<Position> New vertical or horizontal position of the splitter as a fraction of the screen area (without channel and status bar and softkey menu). The point of origin (x = 0, y = 0) is in the lower left corner of the screen. The end point (x = 100, y = 100) is in the upper right corner of the screen. (See figure 10-1.)
The direction in which the splitter is moved depends on the screen layout. If the windows are positioned horizontally, the splitter also moves horizontally. If the windows are positioned vertically, the splitter also moves vertically.

Range: 0 to 100

Example: `LAY:SPL 1,3,50`
Moves the splitter between window 1 ('Frequency Sweep') and 3 ('Marker Table') to the center (50%) of the screen, i.e. in the figure above, to the left.

Example: `LAY:SPL 1,4,70`
Moves the splitter between window 1 ('Frequency Sweep') and 3 ('Marker Peak List') towards the top (70%) of the screen.
The following commands have the exact same effect, as any combination of windows above and below the splitter moves the splitter vertically.

```
LAY:SPL 3,2,70
LAY:SPL 4,1,70
LAY:SPL 2,1,70
```

LAYout:WINDow<n>:ADD? <Direction>,<WindowType>

This command adds a measurement window to the display. Note that with this command, as opposed to `LAYout:ADD[:WINDow]?`, the suffix <n> determines the existing window next to which the new window is added.

To replace an existing window, use the `LAYout:WINDow<n>:REPLace` command.

This command is always used as a query so that you immediately obtain the name of the new window as a result.

Parameters:

<Direction> LEFT | RIGHt | ABOVe | BELow

<WindowType> Type of measurement window you want to add.
See `LAYout:ADD[:WINDow]?` on page 557 for a list of available window types.

Return values:

<NewWindowName> When adding a new window, the command returns its name (by default the same as its number) as a result.

Example: `LAY:WIND1:ADD? LEFT,MTAB`
Result:
`'2'`
Adds a new window named '2' with a marker table to the left of window 1.

Usage: Query only

LAYout:WINDow<n>:IDENtify?

This command queries the **name** of a particular display window (indicated by the <n> suffix).

Note: to query the **index** of a particular window, use the `LAYout:IDENtify[:WINDow]?` command.

Return values:

<WindowName> String containing the name of a window.
In the default state, the name of the window is its index.

Usage: Query only

LAYout:WINDow<n>:REMove

This command removes the window specified by the suffix <n> from the display.

The result of this command is identical to the `LAYout:REMove[:WINDow]` command.

Usage: Event

LAYout:WINDow<n>:REPLace <WindowType>

This command changes the window type of an existing window (specified by the suffix <n>).

The result of this command is identical to the `LAYout:REPLace[:WINDow]` command.

To add a new window, use the `LAYout:WINDow<n>:ADD?` command.

Parameters:

<WindowType> Type of measurement window you want to replace another one with.
See `LAYout:ADD[:WINDow]?` on page 557 for a list of available window types.

10.5 Setting Basic Measurement Parameters

All commands that set measurement-independant parameters are described here.

10.5.1 Defining the Frequency and Span

The commands required to configure the frequency and span settings in a remote environment are described here. The tasks for manual operation are described in chapter 5.3, "Frequency and Span Configuration", on page 177.

10.5.1.1 Defining the Frequency Range

CALCulate<n>:MARKer<m>:FUNCtion:CENTer

This command matches the center frequency to the frequency of a marker.

If you use the command in combination with a delta marker, that delta marker is turned into a normal marker.

Example: `CALC:MARK2:FUNC:CENT`
Sets the center frequency to the frequency of marker 2.

Usage: Event

Manual control: See "Center Frequency = Marker Frequency" on page 287

CALCulate<n>:MARKer<m>:FUNCtion:CSTep

This command matches the center frequency step size to the current marker frequency.

The command turns delta markers into normal markers.

Usage: Event

[SENSe:]FREQuency:CENTer <Frequency>

This command defines the center frequency.

Parameters:

<Frequency> The allowed range and f_{max} is specified in the data sheet.

UP
Increases the center frequency by the step defined using the `[SENSe:]FREQuency:CENTer:STEP` command.

DOWN
Decreases the center frequency by the step defined using the `[SENSe:]FREQuency:CENTer:STEP` command.

*RST: fmax/2
Default unit: Hz

Example:
```
FREQ:CENT 100 MHz
FREQ:CENT:STEP 10 MHz
FREQ:CENT UP
```
Sets the center frequency to 110 MHz.

Usage: SCPI confirmed

Manual control: See "Center" on page 180
See "Preview" on page 216
See "Frequency" on page 216

[SENSe:]FREQuency:CENTer:STEP <StepSize>

This command defines the center frequency step size.

You can increase or decrease the center frequency quickly in fixed steps using the `SENS:FREQ UP` AND `SENS:FREQ DOWN` commands, see `[SENSe:]FREQuency:CENTer` on page 563.

Parameters:

<StepSize> f_{max} is specified in the data sheet.

Range: 1 to fMAX
*RST: 0.1 x span
Default unit: Hz

Example:
```
FREQ:CENT 100 MHz
FREQ:CENT:STEP 10 MHz
FREQ:CENT UP
```
Sets the center frequency to 110 MHz.

Manual control: See "Center Frequency Stepsize" on page 181

[SENSe:]FREQuency:CENTer:STEP:AUTO <State>

This command couples or decouples the center frequency step size to the span.

Parameters:

<State> ON | OFF

*RST: ON

Example: `FREQ:CENT:STEP:AUTO ON`
Activates the coupling of the step size to the span.

[SENSe:]FREQuency:CENTer:STEP:LINK <CouplingType>

This command couples and decouples the center frequency step size to the span or the resolution bandwidth.

Parameters:
<CouplingType>

SPAN
Couples the step size to the span. Available for measurements in the frequency domain.

RBW
Couples the step size to the resolution bandwidth. Available for measurements in the time domain.

OFF
Decouples the step size.

*RST: SPAN

Example: `FREQ:CENT:STEP:LINK SPAN`

Manual control: See "Center Frequency Stepsize" on page 181

[SENSe:]FREQuency:CENTer:STEP:LINK:FACTor <Factor>

This command defines a step size factor if the center frequency step size is coupled to the span or the resolution bandwidth.

Parameters:
<Factor>
1 to 100 PCT
*RST: 10

Example: `FREQ:CENT:STEP:LINK:FACT 20PCT`

Manual control: See "Center Frequency Stepsize" on page 181

[SENSe:]FREQuency:OFFSet <Offset>

This command defines a frequency offset.

If this value is not 0 Hz, the application assumes that the input signal was frequency shifted outside the application. All results of type "frequency" will be corrected for this shift numerically by the application.

See also "Frequency Offset" on page 182.

Parameters:
<Offset>
Range: -100 GHz to 100 GHz
*RST: 0 Hz

Example: `FREQ:OFFS 1GHZ`

Usage: SCPI confirmed

Manual control: See "Frequency Offset" on page 182

[SENSe:]FREQuency:SPAN <Span>

This command defines the frequency span.

If you set a span of 0 Hz in the Spectrum application, the R&S FSW starts a measurement in the time domain.

Parameters:

<Span> The minimum span for measurements in the frequency domain is 10 Hz. For SEM and spurious emission measurements, the minimum span is 20 Hz.

Range: 0 Hz to fmax
*RST: Full span

Usage: SCPI confirmed

Manual control: See "Span" on page 180

[SENSe:]FREQuency:SPAN:FULL

This command restores the full span.

