'pass word   |  |
| FSU + FSE    | SYSTem:PRESet                                     |  |  |
| ESI/<br>FSIQ | SYSTem:PRESet:COMPatible                          | FSE   OFF  | not available for FSU  |
| FSU + FSE    | SYSTem:SET  |  |  |
| FSU + FSE    | SYSTem:SPEaker:VOLume                             | 0 to 1   |  |
| FSU + FSE    | SYSTem:TIME                                       | 0 to 23, 0 to 59, 0 to 59  |  |
| FSU + FSE    | SYSTem:VERsion?                                   |  |  |
| FSU + FSE    | TRACe:COpy  | TRACE1   TRACE2   TRACE3 , TRACE1   TRACE2   TRACE3  | only TRACE1...TRACE3 available for FSU                           |
| FSET/<br>ESI | TRACe:FEED:CONTRol<1...4>                         | ALWayS   NEVer   | not available for FSU  |
| FSU + FSE    | TRACe[:DATA]                                      | TRACE1   TRACE2   TRACE3 , <block>   <numeric_value>   | only TRACE1...TRACE3 available for FSU                           |
| FSET/<br>ESI | TRACe[:DATA]                                      | TRACE1  TRACE2  TRACE3  TRACE4  SINGLE  STATus, <block>   <numeric_value>                                    |  |
| FSU          | TRACe:IQ:DATA?                                    |  | new function for FSU   |
| FSU          | TRACe:IQ:DATA:MEMory?                             | <offset samples>, <# of samples>   | new function for FSU   |
| FSU          | TRACe:IQ:SET                                      | <filter type>, <rbw>, <sample rate>, <trigger source>, <trigger slope>, <pretrigger samples>, <# of samples> | new function for FSU   |
| FSU          | TRACe:IQ:AVERage[:STATe]                          | ON   OFF   | new function for FSU   |
| FSU          | TRACe:IQ:AVERage:COUNt                            | <numeric value>  | new function for FSU   |
| FSU          | TRACe:IQ:SRATE                                    | 16kHz to 32MHz   | new function for FSU   |
| FSU          | TRACe:IQ[:STATe]                                  | ON   OFF   | new function for FSU   |
| FSU + FSE    | TRIGger<1 2>[:SEQUence]:HOLDoff                   | 0 to 100s  |  |
| FSE          | TRIGger<1 2>[:SEQUence]:LEVel:AF                  | -120 to +120PCT  | not available for FSU  |
| FSE          | TRIGger<1 2>[:SEQUence]:LEVel:VIDeo               | 0 to 100PCT  | not available for FSU; replaced by TRIGger:SEQUence:SOURce:VIDeo |
| FSE          | TRIGger<1 2>[:SEQUence]:LEVel[:EXTernal]          | -5.0 to +5.0V  | not available for FSU  |

## Differences in GPIB behavior between the FSP 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 FSP and the FSE families of instruments. FSE alone in column "Devices" denotes the instrument families FSE, FSIQ, FSET and ESIB, unless otherwise noted in column "Notes".

| Devices   | Command                                | Parameter              | Notes   |
|-----------|--|------------------------|---|
| FSU + FSE | *CAL?                                  |                        | FSU: executes total calibration<br>FSE: executes short calibration  |
| FSU + FSE | *CLS                                   |                        |   |
| FSU + FSE | *ESE                                   |                        |   |
| FSU + FSE | *ESR?                                  |                        |   |
| FSU + FSE | *IDN?                                  |                        | model indicator and version index is different for FSU and FSE  |
| FSU + FSE | *IST?                                  |                        |   |
| FSU + FSE | *OPC?                                  |                        |   |
| FSU + FSE | *OPT?                                  |                        | list of available options is slightly different for FSU and FSE, but equally available options have equal names           |
| FSU + FSE | *PCB                                   |                        |   |
| FSU + FSE | *PRE                                   |                        |   |
| FSU + FSE | *PSC                                   |                        |   |
| FSU + FSE | *RST                                   |                        | instrument settings are slightly different for FSU and FSE due to different instrument specs                              |
| FSU + FSE | *SRE                                   |                        |   |
| FSU + FSE | *STB?                                  |                        |   |
| FSU + FSE | *TRG                                   |                        | FSU starts measurement in active screen<br>FSE: starts measurement in both screens (split screen mode)                    |
| FSU + FSE | *TST?                                  |                        |   |
| FSU + FSE | *WAI                                   |                        |   |
| FSU + FSE | ABORt                                  |                        |   |
| FSE       | CALCulate:LiMit:CATalog?               |                        | not available in FSU  |
| FSU       | CALCulate:STATistics:APD[:STATe]       | ON   OFF               | new function for FSU  |
| FSU       | CALCulate:STATistics:CCDF[:STATe]      | ON   OFF               | new function for FSU  |
| FSU       | CALCulate:STATistics:NSAMples          | 100 to 1E9             | new function for FSU  |
| FSU       | CALCulate:STATistics:PRESet            |                        | new function for FSU  |
| FSU       | CALCulate:STATistics:Result<1...3>?    | MEAN PEAK CFACtor  ALL | new function for FSU  |
| FSU       | CALCulate:STATistics:SCALe:AUTO        | ONCE                   | new function for FSU  |
| FSU       | CALCulate:STATistics:X:RANGe           | -10dB to 200dB         | new function for FSU  |
| FSU       | CALCulate:STATistics:X:RLEVel          | -130dBm to 30dBm       | new function for FSU  |
| FSU       | CALCulate:STATistics:Y:LOWer           | -1E-9 to 0.1           | new function for FSU  |
| FSU       | CALCulate:STATistics:Y:UPPer           | -1E-8 to 1.0           | new function for FSU  |
| FSE       | CALCulate<1 2>:CTHReshold              | MIN to MAX             | not available in FSU  |
| FSE       | CALCulate<1 2>:CTHReshold:STATe        | ON   OFF               | not available in FSU  |
| FSU       | 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 4 markers and 4 deltamarkers; the most recently used marker serves as the reference marker for all deltamarkers |

## Alphabetical List of Commands

In the following, all remote-control commands are listed with their parameters and page numbers. Generally, they are arranged alphabetically according to the keywords of the command. The list of common commands starts the table.

| Command   | Parameter                         | Page |
|---|-----------------------------------|------|
| *CAL?   |                                   | 6.5  |
| *CLS  |                                   | 6.5  |
| *ESE  | 0 to 255                          | 6.5  |
| *ESR?   |                                   | 6.5  |
| *IDN?   |                                   | 6.5  |
| *IST?   |                                   | 6.5  |
| *OPC  |                                   | 6.5  |
| *OPC?   |                                   | 6.5  |
| *OPT?   |                                   | 6.6  |
| *PCB  | 0 to 30                           | 6.6  |
| *PRE  | 0 to 255                          | 6.6  |
| *PSC  | 0   1                             | 6.6  |
| *RST  |                                   | 6.7  |
| *SRE  | 0 to 255                          | 6.7  |
| *STB?   |                                   | 6.7  |
| *TRG  |                                   | 6.7  |
| *TST?   |                                   | 6.7  |
| *WAI  |                                   | 6.7  |
| ABORt   |                                   | 6.8  |
| CALCulate<1 2>:DELTamarker<1to4>[:STATe]                              | ON   OFF                          | 6.9  |
| CALCulate<1 2>:DELTamarker<1to4>:MODE                                 | ABSolute   RELative               | 6.10 |
| CALCulate<1 2>:DELTamarker<1to4>:AOFF                                 |                                   | 6.10 |
| CALCulate<1 2>:DELTamarker<1to4>:TRACe                                | 1to3                              | 6.10 |
| CALCulate<1 2>:DELTamarker<1to4>:X                                    | 0 to MAX (frequency   sweep time) | 6.11 |
| CALCulate<1 2>:DELTamarker<1to4>:X:RELative                           |                                   | 6.11 |
| CALCulate<1 2>:DELTamarker<1to4>:Y?                                   |                                   | 6.12 |
| CALCulate<1 2>:DELTamarker<1to4>:MAXimum[:PEAK]                       |                                   | 6.12 |
| CALCulate<1 2>:DELTamarker<1to4>:MAXimum:NEXT                         |                                   | 6.12 |
| CALCulate<1 2>:DELTamarker<1to4>:MAXimum:RIGHT                        |                                   | 6.13 |
| CALCulate<1 2>:DELTamarker<1to4>:MAXimum:LEFT                         |                                   | 6.13 |
| CALCulate<1 2>:DELTamarker<1to4>:MINimum[:PEAK]                       |                                   | 6.13 |
| CALCulate<1 2>:DELTamarker<1to4>:MINimum:NEXT                         |                                   | 6.13 |
| CALCulate<1 2>:DELTamarker<1to4>:MINimum:RIGHT                        |                                   | 6.14 |
| CALCulate<1 2>:DELTamarker<1to4>:MINimum:LEFT                         |                                   | 6.14 |
| CALCulate<1 2>:DELTamarker<1to4>:FUNCTion:FIXed[:STATe]               | ON   OFF                          | 6.14 |
| CALCulate<1 2>:DELTamarker<1to4>:FUNCTion:FIXed:RPOint:MAXimum[:PEAK] | <numeric_value>                   | 6.15 |
| CALCulate<1 2>:DELTamarker<1to4>:FUNCTion:FIXed:RPOint:Y              | <numeric_value>                   | 6.15 |
| CALCulate<1 2>:DELTamarker<1to4>:FUNCTion:FIXed:RPOint:Y:OFFSet       | <numeric_value>                   | 6.15 |
| CALCulate<1 2>:DELTamarker<1to4>:FUNCTion:FIXed:RPOint:X              | <numeric_value>                   | 6.16 |

| Command  | Parameter   | Page |
|--|---|------|
| CALCulate<1 2>:DELTAmarker<1to4>:FUNCTion:PNOise[:STATe]           | ON   OFF  | 6.16 |
| CALCulate<1 2>:DELTAmarker<1to4>:FUNCTion:PNOise:RESult?           |   | 6.16 |
| CALCulate<1 2>:FEED  | 'XTIM:AM'   'XTIM:RFPower'   'XTIM:FM'   'XTIM:SPECTrum'   'XTIM:AMSummary'   'XTIM:FMSummary'   'XPOW:CDP'   'XPOW:CDP:RAT'   'XPOW:CDP:OVERview'   'XTIM:CDP:ERR'   'XTIM:CDP:ERR:PHASe'   'XTIM:CDP:ERR:SUMMary'   'XTIM:CDP:ERR:CTABle'   'XTIM:CDP:ERR:PCDomain'   'XTIM:CDP:MACCuracy'   'XTIM:CDP:PVSLOT'   'XTIM:CDP:PVSymbol'   'XTIM:CDP:BSTReam'   'XTIM:CDP:SYMB:CONStellation'   'XTIM:CDP:SYMB:EVM' | 6.17 |
| CALCulate<1 2>:LIMit<1to8>:TRACe                                   | <numeric_value>   | 6.20 |
| CALCulate<1 2>:LIMit<1..8>:UNIT                                    | DBM   DBPW   WATT   DBUV   DBMV   VOLT   DBUA   AMPere   DB   DEG   RAD   S   HZ   PCT   UNITLESS   | 6.21 |
| CALCulate<1 2>:LIMit<1to8>:FAIL?                                   |   | 6.21 |
| CALCulate<1 2>:LIMit<1to8>:CLEAr[:IMMEdiate]                       |   | 6.22 |
| CALCulate<1 2>:LIMit<1to8>:COMMeNt                                 | <string>  | 6.22 |
| CALCulate<1 2>:LIMit<1to8>:COpy                                    | 1 to 8 <name>   | 6.22 |
| CALCulate<1 2>:LIMit<1to8>:NAME                                    | 1 to 8 <string>   | 6.22 |
| CALCulate<1 2>:LIMit<1to8>:DELeTe                                  |   | 6.23 |
| :CALCulate<1 2>:LIMit<1to8>:ESPectrum:MODE                         | AUTO   MANual   USER  | 6.24 |
| :CALCulate<1 2>:LIMit<1to8>:ESPectrum:VALue                        | <numeric_value>   | 6.24 |
| REStore  |   | 6.25 |
| CALCulate<1 2>:LIMit<1to8>:ACPower[:STATe]                         | ON   OFF  | 6.26 |
| CALCulate<1 2>:LIMit<1to8>:ACPower:ACHannel[:RELative]             | 0to100 DB, 0to100 DB  | 6.27 |
| CALCulate<1 2>:LIMit<1to8>:ACPower:ACHannel[:RELative]:STATe       | ON   OFF  | 6.28 |
| CALCulate<1 2>:LIMit<1to8>:ACPower:ACHannel:ABSolute               | -200 to 200 DBM, -200 to 200 DBM  | 6.29 |
| CALCulate<1 2>:LIMit<1to8>:ACPower:ACHannel:ABSolute:STATe         | ON   OFF  | 6.30 |
| CALCulate<1 2>:LIMit<1to8>:ACPower:ACHannel:RESult?                |   | 6.31 |
| CALCulate<1 2>:LIMit<1to8>:ACPower:ALTErnate<1 2>[:RELative]       | 0 to 100 DB, 0to 100 DB   | 6.32 |
| CALCulate<1 2>:LIMit<1to8>:ACPower:ALTErnate<1 2>[:RELative]:STATe | ON   OFF  | 6.33 |
| CALCulate<1 2>:LIMit<1to8>:ACPower:ALTErnate<1 2>:ABSolute         | -200 to 200 DBM, -200 to 200 DBM  | 6.34 |
| CALCulate<1 2>:LIMit<1to8>:ACPower:ALTErnate<1 2>:ABSolute:STATe   | ON   OFF  | 6.35 |
| CALCulate<1 2>:LIMit<1to8>:ACPower:ALTErnate<1 2>:RESult?          |   | 6.36 |
| CALCulate<1 2>:LIMit<1to8>:CONTRol[:DATA]                          | <numeric value>,<numeric value>   | 6.37 |
| CALCulate<1 2>:LIMit<1to8>:CONTRol:DOMain                          | FREQuency   TIME  | 6.37 |
| CALCulate<1 2>:LIMit<1to8>:CONTRol:OFFset                          | <numeric value>   | 6.38 |
| CALCulate<1 2>:LIMit<1to8>:CONTRol:MODE                            | RELative   ABSolute   | 6.38 |
| CALCulate<1 2>:LIMit<1to8>:CONTRol:SHIFt                           | <numeric_value>   | 6.38 |
| CALCulate<1 2>:LIMit<1to8>:LOWer[:DATA]                            | <numeric value>   | 6.39 |
| CALCulate<1 2>:LIMit<1to8>:LOWer:STATe                             | ON   OFF  | 6.40 |
| CALCulate<1 2>:LIMit<1to8>:LOWer:OFFset                            | <numeric value>   | 6.40 |
| CALCulate<1 2>:LIMit<1to8>:LOWer:MARGIn                            | <numeric value>   | 6.40 |

| Command  | Parameter                            | Page |
|--|--------------------------------------|------|
| CALCulate<1 2>:LIMit<1to8>:LOWer:MODE                                  | RELative   ABSolute                  | 6.40 |
| CALCulate<1 2>:LIMit<1to8>:LOWer:SHIFt                                 | <numeric_value>                      | 6.41 |
| CALCulate<1 2>:LIMit<1to8>:LOWer:THReshold                             | <numeric value>                      | 6.41 |
| CALCulate<1 2>:LIMit<1to8>:UPPer[:DATA]                                | <numeric value>                      | 6.42 |
| CALCulate<1 2>:LIMit<1to8>:UPPer:STATe                                 | ON   OFF                             | 6.43 |
| CALCulate<1 2>:LIMit<1to8>:UPPer:OFFset                                | <numeric value>                      | 6.43 |
| CALCulate<1 2>:LIMit<1to8>:UPPer:MARGin                                | <numeric value>                      | 6.43 |
| CALCulate<1 2>:LIMit<1to8>:UPPer:MODE                                  | RELative   ABSolute                  | 6.44 |
| CALCulate<1 2>:LIMit<1to8>:UPPer:SHIFt                                 | <numeric_value>                      | 6.44 |
| CALCulate<1 2>:LIMit<1to8>:UPPer:THReshold                             | <numeric value>                      | 6.44 |
| CALCulate<1 2>:MARKer<1to4>[:STATe]                                    | ON   OFF                             | 6.45 |
| CALCulate<1 2>:MARKer<1to4>:AOFF                                       |                                      | 6.46 |
| CALCulate<1 2>:MARKer<1to4>:TRACe                                      | 1to3                                 | 6.46 |
| CALCulate<1 2>:MARKer<1to4>:X  | 0 to MAX (frequency   sweep time)    | 6.46 |
| CALCulate<1 2>:MARKer<1to4>:X:SLIMits[:STATe]                          | ON   OFF                             | 6.46 |
| CALCulate<1 2>:MARKer<1to4>:X:SLIMits:LEFT                             | 0 to MAX (frequency   sweep time)    | 6.47 |
| CALCulate<1 2>:MARKer<1to4>:X:SLIMits:RIGHT                            | 0 to MAX (frequency   sweep time)    | 6.47 |
| CALCulate<1 2>:MARKer<1to4>:COUNT                                      | ON   OFF                             | 6.48 |
| CALCulate<1 2>:MARKer<1to4>:COUNT:RESolution                           | 0.1   1   10   100   1000   10000 Hz | 6.48 |
| CALCulate<1 2>:MARKer<1to4>:COUNT:FREQUency?                           |                                      | 6.48 |
| CALCulate<1 2>:MARKer<1to4>:LOEXclude                                  | ON   OFF                             | 6.49 |
| CALCulate<1 2>:MARKer<1to4>:Y?   |                                      | 6.49 |
| CALCulate<1 2>:MARKer<1to4>:Y:PERCent                                  | 0 to 100%                            | 6.49 |
| CALCulate<1 2>:MARKer<1to4>:MAXimum[:PEAK]                             |                                      | 6.50 |
| CALCulate<1 2>:MARKer<1to4>:MAXimum:NEXT                               |                                      | 6.50 |
| CALCulate<1 2>:MARKer<1to4>:MAXimum:RIGHT                              |                                      | 6.50 |
| CALCulate<1 2>:MARKer<1to4>:MAXimum:LEFT                               |                                      | 6.51 |
| CALCulate<1 2>:MARKer<1to4>:MINimum[:PEAK]                             |                                      | 6.51 |
| CALCulate<1 2>:MARKer<1to4>:MINimum:NEXT                               |                                      | 6.51 |
| CALCulate<1 2>:MARKer<1to4>:MINimum:RIGHT                              |                                      | 6.52 |
| CALCulate<1 2>:MARKer<1to4>:MINimum:LEFT                               |                                      | 6.52 |
| CALCulate<1 2>:MARKer<1to4>:PEXCursion                                 | <numeric value>                      | 6.52 |
| CALCulate<1 2>:MARKer<1to4>:FUNctioN:ADEMod:FM[:RESult<1to3>]?         | PPEak   MPEak   MIDDLE   RMS         | 6.53 |
| CALCulate<1 2>:MARKer<1to4>:FUNctioN:ADEMod:AFREquency[:RESult<1to3>]? |                                      | 6.53 |
| CALCulate<1 2>:MARKer<1to4>:FUNctioN:ADEMod:FERRor[:RESult<1to3>]?     |                                      | 6.54 |
| CALCulate<1 2>:MARKer<1to4>:FUNctioN:ADEMod:CARRier[:RESult<1to3>]?    |                                      | 6.54 |
| CALCulate<1 2>:MARKer<1to4>:FUNctioN:FPEaks[:IMMediate]                | <numeric value>                      | 6.55 |
| CALCulate<1 2>:MARKer<1to4>:FUNctioN:FPEaks:COUNt?                     |                                      | 6.56 |
| CALCulate<1 2>:MARKer<1to4>:FUNctioN:FPEaks:X?                         |                                      | 6.56 |
| CALCulate<1 2>:MARKer<1to4>:FUNctioN:FPEaks:X?                         |                                      | 6.57 |
| CALCulate<1 2>:MARKer<1to4>:FUNctioN:FPEaks:SORT                       | X   Y                                | 6.57 |
| CALCulate<1 2>:MARKer<1to4>:FUNctioN:NDBDown                           | <numeric value>                      | 6.57 |
| CALCulate<1 2>:MARKer<1to4>:FUNctioN:NDBDown:STATe                     | ON   OFF                             | 6.58 |
| CALCulate<1 2>:MARKer<1to4>:FUNctioN:NDBDown:RESult?                   |                                      | 6.58 |

| Command   | Parameter  | Page |
|---|--|------|
| CALCulate<1 2>:MARKer<1to4>:FUNction:NDBDown:FREQuency?                 |  | 6.59 |
| CALCulate<1 2>:MARKer:FUNction:ZOOM                                     | <numeric value>                                    | 6.59 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:NOISe[:STATe]                      | ON   OFF   | 6.60 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:NOISe:RESult?                      |  | 6.60 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:DEModulation:SElect                | AM   FM  | 6.60 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:DEModulation[:STATe]               | ON   OFF   | 6.61 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:DEModulation:HOLDoff               | 10ms to 1000s                                      | 6.61 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:DEModulation:CONTInuous            | ON   OFF   | 6.61 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:MDEPth[:STATe]                     |  | 6.62 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:MDEPth:RESult?                     |  | 6.62 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:TOI[:STATe]                        | ON   OFF   | 6.63 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:TOI:RESult?                        |  | 6.63 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:CENTer                             |  | 6.64 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:CSTep                              |  | 6.64 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:REFerence                          |  | 6.64 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:POWer:SElect?                      | ACPower   CPower   OBANdwidth   OBWidth   CN   CN0 | 6.65 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:POWer:RESult?                      | ACPower   CPower   OBANdwidth   OBWidth   CN   CN0 | 6.66 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:POWer:RESult:PHZ                   | ON   OFF   | 6.68 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:POWer[:STATe]                      | OFF  | 6.69 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:POWer:PRESet                       | <standard>   | 6.69 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:STRack[:STATe]                     | ON   OFF   | 6.70 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:STRack:BANDwidth BWIDth            | 10 HztoMAX(SPAN)                                   | 6.70 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:STRack:THReshold                   | -330 dBmto+30 dBm                                  | 6.71 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:STRack:TRACe                       | 1 to 3   | 6.71 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:SUMMary[:STATe]                    | ON   OFF   | 6.73 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:SUMMary:PPEak[:STATe]              | ON   OFF   | 6.73 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:SUMMary:PPEak:RESult?              |  | 6.73 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:SUMMary:PPEak:AVERage:RESult?      |  | 6.74 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:SUMMary:PPEak:PHOLD:RESult?        |  | 6.74 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:SUMMary:RMS[:STATe]                | ON   OFF   | 6.75 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:SUMMary:RMS:RESult?                |  | 6.75 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:SUMMary:RMS:AVERage:RESult?        |  | 6.75 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:SUMMary:RMS:PHOLD:RESult?          |  | 6.76 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:SUMMary:MEAN[:STATe]               | ON   OFF   | 6.76 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:SUMMary:MEAN:RESult?               |  | 6.77 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:SUMMary:MEAN:AVERage:RESult?       |  | 6.77 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:SUMMary:MEAN:PHOLD:RESult?         |  | 6.78 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:SUMMary:SDEViation[:STATe]         | ON   OFF   | 6.78 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:SUMMary:SDEViation:RESult?         |  | 6.79 |
| CALCulate<1 2>:MARKer<1to4>:FUNction:SUMMary:SDEViation:AVERage:RESult? |  | 6.79 |

