ROHDE&SCHWARZ

Test and Measurement
Division

Operating Manual

Remote Control for R&S® FSH

R&S® FSH-K1

1157.3458.02

R&S FSH – Firmware Version 11.0

Dear Customer,

Contents

Enabling Remote Control Option R&S FSH-K1

The R&S FSH spectrum analyzer can be fitted with the Remote Control Option R&S FSH-K1, which is enabled by entering a key code. The key code is based on the unique serial number of the instrument. To retrofit an option, enable it with a key code.

Operation

- Press the GENERAL key.
- Use the Rotary knob or the Cursor keys to select the OPTIONS... menu item and confirm the entry with the ENTER key.

Enter the key code (ten-digit number) for the option with the decimal keys and confirm with the ENTER key.

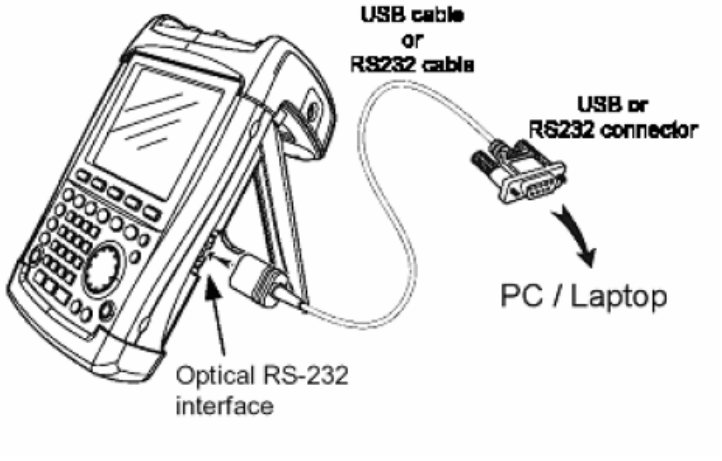
If the correct key code is entered, the R&S FSH displays "Remote Control enabled".
If an invalid key code is entered, the R&S FSH displays "Option key error".
The correct key code can then be entered.

Connecting PCs

The R&S FSH can be remote controlled by a PC or Laptop equipped with an USB interface or a RS232 interface.

RS232 optical interface
The RS232 optical interface is used for connecting a PC or Laptop. The interface connector is located at the right-hand side of the R&S FSH, it can be accessed by folding out the support.
The USB Optical Interface Cable R&S FSH-Z37 (supplied with the R&S FSH) or the RS232 Optical Interface Cable R&S FSH-Z34 are used to make the connection. The optical connection prevents spurious measurements being caused by interference from these devices.

- Fold out the support at the rear of the R&S FSH.
- Connect the optical connector of the RS-232 cable to the optical interface on the right-hand side of the R&S FSH.
- Connect the USB connector of the cable to the USB connector of the PC (R&S FSH-Z37) or the 9-pin D-Sub connector of the cable to the RS-232 connector of the PC (R&S FSH-Z34).
- For the USB cable R&S FSH-Z37: Install the USB driver supplied on the R&S FSH CD-ROM.



Installation of the driver for the USB optical cable (R&S FSH-Z37)

The USB driver available on the R&S FSH CD-ROM emulates a serial COM port on the PC. In order to install the driver on a PC equiped with Windows XP or Windows 2000 please proceed as follows:

- Connect the optical USB cable to the PC. The hardware installation wizzard will pop up and state that it has found a USB to serial bridge.
- Insert the R&S FSH CD-ROM.
- Select “automatic software installation” and press “Next”. The installation wizzard will automatically search for the necessary driver and install it.

  In case that the wizzard does not find the driver files you will be prompted for manual entry of the corresponding path. The driver is located on the CD-ROM in folder “\drivers\USB”.
- Press “Finish” in order to finalize the installation. The USB cable is now ready for use.

Serial Port Configuration

The serial interface configuration on the PC should be set to

8 data bits, 1 stop bit, no parity

The baud rate can be configured via the Setup menu on the R&S FSH or the SET BAUD command. The baud rates can be 9.600, 19.200, 38.400, 57.600 or 115.200 Baud. The default baud rate is 19.200 Baud

Notational Conventions

The following section describes the notational conventions as they are used throughout this document.

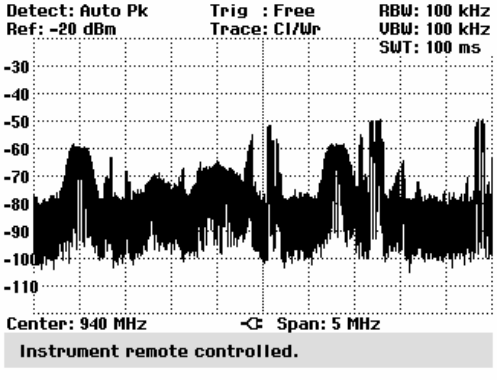
Meta Symbol	**Specification**
:=	Equals
|	Separator for selectable items
"..."	Characters between " " are taken as they are, but the " " are excluded (example "," means an ASCII comma).
[...]	Specifies an optional element
{...}	Specifies an element that may be repeated.

Item	**Description**
<character>	'0' .. '9', 'a' .. 'z', 'A' .. 'Z'
<string>	<character> { <character> }
<sign>	('+' | '-')
<digit>	'0' .. '9'
<numeric value>	[<sign>] <digit> { <digit> } [. { <digit> }] [e | E [<sign>] { <digit>}]

Starting Remote Control Operation

On power-on, the R&S FSH is always in the manual operation state ("LOCAL" state) and can be operated via the front panel.

- If the R&S FSH receives a remote command the instrument remains in local state. It is switched to remote state as soon as it receives the command "REMOTE" from the PC.
- In remote state the front panel access is disabled.
- The R&S FSH can be switched back to local state by sending the LOCAL command.



Device Messages

The remote control command set of the R&S FSH can be grouped into three categories:

- **SET commands**

  SET commands are used to program parameters of the instrument like center frequency, span, etc.

- **GET commands**

  GET commands are used to query current settings and data from the instrument like center frequency, marker, trace data, etc.

- **CMD commands**

  CMD commands are used to initiate an action or a state transition in the instrument like marker-to-peak, preset, remote state, etc.

Acknowledge Response <ack>

After receiving a SET, GET or CMD command the R&S FSH responds with an "acknowledge" message. The acknowledge message consists of an ASCII digit ("0" for no error) followed by a Carriage Return <cr>. The response message indicates if the command or parameter is valid.
A second acknowledge response is generated after the command parameter.

<ack> response:

"0" No Error.

"1" Syntax Error. This response is generated when the command sent to the instrument is not known or when the timeout on data reception expired. It is also generated, when the parameter or value for the command are in the wrong data format.

"2" Execution Error. The command sent is not allowed in the current measurement mode.

"3" Dataset Storage Full. This response is generated when the dataset storage is full.

"4" Not Allowed. In the current state of the R&S FSH setting this parameter or value is not allowed.

"5" Out Of Range. The parameter value is out of range and cannot be programmed.

Timeout

To prevent any lockups in the communication between PC and instrument the data transfer via the serial interface is monitored by the R&S FSH. There is a timeout time of 60 seconds on every byte received by the instrument. When the time between 2 bytes in a command or parameter send exceeds 60 seconds the R&S FSH will respond with a 'Syntax Error' acknowledge message ("1"<cr>).

Note: When using remote control commands and the sweep time is less than 30 ms (e.g. Zero span) the measurement will stop until the complete command is received (in this case all interrupts are switched off due to the processing of all data points).

Functional Description of Commands

The command strings and parameter strings are not case sensitive, eg 'Freq' is similar to 'FREQ'.

GET Command

GET commands are used to query parameter settings or measured data from the instrument.

Program syntax: `get<cr>`

Response syntax: `<ack><cr>`

Program syntax: `<parameter><cr>`

<parameter> := `<string>`
This is one of the parameters defined in the following section.

Response syntax: `<ack><cr>`

`<value><cr>`

<value>:= This field depends on the type of parameter, see the specific value descriptions

Example: This command queries the unit from the instrument.

`get<cr>`	(send 'get' command)
`0<cr>`	(responds 'command ok')
`UNIT<cr>`	(send parameter 'UNIT')
`0<cr>`	(responds 'parameter ok')
`6<cr>`	(responds UNIT value 'Volt')

SET Command

SET commands are used to program parameter and setup settings of the instrument.

Program syntax: `set<cr>`

Response syntax: `<ack><cr>`

Program syntax: `<parameter>,<value><cr>`

<parameter> := `<string>`
This is one of the parameters defined in the following section.

<value>:= This field depends on the type of parameter, see the specific value descriptions

Response syntax: `<ack><cr>`

Example: This command sets the unit to Watt.

`set<cr>`	(send 'set' command)
`0<cr>`	(responds 'command ok')
`UNIT,7<cr>`	(send parameter 'UNIT' value is 'Watt')
`0<cr>`	(responds 'parameter ok')

CMD Command

CMD commands are used to initiate an action or a state transition on the instrument.

Program syntax: `cmd<cr>`

Response syntax: `<ack><cr>`

Program syntax: `<parameter>,<value><cr>`

<parameter> := `<string>`
This is one of the commands defined in the following section

<value>:= This field depends on the type of parameter, see the specific value descriptions

Response syntax: `<ack><cr>`

Example 1: This command sets the instrument in Remote Controlled.

`cmd<cr>`	(send 'cmd' command)
`0<cr>`	(responds 'command ok')
`REMOTE<cr>`	(send parameter 'REMOTE')
`0<cr>`	(responds 'parameter ok')

Example 2: This command saves a dataset on the instrument with the name 'test'.

`cmd<cr>`	(send 'cmd' command)
`0<cr>`	(responds 'command ok')
`SAVE,test<cr>`	(send parameter 'SAVE' with name 'test')
`0<cr>`	(responds 'parameter ok')

Parameter Overview

In the following tables all parameters and commands are listed with the different measurement modes they are active in.

Note: Parameters are not always available, this depends on the type of measurement selected and other settings.

Get / Set Parameter

Parameter	Analyzer	Receiver Mode	Tracking Gen.	Isotropic Antenna	Power Sensor	Carrier Noise	Channel Power	Occupied BW	TDMA Power	Distance to Fault	WCDMA BTS CDP
ACCESSORY	*	*	*	*	*	*	*	*	*	*	*
ANTDIV											*
AUTOCISPRBW		*									
AUTODET	*		*	*		*	*	*	*		
AUTORBW	*		*	*		*	*	*			
AUTOSPAN						*	*	*		*	
AUTOSWPTIME	*		*	*		*	*	*		*	
AUTOVBW	*		*	*		*	*	*			
BAUD	*	*	*	*	*	*	*	*	*	*	
CABLELEN										*	
CABLEMOD										*	
CHANNEL	*	*		*		*	*	*	*		
CHMODE	*	*		*		*	*	*	*		
CHPWRBW							*				
CHPWRSTD							*				
CHPWRCSTD							*				
CHPWRUNIT							*				
CHTABLE	*	*		*		*	*	*	*		
CISPRBW		*									
CNCHBW						*					
CNMANREFPWR						*					
CNMEASMODE						*					
CNMODE						*					
CNNORM						*					
CNPILOTFRQ						*					
CNPWRDISP						*					
CNREFPWR						*					
CNUNIT						*					
CNVISIONFRQ						*					
DELTA1	*	*	*	*						*	
DELTA	*	*	*	*						*	
DELTAALLON	*	*	*	*						*	
DELTA1ON	*	*	*	*						*	
DELTAON	*	*	*	*						*	

Parameter	Analyzer	Receiver Mode	Tracking Gen.	Isotropic Antenna	Power Sensor	Carrier Noise	Channel Power	Occupied BW	TDMA Power	Distance to Fault	WCDMA BTS CDP
DISPLAY	*	*	*	*	*	*	*	*	*	*	*
DTFMODE										*	
DYNRANGE	*	*	*	*	*	*	*	*	*	*	
EXTINPUT	*	*	*	*	*	*	*	*	*	*	
FREQ	*	*	*	*	*	*	*	*	*	*	*
FREQOFFS	*			*		*	*	*	*		
FREQSTART		*									
FREQSTOP		*									
LENUNIT	*	*	*	*	*	*	*	*	*	*	
LIMDEF	*	*	*	*		*	*	*	*	*	
LIMLOW	*	*	*	*		*	*	*	*	*	
LIMUPP	*	*	*	*		*	*	*	*	*	
MARK1	*	*	*	*						*	
MARK	*	*	*	*						*	
MARKALLON	*	*	*	*						*	
MARK1ON	*	*	*	*						*	
MARKON	*	*	*	*						*	
MARKMODE	*	*	*	*						*	
MARKDEMOD	*	*		*							
MARKTIME	*	*		*							
MARKVOL	*	*		*							
MARKIMPREF			*								
MARKMEASY			*								
MATHMODE	*										
MEAS	*	*	*	*	*	*	*	*	*	*	*
MEASTIME		*			*				*		
OBWSTD								*			
OBWCSTD								*			
OBWCHBW								*			
PREAMP	*	*	*	*		*	*	*	*	*	
PSCRCD											*
PWRSSTD					*						
RANGE	*	*	*	*		*	*	*	*	*	
RBW	*	*	*	*		*	*	*	*		
REFLUNIT					*						
REFLVL	*	*	*	*	*	*	*	*	*		*
REFLVLOFFS	*	*	*	*	*	*	*	*	*	*	*
RFINPUT	*	*	*	*		*	*	*	*		*
SCANMODE		*									
SCANSTART		*									
SCANSTOP		*									
SCANSTEP		*									
SPAN	*		*	*		*	*	*			
SSCRCD											*
SWPCONT	*	*	*	*		*	*	*	*		*