Usage: Event
SCPI confirmed

Manual control: See "Full Span" on page 181
See "Zero Span" on page 181

[SENSe:]FREQuency:STARt <Frequency>

This command defines a start frequency for measurements in the frequency domain.

Parameters:

<Frequency> 0 to (fmax - min span)

*RST: 0

Example: `FREQ:STAR 20MHz`

Usage: SCPI confirmed

Manual control: See "Start / Stop" on page 181

[SENSe:]FREQuency:STOP <Frequency>

This command defines a stop frequency for measurements in the frequency domain.

Parameters:

<Frequency> min span to fmax

*RST: fmax

Example: `FREQ:STOP 2000 MHz`

Usage: SCPI confirmed

Manual control: See "Start / Stop" on page 181

10.5.1.2 Configuring Signal Tracking

When signal tracking is 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.

For more details see chapter 5.3.1, "Impact of the Frequency and Span Settings", on page 178..

CALCulate:MARKer:FUNCtion:STRack[:STATe] <State>

This command turns signal tracking on and off.

Parameters:

<State> ON | OFF

*RST: OFF

Manual control: See "Signal Tracking" on page 182
See "Signal Tracking State" on page 182

CALCulate:MARKer:FUNCtion:STRack:BANDwidth <Bandwidth>

This command defines the bandwidth around the center frequency that is included in the signal tracking process.

Note that you have to turn on signal tracking before you can use the command.

Parameters:

<Bandwidth> Range: 10 Hz to Max span
*RST: (= span/10 on activating the function)
Default unit: Hz

Manual control: See "Signal Tracking" on page 182
See "Tracking Bandwidth" on page 183

CALCulate:MARKer:FUNCtion:STRack:THReshold <Level>

This command defines the threshold level for the signal tracking process.

Note that you have to turn on signal tracking before you can use the command.

Parameters:

<Level> The unit depends on CALCulate<n>:UNIT:POWer.

Range: -130 dBm to 30 dBm
*RST: -120 dBm

Manual control: See "Signal Tracking" on page 182
See "Tracking Threshold" on page 183

CALCulate:MARKer:FUNCtion:STRack:TRACe <TraceNumber>

This command selects the trace on which the largest signal is searched for.

Parameters:

<TraceNumber> 1 to 6

Range: 1 to 6
*RST: 1

Manual control: See "Signal Tracking" on page 182
See "Signal Track Trace" on page 183

10.5.2 Configuring Bandwidth and Sweep Settings

The commands required to configure the bandwidth, sweep and filter settings in a remote environment are described here. The tasks for manual operation are described in chapter 5.5, "Bandwidth, Filter and Sweep Configuration", on page 193.

10.5.2.1 Configuring the Bandwidth and Filter

[SENSe:]BANDwidth|BWIDth[:RESolution] <Bandwidth>

This command defines the resolution bandwidth.

The command also decouples the resolution bandwidth from the span.

For statistics measurements, this command defines the **demodulation** bandwidth.

Parameters:

<Bandwidth> refer to data sheet

*RST: RBW: AUTO is set to ON; DBW: 3MHz

Example: BAND 1 MHz
Sets the resolution bandwidth to 1 MHz

Usage: SCPI confirmed

Manual control: See "Analysis Bandwidth" on page 123
See "RBW" on page 200
See "Preview" on page 216
See "RBW" on page 216

[SENSe:]BANDwidth|BWIDth[:RESolution]:AUTO <State>

This command couples and decouples the resolution bandwidth to the span.

Parameters:
<State> ON | OFF
*RST: ON

Example: BAND:AUTO OFF
Switches off the coupling of the resolution bandwidth to the span.

Usage: SCPI confirmed

Manual control: See "RBW" on page 200
See "Default Coupling" on page 202

[SENSe:]BANDwidth|BWIDth[:RESolution]:RATio <Ratio>

This command defines the ratio between the resolution bandwidth (Hz) and the span (Hz).

Note that the ratio defined with the remote command (RBW/span) is reciprocal to that of the manual operation (span/RBW).

Parameters:
<Ratio> Range: 0.0001 to 1
*RST: 0.01

Example: BAND:RAT 0.1

Manual control: See "Span/RBW" on page 202

[SENSe:]BANDwidth|BWIDth[:RESolution]:TYPE <FilterType>

This command selects the resolution filter type.

When you change the filter type, the command selects the next larger filter bandwidth if the same bandwidth is unavailable for that filter.

Parameters:

<FilterType>

CFILter
channel filters

NORMal
Gaussian filters

P5
5-pole filters
The 5-pole filter is not available for FFT sweeps.

RRC
RRC filters

*RST: NORMal

Example: `BAND:TYPE NORM`

Manual control: See "Filter Type" on page 202

[SENSe:]BANDwidth|BWIDth:VIDeo <Bandwidth>

This command defines the video bandwidth.

The command decouples the video bandwidth from the resolution bandwidths.

Parameters:

<Bandwidth> refer to data sheet

*RST: AUTO is set to ON

Example: `BAND:VID 10 kHz`

Manual control: See "VBW" on page 201

[SENSe:]BANDwidth|BWIDth:VIDeo:AUTO <State>

This command couples and decouples the video bandwidth to the resolution bandwidth.

Parameters:

<State> ON | OFF

*RST: ON

Example: `BAND:VID:AUTO OFF`

Manual control: See "VBW" on page 201
See "RBW/VBW " on page 202
See "Default Coupling" on page 202

[SENSe:]BANDwidth|BWIDth:VIDeo:RATio <Ratio>

This command defines the coupling ratio of the video bandwidth to the resolution bandwidth (RBW/VBW).

Parameters:

<Ratio> Range: 0,001 to 1000

*RST: 1

Example: BAND:VID:RAT 3
Sets the coupling of video bandwidth to video bandwidth = 3*resolution bandwidth

Manual control: See "RBW/VBW " on page 202

[SENSe:]BANDwidth|BWIDth:VIDeo:TYPE <Mode>

This command selects the position of the video filter in the signal path.

Changing the video filter position is possible only if the resolution bandwidth is ≤ 100 kHz.

Parameters:

<Mode>

LINear
The video filter is applied in front of the logarithmic amplifier.
In linear mode, measurements with a logarithmic level scale result in flatter falling edges compared to logarithmic mode. The reason is the conversion of linear power values into logarithmic level values: if you halve the linear power, the logarithmic level decreases by 3 dB.

LOGarithmic
The video filter is applied after the logarithmic amplifier

*RST: LINear

Example: BAND:VID:TYPE LIN
Video filter ahead of the logarithmic amplifier

10.5.2.2 Configuring the Sweep

Useful commands for configuring sweeps described elsewhere:

- [SENSe:]AVERage<n>:COUNt on page 615
- [SENSe:]AVERage<n>[:STATe<t>] on page 616
- [SENSe:]AVERage<n>:TYPE on page 616

Remote commands exclusive to configuring sweeps:

[SENSe:]SWEep:COUNt <SweepCount>

This command defines the number of sweeps the R&S FSW uses to average traces.

In case of continuous sweeps, the R&S FSW calculates the moving average over the average count.

In case of single sweep measurements, the R&S FSW stops the measurement and calculates the average after the average count has been reached.

Parameters:

<SweepCount> If you set a sweep count of 0 or 1, the R&S FSW performs one single sweep in single sweep mode.
In continuous sweep mode, if the sweep count is set to 0, a moving average over 10 sweeps is performed.