| Command   | Parameter  | Page |
|---|--|------|
| CALCulate<1 2>:MARKer<1to4>:FUNCTION:SUMMARY:SDEVIation:PHOLD:RESult? |  | 6.80 |
| CALCulate<1 2>:MARKer<1to4>:FUNCTION:SUMMARY:PHOLD                    | ON   OFF   | 6.80 |
| CALCulate<1 2>:MARKer<1to4>:FUNCTION:SUMMARY:AVERAge                  | ON   OFF   | 6.81 |
| CALCulate<1 2>:MARKer<1to4>:FUNCTION:SUMMARY:MODE                     | ABSolute   RELative  | 6.81 |
| CALCulate<1 2>:MARKer<1to4>:FUNCTION:SUMMARY:REFerence:AUTO           | ONCE   | 6.82 |
| CALCulate<1 2>:MARKer<1to4>:FUNCTION:SUMMARY:AOFF                     |  | 6.82 |
| CALCulate<1 2>:MARKer<1to4>:FUNCTION:MSUMmary?                        | <time offset of first pulse>,<br><measurement time>, <period>,<br>< # of pulses to measure>  | 6.83 |
| CALCulate<1 2>:MARKer<1>:FUNCTION:CPICH                               |  | 6.84 |
| CALCulate<1 2>:MARKer<1.>:FUNCTION:PCCPch                             |  | 6.84 |
| CALCulate<1 2>:MARKer<1.>:FUNCTION:DPCCh                              |  | 6.85 |
| CALCulate<1 2>:MARKer<1 to 4>:FUNCTION:WCDPower:BTS:RESult?           | PTOTal   FERRor   TFRame  <br>MACCuracy   PCDerror   EVMRms  <br>EVMPeak   CERRor   CSLot   SRATe  <br>CHANNel   CDPabsolute   CDPRelative<br>  IQOFset   IQIMbalance                | 6.85 |
| CALCulate<1 2>:MARKer<1 to 4>:FUNCTION:WCDPower:MS:RESult?            | PTOTal   FERRor   TFRame  <br>MACCuracy   PCDerror   EVMRms  <br>EVMPeak   CERRor   SRATe  <br>CHANNel   CDPabsolute   CDPRelative<br>  IQOFset   IQIMbalance   CMAPing  <br>PSYMBOL | 6.86 |
| CALCulate<1 2>:MATH[:EXPRession][:DEFine]                             | <expr>   | 6.87 |
| CALCulate<1 2>:MATH:POS   | -100PCT to 200PCT  | 6.87 |
| CALCulate<1 2>:MATH:STATe   | ON   OFF   | 6.88 |
| CALCulate<1 2>:MATH:MODE LINear   LOGarithmic                         |  | 6.88 |
| CALCulate:STATistics:APD[:STATe]                                      | ON   OFF   | 6.89 |
| CALCulate:STATistics:CCDF[:STATe]                                     | ON   OFF   | 6.89 |
| CALCulate:STATistics:NSAMples   | 100 to 1E9   | 6.90 |
| CALCulate:STATistics:SCALE:AUTO                                       | ONCE   | 6.90 |
| CALCulate:STATistics:SCALE:X:RLEVEL                                   | -130dBm to 30dBm   | 6.90 |
| CALCulate:STATistics:SCALE:X:RANGE                                    | -10dB to 200dB   | 6.91 |
| CALCulate:STATistics:SCALE:Y:UPPER                                    | -1E-8 to 1.0   | 6.91 |
| CALCulate:STATistics:SCALE:Y:LOWER                                    | -1E-9 to 0.1   | 6.91 |
| CALCulate:STATistics:PRESet   |  | 6.91 |
| CALCulate:STATistics:Result<1to3>?                                    | MEAN PEAK CFACtor ALL  | 6.92 |
| CALCulate<1 2>:DLINe<1 2>   | MIN .. MAX (depending on current unit)   | 6.93 |
| CALCulate<1 2>:DLINe<1 2>:STATe                                       | ON   OFF   | 6.93 |
| CALCulate<1 2>:THReshold  | MIN .. MAX (depending on current unit)   | 6.93 |
| CALCulate<1 2>:THReshold:STATe  | ON   OFF   | 6.94 |
| CALCulate<1 2>:FLINe<1 2>   | 0tofmax  | 6.94 |
| CALCulate<1 2>:FLINe<1 2>:STATe                                       | ON   OFF   | 6.94 |
| CALCulate<1 2>:TLINe<1 2>   | 0 to 1000s   | 6.94 |
| CALCulate<1 2>:TLINe<1 2>:STATe                                       | ON   OFF   | 6.94 |
| CALCulate<1 2>:UNIT:POWER   | DBM   V   A   W   DBPW   WATT  <br>DBUV   DBMV   VOLT   DBUA  <br>AMPere   DBPT DBUA_M   DBUV_M  | 6.95 |
| CALibration[:ALL]?  |  | 6.96 |
| CALibration:ABORT   |  | 6.96 |

| Command                                      | Parameter   | Page  |
|--|---|-------|
| CALibration:RESult?                          |   | 6.97  |
| CALibration:STATe                            | ON   OFF  | 6.97  |
| CONFigure:CHANnel:SLOT:MULTi                 | ACT1_SYNC1   ACT2_SYNC1  <br>ACT2_SYNC2   ACT3_SYNC1  <br>ACT3_SYNC2   ACT3_SYNC3  <br>ACT4_SYNC1   ACT4_SYNC2  <br>ACT4_SYNC3   ACT4_SYNC4  <br>ACT8SYNC1   ACT8SYNC2  <br>ACT8SYNC3   ACT8SYNC4  <br>ACT8SYNC5   ACT8SYNC6  <br>ACT8SYNC7   ACT8SYNC8 | 6.98  |
| CONFigure:CHANnel:TSC                        | 0 to 7   USER   | 6.99  |
| CONFigure:CHANnel:TSC:USER                   | <string>  | 6.100 |
| CONFigure:PRATe 4   8                        |   | 6.100 |
| CONFigure:REStore                            |   | 6.101 |
| CONFigure:MTYPe                              | GMSK   EDGE   | 6.101 |
| CONFigure:BURSt:PFERror[:IMMediate]          |   | 6.102 |
| CONFigure:BURSt:MACCuracy[:IMMediate]        |   | 6.103 |
| CONFigure:BURSt:POWer[:IMMediate]            |   | 6.103 |
| CONFigure:BURSt:PTEmplate[:IMMediate]        |   | 6.103 |
| CONFigure:BURSt:PTEmplate:SElect             | FULL   TOP   RIsing   FALLing   | 6.104 |
| CONFigure:SPEctrum:MODulation[:IMMediate]    |   | 6.105 |
| CONFigure:SPEctrum:SWITching[:IMMediate]     |   | 6.105 |
| CONFigure:SPURious[:IMMediate]               |   | 6.106 |
| CONFigure:WCDPower[:BTS]:MEASurement:        | POWer   ACLR   ESPectrum  <br>OBANdwith   OBWidth   WCDPower  <br>FDMaIn   TDMaIn   CCDF  | 6.107 |
| CONFigure<1>:WCDPower[:BTS]:CTABle[:STATe]   | ON   OFF  | 6.108 |
| CONFigure<1>:WCDPower[:BTS]:CTABle:SElect    | <file_name>   | 6.108 |
| CONFigure<1>:WCDPower[:BTS]:CTABle:NAME      | <file_name>   | 6.108 |
| CONFigure<1>:WCDPower[:BTS]:CTABle:DATA      | 2 to 9, 0 .. 511, 0   1, <numeric_value><br>  AUTO, 2 4 8 16 . 0 1,<br><numeric_value>to.   | 6.108 |
| CONFigure<1>:WCDPower[:BTS]:CTABle:COMMeNt   | <string>  | 6.109 |
| CONFigure<1>:WCDPower[:BTS]:CTABle:COpy      | <file_name>   | 6.109 |
| CONFigure<1>:WCDPower[:BTS]:CTABle:DELeTe    |   | 6.110 |
| CONFigure<1>:WCDPower[:BTS]:CTABle:CATALog?* |   | 6.110 |
| :CONFigure<1>:WCDPower[:BTS]:CTABle:REStore  |   | 6.110 |
| CONFigure:WCDPower:MS:MEASurement            | POWer   ACLR   ESPectrum  <br>OBANdwith   OBWidth   WCDPower  <br>FDMaIn   TDMaIn   CCDF  | 6.110 |
| CONFigure<1>:WCDPower:MS:CTABle[:STATe]      | ON   OFF  | 6.111 |
| CONFigure<1>:WCDPower:MS:CTABle:SElect       | <string>  | 6.111 |
| CONFigure<1>:WCDPower:MS:CTABle:NAME         | <file_name>   | 6.111 |
| CONFigure<1>:WCDPower:MS:CTABle:DATA         | <numeric_value>, <numeric_value>to.   | 6.111 |
| CONFigure<1>:WCDPower:MS:CTABle:COMMeNt      | <string>  | 6.112 |
| CONFigure<1>:WCDPower:MS:CTABle:COpy         | <file_name>   | 6.112 |
| CONFigure<1>:WCDPower[:BTS]:CTABle:DELeTe    |   | 6.112 |
| CONFigure<1>:WCDPower:MS:CTABle:CATALog?*    |   | 6.113 |
| DIAGnostic<1 2>:SERVice:INPut[:SElect]       | CALibration   RF  | 6.114 |
| DIAGnostic<1 2>:SERVice:INPut:PULSed[:State] | ON   OFF  | 6.114 |



| Command   | Parameter                                  | Page  |
|---|--|-------|
| DIAGnostic<1 2>:SERVice:INPut:PULSed:PRATe                | 10 kHz   100 kHz   1 MHz   640 MHz         | 6.114 |
| DIAGnostic<1 2>:SERVice:SFUNction                         | <string>to                                 | 6.115 |
| DIAGnostic<1 2>:SERVice:NSource                           | ON   OFF                                   | 6.115 |
| DIAGnostic<1 2>:SERVice:CSource[:POWER]                   | <numeric_value>                            | 6.115 |
| DIAGnostic<1 2>:SERVice:STESSt:RESult?                    |  | 6.116 |
| DIAGnostic<1 2>:SERVice:HWINfo?                           |  | 6.116 |
| DISPlay:FORmat  | SINGLE   SPLit                             | 6.118 |
| DISPlay:ANNOtation:FREQUency                              | ON   OFF                                   | 6.118 |
| DISPlay:LOGO  | ON   OFF                                   | 6.118 |
| DISPlay:PSAVE[:STATe]                                     | ON   OFF                                   | 6.118 |
| DISPlay:PSAVE:HOLDoff                                     | 0 to 60                                    | 6.118 |
| DISPlay:CMAP<1to26>:DEFault<1 2>                          |  | 6.119 |
| DISPlay:CMAP<1to26>:HSL                                   | 0..1,0..1,0..1                             | 6.119 |
| DISPlay:CMAP<1to26>:PDEFined                              | <color>                                    | 6.120 |
| DISPlay[:WINDow<1 2>]:SELect                              |  | 6.120 |
| DISPlay[:WINDow<1 2>]:TEXT[:DATA]                         | <string>                                   | 6.120 |
| DISPlay[:WINDow<1 2>]:TEXT:STATe                          | ON   OFF                                   | 6.121 |
| DISPlay[:WINDow<1 2>]:TIME                                | ON   OFF                                   | 6.121 |
| DISPlay[:WINDow<1 2>]:TRACe<1to3>:Y[:SCALE]               | 10dB to 200dB                              | 6.121 |
| DISPlay[:WINDow<1 2>]:TRACe<1to3>:Y[:SCALE]:MODE          | ABSolute   RELative                        | 6.121 |
| DISPlay[:WINDow<1 2>]:TRACe<1to3>:Y[:SCALE]:RLEVel        | -130dBm to 30dBm                           | 6.122 |
| DISPlay[:WINDow<1 2>]:TRACe<1to3>:Y[:SCALE]:RLEVel:OFFSet | -200dB to 200dB                            | 6.122 |
| DISPlay[:WINDow<1 2>]:TRACe<1to3>:Y[:SCALE]:RVALue        | <numeric value>                            | 6.122 |
| DISPlay[:WINDow<1 2>]:TRACe<1to3>:Y[:SCALE]:RPOSition     | 0 to 100 PCT                               | 6.123 |
| DISPlay[:WINDow<1 2>]:TRACe<1to3>:Y[:SCALE]:PDIVision     |  | 6.123 |
| DISPlay[:WINDow<1 2>]:TRACe<1to3>:Y:SPACing               | LINear   LOGarithmic                       | 6.123 |
| DISPlay[:WINDow<1 2>]:TRACe<1to3>:MODE                    | WRITe   VIEW   AVERAge   MAXHold   MINHold | 6.124 |
| DISPlay[:WINDow<1 2>]:TRACe<1to3>[:STATe]                 | ON   OFF                                   | 6.124 |
| FETCh:BURSt:PERRor:RMS:AVERAge?                           |  | 6.126 |
| FETCh:BURSt:PERRor:RMS:MAXimum?                           |  | 6.126 |
| FETCh:BURSt:PERRor:PEAK:AVERAge?                          |  | 6.127 |
| FETCh:BURSt:PERRor:PEAK:MAXimum?                          |  | 6.127 |
| FETCh:BURSt:FERRor:AVERAge?                               |  | 6.128 |
| FETCh:BURSt:FERRor:MAXimum?                               |  | 6.128 |
| FETCh:BURSt:IQOFFset:AVERAge?                             |  | 6.128 |
| FETCh:BURSt:IQOFFset:MAXimum?                             |  | 6.129 |
| FETCh:BURSt:IQIMbalance:AVERAge?                          |  | 6.129 |
| FETCh:BURSt:IQIMbalance:MAXimum?                          |  | 6.130 |
| FETCh:BURSt:PTEMplate:REFerence?                          |  | 6.130 |
| FETCh:BURSt:MACCuracy:RMS:AVERAge?                        |  | 6.131 |
| FETCh:BURSt:MACCuracy:RMS:MAXimum?                        |  | 6.131 |
| FETCh:BURSt:MACCuracy:PEAK:AVERAge?                       |  | 6.132 |
| FETCh:BURSt:MACCuracy:PEAK:MAXimum?                       |  | 6.133 |
| FETCh:BURSt:MACCuracy:OSUPpress:AVERAge?                  |  | 6.133 |
| FETCh:BURSt:MACCuracy:OSUPpress:MAXimum?                  |  | 6.134 |

| Command                                    | Parameter  | Page  |
|--|--|-------|
| FETCh:BURSt:MACCuracy:PERCentile:AVERAge?  |  | 6.134 |
| FETCh:BURSt:MACCuracy:PERCentile:MAXimum?  |  | 6.135 |
| FETCh:BURSt:MACCuracy:FREQUency:AVERAge?   |  | 6.135 |
| FETCh:BURSt:MACCuracy:FREQUency:MAXimum?   |  | 6.136 |
| FETCh:BURSt:MACCuracy:IQOFfset:AVERAge?    |  | 6.136 |
| FETCh:BURSt:MACCuracy:IQOFfset:MAXimum?    |  | 6.137 |
| FETCh:BURSt:MACCuracy:IQIMbalance:AVERAge? |  | 6.137 |
| FETCh:BURSt:MACCuracy:IQIMbalance:MAXimum? |  | 6.138 |
| FETCh:MODulation[:ALL]?                    | ARFCn  | 6.140 |
| FETCh:SPECTrum:MODulation:REFerence?       |  | 6.141 |
| FETCh:SPECTrum:SWITChing[:ALL]?            |  | 6.142 |
| FORMat[:DATA]                              | ASCIi   REAL   UINT[,32]                                   | 6.143 |
| FORMat:DEXPort:DSEParator POINT COMMa      |  | 6.143 |
| HCOPy:ABORT                                |  | 6.144 |
| HCOPy:CMAP<1to26>:DEFault<1 2 3>           |  | 6.144 |
| HCOPy:CMAP<1to26>:HSL                      | 0..1,0..1,0..1   | 6.145 |
| HCOPy:CMAP<1to26>:PDEFined                 | <color>  | 6.146 |
| HCOPy:DESTination<1 2>                     | " 'MMEM'   'SYST:COMM:PRIN'   'SYST:COMM:CLIP'             | 6.146 |
| HCOPy:DEVice:COLor                         | ON   OFF   | 6.147 |
| HCOPy:DEVice:LANGUage<1 2>                 | GDI   WMF   EWMF   BMP                                     | 6.147 |
| HCOPy[:IMMediate]                          |  | 6.147 |
| HCOPy:ITEM:ALL                             |  | 6.148 |
| HCOPy:ITEM:WINDow<1 2>:TABLe:STATe         | ON   OFF   | 6.148 |
| HCOPy:ITEM:WINDow<1 2>:TEXT                | <string>   | 6.148 |
| HCOPy:ITEM:WINDow<1 2>:TRACe:STATe         | ON   OFF   | 6.148 |
| HCOPy:PAGE:ORientation<1 2>                | LANDscape   PORTRait                                       | 6.149 |
| INITiate<1 2>:CONTInuous                   | ON   OFF   | 6.150 |
| INITiate<1 2>:CONMeas                      | ON   OFF   | 6.150 |
| INITiate<1 2>[:IMMediate]                  |  | 6.151 |
| INITiate<1 2>:DISPlay                      | ON   OFF   | 6.151 |
| INPut<1 2>:ATTenuation                     | 0 to 75dB  | 6.152 |
| INPut<1 2>:ATTenuation:AUTO                | ON   OFF   | 6.152 |
| INPut<1 2>:ATTenuation:PROTEction:RESet    |  | 6.153 |
| INPut:COUPling                             | AC   DC  | 6.153 |
| INPut<1 2>:EATT                            | 0 to 30dB  | 6.153 |
| INPut<1 2>:EATT:AUTO                       | ON   OFF   | 6.154 |
| INPut<1 2>:EATT:STATe                      | ON   OFF   | 6.154 |
| INPut<1 2>:IMPedance                       | 50   75  | 6.154 |
| INPut<1 2>:GAIN:STATe                      | ON   OFF   | 6.154 |
| INPut<1 2>:MIXer[:POWER]                   | <numeric value>  | 6.155 |
| INPut<1 2>:MIXer:AUTO                      | on   OFF   | 6.155 |
| INSTrument<1 2>[:SElect]                   | SANalyzer   ADEMod   MGSM   WCDPower BWCDpower   MWCDpower | 6.156 |
| INSTrument<1 2>:NSElect                    | <numeric value>  | 6.157 |
| INSTrument:COUple                          | NONE   RLEVel   CF_B   CF_A                                | 6.157 |

| Command   | Parameter                 | Page  |
|---|---------------------------|-------|
| MMEMory:CATalog?                                  | Pfad                      | 6.160 |
| MMEMory:CDIRectory                                | Verzeichnisname           | 6.160 |
| MMEMory:COpy                                      | Pfad\Datei, Pfad\Datei    | 6.160 |
| MMEMory:DATA                                      | Dateiname[, <Blockdaten>] | 6.161 |
| MMEMory:DELeTe                                    | Pfad\Dateiname            | 6.162 |
| MMEMory:LOAD:STATe                                | 1,Pfad                    | 6.163 |
| MMEMory:LOAD:AUTO                                 | 1,Pfad                    | 6.164 |
| MMEMory:MDIRectory                                | Pfad                      | 6.164 |
| MMEMory:MOVE                                      | Pfad                      | 6.165 |
| MMEMory:MSIS                                      | 'A:'   'D:'               | 6.165 |
| MMEMory:NAME                                      | Pfad\Dateiname            | 6.165 |
| MMEMory:RDIRectory                                | Verzeichnisname           | 6.166 |
| MMEMory:STORe<1 2>:STATe                          | 1,Pfad                    | 6.166 |
| MMEMory:STORe<1 2>:TRACe                          | 1to3,Pfad                 | 6.166 |
| MMEMory:CLear:STATe                               | 1,Pfad                    | 6.167 |
| MMEMory:CLear:ALL                                 |                           | 6.167 |
| MMEMory:SELeCt[:ITEM]:HWSettings                  | ON   OFF                  | 6.167 |
| MMEMory:SELeCt[:ITEM]:TRACe[:ACTive]              | ON   OFF                  | 6.168 |
| MMEMory:SELeCt[:ITEM]:LINES:ALL                   | ON   OFF                  | 6.168 |
| MMEMory:SELeCt[:ITEM]:SCData                      | ON   OFF                  | 6.168 |
| MMEMory:SELeCt[:ITEM]:TRANsducer[:ACTive%ON   OFF |                           | 6.168 |
| MMEMory:SELeCt[:ITEM]:TRANsducer:ALL%ON   OFF     |                           | 6.169 |
| MMEMory:SELeCt[:ITEM]:ALL                         |                           | 6.169 |
| MMEMory:SELeCt[:ITEM]:NONE                        |                           | 6.169 |
| MMEMory:SELeCt[:ITEM]:DEFault                     |                           | 6.169 |
| MMEMory:COMMent                                   | <string>                  | 6.170 |
| READ:AUTO:LEVTime?                                |                           | 6.171 |
| READ:BURSt:PERRor:RMS:AVERAge?                    |                           | 6.174 |
| READ:BURSt:PERRor:RMS:MAXimum?                    |                           | 6.174 |
| READ:BURSt:PERRor:PEAK:AVERAge?                   |                           | 6.175 |
| READ:BURSt:PERRor:PEAK:MAXimum?                   |                           | 6.175 |
| READ:BURSt:FERRor:AVERAge?                        |                           | 6.176 |
| READ:BURSt:FERRor:MAXimum?                        |                           | 6.176 |
| READ:BURSt:IQOFfset:AVERAge?                      |                           | 6.177 |
| READ:BURSt:IQOFfset:MAXimum?                      |                           | 6.177 |
| READ:BURSt:IQIMbalance:AVERAge?                   |                           | 6.178 |
| READ:BURSt:IQIMbalance:MAXimum?                   |                           | 6.178 |
| READ:BURSt:PTEMplate:REFerence[:IMMediate]?       |                           | 6.179 |
| READ:BURSt:REFerence[:IMMediate]?                 |                           | 6.179 |
| READ:BURSt:MACCuracy:RMS:AVERAge?                 |                           | 6.180 |
| READ:BURSt:MACCuracy:RMS:MAXimum?                 |                           | 6.180 |
| READ:BURSt:MACCuracy:PEAK:AVERAge?                |                           | 6.181 |
| READ:BURSt:MACCuracy:PEAK:MAXimum?                |                           | 6.181 |
| READ:BURSt:MACCuracy:OSUPpress:AVERAge?           |                           | 6.182 |
| READ:BURSt:MACCuracy:OSUPpress:MAXimum?           |                           | 6.182 |
| READ:BURSt:MACCuracy:PERCentile:AVERAge?          |                           | 6.183 |

| Command   | Parameter   | Page  |
|---|---|-------|
| READ:BURSt:MACCuracy:PERCentile:MAXimum?              |   | 6.183 |
| READ:BURSt:MACCuracy:FREQuency:AVERage?               |   | 6.184 |
| READ:BURSt:MACCuracy:FREQuency:MAXimum?               |   | 6.184 |
| READ:BURSt:MACCuracy:IQOffset:AVERage?                |   | 6.185 |
| READ:BURSt:MACCuracy:IQOffset:MAXimum?                |   | 6.185 |
| FETCh:BURSt:MACCuracy:IQIMbalance:AVERage?            |   | 6.186 |
| FETCh:BURSt:MACCuracy:IQIMbalance:MAXimum?            |   | 6.186 |
| READ:SPECtrum:MODulation[:ALL]?                       |   | 6.187 |
| READ:SPECtrum:MODulation:REFeRence[:IMMediate]?       |   | 6.188 |
| READ:SPECtrum:SWITChing[:ALL]?                        |   | 6.189 |
| [SENSe:]ADEMod:AF:COUPling                            | AC   DC   | 6.193 |
| [SENSe:]ADEMod:BANDwidth   BWIDth:DEModulation        | <numeric_value>   | 6.193 |
| [SENSe:]ADEMod:MTIME                                  | <numeric_value>   | 6.193 |
| [SENSe:]ADEMod:RLENgth?                               |   | 6.194 |
| [SENSe:]ADEMod:STATE                                  | ON   OFF  | 6.194 |
| [SENSe:]ADEMod:SET                                    | <sample rate>,<record length>,<trigger source>,<trigger slope>,<offset samples>,<# of meas> | 6.194 |
| [SENSe:]ADEMod:SRATe?                                 |   | 6.195 |
| [SENSe:]ADEMod:AM[:TYPE]                              | <result type 1>,<result type 2>,<result type 3>   | 6.196 |
| [SENSe:]ADEMod:AM:RESult?                             | <result type>   | 6.196 |
| [SENSe:]ADEMod:FM[:TYPE]                              | <result type 1>,<result type 2>,<result type 3>   | 6.197 |
| [SENSe:]ADEMod:FM:RESult?                             | <result type>   | 6.198 |
| [SENSe:]ADEMod:FM:OFFset?                             | <result type>   | 6.199 |
| [SENSe:]ADEMod:SPECtrum:BANDwidth BWIDth[:RESolution] | 1 Hz to 10 MHz  | 6.200 |
| [SENSe:]ADEMod:SPECtrum:SPAN                          | <numeric_value>   | 6.200 |
| [SENSe:]ADEMod:SPECtrum[:TYPE]                        | <result type 1>,<result type 2>,<result type 3>   | 6.201 |
| [SENSe:]ADEMod:SPECtrum:OFFset?                       | <result type>   | 6.201 |
| [SENSe<1 2>:]ADEMod:ZOOM[:STATe]                      | ON   OFF  | 6.203 |
| [SENSe<1 2>:]ADEMod:ZOOM:STARt                        | 0s to measurement time  | 6.203 |
| [SENSe<1 2>:]AVERage:COUNT                            | 0 to 32767  | 6.204 |
| [SENSe<1 2>:]AVERage[:STATe<1to3>]                    | ON   OFF  | 6.204 |
| [SENSe<1 2>:]AVERage:TYPE                             | VIDeo   LINear  | 6.205 |
| [SENSe<1 2>:]BANDwidth BWIDth[:RESolution]            | 10 Hz to 50MHz  | 6.206 |
| [SENSe<1 2>:]BANDwidth BWIDth[:RESolution]:AUTO       | ON   OFF  | 6.207 |
| [SENSe<1 2>:]BANDwidth BWIDth[:RESolution]:RATio      | 0.0001 to 1   | 6.207 |
| [SENSe<1 2>:]BANDwidth BWIDth[:RESolution]:TYPE       | NORMal   FFT   CFILter   RRC  | 6.208 |
| [SENSe<1 2>:]BANDwidth BWIDth:VIDeo                   | 1Hz to 10MHz  | 6.208 |
| [SENSe<1 2>:]BANDwidth BWIDth:VIDeo:AUTO              | ON   OFF  | 6.208 |
| [SENSe<1 2>:]BANDwidth BWIDth:VIDeo:RATio             | 0.01 to 1000  | 6.209 |
| [SENSe<1 2>:]BANDwidth BWIDth:VIDeo:TYPE              | LINear   LOGarithmic  | 6.209 |
| [SENSe<1 2>:]BANDwidth BWIDth:DEMod                   | <numeric_value>   | 6.210 |
| [SENSe<1 2>:]BANDwidth BWIDth:PLL                     | AUTO   HIGH   MEDIUm   LOW  | 6.210 |
| [SENSe<1 2>:]CDPower:PRESet                           |   | 6.211 |
| [SENSe<1 2>:]CDPower:MPERiod                          | 1   2   4   8   12   16   20   24   | 6.211 |