Parameter	Analyzer	Receiver Mode	Tracking Gen.	Isotropic Antenna	Power Sensor	Carrier Noise	Channel Power	Occupied BW	TDMA Power	Distance to Fault	WCDMA BTS CDP
SWPTIME	*		*	*		*	*	*	*		*
TDMASTD									*		
TDMACSTD									*		
TGATT			*								
TGLVL			*								
TGMODE			*								
THRLOW		*									
THRUPP		*									
TRACEAVG	*		*	*		*	*	*	*		
TRACEDET	*	*	*	*		*	*	*	*		
TRACEMODE	*	*	*	*		*	*	*	*		
TRD1	*	*				*	*	*	*		
TRD1X				*							
TRD1Y				*							
TRD1Z				*							
TRD2	*	*		*		*	*	*	*		
TRIGDEL	*		*	*		*	*	*	*		
TRIGLVL	*		*	*		*	*	*	*		
TRIGSRC	*	*	*	*		*	*	*	*		
UNIT	*	*	*	*	*	*	*	*	*	*	
VBW	*		*	*		*	*	*	*		

Get Parameter

Parameter	Analyzer	Receiver Mode	Tracking Gen.	Isotropic Antenna	Power Sensor	Carrier Noise	Channel Power	Occupied BW	TDMA Power	Distance to Fault	WCDMA BTS CDP
CABLELOSS			*								
CARRFREQERR											*
CCORRTRACE			*							*	
CCORRTRACEBIN			*							*	
CHPWR							*				
CNVALUE						*					
CPICHPWR											*
CPICHSLOTNR											*
CPICHSYMEVM											*
CTRACE			*							*	
CTRACEBIN			*							*	
DELTAALL?	*	*	*	*						*	
ELCABLENVAL			*								
EXTREF	*	*	*	*	*	*	*	*	*	*	
IDN?	*	*	*	*	*	*	*	*	*	*	
LEVEL		*									
LIMCHKREMOTE		*									
LIMLIST	*	*	*	*		*	*	*	*	*	
LIMPASS	*	*	*	*		*	*	*	*	*	
MARKALL?	*	*	*	*						*	
MTRACE	*	*	*	*		*	*	*	*	*	
MTRACEBIN	*	*	*	*		*	*	*	*	*	
OCCBW								*			
PCCPCHPWR											*
PCCPCHSYMEVM											*
PSCHPWR											*
PWR					*						
REFL					*						
REFLCAL			*							*	
REFLVECTCAL			*							*	
SSCHPWR											*
STB?	*	*	*	*	*	*	*	*	*	*	
SYNCRESULT											*
TDMAPWR									*		
TEMP	*	*	*	*	*	*	*	*	*	*	*
THRPASS		*									
TOTPWR											*
TRACE	*	*	*	*		*	*	*	*	*	
TRACEBIN	*	*	*	*		*	*	*	*	*	
TRANSCAL			*								
TRANSVECTCAL			*								

CMD Commands

Parameter	Analyzer	Receiver Mode	Tracking Gen.	Isotropic Antenna	Power Sensor	Carrier Noise	Channel Power	Occupied BW	TDMA Power	Distance to Fault	WCDMA BTS CDP
CAL_DTF										*	
CAL_TGSCLRFL			*								
CAL_TGSCLTRN			*								
CAL_TGVECRFL			*								
CAL_TGVECTRN			*								
INIT	*	*	*	*	*	*	*	*	*	*	*
LOCAL	*	*	*	*	*	*	*	*	*	*	*
LVLADJUST						*	*	*	*		*
MARKNXTPK	*	*	*	*						*	
MARKPK	*	*	*	*						*	
MARKMIN	*	*	*	*						*	
MARKTOCENT	*		*	*						*	
LIMDEL	*	*	*	*		*	*	*	*	*	
MARKTOLVL	*	*	*	*						*	
PRESET	*	*	*	*	*	*	*	*	*	*	*
PWRTOREF					*						
RECALL	*	*	*	*	*	*	*	*	*	*	*
REMOTE	*	*	*	*	*	*	*	*	*	*	*
RESTART											
SAVE	*	*	*	*	*	*	*	*	*	*	*
THROFF		*									
TRACETOMEM	*										
WAIT	*	*	*	*	*	*	*	*	*	*	
ZERO					*						

Note: When the instrument is in the state standby (Off) only the parameters IDN?, BAUD and MEAS are available.

Command Description

General Commands

Command	Parameters	Unit	Comment
IDN?			GET command only
BAUD	0...4		SET command only
REMOTE			
LOCAL			
PRESET			
INIT			
WAIT			
STB?			GET command only
EXTINPUT	0, 1		
SAVE	<string>		
RECALL	<string>		
EXTREF	0…3		GET command only
DISPLAY	0...1		
TEMP			GET command only

IDN?

This command returns the instrument ID string.
This string contains: <manufacturer>,<model number>,<serial number>,<software version>.
<model number>: 03, 13, 23 for the according FSH3 model
06, 26 for the according FSH6 model

Example:

```
get<cr>
0<cr>
idn?<cr>                                  'query ID string
0<cr>                                     'responds parameter ok
Rohde&Schwarz,23,100212,V11.0             'instrument ID string
```

BAUD (Serial baud rate)

This command sets the serial interface baud rate. The default baud rate is 19.200 Baud.

Value	Baud rate
0	19.200
1	38.400
2	57.600
3	115.200
4	9.600

Example:

```
set<cr>
0<cr>
baud,3<cr>          ‘set baud rate on 115.200
0<cr>               ‘responds ok with current baud rate
                    ‘instrument is set to new baud rate
```

REMOTE

This command sets the instrument to remote state. Front panel interaction is disabled.

Example:

```
cmd<cr>
0<cr>
remote<cr>          ‘set instrument to remote
0<cr>               ‘responds parameter ok
```

LOCAL

This command sets the instrument to local state. Front panel operation is enabled.

Example:

```
cmd<cr>
0<cr>
local<cr>           ‘set instrument to local
0<cr>               ‘responds parameter ok
```

PRESET

This command sets the instrument to the preset settings.

Example:

```
cmd<cr>
0<cr>
preset<cr>          ‘set instrument to preset
0<cr>               ‘responds parameter ok
```

INIT

This command starts / re-starts a new sweep.

Example:

```
cmd<cr>
0<cr>
init<cr>            ‘start new sweep
0<cr>               ‘responds parameter ok
```

WAIT

This command is used to synchronize with the end of a sweep. After sending the WAIT command the <ack> acknowledge is holdoff until the sweep is complete.

Example:

```
cmd<cr>
0<cr>
wait<cr>                ‘wait for end of sweep
0<cr>                   ‘responds parameter ok, sweep complete
```

STB?

This command returns the instrument status. The status indicates any settings/conditions that causes measurements to be questionable (response: ‘1’) or not (response ‘0’).

Example:

```
get<cr>
0<cr>
stb?<cr>                ‘query status
0<cr>                   ‘responds parameter ok
0<cr>                   ‘status: o.k.
```

EXTINPUT (External Input)

This command switches between external trigger input and external reference input on the external input connector. Default is ‘External Trigger’.

Value	External Input Connector
0	External Trigger
1	External Reference

Example:

```
set<cr>
0<cr>
extinput,1<cr>          ‘enable external reference on input connector
0<cr>                   ‘responds parameter ok
```

SAVE

This command saves the current setting and measurement in the specified dataset. If the dataset exists it will be overwritten. Dataset names are not case sensitive.

Example:

```
cmd<cr>
0<cr>
save,mydata.001<cr>     ‘save settings to dataset “MYDATA.001”
0<cr>                   ‘responds parameter ok
```

RECALL

This command recalls a stored dataset. Dataset names are not case sensitive.

Example:

```
cmd<cr>
0<cr>
recall,mydata.001<cr>   ‘recall settings from dataset “MYDATA”
0<cr>                   ‘responds parameter ok
```

EXTREF (External Reference status)

This command returns the external reference status.

Value	Status external reference
0	Disabled
1	Out of range
2	Catching
3	Locked

Example:

```
get<cr>
0<cr>
extref<cr>          ‘get status of external reference
0<cr>               ‘responds parameter ok
1<cr>               ‘response status out of range
```

DISPLAY

This command turns the display on or off.

Value	
0	Off
1	On

Example:

```
set<cr>
0<cr>
display,0<cr>       ‘turn display off
0<cr>               ‘responds parameter ok
```

TEMP (Temperature)

This command returns the current temperature inside the instrument.

Example:

```
get<cr>
0<cr>
temp<cr>            ‘query temperature
0<cr>               ‘responds parameter ok
32.6                ‘instrument temperature (Celsius)
```

Frequency and Span Settings

Command	Parameters	Unit	Comment
FREQ	<numeric value>	Hz	
FREQOFFS	<numeric value>	Hz	
SPAN	<numeric value>	Hz	
AUTOSPAN	0, 1		
CHANNEL	<numeric value>		
CHTABLE	<string>		

FREQ (Frequency)

This command sets the center frequency.
The start and stop frequency of the instrument is defined by the current center frequency and span.

Example:

```
set<cr>
0<cr>
freq,950E6<cr>          'set center frequency to 950 MHz
0<cr>                   'responds parameter ok
```

FREQOFFS (Frequency Offset)

This command sets the frequency offset.
The new center frequency is the current frequency plus the frequency offset.

Example:

```
set<cr>
0<cr>
freqoffs,10E6<cr>       'set frequency offset to 10 MHz
0<cr>                   'responds parameter ok
```

SPAN

This command sets the span.
The start and stop frequency of the instrument is defined by the current center frequency and span.
The <numeric value> = 0 is used for Zero Span.

Example:

```
set<cr>
0<cr>
span,20E6<cr>           'set span to 20 MHz
0<cr>                   'responds parameter ok
```

AUTOSPAN

This command switches span mode AUTO on/off (Measure Mode: Channel Power or Occupied BW)

Value	Span Mode
0	Auto Off
1	Auto On

Example:

```
set<cr>
0<cr>
autospan,1<cr>    'set Auto span On
0<cr>             'responds parameter ok
```

CHANNEL (Channel Number)

This command defines the channel number. Use CHTABLE command to select a channel table first.

Example:

```
set<cr>
0<cr>
channel,55<cr>        'selects channel no. 55
```

CHTABLE (Channel Table)

This command selects a channel table for the channel mode.

Example:

```
set<cr>
0<cr>
chtable,FMBand<cr>    'selects channel table "FMBand"
0<cr>                 'responds parameter ok
```

Amplitude Settings

Command	Parameters	Unit	Comment
REFLVL	<numeric value>		Uses current unit
REFLVLOFFS	<numeric value>	dB	
RANGE	0...20		
DYNRANGE	0, 1		
UNIT	0...8		
RFINPUT	0, 1		
PREAMP	0, 1		

REFLVL (Reference Level)

This command sets the reference level using the current unit.

Example:

```
set<cr>
0<cr>
reflvl,-30<cr>          'set reference level to –30dBm
0<cr>                   'responds parameter ok
```

REFLVLOFFS (Reference Level Offset)

This command sets the reference level offset in dB.
The new reference level is the current reference level plus the reference level offset.

Example:

```
set<cr>
0<cr>
reflvloffs,-6<cr>       'set reference level offset to –6 dB
0<cr>                   'responds parameter ok
```

RANGE

This command defines the range.