Range: 0 to 200000
*RST: 0

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.

Usage: SCPI confirmed

Manual control: See "Sweep/Average Count" on page 203

[SENSe:]SWEep:OPTimize <Mode>

This command selects the sweep type optimization mode.

Parameters:

<Mode>

AUTO
Automatically applies the sweep optimization mode that is best for the current measurement.

DYNamic
Optimizes the sweep mode for a large dynamic range.

SPEed
Optimizes the sweep mode for high performance.

*RST: AUTO

Example:
```
SWE:OPT DYN
```
Select dynamic sweep mode.

Manual control: See "Optimization" on page 203

[SENSe:]SWEep:POINts <SweepPoints>

This command defines the number of measurement points analyzed during a sweep.

Note that the number of sweep points is limited to 10001 when measuring spurious emissions.

Parameters:
<SweepPoints> Range: 101 to 200 000
*RST: 1001

Example: `SWE:POIN 251`

Usage: SCPI confirmed

Manual control: See "Sweep Points" on page 203

[SENSe:]SWEep:TIME <Time>

This command defines the sweep (or: data capture) time.

In the Spectrum application, the command decouples the sweep time from the span and resolution and video bandwidths.

Parameters:
<Time> refer to data sheet
*RST: (AUTO is set to ON)

Example: `SWE:TIME 10s`

Usage: SCPI confirmed

Manual control: See "Sweep Time" on page 49
See "Sweep Time" on page 201
See "Preview" on page 216
See "Sweep Time" on page 216

[SENSe:]SWEep:TIME:AUTO <State>

This command couples and decouples the sweep time to the span and the resolution and video bandwidths.

Parameters:
<State> ON | OFF
*RST: ON

Example: `SWE:TIME:AUTO ON`
Activates automatic sweep time.

Usage: SCPI confirmed

Manual control: See "Harmonic Sweep Time" on page 141
See "Sweep Time" on page 201
See "Default Coupling" on page 202

[SENSe:]SWEep:TYPE <Type>

This command selects the sweep type.

Parameters:

<Type>

AUTO
Automatic selection of the sweep type between sweep mode and FFT.

FFT
FFT mode

*RST: AUTO

Example: `SWE:TYPE FFT`

Manual control: See "Sweep Type" on page 203

[SENSe:]SWEep:TYPE:USED

This command queries the sweep type if you have turned on automatic selection of the sweep type.

Return values:

<Type>

SWE
Normal sweep

FFT
FFT mode

[SENSe:]BANDwidth|BWIDth[:RESolution]:FFT <FilterMode>

Defines the filter mode to be used for FFT filters by defining the partial span size. The partial span is the span which is covered by one FFT analysis.

This command is only available when using the sweep type "FFT".

Note: this command is maintained for compatibility reasons only. For new remote control programs, use the `[SENSe:]SWEep:OPTimize` command.

Parameters:

<FilterMode> WIDE | AUTO | NARRow

AUTO
Automatically applies the sweep optimization mode that is best for the current measurement.

NARRow
Optimizes the sweep mode for a large dynamic range.

WIDE
Optimizes the sweep mode for high performance.

*RST: AUTO

Example: `BAND:TYPE FFT`
Select FFT filter.

Example: `BAND:FFT NARR`
Select narrow partial span for FFT filter.

10.5.3 Configuring the Vertical Axis (Amplitude, Scaling)

The following commands are required to configure the amplitude and vertical axis settings in a remote environment.

10.5.3.1 Amplitude Settings

The tasks for manual configuration are described in chapter 5.4.2, "Amplitude Settings", on page 187.

Useful commands for amplitude configuration described elsewhere:

- `[SENSe:]ADJust:LEVel` on page 595

Remote commands exclusive to amplitude configuration:

CALCulate<n>:MARKer<m>:FUNCtion:REFerence

This command matches the reference level to the power level of a marker.

If you use the command in combination with a delta marker, that delta marker is turned into a normal marker.

Example: `CALC:MARK2:FUNC:REF`
Sets the reference level to the level of marker 2.

Usage: Event

Manual control: See "Reference Level = Marker Level" on page 288

CALCulate<n>:UNIT:POWer <Unit>

This command selects the unit of the y-axis.

The unit applies to all measurement windows.

Parameters:

<Unit> DBM | V | A | W | DBPW | WATT | DBUV | DBMV | VOLT | DBUA | AMPere

*RST: dBm

Example: `CALC:UNIT:POW DBM`
Sets the power unit to dBm.

Manual control: See "Reference Level" on page 187
See "Unit" on page 188

DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:RLEVel <ReferenceLevel>

This command defines the reference level.

With a reference level offset ≠ 0, the value range of the reference level is modified by the offset.

Parameters:
<ReferenceLevel> The unit is variable.
Range: see datasheet
*RST: 0 dBm

Example: `DISP:TRAC:Y:RLEV -60dBm`

Usage: SCPI confirmed

Manual control: See "Reference Level" on page 187

DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:RLEVel:OFFSet <Offset>

This command defines a reference level offset.

Parameters:
<Offset> Range: -200 dB to 200 dB
*RST: 0dB

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

Manual control: See "X-Axis" on page 127
See "Shifting the Display (Offset)" on page 127
See "Reference Level" on page 187
See "Shifting the Display (Offset)" on page 188

[SENSe:]POWer:NCORrection <State>

This command turns noise cancellation on and off.

If noise cancellation is on, the R&S FSW performs a reference measurement to determine its inherent noise and subtracts the result from the channel power measurement result (first active trace only).

For more information see "Noise cancellation" on page 47.

Parameters:
<State> ON | OFF
*RST: OFF

Example: `POW:NCOR ON`

Manual control: See "Noise cancellation" on page 47

10.5.3.2 Configuring the Attenuation

INPut:ATTenuation <Attenuation>

This command defines the total attenuation for RF input.

If an electronic attenuator is available and active, the command defines a mechanical attenuation (see `INPut:EATT:STATe` on page 578).

If you set the attenuation manually, it is no longer coupled to the reference level, but the reference level is coupled to the attenuation. Thus, if the current reference level is not compatible with an attenuation that has been set manually, the command also adjusts the reference level.

Parameters:

<Attenuation>
Range: see data sheet
Increment: 5 dB
*RST: 10 dB (AUTO is set to ON)

Example:
```
INP:ATT 30dB
```
Defines a 30 dB attenuation and decouples the attenuation from the reference level.

Usage: SCPI confirmed

Manual control: See "RF Attenuation" on page 189
See "Attenuation Mode / Value" on page 189

INPut:ATTenuation:AUTO <State>

This command couples or decouples the attenuation to the reference level. Thus, when the reference level is changed, the R&S FSW determines the signal level for optimal internal data processing and sets the required attenuation accordingly.

Parameters:

<State>
ON | OFF
*RST: ON

Example:
```
INP:ATT:AUTO ON
```
Couples the attenuation to the reference level.

Usage: SCPI confirmed

Manual control: See "RF Attenuation" on page 189
See "Attenuation Mode / Value" on page 189

INPut:EATT <Attenuation>

This command defines an electronic attenuation manually. Automatic mode must be switched off (`INP:EATT:AUTO OFF`, see `INPut:EATT:AUTO` on page 578).

If the current reference level is not compatible with an attenuation that has been set manually, the command also adjusts the reference level.