| Command   | Parameter   | Page  |
|---|---|-------|
| [SENSe<1 2>:]CDPower:MPERiod:AUTO                   | ON   OFF  | 6.212 |
| [SENSe<1 2>:]CDPower:PNOFset                        | <num_value>   | 6.212 |
| [SENSe<1 2>:]CDPower:ICTReshold                     | -59 to 10 dB  | 6.212 |
| [SENSe<1 2>:]CDPower:SBANd                          | NORMAl   INVers   | 6.212 |
| [SENSe<1 2>:]CDPower:LEVel:ADJust                   |   | 6.212 |
| [SENSe<1 2>:]CDPower:LCODE[:VALue]                  | <hex>   | 6.213 |
| [SENSe<1 2>:]CDPower:LCODE:TYPE                     | LONG   SHORt  | 6.213 |
| [SENSe<1 2>:]CDPower:CODE                           | 0 to 511  | 6.213 |
| [SENSe<1 2>:]CDPower:SLOT                           | 0 to 14   | 6.213 |
| [SENSe<1 2>:]CDPower:MAPPing                        | I   Q   | 6.213 |
| :SENSe<1 2>:CDPower:SFACTOR                         | 4   8   16   32   64   128   256   512  | 6.214 |
| [SENSe:]CDPower:NORMAlize                           | ON   OFF  | 6.214 |
| [SENSe:]CDPower:QINVert                             | ON   OFF  | 6.214 |
| :[SENSe:]CDPower:PREFerence                         | TOTAl   CPICh   | 6.214 |
| :[SENSe<1 2>:]CDPower:STYPe CPICh   SCHannel        |   | 6.214 |
| :[SENSe<1 2>:]CDPower:ANTenna OFF   <numeric_value> |   | 6.215 |
| :[SENSe<1 2>:]CDPower:BASE SLOT   FRAME             |   | 6.215 |
| [SENSe<1 2>:]CORRection[:STATe]                     | ON   OFF  | 6.216 |
| [SENSe<1 2>:]CORRection:METhod                      | TRANSmision   REFLEXion   | 6.216 |
| [SENSe<1 2>:]CORRection:COLLect[:ACQuire]           | THROugh   OPEN  | 6.217 |
| [SENSe<1 2>:]CORRection:RECall                      |   | 6.217 |
| [SENSe<1 2>:]CORRection:TRANSDucer:SElect           | <name>  | 6.217 |
| [SENSe<1 2>:]CORRection:TRANSDucer:UNIT             | <string>  | 6.218 |
| [SENSe<1 2>:]CORRection:TRANSDucer:SCALing          | LINear LOGarithmic  | 6.218 |
| :[SENSe<1 2>:]CORRection:TRANSDucer:COMMeNT         | <string>  | 6.218 |
| [SENSe<1 2>:]CORRection:TRANSDucer:DATA             | <freq>,<level>..  | 6.219 |
| [SENSe<1 2>:]CORRection:TRANSDucer[:STATe]%         | ON   OFF  | 6.219 |
| [SENSe<1 2>:]CORRection:TRANSDucer:DELeTe           |   | 6.219 |
| [SENSe<1 2>:]CORRection:TRANSDucer:VIEW             | ON   OFF  | 6.219 |
| [SENSe<1 2>:]DETEctor<1..4>[:FUNCTion]              | APEak   NEGative   POSitive   SAMPlE   RMS   AVERage   QPEak  | 6.220 |
| [SENSe<1 2>:]DETEctor[:FUNCTion]:AUTO               | ON   OFF  | 6.220 |
| [SENSe<1 2>:]FREQUency:CENTer                       | 0 to $f_{max}$  | 6.221 |
| [SENSe<1 2>:]FREQUency:CENTer:STEP                  | 0 to $f_{max}$  | 6.221 |
| [SENSe<1 2>:]FREQUency:CENTer:STEP:LINK             | SPAN   RBW   OFF  | 6.221 |
| [SENSe<1 2>:]FREQUency:CENTer:STEP:LINK:FACTor      | 1 to 100 PCT  | 6.222 |
| [SENSe<1 2>:]FREQUency:SPAN                         | 0 to $f_{max}$  | 6.222 |
| [SENSe<1 2>:]FREQUency:SPAN:FULL                    |   | 6.222 |
| [SENSe<1 2>:]FREQUency:STARt                        | 0 to $f_{max}$  | 6.222 |
| [SENSe<1 2>:]FREQUency:STOP                         | 0 to $f_{max}$  | 6.223 |
| [SENSe<1 2>:]FREQUency:MODE                         | CW FIXed   SWEEp  | 6.223 |
| [SENSe<1 2>:]FREQUency:OFFSet                       | <numeric_value>   | 6.223 |
| [SENSe<1 2>:]LIST:POWer[:SEQUence]                  | <analyzer freq>,<ref level>,<rf att>,<el att>,<filter type>,<rbw>,<vbw>,<meas time>,<trigger level>,to. | 6.225 |
| [SENSe<1 2>:]LIST:POWer:SET                         | <PEAK meas>,<RMS meas>,<AVG meas>,<trigger mode>,<trigger slope>,<trigger offset>,<gate length>         | 6.228 |

| Command   | Parameter  | Page  |
|---|--|-------|
| [SENSe<1 2>:]LIST:POWer:RESult?                             |  | 6.229 |
| [SENSe<1 2>:]LIST:POWer:STATe                               | OFF  | 6.229 |
| [SENSe<1 2>:]MPOWer[:SEQuence]                              | <analyzer freq>,<rbw>,<meas time>,<trigger source>,<trigger level>,<trigger offset>,<type of meas>,<# of meas> | 6.231 |
| [SENSe<1 2>:]MPOWer:RESult[:LIST]?                          |  | 6.233 |
| [SENSe<1 2>:]MPOWer:RESult:MIN?                             |  | 6.233 |
| [SENSe<1 2>:]POWer:ACHannel:SPACing[:ACHannel]              | 100to2000MHz   | 6.234 |
| [SENSe<1 2>:]POWer:ACHannel:SPACing:ALTErnate<1 2>          | 100to2000MHz   | 6.235 |
| [SENSe<1 2>:]POWer:ACHannel:ACPairs                         | 0..3   | 6.235 |
| [SENSe<1 2>:]POWer:ACHannel:BANDwidth BWIDth[:CHANnel]      | 100to1000MHz   | 6.235 |
| [SENSe<1 2>:]POWer:ACHannel:BANDwidth BWIDth:ACHannel       | 100to1000MHz   | 6.236 |
| [SENSe<1 2>:]POWer:ACHannel:BANDwidth BWIDth:ALTErnate<1 2> | 100to1000MHz   | 6.236 |
| [SENSe<1 2>:]POWer:ACHannel:MODE                            | ABSolute   RELative  | 6.236 |
| [SENSe<1 2>:]POWer:ACHannel:REFerence:AUTO                  | ONCE   | 6.237 |
| [SENSe<1 2>:]POWer:ACHannel:PRESet                          | ACPower   CPower   OBANDwidth   OBWidth   CN   CN0   | 6.237 |
| [SENSe<1 2>:]POWer:ACHannel:PRESet:RLEVel                   |  | 6.237 |
| [SENSe<1 2>:]POWer:BANDwidth BWIDth                         | 10to99.9PCT  | 6.238 |
| [SENSe<1 2>:]POWer:HSPeed                                   | ON   OFF   | 6.238 |
| [SENSe<1 2>:]POWer:NCORrection                              | ON   OFF   | 6.238 |
| [SENSe<1 2>:]POWer:TRACe                                    | 1to3   | 6.239 |
| [SENSe<1 2>:]ROSCillator:SOURce                             | INTernal   EXTernal  | 6.240 |
| [SENSe<1 2>:]ROSCillator[:INTernal:]TUNe                    | 0to4095  | 6.240 |
| [SENSe<1 2>:]ROSCillator[:INTernal:]TUNe:SAVE               |  | 6.240 |
| [SENSe<1 2>:]SWEep:TIME                                     | 2,5ms to 16000s   1μsto16000s  | 6.241 |
| [SENSe<1 2>:]SWEep:TIME:AUTO                                | ON   OFF   | 6.241 |
| [SENSe<1 2>:]SWEep:COUNT                                    | 0 to 32767   | 6.242 |
| [SENSe<1 2>:]SWEep:EGATe                                    | ON   OFF   | 6.242 |
| [SENSe<1 2>:]SWEep:EGATe:TYPE                               | LEVel   EDGE   | 6.243 |
| [SENSe<1 2>:]SWEep:EGATe:POLarity                           | POSitive   NEGative  | 6.243 |
| [SENSe<1 2>:]SWEep:EGATe:HOLDoff                            | 125ns to 100s  | 6.243 |
| [SENSe<1 2>:]SWEep:EGATe:LENGth                             | 0 to 100s  | 6.243 |
| [SENSe<1 2>:]SWEep:EGATe:SOURce                             | EXTernal   IFPower   | 6.244 |
| [SENSe<1 2>:]SWEep:POINts                                   | 155 to 10001   | 6.244 |
| SOURce<1 2>:EXTernal<1 2>[:STATe]                           | ON   OFF   | 6.246 |
| SOURce<1 2>:EXTernal<1 2>:FREQUency[:FACTor]:DENominator    | <numeric_value>  | 6.247 |
| SOURce<1 2>:EXTernal<1 2>:FREQUency[:FACTor]:NUMerator      | <numeric_value>  | 6.247 |
| SOURce<1 2>:EXTernal<1 2>:FREQUency:OFFSet                  | <numeric_value>  | 6.248 |
| SOURce<1 2>:EXTernal<1 2>:FREQUency:SWEep[:STATe]           | ON   OFF   | 6.248 |
| SOURce<1 2>:EXTernal<1 2>:POWer[:LEVel]                     | <numeric_value>  | 6.248 |
| SOURce<1 2>:EXTernal<1 2>:ROSCillator[:SOURce]              | INTernal   EXTernal  | 6.249 |
| STATus:OPERation[:EVENT?]                                   |  | 6.251 |
| STATus:OPERation:CONDition?                                 |  | 6.251 |
| STATus:OPERation:ENABLE                                     | 0 to 65535   | 6.251 |
| STATus:OPERation:PTRansition                                | 0 to 65535   | 6.251 |
| STATus:OPERation:NTRansition                                | 0 to 65535   | 6.252 |

| Command  | Parameter                                    | Page  |
|--|--|-------|
| STATus:PRESet  |  | 6.252 |
| STATus:QUEStionable[:EVENT]?                           |  | 6.252 |
| STATus:QUEStionable:CONDition?                         |  | 6.252 |
| STATus:QUEStionable:ENABle                             | 0 to 65535                                   | 6.252 |
| STATus:QUEStionable:PTRansition                        | 0 to 65535                                   | 6.253 |
| STATus:QUEStionable:NTRansition                        | 0 to 65535                                   | 6.253 |
| STATus:QUEStionable:POWER[:EVENT]?                     |  | 6.253 |
| STATus:QUEStionable:POWER:CONDition?                   |  | 6.253 |
| STATus:QUEStionable:POWER:ENABle                       | 0 to 65535                                   | 6.253 |
| STATus:QUEStionable:POWER:PTRansition                  | 0 to 65535                                   | 6.254 |
| STATus:QUEStionable:POWER:NTRansition                  | 0 to 65535                                   | 6.254 |
| STATus:QUEStionable:LIMit<1 2>[:EVENT]?                |  | 6.254 |
| STATus:QUEStionable:LIMit<1 2>:CONDition?              |  | 6.254 |
| STATus:QUEStionable:LIMit<1 2>:ENABle                  | 0 to 65535                                   | 6.254 |
| STATus:QUEStionable:LIMit<1 2>:PTRansition             | 0 to 65535                                   | 6.255 |
| STATus:QUEStionable:LIMit<1 2>:NTRansition             | 0 to 65535                                   | 6.255 |
| STATus:QUEStionable:LMARgin<1 2>[:EVENT]?              |  | 6.255 |
| STATus:QUEStionable:LMARgin<1 2>:CONDition?            |  | 6.255 |
| STATus:QUEStionable:LMARgin<1 2>:ENABle                | 0 to 65535                                   | 6.255 |
| STATus:QUEStionable:LMARgin<1 2>:PTRansition           | 0 to 65535                                   | 6.256 |
| STATus:QUEStionable:LMARgin<1 2>:NTRansition           | 0 to 65535                                   | 6.256 |
| STATus:QUEStionable:SYNC[:EVENT]?                      |  | 6.256 |
| STATus:QUEStionable:SYNC:CONDition?                    |  | 6.256 |
| STATus:QUEStionable:SYNC:ENABle                        | 0 to 65535                                   | 6.256 |
| STATus:QUEStionable:SYNC:PTRansition                   | 0 to 65535                                   | 6.257 |
| STATus:QUEStionable:SYNC:NTRansition                   | 0 to 65535                                   | 6.257 |
| STATus:QUEStionable:ACPLimit[:EVENT]?                  |  | 6.257 |
| STATus:QUEStionable:ACPLimit:CONDition?                |  | 6.257 |
| STATus:QUEStionable:ACPLimit:ENABle                    | 0 to 65535                                   | 6.257 |
| STATus:QUEStionable:ACPLimit:PTRansition               | 0 to 65535                                   | 6.258 |
| STATus:QUEStionable:ACPLimit:NTRansition               | 0 to 65535                                   | 6.258 |
| STATus:QUEStionable:FREQUency[:EVENT]?                 |  | 6.258 |
| STATus:QUEStionable:FREQUency:CONDition?               |  | 6.258 |
| STATus:QUEStionable:FREQUency:ENABle                   | 0 to 65535                                   | 6.258 |
| STATus:QUEStionable:FREQUency:PTRansition              | 0 to 65535                                   | 6.259 |
| STATus:QUEStionable:FREQUency:NTRansition              | 0 to 65535                                   | 6.259 |
| STATus:QUEue[:NEXT?]                                   |  | 6.259 |
| SYSTem:COMMunicate:GPIB[:SELF]:ADDRess                 | 0 to 30                                      | 6.261 |
| SYSTem:COMMunicate:GPIB[:SELF]:RTERminator             | LFEOI   EOI                                  | 6.261 |
| SYSTem:COMMunicate:GPIB:RDEVice:GENerator<1 2>:ADDRess | 0to30  | 6.261 |
| SYSTem:COMMunicate:GPIB:RDEVice:GENerator<1 2>:LINK    | GPIB   TTL                                   | 6.262 |
| SYSTem:COMMunicate:GPIB:RDEVice:GENerator<1 2>:TYPE    | <name>                                       | 6.263 |
| SYSTem:COMMunicate:SERial:CONTRol:DTR                  | IBFull   OFF                                 | 6.264 |
| SYSTem:COMMunicate:SERial:CONTRol:RTS                  | IBFull   OFF                                 | 6.264 |
| SYSTem:COMMunicate:SERial[:RECeive]:BAUD               | 110   300   600   1200   2400   9600   19200 | 6.264 |

| Command   | Parameter  | Page  |
|---|--|-------|
| SYSTem:COMMunicate:SERial[:RECeive]:BITS                          | 7   8  | 6.265 |
| SYSTem:COMMunicate:SERial[:RECeive]:PARity[:TYPE]                 | EVEN   ODD   NONE  | 6.265 |
| SYSTem:COMMunicate:SERial[:RECeive]:SBITS                         | 1   2  | 6.265 |
| SYSTem:COMMunicate:SERial[:RECeive]:PACE                          | XON   NONE   | 6.265 |
| SYSTem:COMMunicate:PRINter:ENUMerate:FIRSt?                       |  | 6.266 |
| SYSTem:COMMunicate:PRINter:ENUMerate:NEXt?                        |  | 6.266 |
| SYSTem:COMMunicate:PRINter:SElect<1 2> <printer_name>             |  | 6.266 |
| SYSTem:DATE   | 1980 to 2099, 1to12, 1to31   | 6.267 |
| SYSTem:DISPlay:FPANel   | ON   OFF   | 6.267 |
| SYSTem:DISPlay:UPDate   | ON   OFF   | 6.267 |
| SYSTem:ERRor?   |  | 6.267 |
| SYSTem:ERRor:LIST?  |  | 6.268 |
| SYSTem:ERRor:CLEar:ALL  |  | 6.268 |
| SYSTem:FIRMware:UPDate  | <path>   | 6.268 |
| SYSTem:PASSword[:CENable]   | 'Passwort'   | 6.269 |
| SYSTem:PRESet   |  | 6.269 |
| SYSTem:SET  |  | 6.269 |
| SYSTem:SPEaker:VOLume   | 0 to 1   | 6.269 |
| SYSTem:TIME   | 0 to 23, 0 to 59, 0 to 59  | 6.270 |
| SYSTem:VERsion?   |  | 6.270 |
| TRACe<1 2>[:DATA]   | TRACE1   TRACE2   TRACE3   ABITstream   PWCDp , <block>   <numeric_value>                                    | 6.271 |
| TRACe<1 2>:COPY   | TRACE1   TRACE2   TRACE3 , TRACE1   TRACE2   TRACE3  | 6.276 |
| TRACe<1 2>:IQ:AVERAge[:STATe]                                     | ON   OFF   | 6.279 |
| TRACe<1 2>:IQ:AVERAge:COUNt                                       | 0 to 32767   | 6.279 |
| TRACe<1 2>:IQ:DATA?   |  | 6.280 |
| TRACe<1 2>:IQ:DATA:MEMory?  | <offset sample>, <number of samples>   | 6.281 |
| TRACe<1 2>:IQ:SET   | <filter type>, <rbw>, <sample rate>, <trigger source>, <trigger slope>, <pretrigger samples>, <# of samples> | 6.282 |
| TRACe<1 2>:IQ:SRATe   | 15.625kHz to 32MHz   | 6.283 |
| TRACe<1 2>:IQ[:STATe]   | ON   OFF   | 6.283 |
| TRACe<1 2>:IQ:SYNChronize[:STATe]                                 | ON   OFF   | 6.284 |
| TRACe<1 2>:IQ:ONLine[:STATe]                                      | ON   OFF   | 6.285 |
| TRACe<1 2>:IQ:ONLine:SFACTor:I? TRACe<1 2>:IQ:ONLine:SFACTor:Q?   |  | 6.286 |
| TRIGger<1 2>[:SEQUence]:SOURce                                    | IMMediate   EXTernal   VIDeo   IFPower   | 6.287 |
| TRIGger<1 2>[:SEQUence]:LEVel:AM                                  | -100 to +30dBm   | 6.288 |
| TRIGger<1 2>[:SEQUence]:LEVel:AF TRIGger<1 2>[:SEQUence]:LEVel:FM | -10 to +10MHz  | 6.288 |
| TRIGger<1 2>[:SEQUence]:HOLDoff                                   | 0 to 100s  | 6.289 |
| TRIGger<1 2>[:SEQUence]:SLOPe                                     | POSitive   NEGative  | 6.289 |
| TRIGger[:SEQUence]:SYNChronize:ADJust:EXTernal                    | -460µs to 100s   | 6.289 |
| TRIGger[:SEQUence]:SYNChronize:ADJust:IFPower                     | -460µs to 100s   | 6.290 |
| UNIT<1 2>:POWer   | DBM   DBPW   WATT   DBUV   DBMV   VOLT   DBUA   AMP   V   A   W  | 6.291 |



## Table of Softkeys with IEC/IEEE-Bus Command Assignment

### FREQUENCY Key

|                  |   |
|------------------|---|
| <b>FREQ</b>      |   |
| CENTER           | [SENSe:]FREQuency:CENTer <num_value>  |
| CF-SREPSIZE      |   |
| 0.1 * SPAN       | [SENSe:]FREQuency:CENTer:STEP:LINK SPAN;<br>[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor 10PCT       |
| 0.5 * SPAN       | [SENSe:]FREQuency:CENTer:STEP:LINK SPAN;<br>[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor 50PCT       |
| X * SPAN         | [SENSe:]FREQuency:CENTer:STEP:LINK SPAN;<br>[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor <num_value> |
| 0.1 * RBW        | [SENSe:]FREQuency:CENTer:STEP:LINK RBW;<br>[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor 10PCT        |
| 0.5 * RBW        | [SENSe:]FREQuency:CENTer:STEP:LINK RBW;<br>[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor 50PCT        |
| X * RBW          | [SENSe:]FREQuency:CENTer:STEP:LINK RBW;<br>[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]<br>ON   OFF                                  |
| TRACK BW         | CALCulate<1 2>:MARKer<1...4>:FUNction:STRack:BANDwidth<br><num_value>                             |
| TRACK THRESHOLD  | CALCulate<1 2>:MARKer<1...4>:FUNction:STRack:THReshold<br><num_value>                             |
| SELECT TRACE     | CALCulate<1 2>:MARKer<1...4>:FUNction:STRack:TRACe 1   2   3                                      |

## SPAN Key

|                     |   |
|---------------------|---|
| SPAN                | [SENSe:]FREQuency:SPAN <num_value>                                    |
| SPAN<br>MANUAL      | [SENSe:]SWEeptime <num_value>   |
| SWEePTIME<br>MANUAL | [SENSe:]FREQuency:SPAN:FULL   |
| FULL<br>SPAN        | [SENSe:]FREQuency:SPAN 0HZ<br>OR<br>[SENSe:]FREQuency:MODE CW   FIXed |
| ZERO<br>SPAN        | no corresponding IEC/IEEE-bus command                                 |
| LAST<br>SPAN        |   |

## AMPT Key

|                       |   |
|-----------------------|---|
| <b>AMPT</b>           |   |
| REF<br>LEVEL          | DISPlay[:WINDow<1 2>]:TRACe<1...3>:Y[:SCALe]:RLEVel<br><num_value>  |
| RANGE<br>LOG 100 dB   | DISPlay[:WINDow<1 2>]:TRACe<1...3>:Y:SPACing LOGarithmic;<br>DISPlay[:WINDow<1 2>]:TRACe<1...3>:Y[:SCALe] 100 dB      |
| RANGE<br>LOG MANUAL   | DISPlay[:WINDow<1 2>]:TRACe<1...3>:Y:SPACing LOGarithmic;<br>DISPlay[:WINDow<1 2>]:TRACe<1...3>:Y[:SCALe] <num_value> |
| RANGE<br>LINEAR       | DISPlay[:WINDow<1 2>]:TRACe<1...3>:Y:SPACing LINEar   |
| 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<br>MANUAL    | INPut:ATTenuation <num_value>   |
| RF ATTEN<br>AUTO      | INPut:ATTenuation:AUTO ON   |
| MIXER                 |   |
| MIXER LVL<br>AUTO     | INPut<1 2>:MIXer:AUTO ON  |
| MIXER LVL<br>MANUAL   | INPut<1 2>[:POWer]:MIXer <num_value>  |
| REF LEVEL<br>POSITION | DISPlay[:WINDow<1 2>]:TRACe<1...3>:Y[:SCALe]:RPOsition<br><num_value>   |
| REF LEVEL<br>OFFSET   | DISPlay[:WINDow<1 2>]:TRACe<1...3>:Y[:SCALe]:RLEVel:OFFSet<br><num_value>   |
| GRID<br>ABS/REL       | DISPlay[:WINDow<1 2>]:TRACe<1...3>:Y[:SCALe]:MODE<br>ABSolute RELative  |
| EL ATTEN<br>AUTO      | INPut:EATT:AUTO ON (with option Electronic Attenuator FSU-B25 only)   |

|                     |   |
|---------------------|---|
| EL ATTEN<br>MANUAL  | INPut:EATT <num_value> (with option Electronic Attenuator FSU-B25 only) |
| EL ATTEN<br>OFF     | INPut:EATT:STATE OFF (with option Electronic Attenuator FSU-B25 only)   |
| RF INPUT<br>50Ω 75Ω | INPut:IMPedance 50   75   |

## MKR Key

|                         |   |
|-------------------------|---|
| <b>MKR</b>              |   |
| MARKER<br>1..4          | <pre>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;[:STATe] ON   OFF; CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:X &lt;numeric value&gt;; CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:Y? CALCulate&lt;1 2&gt;:DELTamarker1[:STATe] ON   OFF; CALCulate&lt;1 2&gt;:DELTamarker&lt;1...4&gt;:X &lt;numeric value&gt;; CALCulate&lt;1 2&gt;:DELTamarker&lt;1...4&gt;:Y?</pre> |
| MARKER<br>NORM DELTA    | <pre>CALCulate&lt;1 2&gt;:DELTamarker&lt;1...4&gt;[:STATe] ON   OFF;</pre>  |
| SIGNAL<br>COUNT         | <pre>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:COUNT ON   OFF; CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:COUNT:FREQUency?</pre>   |
| REFERENCE<br>FIXED      |   |
| REF FXD<br>FREQUENCY    | <pre>CALCulate&lt;1 2&gt;:DELTamarker&lt;1...4&gt;:FUNCTion:FIXed[:STATe] ON   OFF</pre>  |
| REF POINT<br>LEVEL      | <pre>CALCulate&lt;1 2&gt;:DELTamarker&lt;1..4&gt;:FUNCTion:FIXed:RPoint:Y &lt;num_value&gt;</pre>   |
| REF POINT<br>LVL OFFSET | <pre>CALCulate&lt;1 2&gt;:DELTamarker&lt;1..4&gt;:FUNCTion:FIXed:RPoint:Y: OFFSet &lt;num_value&gt;</pre>   |
| REF POINT<br>FREQUENCY  | <pre>CALCulate&lt;1 2&gt;:DELTamarker&lt;1..4&gt;:FUNCTion:FIXed:RPoint:X &lt;num_value&gt;</pre>   |
| <b>OR:</b>              |   |
| REF POINT<br>TIME       | <pre>CALCulate&lt;1 2&gt;:DELTamarker&lt;1..4&gt;:FUNCTion:FIXed:RPoint:X &lt;num_value&gt;</pre>   |
| PEAK<br>SEARCH          | <pre>CALCulate&lt;1 2&gt;:DELTamarker&lt;1..4&gt;:FUNCTion:FIXed:RPoint: MAX</pre>  |
| MARKER<br>ZOOM          | <pre>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNCTion:ZOOM &lt;num_value&gt;</pre>   |
| ALL MARKER<br>OFF       | <pre>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:AOFF CALCulate&lt;1 2&gt;:DELTamarker&lt;1...4&gt;:AOFF</pre>   |
| MKR-><br>TRACE          | <pre>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:TRACe &lt;num_value&gt; CALCulate&lt;1 2&gt;:DELTamarker&lt;1...4&gt;:TRACe &lt;num_value&gt;</pre>   |
| CNT RESOL<br>...        | <pre>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:COUNT:RESolution &lt;numeric value&gt;</pre>  |