Value	Range
0	10 dB/DIV
1	5 dB/DIV
2	2 dB/DIV
3	1 dB/DIV
4	LIN 0-100%
5	VSWR 1-6 (Tracking Gen, DTF)
6	VSWR 1-2 (Tracking Gen, DTF)
7	VSWR 1-1.5 (Tracking Gen, DTF)
8	VSWR 1-1.1 (Tracking Gen, DTF)
9	Smith Chart
10	0,001 Rho/DIV
11	0,01 Rho/DIV
12	0,1 Rho/DIV
13	1 Rho/DIV

Value	Range
14	1 mRho/DIV
15	10 mRho/DIV
16	100 mRho/DIV
17	1000 mRho/DIV
18	0,1 dB/DIV
19	VSWR 1-10 (Tracking Gen, DTF)
20	VSWR 1-20 (Tracking Gen, DTF)
21	Degrees
22	1 ns/DIV
23	2 ns/DIV
24	5 ns/DIV
25	10 ns/DIV
26	20 ns/DIV
27	50 ns/DIV
28	100 ns/DIV

Example:

```
set<cr>
0<cr>
range,2<cr>          'set range to 2 dB/DIV
0<cr>                'responds parameter ok
```

DYNRANGE (Dynamic Range)

This command defines the dynamic range. Default on Preset is 'Low Distortion'.

Value	Range
0	Low Distortion
1	Low Noise

Example:

```
set<cr>
0<cr>
dynrange,1<cr>       'set dynamic range to 'Low Noise'
0<cr>                'responds parameter ok
```

UNIT

This command defines the unit of the level.

Value	Unit
0	dBm
1	dBmV
2	dBµV
3	dBµV/m
4	dBµA/m
5	dB
6	Volt
7	Watt
8	V/m

Example:

```
set<cr>
0<cr>
unit,2<cr>          'set unit to dBµV
0<cr>               'responds parameter ok
```

RFINPUT (RF Input Impedance)

This command defines the input impedance.

Value	Input Impedance
0	50 Ω
1	75 Ω

Example:

```
set<cr>
0<cr>
rfinput,1<cr>       'set input impedance to 75 Ω
0<cr>               'responds parameter ok
```

PREAMP (Preamplifier)

This command switches the preamplifier on/off. Default on Preset is 'Preamp OFF'

Value	Preamp
0	OFF
1	ON

Example:

```
set<cr>
0<cr>
preamp,1<cr>        'turns the preamp on
0<cr>               'responds parameter ok
```

Bandwidth Settings

Command	Parameters	Unit	Comment
AUTORBW	0, 1		
RBW	0...10		
AUTOVBW	0, 1		
VBW	0...12		
AUTOCISPRBW	0, 1		Receiver Mode only (R&S FSH-K3)
CISPRBW	0…3		Receiver Mode only (R&S FSH-K3)

AUTORBW (Auto Resolution Bandwidth)

This command switches the auto coupling of the resolution bandwidth on/off. If AUTORBW is active the current setting of the resolution bandwidth can be queried with the GET RBW command.

Value	Auto Resolution Bandwidth
0	OFF
1	ON

Example:

```
set<cr>
0<cr>
autorbw,1<cr>     'turns the RBW auto coupling on
0<cr>             'responds parameter ok
```

RBW (Resolution Bandwidth)

This command sets the resolution bandwidth.

Value	Resolution Bandwidth
0	Auto (Set only)
1	100 Hz (Model23 only)
2	300 Hz (Model23 only)
3	1 kHz
4	3 kHz
5	10 kHz
6	30 kHz
7	100 kHz
8	300 kHz
9	1 MHz
10	200 kHz

Example:

```
set<cr>
0<cr>
rbw,4<cr>         'set resolution bandwidth to 3 kHz
0<cr>             'responds parameter ok
```

AUTOVBW (Auto Video Bandwidth)

This command switches the auto coupling of the video bandwidth on/off. If AUTOVBW is active the current setting of the video bandwidth can be queried with the GET VBW command.

Value	Auto Video Bandwidth
0	OFF
1	ON

Example:

```
set<cr>
0<cr>
autovbw,1<cr>     'turns the VBW auto coupling on
0<cr>             'responds parameter ok
```

VBW (Video Bandwidth)

This command sets the video bandwidth.

Value	Video Bandwidth
0	Auto (Set only)
1	10 Hz
2	30 Hz
3	100 Hz
4	300 Hz
5	1 kHz
6	3 kHz
7	10 kHz
8	30 kHz
9	100 kHz
10	300 kHz
11	1 MHz
12	3 MHz

Example:

```
set<cr>
0<cr>
vbw,5<cr>         'set video bandwidth to 1 kHz
0<cr>             'responds parameter ok
```

AUTOCISPRBW (Auto CISPR Bandwidth)

This command switches the auto setting of the CISPR bandwidth on/off. If AUTOCISPRBW is active the current setting of the CISPR bandwidth can be queried with the GET CISPRBW command. This command is available in Receiver Mode only (R&S FSH-K3).

Value	Auto CISPR Bandwidth
0	OFF
1	ON

Example:

```
set<cr>
0<cr>
autocisprbw,1<cr>          'turns the CISPRBW auto coupling on
0<cr>                      'responds parameter ok
```

CISRBW (CISPR Bandwidth)

This command sets the CISPR bandwidth. This command is available in Receiver Mode only (R&S FSH-K3).

Value	CISPR Bandwidth
0	200 Hz
1	9 kHz
2	120 kHz
3	1 MHz

Example:

```
set<cr>
0<cr>
cisprbw,2<cr>              'set CISPR bandwidth to 120 kHz
0<cr>                      'responds parameter ok
```

Sweep Settings

Command	Parameters	Unit	Comment
AUTOSWPTIME	0, 1		
SWPTIME	<numeric value>	s	Value 0: Auto
SWPCONT	0, 1		
TRIGSRC	0...3		
TRIGLVL	<numeric value>	%	
TRIGDEL	<numeric value>	s	

AUTOSWPTIME (Auto Sweep Time)

This command switches the auto coupling of the sweep time on/off. If AUTOSWPTIME is active the current setting of the sweep time can be queried with the GET SWPTIME command.

Value	Auto Sweep Time
0	OFF
1	ON

Example:

```
set<cr>
0<cr>
autoswptime,1<cr>        'turns the sweep time auto on
0<cr>                    'responds parameter ok
```

SWPTIME (Sweep Time)

This command sets the sweep time. The value 0 sets the sweep time to Auto.

Example:

```
set<cr>
0<cr>
swptime,0.2<cr>          'set resolution bandwidth to 200 ms
0<cr>                    'responds parameter ok
```

SWPCONT (Sweep Continuous)

This command sets the instrument to single sweep or continuous sweep.

Value	Sweep
0	Single
1	Continuous

Example:

```
set<cr>
0<cr>
swpcont,0<cr>            'set to single sweep
0<cr>                    'responds parameter ok
```

TRIGSRC (Trigger Source)

This command selects the trigger source.

Value	Trigger Source
0	Free run
1	Video
2	External - Rise
3	External - Fall

Example:

```
set<cr>
0<cr>
trigsrc,1<cr>          'set to video trigger
0<cr>                  'responds parameter ok
```

TRIGLVL (Trigger Level)

This command defines the video trigger level (0…100%).

Example:

```
set<cr>
0<cr>
trigLVL,50<cr>         'set video trigger level to 50%
0<cr>                  'responds parameter ok
```

TRIGDEL (Trigger Delay)

This command defines the trigger delay.

Example:

```
set<cr>
0<cr>
trigdel,100E-6<cr>     'set trigger delay to 100 µs
0<cr>                  'responds parameter ok
```

Trace Settings

Command	Parameters	Unit	Comment
TRACEMODE	0..4		
WRAPPHASE	0,1		
TRACEDET	0...6		
TRACEAVG	2…999		
TRACE	<numeric value>,....		GET command only
TRACEBIN	<value>,...		GET command only
TRACETOMEM			CMD command only
CCORRTRACE	<numeric value>,....		GET command only
CCORRTRACEBIN	<value>,...		GET command only
CTRACE	<numeric value>,....		GET command only
CTRACEBIN	<value>,...		GET command only
MATHMODE	<numeric value>		
MTRACE	<string>		GET command only
MTRACEBIN	<string>		GET command only

TRACEMODE

This command defines the trace mode.

Value	Trace Mode
0	Clear Write
1	Average
2	Max Hold
3	Min Hold
4	View

Example:

```
set<cr>
0<cr>
tracemode,2<cr>          'set trace mode to "Max Hold"
0<cr>                    'responds parameter ok
```

WRAPPHASE (Phase Wrapping)

This command defines the phase wrapping.

Value	Phase Wrapping
0	Unwrap
1	Wrap

Example:

```
set<cr>
0<cr>
wrapphase,0<cr>          'set wrap phase to unwrap
0<cr>                    'responds parameter ok
```

Note: This command is available in Tracking Genarator only with measurement modes Smith Chart, Phase or Vector Magnitude active.

TRACEDET (Trace Detector)

This command defines the detector used. The Average and Quasi-Peak detector are available in Receiver Mode (R&S FSH-K3) only.

Value	Detector
0	Auto Peak
1	Min Peak
2	Max Peak / Peak
3	Sample
4	RMS
5	Average
6	Quasi-Peak

Example:

```
set<cr>
0<cr>                    'responds parameter ok
tracedet,3<cr>           'selects sample detector
0<cr>                    'responds parameter ok
```

TRACEAVG (Trace Average)

This command sets the number of traces used to calculate the trace average

Example:

```
set<cr>
0<cr>
traceavg,50<cr>          'calculate trace average over 50 traces
0<cr>                    'responds parameter ok
```

TRACE (Trace Data)

This command reads out the trace data in alphanumeric format.
The current unit is used for the values. A trace consists of 301 data values. If the Auto Peak detector is used, both max and min values are returned (602 values: 301 min values then 301 max values).

Example:

```
get<cr>
0<cr>
trace<cr>                'readout trace data
0<cr>                    'responds parameter ok
-103.22,-106.88,-96.27,.....
```

Note: In Tracking Generator with measurement modes Smith Chart, Phase or Vector Magnitude the trace will also be sent in unit degrees. First 301 magnitude values and 301 additional phase values. Phase values are wrapped or unwrapped depending on Wrapphase.

TRACEBIN (Trace Data Binary)

This command reads out the trace data in binary format.
Each sample consists of 4 bytes with the LSB send first. The 4 bytes represent the measured power in the current unit. The sample values are multiplied to provide the highest resolution possible.

Value	Binary values
0	dBm * 1000
1	dBmV * 1000
2	dBµV * 1000
3	dBµV/m * 1000
4	dBµA/m * 1000
5	dB * 1000
6	Volt * 1000000
7	Watt * 1000000000
8	Degrees * 1000
9	Seconds * 1000000

A trace consists of 301 samples. If the Auto Peak detector is used, both Max and Min values are returned (602 samples: 301 min values then 301 max values).

Example:

```
get<cr>
0<cr>
tracebin<cr>          'readout binary trace data
0<cr>                 'responds parameter ok
<sample><sample>....
```

Note: In Tracking Generator with measurement modes Smith Chart, Phase or Vector Magnitude the trace will also be sent in unit degrees. First 301 magnitude values and 301 additional phase values. Phase values are wrapped or unwrapped depending on Wrapphase.

TRACETOMEM (Copy current trace to memory)

This command stores the current trace to memory.

Example:

```
cmd<cr>
0<cr>                 'responds parameter ok
tracetomem<cr>        'store the current trace to memory
0<cr>                 'responds parameter ok
```

CCORRTRACE (Complex Corrected Trace Data)

This command reads out the corrected magnitude and phase values (if applicable) in alphanumeric format. The magnitude unit is dB, the phase unit is radiants. Dependent on the wrap mode the wrapped or unwrapped phase values are provided. Phase information is only applicable when vector calibrated but not in group delay measurement mode.

A complex trace consists of 301 magnitude and 301 phase values.

Example:

```
get<cr>
0<cr>
ccorrtrace<cr>          'readout corrected trace data
0<cr>                   'responds parameter ok
-103.22,-106.88,-96.27,.....
```

Note: This command is only supported in Tracking Generator Measurement.
In Tracking Generator with measurement modes Smith Chart, Phase or Vector Magnitude the trace will also be sent in unit degrees. First 301 magnitude values and 301 additional phase values. Phase values are wrapped or unwrapped depending on Wrapphase.

CCORRTRACEBIN (Complex Corrected Trace Data Binary)

This command reads out the corrected magnitude and phase values (if applicable) in binary format. Dependent on the wrap mode the wrapped or unwrapped phase values are provided. Phase information is only applicable when vector calibrated but not in group delay measurement mode.

A complex trace consists of 301 magnitude and 301 phase values.