Parameters:

<Attenuation> attenuation in dB

Range: see data sheet
Increment: 1 dB
*RST: 0 dB (OFF)

Example:
```
INP:EATT:AUTO OFF
INP:EATT 10 dB
```

Manual control: See "Using Electronic Attenuation (Option B25)" on page 189

INPut:EATT:AUTO <State>

This command turns automatic selection of the electronic attenuation on and off.

If on, electronic attenuation reduces the mechanical attenuation whenever possible.

Parameters:

<State> ON | OFF

*RST: ON

Example:
```
INP:EATT:AUTO OFF
```

Manual control: See "Using Electronic Attenuation (Option B25)" on page 189

INPut:EATT:STATe <State>

This command turns the electronic attenuator on and off.

Parameters:

<State> ON | OFF

*RST: OFF

Example:
```
INP:EATT:STAT ON
```
Switches the electronic attenuator into the signal path.

Manual control: See "Using Electronic Attenuation (Option B25)" on page 189

10.5.3.3 Configuring a Preamplifier

INPut:GAIN:STATe <State>

This command turns the preamplifier on and off.

The command requires option R&S FSW-B24.

For R&S FSW 26 models, the input signal is amplified by 30 dB if the preamplifier is activated.

For R&S FSW 8 or 13 models, the preamplification is defined by `INPut:GAIN[:VALue]`.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `INP:GAIN:STAT ON`
Switches on 30 dB preamplification.

Usage: SCPI confirmed

Manual control: See "Input Settings" on page 190
See "Preamplifier (option B24)" on page 190

INPut:GAIN[:VALue] <Gain>

This command selects the preamplification level if the preamplifier is activated (`INP:GAIN:STAT ON`, see `INPut:GAIN:STATe` on page 579).

The command requires option R&S FSW-B24.

Parameters:

<Gain> 15 dB | 30 dB

The availability of preamplification levels depends on the R&S FSW model.
- R&S FSW8: 15dB and 30 dB
- R&S FSW13: 15dB and 30 dB
- R&S FSW26: 30 dB

All other values are rounded to the nearest of these two.

*RST: OFF

Example: `INP:GAIN:VAL 30`
Switches on 30 dB preamplification.

Usage: SCPI confirmed

Manual control: See "Input Settings" on page 190
See "Preamplifier (option B24)" on page 190

10.5.3.4 Scaling the Y-Axis

DISPlay[:WINDow<n>]:TRACe:Y[:SCALe] <Range>

This command defines the display range of the y-axis.

Note that the command works only for a logarithmic scaling. You can select the scaling with `DISPlay[:WINDow<n>]:TRACe:Y:SPACing`.

Parameters:

<Range>
Range: 1 dB to 200 dB
*RST: 100 dB

Example: `DISP:TRAC:Y 110dB`

Usage: SCPI confirmed

Manual control: See "Range" on page 191

DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:AUTO ONCE

Automatic scaling of the y-axis is performed once, then switched off again.

Usage: SCPI confirmed

Manual control: See "Auto Scale Once" on page 192

DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:MODE <Mode>

This command selects the type of scaling of the y-axis.

When the display update during remote control is off, this command has no immediate effect.

Parameters:

<Mode>
ABSolute
absolute scaling of the y-axis
RELative
relative scaling of the y-axis
*RST: ABSolute

Example: `DISP:TRAC:Y:MODE REL`

Manual control: See "Scaling" on page 192

DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]:RPOSition <Position>

This command defines the vertical position of the reference level on the display grid.

The R&S FSW adjusts the scaling of the y-axis accordingly.

Parameters:

<Position> 0 PCT corresponds to the lower display border, 100% corresponds to the upper display border.

*RST: 100 PCT = frequency display; 50 PCT = time display

Example: `DISP:TRAC:Y:RPOS 50PCT`

Usage: SCPI confirmed

Manual control: See "Ref Level Position" on page 192

DISPlay[:WINDow<n>]:TRACe:Y:SPACing <ScalingType>

This command selects the scaling of the y-axis.

Parameters:

<ScalingType>

LOGarithmic
Logarithmic scaling.

LINear
Linear scaling in %.

LDB
Linear scaling in the specified unit.

PERCent
Linear scaling in %.

*RST: LOGarithmic

Example: `DISP:TRAC:Y:SPAC LIN`
Selects linear scaling in %.

Usage: SCPI confirmed

Manual control: See "Scaling" on page 192

10.5.4 Configuring Triggered and Gated Measurements

The commands required to configure a triggered or gated measurement in a remote environment are described here. The tasks for manual operation are described in chapter 5.6, "Trigger and Gate Configuration", on page 208.

*OPC should be used after requesting data. This will hold off any subsequent changes to the selected trigger source, until after the sweep is completed and the data is returned.

10.5.4.1 Configuring the Triggering Conditions

TRIGger[:SEQuence]:DTIMe <DropoutTime>

Defines the time the input signal must stay below the trigger level before a trigger is detected again.

Parameters:

<DropoutTime> Dropout time of the trigger.

Range: 0 s to 10.0 s
*RST: 0 s

Manual control: See "Trigger Settings" on page 216
See "Drop-Out Time" on page 219

TRIGger[:SEQuence]:HOLDoff[:TIME] <Offset>

Defines the time offset between the trigger event and the start of the sweep (data capturing).

A negative offset is possible for time domain measurements.

For the trigger sources "External" or "IF Power", a common input signal is used for both trigger and gate. Therefore, changes to the gate delay will affect the trigger offset as well.

Parameters:

<Offset> For measurements in the frequency domain, the range is 0 s to 30 s.
For measurements in the time domain, the range is the negative sweep time to 30 s.

*RST: 0 s

Example:

```
TRIG:HOLD 500us
```

Manual control: See "Trigger Settings" on page 216
See "Trigger Offset" on page 220

TRIGger[:SEQuence]:IFPower:HOLDoff <Period>

This command defines the holding time before the next trigger event.

Note that this command is available for **any trigger source**, not just IF Power.

Note: If you perform gated measurements in combination with the IF Power trigger, the R&S FSW ignores the holding time for frequency sweep, FFT sweep, zero span and I/Q data measurements.

Parameters:
<Period> *RST: 150 ns

Example: `TRIG:SOUR IFP`
Sets the IF power trigger source.
`TRIG:IFP:HOLD 200 ns`
Sets the holding time to 200 ns.

Manual control: See "Trigger Settings" on page 216
See "Trigger Holdoff" on page 220

TRIGger[:SEQuence]:IFPower:HYSTeresis <Hysteresis>

This command defines the trigger hysteresis.

Parameters:
<Hysteresis> Range: 3 dB to 50 dB
*RST: 3 dB

Example: `TRIG:SOUR IFP`
Sets the IF power trigger source.
`TRIG:IFP:HYST 10DB`
Sets the hysteresis limit value.

Manual control: See "Trigger Settings" on page 216
See "Hysteresis" on page 220

TRIGger[:SEQuence]:LEVel[:EXTernal<port>] <TriggerLevel>

This command defines the level the external signal must exceed to cause a trigger event.

Note that the variable INPUT/OUTPUT connectors (ports 2+3) must be set for use as input using the `OUTPut:TRIGger<port>:DIRection` command.