## MKR-> Key

|                        |  |
|------------------------|--|
| MKR->                  |  |
| SELECT MARKER          | No corresponding IEC/IEEE-bus command  |
| PEAK                   | CALCulate<1   2>:MARKer<1...4>:MAXimum[:PEAK]<br>CALCulate<1   2>:DELTamarker<1...4>:MAXimum[:PEAK]  |
| CENTER<br>= MKR FREQ   | CALCulate<1   2>:MARKer<1...4>:FUNction:CENTer   |
| REF LEVEL<br>= MKR LVL | CALCulate<1   2>:MARKer<1...4>:FUNction:REFerence  |
| NEXT PEAK              | CALCulate<1   2>:MARKer<1...4>:MAXimum:NEXT<br>CALCulate<1   2>:DELTamarker<1...4>:MAXimum:NEXT  |
| NEXT MODE              |  |
| ABSOLUTE<br>PEAK / MIN | CALCulate<1   2>:MARKer<1...4>:MAXimum:NEXT<br>CALCulate<1   2>:DELTamarker<1...4>:MAXimum:NEXT<br>CALCulate<1   2>:MARKer<1...4>:MINimum:NEXT<br>CALCulate<1   2>:DELTamarker<1...4>:MINimum:NEXT     |
| SEARCH<br>NEXT LEFT    | CALCulate<1   2>:MARKer<1...4>:MAXimum:LEFT<br>CALCulate<1   2>:DELTamarker<1...4>:MAXimum:LEFT<br>CALCulate<1   2>:MARKer<1...4>:MINimum:LEFT<br>CALCulate<1   2>:DELTamarker<1...4>:MINimum:LEFT     |
| SEARCH<br>NEXT RIGHT   | CALCulate<1   2>:MARKer<1...4>:MAXimum:RIGHT<br>CALCulate<1   2>:DELTamarker<1...4>:MAXimum:RIGHT<br>CALCulate<1   2>:MARKer<1...4>:MINimum:RIGHT<br>CALCulate<1   2>:DELTamarker<1...4>:MINimum:RIGHT |
| SEARCH<br>LIMITS       |  |
| LEFT<br>LIMIT          | CALCulate<1   2>:MARKer<1...4>:X:SLIMits[:STATE] ON   OFF<br>CALCulate<1   2>:MARKer<1...4>:X:SLIMits:LEFT <num_value>   |
| RIGHT<br>LIMIT         | CALCulate<1   2>:MARKer<1...4>:X:SLIMits[:STATE] ON   OFF<br>CALCulate<1   2>:MARKer<1...4>:X:SLIMits:RIGHT <num_value>  |
| THRESHOLD              | CALCulate<1   2>:THREShold[:STATE] ON   OFF<br>CALCulate<1   2>:THREShold <num_value>  |
| SEARCH LIM<br>OFF      | CALCulate<1   2>:MARKer<1...4>:X:SLIMits[:STATE] OFF<br>CALCulate<1   2>:THREShold[:STATE] ON   OFF  |
| PEAK<br>EXCURSION      | CALCulate<1   2>:MARKer<1...4>:PEXCursion <num_value>  |
| MKR-><br>TRACE         | CALCulate<1   2>:MARKer<1...4>:TRACe <numeric value><br>CALCulate<1   2>:DELTamarker<1...4>:TRACe <numeric value>  |
| MKR-><br>CF STEPSIZE   | CALCulate<1   2>:MARKer<1...4>:FUNction:CSTep  |
| MIN                    | CALCulate<1   2>:MARKer<1...4>:MINimum[:PEAK]<br>CALCulate<1   2>:DELTamarker<1...4>:MINimum[:PEAK]  |
| MIN NEXT               | CALCulate<1   2>:MARKer<1...4>:MINimum:NEXT<br>CALCulate<1   2>:DELTamarker<1...4>:MINimum:NEXT  |

NEXT MODE

see above

EXCLUDE LO

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

## MKR FCTN Key

|                         |   |
|-------------------------|---|
| <b>MKR<br/>FUNC</b>     |   |
| SELECT<br>MARKER        | no corresponding IEC/IEEE-bus command   |
| PEAK                    | CALCulate<1   2>:MARKer<1...4>:MAXimum[:PEAK]<br>CALCulate<1   2>:DELTamarker<1...4>:MAXimum[:PEAK]   |
| NOISE MEAS              | CALCulate<1   2>:MARKer<1...4>:FUNction:NOISe[:STATe] ON   OFF;<br>CALCulate<1   2>:MARKer<1...4>:FUNction:NOISe:RESult?  |
| PHASE<br>NOISE          |   |
| PH NOISE<br>ON OFF      | CALCulate<1   2>:DELTamarker<1...4>:FUNction:PNOise[:STATe] ON   OFF<br>CALCulate<1   2>:DELTamarker<1...4>:FUNction:PNOise:RESult?   |
| REF POINT<br>LEVEL      | CALCulate<1   2>:DELTamarker<1..4>:FUNction:FIXed:RPOint:Y<br><num_value>   |
| REF POINT<br>LVL OFFSET | CALCulate<1   2>:DELTamarker<1..4>:FUNction:FIXed:RPOint:Y:<br>OFFSet <num_value>   |
| REF POINT<br>FREQUENCY  | CALCulate<1   2>:DELTamarker<1..4>:FUNction:FIXed:RPOint:X<br><num_value>   |
| PEAK<br>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<br>CALCulate<1   2>:MARKer<1...4>:FUNction:NDBDown <num_value><br>CALCulate<1   2>:MARKer<1...4>:FUNction:NDBDown:RESult?<br>CALCulate<1   2>:MARKer<1...4>:FUNction:NDBDown:FREquency |
| PEAK<br>LIST            |   |
| NEW<br>SEARCH           | INIT;*WAI;<br>CALCulate<1   2>:MARKer<1...4>:FUNction:FPEaks 10;<br>CALCulate<1   2>:MARKer<1...4>:FUNction:FPEaks:COUNT?;<br>CALCulate<1   2>:MARKer<1...4>:FUNction:FPEaks:Y?;<br>CALCulate<1   2>:MARKer<1...4>:FUNction:FPEaks:X?;                  |
| SORT MODE<br>FREQ LEVEL | CALCulate<1   2>:MARKer<1...4>:FUNction:FPEaks:SORT X   Y   |
| PEAK<br>EXCURSION       | CALCulate<1   2>:MARKer<1...4>:PEXCursion <num_value>   |
| LEFT<br>LIMIT           | CALCulate<1   2>:MARKer<1...4>:X:SLIMits[:STATe] ON   OFF<br>CALCulate<1   2>:MARKer<1...4>:X:SLIMits:LEFT <num_value>  |
| RIGHT<br>LIMIT          | CALCulate<1   2>:MARKer<1...4>:X:SLIMits[:STATe] ON   OFF<br>CALCulate<1   2>:MARKer<1...4>:X:SLIMits:RIGHT <num_value>   |
| THRESHOLD               | CALCulate<1   2>:THReshold[:STATe] ON   OFF<br>CALCulate<1   2>:THReshold <num_value>   |
| PEAK LIST<br>OFF        |   |



MARKER  
DEMODO

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

|                         |   |
|-------------------------|---|
| <b>BW</b>               |   |
| RES BW<br>MANUAL        | [SENSe:]BANDwidth BWIDth:AUTO OFF<br>[SENSe:]BANDwidth BWIDth[:RESolution] <num_value>                                  |
| VIDEO BW<br>MANUAL      | [SENSe:]BANDwidth BWIDth:VIDeo:AUTO OFF<br>[SENSe:]BANDwidth BWIDth:VIDeo <num_value>                                   |
| SWEEP TIME<br>MANUAL    | [SENSe:]SWEep:TIME:AUTO OFF<br>[SENSe:]SWEep:TIME <num_value>   |
| RES BW<br>AUTO          | [SENSe:]BANDwidth BWIDth[:RESolution]:AUTO ON   |
| VIDEO BW<br>AUTO        | [SENSe:]BANDwidth BWIDth:VIDeo:AUTO ON  |
| SWEEP TIME<br>AUTO      | [SENSe:]SWEep:TIME:AUTO ON  |
| COUPLING<br>RATIO       | --  |
| RBW / VBW<br>SINE [1/3] | [SENSe:]BANDwidth BWIDth:VIDeo:RATIo 3  |
| RBW / VBW<br>PULSE [.1] | [SENSe:]BANDwidth BWIDth:VIDeo:RATIo 10   |
| RBW / VBW<br>NOISE [10] | [SENSe:]BANDwidth BWIDth:VIDeo:RATIo 0.1  |
| RBW / VBW<br>MANUAL     | [SENSe:]BANDwidth BWIDth:VIDeo:RATIo <num_value>  |
| SPAN / RBW<br>AUTO [50] | [SENSe:]BANDwidth BWIDth[:RESolution]:RATIo 0.02  |
| SPAN / RBW<br>MANUAL    | [SENSe:]BANDwidth BWIDth[:RESolution]:RATIo <num_value>   |
| COUPLING<br>DEFAULT     | [SENSe:]BANDwidth BWIDth[:RESolution]:AUTO ON;<br>[SENSe:]BANDwidth BWIDth:VIDeo:AUTO ON;<br>[SENSe:]SWEep:TIME:AUTO ON |
| FILTER<br>TYPE          | [SENSe:]BANDwidth BWIDth[:RESolution]:TYPE NORMAl   FFT<br>  CFILter   RRC  |
| MAIN PLL<br>BANDWIDTH   | [SENSe:]BANDwidth BWIDth:PLL AUTO   HIGH   MEdium   LOW   |
| VBW MODE<br>LIN LOG     | [SENSe:]BANDwidth BWIDth:VIDeo:TYPE LINear   LOGarithmic  |

**SWEEP Key**

|                       |  |
|-----------------------|--|
| <b>SWEEP</b>          |  |
| CONTINUOUS<br>SWEEP   | INITiate:CONTInuous ON                         |
| SINGLE<br>SWEEP       | INITiate:CONTInuous OFF;<br>INITiate:IMMediate |
| CONTINUE<br>SGL SWEEP | INITiate:CONMeasure                            |
| SWEEP TIME<br>MANUAL  | [SENSe:]SWEep:TIME <num_value>                 |
| SWEEP TIME<br>AUTO    | [SENSe:]SWEep:TIME:AUTO ON   OFF               |
| SWEEP<br>COUNT        | [SENSe:]SWEep:COUNT <num_value>                |
| SWEEP<br>POINTS       | [SENSe:]SWEep:POINTS <num_value>               |
| SGL SWEEP<br>DISP OFF | INITiate:DISPlay OFF<br>INITiate:IMMediate     |

## MEAS Key

|                       |  |
|-----------------------|--|
| <b>MEAS</b>           |  |
| TIME DOM<br>POWER     | <p>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNction:SUMMary:RMS[:STATe] ON</p> <p>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNction:SUMMary:PPEak[:STATe] ON</p> <p>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNction:SUMMary:MEAN[:STATe] ON</p> <p>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNction:SUMMary:SDEVIation[:STATe] ON</p>  |
| POWER<br>ON OFF       | <p>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNction:SUMMary:RMS[:STATe] ON OFF</p> <p>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNction:SUMMary:PPEak[:STATe] ON OFF</p> <p>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNction:SUMMary:MEAN[:STATe] ON OFF</p> <p>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNction:SUMMary:SDEVIation[:STATe] ON OFF</p>  |
| RMS                   | <p>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNction:SUMMary:RMS[:STATe] ON   OFF</p> <p>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNction:SUMMary:RMS:RESult?</p>   |
| PEAK                  | <p>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNction:SUMMary:PPEak[:STATe] ON   OFF</p> <p>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNction:SUMMary:PPEak:RESult?</p>   |
| MEAN                  | <p>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNction:SUMMary:MEAN[:STATe] ON   OFF</p> <p>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNction:SUMMary:MEAN:RESult?</p>   |
| STANDARD<br>DEVIATION | <p>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNction:SUMMary:SDEVIation[:STATe] ON OFF</p> <p>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNction:SUMMary:SDEVIation:RESult?</p>   |
| LIMITS<br>ON OFF      | <p>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:SLIMits ON   OFF</p>   |
| START<br>LIMIT        | <p>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:SLIMits:LEFT &lt;num_value&gt;</p>   |
| STOP<br>LIMIT         | <p>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:SLIMits:RIGHT &lt;num_value&gt;</p>  |
| SET<br>REFERENCE      | <p>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNction:SUMMary:REFerence:AUTO ONCE</p>   |
| POWER<br>ABS REL      | <p>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNction:SUMMary:MODE ABS   REL</p>  |
| MAX HOLD<br>ON OFF    | <p>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNction:SUMMary:PHOLD ON   OFF</p> <p>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNction:SUMMary:PPEak:PHOLD:RESult?</p> <p>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNction:SUMMary:RMS:PHOLD:RESult?</p> <p>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNction:SUMMar:MEAN:PHOLD:RESult?</p> <p>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNction:SUMMary:SDEVIation:PHOLD:RESult?</p> |

|                               |   |
|-------------------------------|---|
| <p>AVERAGE<br/>ON OFF</p>     | <p>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNction:SUMMary:AVERAge<br/>ON   OFF<br/>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNction:SUMMary:PPEak:AVERAge:RESult?<br/>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNction:SUMMary:RMS:AVERAge:RESult?<br/>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNction:SUMMar:MEAN:AVERAge:RESult?<br/>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNction:SUMMary:SDEVIation:AVERAge:RES?</p> |
| <p>NUMBER OF<br/>SWEEPS</p>   | <p>[SENSe:]SWEep:COUNT &lt;num_value&gt;</p>  |
| <p>CHAN PWR<br/>ACP</p>       | <p>--</p>   |
| <p>CP / ACP<br/>ON OFF</p>    | <p>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNction:POWer:SElect CPOWer   ACPower;<br/>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNction:POWer:RESult?<br/>CPOWer   ACPower;<br/>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNction:POWer[:STATe] OFF</p>   |
| <p>CP / ACP<br/>STANDARD</p>  | <p>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNction:POWer:PRESet<br/>&lt;standard&gt;</p>  |
| <p>CP / ACP<br/>CONFIG</p>    | <p>--</p>   |
| <p>NO. OF<br/>ADJ CHAN</p>    | <p>[SENSe:]POWer:ACHannel:ACPairs &lt;num_value&gt;</p>   |
| <p>CHANNEL<br/>BANDWIDTH</p>  | <p>[SENSe:]POWer:ACHannel:BANDwidth BWIDth[:CHANnel]<br/>&lt;num_value&gt;</p>  |
| <p>ADJ CHAN<br/>BANDWIDTH</p> | <p>[SENSe:]POWer:ACHannel:BANDwidth BWIDth:ACHannel &lt;num_value&gt;<br/>[SENSe:]POWer:ACHannel:BANDwidth BWIDth:ALternate<br/>&lt;1 2&gt; &lt;num_value&gt;</p>   |
| <p>ADJ CHAN<br/>SPACING</p>   | <p>[SENSe:]POWer:ACHannel:SPACing:ACHannel &lt;num_value&gt;<br/>[SENSe:]POWer:ACHannel:SPACing:ALternate&lt;1 2&gt; &lt;num_value&gt;</p>  |
| <p>CP/ACP<br/>ABS/REL</p>     | <p>[SENSe:]POWer:ACHannel:MODE ABSolute RELative</p>  |
| <p>CHAN PWR<br/>/HZ</p>       | <p>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNction:POWer:RESult:PHZ<br/>ON   OFF</p>  |
| <p>SELECT<br/>TRACE</p>       | <p>[SENSe:]POWer:TRACe 1 2 3</p>  |
| <p>ADJUST<br/>SETTINGS</p>    | <p>[SENSe:]POWer:ACHannel:PRESet<br/>ACPowEr CPOWer OBANDwidth OBwidth</p>  |
| <p>ACP LIMIT<br/>CHECK</p>    | <p>CALCulate&lt;1 2&gt;:LIMit&lt;1...8&gt;:ACPowEr[:STATe] ON   OFF<br/>CALCulate&lt;1 2&gt;:LIMit&lt;1...8&gt;:ACPowEr:ACHannel:RESult?<br/>CALCulate&lt;1 2&gt;:LIMit&lt;1...8&gt;:ACPowEr:ALternate&lt;1 2&gt;:RESult?</p>   |

|                       |   |
|-----------------------|---|
| EDIT<br>ACP LIMITS    | <p>CALCulate&lt;1 2&gt;:LIMit&lt;1...8&gt;:ACPoweR[:STATe] ON   OFF<br/>                 CALCulate&lt;1 2&gt;:LIMit&lt;1...8&gt;:ACPoweR:ACHannel[:RELative]:<br/>                 STATE ON   OFF<br/>                 CALCulate&lt;1 2&gt;:LIMit&lt;1...8&gt;:ACPoweR:ACHannel[:RELative]<br/>                 &lt;num_val&gt;, &lt;num_val&gt;<br/>                 CALCulate&lt;1 2&gt;:LIMit&lt;1...8&gt;:ACPoweR:ACHannel:ABSolute:STATE<br/>                 ON   OFF<br/>                 CALCulate&lt;1 2&gt;:LIMit&lt;1...8&gt;:ACPoweR:ACHannel:ABSolute<br/>                 &lt;num_value&gt;, &lt;num_value&gt;<br/>                 CALCulate&lt;1 2&gt;:LIMit&lt;1...8&gt;:ACPoweR:ALternate[:RELative]:<br/>                 STATE ON   OFF<br/>                 CALCulate&lt;1 2&gt;:LIMit&lt;1...8&gt;:ACPoweR:ALternate[:RELative]<br/>                 &lt;num_value&gt;, &lt;num_value&gt;<br/>                 CALCulate&lt;1 2&gt;:LIMit&lt;1...8&gt;:ACPoweR:ALternate:ABSolute:STATE<br/>                 ON   OFF<br/>                 CALCulate&lt;1 2&gt;:LIMit&lt;1...8&gt;:ACPoweR:ALternate:ABSolute<br/>                 &lt;num_value&gt;, &lt;num_value&gt;</p> |
| SET CP<br>REFERENCE   | [SENSe:]POWER:ACHannel:REfERENCE:AUTO ONCE  |
| SWEEP<br>TIME         | [SENSe:]SWEep:TIME <num_value>  |
| FAST ACP<br>ON OFF    | [SENSe:]POWER:HSPeEd ON   OFF   |
| NOISE CORR<br>ON OFF  | [SENSe:]POWER:NCORrection ON   OFF  |
| FULL SIZE<br>DIAGRAM  |   |
| ADJUST<br>REF LVL     | [SENSe:]POWER:ACHannel:PRESet:RLEVel  |
| OCCUPIED<br>PWR BANDW |   |
| OCCUP BW<br>ON OFF    | <p>CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNctioN:POWER:SElect<br/>                 OBANDwidth   OBWidth<br/>                 CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNctioN:POWER:RESult?<br/>                 OBANDwidth   OBWidth<br/>                 CALCulate&lt;1 2&gt;:MARKer&lt;1...4&gt;:FUNctioN:POWER[:STATe] OFF</p>   |
| % POWER<br>BANDWIDTH  | [SENSe:]POWER:BANDwidth BWIDth <num_value>  |
| CHANNEL<br>BANDWIDTH  | [SENSe:]POWER:ACHannel:BANDwidth BWIDth <num_value>   |
| NOISE CORR<br>ON OFF  | [SENSe:]POWER:NCORrection ON   OFF  |
| ADJUST<br>REF LVL     | [SENSe:]POWER:ACHannel:PRESet:RLEVel  |
| ADJUST<br>SETTINGS    | [SENSe:]POWER:PRESet ACPoweR CPoweR OBANDwidth OBWidth  |

|                  |   |
|------------------|---|
| SIGNAL STATISTIC |   |
| APD<br>ON OFF    | CALCulate:STATistics:APD[:STATE] ON   OFF<br>CALCulate:STATistics:RESult<1...3>? MEAN   PEAK   CFACtor   ALL          |
| CCDF<br>ON OFF   | CALCulate:STATistics:CCDF[:STATE] ON   OFF<br>CALCulate:STATistics:RESult<1...3>? MEAN   PEAK   CFACtor   ALL         |
| PERCENT MARKER   | CALC:MARK:Y:PERC 0...100%   |
| RES BW           | [SENSe:]BANDwidth[:RESolution]:AUTO OFF<br>[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;<br>INITiate:IMMediate  |
| COUNT MEAS       | INITiate:CONTinuous ON;<br>INITiate:IMMediate   |
| MODULATION DEPTH | CALCulate<1 2>:MARKer<1...4>:FUNctioN:MDEPth[:STATE] ON   OFF<br>CALCulate<1 2>:MARKer<1...4>:FUNctioN:MDEPth:RESult? |
| TOI              | CALCulate<1 2>:MARKer<1...4>:FUNctioN:TOI[:STATE] ON   OFF<br>CALCulate<1 2>:MARKer<1...4>:FUNctioN:TOI:RESult?       |
| SELECT MARKER    | no corresponding IEC/IEEE-bus command   |

## Taste TRIG

|                         |   |
|-------------------------|---|
| <b>TRIG</b>             |   |
| FREE RUN                | TRIGger[:SEquence]:SOURce IMMEDIATE   |
| VIDEO                   | TRIGger[:SEquence]:SOURce VIDEO<br>TRIGger[:SEquence]:LEVel:VIDeo <numeric value>   |
| EXTERN                  | TRIGger[:SEquence]:SOURce EXTERNAL<br>[SENSe:]SWEep:EGATE:SOURce EXTERNAL   |
| IF POWER                | TRIGger[:SEquence]:SOURce IFPower<br>TRIGger[:SEquence]:LEVel:IFPower <numeric value><br>[SENSe:]SWEep:EGATE:SOURce IFPower |
| TRIGGER<br>OFFSET       | TRIGger[:SEquence]:HOLDoff <num_value>  |
| POLARITY<br>POS/NEG     | TRIGger[:SEquence]:SLOPe POSitive   NEGative or<br>[SENSe:]SWEep:EGATE:POLarity POSitive   NEGative                         |
| GATED<br>TRIGGER        | [SENSe:]SWEep:EGATE ON   OFF<br>[SENSe:]SWEep:EGATE:SOURce IFPower   EXTERNAL   |
| GATE<br>SETTINGS        | --  |
| GATE MODE<br>LEVEL/EDGE | [SENSe:]SWEep:EGATE:TYPE LEVel   EDGE   |
| POLARITY<br>POS/NEG     | [SENSe:]SWEep:EGATE:POLarity POSitive   NEGative  |
| GATE<br>DELAY           | [SENSe:]SWEep:EGATE:HOLDoff <num_value>   |
| GATE<br>LENGTH          | [SENSe:]SWEep:EGATE:LENGth <num_value>  |
| SWEEP<br>TIME           | --  |



## TRACE Key

|                   |   |
|-------------------|---|
| <b>TRACE</b>      |   |
| 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<br>or:<br>[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><br>or:<br>[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<br>CALCulate<1 2>:MATH[:EXPRession][:DEFine] (TRACE1 - TRACE2) |
| T1-T3->T1         | CALCulate<1 2>:MATH:STATE ON<br>CALCulate<1 2>:MATH[:EXPRession][:DEFine] (TRACE1 - TRACE3) |
| TRACE POSITION    | CALCulate<1 2>:MATH:POSition <num_value>  |

|                      |   |
|----------------------|---|
| TRACE MATH<br>OFF    | CALCulate<1 2>:MATH:STATE OFF   |
| MIN HOLD             | DISPlay[:WINDow<1 2>]:TRACe<1...3>:MODE MINHold   |
| AVG MODE<br>LOG LIN  | CALCulate<1 2>:MATH:MODE LINear   LOGarithmic<br>or:<br>[SENSe:]AVERAge:TYPE VIDEo   LINear |
| ASCII FILE<br>EXPORT | FORMat[:DATA] ASCii<br>MMEMy:STORe<1 2>:TRACe 1,'TRACE.DAT'                                 |
| DECIM SEP<br>. ,     | FORMat:DEXPort:DSEParator POINT   COMMa   |
| COPY<br>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<br>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><br>CALCulate<1 2>:LIMIT<1...8>:LOWer:OFFset <num_value> |
| DISPLAY<br>LINES     |  |
| DISPLAY<br>LINE 1    | CALCulate<1 2>:DLINe1:STATe ON OFF<br>CALCulate<1 2>:DLINe1 -30 dBm  |
| DISPLAY<br>LINE 2    | CALCulate<1 2>:DLINe2:STATe ON OFF<br>CALCulate<1 2>:DLINe2 -30 dBm  |
| FREQUENCY<br>LINE 1  | CALCulate<1 2>:FLINe1:STATe ON OFF<br>CALCulate<1 2>:FLINe1 0 HZ   |
| FREQUENCY<br>LINE 2  | CALCulate<1 2>:FLINe2:STATe ON OFF<br>CALCulate<1 2>:FLINe2 3 GHZ  |
| TIME<br>LINE 1       | CALCulate<1 2>:TLINe1:STATe ON OFF<br>CALCulate<1 2>:TLINe1 0 S  |
| TIME<br>LINE 2       | CALCulate<1 2>:TLINe2:STATe ON OFF<br>CALCulate<1 2>:TLINe2 2.5 MS   |

## DISP Key

|                     |   |
|---------------------|---|
| <b>DISP</b>         |   |
| FULL SCREEN         | DISPlay:FORmat SINGLE<br>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><br>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    | <i>no corresponding IEC/IEEE-bus command</i>  |
| DEFAULT COLORS 1    | DISPlay:CMAP<1...13>:DEFault1   |
| DEFAULT COLORS 2    | DISPlay:CMAP<1...13>:DEFault2   |
| DISPLAY PWR SAVE    | DISPlay:PSAVe[:STATE] ON   OFF<br>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  <br>MAGenta   YELLOW   WHITE   DGRAY   LGRAY  <br>LBLUE   LGREEN   LCYan   LRED   MAGenta |