Example:

```
get<cr>
0<cr>
ccorrtracebin<cr>       'readout corrected binary trace data
0<cr>                   'responds parameter ok
<sample><sample>....
```

Note: This command is only supported in Tracking Generator Measurement.
In Tracking Generator with measurement modes Smith Chart, Phase or Vector Magnitude the trace will also be sent in unit degrees. First 301 magnitude values and 301 additional phase values. Phase values are wrapped or unwrapped depending on Wrapphase.

CTRACE (Complex Trace Data)

This command reads out the raw (= uncorrected) magnitude and phase values in alphanumeric format. The magnitude unit is dBm, the phase unit is radiants. A complex trace consists of 301 magnitude and 301 phase values. If In DTF mode CTRACE will return 1024 magnitude and 1024 phase values.

Example:

```
get<cr>
0<cr>
ctrace<cr>              'readout magnitude and phase values
0<cr>                   'responds parameter ok
-103.22,-106.88,-96.27,.....
```

Note: In Tracking Generator with measurement modes Smith Chart, Phase or Vector Magnitude the trace will also be sent in unit degrees. First 301 magnitude values and 301 additional phase values. Phase values are wrapped or unwrapped depending on Wrapphase.

CTRACEBIN (Complex Trace Data Binary)

This command reads out the raw (= uncorrected) magnitude and phase values in binary format.
A complex trace consists of 301 magnitude and 301 phase sample values . If In DTF mode CTRACE will return 1024 magnitude and 1024 phase sample values.
Each sample consists of 4 bytes with the LSB send first.

Example:

```
get<cr>
0<cr>
ctracebin<cr>           'readout binary complex trace data
0<cr>                   'responds parameter ok
<sample><sample>....
```

Note: In Tracking Generator with measurement modes Smith Chart, Phase or Vector Magnitude the trace will also be sent in unit degrees. First 301 magnitude values and 301 additional phase values. Phase values are wrapped or unwrapped depending on Wrapphase.

MATHMODE (Math Mode)

This command defines the math mode used for analyzer measurements.

Value	Math Mode
0	Math mode OFF
1	Memory trace – Trace
2	Trace – Memory trace

Example:

```
set<cr>
0<cr>
mathmode,1<cr>          'set math mode to "mem. trace – trace"
0<cr>                   'responds parameter ok
```

MTRACE (Trace Data from saved Data Set)

This command reads out the trace data in alphanumeric format from a previously saved data set.
The current unit is used for the values. A trace consists of 301 data values. If the Auto Peak detector is used, both max and min values are returned (602 values: 301 min values then 301 max values).

Example:

```
get<cr>
0<cr>
mtrace,mydata.001<cr>   'readout trace data from data set "mydata.001"
0<cr>                   'responds parameter ok
-103.22,-106.88,-96.27,.....
```

Note: In Tracking Generator with measurement modes Smith Chart, Phase or Vector Magnitude the trace will also be sent in unit degrees. First 301 magnitude values and 301 additional phase values. Phase values are wrapped or unwrapped depending on Wrapphase.

MTRACEBIN (Trace Data Binary from saved Data Set)

This command reads out the trace data in binary format from a previously saved data set..
Each sample consists of 4 bytes with the LSB send first. The 4 bytes represent the measured power in the current unit. The sample values are multiplied to provide the highest resolution possible.

Value	Binary values
0	dBm * 1000
1	dBmV * 1000
2	dBµV * 1000
3	dBµV/m * 1000
4	dBµA/m * 1000
5	dB * 1000
6	Volt * 1000000
7	Watt * 1000000000
8	Degrees * 1000
9	Seconds * 1000000

A trace consists of 301 samples. If the Auto Peak detector is used, both Max and Min values are returned (602 samples: 301 min values then 301 max values).

Example:

```
get<cr>
0<cr>
mtracebin,mydata.001<cr>    'readout binary trace data from data set
0<cr>                       'responds parameter ok
<sample><sample>....
```

Note: In Tracking Generator with measurement modes Smith Chart, Phase or Vector Magnitude the trace will also be sent in unit degrees. First 301 magnitude values and 301 additional phase values. Phase values are wrapped or unwrapped depending on Wrapphase.

Marker

Command	Parameters	Unit	Comment
MARK1ON	0, 1		
MARK1	<numeric value>		
MARKON	<1…6>, 0, 1		
MARK	<1…6>, <numeric value>		
DELTA1ON	0, 1		
DELTA1	<numeric value>		
DELTAON	<1…6>, 0, 1		
DELTA	<2…6>, <numeric value>		
MARKALLON	0, 1		SET command only
DELTAALLON	0, 1		SET command only
MARKALL?			GET command only
DELTAALL?			GET command only
MARKPK	[1…6]		CMD command only
MARKNXTPK	[1…6]		CMD command only
MARKMIN	[1…6]		CMD command only
MARKTOCENT	[1…6]		CMD command only
MARKTOLVL	[1…6]		CMD command only
MARKMODE	0...3		
MARKDEMOD	0…2		
MARKTIME	< numeric value>	s	
MARKVOL	0…100	%	
MARKIMPREF	< numeric value>	Ω	
MARKMEASY	[0…6]		

MARK1ON (Marker On)

This command turns the marker on / off.

Value	Marker
0	OFF
1	ON

Example:

```
set<cr>
0<cr>
mark1on,1<cr>          'turns marker on
0<cr>                  'responds parameter ok
```

MARK1 (Marker)

This command sets the marker to the specified position or queries the current marker value.
The marker unit depends on the unit of the x-axis which can be Hz, seconds or meter/feet depending of the measurement mode. The unit of the second value in the GET command response depends on the current unit of the y-axis.
If Smith Chart is active, the second and third values are the complex impedance.

Example:

```
set<cr>
0<cr>
mark1,100E6<cr>          'set marker to 100 MHz
0<cr>                    'responds parameter ok
```

Example 2:

```
get<cr>
0<cr>
mark1<cr>                'query current marker value
0<cr>                    'responds parameter ok
947.25e6,-79.28<cr>      'returns Marker frequency and level
```

MARKON (Multimarker On)

This command turns the corresponding (multi) marker on / off. MARKON,1 is used for the marker in normal and in multi marker mode. MARKON,2 to MARKON,6 are available in multi marker mode only.

Param 1		Param 2	
Value	Marker No	Value	Marker Mode
1…6	Marker 1 … 6	0	OFF
		1	ON

Example:

```
set<cr>
0<cr>
markon,3,1<cr>           'turns multi marker 3 on
0<cr>                    'responds parameter ok
```

MARK (Multimarker)

This command sets the corresponding (multi) marker to the specified position or queries the current marker value.
The marker unit depends on the unit of the x-axis which can be Hz, seconds or meter/feet depending of the measurement mode. The unit of the second value in the GET command response depends on the current unit of the y-axis.
If Smith Chart is active, the second and third values are the complex impedance.

Value	Multimarker
1…6	Marker 1…6

MARK,1 is used for the marker in normal and multi marker mode, MARK,2 to MARK,6 are available in multi marker mode only.

Example:

```
set<cr>
0<cr>
mark,2,100E6<cr>        'set multi marker 2 to 100 MHz
0<cr>                   'responds parameter ok
```

Example 2:

```
get<cr>
0<cr>
mark,2<cr>              'query multi marker 2 value
0<cr>                   'responds parameter ok
947.25e6,-79.28<cr>     'returns Marker frequency and level
```

DELTA1ON (Deltamarker On)

This command turns the marker on / off.

Value	Deltamarker
0	OFF
1	ON

Example:

```
set<cr>
0<cr>
delta1on,1<cr>          'turns deltamarker on
0<cr>                   'responds parameter ok
```

DELTA1 (Deltamarker)

This command sets the deltamarker to the specified position in relation to the marker or queries the current deltamarker value.
The deltamarker unit depends on the unit of the x-axis which can be Hz, seconds or meter/feet depending of the measurement mode. The unit of the second value in the GET command response depends on the current unit of the y-axis.
If Smith Chart is active, the second and third values are the complex impedance.

Example:

```
set<cr>
0<cr>
delta1,-100E3<cr>       'set deltamarker to 100 kHz below the marker
0<cr>                   'responds parameter ok
```

Example 2:

```
get<cr>
0<cr>
delta1<cr>              'query current marker value
0<cr>                   'responds parameter ok
-100e3,-8.23<cr>        'returns deltamarker frequency and relative level
```

DELTAON (Delta Multimarker On)

This command turns the corresponding deltamarker on / off. DELTAON,1 is used for the deltamarker in normal and in multi marker mode. DELTAON,2 to DELTAON,6 are available in multi marker mode only

Param 1		Param 2	
Value	Deltamarker No	Value	Deltamarker
1…6	Deltamarker 1…6	0	OFF
		1	ON

Example:

```
set<cr>
0<cr>
deltaon,2,1<cr>        'turns deltamarker 2 on
0<cr>                  'responds parameter ok
```

DELTA (Delta Multimarker)

This command sets the corresponding deltamarker to the specified position in relation to the marker or queries the current deltamarker value.
The deltamarker unit depends on the unit of the x-axis which can be Hz, seconds or meter/feet depending of the measurement mode. The unit of the second value in the GET command response depends on the current unit of the y-axis.
If Smith Chart is active, the second and third values are the complex impedance.

Value	Deltamarker
2…6	Deltamarker 2…6

DELTA,2 is used for the deltamarker in normal and multi marker mode, DELTA,3 to DELTA,6 are available in multi marker mode only.

Example:

```
set<cr>
0<cr>
delta,2,-100E3<cr>     'set deltamarker 2 to 100 kHz below the marker
0<cr>                  'responds parameter ok
```

Example 2:

```
get<cr>
0<cr>
delta,2<cr>            'query delta marker 2 value
0<cr>                  'responds parameter ok
-100e3,-8.23<cr>       'returns deltamarker frequency and relative level
```

MARKALLON (All Multimarker On)

This command turns all multimarker on / off. This command is available in multi marker mode only.

Value	All Marker
0	OFF
1	ON

Example:

```
set<cr>
0<cr>
markallon,1<cr>        'turns all multi marker on
0<cr>                  'responds parameter ok
```

DELTAALLON (All Deltamarker On)

This command turns all deltamarker on / off. This command is available in multi marker mode only.

Value	All Deltamarker
0	OFF
1	ON

Example:

```
set<cr>
0<cr>
deltaallon,1<cr>        'turns all deltamarker on
0<cr>                   'responds parameter ok
```

MARKALL? (Multimarker)

This command queries the current list of multimarkers. Each multimarker returns three numbers: multimarker number, x-axis value, y-axis value. This GET command is available in multi marker mode only.
The unit of the second number in the GET command response depends on the unit of the x-axis which can be Hz, seconds or meter/feet depending of the measurement mode. The unit of the third value in the GET command response depends on the current unit of the y-axis.

Example:

```
get<cr>
0<cr>
markall?<cr>            'query multi marker list (e.g. 2 multimarkers)
0<cr>                   'responds parameter ok
1,103.4e6,-45.66,2,110.8e6,-23.67<cr>
```

DELTAALL? (Multi Deltamarker)

This command queries the current list of multi deltamarker values. Each delta multimarker returns three numbers: delta multimarker number, x-axis value, y-axis value. This GET command is available in multi marker mode only.
The unit of the second number in the GET command response depends on the unit of the x-axis which can be Hz, seconds or meter/feet depending of the measurement mode. The unit of the third value in the GET command response depends on the current unit of the y-axis.

Example:

```
get<cr>
0<cr>
deltaall?<cr>           'query delta marker list (e.g. 3 delta multimarker)
0<cr>                   'responds parameter ok
1,-100.0e3,-6.02,2,100.5e3,-3.67,3,300.4e6,-12.5<cr>
```

MARKPK (Marker Peak)

This command sets the current or corresponding marker to the peak (highest signal).

Optional Value	Marker
1…6	Marker 1…6

Example:

```
cmd<cr>
0<cr>
markpk<cr>          'set marker to peak
0<cr>               'responds parameter ok
```

Example 2:

```
cmd<cr>
0<cr>
markpk,4<cr>        'set multi marker 4 to peak
0<cr>               'responds parameter ok
```

MARKNXTPK (Marker Next Peak)

This command sets the current or corresponding marker to the next peak.

Optional Value	Marker
1…6	Marker 1…6

Example:

```
cmd<cr>
0<cr>
marknxtpk<cr>       'set marker to next peak
0<cr>               'responds parameter ok
```

MARKMIN (Marker Minimum)

This command sets the current or corresponding marker to the minimum (lowest signal).

Optional Value	Marker
1…6	Marker 1…6

Example:

```
cmd<cr>
0<cr>
markmin<cr>         'set marker to minimum
0<cr>               'responds parameter ok
```

MARKTOCENT (Marker Frequency To Center Frequency)

This command sets the current or corresponding marker as center frequency.