Suffix:
<port> 1 | 2 | 3
Selects the trigger port.
1 = trigger port 1 (TRIGGER INPUT connector on front panel)
2 = trigger port 2 (TRIGGER INPUT/OUTPUT connector on front panel)
3 = trigger port 3 (TRIGGER3 INPUT/OUTPUT connector on rear panel)

Parameters:
<TriggerLevel> Range: 0.5 V to 3.5 V
*RST: 1.4 V

Example: `TRIG:LEV 2V`

Manual control: See "Trigger Settings" on page 216
See "Trigger Level" on page 219

TRIGger[:SEQuence]:LEVel:IFPower <TriggerLevel>

This command defines the power level at the third intermediate frequency that must be exceeded to cause a trigger event. Note that any RF attenuation or preamplification is considered when the trigger level is analyzed.

Parameters:
<TriggerLevel> Range: -50 dBm to 20 dBm
*RST: -20 dBm

Example: `TRIG:LEV:IFP -30DBM`

Manual control: See "Trigger Settings" on page 216
See "Trigger Level" on page 219

TRIGger[:SEQuence]:LEVel:IQPower <TriggerLevel>

This command defines the magnitude the I/Q data must exceed to cause a trigger event. Note that any RF attenuation or preamplification is considered when the trigger level is analyzed.

Parameters:
<TriggerLevel> Range: -130 dBm to 30 dBm
*RST: -20 dBm

Example: `TRIG:LEV:IQP -30DBM`

Manual control: See "Trigger Settings" on page 216
See "Trigger Level" on page 219

TRIGger[:SEQuence]:LEVel:RFPower <TriggerLevel>

This command defines the power level the RF input must exceed to cause a trigger event. Note that any RF attenuation or preamplification is considered when the trigger level is analyzed.

The input signal must be between 500 MHz and 8 GHz.

Parameters:
<TriggerLevel> Range: -50 dBm to -10 dBm
*RST: -20 dBm

Example: `TRIG:LEV:RFP -30dBm`

Manual control: See "Trigger Settings" on page 216
See "Trigger Level" on page 219

TRIGger[:SEQuence]:LEVel:VIDeo <Level>

This command defines the level the video signal must exceed to cause a trigger event. Note that any RF attenuation or preamplification is considered when the trigger level is analyzed.

Parameters:
<Level> Range: 0 PCT to 100 PCT
*RST: 50 PCT

Example: `TRIG:LEV:VID 50PCT`

Manual control: See "Trigger Settings" on page 216
See "Trigger Level" on page 219

TRIGger[:SEQuence]:SLOPe <Type>

For all trigger sources except time you can define whether triggering occurs when the signal rises to the trigger level or falls down to it.

Parameters:
<Type> POSitive | NEGative

POSitive
Triggers when the signal rises to the trigger level (rising edge).

NEGative
Triggers when the signal drops to the trigger level (falling edge).

*RST: POSitive

Example: `TRIG:SLOP NEG`

Manual control: See "Trigger Settings" on page 216
See "Slope" on page 220

TRIGger[:SEQuence]:SOURce <Source>

This command selects the trigger source.

For details on trigger sources see "Trigger Source" on page 216.

Using a trigger or gated measurements turns the squelch off (see `[SENSe:]DEMod:SQUelch[:STATe]` on page 665).

Note on external triggers:

If a measurement is configured to wait for an external trigger signal in a remote control program, remote control is blocked until the trigger is received and the program can continue. Make sure this situation is avoided in your remote control programs.

For troubleshooting tips see "Uncompleted sequential commands" on page 772.

Parameters:

<Source>

IMMediate
Free Run

EXTern
Trigger signal from the TRIGGER INPUT connector.

EXT2
Trigger signal from the TRIGGER INPUT/OUTPUT connector.
Note: Connector must be configured for "Input".

EXT3
Trigger signal from the TRIGGER 3 INPUT/ OUTPUT connector.
Note: Connector must be configured for "Input".

RFPower
First intermediate frequency

IFPower
Second intermediate frequency

TIME
Time interval

VIDeo
Video mode is available in the time domain and only in the Spectrum application.

PSEN
External power sensor

*RST: IMMediate

Example:

```
TRIG:SOUR EXT
```

Selects the external trigger input as source of the trigger signal

Manual control:

See "Using the power sensor as an external trigger" on page 174
See "Trigger Settings" on page 216
See "Trigger Source" on page 216
See "Free Run" on page 217
See "External Trigger 1/2/3" on page 217
See "Video" on page 217
See "IF Power" on page 218
See "RF Power" on page 218
See "Power Sensor" on page 218
See "Time" on page 219

TRIGger[:SEQuence]:TIME:RINTerval <Interval>

This command defines the repetition interval for the time trigger.

Parameters:

<Interval>

2.0 ms to 5000

Range: 2 ms to 5000 s
*RST: 1.0 s

Example: `TRIG:SOUR TIME`
Selects the time trigger input for triggering.
`TRIG:TIME:RINT 50`
The sweep starts every 50 s.

Manual control: See "Trigger Settings" on page 216
See "Repetition Interval" on page 219

10.5.4.2 Configuring Gated Measurements

[SENSe:]SWEep:EGATe <State>

This command turns gated measurements on and off.

In case of measurements with an external gate, the measured values are recorded as long as the gate is opened. During a sweep the gate can be opened and closed several times. The synchronization mechanisms with *OPC, *OPC? and *WAI remain completely unaffected.

The measurement ends when a particular number of measurement points has been recorded (see `[SENSe:]SWEep:POINts` on page 572).

Performing gated measurements turns the squelch off.

Parameters:
<State> ON | OFF
*RST: OFF

Example: `SWE:EGAT ON`
Switches on the external gate mode.
`SWE:EGAT:TYPE EDGE`
Switches on the edge-triggered mode.
`SWE:EGAT:HOLD 100US`
Sets the gate delay to 100 µs.
`SWE:EGAT:LEN 500US`
Sets the gate opening time to 500 µs.
`INIT;*WAI`
Starts a sweep and waits for its end.

[SENSe:]SWEep:EGATe:HOLDoff <DelayTime>

This command defines the length of the trigger delay.

The trigger delay has no effect on

- measurements using the "Level" gate mode

- frequency sweep, FFT sweep, zero span and I/Q mode measurements using an IF Power trigger.

Parameters:
<DelayTime> Range: 0 s to 30 s
*RST: 0 s

Example: `SWE:EGAT:HOLD 100us`

Manual control: See "Gate Settings" on page 222
See "Gate Delay" on page 222

[SENSe:]SWEep:EGATe:LENGth <GateLength>

This command defines the gate length.

Parameters:
<GateLength> Range: 125 ns to 30 s
*RST: 400µs

Example: `SWE:EGAT:LENG 10ms`

Manual control: See "Gate Settings" on page 222
See "Gate Length" on page 222

[SENSe:]SWEep:EGATe:POLarity <Polarity>

This command selects the polarity of an external gate signal.

The setting applies both to the edge of an edge-triggered signal and the level of a level-triggered signal.

Parameters:
<Polarity> POSitive | NEGative
*RST: POSitive

Example: `SWE:EGAT:POL POS`

Manual control: See "Trigger Settings" on page 216
See "Slope" on page 220

[SENSe:]SWEep:EGATe:SOURce <Source>

This command selects the signal source for gated measurements.

If an IF power signal is used, the gate is opened as soon as a signal at > -20 dBm is detected within the IF path bandwidth (10 MHz).

For more information see "Trigger Source" on page 216.

Parameters:
<Source> EXTernal | EXT2 | EXT3 | IFPower | IQPower | VIDeo | RFPower | PSEN
*RST: IFPower

Example: `SWE:EGAT:SOUR IFP`
Switches the gate source to IF power.