## FILE Key

|                    |  |
|--------------------|--|
| <b>FILE</b>        |  |
| SAVE               | MMEemory:STORe:STATe 1,<file_name>   |
| RECALL             | MMEemory:LOAD:STATe 1,<file_name>  |
| EDIT COMMENT       | MMEemory:COMMeNt <string>  |
| ITEMS TO SAVE/RCL  |  |
| SELECT ITEMS       | MMEemory:SElect[:ITEM]:HWSettings ON OFF<br>MMEemory:SElect[:ITEM]:TRACe[:ACTiVe] ON OFF<br>MMEemory:SElect[:ITEM]:LINEs:ALL ON OFF<br>MMEemory:SElect[:ITEM]:NONE |
| DEFAULT CONFIG     | MMEemory:SElect[:ITEM]:DEFault   |
| DISABLE ALL ITEMS  | MMEemory:SElect[:ITEM]:NONE  |
| ENABLE ALL ITEMS   | MMEemory:SElect[:ITEM]:ALL   |
| DATA SET LIST      | --   |
| DATA SET CLEAR     | MMEemory:CLEAr:STATe 1,<file_name>   |
| DATA SET CLEAR ALL | MMEemory:CLEAr:ALL   |
| STARTUP RECALL     | MMEemory:LOAD:AUTO 1,<file_name>   |
| FILE MANAGER       |  |
| EDIT PATH          | MMEemory:MSIS <device><br>MMEemory:CDIRectory <directory_name>   |
| MAKE DIRECTORY     | MMEemory:MDIRectory <directory_name>   |
| FORMAT DISK        | MMEemory:INITialize <msus>   |
| RENAME             | MMEemory:MOVE <file_source>,<file_destination>   |
| SORT MODE          | no corresponding IEC/IEEE-bus command  |
| COPY               | MMEemory:COpy <file_source>,<file_destination>   |
| DELETE             | MMEemory:DELeTe <file_name><br>MMEemory:RDIRectory <directory_name>  |

### CAL Key

|                    |                            |
|--------------------|----------------------------|
| <b>CAL</b>         |                            |
| CAL<br>TOTAL       | CALibration[:ALL]?         |
| CAL<br>ABORT       | CALibration:ABORT          |
| CAL CORR<br>ON OFF | CALibration:STATE ON   OFF |
| CAL<br>RESULTS     | CALibration:RESults?       |

### SETUP Key

|                      |   |
|----------------------|---|
| REFERENCE<br>INT/EXT | [SENSe:]ROSCillator:SOURce INTernal EXTernal  |
| NOISE SCR<br>ON OFF  | DIAGnostic:SERVice:NSource ON   OFF <num_value>   |
| PREAMP               | INPut:GAIN <num_value> (with option Electronic Attenuator - FSU-B25 only)   |
| TRANSDUCER           | --  |
| TRANSDUCER<br>FACTOR | CORR:TRAN:SEL <name><br>CORR:TRAN ON   OFF  |
| NEW                  | --  |
| EDIT                 | --  |
| DELETE               | CORR:TRAN DEL   |
| PAGE<br>UP           | --  |
| PAGE<br>DOWN         | --  |
| GENERAL<br>SETUP     | --  |
| GPIB<br>ADDRESS      | SYSTem:COMMunicate:GPIB[:SELF]:ADDRESS 0...30   |
| COM<br>INTERFACE     | SYSTem:COMMunicate:SERial[:RECeive:]BAUD <num_value><br>SYSTem:COMMunicate:SERial[:RECeive:]BITS 7   8<br>SYSTem:COMMunicate:SERial:RECeive:PARity[:TYPE] EVEN   ODD   NONE<br>SYSTem:COMMunicate:SERial[:RECeive:]SBITS 1 2<br>SYSTem:COMMunicate:SERial:CONTrol:DTR IBFull   OFF<br>SYSTem:COMMunicate:SERial:CONTrol:RTS IBFull   OFF<br>SYSTem:COMMunicate:SERial[:RECeive:]PACE XON   NONE |
| TIME+DATE            | SYSTem:TIME 0...23, 0...59, 0...59<br>SYSTem:DATE <num>, <num>, <num>   |

|                     |  |
|---------------------|--|
| CONFIGURE NETWORK   | with option LAN-Interface FSU-B16 only<br>--   |
| NETWORK LOGIN       | with option LAN-Interface FSU-B16 only<br>--   |
| OPTIONS             | --   |
| SOFT FRONTPANEL     | --   |
| SYSTEM INFO         | --   |
| HARDWARE INFO       | DIAGnostic:SERvice:HWInfo?   |
| STATISTICS          | --   |
| SYSTEM MESSAGES     | SYSTem:ERRor?<br>SYSTem:ERRor:LIST?  |
| CLEAR ALL MESSAGES  | SYSTem:ERRor?  |
| SAVE CHANGES        | --   |
| SERVICE             | --   |
| INPUT RF            | DIAGnostic:SERvice:INPut[:SElect] RF   |
| INPUT CAL           | DIAGnostic:SERvice:INPut[:SElect] CALibration<br>DIAGnostic:SERvice:CSource[:POWER] <num_value><br>*TST? |
| SELFTTEST           |  |
| SELFTTEST RESULTS   | DIAGnostic:SERvice:STEST:RESult?   |
| REFERENCE FREQUENCY | [SENSE<1 2>:]ROScillator[:INTernal]:TUNe 0...4095  |
| CAL SIGNAL POWER    | --   |
| SAVE CHANGES        | [SENSE<1 2>:]ROScillator[:INTernal]:TUNe:SAVe  |
| ENTER PASSWORD      | SYSTem:PASSword[:CENable] <string>   |
| CAL GEN 128 MHz     | DIAGnostic:SERvice:INPut:PULSed OFF  |
| CAL GEN COMB        | DIAGnostic:SERvice:INPut:PULSed ON<br>DIAGnostic:SERvice:INPut:PULSed:PRATe 128 MHz                      |
| SERVICE FUNCTION    | DIAGnostic:SERvice:SFUNction <string>  |
| FIRMWARE UPDATE     | --   |
| RESTORE FIRMWARE    | --   |



## HCOPY Key

|                       |   |
|-----------------------|---|
| <b>HCOPY</b>          |   |
| PRINT<br>SCREEN       | <p>HCOPY:ITEM:ALL<br/>HCOPY:IMMEDIATE</p> <p>Bei Ausdruck in Datei zusätzlich <span style="float: right;">MMEMORY:NAME &lt;file_name&gt;</span></p>   |
| PRINT<br>TRACE        | <p>HCOPY:ITEM:WINDOW&lt;1 2&gt;:TRACE:STATE ON   OFF<br/>HCOPY:IMMEDIATE</p> <p>for printout into file add <span style="float: right;">MMEMORY:NAME &lt;file_name&gt;</span></p>  |
| PRINT<br>TABLE        | <p>HCOPY:ITEM:WINDOW&lt;1 2&gt;:TABLE:STATE ON   OFF<br/>HCOPY:IMMEDIATE</p> <p>for printout into file add <span style="float: right;">MMEMORY:NAME &lt;file_name&gt;</span></p>  |
| HARDCOPY<br>ABORT     | HCOPY:ABORT   |
| DEVICE1               | <p>SYSTEM:COMMUNICATE:PRINTER:ENUMERATE:FIRST?<br/>SYSTEM:COMMUNICATE:PRINTER:ENUMERATE:NEXT?<br/>SYSTEM:COMMUNICATE:PRINTER:SELECT &lt;string&gt;<br/>HCOPY:DESTINATION &lt;string&gt;<br/>HCOPY:DEVICE:LANGUAGE GDI   WMF   EWMF   BMP<br/>HCOPY:PAGE:ORIENTATION&lt;1 2&gt; LANDSCAPE   PORTRAIT</p> |
| DEVICE2               | <p>SYSTEM:COMMUNICATE:PRINTER:ENUMERATE:FIRST?<br/>SYSTEM:COMMUNICATE:PRINTER:ENUMERATE:NEXT?<br/>SYSTEM:COMMUNICATE:PRINTER:SELECT "string"<br/>HCOPY:DESTINATION2 &lt;string&gt;<br/>HCOPY:DEVICE:LANGUAGE GDI   WMF   EWMF   BMP<br/>HCOPY:PAGE:ORIENTATION&lt;1 2&gt; LANDSCAPE   PORTRAIT</p>      |
| COLOR                 | <p>HCOPY:DEVICE:COLOR ON   OFF<br/>HCOPY:CMAP:DEFAULT1</p>  |
| COMMENT<br>SCREEN A/B | HCOPY:ITEM:WINDOW<1 2>:TEXT <string>  |
| INSTALL<br>PRINTER    |   |

## Hotkeys

|            |  |
|------------|--|
| SPECTRUM   | INSTRument[:SElect] SANalyzer<br>INSTRument:NSElect 1  |
| NETWORK    | with option external generator control FSP-B10 only.<br>--   |
| SCREEN A/B | FULL SCREEN: Selection of the active window: DISPLAY[:WINDow<1 2><br>The window valid for the setting is selected by the numeric s<br><br>SPLIT SCREEN: The two measurement windows are active.<br>The window valid for the setting is selected by the numeric<br>suffix in the command, eg SENSE<1 2> |

## Hotkey NETWORK

|                       |   |
|-----------------------|---|
| NETWORK               | with option external generator control FSP-B10 only:<br>--  |
| SOURCE<br>POWER       | SOURCE:POWER <num_value>  |
| POWER<br>OFFSET       | SOURCE:POWER:OFFSET <num_value>   |
| SOURCE<br>CAL         | with option external generator control FSP-B10 only:  |
| CAL TRANS             | [SENSe:]CORRection:METhod TRANsmission<br>[SENSe:]CORRection:COLLect[:ACQuire] THROugh  |
| CAL REFL<br>SHORT     | [SENSe:]CORRection:METhod REFLEXion<br>[SENSe:]CORRection:COLLect[:ACQuire] THROugh   |
| CAL REFL<br>OPEN      | [SENSe:]CORRection:METhod REFLEXion<br>[SENSe:]CORRection:COLLect[:ACQuire] OPEN  |
| NORMALIZE             | [SENSe:]CORRection[:STATe] ON   OFF   |
| REF VALUE<br>POSITION | DISP:WIND:TRAC:Y:RPOS <num_value>   |
| REF VALUE             | DISP:WIND:TRAC:Y:RVAL <num_value>   |
| RECALL                | [SENSe:]CORRection:RECall   |
| EXT<br>SOURCE         | with option external generator control FSP-B10 only:  |
| EXT SRC<br>ON / OFF   | SOURCE:EXTErnal[:STATe] ON   OFF  |
| SELECT<br>GENERATOR   | SYSTem:COMMunicate:RDEvice:GENERator:TYPE 'SME02'<br>SYSTem:COMMunicate:RDEvice:GENERator:LINK TTL<br>SYSTem:COMMunicate:GPIB:RDEvice:GENERator:ADDRESS 28  |
| FREQUENCY<br>SWEEP    | SOURCE:EXTErnal:POWER -30dBm<br>SOURCE:EXTErnal:FREQUency:NUMERator 4<br>SOURCE:EXTErnal:FREQUency:DENominator 3<br>SOURCE:EXTErnal:FREQUency:OFFSet 100MHZ |



## Contents - Chapter 7 "Remote Control - Programming Examples"

|  |             |
|--|-------------|
| <b>7 Remote Control - Programming Examples .....</b>                     | <b>7.1</b>  |
| <b>Basic Steps of IEC/IEEE-Bus Programming.....</b>                      | <b>7.1</b>  |
| Including IEC-Bus Library for VisualBasic .....                          | 7.1         |
| Initialization and Default Status .....                                  | 7.2         |
| Creating Global Variables.....   | 7.2         |
| Initiate Controller .....  | 7.2         |
| Initiate Instrument.....   | 7.3         |
| Switching the Display On/Off.....  | 7.3         |
| Configuring Power Save Function (Display Permanently Switched Off) ..... | 7.4         |
| Transmission of Simple Instrument Setting Commands .....                 | 7.4         |
| Return to Manual Control.....  | 7.4         |
| Reading Out Instrument Settings .....                                    | 7.5         |
| Positioning Markers and Displaying Values.....                           | 7.5         |
| Command Synchronization.....   | 7.6         |
| Service Request .....  | 7.7         |
| Initiate Service Request.....  | 7.7         |
| Waiting for the Arrival of a Service Request .....                       | 7.8         |
| Waiting Without Blocking the Keyboard and Mouse .....                    | 7.9         |
| Service Request Routine.....   | 7.10        |
| Reading Out the Output Buffer.....                                       | 7.10        |
| Reading Out Error Messages.....  | 7.11        |
| Evaluation of SCPI Status Registers .....                                | 7.11        |
| Evaluation of Event Status Register .....                                | 7.12        |
| <b>More Complex Programming Examples.....</b>                            | <b>7.13</b> |
| Default Setting of the FSU .....   | 7.13        |
| Setting the IEC/IEEE Bus Status Register .....                           | 7.13        |
| Default Setting for Measurements.....                                    | 7.14        |
| Using Marker and Delta Marker.....                                       | 7.15        |
| Marker Search Functions, Limitation of Search Range.....                 | 7.15        |
| Measuring Spurious Emissions .....                                       | 7.17        |
| Frequency Counting .....   | 7.18        |
| Operation with Fixed Reference Point (Reference Fixed).....              | 7.19        |
| Phase and Phase Noise Measurement.....                                   | 7.20        |
| Shape Factor Measurement (using n dB down).....                          | 7.21        |
| Measuring the Third Order Intercept Point.....                           | 7.22        |
| Measuring the AM Modulation Depth .....                                  | 7.23        |
| Limit Lines and Limit Test.....  | 7.24        |
| Measuring the Channel and Adjacent Channel Power .....                   | 7.26        |
| Occupied Bandwidth Measurement.....                                      | 7.28        |
| Time Domain Power Measurement.....                                       | 7.29        |
| Fast Power Measurement on Power Ramps.....                               | 7.30        |
| Power Measurement with Multi-Summary Marker .....                        | 7.30        |
| Multi-Burst Power Measurement .....                                      | 7.32        |
| Fast Level Measurement Using Frequency Lists .....                       | 7.34        |
| Level Correction of Transducers (Definition of Transducer Factors) ..... | 7.36        |
| Reading Trace Data .....   | 7.37        |

---

|   |      |
|---|------|
| Measuring the Magnitude and Phase of a Signal (I/Q Data Acquisition)..... | 7.39 |
| Averaging I/Q Data .....  | 7.42 |
| Storing and Loading Device Settings.....                                  | 7.43 |
| Storing Instrument Settings .....   | 7.43 |
| Loading Device Settings.....  | 7.44 |
| Setting the Data Set for Startup Recall .....                             | 7.44 |
| Reading and Writing Files .....   | 7.45 |
| Reading a File from the Instrument.....                                   | 7.45 |
| Creating a File on the Instrument.....                                    | 7.46 |
| Configuring and Starting a Printout.....                                  | 7.47 |



## 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 "gplib.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()

ieaddress% = 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%, ieaddress%)             '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 FSU

The following settings are an example of how to modify the default setting of the FSU.

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()

'----- FSU 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 FSU 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

CALL IBRD(analyzer%, result\$) 'frequency and level, both must  
'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 FSU'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  $\pm 400$  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$(1000)
frequlist$ = Space$(1000)
count$ = Space$(30)

'----- FSU 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  $\pm 400$  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$)
                                'and read it in
CALL IBWRT(analyzer%,"CALC:MARK:FUNC:FPE:X?")
                                'Query and read
CALL IBRD(analyzer%, frequlist$)
                                '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: ";frequlist$
                                '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 FSU 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 FSU. 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 FSU 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 3<sup>rd</sup> harmonic.

The default setting of the FSU 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)

'----- FSU 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 FSU 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 FSU is used for measurements (SetupInstrument).

```

REM *****
Public Sub ShapeFactor()

result$ = Space$(100)
'----- FSU default setting -----
CALL SetupInstrument           'Default setting
CALL IBWRT(analyzer%,"INIT:CONT OFF") 'Single sweep
'----- Set frequency -----
CALL IBWRT(analyzer%,"FREQ:SPAN 1MHz") 'Span
CALL IBWRT(analyzer%,"BAND:RES 30kHz") 'Resolution bandwidth
CALL IBWRT(analyzer%,"INIT;*WAI") 'Perform sweep with sync
'----- Measure 60 dB value -----
CALL IBWRT(analyzer%,"CALC:MARK:PEXC 6DB") 'Peak excursion
CALL IBWRT(analyzer%,"CALC:MARK:STAT ON") 'Marker1 on
CALL IBWRT(analyzer%,"CALC:MARK:TRAC 1") 'Assign marker1 to trace1
CALL IBWRT(analyzer%,"CALC:MARK:MAX") 'Set marker1 to 100 MHz
CALL IBWRT(analyzer%,"CALC:MARK:FUNC:NDBD 60dB") 'Read out bandwidth measured
CALL IBWRT(analyzer%,"CALC:MARK:FUNC:NDBD:RES?") 'at 60 dB
CALL IBRD(analyzer%,result$)
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  $P_{N2}$ .

$$f_{s1} = 2 \times f_{n1} - f_{n2} \text{ (1)}$$

$$f_{s2} = 2 \times f_{n2} - f_{n1} \text{ (2)}$$

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 FSU is used for measurements (SetupInstrument).

```

REM *****
Public Sub TOI()

result$ = Space$(100)

'----- FSU 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$(100)
'----- FSU default setting -----
CALL SetupInstrument           'Default setting
CALL IBWRT(analyzer%,"FREQUENCY:CENTER 128MHZ;Span 10MHZ")'Span
Call ibwrt(analyzer%,"Diag:Serv:Inp Cal;CSO -30dBm")  'Cal signal on
'----- Definition of limit lines -----
CALL IBWRT(analyzer%,"CALC:LIM5:NAME 'TEST1'")        'Define name
CALL IBWRT(analyzer%,"CALC:LIM5:COMM 'Upper limit'")  'Define comment
CALL IBWRT(analyzer%,"CALC1:LIM5:TRAC 1")            'Assign trace in screen A
CALL IBWRT(analyzer%,"CALC2:LIM5:TRAC 2")            'Assign trace in screen B
CALL IBWRT(analyzer%,"CALC:LIM5:CONT:DOM FREQ")      'Define x axis range
CALL IBWRT(analyzer%,"CALC:LIM5:CONT:MODE ABS")      'Define x axis scaling
CALL IBWRT(analyzer%,"CALC:LIM5:UNIT DB")            'Define y axis unit
CALL IBWRT(analyzer%,"CALC:LIM5:UPP:MODE REL")       'Define y axis scaling
'----- Definition of data points and threshold -----
xlimit$ = "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)

'----- FSU 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)

'----- FSU 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 FSU 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)

'----- FSU 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 FSU 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$ =          " CALC:MARK:FUNC:SUMM:PPE:RES?;" 'Query results:
query$ = query$ + ":CALC:MARK:FUNC:SUMM:MEAN:RES?;" 'Peak measurement
query$ = query$ + ":CALC:MARK:FUNC:SUMM:RMS:RES?;"  'Mean measurement
query$ = query$ + ":CALC:MARK:FUNC:SUMM:SDEV:RES?;" 'RMS measurement
Call IBWRT(analyzer%, query$) 'Standard deviation

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 FSU 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.

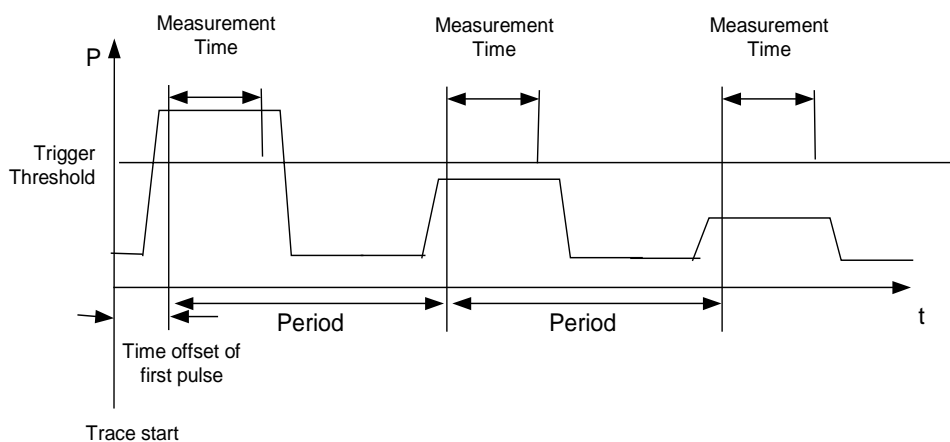


Fig. 7-1 Block diagram illustrating signal processing in analyzer

In the example below, a sequence of 8 pulses is measured with an offset of 50  $\mu\text{s}$  of the first pulse, 450  $\mu\text{s}$  measurement time/pulse and 576.9  $\mu\text{s}$  pulse period.

```

REM *****
Public Sub MultiSumMarker()

result$ = Space$(200)

'----- FSU 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 FSU 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.

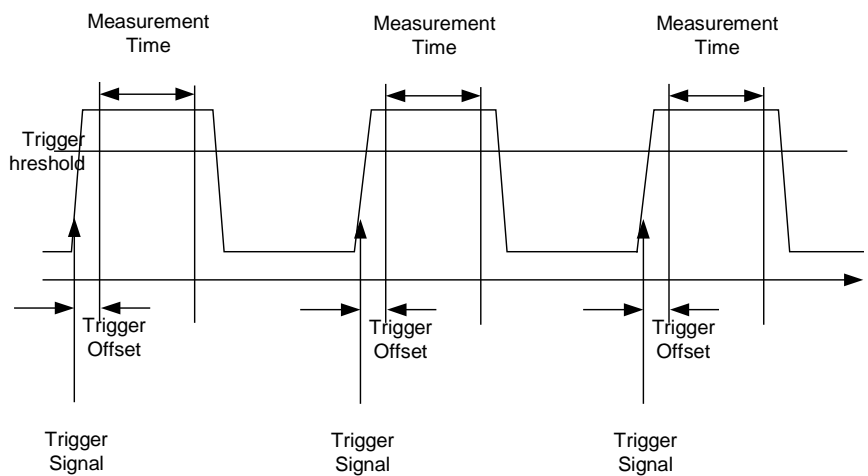


Fig. 7-2 Block diagram illustrating signal processing in analyzer

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  $\mu$ s trigger offset, 434  $\mu$ s measurement time/pulse, video trigger with 50% trigger threshold, and peak detection:

```

REM *****
Public Sub MultiBurstPower()

result$ = Space$(200)

'----- FSU 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 FSU 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  $\pm 200$  kHz,  $\pm 400$  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 FSU 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  $\mu$ s  
 Trigger delay: 100  $\mu$ s  
 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)

'----- FSU 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 FSU 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 FSU 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.

**Note:** *The trace data arrays are dimensioned in such a way that they can accommodate the trace data of the FSU (625 points).*

```

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

'----- FSU 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 Tracel: ",asciiResult$   'Output
END SUB
REM *****

```

## Measuring the Magnitude and Phase of a Signal (I/Q Data Acquisition)

Due to the FSU'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).

Fig. 7-3 shows the hardware of the analyzer from the IF section to the processor. The IF filter is the resolution filter of the spectrum analyzer with bandwidths selectable from 300 kHz to 10 MHz. The A/D converter samples the IF signal (20.4 MHz) at a rate of 32 MHz.

The digital signal is down-converted to the complex baseband, lowpass-filtered, and the sampling rate is reduced, i.e. the output sampling rate is set between 15.625 kHz and 32 MHz by dividing the original sampling rate by powers of 2. This avoids unnecessary oversampling at narrower bandwidths, which saves processing time and increases the maximum recording time. The I/Q data is written to separate memories of 512 k words each. The memories are hardware-triggered.

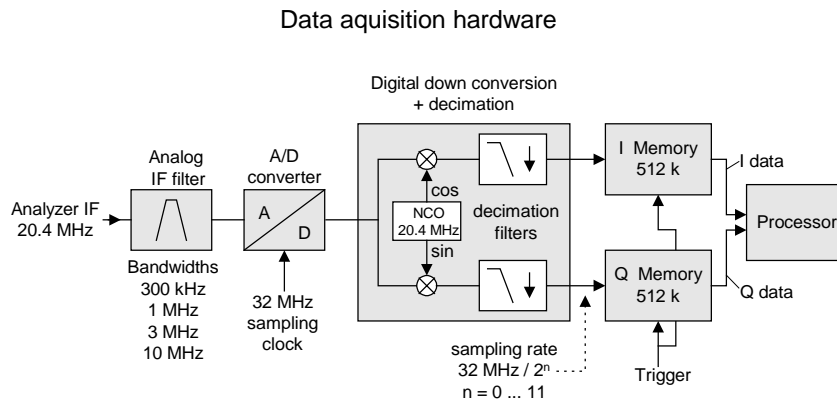


Fig. 7-3 Block diagram illustrating signal processing in the analyzer

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 sampling concept of the FSU (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:

$$f_{\text{image}} = 2 \cdot (f_{\text{center}} + 5.4 \text{ MHz}) - f_{\text{signal}}$$

where

$f_{\text{image}}$  = image frequency in MHz

$f_{\text{center}}$  = center frequency in MHz

$f_{\text{signal}}$  = 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  $\geq 300$  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.