Optional Value	Marker
1…6	Marker 1…6

Example:

```
cmd<cr>
0<cr>
marktocent<cr>      'set marker frequency to center frequency
0<cr>               'responds parameter ok
```

MARKTOLVL (Marker Level To Reference Level)

This command sets the current or corresponding marker level as reference level.

Optional Value	Marker
1…6	Marker 1…6

Example:
```
cmd<cr>
0<cr>
marktolvl<cr>          'set marker level to reference level
0<cr>                  'responds parameter ok
```

Example 2:
```
cmd<cr>
0<cr>
marktolvl,4<cr>        'set multi marker 4 level to reference level
0<cr>                  'responds parameter ok
```

MARKMODE (Marker Mode)

This command defines the marker mode.

Value	Marker Mode
0	Normal
1	Noise
2	Frequency Count
3	Multimarker

Example:
```
set<cr>
0<cr>
markmode,2<cr>         'turns on frequency count
0<cr>                  'responds parameter ok
```

MARKDEMOD (Marker Demodulation)

This command defines the marker demodulation mode.

Value	Demodulation
0	OFF
1	AM
2	FM

Example:
```
set<cr>
0<cr>
markdemod,2<cr>        'turns on FM demodulation
0<cr>                  'responds parameter ok
```

MARKTIME (Marker Demodulation Time)

This command defines the demodulation time at the current marker position. The demodulation time range is 0.1 sec to 500 sec.

Example:
```
set<cr>
0<cr>
marktime,2.5<cr>       'set demod time at marker position to 2.5 sec
0<cr>                  'responds parameter ok
```

MARKVOL (Marker Demodulation Volume)

This command sets the volume of the demodulation AF output.The range is 1 to 100% in 1% steps.

Example:

```
set<cr>
0<cr>
markvol,50<cr>          'set volume of AF output to 50%
0<cr>                   'responds parameter ok
```

MARKIMPREF (Marker Impedance Reference)

This command sets or gets the impedance reference in Ohm.

Example:

```
set<cr>
0<cr>
markimpref,50000<cr>    'set impedance reference to 50 kΩ
0<cr>                   'responds parameter ok
```

MARKMEASY (Marker Measurement Mode)

This command sets or gets the Marker Format.

Value	Marker Meas Mode
0	dB MAG AND PHASE
1	LIN MAG AND PHASE
2	REAL AND IMG
3	R+jX
4	G+jB
5	(R+jX)/Z0
6	(G+jB)/Y0

Example:

```
set<cr>
0<cr>
markmeasy,4<cr>         'set impedance G+jB.
0<cr>                   'responds parameter ok
```

Measurement

Command	Parameters	Unit	Comment
MEAS	0…11		
TRD1	<string>		Not in Isotropic Antenna mode
TRD1X	<string>		Isotropic Antenna mode only
TRD1Y	<string>		Isotropic Antenna mode only
TRD1Z	<string>		Isotropic Antenna mode only
TRD2	<string>		
ACCESSORY	<numeric value>		
LIMDEF	<name>,<description>,<x-unit>,<x-scale>,<y-unit>,<x0>,<y0>[,<xn>,<yn>]		
LIMDEL	<name>		CMD command only
LIMLIST			GET command only
LIMLOW	<string>		
LIMUPP	<string>		
LIMPASS			GET command only
LIMCHKREMOTE	0, 1		Receiver Mode only (R&S FSH-K3)
THRLOW	<numeric value>		Receiver Mode only (R&S FSH-K3)
THRUPP	<numeric value>		Receiver Mode only (R&S FSH-K3)
THRPASS			Receiver Mode only (R&S FSH-K3) GET command only
THROFF			Receiver Mode only (R&S FSH-K3) CMD command only

MEAS (Measurement Mode)

This command defines the measurement mode.

Value	Measurement
0	Off
1	Analyzer
2	Tracking Generator (Model 13, 23 and 26)
3	Power Sensor
4	Channel Power
5	Occupied Bandwidth
6	TDMA Power
7	Distance to Fault (R&S FSH-B1)
8	Receiver Mode (R&S FSH-K3)
9	Carrier / Noise
10	Isotropic Antenna
11	WCDMA BTS CDP

Using the value 0 the instrument can turned off if the power adapter is connected. If the instrument is OFF it can be turned on programmatically by selecting one of the measurement modes.

Example:

```
set<cr>
0<cr>
meas,4<cr>          'selects channel power measurement
0<cr>               'responds parameter ok
```

TRD1 (Transducer)

This command selects a transducer. To turn a transducer off, use the string 'NONE':

Example:

```
set<cr>
0<cr>
trd1,hl223<cr>      'selects transducer table "HL223"
0<cr>               'responds parameter ok
```

Example 2:

```
set<cr>
0<cr>
trd1,none<cr>       'de-activates any transducer
0<cr>               'responds parameter ok
```

TRD1X (Transducer X – dBµV/m)

This command selects an X-direction transducer (dBµV/m only) for the Isotropic Antenna measurement. To turn a transducer off, use the string 'NONE':

Example:

```
set<cr>
0<cr>
trd1x,ts-emf-x<cr>  'selects transducer table "TS-EMF-X"
0<cr>               'responds parameter ok
```

Example 2:

```
set<cr>
0<cr>
trd1x,none<cr>      'de-activates any transducer
0<cr>               'responds parameter ok
```

TRD1Y (Transducer Y – dBµV/m)

This command selects a Y-direction transducer (dBµV/m only) for the Isotropic Antenna measurement. To turn a transducer off, use the string 'NONE':

Example:

```
set<cr>
0<cr>
trd1y,ts-emf-y<cr>      'selects transducer table "TS-EMF-Y"
0<cr>                   'responds parameter ok
```

Example 2:

```
set<cr>
0<cr>
trd1y,none<cr>          'de-activates any transducer
0<cr>                   'responds parameter ok
```

TRD1Z (Transducer Z – dBµV/m)

This command selects a Z-direction transducer (dBµV/m only) for the Isotropic Antenna measurement. To turn a transducer off, use the string 'NONE':

Example:

```
set<cr>
0<cr>
trd1z,ts-emf-z<cr>      'selects transducer table "TS-EMF-Z"
0<cr>                   'responds parameter ok
```

Example 2:

```
set<cr>
0<cr>
trd1z,none<cr>          'de-activates any transducer
0<cr>                   'responds parameter ok
```

TRD2 (Transducer – dB)

This command selects a transducer (dB only). To turn a transducer off, use the string 'NONE'.

Example:

```
set<cr>
0<cr>
trd1,preamp<cr>         'selects transducer table "preamp"
0<cr>                   'responds parameter ok
```

ACCESSORY (Connected Accessory)

This command gets or sets the connected accessory.

Value	Accessory
0	Auto Detect
1	None
2	Bridge FSH-Z2
3	Bridge FSH-Z3
4	Power sensor
5	Isotropic Antenna

Example:

```
set<cr>
0<cr>
accessory,0<cr>         'Sets auto detection of accessory"
0<cr>                   'responds parameter ok
```

LIMDEF (Define Limit Line)

This command defines a limit line.The list of parameters are the following:

<name>,<description>,<x-unit>,<x-scale>,<y-unit>,<x0>,<y0>[,...<xn>,<yn>]

The parameter <name> and <description> are strings. The parameters x-unit and y-unit are listed in the tables below:

Parameter x-unit:

Value	Unit
0	Hz
1	Seconds
2	Meter

The parameter x-scale defines whether the x values are absolute values or relative values according to the center x value:

Value	x-scale
0	Absolute
1	Relative

Parameter y-unit:

Value	Unit
0	dB
1	dBm
2	dBµV
3	dBmV
4	dBµV/m
5	dBµA/m
6	VSWR
7	Rho
8	Volt
9	Watt
10	Volt/m
11	Watt/m^2
12	Seconds
13	Degrees

The following example defines the limit line “LIMIT”, with description “Max” in dBm on the frequency axis (Hz) as an absolute limit line with 4 values (100MHz -30dBm, 200MHz -10dBm, 300MHz -10dBm, 400MHz -30dBm):

Example:

```
set<cr>
0<cr>
limdef,LIMIT,Max,0,0,1,100e6,-30,200e6,-10,300e6,
    -10,400e6,-30<cr>
                                ‘defines limit line “LIMIT”
0<cr>                           ‘responds parameter ok
```

Note: To replace an existing limit line in the instrument it has to be deleted first by using the LIMDEL command described below.

LIMDEL (Delete Limit Line)

This command deletes a limit line.

Example:

```
cmd<cr>
0<cr>
limdel,LIMIT<cr>        'deletes limit line "LIMIT"
0<cr>                   'responds parameter ok
```

LIMLIST (Available Limit Line List)

This command returns the list with available limit lines

Example:

```
get<cr>
0<cr>
limlist<cr>             'gets the limit line list
0<cr>                   'responds parameter ok
upper limit, lower limit, absolute limit<cr>
```

LIMLOW (Lower Limit Line)

This command selects the lower limit line. To turn a limit line off, use the string 'NONE'.

Example:

```
set<cr>
0<cr>
limlow,lowtest<cr>      'selects lower limit line "LOWTEST"
0<cr>                   'responds parameter ok
```

LIMUPP (Upper Limit Line)

This command selects the upper limit line. To turn a limit line off, use the string 'NONE'.

Example:

```
set<cr>
0<cr>
limupp,hightest<cr>     'selects upper limit line "HIGHTEST"
0<cr>                   'responds parameter ok
```

LIMPASS (Limits Passed Query)

This command returns the limit check status.

Value	Limit Check
0	Unkown
1	Failed
2	Passed

Example:

```
get<cr>
0<cr>
limpass<cr>             'query limit check
0<cr>                   'responds parameter ok
2                       'limit check passed
```

LIMCHKREMOTE (Limit Check Remote Message)

This command enables the remote message (frequency/channel + level) on limit check and/or on threshold limit fail. The instrument will send a message (frequency/channel and level) every time the limit is exceeded.

Value	Limit Check Remote
0	OFF
1	Limit Check – Remote message on fail

Example:

```
get<cr>
0<cr>
limchkremote,1<cr>      'enable remote massage on limit fail
0<cr>                   'responds parameter ok
123.456E6,23.5<cr>      'limit exceeded
130.567E6,22.0<cr>      'limit exceeded…..
…
0<cr>                   'remote message on limit fail OFF
```

THRLOW (Lower Threshold Line)

This command defines the lower threshold line (value). The unit of the threshold value is specified with the Unit parameter. This command is available in Receiver / Scan Mode only.

Example:

```
set<cr>
0<cr>
thrlow,30<cr>           'specifies lower threshold line to -30 dBuV
0<cr>                   'responds parameter ok
```

THRUPP (Upper Threshold Line)

This command defines the upper threshold line (value). The unit of the threshold value is specified with the Unit parameter. Available in Receiver / Scan Mode only.

Example:

```
set<cr>
0<cr>
thrupp,70<cr>           'specifies upper threshold line to 70 dBuV
0<cr>                   'responds parameter ok
```

THRPASS (Threshold Line Passed Query)

This command returns the threshold line check status. Available in Receiver / Scan Mode only.

Value	Threshold Line Check
0	Unkown
1	Failed
2	Passed

Example:

```
get<cr>
0<cr>
thrpass<cr>             'query threshold line check
0<cr>                   'responds parameter ok
2                       'threshold check passed
```

Tracking Generator

This command set applies to model 13, model 23 and model 26 only.

Command	Parameters	Unit	Comment
CAL_TGSCLRFL			CMD command only
CAL_TGSCLTRN			CMD command only
CAL_TGVECRFL			CMD command only
CAL_TGVECTRN			CMD command only
TRANSCAL			GET command only
REFLCAL			GET command only
TRANSVECTCAL			GET command only Option R&S FSH-K2
REFLVECTCAL			GET command only Option R&S FSH-K2
TGATT	<numeric value>		Model 23 & Model 26 (Serial No 100500 or higher)
TGLVL	<numeric value>		Model 23 only
TGMODE	[0…4]		Option R&S FSH-K2
CABLELOSS			GET command only Option R&S FSH-K2
ELCABLENVAL	<numeric value>	m / feet	GET command only Option R&S FSH-K2

CAL_TGSCLRFL (Calibrate Tracking Generator Scalar Reflection)

This command initiates a scalar reflection calibration. This calibration contains two phases; OPEN phase and SHORT phase. Connect OPEN before initiating calibration command, after first phase reports ready connect SHORT and continue by issuing the command again.