Manual control: See "Trigger Settings" on page 216
See "Trigger Source" on page 216
See "External Trigger 1/2/3" on page 217
See "Video" on page 217
See "IF Power" on page 218
See "RF Power" on page 218
See "Power Sensor" on page 218

[SENSe:]SWEep:EGATe:TYPE <Type>

This command selects the way gated measurements are triggered.

Parameters:
<Type>

LEVel
The trigger event for the gate to open is a particular power level. After the gate signal has been detected, the gate remains open until the signal disappears.
Note: If you perform gated measurements in combination with the IF Power trigger, the R&S FSW ignores the holding time for frequency sweep, FFT sweep, zero span and I/Q mode measurements.

EDGE
The trigger event for the gate to open is the detection of the signal edge.
After the gate signal has been detected, the gate remains open until the gate delay is over.

*RST: EDGE

Example: `SWE:EGAT:TYPE EDGE`

Manual control: See "Gate Settings" on page 222
See "Gate Mode" on page 222

10.5.4.3 Configuring the Trigger Output

The following commands are required to send the trigger signal to one of the variable TRIGGER INPUT/OUTPUT connectors. The tasks for manual operation are described in "Trigger 2/3" on page 167.

OUTPut:TRIGger<port>:DIRection <Direction>

This command selects the trigger direction.

Suffix:
<port> 2 | 3
Selects the trigger port to which the output is sent.
2 = trigger port 2 (front)
3 = trigger port 3 (rear)

Parameters:
<Direction> **INPut**
Port works as an input.

OUTPut
Port works as an output.

*RST: INPut

Manual control: See "Trigger 2/3" on page 167

OUTPut:TRIGger<port>:LEVel <Level>

This command defines the level of the signal generated at the trigger output.

This command works only if you have selected a user defined output with `OUTPut:TRIGger<port>:OTYPe`.

Suffix:
<port> 2 | 3
Selects the trigger port to which the output is sent.
2 = trigger port 2 (front)
3 = trigger port 3 (rear)

Parameters:
<Level> **HIGH**
TTL signal.

LOW
0 V

*RST: LOW

Manual control: See "Trigger 2/3" on page 167
See "Output Type" on page 167
See "Level" on page 168

OUTPut:TRIGger<port>:OTYPe <OutputType>

This command selects the type of signal generated at the trigger output.

Suffix:
<port> 2 | 3
Selects the trigger port to which the output is sent.
2 = trigger port 2 (front)
3 = trigger port 3 (rear)

Parameters:

<OutputType>

DEVice
Sends a trigger signal when the R&S FSW has triggered internally.

TARMed
Sends a trigger signal when the trigger is armed and ready for an external trigger event.

UDEFined
Sends a user defined trigger signal. For more information see `OUTPut:TRIGger<port>:LEVel`.

*RST: DEVice

Manual control: See "Trigger 2/3" on page 167
See "Output Type" on page 167

OUTPut:TRIGger<port>:PULSe:IMMediate

This command generates a pulse at the trigger output.

Suffix:

<port>

2 | 3
Selects the trigger port to which the output is sent.
2 = trigger port 2 (front)
3 = trigger port 3 (rear)

Usage: Event

Manual control: See "Trigger 2/3" on page 167
See "Output Type" on page 167
See "Send Trigger" on page 168

OUTPut:TRIGger<port>:PULSe:LENGth <Length>

This command defines the length of the pulse generated at the trigger output.

Suffix:

<port>

2 | 3
Selects the trigger port to which the output is sent.
2 = trigger port 2 (front)
3 = trigger port 3 (rear)

Parameters:

<Length>

Pulse length in seconds.

Manual control: See "Trigger 2/3" on page 167
See "Output Type" on page 167
See "Pulse Length" on page 168

10.5.5 Adjusting Settings Automatically

The commands required to adjust settings automatically in a remote environment are described here. The tasks for manual operation are described in chapter 5.7, "Adjusting Settings Automatically", on page 225.

MSRA operating mode

In MSRA operating mode, settings related to data acquisition (measurement time, hysteresis) can only be adjusted automatically in the MSRA Master, not in the MSRA applications.

[SENSe:]ADJust:ALL

This command initiates a measurement to determine and set the ideal settings for the current task automatically (only once for the current measurement).

This includes:

- Center frequency
- Reference level

Example: `ADJ:ALL`

Usage: Event

Manual control: See "Adjusting all Determinable Settings Automatically (Auto All)" on page 226

[SENSe:]ADJust:CONFigure:DURation <Duration>

In order to determine the ideal reference level, the R&S FSW performs a measurement on the current input data. This command defines the length of the measurement if `[SENSe:]ADJust:CONFigure:DURation:MODE` is set to `MANual`.

Parameters:

<Duration> Numeric value in seconds

Range: 0.001 to 16000.0
*RST: 0.001
Default unit: s

Example: ADJ:CONF:DUR:MODE MAN
Selects manual definition of the measurement length.
ADJ:CONF:LEV:DUR 5ms
Length of the measurement is 5 ms.

Manual control: See "Changing the Automatic Measurement Time (Meastime Manual)" on page 227

[SENSe:]ADJust:CONFigure:DURation:MODE <Mode>

In order to determine the ideal reference level, the R&S FSW performs a measurement on the current input data. This command selects the way the R&S FSW determines the length of the measurement .

Parameters:

<Mode>

AUTO
The R&S FSW determines the measurement length automatically according to the current input data.

MANual
The R&S FSW uses the measurement length defined by [SENSe:]ADJust:CONFigure:DURation on page 592.

*RST: AUTO

Manual control: See "Resetting the Automatic Measurement Time (Meastime Auto)" on page 227
See "Changing the Automatic Measurement Time (Meastime Manual)" on page 227

[SENSe:]ADJust:CONFigure:HYSTeresis:LOWer <Threshold>

When the reference level is adjusted automatically using the [SENSe:]ADJust:LEVel on page 595 command, the internal attenuators and the preamplifier are also adjusted. In order to avoid frequent adaptation due to small changes in the input signal, you can define a hysteresis. This setting defines a lower threshold the signal must fall below (compared to the last measurement) before the reference level is adapted automatically.

Parameters:

<Threshold>

Range: 0 dB to 200 dB
*RST: +1 dB
Default unit: dB

Example: SENS:ADJ:CONF:HYST:LOW 2
For an input signal level of currently 20 dBm, the reference level will only be adjusted when the signal level falls below 18 dBm.

Manual control: See "Lower Level Hysteresis" on page 227

[SENSe:]ADJust:CONFigure:HYSTeresis:UPPer <Threshold>

When the reference level is adjusted automatically using the `[SENSe:]ADJust:LEVel` on page 595 command, the internal attenuators and the preamplifier are also adjusted. In order to avoid frequent adaptation due to small changes in the input signal, you can define a hysteresis. This setting defines an upper threshold the signal must exceed (compared to the last measurement) before the reference level is adapted automatically.

Parameters:

<Threshold>
Range: 0 dB to 200 dB
*RST: +1 dB
Default unit: dB

Example: `SENS:ADJ:CONF:HYST:UPP 2`

Example: For an input signal level of currently 20 dBm, the reference level will only be adjusted when the signal level rises above 22 dBm.

Manual control: See "Upper Level Hysteresis" on page 227

[SENSe:]ADJust:CONFigure:TRIG <State>

Defines the behaviour of the measurement when adjusting a setting automatically (using `SENS:ADJ:LEV ON`, for example). See "Adjusting settings automatically during triggered measurements" on page 226.