**Note:** *The arrays for measured data are dimensioned in such a way that they can accommodate 2 \* 128 k \* 4 byte.*

```
REM *****
Public Sub ReadIQData()

    'Note:
    'Visual Basic is not capable
    'of reading data sets
    'larger than 128k words!

    Dim digits As Byte           'Number of digits of
                                'length information
    Dim IQBytes As Long          'Length of trace data in byte
    Dim IQValues As Long        'Number of measured values
                                'in buffer

    asciiResult$ = Space$(6553600) 'Buffer for ASCII I/Q data
                                    '(= 25*2*1024 byte)

    result$ = Space$(100)        'Buffer for results

    '----- FSU 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,
'S32 MHz sampling rate, free run trigger, pos. trigger edge and 0 s trigger
'delay.
CALL IBWRT(analyzer%,"TRAC:IQ:SET NORM,10MHz,32MHz,IMM,POS,0,130560")

'----- Read data in binary format -----
Call ibwrt(analyzer%, "FORMAT REAL,32")      'Select binary format
Call ibwrt(analyzer%, "TRAC:IQ:DATA?")      'Measure and read I/Q data
Call ilrd(analyzer%, result$, 2)            'Read and store number of
digits = Val(Mid$(result$, 2, 1))          'digits of length information
result$ = Space$(100)                       'Re-initialize buffer
Call ilrd(analyzer%, result$, digits)       'Read and store
IQBytes = Val(Left$(result$, digits))       'length information
IQBytes = IQBytes / 2                       'Halve number of bytes
                                         'per buffer
Call ibrd32(analyzer%, IData(0), IQBytes)   'Read I data into buffer
Call ibrd32(analyzer%, QData(0), IQBytes)   'Read Q data into buffer
Call ilrd(analyzer%, result$, 1)           'Read delimiter <NL>

'----- Output binary data as frequency/level pairs -----
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

'----- Read data in ASCII format -----
Call ibwrt(analyzer%,"FORMAT ASCII")        'Select ASCII format
Call ibwrt(analyzer%, "TRAC:IQ:DATA?")     'Re-measure and read I/Q data
CALL ibrd(analyzer%, asciiResult$)
CALL IBWRT(analyzer%,"TRAC:IQ:STAT OFF")    'De-activate I/Q data
                                         'acquisition mode if no
                                         'further measurements are
                                         'to be performed

END SUB
REM *****