Example:

```
cmd<cr>
0<cr>
cal_tgsclrfl<cr>      'initiate scalar reflection calibration (OPEN)
0<cr>                 'responds parameter ok
0<cr>                 'first phase ready
cal_tgsclrfl<cr>      'continue scalar reflection calibration (SHORT)
0<cr>                 'responds parameter ok
0<cr>                 'scalar reflection calibration ready
```

CAL_TGSCLTRN (Calibrate Tracking Generator Scalar Transmission)

This command initiates a scalar transmission calibration. This calibration contains one phase; calibrating THROUGH. Connect THROUGH before initiating calibration command.

Example:

```
cmd<cr>
0<cr>
cal_tgscltrn<cr>      'initiate scalar transmission calibration
0<cr>                 'responds parameter ok
0<cr>                 'scalar transmission calibration ready
```

CAL_TGVECRFL (Calibrate Tracking Generator Vector Reflection)

This command initiates a vector reflection calibration. This calibration contains three phases; OPEN phase, SHORT phase and a LOAD phase. Connect OPEN before initiating calibration command, after first phase reports ready connect SHORT and continue by issuing the command again. When OPEN calibration reports ready connect LOAD and resume calibration by issuing the command again.

Example:

```
cmd<cr>
0<cr>
cal_tgvecrfl<cr>        'initiate vector reflection calibration (OPEN)
0<cr>                   'responds parameter ok
0<cr>                   'first phase ready
cal_tgsclrfl<cr>        'continue scalar reflection calibration (SHORT)
0<cr>                   'responds parameter ok
0<cr>                   'second phase ready
cal_tgsclrfl<cr>        'continue scalar reflection calibration (LOAD)
0<cr>                   'responds parameter ok
0<cr>                   'vector reflection calibration ready
```

CAL_TGVECTRN (Calibrate Tracking Generator Vector Transmission)

This command initiates a vector transmission calibration. This calibration contains two phases; THROUGH phase and LOAD phase. Connect THROUGH before initiating calibration command, after first phase reports ready connect LOAD and continue by issuing the command again.

Example:

```
cmd<cr>
0<cr>
cal_tgvectrn<cr>        'initiate vector transmission calibration (THROUGH)
0<cr>                   'responds parameter ok
0<cr>                   'first phase ready
cal_tgvectrn<cr>        'continue vector transmission calibration (LOAD)
0<cr>                   'responds parameter ok
0<cr>                   'vector transmission calibration ready
```

TRANSCAL (Transmission Calibrated)

This command queries the state of the transmission calibration.

Value	Transmission Cal
0	Not calibrated
1	Calibrated

Example:

```
get<cr>
0<cr>
transcal<cr>            'query state of transmission calibration
0<cr>                   'responds parameter ok
1<cr>                   'response: transmission calibrated
```

REFLCAL (Reflection Calibrated)

This command queries the state of the reflection calibration.

Value	Reflection Cal
0	Not calibrated
1	Calibrated

Example:

```
get<cr>
0<cr>
reflcal<cr>          ‘query state of reflection calibration
0<cr>                ‘responds parameter ok
1<cr>                ‘response: reflection calibrated
```

TRANSVECTCAL (Transmission Vector Calibrated)

This command queries the state of the transmission vector calibration. Applies to option R&S FSH-K2 only.

Value	Transmission Vector Cal
0	Not calibrated
1	Calibrated

Example:

```
get<cr>
0<cr>
transvectcal<cr>     ‘query state of transmission vector calibration
0<cr>                ‘responds parameter ok
1<cr>                ‘response: transmission vector calibrated
```

REFLVECTCAL (Reflection Vector Calibrated)

This command queries the state of the reflection vector calibration. Applies to option R&S FSH-K2 only

Value	Reflection Vector Cal
0	Not calibrated
1	Calibrated

Example:

```
get<cr>
0<cr>
reflvectcal<cr>      ‘query state of reflection vector calibration
0<cr>                ‘responds parameter ok
1<cr>                ‘response: reflection vector calibrated
```

TGATT (Tracking Generator Level Attenuation)

This command defines the tracking generator output level attenuation. Applies to model 23 & 26 only. The numeric values vary between 0 dB and 20 dB in 1 db steps.

Example:

```
set<cr>
0<cr>
tgatt,6<cr>          ‘sets tracking generator attenuation to 6dB
0<cr>                ‘responds parameter ok
```

TGLVL (Tracking Generator Level)

This command defines the tracking generator output level. Applies to model 23 only.
The only two numeric values which are valid are 0 and –20.

Example:

```
set<cr>
0<cr>
tglvl,-20<cr>          'sets tracking generator output level to –20 dBm
0<cr>                  'responds parameter ok
```

Example 2:

```
set<cr>
0<cr>
tglvl,0<cr>            'sets tracking generator output level to 0 dBm
0<cr>                  'responds parameter ok
```

TGMODE (Tracking Generator Mode)

This command defines the tracking generator mode. Applies to option R&S FSH-K2 only. This command is only available when Vector calibrated.

Value	Tracking Generator Mode
0	Magnitude
1	Cable loss meas
2	Phase
3	Smith Chart
4	Group Delay

Example:

```
set<cr>
0<cr>
tgmode, 1<cr>          'set tracking generator mode to cable loss meas
0<cr>                  'responds parameter ok
```

CABLELOSS (Cable Loss)

This command queries the measured cable loss

Example:

```
get<cr>
0<cr>
cableloss<cr>          'query cable loss measurement result
0<cr>                  'responds parameter ok
0.7<cr>                'response: cable loss
```

ELCABLENVAL (Electrical Cable Length)

This command queries the electrical cable length

Example:

```
get<cr>
0<cr>
elcablenval<cr>        'query electrical cable length measurement result
0<cr>                  'responds parameter ok
5.12<cr>               'response: electrical cable length
```

Note: This command is only available when measurement mode is Phase and zero span is not active.

Power Sensor

Command	Parameters	Unit	Comment
PWR	<numeric value>		GET command only
REFL	<numeric value>		GET command only
ZERO			CMD command only
PWRTOREF			CMD command only
MEASTIME	0...2		
REFLUNIT	0, 1		R&S FSH-Z44 only
PWRSSTD	0…7		R&S FSH-Z44 only

PWR (Power Level)

This command queries the power level measured by the sensor.

Example:

```
get<cr>
0<cr>
pwr<cr>          'query power level from sensor
0<cr>            'responds parameter ok
-33.45<cr>       'response: power
```

REFL (Reflection)

This command queries the reflection measured by the power sensor R&S FSH-Z44. The unit (dB or VSWR) depends on the setting of reflection unit (SET REFLUNIT command).

Example:

```
get<cr>
0<cr>
refl<cr>         'query reflection from sensor
0<cr>            'responds parameter ok
2.54<cr>         'response: reflection value
```

ZERO (Power Sensor Zeroing)

This command initiates the power sensor zeroing.

Example:

```
cmd<cr>
0<cr>
zero<cr>         'query power level from sensor
0<cr>            'responds parameter ok
```

PWRTOREF (Power to Reference)

This command defines the current power level as the reference value.

Example:

```
cmd<cr>
0<cr>
pwrtoref<cr>     'defines power level as reference value
0<cr>            'responds parameter ok
```

MEASTIME (Measurement Time)

This command defines the measurement time for the power sensor (R&S FSH-Z1 and R&S FSH-Z18).

Value	Measurement Time
0	Short
1	Normal
2	Long

Example:

```
set<cr>
0<cr>
measTime,2<cr>          'sets measurement time to "long"
0<cr>                   'responds parameter ok
```

REFLUNIT (Reflection Unit)

This command defines the reflection unit for the power sensor R&S FSH-Z44.

Value	Reflection Unit
0	dB
1	VSWR

Example:

```
set<cr>
0<cr>
reflunit,1<cr>          'sets reflection unit to VSWR
0<cr>                   'responds parameter ok
```

PWRSSTD (Power Sensor Standard)

This command defines the standard used for the power sensor R&S FSH-Z44 measurements.

Value	Channel Power Standard
0	User
1	GSM
2	EDGE
3	3GPP WCDMA
4	cdmaOne
5	cdma2000 1x
6	DVB-T
7	DAB

Example:

```
set<cr>
0<cr>
pwrsstd,2<cr>           'select EDGE as standard
0<cr>                   'responds parameter ok
```

Channel Power

Command	Parameters	Unit	Comment
CHPWR	<numeric value>		GET command only
CHPWRSTD	0…3		
CHPWRCSTD	<string>		
CHPWRUNIT	0…2		
CHPWRBW	<numeric value>	Hz	
LVLADJUST			CMD command only

CHPWR (Channel Power)

This command queries the measured channel power.

Example:

```
get<cr>
0<cr>
chpwr<cr>          'query power level from sensor
0<cr>              'responds parameter ok
-47.45<cr>         'response: channel power
```

CHPWRSTD (Channel Power Standard)

This command defines the standard used for the channel power measurement.

Value	Channel Power Standard
0	User
1	3GPP WCDMA
2	cdmaOne
3	cdma2000 1x

Example:

```
set<cr>
0<cr>
chpwrstd,2<cr>     'select cdmaOne as standard
0<cr>              'responds parameter ok
```

Note: If any customized standard was previously selected a value of '4' will be returned as a response to a GET CHPWRSTD query.

CHPWRCSTD (Channel Power Customized Standard)

This command selects the customized standard for the channel power measurement previously loaded with R&S FSHView software.

Example:

```
set<cr>
0<cr>
chpwrcstd,MyStd<cr>   'select MyStd as standard
0<cr>                 'responds parameter ok
```

CHPWRUNIT (Channel Power Unit)

This command defines the unit used for the channel power measurement.

Value	Channel Power Unit
0	dBm
1	dBmV
2	dBµV

Example:

```
set<cr>
0<cr>
chpwrunit,1<cr>          'set unit to dBmV
0<cr>                    'responds parameter ok
```

CHPWRBW (Channel Power Bandwidth)

This command defines the bandwidth used for channel power measurements.

Example:

```
set<cr>
0<cr>
chpwrbw,3.5E6<cr>        'set channel power bandwidth to 3.5 MHz
0<cr>                    'responds parameter ok
```

LVLADJUST (Level Adjust)

This command initiates a level adjustment for the channel power measurement.

Example:

```
cmd<cr>
0<cr>
lvladjust<cr>            'initiates level adjustment
0<cr>                    'responds parameter ok
```

Note: To check if the level adjustment is ready, the WAIT command can be used

Occupied Bandwidth

Command	Parameters	Unit	Comment
OBW	<numeric value>		GET command only
OBWSTD	0…3		
OBWCSTD	<string>		
OBWCHBW	<numeric value>	Hz	
LVLADJUST			CMD command only

OBW (Occupied Bandwidth)

This command queries the measured occupied bandwidth.

Example:

```
get<cr>
0<cr>
obw<cr>          'query power level from sensor
0<cr>            'responds parameter ok
-22E6<cr>        'response: occupied bandwidth
```

OBWSTD (Occupied Bandwidth Standard)

This command defines the standard used for the occupied bandwidth measurement.

Value	Occupied Bandwidth Standard
0	User
1	3GPP WCDMA
2	cdmaOne
3	cdma2000 1x

Example:

```
set<cr>
0<cr>
obwstd,1<cr>     'select 3GPP WCDMA as standard
0<cr>            'responds parameter ok
```

Note: If any customized standard was previously selected a value of '4' will be returned as a response to a GET OBWSTD query.

OBWCSTD (Occupied Bandwidth Customized Standard)

This command selects the customized standard for the occupied bandwidth measurement previously loaded with R&S FSHView software.

Example:

```
set<cr>
0<cr>
obwcstd,MyStd<cr>    'select MyStd as standard
0<cr>                'responds parameter ok
```

OBWCHBW (Occupied Bandwidth Channel Bandwidth)

This command defines the bandwidth used for occupied bandwidth measurements.

Example:

```
set<cr>
0<cr>
obwchbw,5E6<cr>          'set channel bandwidth to 5 MHz
0<cr>                    'responds parameter ok
```

LVLADJUST (Level Adjust)

This command initiates a level adjustment for the occupied bandwidth measurement.

Example:

```
cmd<cr>
0<cr>
lvladjust<cr>            'initiates level adjustment
0<cr>                    'responds parameter ok
```

Note: To check if the level adjustment is ready, the WAIT command can be used

TDMA Power

Command	Parameters	Unit	Comment
TDMAPWR	<numeric value>		GET command only
TDMASTD	0…1		
MEASTIME	<numeric value>	s	
LVLADJUST			CMD command only

TDMAPWR (TDMA Power)

This command queries the measured TDMA power.

Example:

```
get<cr>
0<cr>
tdmapwr<cr>          'query power level from sensor
0<cr>                'responds parameter ok
-32.45<cr>           'response: TDMA power
```

TDMASTD (TDMA Power Standard)

This command defines the standard used for the TDMA power measurement.