Parameters:

<State>
ON
The measurement for automatic adjustment waits for the trigger.
OFF
The measurement for automatic adjustment is performed immediately, without waiting for a trigger.
*RST: ON

[SENSe:]ADJust:FREQuency

This command sets the center frequency to the highest signal level in the current frequency range.

Example: `ADJ:FREQ`

Usage: Event

Manual control: See "Adjusting the Center Frequency Automatically (Auto Freq)" on page 226

[SENSe:]ADJust:LEVel

This command initiates a single (internal) measurement that evaluates and sets the ideal reference level for the current input data and measurement settings. This ensures that the settings of the RF attenuation and the reference level are optimally adjusted to the signal level without overloading the R&S FSW or limiting the dynamic range by an S/N ratio that is too small.

Example: `ADJ:LEV`

Usage: Event

Manual control: See "Reference Level" on page 187
See "Setting the Reference Level Automatically (Auto Level)" on page 189

10.5.6 Configuring the Data Input and Output

10.5.6.1 RF Input

INPut:ATTenuation:PROTection:RESet

This command resets the attenuator and reconnects the RF input with the input mixer after an overload condition occured and the protection mechanism intervened.The error status bit (bit 3 in the `STAT:QUES:POW` status register) and the `INPUT OVLD` message in the status bar are cleared.

(See `STATus:QUEStionable:POWer[:EVENt]?` on page 722 and "STATus:QUESTionable:POWer Register" on page 408).

The command works only if the overload condition has been eliminated first.

For details on the protection mechanism see chapter 5.2.1.1, "RF Input Protection", on page 161.

Usage: Event

INPut:COUPling <CouplingType>

This command selects the coupling type of the RF input.

Parameters:

<CouplingType>
AC
AC coupling
DC
DC coupling
*RST: AC

Example: `INP:COUP:DC`

Usage: SCPI confirmed

Manual control: See "Input Coupling" on page 164

INPut:FILTer:HPASs[:STATe] <State>

Activates an additional internal high-pass filter for RF input signals from 1 GHz to 3 GHz. This filter is used to remove the harmonics of the R&S FSW in order to measure the harmonics for a DUT, for example.

This function requires option R&S FSW-B13.

(Note: for RF input signals outside the specified range, the high-pass filter has no effect. For signals with a frequency of approximately 4 GHz upwards, the harmonics are suppressed sufficiently by the YIG filter.)

Parameters:

<State>
ON | OFF
*RST: OFF

Usage: SCPI confirmed

Manual control: See "High-Pass Filter 1...3 GHz" on page 165

INPut:FILTer:YIG[:STATe] <State>

This command turns the YIG-preselector on and off.

Note the special conditions and restrictions for the YIG filter described in "YIG-Preselector" on page 165.

Parameters:

<State>
ON | OFF
*RST: ON (OFF for I/Q Analyzer, GSM and MC Group Delay measurements)

Example: `INP:FILT:YIG OFF`
Deactivates the YIG-preselector.

Manual control: See "YIG-Preselector" on page 165

INPut:IMPedance <Impedance>

This command selects the nominal input impedance of the RF input.

75 Ω should be selected if the 50 Ω input impedance is transformed to a higher impedance using a matching pad of the RAZ type (= 25 Ω in series to the input impedance of the instrument). The power loss correction value in this case is 1.76 dB = 10 log (75Ω/50Ω).

Parameters:

<Impedance> 50 | 75

*RST: 50 Ω

Example: `INP:IMP 75`

Usage: SCPI confirmed

Manual control: See "Impedance" on page 164
See "Reference Level" on page 187
See "Unit" on page 188

INPut:SELect <Source>

This command selects the signal source for measurements, i.e. it defines which connector is used to input data to the R&S FSW. If no additional options are installed, only RF input is supported.

Parameters:

<Source>

RF
Radio Frequency ("RF INPUT" connector)

DIQ
Digital IQ data (only available with optional Digital Baseband Interface R&S FSW-B17)
For details on I/Q input see the R&S FSW I/Q Analyzer User Manual.

*RST: RF

Manual control: See "Radio Frequency State" on page 164

INPut:UPORt:STATe <State>

This command toggles the control lines of the user ports for the **AUX PORT** connector. This 9-pole SUB-D male connector is located on the rear panel of the R&S FSW.

See the R&S FSW Getting Started manual for details.

Parameters:

<State>

ON
User port is switched to INPut

OFF
User port is switched to OUTPut

*RST: ON

INPut:UPORt[:VALue]?

This command queries the control lines of the user ports.

Example: `INP:UPOR?`

Usage: Query only

10.5.6.2 Working with Power Sensors

The following commands describe how to work with power sensors.

Configuring Power Sensors

SYSTem:COMMunicate:RDEVice:PMETer<p>:CONFigure:AUTO[:STATe] <State>

This command turns automatic assignment of a power sensor to the power sensor index on and off.

Suffix:
<p> 1...4
Power sensor index

Parameters:
<State> ON | OFF
*RST: ON

Example: `SYST:COMM:RDEV:PMET:CONF:AUTO OFF`

Manual control: See "Select" on page 172

SYSTem:COMMunicate:RDEVice:PMETer:COUNt?

This command queries the number of power sensors currently connected to the R&S FSW.

Parameters:
<NumberSensors> Number of connected power sensors.

Example: `SYST:COMM:RDEV:PMET:COUN?`

Usage: Query only

Manual control: See "Select" on page 172

SYSTem:COMMunicate:RDEVice:PMETer<p>:DEFine <Placeholder>, <Type>, <Interface>, <SerialNo>

This command assigns the power sensor with the specified serial number to the selected power sensor index (configuration).

The query returns the power sensor type and serial number of the sensor assigned to the specified index.

Suffix:

<p> 1...4
Power sensor index

Setting parameters:

<Placeholder> Currently not evaluated

<SerialNo> Serial number of a connected power sensor

Query parameters:

<Type> The power sensor type, e.g. "NRP-Z81".

<Interface> Currently not evaluated

Return values:

<Placeholder> Currently not used

<Type> Detected power sensor type, e.g. "NRP-Z81".

<Interface> Interface the power sensor is connected to; always "USB"

<SerialNo> Serial number of the power sensor assigned to the specified index

Example: `SYST:COMM:RDEV:PMET2:DEF '','NRP-Z81','','123456'`
Assigns the power sensor with the serial number '123456' to the configuration "Power Sensor 2".
`SYST:COMM:RDEV:PMET2:DEF?`
Queries the sensor assigned to "Power Sensor 2".
Result:
`'','NRP-Z81','USB','123456'`
The NRP-Z81 power sensor with the serial number '123456' is assigned to the "Power Sensor 2".

Manual control: See "Select" on page 172

Configuring Power Sensor Measurements

CALibration:PMETer<p>:ZERO:AUTO ONCE

This commands starts to zero the power sensor.

Note that you have to disconnect the signals from the power sensor input before you start to zero the power sensor. Otherwise, results are invalid.

Suffix:
<p> 1...4
Power sensor index

Parameters:
ONCE

Example: `CAL:PMET2:ZERO:AUTO ONCE;*WAI`
Starts zeroing the power sensor 2 and delays the execution of further commands until zeroing is concluded.

Usage: Event

Manual control: See "Zeroing Power Sensor" on page 172

CALCulate<n>:PMETer<p>:RELative[:MAGNitude] <RefValue>

This command defines the reference value for relative measurements.