```



## Averaging I/Q Data

The FSU 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 FSU.
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:

```
'----- FSU 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,
'S32 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.

'----- FSU 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()

'----- Default setting of status register -----
'This subroutine loads data set "TEST1" in directory D:\USER\DATA.
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 FSU 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 FSU -----
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

'----- FSU 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$(0)) 'device and indicate
PRINT "Drucker 0: "+Devices$(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$(i),2) = "" THEN GOTO SelectDevice 'Abort at end of
                                                'list
    PRINT "Drucker"+Str$(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"

|  |            |
|--|------------|
| <b>8 Maintenance and Instrument Interfaces .....</b> | <b>8.1</b> |
| <b>Maintenance .....</b>                             | <b>8.1</b> |
| Mechanical and Electrical Maintenance .....          | 8.1        |
| Storing and Packing.....                             | 8.1        |
| List of Power Cables Available .....                 | 8.1        |
| <b>Instrument Interfaces .....</b>                   | <b>8.2</b> |
| AF Output .....                                      | 8.2        |
| Probe Connector (PROBE POWER).....                   | 8.2        |
| External Keyboard (KEYBOARD) .....                   | 8.2        |
| IEC Bus Interface .....                              | 8.3        |
| Interface Characteristics.....                       | 8.3        |
| Bus Lines.....                                       | 8.3        |
| Interface Functions.....                             | 8.4        |
| IEC Bus Messages.....                                | 8.4        |
| Interface Messages .....                             | 8.5        |
| Instrument Messages .....                            | 8.5        |
| Printer Interface (LPT) .....                        | 8.6        |
| RS-232-C Interface (COM).....                        | 8.7        |
| Interface Characteristics.....                       | 8.7        |
| Signal Lines .....                                   | 8.7        |
| Transmission Parameters .....                        | 8.8        |
| Control Characters .....                             | 8.9        |
| Handshake .....                                      | 8.9        |
| Monitor Connector (MONITOR).....                     | 8.10       |
| Noise Source Control (NOISE SOURCE) .....            | 8.10       |
| External Trigger Input (EXT TRIG/GATE) .....         | 8.11       |
| Mouse Connector (MOUSE).....                         | 8.11       |
| Reference Output/Input (REF IN and REF OUT) .....    | 8.11       |
| IF Output 20.4 MHz (20.4 MHz OUT) .....              | 8.11       |
| IEC 2 Interface (Option FSP-B10) .....               | 8.11       |
| AUX CONTROL Interface (Option FSP-B10).....          | 8.12       |
| LAN Interface (Option FSU-B16).....                  | 8.12       |





## 8 Maintenance and Instrument Interfaces

The FSU following chapter contains information on the maintenance of the FSU 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 FSU 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 FSU can be stored at a temperature of  $-5^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$ . 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<br>DS 0099.1456 | DIN 49 441, 10 A, 250 V, angular<br>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.

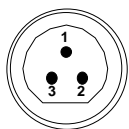


The connector is only available with option FSP-B3, AF demodulator.

### Probe Connector (PROBE POWER)

To allow the connection of probes, the FSU 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.

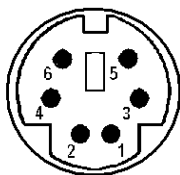


| Pin | Signal              |
|-----|---------------------|
| 1   | GND                 |
| 2   | -12.6 V; max 150 mA |
| 3   | +15 V; max 150 mA   |

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 FSU. 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.

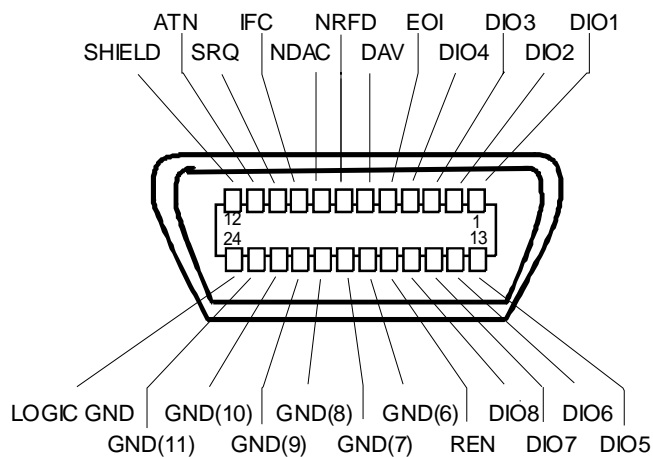


Fig. 8-3 Pin assignment of IEC-Bus interface

### 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.   |

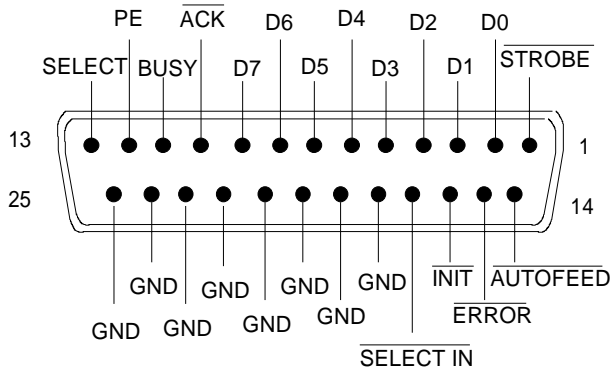
### Instrument Messages

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)<br>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 FSU 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.

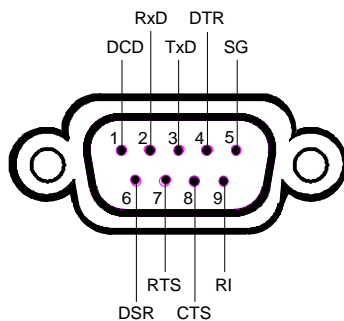


Fig. 8-5 Pin assignment of the RS-232-C interface

### Signal Lines

#### DCD (Data Carrier Detect),

*Not used in FSU.*

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 FSU.*  
 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.

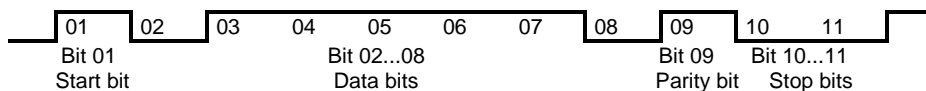
**Data bits**      Data transmission is in 7- or 8-bit ASCII code. The first bit transmitted is the LSB (least significant bit).

**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.

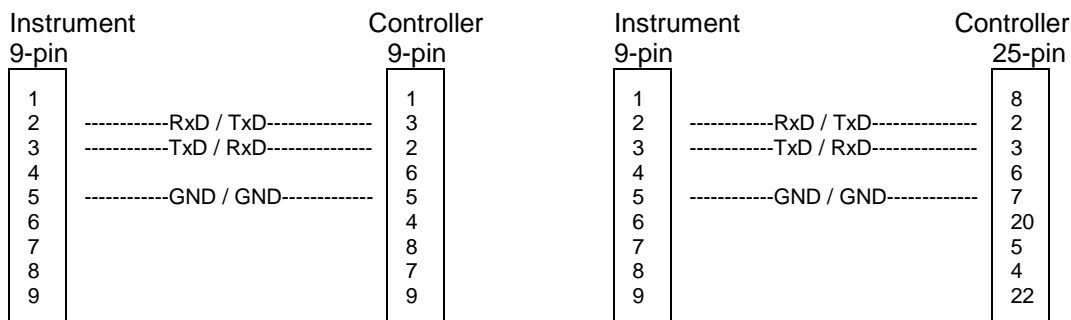


Fig. 8-6 Wiring of the data lines for software handshake

**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.

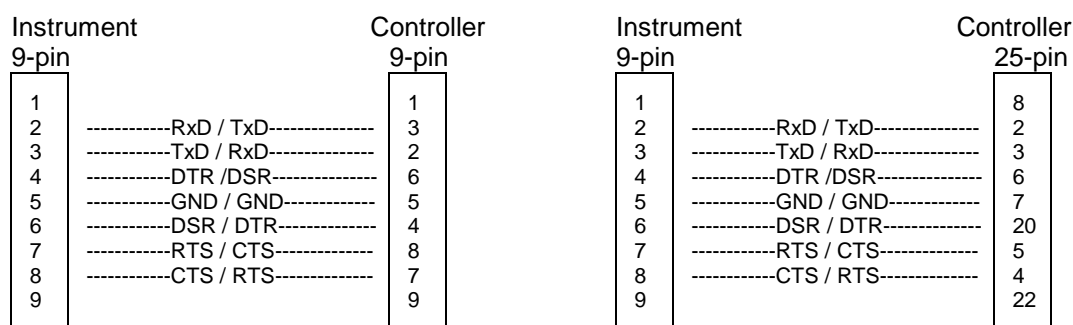


Fig. 8-7 Wiring of the data, control and acknowledge lines for hardware handshake

The configuration of the user ports takes place in the *SETUP* menu (SETUP key) in the *GENERAL SETUP* sub-menu.

**Monitor Connector (MONITOR)**

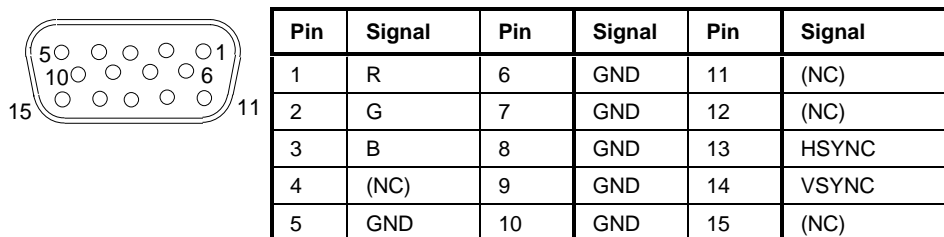


Fig. 8-8 Pin assignments of the MONITOR connector.

**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:

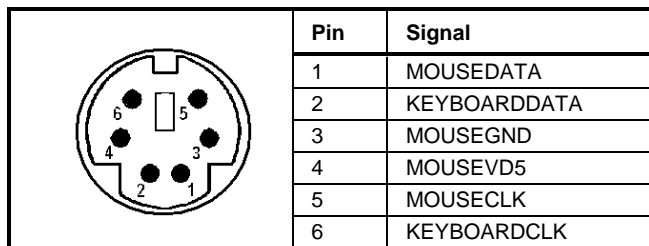


Fig 8-9 Pin assignments for the MOUSE connector.

### 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 FSU. 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 FSU 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 FSP-B10)

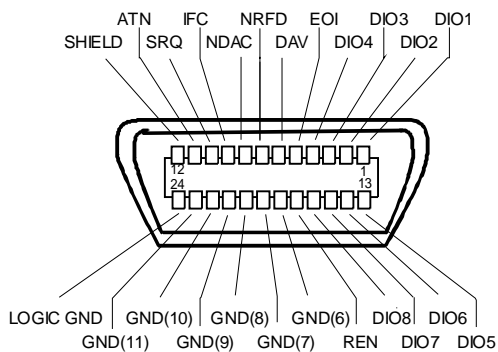


Fig. 8-10 Pin assignment of IEC 2 interface

## AUX CONTROL Interface (Option FSP-B10)

FSU External Generator Control Option - FSU-B10). The voltage levels are of the TTL type (low < 0.4 V, high > 2 V).

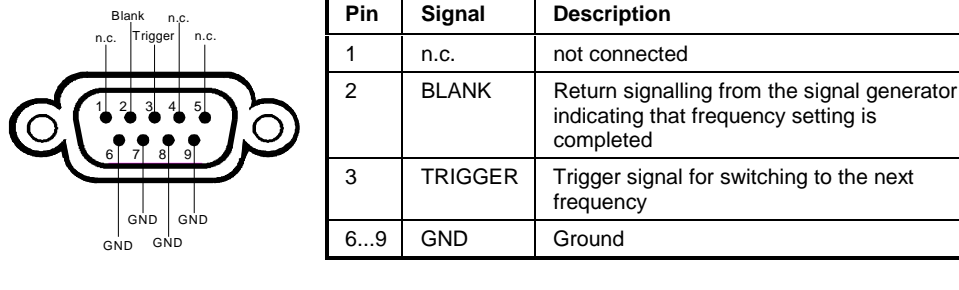


Fig. 8-11 Pin assignment of AUX CONTROL connector

## LAN Interface (Option FSU-B16)

The optional 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**
  - SCPI-Specific Error Messages..... 9.2
  - Device-Specific Messages ..... 9.8



## 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 FSU 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<br>Error explanation                                  |
|------------|--|
| 0          | <b>No error</b><br>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<br>Error explanation  |
|------------|--|
| -100       | <b>Command Error</b><br>The command is faulty or invalid.  |
| -101       | <b>Invalid Character</b><br>The command contains an invalid sign.<br>Example: A header contains an ampersand, " <b>SENSe&amp;</b> ".                               |
| -102       | <b>Syntax error</b><br>The command is invalid.<br>Example: The command contains block data the instrument does not accept.   |
| -103       | <b>Invalid separator</b><br>The command contains an imallowed sign instead of a separator.<br>Example: A semicolon is missing after the command.                   |
| -104       | <b>Data type error</b><br>The command contains an invalid value indication.<br>Example: ON is indicated instead of a numeric value for frequency setting.          |
| -105       | <b>GET not allowed</b><br>A Group Execute Trigger (GET) is within a command line.  |
| -108       | <b>Parameter not allowed</b><br>The command contains too many parameters.<br>Example: Command <b>SENSe:FREQuency:CENTer</b> permits only one frequency indication. |

Continuation: Command Error

| Error code | Error text in the case of queue poll<br>Error explanation   |
|------------|---|
| -109       | <b>Missing parameter</b><br>The command contains too few parameters.<br>Example: The command <b>SENSe:FREQuency:CENTer</b> requires a frequency indication.   |
| -110       | <b>Command header error</b><br>The header of the command is faulty.   |
| -111       | <b>Header separator error</b><br>The header contains an imallowed separator.<br>Example: the header is not followed by a "White Space", " <b>*ESE255</b> "  |
| -112       | <b>Program mnemonic too long</b><br>The header contains more than 12 characters.  |
| -113       | <b>Undefined header</b><br>The header is not defined for the instrument.<br>Example: <b>*XYZ</b> is undefined for every instrument.   |
| -114       | <b>Header suffix out of range</b><br>The header contains an imallowed numeric suffix.<br>Example: <b>SENSe3</b> does not exist in the instrument.   |
| -120       | <b>Numeric data error</b><br>The command contains a faulty numeric parameter.   |
| -121       | <b>Invalid character in number</b><br>A number contains an invalid character.<br>Example: An "A" in a decimal number or a "9" in an octal number.   |
| -123       | <b>Exponent too large</b><br>The absolute value of the exponent is greater than 32000.  |
| -124       | <b>Too many digits</b><br>The number includes too many digits.  |
| -128       | <b>Numeric data not allowed</b><br>The command includes a number which is not allowed at this position.<br>Example: The command <b>INPut:COUPLing</b> requires indication of a text parameter.            |
| -130       | <b>Suffix error</b><br>The command contains a faulty suffix.  |
| -131       | <b>Invalid suffix</b><br>The suffix is invalid for this instrument.<br>Example: nHz is not defined.   |
| -134       | <b>Suffix too long</b><br>The suffix contains more than 12 characters.  |
| -138       | <b>Suffix not allowed</b><br>A suffix is not allowed for this command or at this position of the command.<br>Example: The command <b>*RCL</b> does not permit a suffix to be indicated.                   |
| -140       | <b>Character data error</b><br>The command contains a faulty text parameter   |
| -141       | <b>Invalid character data</b><br>The text parameter either contains an invalid character or it is invalid for this command.<br>Example: Write error with parameter indication; <b>INPut:COUPLing XC</b> . |

Continuation: Command Error

| <b>Error code</b> | <b>Error text in the case of queue poll</b><br>Error explanation  |
|-------------------|---|
| -144              | <b>Character data too long</b><br>The text parameter contains more than 12 characters.  |
| -148              | <b>Character data not allowed</b><br>The text parameter is not allowed for this command or at this position of the command.<br>Example: The command *RCL requires a number to be indicated. |
| -150              | <b>String data error</b><br>The command contains a faulty string.   |
| -151              | <b>Invalid string data</b><br>The command contains a faulty string.<br>Example: An END message has been received prior to the terminating apostrophe.                                       |
| -158              | <b>String data not allowed</b><br>The command contains a valid string at a position which is not allowed.<br>Example: A text parameter is set in quotation marks, INPut:COUPling "DC"       |
| -160              | <b>Block data error</b><br>The command contains faulty block data.  |
| -161              | <b>Invalid block data</b><br>The command contains faulty block data.<br>Example: An END message was received prior to reception of the expected number of data.                             |
| -168              | <b>Block data not allowed</b><br>The command contains valid block data at an imallowed position.<br>Example: The command *RCL requires a number to be indicated.                            |
| -170              | <b>Expression error</b><br>The command contains an invalid mathematical expression.   |
| -171              | <b>Invalid expression</b><br>The command contains an invalid mathematical expression.<br>Example: The expression contains mismatching parentheses.  |
| -178              | <b>Expression data not allowed</b><br>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<br>Error explanation   |
|------------|---|
| -200       | <b>Execution error</b><br>Error on execution of the command.  |
| -201       | <b>Invalid while in local</b><br>The command is not executable while the device is in local due to a hard local control.<br>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       | <b>Settings lost due to rtl</b><br>A setting associated with hard local control was lost when the device changed to LOCS from REMS or to LWLS from RWLS.  |
| -210       | <b>Trigger error</b><br>Error on triggering the device.   |
| -211       | <b>Trigger ignored</b><br>The trigger (GET, *TRG or trigger signal) was ignored because of device timing considerations.<br>Example: The device was not ready to respond.   |
| -212       | <b>Arm ignored</b><br>An arming signal was ignored by the device.   |
| -213       | <b>Init ignored</b><br>Measurement initialisation was ignored as another measurement was already in progress.   |
| -214       | <b>Trigger deadlock</b><br>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       | <b>Arm deadlock</b><br>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       | <b>Parameter error</b><br>The command contains a faulty or invalid parameter.   |
| -221       | <b>Settings conflict</b><br>There is a conflict between setting of parameter value and instrument state.  |
| -222       | <b>Data out of range</b><br>The parameter value lies out of the allowed range of the instrument.  |
| -223       | <b>Too much data</b><br>The command contains too many data.<br>Example: The instrument does not have sufficient storage space.  |
| -224       | <b>Illegal parameter value</b><br>The parameter value is invalid.<br>Example: The text parameter is invalid , TRIGger : SWEEP : SOURCE TASTE  |

Continuation: Execution Error

| <b>Error code</b> | <b>Error text in the case of queue poll</b><br>Error explanation  |
|-------------------|---|
| -230              | <b>Data corrupt or stale</b><br>The data are incomplete or invalid.<br>Example: The instrument has aborted a measurement. |
| -231              | <b>Data questionable</b><br>The measurement accuracy is suspect.  |
| -240              | <b>Hardware error</b><br>The command cannot be executed due to problems with the instrument hardware.                     |
| -241              | <b>Hardware missing</b><br>Hardware is missing.<br>Example: An option is not fitted.                                      |
| -250              | <b>Mass storage error</b><br>A mass storage error occurred.   |
| -251              | <b>Missing mass storage</b><br>The mass storage is missing.<br>Example: An option is not installed.                       |
| -252              | <b>Missing media</b><br>The media is missing.<br>Example: There is no floppy in the floppy disk drive.                    |
| -253              | <b>Corrupt media</b><br>The media is corrupt.<br>Example: The floppy is bad or has the wrong format.                      |
| -254              | <b>Media full</b><br>The media is full.<br>Example: There is no room on the floppy.                                       |
| -255              | <b>Directory full</b><br>The media directory is full.   |
| -256              | <b>File name not found</b><br>The file name cannot be found on the media.   |
| -257              | <b>File name error</b><br>The file name is wrong.<br>Example: An attempt is made to copy to a duplicate file name.        |
| -258              | <b>Media protected</b><br>The media is protected.<br>Example: The write-protect tab on the floppy is present.             |
| -260              | <b>Expression error</b><br>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<br>Error explanation  |
|------------|--|
| -300       | <b>Device-specific error</b><br>FSU-specific error not defined in greater detail.  |
| -310       | <b>System error</b><br>This error message suggests an error within the instrument. Please inform the R&S Service.  |
| -313       | <b>Calibration memory lost</b><br>Loss of the non-volatile data stored using the *CAL? command. This error occurs when the correction data recording has failed.   |
| -330       | <b>Self-test failed</b><br>The selftest could not be executed.   |
| -350       | <b>Queue overflow</b><br>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<br>Error explanation   |
|------------|---|
| -400       | <b>Query error</b><br>General error occurring when data are requested by a query.   |
| -410       | <b>Query INTERRUPTED</b><br>The query has been interrupted.<br>Example: After a query, the instrument receives new data before the response has been sent completely. |
| -420       | <b>Query UNTERMINATED</b><br>The query is incomplete.<br>Example: The instrument is addressed as a talker and receives incomplete data.                               |
| -430       | <b>Query DEADLOCKED</b><br>The query cannot be processed.<br>Example: The input and output buffers are full, the instrument cannot continue operation.                |
| -440       | <b>Query UNTERMINATED after indefinite response</b><br>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<br>Error explanation   |
|------------|---|
| 1036       | <b>MS: The correction table based amplifier gain exceeds the amplifier range for CALAMP1 and CALAMP2 on IF board</b><br>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 correctly adjusted or defective. |
| 1052       | <b>Frontend LO is Unlocked</b><br>This message is output when the phase regulation of the local oscillator fails in the RF frontend.  |
| 1060       | <b>Trigger-Block Gate Delay Error- gate length &lt; Gate Delay</b><br>This message is output when the gate signal length is not sufficient for the pull-in delay with a predefined gate delay.  |
| 1064       | <b>Tracking LO is Unlocked</b><br>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<br>Error explanation   |
|------------|---|
| 2022       | <b>OPTIONS.INI invalid</b><br>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       | <b>Hardcopy not possible during measurement sequence</b><br>This message is output when a printout is started during scan sequences that cannot be interrupted. Such sequences are for example: <ul style="list-style-type: none"> <li>• Recording the system error correction data (calibration)</li> <li>• Instrument selftest</li> </ul> In such cases a synchronization to the end of the scan sequence should be performed prior to starting the printout. |
| 2033       | <b>Printer Not Available</b><br>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       | <b>CPU Temperature is too high</b><br>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.

|   |                        |      |
|---|------------------------|------|
| *   | lin/log .....          | 4.40 |
|   | single sweep .....     | 4.38 |
|   | sweep count .....      | 4.38 |
|   | AVG (trace info) ..... | 3.5  |
| * (enhancement lable).....                        | 3.6, 4.39              |      |
| <b>0</b>  |                        |      |
| 0 to 9 (key) .....                                | 3.11                   |      |
| <b>1</b>  |                        |      |
| 1 - 2 (trace info) .....                          | 4.49                   |      |
| 1 - 3 (trace info) .....                          | 4.49                   |      |
| <b>2</b>  |                        |      |
| 20.4 MHz Out .....                                | 8.11                   |      |
| <b>7</b>  |                        |      |
| 75 $\Omega$ (enhancement lable) .....             | 3.6                    |      |
| <b>A</b>  |                        |      |
| Abort   |                        |      |
| print .....                                       | 4.169                  |      |
| recording of correction data .....                | 4.51                   |      |
| AC supply connection .....                        | 1.16                   |      |
| ACP measurement .....                             | 4.83                   |      |
| Addressed command .....                           | 8.5                    |      |
| Adjacent-channel power measurement .....          | 4.85                   |      |
| Administrator function .....                      | 1.19                   |      |
| AF demodulation .....                             | 4.67                   |      |
| AF OUTPUT .....                                   | 8.2                    |      |
| AM demodulation .....                             | 4.68                   |      |
| AM modulation depth .....                         | 4.109                  |      |
| Amplitude .....                                   | 4.11                   |      |
| Amplitude probability distribution function ..... | 4.103                  |      |
| Amplitude statistics .....                        | 4.101                  |      |
| Analyzer mode .....                               | 4.5                    |      |
| Annotation .....                                  | 4.128                  |      |
| AP (trace info) .....                             | 3.5                    |      |
| APD function .....                                | 4.103                  |      |
| Ascii # .....                                     | 5.14                   |      |
| Attenuation .....                                 | 4.13                   |      |
| Autopeak detector .....                           | 4.46                   |      |
| AV (trace info) .....                             | 3.5                    |      |
| Average detector .....                            | 4.45, 4.48             |      |
| Averaging .....                                   | 4.38, 4.81             |      |
| continuous sweep .....                            | 4.38                   |      |
| <b>B</b>  |                        |      |
| BACK (key) .....                                  | 3.11                   |      |
| Band filter, digital .....                        | 4.22                   |      |
| Bandpass .....                                    | 4.22                   |      |
| Bandwidth   |                        |      |
| occupied .....                                    | 4.98                   |      |
| resolution .....                                  | 4.18                   |      |
| video .....                                       | 4.18                   |      |
| Baud rate .....                                   | 4.141                  |      |
| Block data .....                                  | 5.14                   |      |
| Boolean parameter .....                           | 5.13                   |      |
| Brightness .....                                  | 4.130                  |      |
| Brightness, Screen .....                          | 4.174                  |      |
| <b>C</b>  |                        |      |
| Calibration                                       |                        |      |
| functioning .....                                 | 4.190                  |      |
| reflection measurement .....                      | 4.189                  |      |
| transmission measurement .....                    | 4.183                  |      |
| Calibration results .....                         | 4.51                   |      |
| CANCEL (key) .....                                | 3.11                   |      |
| CCDF function .....                               | 4.103                  |      |
| CCIR 473-4 .....                                  | 4.36                   |      |
| CCVS signal .....                                 | 4.36                   |      |
| Center frequency .....                            | 4.6                    |      |
| Step size .....                                   | 4.6                    |      |
| Channel   |                        |      |
| power .....                                       | 4.92                   |      |
| bandwidth .....                                   | 4.91, 4.98, 4.108      |      |
| number .....                                      | 4.90                   |      |
| spacing .....                                     | 4.92                   |      |
| Channel filters .....                             | 4.24                   |      |
| Channel power measurement .....                   | 4.85                   |      |
| Characters, special .....                         | 6.2                    |      |
| Clear/Write mode .....                            | 4.37                   |      |
| CLWR (trace info) .....                           | 3.5                    |      |
| Colon .....                                       | 5.14                   |      |
| Color .....                                       | 4.130, 4.173           |      |
| Color printout .....                              | 4.173                  |      |
| COM interface .....                               | 4.141, 8.7             |      |
| Comma .....                                       | 5.14                   |      |
| Command   |                        |      |
| # .....   | 5.14                   |      |
| addressed .....                                   | 8.5                    |      |
| alphabetical list .....                           | 6.239                  |      |
| colon .....                                       | 5.14                   |      |



- comma ..... 5.14
  - description ..... 6.1
  - header ..... 5.10
  - line ..... 5.12
  - list ..... 6.239
  - long form ..... 5.11
  - overlapping execution ..... 5.17
  - programming examples ..... 7.1
  - query ..... 5.12
  - question mark ..... 5.12, 5.14
  - quotation mark ..... 5.14
  - recognition ..... 5.16
  - sequence ..... 5.17
  - short form ..... 5.11
  - softkey assignment ..... 6.337
  - structure ..... 5.9
  - suffix ..... 5.11
  - syntax elements ..... 5.14
  - universal ..... 8.5
  - white space ..... 5.14
  - Common commands ..... 6.4
  - CONDition register part ..... 5.19
  - Configuration ..... 4.131
  - save ..... 4.157
  - Continue single sweep ..... 4.27
  - Continuous sweep ..... 4.26
  - Control characters ..... 8.9
  - Copy
    - file ..... 4.166
    - limit line ..... 4.117
    - trace ..... 4.43
  - Correction
    - inherent noise ..... 4.87
  - Correction data ..... 4.50
  - Correction of entry ..... 3.17
  - Correction values
    - normalization ..... 4.181
  - Counter resolution ..... 4.55
  - Coupling
    - bandwidths ..... 4.16
    - default settings ..... 4.20, 4.22
    - frequency of diagrams ..... 4.127
    - reference level of diagrams ..... 4.127
    - resolution bandwidth ..... 4.19
    - sweep time ..... 4.20
    - video bandwidth ..... 4.19
  - CP measurement ..... 4.85
  - Cumulative distribution function ..... 4.103
- D**
- Date ..... 4.128
  - input ..... 4.144
  - DCL ..... 5.16
  - Decimal point ..... 3.11
  - Default
    - coupling ratios ..... 4.20
    - display settings ..... 4.128
    - scalings of x- and y-axis ..... 4.105
  - Delay, gate signal ..... 4.34
  - Delete
    - file ..... 4.166
    - limit line ..... 4.117
  - Demodulation ..... 4.67
  - Detector
    - autopeak ..... 4.44
    - average ..... 4.45
    - max peak ..... 4.44
    - min peak ..... 4.44
    - quasipeak ..... 4.45
    - RMS ..... 4.45
    - sample ..... 4.44
  - Device reset (overall) ..... 4.2
  - Directory
    - create ..... 4.166
    - rename ..... 4.166
  - Diskette, format ..... 4.166
  - Display
    - brightness ..... 4.130
    - color ..... 4.130
    - date ..... 4.128
    - deactivation during single sweep ..... 4.28
    - power-save mode ..... 1.18, 4.129
    - saturation ..... 4.130
    - time ..... 4.128
    - tint ..... 4.130
    - title ..... 4.128
  - Display line ..... 4.123
  - Display mode
    - full screen ..... 3.8, 4.126
    - split screen ..... 3.8, 4.126
  - Display range
    - frequency ..... 4.6
    - level ..... 4.11
    - span ..... 4.10
  - Distribution function ..... 4.103
  - Double dagger ..... 5.14
- E**
- Editing
    - limit line ..... 4.118
    - parameter ..... 3.16
    - table ..... 3.21
  - Electrostatic discharge ..... 1.14
  - EMI Protection ..... 1.16
  - ENABle register part ..... 5.19
  - Enabling the front panel keys ..... 4.4
  - Enhancement labels ..... 3.6
  - ENTER (key) ..... 3.11
  - Entry
    - abort ..... 3.11
    - activate ..... 3.14, 3.23
    - correct ..... 3.17
    - terminate ..... 3.11
  - Error messages ..... 4.152, 9.1
  - Error variable - *iberr* ..... 4.220
  - Error-queue query ..... 5.32
  - ESC (key) ..... 3.11
  - ESE (event status enable register) ..... 5.22
  - ESR (event status register) ..... 5.22
  - EVENT register part ..... 5.19
  - Event status enable register (ESE) ..... 5.22
  - Event status register (ESR) ..... 5.22
  - EXT (enhancement lable) ..... 3.6
  - EXT TRIGGER/GATE input ..... 4.30, 8.11
  - External generator ..... 4.181
  - External noise source ..... 4.132
- F**
- Fast power measurement ..... 4.88
  - FFT filter ..... 4.22
  - Field, first or second ..... 4.36
  - File
    - copy ..... 4.166
    - delete ..... 4.166
    - rename ..... 4.166
    - sort ..... 4.166

- F**
- Filter
    - band filter ..... 4.22
    - FFT ..... 4.22
  - Firmware update..... 4.156
  - Firmware version..... 4.151
  - Fixed filter..... 4.22
  - FM demodulation..... 4.68
  - Free-run sweep ..... 4.29
  - Frequency ..... 4.5
    - axis labelling..... 3.4
    - center ..... 4.6
    - counter ..... 4.55
    - coupling of diagrams ..... 4.127
    - display window ..... 4.5, 4.10
    - Line ..... 4.124
    - offset ..... 4.9
    - Offset (ext. generator) ..... 4.191
    - span ..... 4.10
    - start ..... 4.8
    - stop ..... 4.8
    - switching off display ..... 4.128
  - Frequency-converting measurements ..... 4.191
  - FRQ (enhancement table)..... 3.6
  - FS-K5..... 6.98
  - FS-K72/K73..... 6.211
  - Full screen..... 3.8, 4.126
  - Full span..... 4.10
- G**
- GAT (enhancement table)..... 3.6
  - Gate
    - delay ..... 4.34
    - external/internal..... 4.32
    - length ..... 4.34
  - GET (Group Execute Trigger)..... 5.16
  - Getting Started with the Instrument..... 1.14
  - GHz-dBm (key)..... 3.11
  - GSM MS Analyzer (FS-K5)..... 6.98
- H**
- Hardcopy
    - format..... 4.172
    - orientation ..... 4.172
    - screen ..... 4.169
  - Hardware Adjustment ..... 4.156
  - Hardware settings, indication..... 3.3
  - Header..... 5.10
  - Help line editor..... 3.20
  - Horizontal sync signal..... 4.36
  - Hotkey
    - SCREEN A/B ..... 4.3, 6.120
    - SPECTRUM..... 4.3, 4.5, 6.156
  - Hue, Screen..... 4.174
  - Hz/dB. (key)..... 3.11
- I**
- IEC/IEEE bus
    - address ..... 4.140
    - command description ..... 6.1
    - interface ..... 8.2
    - interface functions ..... 8.4
    - programming examples ..... 7.1
  - IFOVL..... 3.5
  - Impedance of input ..... 4.14
- Indication**
- hardware settings..... 3.3
  - instrument settings..... 3.6
  - marker information ..... 3.4
  - Inherent noise, Correction ..... 4.87
  - Initial configuration ..... 4.2
  - Input
    - EXT TRIGGER/GATE..... 4.30, 8.11
    - REF IN..... 8.11
  - Input impedance..... 4.14
  - Instrument functions..... 4.1
  - Interface functions
    - IEC/IEEE bus..... 8.4
  - Interfaces ..... 8.2
  - Intermodulation product..... 4.110
  - Interrupt..... 5.31
  - IST flag ..... 5.22
- K**
- Key**
- 0 to 9..... 3.11
  - AMPT..... 4.11
  - BACK..... 3.11
  - BW ..... 4.17
  - CAL..... 4.50
  - CANCEL ..... 3.11
  - DISP ..... 4.125
  - ENTER..... 3.11
  - ESC ..... 3.11, 6.22
  - FILE ..... 4.157
  - FREQ..... 4.5
  - GHz-dBm ..... 3.11
  - Hz/dB ..... 3.11
  - kHz/dB ..... 3.11
  - LINES ..... 4.114, 4.123
  - MEAS ..... 4.77
  - MHz/dBm ..... 3.11
  - MKR..... 4.52
  - MKR FCTN ..... 4.59
  - MKR to..... 4.69
  - PRESET ..... 4.2, 6.7, 6.269
  - roll-key ..... 3.12
  - SETUP..... 4.131
  - SPAN..... 4.10
  - SWEEP..... 4.26
  - TRACE..... 4.36
  - TRIG ..... 4.29
- Keyboard**
- connection ..... 1.20
  - connector ..... 8.2
  - kHz/dB (key)..... 3.11
- L**
- LAN-Interface ..... 4.197
  - Level ..... 4.11
    - display range..... 4.11
    - offset (phase noise) ..... 4.63
    - range..... 4.11
    - reference..... 4.11
  - Limit
    - ACP measurement..... 4.94
    - evaluation range ..... 4.80
    - probability range ..... 4.105
  - Limit check..... 4.116
    - ACP measurement..... 4.94
  - Limit Check ..... 4.116
  - Limit line

- copy ..... 4.117
  - delete ..... 4.117
  - domain ..... 4.119
  - edit ..... 4.118
  - limit check ..... 4.116
  - offset ..... 4.117
  - save ..... 4.122
  - scaling ..... 4.120
  - select ..... 4.115
  - shift ..... 4.122
  - unit ..... 4.120
  - value ..... 4.122
  - Line
    - Frequency (Frequency Line 1, 2) ..... 4.124
    - limit ..... 4.115
    - reference (tracking generator) ..... 4.186
    - threshold ..... 4.72
    - Time (Time Line 1, 2) ..... 4.124
  - Line system ..... 4.36
  - Lines ..... 4.124
  - LO exclude ..... 4.76
  - Login/out (NT controller) ..... 1.19
  - Logo ..... 4.128
  - Lower case ..... 6.2
  - LPT interface ..... 8.6
- M**
- Maintenance ..... 8.1
  - Manual operation
    - return to ..... 5.4, 5.6
    - switch to ..... 4.4
  - Marker ..... 4.52
    - center frequency to ..... 4.70
    - CF stepsize to ..... 4.75
    - indication ..... 3.4
    - N dB Down ..... 4.64
    - normal ..... 4.52
    - peak ..... 4.60, 4.70
    - reference level to ..... 4.70
    - search limit ..... 4.72
    - signal track ..... 4.9
    - to trace ..... 4.54, 4.68
    - zoom ..... 4.58
  - Max hold ..... 4.37
  - Max peak detector ..... 4.47
  - MAXH (trace info) ..... 3.5
  - Maximum peak value ..... 4.81
  - Maximum search ..... 4.70
  - Maximum value ..... 4.79
  - Mean power (GSM burst) ..... 4.80
  - Mean value ..... 4.80
  - Measurement
    - frequency-converting ..... 4.191
    - reflection ..... 4.189
    - transmission ..... 4.183
  - Measurement example
    - ACP with user-specific channel configuration ..... 4.96
    - adjacent-channel power for a specific standard ..... 4.95
    - CCDF of a IS95 BTS signal ..... 4.106
    - occupied bandwidth of a PDC signal ..... 4.100
    - signal/noise power density (C/No) of an IS95 CDMA signal ..... 4.97
  - Measurement Example
    - Harmonic ..... 2.5
  - Measurement of Carrier/Noise Ratio C/N and C/No ..... 4.107
  - Measurement, save ..... 4.157
  - Menu
    - call ..... 3.10
    - change keys ..... 3.10
  - Messages ..... 4.152
    - acknowledgement ..... 3.7
  - MHz/dBm (key) ..... 3.11
  - MI (trace info) ..... 3.5
  - Min hold ..... 4.40
  - Min peak detector ..... 4.47
  - MINH (trace info) ..... 3.5
  - Minimum search ..... 4.76
  - Mobile radio standard ..... 4.86
  - Mode
    - analyzer ..... 4.5
  - Modulation depth ..... 4.109
  - Monitor
    - connection ..... 1.22
    - connector ..... 8.10
  - Mouse
    - connection ..... 1.21
    - connector ..... 8.11
  - Mouse-Buchse ..... 8.2
  - MSG ..... 3.5
- N**
- Noise
    - source, external ..... 4.132
  - Noise measurement ..... 4.60
  - NOISE SOURCE ..... 8.11
  - Noise, Correction ..... 4.87
  - Normalization ..... 4.185
  - NT computer ..... 1.19
  - NTRansition register part ..... 5.19
  - Numerical values (command) ..... 5.13
- O**
- Occupied bandwidth ..... 4.98
  - Offset
    - frequency ..... 4.9
    - frequency (ext. generator) ..... 4.191
    - gate signal ..... 4.34
    - limit line ..... 4.117
    - phase noise ..... 4.63
    - reference level ..... 4.14
    - trigger ..... 4.30
  - Operating mode