Value	TDMA Power Standard
0	User
1	GSM / EDGE

Example:

```
set<cr>
0<cr>
tdmastd,1<cr>        'select GSM/EDGE as standard
0<cr>                'responds parameter ok
```

Note: If any customized standard was previously selected a value of '2' will be returned as a response to a GET TDMASTD query.

TDMACSTD (TDMA Customized Standard)

This command selects the customized standard for the TDMA power measurement previously loaded with R&S FSHView software.

Example:

```
set<cr>
0<cr>
tdmacstd,MyStd<cr>   'select MyStd as standard
0<cr>                'responds parameter ok
```

MEASTIME (Measurement Time)

This command defines the measurement time for the TDMA power measurement.

Example:

```
set<cr>
0<cr>
measTime,500E-6<cr>     'sets measurement time to 500 µs
0<cr>                   'responds parameter ok
```

LVLADJUST (Level Adjust)

This command initiates a level adjustment for the TDMA power measurement.

Example:

```
cmd<cr>
0<cr>
lvladjust<cr>           'initiates level adjustment
0<cr>                   'responds parameter ok
```

Note: To check if the level adjustment is ready, the WAIT command can be used

Distance To Fault Measurement

The DTF Measurement requires the option R&S FSH-B1.

Command	Parameters	Unit	Comment
CABLEMOD	<string>		
CABLELEN	<numeric value>	m / feet	
CAL_DTF			
DTFMODE	0...2		
LENUNIT	<meter> | <feet>		

CABLEMOD (Cable Model)

This command selects the cable model.
To turn cable model selection off, use the string 'NONE'.

Example:

```
set<cr>
0<cr>
cablemod,rg58c<cr>      'selects cable model "RG58C"
0<cr>                   'responds parameter ok
```

CABLELEN (Cable Length)

This command defines the cable length.
The unit of the length can either be Meter or Feet depending on the Length Unit setting. The cable length is converted and rounded to meters internally.

Example:

```
set<cr>
0<cr>
cablelen,12<cr>         'sets cable length to 12 meter
0<cr>                   'responds parameter ok
```

CAL_DTF (Calibrate Distance To Fault)

This command calibrates the distance to fault measurement.

Example:

```
cmd<cr>
0<cr>
cal_dtf<cr>             'Initiates the actual calibration
0<cr>                   'responds parameter ok
0<cr>                   'calibration ready
```

DTFMODE (DTF Measurement Mode) Power)

This command defines the measurement mode in DTF.

Value	Channel Power Standard
0	DTF
1	Reflection
2	Spectrum

Example:

```
set<cr>
0<cr>
dtfmode,2<cr>          'set DTF mode to "Spectrum"
0<cr>                  'responds parameter ok
```

LENUNIT (Cable Length Unit)

This command sets the cable length unit to meters or feet.

Example:

```
set<cr>
0<cr>
lenunit,feet<cr>       'sets cable length unit to Feet
0<cr>                  'responds parameter ok
```

Receiver Mode

The Receiver Mode requires the option R&S FSH-K3.

Command	Parameters	Unit	Comment
CHANNEL	<numeric value>		
CHMODE	0, 1		Fixed Channel Mode
CHTABLE	<string>		
LEVEL			GET command only
MEASTIME	<numeric value>	s	
SCANMODE	0, 1		
SCANSTART	<numeric value>		Freq Scan Mode
SCANSTOP	<numeric value>		Freq Scan Mode
SCANSTEP	<numeric value>		Freq Scan Mode
FREQSTART	<numeric value>		Channel Scan Mode
FREQSTOP	<numeric value>		Channel Scan Mode

CHMODE (Channel Mode)

This command switches between the channel mode and frequency mode. Use the command CHTABLE to define a channel table for the channel mode.

Value	Channel Mode
0	Frequency Mode
1	Channel Mode

Example:

```
set<cr>
0<cr>
chmode,1<cr>          ‘selects channel mode
0<cr>                 ‘responds parameter ok
```

CHANNEL (Channel Number)

This command defines the channel number. Use CHTABLE command to select a channel table first.

Example:

```
set<cr>
0<cr>
channel,55<cr>        ‘selects channel no. 55
```

CHTABLE (Channel Table)

This command selects a channel table for the channel mode.

Example:

```
set<cr>
0<cr>
chtable,FMBand<cr>    ‘selects channel table “FMBand”
0<cr>                 ‘responds parameter ok
```

LEVEL (Signal Level)

This command queries the signal level measured (fixed frequency/channel mode only).

Example:

```
get<cr>
0<cr>
level<cr>              ‘query signal level
0<cr>                  ‘responds parameter ok
45.6<cr>               ‘response: signal level
```

MEASTIME (Measurement Time)

This command defines the measurement time for the receiver mode.

Example:

```
set<cr>
0<cr>
measTime,5E-3<cr>      ‘sets measurement time to 5 ms
0<cr>                  ‘responds parameter ok
```

SCANMODE (Scan Mode)

This command switches between frequency/channel scan mode and fixed frequency/channel mode. Use the command CHMODE to toggle between frequency and channel mode.

Value	Scan Mode
0	Fixed Freq/Channel Mode
1	Feq/Channel Scan Mode

Example:

```
set<cr>
0<cr>
scanmode,1<cr>         ‘selects scan mode
0<cr>                  ‘responds parameter ok
```

SCANSTART (Frequency Scan Start)

This command defines the scan start frequency for the frequency scan mode.

Example:

```
set<cr>
0<cr>
scanstart,88E6<cr>     ‘sets scan start frequency to 88 MHz
0<cr>                  ‘responds parameter ok
```

SCANSTOP (Frequency Scan Stop)

This command defines the scan stop frequency for the frequency scan mode.

Example:

```
set<cr>
0<cr>
scanstop,108E6<cr>     ‘sets scan stop frequency to 108 MHz
0<cr>                  ‘responds parameter ok
```

SCANSTEP (Frequency Scan Step)

This command defines the scan step frequency for the frequency scan mode.

Example:

```
set<cr>
0<cr>
scanstep,200E3<cr>      'sets scan step frequency to 200 kHz
0<cr>                   'responds parameter ok
```

FREQSTART (Channel Scan Start Frequency)

This command defines the start frequency for the channel scan mode.

Example:

```
set<cr>
0<cr>
freqstart,100E6<cr>     'sets scan start frequency to 100 MHz
0<cr>                   'responds parameter ok
```

FREQSTOP (Channel Scan Stop Frequency)

This command defines the stop frequency for the channel scan mode.

Example:

```
set<cr>
0<cr>
freqstop,1E9<cr>        'sets scan stop frequency to 1 GHz
0<cr>                   'responds parameter ok
```

Carrier / Noise Measurement

Command	Parameters	Unit	Comment
CNCHBW	<numeric value>	Hz	
CNMANREFPWR	0, 1		
CNMEASMODE	0...2		
CNMODE	0, 1		
CNNORM	0, 1		
CNPILOTFRQ	<numeric value>	Hz	
CNPWRDISP	0, 1		
CNREFPWR	<numeric value>		
CNUNIT	0...2		
CNVALUE			GET command only
CNVISIONFREQ	<numeric value>	Hz	
LVLADJUST			CMD command only

CNCHBW (Carrier Noise Channel Bandwidth)

This command defines the bandwidth used for carrier noise measurements. It defines the channel bandwidth of the reference measurement if the C/N reference measurement is selected and it defines the channel bandwidth of the noise measurement if the C/N noise measurement is selected. The measurement mode is selected by the command CNMODE.

Example:

```
set<cr>
0<cr>
cnchbw,5E6<cr>          'set channel bandwidth to 5 MHz
0<cr>                   'responds parameter ok
```

CNMANREFPWR (Carrier Noise Manual Ref Power Active)

This command defines if the manual ref power is active. If the manual reference power is selected a reference power must be set (CNREFPWR). Otherwise the reference power of the reference power measurement is applied.

Value	Manual Ref Power Active
0	OFF
1	ON

Example:

```
set<cr>
0<cr>
cnmanrefpwr,1<cr>       'select manual reference power
0<cr>                   'responds parameter ok
```

CNMEASMODE (Carrier Noise Measurement Mode)

This command defines the kind of reference measurement mode if the reference measurement mode is selected. It is used for the carrier noise measurement.

Value	Measurement Mode
0	Digital Tx
1	Analog TV
2	CW Tx

Example:

```
set<cr>
0<cr>
cnmeasmode,1<cr>        'select Analog TV as measurement mode
0<cr>                   'responds parameter ok
```

CNMODE (Carrier Noise Mode)

This command defines if the C/N reference measurement or the C/N noise measurement is active.

Value	C/N Noise Measurement Active
0	OFF
1	ON

Example:

```
set<cr>
0<cr>
cnmode,0<cr>            'select C/N reference measurement
0<cr>                   'responds parameter ok
```

CNNORM (Carrier Noise Norm)

This command defines the norm used for the noise measurement.

Value	Norm
0	C/N
1	C/No

Example:

```
set<cr>
0<cr>
cnnorm,1<cr>            'select C/No as norm
0<cr>                   'responds parameter ok
```

CNPILOTFRQ (Carrier Noise Pilot Frequency)

This command defines the pilot frequency used for digital TV carrier noise measurements. It is only available if the Digital TV standard 8-VSB/ATSC is selected. It defines the pilot frequency of the reference measurement if the C/N reference measurement is selected and it defines the pilot frequency of the noise measurement if the C/N noise measurement is selected. The measurement mode is selected by the command CNMODE.

Example:

```
set<cr>
0<cr>
cnpilotfrq,450E6<cr>    'set pilot frequency to 450 MHz
0<cr>                   'responds parameter ok
```

CNPWRDISP (Carrier Noise Power Display)

This command turns the C/N power display on or off.

Value	Power Display
0	OFF
1	ON

Example:

```
set<cr>
0<cr>
cnpwrdisp,1<cr>
0<cr>                    ‘responds parameter ok
```

CNREFPWR (Carrier Noise Ref Power)

This command defines the reference power used for carrier noise measurements.

Example:

```
set<cr>
0<cr>
cnrefpwr,400E-3<cr>      ‘set ref power to 0.4
0<cr>                    ‘responds parameter ok
```

CNUNIT (Carrier Noise Unit)

This command defines the unit used for the reference.

Value	Unit
0	dBm
1	dBmV
2	dBuV

Example:

```
set<cr>
0<cr>
cnunit,1<cr>             ‘select dBmV as unit
0<cr>                    ‘responds parameter ok
```

CNVALUE (Carrier Noise Measurement Value)

This command queries the measured C/N value. The value depends on the CNMODE selected (either C/N reference measurement or C/N Noise measurement).

Example:

```
get<cr>
0<cr>
cnvalue<cr>              ‘query C/N measurement
0<cr>                    ‘responds parameter ok
-20.3<cr>                ‘response: C/N result
```

CNVISIONFRQ (Carrier Noise Vision Frequency)

This command defines the vision carrier frequency used for analog TV carrier noise measurements.

Example:

```
set<cr>
0<cr>
cnpilotfrq,450E6<cr>     ‘set pilot frequency to 450 MHz
0<cr>                    ‘responds parameter ok
```

LVLADJUST (Level Adjust)

This command initiates a level adjustment for carrier noise measurement. It is applied to the reference channel if the reference measurement is selected and it is applied to the noise channel if the noise measurement is selected.

Example:

```
cmd<cr>
0<cr>
lvladjust<cr>          'initiates level adjustment
0<cr>                  'responds parameter ok
```

Note: To check if the level adjustment is ready, the WAIT command can be used

WCDMA BTS CDP Measurement

The WCDMA Measurement requires the option R&S FSH-K4.

Command	Parameters	Unit	Comment
ANTDIV	<numeric value>		
CARRFREQERR		Hz	GET command only
CPICHPWR	<1…6>	dBm	
CPICHSLOTNR			GET command only
CPICHSYMEVM		% rms	GET command only
PCCPCHPWR		dBm	GET command only
PCCPCHSYMEVM		% rms	GET command only
PSCHPWR		dBm	GET command only
PSCRCD	<1…6>,<numeric value>		
SSCHPWR		dBm	GET command only
SSCRCD	<1…6>,<numeric value>		
SYNCRESULT			GET command only
TOTPWR		dBm	GET command only
AUTOSDSNGL			CMD command only
AUTOSDMUL			CMD command only
CPICHEIRAT		dB	GET command only
PCCPCHEIRAT		dB	GET command only

ANTDIV (Antenna diversity)

This command defines the antenna diversity mode used for WCDMA measurements.

Value	Antenna Diversity Mode
0	Antenna Div. mode OFF
1	Antenna Div. mode no. 1
2	Antenna Div. mode no. 2

Example:

```
set<cr>
0<cr>
antdiv,1<cr>          'set antenna diversity to type No. 1
0<cr>                 'responds parameter ok
```

CARRFREQERR (Carrier Frequency Error)

This command retrieves the carrier frequency error for WCDMA measurements. Unit is Hz.