    - analyzer ..... 4.5
  - Operating time ..... 4.151
  - Option
    - FS-K72/K73 ..... 6.211
    - FSP-B10 – External Generator ..... 4.181
    - FSU-B16 – LAN Interface ..... 4.197
  - Option: ..... 6.98
  - Order number ..... 4.150
  - Orientation ..... 4.172
  - Output
    - AF OUTPUT ..... 8.2
    - IF 20.4 MHz Out ..... 8.11
    - noise source control ..... 8.11
    - REF OUT ..... 8.11
  - OVEN ..... 3.5
  - Overwrite mode ..... 4.37
  - OVLd ..... 3.5, 4.190

**P**

|   |            |
|---|------------|
| Packing.....                                | 8.1        |
| Parallel poll.....                          | 5.32       |
| Parallel poll enable register (PPE).....    | 5.22       |
| Parameter                                   |            |
| block data.....                             | 5.14       |
| boolean.....                                | 5.13       |
| editing.....                                | 3.16       |
| numerical values.....                       | 5.13       |
| selection.....                              | 3.13       |
| string.....                                 | 5.14       |
| text.....                                   | 5.14       |
| Password                                    |            |
| service functions.....                      | 4.154      |
| Windows NT.....                             | 1.19       |
| Path.....                                   | 4.165      |
| Peak excursion.....                         | 4.73       |
| Peak search.....                            | 4.60, 4.70 |
| Phase noise measurement.....                | 4.62       |
| PK (trace info).....                        | 3.5        |
| Polarity                                    |            |
| external trigger/gate.....                  | 4.33       |
| trigger edge.....                           | 4.30       |
| video.....                                  | 4.36       |
| Power bandwidth percentage.....             | 4.98       |
| Power cables.....                           | 8.1        |
| Power measurement.....                      | 4.77       |
| CP/ACP.....                                 | 4.83       |
| Fast.....                                   | 4.88       |
| occupied bandwidth.....                     | 4.98       |
| signal amplitude statistics.....            | 4.101      |
| Time Domain.....                            | 4.78       |
| Power, mean.....                            | 4.80       |
| Power-save mode                             |            |
| display.....                                | 1.18       |
| hard disk.....                              | 1.18       |
| PPE (parallel poll enable register).....    | 5.22       |
| Preamplifier.....                           | 4.133      |
| Preparing the Instrument for Operation..... | 1.14       |
| Preset instrument.....                      | 4.2        |
| Pretrigger.....                             | 4.30       |
| Print                                       |            |
| abort.....                                  | 4.169      |
| start.....                                  | 4.169      |
| PRINT SCREEN (Gate Signal).....             | 4.34       |
| Printer                                     |            |
| configuration.....                          | 4.167      |
| connection.....                             | 1.23, 8.6  |
| interface.....                              | 8.6        |
| PRN (enhancement table).....                | 3.6        |
| Probe Power connector.....                  | 8.2        |
| PTRansition register part.....              | 5.19       |
| Putting into operation                      |            |
| AC supply connection.....                   | 1.16       |

**Q**

|                         |            |
|-------------------------|------------|
| QP (trace info).....    | 3.5        |
| Quasipeak detector..... | 4.45       |
| Query.....              | 5.12, 5.32 |
| Question mark.....      | 5.12, 5.14 |
| Quotation mark.....     | 5.14       |

**R**

|                                    |      |
|------------------------------------|------|
| Rackmounting.....                  | 1.15 |
| Recording the correction data..... | 4.50 |
| Reference                          |      |

|                                   |            |
|-----------------------------------|------------|
| dataset (tracking generator)..... | 4.190      |
| external.....                     | 4.132      |
| fixed.....                        | 4.56       |
| frequency.....                    | 4.56       |
| level to marker level.....        | 4.70       |
| line (tracking generator).....    | 4.186      |
| position for normalization.....   | 4.186      |
| Reference level.....              | 4.11       |
| channel power.....                | 4.88       |
| coupling of diagrams.....         | 4.127      |
| offset.....                       | 4.14       |
| position.....                     | 4.14       |
| to marker level.....              | 4.70       |
| Reference point                   |            |
| frequency.....                    | 4.56       |
| frequency (phase noise).....      | 4.64       |
| level.....                        | 4.56       |
| offset.....                       | 4.56       |
| level (phase noise).....          | 4.63       |
| offset.....                       | 4.63       |
| time.....                         | 4.57       |
| x axis.....                       | 4.57       |
| Reference value                   |            |
| channel power.....                | 4.87       |
| time domain power.....            | 4.81       |
| Reflection measurement.....       | 4.189      |
| Remote control                    |            |
| basics.....                       | 5.1        |
| IEC/IEEE bus.....                 | 5.4        |
| RS-232-C.....                     | 5.5        |
| switch over.....                  | 5.3        |
| Remote Control                    |            |
| RSIB.....                         | 4.217      |
| Rename                            |            |
| directory.....                    | 4.166      |
| file.....                         | 4.166      |
| Reset                             |            |
| device.....                       | 4.2        |
| status reporting system.....      | 5.33       |
| Resolution bandwidth.....         | 4.18       |
| Resolution counter.....           | 4.55       |
| RF ATTEN MANUAL.....              | 4.15       |
| RF attenuation.....               | 4.13       |
| RM (trace info).....              | 3.5        |
| RMS detector.....                 | 4.45, 4.47 |
| RMS value.....                    | 4.79       |
| Roll-key.....                     | 3.12       |
| RS-232-C                          |            |
| configuration.....                | 4.141      |
| interface.....                    | 8.7        |
| transmission parameters.....      | 8.8        |

**S**

|                                       |       |
|---------------------------------------|-------|
| SA (trace info).....                  | 3.5   |
| Sample detector.....                  | 4.47  |
| Sample number.....                    | 4.104 |
| Saturation.....                       | 4.130 |
| Saturation, Screen.....               | 4.175 |
| Save                                  |       |
| configuration.....                    | 4.157 |
| limit line.....                       | 4.122 |
| measurement.....                      | 4.157 |
| Scalar reflection measurement.....    | 4.189 |
| Scaling                               |       |
| level axis.....                       | 4.14  |
| level display range.....              | 4.12  |
| limit line.....                       | 4.120 |
| x- and y-axis (signal statistic)..... | 4.104 |
| SCPI                                  |       |

- conformity information ..... 6.1
- introduction ..... 5.9
- version ..... 5.1
- Screen ..... 3.1
  - brightness ..... 4.174
  - full screen ..... 4.126
  - hue ..... 4.174
  - Saturation ..... 4.175
  - split screen ..... 3.8, 4.126
  - subdivision ..... 3.2
- Search
  - bandwidth ..... 4.9
  - direction ..... 4.71
  - minimum ..... 4.76
  - peak ..... 4.60, 4.70
  - peak excursion ..... 4.73
  - PEAK EXCURSION ..... 4.66
  - range ..... 4.72
- Selftest ..... 4.155
- Sensitivity
  - APD measurement ..... 4.105
  - CCDF measurement ..... 4.105
- Serial interface ..... 8.7
  - configuration ..... 4.141
- Serial number ..... 4.150
- Serial poll ..... 5.31
- Service functions ..... 4.153
- Service request (SRQ) ..... 5.21, 5.31
- Service request enable register (SRE) ..... 5.21
- Setting Up the Instrument ..... 1.14
- Settings, indication ..... 3.6
- Setup ..... 4.131
  - general ..... 4.140
- SGL (enhancement table) ..... 3.6
- Sign (key) ..... 3.11
- Signal amplitude statistics ..... 4.101
- Signal count ..... 4.55
- Signal tracking ..... 4.9
  - search bandwidth ..... 4.9
- Single sweep ..... 4.26
- Softkey
  - % POWER BANDWIDTH ..... 4.98, 6.238
  - = CENTER ..... 4.7, 4.8
  - = MARKER ..... 4.7, 4.8
  - 0.1 \* RBW ..... 4.7, 6.221, 6.222
  - 0.1 \* SPAN ..... 4.6, 6.221, 6.222
  - 0.5 \* RBW ..... 4.7, 6.221, 6.222
  - 0.5 \* SPAN ..... 4.6, 6.221, 6.222
  - ABSOLUTE PEAK/MIN ..... 4.71, 6.12, 6.13
  - ACP LIMIT CHECK ..... 4.94, 6.26
  - ADJ CHAN BANDWIDTH ..... 4.91, 6.236
  - ADJ CHAN SPACING ..... 4.92, 6.234, 6.235
  - ADJUST REF LVL ..... 4.88, 4.99, 6.237
  - ADJUST SETTINGS ..... 4.105, 4.108, 6.90, 6.237
  - ADJUST SETTINGS (occupied bandwidth) ..... 4.99
  - ADJUST SETTINGS (power measurements) ..... 4.93
  - ALL MARKER OFF ..... 4.58, 6.10, 6.46
  - AM ..... 4.68, 6.60, 6.287
  - AMPERE ..... 4.12, 6.95, 6.291
  - ANNOTATION ON/OFF ..... 4.128, 6.118
  - APD ON/OFF ..... 4.103, 6.89, 6.92
  - area ..... 3.9
  - ASCII FILE EXPORT ..... 4.41, 6.143, 6.166, 6.167
  - AUTO SELECT ..... 4.46, 6.220
  - AVERAGE ..... 4.38, 6.124, 6.204
  - AVERAGE ON/OFF ... 4.81, 6.74, 6.75, 6.77, 6.79, 6.81
  - AVG MODE LOG/LIN ..... 4.40, 6.88, 6.205
  - BLANK ..... 4.39, 6.124
  - BRIGHTNESS ..... 4.130, 4.174, 6.119, 6.145
  - C/N ..... 4.107, 4.108
  - C/No ..... 4.108, 6.66
  - CAL ABORT ..... 4.51, 6.96
  - CAL CORR ON/OFF ..... 4.51, 6.97
  - CAL GEN 128 MHZ ..... 4.154, 6.114
  - CAL GEN COMB ..... 4.154, 6.114
  - CAL REFL OPEN ..... 4.189, 6.216, 6.217
  - CAL REFL SHORT ..... 4.189, 6.216, 6.217
  - CAL RESULTS ..... 4.51, 6.97
  - CAL TOTAL ..... 4.50, 6.96
  - CAL TRANS ..... 4.184, 6.216
  - CCDF ON/OFF ..... 4.103, 6.89, 6.92
  - CCVS INT / EXT ..... 4.36, 6.244
  - CENTER ..... 4.6, 6.221
  - CENTER = MKR FREQ ..... 4.70, 6.64
  - CENTER A = MARKER B ..... 4.127, 6.157
  - CENTER B = MARKER A ..... 4.127, 6.157
  - CF STEPSIZE ..... 6.221
  - CHAN PWR / HZ ..... 4.93, 6.68
  - CHAN PWR / ACP ..... 4.85, 6.65
  - CHANNEL BANDWIDTH ..... 4.91, 4.98, 4.108, 6.235
  - CLEAR ALL MESSAGES ..... 4.152, 6.267, 6.268
  - CLEAR/WRITE ..... 4.37, 6.124
  - CN ..... 6.66
  - CNT RESOL ..... 6.48
  - CNT RESOL ..... 4.55
  - COLOR ON/ OFF ..... 6.147
  - COLOR ON/OFF ..... 4.173
  - COLORS ..... 4.172, 4.173
  - COM INTERFACE ..... 4.141, 6.264
  - command assignment ..... 6.337
  - COMMENT SCREEN A/B ..... 4.172, 6.148
  - CONFIGURE NETWORK ..... 4.145
  - CONT DEMOD ..... 4.68, 6.61
  - CONT MEAS ..... 4.106, 6.150, 6.151
  - CONTINUE SGL SWEEP ..... 4.27, 6.150, 6.151
  - CONTINUOUS SWEEP ..... 4.25, 4.26, 6.150, 6.151
  - COPY ..... 4.166, 6.160
  - COPY LIMIT LINE ..... 4.117, 6.22
  - COPY TRACE ..... 4.43, 6.276
  - COUPLING DEFAULT ..... 4.22, 6.207, 6.241
  - COUPLING RATIO ..... 4.20, 6.207
  - CP/ACP ABS/REL ..... 4.92, 6.236
  - CP/ACP CONFIG ..... 4.90, 6.26, 6.234
  - CP/ACP ON/OFF ..... 4.85, 6.65, 6.66, 6.69
  - CP/ACP STANDARD ..... 4.86, 6.69
  - DATA SET CLEAR ..... 4.163, 6.167
  - DATA SET CLEAR ALL ..... 4.163, 6.167
  - DATA SET LIST ..... 4.163
  - DATAENTRY OPAQUE ..... 4.128
  - dBm ..... 4.12, 6.95, 6.291
  - dBmV ..... 4.12, 6.95, 6.291
  - dBpW ..... 4.12, 6.95, 6.291
  - dBuA ..... 4.12, 6.95, 6.291
  - dBuV ..... 4.12, 6.95, 6.291
  - DÉCIM SEP ..... 4.43, 6.143
  - DEFAULT COLORS ..... 4.128, 6.119, 6.144
  - DEFAULT CONFIG ..... 4.162, 6.169
  - DEFAULT SETTINGS ..... 4.105, 6.91
  - DELETE ..... 4.135, 4.166, 6.162, 6.166, 6.219
  - DELETE LIMIT LINE ..... 4.117, 6.23
  - DELETE LINE ..... 4.139
  - DELETE VALUE ..... 4.122
  - DETECTOR ..... 4.46, 6.220
  - DETECTOR AUTOPEAK ..... 4.46, 6.220
  - DETECTOR AVERAGE ..... 4.48, 6.220
  - DETECTOR MAX PEAK ..... 4.47, 6.220
  - DETECTOR MIN PEAK ..... 4.47, 6.220
  - DETECTOR QPK ..... 4.48, 6.220
  - DETECTOR RMS ..... 4.47, 6.220
  - DETECTOR SAMPLE ..... 4.47, 6.220
  - DEVICE 1/2 ... 4.170, 6.146, 6.147, 6.149, 6.165, 6.266
  - DISPLAY LINE 1 ..... 4.124
  - DISPLAY PWR SAVE ..... 4.129, 6.118

|   |   |   |                                    |
|---|---|---|------------------------------------|
| EDIT.....   | 4.135, 4.136, 6.218                       | NETWORK LOGIN.....                                      | 4.146                              |
| EDIT ACP LIMITS4.94, 6.26, 6.27, 6.28, 6.29, 6.30, 6.31, 6.32, 6.33, 6.34, 6.35 |   | NEW.....  | 4.135, 4.136                       |
| EDIT COMMENT.....   | 4.160, 6.170                              | NEW LIMIT LINE4.119, 6.21, 6.22, 6.37, 6.38, 6.40, 6.42 |                                    |
| EDIT LIMIT LINE4.119, 6.21, 6.37, 6.40, 6.42, 6.43, 6.44                        |   | NEXT MIN.....   | 4.76, 6.13, 6.51, 6.52             |
| EDIT PATH.....  | 4.165, 6.160, 6.165                       | NEXT MODE.....  | 4.71                               |
| ENABLE ALL ITEMS.....   | 4.162, 6.169                              | NEXT PEAK.....  | 4.70, 6.12, 6.13, 6.14, 6.50       |
| ENTER PASSWORD.....   | 4.154, 6.269                              | NO OF SAMPLES.....                                      | 4.104, 6.90                        |
| EXCLUDE LO.....   | 4.76, 6.49                                | NO. OF ADJ CHAN.....                                    | 4.90, 6.235                        |
| EXT SOURCE.....   | 4.192                                     | NOISE CORR ON/OFF.....                                  | 4.87, 6.238                        |
| EXT SRC ON/OFF.....   | 4.192, 6.246                              | NOISE MEAS.....   | 4.60, 6.60                         |
| EXTERN.....   | 4.30, 6.244, 6.287                        | NOISE SRC ON/OFF.....                                   | 4.132, 6.115                       |
| FAST ACP ON/OFF.....  | 4.88, 6.238                               | NORMALIZE.....  | 4.185, 6.216                       |
| FILE MANAGER.....   | 4.165, 6.160                              | NUMBER OF SWEEPS.....                                   | 4.82, 6.242                        |
| FILTER TYPE.....  | 4.22, 6.208                               | OCCUP BW ON/OFF.....                                    | 4.98, 6.65, 6.66, 6.69             |
| FIRMWARE UPDATE.....  | 4.156, 6.268                              | OCCUPIED BANDWIDTH.....                                 | 4.98, 6.65                         |
| FM.....   | 4.68, 6.60, 6.287                         | OPTIMIZED COLORS.....                                   | 4.173                              |
| FORMAT DISK.....  | 4.166, 6.162                              | OPTIONS.....  | 4.147                              |
| FREE RUN.....   | 4.29, 6.287                               | PEAK.....   | 4.60, 4.70, 4.79, 6.12, 6.50, 6.73 |
| FREQUENCY LINE 1/2.....   | 4.124                                     | PEAK EXCURSION.....                                     | 4.66, 4.73, 6.52                   |
| FREQUENCY OFFSET.....   | 4.9, 4.191, 6.223                         | PEAK LIST.....  | 4.65, 6.55                         |
| FREQUENCY SWEEP.....  | 4.195, 6.247, 6.248                       | PEAK LIST OFF.....                                      | 4.66, 6.55                         |
| FULL SCREEN.....  | 4.126, 6.118                              | PEAK SEARCH.....  | 4.64, 6.66                         |
| FULL SIZE DIAGRAM.....  | 4.88                                      | PERCENT MARKER.....                                     | 4.103, 6.49                        |
| FULL SPAN.....  | 4.10, 6.222                               | PH NOISE ON/OFF.....                                    | 4.63, 6.16                         |
| GATE DELAY.....   | 4.34, 6.243                               | PHASE NOISE.....  | 4.62, 6.16                         |
| GATE LENGTH.....  | 4.34, 6.243                               | POLARITY POS/NEG.....                                   | 4.30, 4.33, 6.243, 6.289           |
| GATE MODE LEVEL/EDGE.....   | 4.33, 6.243                               | POWER ABS/REL.....                                      | 4.81, 6.81                         |
| GATE SETTINGS.....  | 4.33, 6.242                               | POWER ON/OFF.....                                       | 4.79, 6.73, 6.75, 6.76, 6.78, 6.82 |
| GATED TRIGGER.....  | 4.32, 6.242, 6.244                        | PREAMP.....   | 4.133, 6.154                       |
| GENERAL SETUP.....  | 4.140                                     | PREDEFINED COLORS.....                                  | 4.130, 4.175, 6.120, 6.146         |
| GPIB ADDRESS.....   | 4.140, 6.261                              | PRINT SCREEN.....                                       | 4.34, 4.169, 6.147, 6.148, 6.165   |
| GRID ABS/REL.....   | 4.14, 6.121                               | PRINT TABLE.....  | 4.169, 6.147, 6.148, 6.165         |
| GRID MIN LEVEL.....   | 6.123                                     | PRINT TRACE.....  | 4.169, 6.147, 6.148, 6.165         |
| HARDCOPY ABORT.....   | 4.169, 6.144                              | RANGE LINEAR.....                                       | 4.12, 6.123                        |
| HARDWARE INFO.....  | 4.150, 6.6, 6.116                         | RANGE LOG 100 dB.....                                   | 4.11, 6.121, 6.123                 |
| HHOR SYNC.....  | 4.36, 6.289                               | RANGE LOG MANUAL.....                                   | 4.12, 6.121, 6.123                 |
| IF POWER.....   | 4.30, 6.244, 6.287, 6.288                 | RBW / VBW MANUAL.....                                   | 4.21, 6.209                        |
| INPUT CAL.....  | 4.153, 4.154, 6.114, 6.115                | RBW / VBW NOISE [10].....                               | 4.21, 6.209                        |
| INPUT RF.....   | 4.153, 4.154, 6.114                       | RBW / VBW PULSE [1].....                                | 4.21, 6.209                        |
| INSERT VALUE.....   | 4.122                                     | RBW / VBW SINE [1/3].....                               | 4.20, 6.209                        |
| INSTALL OPTION.....   | 4.147                                     | RECALL.....   | 4.160, 4.188, 6.163, 6.217         |
| INSTALL PRINTER.....  | 4.172                                     | REF FXD ON/OFF.....                                     | 4.56, 6.14                         |
| ITEMS TO SAVE/RECALL.....   | 4.161, 6.167                              | REF LEVEL.....  | 4.11, 6.122                        |
| LAST SPAN.....  | 4.10                                      | REF LEVEL = MKR LVL.....                                | 4.70, 6.64                         |
| LEFT LIMIT.....   | 4.66, 4.72, 6.46, 6.47                    | REF LEVEL COUPLED.....                                  | 4.127, 6.157                       |
| LIMIT ON/OFF.....   | 4.80, 6.46                                | REF LEVEL OFFSET.....                                   | 4.14, 6.122                        |
| LINES 625 / 525.....  | 4.36, 6.289                               | REF LEVEL POSITION.....                                 | 4.14, 6.123                        |
| LOCAL.....  | 4.4, 5.6                                  | REF POINT FREQUENCY.....                                | 4.56, 4.64, 6.16                   |
| LOGO ON/OFF.....  | 4.128, 6.118                              | REF POINT LEVEL.....                                    | 4.56, 4.63, 6.15                   |
| MAIN PLL BANDWIDTH.....   | 4.25                                      | REF POINT LVL OFFSET.....                               | 4.56, 4.63, 6.15                   |
| MAKE DIRECTORY.....   | 4.166, 6.164                              | REF POINT TIME.....                                     | 4.57, 6.16                         |
| MANUAL.....   | 4.7                                       | REF POINT x-LEVEL.....                                  | 4.57, 6.16                         |
| MARKER 1 to 4.....  | 4.53, 6.11, 6.12, 6.45, 6.46, 6.49        | REF VALUE.....  | 4.187, 6.122                       |
| MARKER DEMOD.....   | 4.67, 6.60                                | REF VALUE POSITION.....                                 | 4.186, 6.123                       |
| MARKER NORM/DELTA.....  | 4.53, 6.9                                 | REFERENCE FIXED.....                                    | 4.56, 6.14                         |
| MARKER ZOOM.....  | 4.58, 6.59                                | REFERENCE INT/EXT.....                                  | 4.132, 6.240                       |
| MAX HOLD.....   | 4.37, 6.124                               | REMOVE OPTION.....                                      | 4.147                              |
| MAX HOLD ON/OFF.....  | 4.81, 6.74, 6.76, 6.78, 6.80              | RENAME.....   | 4.166, 6.165                       |
| MEAN.....   | 4.80, 6.76, 6.77                          | RES BW.....   | 4.104, 6.206                       |
| MIN.....  | 4.76, 6.13, 6.51                          | RES BW AUTO.....  | 4.19, 6.207                        |
| MIN HOLD.....   | 4.40, 6.124                               | RES BW MANUAL.....                                      | 4.18, 6.206                        |
| MKR -> CF STEPSIZE.....   | 4.75, 6.64                                | RESTORE FIRMWARE.....                                   | 4.156                              |
| MKR -> TRACE.....   | 4.54, 4.68, 4.75, 6.10, 6.46              | RF ATTEN AUTO.....                                      | 4.13, 6.152                        |
| MKR DEMOD ON/OFF.....   | 4.67, 6.61                                | RF ATTEN MANUAL.....                                    | 4.13, 4.15, 6.152                  |
| MKR STOP TIME.....  | 4.68, 6.61                                | RF INPUT 50 $\Omega$ / 75 $\Omega$ .....                | 4.14, 6.154                        |
| MODULATION DEPTH.....   | 4.109, 6.62                               | RF INPUT AC/DC.....                                     | 4.13                               |
| N dB DOWN.....  | 4.64, 6.57, 6.58, 6.59                    | RF POWER.....   | 4.36, 6.287, 6.288                 |
| NAME.....   | 4.119, 6.21, 6.22, 6.37, 6.38, 6.41, 6.43 | RIGHT LIMIT.....  | 4.66, 4.72, 6.46, 6.47             |
| NETWORK.....  | 4.181                                     | RMS.....  | 4.79, 6.75                         |
| NETWORK.....  | 4.182                                     | SATURATION.....   | 4.130, 4.175, 6.119, 6.145         |
|   |   | SAVE.....   | 4.160, 6.166                       |

|                           |                               |  |                         |
|---------------------------|-------------------------------|--|-------------------------|
| SAVE LIMIT LINE.....      | 4.122                         | VALUES.....                                | 4.122, 6.37, 6.39, 6.42 |
| SAVE TRD FACTOR.....      | 4.139                         | VBW LIN LOG.....                           | 4.25, 6.209             |
| SCALING.....              | 4.104, 6.90                   | VERT SYNC.....                             | 4.36, 6.289             |
| SCREEN COLORS.....        | 4.173                         | VERT SYNC EVEN FIELD.....                  | 4.36, 6.289             |
| SCREEN TITLE.....         | 4.128, 6.120, 6.121           | VERT SYNC ODD FIELD.....                   | 4.36, 6.289             |
| SEARCH LIMIT OFF.....     | 4.72, 6.46                    | VIDEO.....                                 | 4.29, 6.287, 6.288      |
| SEARCH LIMITS.....        | 4.72, 6.46                    | VIDEO BW AUTO.....                         | 4.19, 6.208             |
| SEARCH NEXT LEFT.....     | 4.71, 6.13, 6.14, 6.52        | VIDEO BW MANUAL.....                       | 4.18, 6.208             |
| SEARCH NEXT RIGHT.....    | 4.71, 6.13, 6.14, 6.50, 6.52  | VIDEO POL POS / NEG.....                   | 4.36, 6.289             |
| SELECT GENERATOR.....     | 4.192, 6.261, 6.262, 6.263    | VIEW.....                                  | 4.39, 6.124             |
| SELECT ITEMS.....         | 4.162, 6.167, 6.168           | VOLT.....                                  | 4.12, 6.95, 6.291       |
| SELECT LIMIT LINE.....    | 4.115, 6.20, 6.21, 6.40, 6.43 | WATT.....                                  | 4.12, 6.95, 6.291       |
| SELECT MARKER.....        | 4.60, 4.69, 4.112, 6.45       | X * RBW.....                               | 4.7, 6.221, 6.222       |
| SELECT OBJECT.....        | 4.129, 4.174                  | X * SPAN.....                              | 4.6, 6.221, 6.222       |
| SELECT TRACE.....         | 4.9, 4.37, 4.93, 6.71, 6.239  | X OFFSET.....                              | 4.117, 6.38             |
| SELFTTEST.....            | 4.155, 6.7                    | X-AXIS RANGE.....                          | 4.105, 6.91             |
| SELFTTEST RESULTS.....    | 4.155, 6.116                  | X-AXIS REF LEVEL.....                      | 4.104, 6.90             |
| SERVICE.....              | 4.153, 6.114                  | Y OFFSET.....                              | 4.117, 6.40, 6.43       |
| SET CP REFERENCE.....     | 4.87, 6.237                   | Y-AXIS MAX VALUE.....                      | 4.105, 6.91             |
| SET REFERENCE.....        | 4.81, 6.82                    | Y-AXIS MIN VALUE.....                      | 4.105, 6.91             |
| SET TO DEFAULT.....       | 4.175                         | ZERO SPAN.....                             | 4.10, 6.222             |
| SGL SWEEP DISP OFF.....   | 4.28, 6.151                   | ZOOM x-AXIS.....                           | 4.34                    |
| SHIFT X LIMIT LINE.....   | 4.122, 6.38                   | Span.....                                  | 4.10                    |
| SHIFT Y LIMIT LINE.....   | 4.122, 6.44                   | Special characters.....                    | 6.2                     |
| SIGNAL COUNT.....         | 4.55, 6.48                    | Spectrum analyzer mode.....                | 4.5                     |
| SIGNAL STATISTIC.....     | 4.103                         | Split screen.....                          | 3.8, 4.126              |
| SIGNAL TRACK.....         | 4.9, 6.70                     | Squelch.....                               | 4.67                    |
| SINGLE MEAS.....          | 4.106, 6.150, 6.151           | SRE (service request enable register)..... | 5.21                    |
| SINGLE SWEEP.....         | 4.26, 6.150, 6.151            | SRQ (service request).....                 | 5.21, 5.31              |
| SOFT FRONT PANEL.....     | 4.148                         | Standard deviation.....                    | 4.80                    |
| SORT MODE.....            | 4.166                         | Standard, mobile radio.....                | 4.86                    |
| SORT MODE FREQ/LEVEL..... | 4.66                          | Start frequency.....                       | 4.8                     |
| SOURCE CAL.....           | 4.183                         | Statistics.....                            | 4.101                   |
| SOURCE POWER.....         | 4.182, 6.245, 6.248           | Status byte (STB).....                     | 5.21                    |
| SPAN MANUAL.....          | 4.10, 6.222                   | Status information.....                    | 3.4                     |
| SPAN/RBW AUTO [50].....   | 4.21, 6.207                   | IFOVL.....                                 | 3.5                     |
| SPAN/RBW MANUAL.....      | 4.22, 6.207                   | MSG.....                                   | 3.5                     |
| SPLIT SCREEN.....         | 4.126, 6.118                  | OVEN.....                                  | 3.5                     |
| STANDARD DEVIATION.....   | 4.80, 6.78, 6.79              | OVLd.....                                  | 3.5                     |
| START.....                | 4.8, 6.222                    | UNCAL.....                                 | 3.4                     |
| START LIMIT.....          | 4.80, 4.81, 6.47              | STATus OPERation register.....             | 5.23                    |
| STARTUP RECALL.....       | 4.163, 6.164                  | STATus QUEStionable register.....          | 5.24                    |
| STATISTICS.....           | 4.151, 6.5                    | ACPLimit register.....                     | 5.25                    |
| STEPSIZE MANUAL.....      | 4.8                           | FREQuency register.....                    | 5.26                    |
| STOP.....                 | 4.8, 6.223                    | LIMit register.....                        | 5.27                    |
| STOP LIMIT.....           | 4.80, 4.81, 6.47              | LMARgin register.....                      | 5.28                    |
| SWEEP COUNT.....          | 4.27, 4.39, 6.242             | POWer register.....                        | 5.29                    |
| SWEEP POINTS.....         | 4.28, 6.244                   | SYNC.....                                  | 5.30                    |
| SWEPTIME AUTO.....        | 4.20, 4.27, 6.241             | Status register.....                       |                         |
| SWEPTIME MANUAL.....      | 4.10, 4.19, 4.27, 6.241       | CONDition part.....                        | 5.19                    |
| SYSTEM INFO.....          | 4.149                         | ENABLE part.....                           | 5.19                    |
| SYSTEM MESSAGES.....      | 4.152, 6.267, 6.268           | ESE.....                                   | 5.22                    |
| T1-T2.....                | 4.49, 6.87                    | ESR.....                                   | 5.22                    |
| T1-T3.....                | 4.49, 6.87                    | EVENT part.....                            | 5.19                    |
| THRESHOLD.....            | 4.66, 4.72, 6.93, 6.94        | NTRansition part.....                      | 5.19                    |
| TIME DOM POWER.....       | 4.78, 6.73, 6.75, 6.76, 6.78  | overview.....                              | 5.20                    |
| TIME LINE 1/2.....        | 4.124                         | PPE.....                                   | 5.22                    |
| TIME+DATE.....            | 4.144, 6.267, 6.270           | PTRansition part.....                      | 5.19                    |
| TIME+DATE ON/OFF.....     | 4.128, 6.121                  | SRE.....                                   | 5.21                    |
| TINT.....                 | 4.130, 4.174, 6.119, 6.145    | STATus OPERation.....                      | 5.23                    |
| TOI.....                  | 4.111, 6.63                   | STATus QUEStionable ACPLimit.....          | 5.25                    |
| TRACE MATH.....           | 4.49, 6.87                    | STATus QUEStionable FREQuency.....         | 5.26                    |
| TRACE MATH OFF.....       | 4.49, 6.88                    | STATus QUEStionable LIMit.....             | 5.27                    |
| TRACE POSITION.....       | 4.49, 6.87                    | STATus QUEStionable LMARgin.....           | 5.28                    |
| TRACK BW.....             | 4.9, 6.70                     | STATus QUEStionable POWer.....             | 5.29                    |
| TRACK ON/OFF.....         | 4.9, 6.70                     | STATus QUEStionable SYNC.....              | 5.30                    |
| TRACK THRESHOLD.....      | 4.9, 6.71                     | STB.....                                   | 5.21                    |
| TRANSDUCER.....           | 4.134, 6.217                  | structure.....                             | 5.18                    |
| TRANSDUCER FACTOR.....    | 4.134, 6.217, 6.219           | sum bit.....                               | 5.19                    |
| TRIGGER OFFSET.....       | 4.30, 6.289                   | Status reporting system.....               | 5.18                    |
| UNIT.....                 | 4.12, 6.95, 6.291             | resetting values.....                      | 5.33                    |
| USER DEFINED.....         | 4.173                         | STB (status byte).....                     | 5.21                    |

- Stepsize ..... 4.8  
     center frequency ..... 4.6  
     coupling ..... 4.8  
 Stop frequency ..... 4.8  
 Storing ..... 8.1  
 String ..... 5.14  
 Suffix ..... 5.11  
 Sum bit ..... 5.19  
 Supply voltage, external noise source ..... 4.132  
 Sweep  
     continue single sweep ..... 4.27  
     continuous ..... 4.26  
     count ..... 4.27  
     coupling ..... 4.16  
     free run ..... 4.29  
     gated ..... 4.31, 4.32  
     settings ..... 4.26  
     single ..... 4.26  
     time ..... 4.10, 4.27  
         coupling ..... 4.20  
 Switching cycles ..... 4.151  
 Switching on/off ..... 1.16  
 Sync signal ..... 4.36  
 Syntax elements of commands ..... 5.14  
 System messages ..... 4.152
- T**
- T1-T2 (trace info) ..... 3.5  
 T1-T3 (trace info) ..... 3.5  
 Table  
     operation ..... 3.21  
     scrolling ..... 3.23  
 Test  
     functional ..... 1.18  
     selftest ..... 4.155  
 Text parameter ..... 5.14  
 Third Order Intercept ..... 4.110  
 Threshold  
     line ..... 4.72  
     signal tracking ..... 4.9  
 Time ..... 4.128  
     input ..... 4.144  
     Line ..... 4.124  
 Time axis ..... 4.10  
 Tint ..... 4.130  
 Title for the active diagram ..... 4.128  
 TOI ..... 4.110  
 Trace ..... 4.36, 4.37  
     average ..... 4.38  
     averaging ..... 4.40  
     blank ..... 4.39  
     Clear/Write ..... 4.37  
     copy ..... 4.43  
     freeze ..... 4.39  
     math ..... 4.49  
     max hold ..... 4.37  
     min hold ..... 4.40  
     position for 0 difference ..... 4.49  
     select ..... 4.36  
     signal tracking ..... 4.9  
 Trace info ..... 3.5  
 Transducer  
     Activating ..... 4.133  
     Entry ..... 4.136  
 Transmission measurement ..... 4.183  
 Transmission parameters RS-232-C/COM ..... 8.8  
 TRG (enhancement table) ..... 3.6  
 Trigger  
     external ..... 4.30  
     external gate ..... 4.32  
     free run ..... 4.29  
     gated sweep ..... 4.33  
     IF power ..... 4.30  
     offset ..... 4.30  
     RF power ..... 4.36  
     slope ..... 4.30  
     sweep ..... 4.29  
     video ..... 4.29
- U**
- UNCAL ..... 3.4  
 Unit  
     level axis ..... 4.12  
     limit line ..... 4.120  
 Unit (key) ..... 3.11  
 Universal command ..... 8.5  
 Upper case ..... 6.2
- V**
- Vertical sync signal ..... 4.36  
 Video bandwidth ..... 4.18  
 Video polarity ..... 4.36  
 Video triggering ..... 4.29  
 VIEW (trace info) ..... 3.5  
 View trace ..... 4.39
- W**
- WCDMA FDD BTS and MS ..... 6.211  
 White space ..... 5.14  
 Windows NT ..... 1.19  
     administrator ..... 1.19  
     login ..... 1.19  
     password ..... 1.19
- Z**
- Zero span ..... 4.10  
 Zoom ..... 4.58  
     amplitude ..... 4.39  
     x-AXIS (gate signal) ..... 4.34