Example:

```
get<cr>
0<cr>
carrfreqerr<cr>       'get carrier frequency error
0<cr>                 'responds parameter ok
0<cr>                 'Carrier frequency error is zero Hz
```

CPICHPWR (CPICH Power)

This command retrieves the P-CPICH Power measurement result for WCDMA measurements. Unit is dBm.

Optional Value	Scrambling Code id
1…6	id 1…6

Example:

```
get<cr>
0<cr>
cpichpwr<cr>      'get CPICH power of scrambling code nr id 1
0<cr>             'responds parameter ok
-9.5<cr>          'CPICH power is -9.5 dBm
```

If an auto scrambling detection multiple has been performed successfully the command allows an option parameter.

Example:

```
get<cr>
0<cr>
cpichpwr,4<cr>    'get CPICH Power of scrambling code id 4
0<cr>             'responds parameter ok
13<cr>            'CPICH Power is 13 dBm
```

CPICHSLOTNR (CPICH Slot Number)

This command retrieves the CPI slot number for WCDMA measurements.

Example:

```
get<cr>
0<cr>
cpichslotnr<cr>   'get CPICH Slot Number
0<cr>             'responds parameter ok
0<cr>             'CPICH slot number is '0'
```

CPICHSYMEVM (CPICH Symbol EVM)

This command retrieves the P-CPICH Symbol EVM measurement result for WCDMA measurements. Unit is % rms.

Example:

```
get<cr>
0<cr>
cpichsymevm<cr>   'get CPICH Symbol EVM
0<cr>             'responds parameter ok
23<cr>            'CPICH Symbol EVM is 23 % rms
```

PCCPCHPWR (P-CCPCH Power)

This command retrieves the P-CCPCH Power measurement result for WCDMA measurements. Unit is dBm.

Example:

```
get<cr>
0<cr>
pccpchpwr<cr>     'get P-CCPCH Power
0<cr>             'responds parameter ok
-26.8<cr>         'P-CCPCH Power is -26.8 dBm
```

PCCPCHSYMEVM (P-CCPCH Symbol EVM)

This command retrieves the P-CCPCH Symbol EVM measurement result for WCDMA measurements. Unit is % rms.

Example:

```
get<cr>
0<cr>
pccpchsymevm<cr>   'get P-CCPCH Symbol EVM
0<cr>              'responds parameter ok
63.9<cr>           'P-CCPCH Symbol EVM is 63.9 % rms
```

PSCHPWR (P-SCH Power)

This command retrieves the P-SCH Power measurement result for WCDMA measurements. Unit is dBm.

Example:

```
get<cr>
0<cr>
pschpwr<cr>        'get P-SCH Power
0<cr>              'responds parameter ok
13<cr>             'P-SCH Power is 13 dBm
```

PSCRCD (Primary Scramble Code)

This command defines the primary part of the scrambling code. The scrambling code is divided into 2 parts, a primary and a secondary part.
Valid input for primary scrambling code varies from 0 to 1535 (0x00 – 0x600-1). From the primary and secondary scrambling codes the common scrambling code can be calculated as follows.

$$Scr_{BS} = Scr_{primary} \cdot 16 + Scr_{\text{sec}\,ondary}$$

Example:

```
set<cr>
0<cr>
pscrcd,123<cr>     'set prim. scramb. code to 123
0<cr>              'responds parameter ok
```

If an auto scrambling detection multiple has been performed successfully the get command allows an option parameter.

Optional Value	Scrambling Code id
1…6	id 1…6

Example:

```
get<cr>
0<cr>
pscrcd,4<cr>       'get prim scrambling code of id 4
0<cr>              'responds parameter ok
1<cr>              'prim scambling code number is 1
```

SSCHPWR (S-SCH Power)

This command retrieves the S-SCH Power measurement result for WCDMA measurements. Unit is dBm.

Example:

```
get<cr>
0<cr>
sschpwr<cr>      'get S-SCH Power
0<cr>            'responds parameter ok
-87.1<cr>        'S-SCH Power is -87.1 dBm
```

SSCRCD (Secondary Scramble Code)

This command defines the secondary part of the scrambling code. The scrambling code is divided into 2 parts, a primary and a secondary part.
Valid input for secondary code varies from 0 to 15 (0x0 – 0x10-1). From the primary and secondary scrambling codes the common scrambling code can be calculated as follows:

$$Scr_{BS} = Scr_{primary} \cdot 16 + Scr_{\sec ondary}$$

Example:

```
set<cr>
0<cr>
sscrcd,8<cr>          'set sec. scrambling code nr to 8
0<cr>                 'responds parameter ok
```

If an auto scrambling detection multiple has been performed successfully the get command allows an option parameter.

Optional Value	Scrambling Code id
1…6	id 1…6

Example:

```
get<cr>
0<cr>
sscrcd,4<cr>      'get sec scrambling code nr of id 4
0<cr>             'responds parameter ok
0<cr>             'sec scambling code number is 0
```

SYNCRESULT (Synchronization result)

This command retrieves the synchronization result for the WDMA measurement.

Value	Synchronization result
0	Synchronization OK
1	Invalid synchronization
2	Incorrect antenna diversity setting
3	Incorrect sent CPICH symbols
4	Incorrect center frequency
5	Incorrect primary or secondary scrambling code

Example:

```
get<cr>
0<cr>
syncresult<cr>    'get synchronization result
0<cr>             'responds parameter ok
2<cr>             'sync. result: SYNC_RESULT_INCORR_ANTENNA_DIV
```

TOTPWR (Total Power)

This command retrieves the total power measurement result for WCDMA measurements. Unit is dBm.

Example:

```
get<cr>
0<cr>
totpwr<cr>      'get total power
0<cr>           'responds parameter ok
-87<cr>         'Total power is -87 dBm
```

AUTOSDSNGL (Auto Scrambling Detection Single)

This command starts the auto scrambling detection single.

Example:

```
cmd<cr>
0<cr>
autosdsngl<cr>  'start auto scrambling detection single
0<cr>           'responds parameter ok
```

AUTOSDMUL (Auto Scrambling Detection Multiple)

This command starts the auto scrambling detection multiple.

Example:

```
cmd<cr>
0<cr>
autosdsngl<cr>  'start auto scrambling detection multiple
0<cr>           'responds parameter ok
```

CPICHEIRAT (P-CPICH Ec/Io)

This command retrieves the CPICH Ec/Io measurement result for WCDMA measurements. Unit is dB.

Example:

```
get<cr>
0<cr>
cpicheirat<cr>  'get CPICH Ec/Io
0<cr>           'responds parameter ok
-26.8<cr>       'CPICH Ec/Io is -26.8 dB
```

PCCPCHEIRAT (P-CCPCH Ec/Io)

This command retrieves the P-CCPCH Ec/Io measurement result for WCDMA measurements. Unit is dB.

Example:

```
get<cr>
0<cr>
pccpcheirat<cr> 'get P-CCPCH Ec/Io
0<cr>           'responds parameter ok
-26.8<cr>       'P-CCPCH Ec/Io is -26.8 dB
```

Programming Examples

The following examples are code snippets in Visual Basic (VB6).

Initialize Communication with R&S FSH

```
Public Function FSHInit(ByVal Port As Integer, ByVal Speed As Long,
                                            Optional ByVal ErrorCode As String) As Boolean

Rem Initialize communication with FSH
Rem Return TRUE if device initialization was successful
Rem Return FALSE otherwise e.g. the device was not found

With MainForm.FSHCommC
    .CommPort = Port
    .Settings = Trim$(Str$(Speed)) + ",N,8,1"
    .InBufferSize = 1000
    .PortOpen = True
    .InBufferCount = 0
End With
InBuffer = vbNullString

End Function
'-----------------------------------------
```

Poll R&S FSH until <cr> received

```
Public Function PollFSH() As String

Dim CrPos As Long

With MainForm.FSHCommC
    Do
        InBuffer = InBuffer + .Input
        DoEvents
        CrPos = InStr(1, InBuffer, vbCr)
    Loop Until CrPos > 0
    PollFSH = Left$(InBuffer, CrPos - 1)
    InBuffer = Mid$(InBuffer, CrPos + 1)
End With

End Function
'-----------------------------------------
```

Send CMD Command to R&S FSH

```
Public Function FSHCmd(ByVal Command As String) As Boolean

Dim TempError As Integer

InBuffer = vbNullString
FSHCmd = False
With MainForm.FSHCommC
    .Output = "cmd" + vbCr
    TempError = Val(PollFSH)
    If TempError = 0 Then
        .Output = Command + vbCr
        TempError = Val(PollFSH)
        If TempError = 0 Then
            FSHCmd = True
        Else
            DebugMsg "CMD error" + Str(TempError) + " for command <" + Command + ">"
        End If
    Else
        DebugMsg "CMD error" + Str(TempError) + " for command <" + Command + ">"
    End If
End With

End Function
'-----------------------------------------
```

Send SET Command to R&S FSH

```
Public Function FSHSet(ByVal Command As String) As Boolean

Dim TempError As Integer

InBuffer = vbNullString
FSHSet = False
With MainForm.FSHCommC
    .Output = "set" + vbCr
    TempError = Val(PollFSH)
    If TempError = 0 Then
        .Output = Command + vbCr
        TempError = Val(PollFSH)
        If TempError = 0 Then
            FSHSet = True
        Else
            ErrorMsg "SET error" + Str(TempError) + " for command <" + Command + ">"
        End If
    Else
        ErrorMsg "SET error" + Str(TempError) + " for command <" + Command + ">"
    End If
End With

End Function
'-----------------------------------------
```

Send GET Command to R&S FSH and Read Response

```
Public Function FSHGet(ByVal Command As String, ByRef Buffer As String) As Boolean

Dim TempError As Integer

InBuffer = vbNullString
FSHGet = False
With MainForm.FSHCommC
    .Output = "get" + vbCr
    TempError = Val(PollFSH)
    If TempError = 0 Then
        .Output = Command + vbCr
        TempError = Val(PollFSH)
        If TempError = 0 Then
            Sleep 50
            Buffer = PollFSH
            FSHGet = True
        Else
            ErrorMsg "GET error" + Str(TempError) + " for command <" + Command + ">"
        End If
    Else
        ErrorMsg "GET error" + Str(TempError) + " for command <" + Command + ">"
    End If
End With

End Function
'-----------------------------------------
```

Example: Program Instrument Setup

```
Private Sub FSHSetup ()

Dim Buffer As String

FSHCmd "REMOTE"              ' Set FSH to Remote State
FSHGet "IDN?", Buffer        ' Query instrument ID
FSHCmd "PRESET"              ' Preset FSH settings
FSHSet "FREQ,950E6"          ' Set Center Frequency to 950 MHz
FSHSet "SPAN,5E6"            ' Set Span to 5 MHz
FSHCmd "LOCAL"               ' Return to Local Mode

End Sub
'-----------------------------------------
```

Read Binary Trace Data from R&S FSH

```
Public Function FSHGetTraceBin(ByRef Values() As Long) As Boolean

Dim InBuffer As String
Dim TempError As Integer

InBuffer = vbNullString
FSHGetTraceBin = False
With MainForm.FSHCommC
    .Output = "GET" + vbCr
    TempError = Val(PollFSH)
    If TempError = 0 Then
        .Output = "TRACEBIN" + vbCr
        TempError = Val(PollFSH)
        If TempError = 0 Then
            InBuffer = PollFSHBin(1205)                          ' 4 x 301 bins with 4 bytes
            AsString.Buffer = StrConv(InBuffer, vbFromUnicode)
            LSet AsValues = AsString
            Values = AsValues.SValues
            ReDim Preserve Values(0 To 300)
            FSHGetTraceBin = True
        Else
            ErrorMsg "GET error" + Str(TempError) + " for command <TRACEBIN>"
        End If
    Else
        ErrorMsg "GET error" + Str(TempError) + " for command <TRACEBIN>"
    End If
End With

End Function
'-----------------------------------------
```

Poll Input Buffer until Number of Bytes are Received

```
Public Function PollFSHBin(ByVal BufferLen As Long) As String

Dim CrPos As Long

With MainForm.FSHCommC
    Do
        InBuffer = InBuffer + .Input
        DoEvents
        DebugMsg "BIN-BUFFER-LEN: " + Str(Len(InBuffer))
    Loop Until Len(InBuffer) >= BufferLen
    PollFSHBin = Left$(InBuffer, BufferLen)
    InBuffer = Mid$(InBuffer, BufferLen + 1)
End With

End Function
```