Suffix:
<p> 1...4
Power sensor index

Parameters:
<RefValue> Range: -200 dBm to 200 dBm
*RST: 0

Example: `CALC:PMET2:REL -30`
Sets the reference value for relative measurements to -30 dBm for power sensor 2.

Manual control: See "Reference Value" on page 173

CALCulate<n>:PMETer<p>:RELative[:MAGNitude]:AUTO ONCE

This command sets the current measurement result as the reference level for relative measurements.

Suffix:
<p> 1...4
Power sensor index

Parameters:
ONCE

Example: `CALC:PMET2:REL:AUTO ONCE`
Takes the current measurement value as reference value for relative measurements for power sensor 2.

Usage: Event

Manual control: See "Setting the Reference Level from the Measurement (Meas->Ref)" on page 173

CALCulate<n>:PMETer<p>:RELative:STATe <State>

This command turns relative power sensor measurements on and off.

Suffix:
<p> 1...4
Power sensor index

Parameters:
<State> ON | OFF
*RST: OFF

Example: `CALC:PMET2:REL:STAT ON`
Activates the relative display of the measured value for power sensor 2.

FETCh:PMETer<p>?

This command queries the results of power sensor measurements.

Suffix:
<p> 1...4
Power sensor index

Return values:
<Level> Power level that has been measured by a power sensor.
The unit is either dBm (absolute measurements) or dB (relative measurements).

Usage: Query only

READ:PMETer<p>?

This command initiates a power sensor measurement and queries the results.

Suffix:
<p> 1...4
Power sensor index

Usage: Query only

[SENSe:]PMETer<p>:DCYCle[:STATe] <State>

This command turns the duty cycle correction on and off.

Suffix:
<p> 1...4
Power sensor index

Parameters:
<State> ON | OFF
*RST: OFF

Example: `PMET2:DCYC:STAT ON`

Manual control: See "Duty Cycle" on page 174

[SENSe:]PMETer<p>:DCYCle:VALue <Percentage>

This command defines the duty cycle for the correction of pulse signals.

The power sensor uses the duty cycle in combination with the mean power to calculate the power of the pulse.

Suffix:
<p> 1...4
Power sensor

Parameters:
<Percentage> Range: 0.001 to 99.999
*RST: 99.999
Default unit: %

Example: `PMET2:DCYC:STAT ON`
Activates the duty cycle correction.
`PMET2:DCYC:VAL 0.5`
Sets the correction value to 0.5%.

Manual control: See "Duty Cycle" on page 174

[SENSe:]PMETer<p>:FREQuency <Frequency>

This command defines the frequency of the power sensor.

Suffix:
<p> 1...4
Power sensor index

Parameters:
<Frequency> The available value range is specified in the data sheet of the power sensor in use.
*RST: 50 MHz

Example: `PMET2:FREQ 1GHZ`
Sets the frequency of the power sensor to 1 GHz.

Manual control: See "Frequency Manual" on page 172

[SENSe:]PMETer<p>:FREQuency:LINK <Coupling>

This command selects the frequency coupling for power sensor measurements.

Suffix:
<p> 1...4
Power sensor index

Parameters:
<Coupling> **CENTer**
Couples the frequency to the center frequency of the analyzer
MARKer1
Couples the frequency to the position of marker 1
OFF
Switches the frequency coupling off
*RST: CENTer

Example: `PMET2:FREQ:LINK CENT`
Couples the frequency to the center frequency of the analyzer

Manual control: See "Frequency Coupling" on page 173

[SENSe:]PMETer<p>:MTIMe <Duration>

This command selects the duration of power sensor measurements.

Suffix:
<p> 1...4
Power sensor index

Parameters:
<Duration> SHORt | NORMal | LONG
*RST: NORMal

Example: `PMET2:MTIM SHOR`
Sets a short measurement duration for measurements of stationary high power signals for the selected power sensor.

Manual control: See "Meas Time/Average" on page 173

[SENSe:]PMETer<p>:MTIMe:AVERage:COUNt <NumberReadings>

This command sets the number of power readings included in the averaging process of power sensor measurements.

Extended averaging yields more stable results for power sensor measurements, especially for measurements on signals with a low power, because it minimizes the effects of noise.

Suffix:
<p> 1...4
Power sensor index

Parameters:
<NumberReadings> An average count of 0 or 1 performs one power reading.
Range: 0 to 256
Increment: binary steps (1, 2, 4, 8, ...)

Example: `PMET2:MTIM:AVER ON`
Activates manual averaging.
`PMET2:MTIM:AVER:COUN 8`
Sets the number of readings to 8.

Manual control: See "Average Count (Number of Readings)" on page 174

[SENSe:]PMETer<p>:MTIMe:AVERage[:STATe] <State>

This command turns averaging for power sensor measurements on and off.

Suffix:
<p> 1...4
Power sensor index

Parameters:
<State> ON | OFF
*RST: OFF

Example: `PMET2:MTIM:AVER ON`
Activates manual averaging.

Manual control: See "Meas Time/Average" on page 173

[SENSe:]PMETer<p>:ROFFset[:STATe] <State>

This command includes or excludes the reference level offset of the analyzer for power sensor measurements.

Suffix:
<p> 1...4
Power sensor index

Parameters:
<State> **ON**
Includes the reference level offset in the results.
OFF
Ignores the reference level offset.
*RST: ON

Example: PMET2:ROFF OFF
Takes no offset into account for the measured power.

Manual control: See "Use Ref Lev Offset" on page 174

[SENSe:]PMETer<p>[:STATe] <State>

This command turns a power sensor on and off.

Suffix:
<p> 1...4
Power sensor index

Parameters:
<State> ON | OFF
*RST: OFF

Example: PMET1 ON
Switches the power sensor measurements on.

Manual control: See "State" on page 171
See "Select" on page 172

[SENSe:]PMETer<p>:UPDate[:STATe] <State>

This command turns continuous update of power sensor measurements on and off.

If on, the results are update even if a single sweep is complete.

Suffix:
<p> 1...4
Power sensor index

Parameters:
<State> ON | OFF
*RST: OFF

Example: PMET1:UPD ON
The data from power sensor 1 is updated continuously.

Manual control: See "Continuous Value Update" on page 172

UNIT<n>:PMETer<p>:POWer <Unit>

This command selects the unit for absolute power sensor measurements.

Suffix:
<p> 1...4
Power sensor index

Parameters:
<Unit> DBM | WATT | W
*RST: DBM

Example: UNIT:PMET:POW DBM

Manual control: See "Unit/Scale" on page 173

UNIT<n>:PMETer<p>:POWer:RATio <Unit>

This command selects the unit for relative power sensor measurements.

Suffix:
<p> 1...4
Power sensor index

Parameters:
<Unit> DB | PCT
*RST: DB

Example: UNIT:PMET:POW:RAT DB

Manual control: See "Unit/Scale" on page 173

Triggering with Power Sensors

[SENSe:]PMETer<p>:TRIGger:DTIMe <Time>

This command defines the time period that the input signal has to stay below the IF power trigger level before the measurement starts.

Suffix:
<p> 1...4
Power sensor index

Parameters:
<Time> Range: 0 s to 1 s
Increment: 100 ns
*RST: 100 µs

Example: PMET2:TRIG:DTIMe 0.001

[SENSe:]PMETer<p>:TRIGger:HOLDoff <Holdoff>

This command defines the trigger holdoff for external power triggers.

Suffix:
<p> 1...4
Power sensor index

Parameters:

<Holdoff> Time period that has to pass between the trigger event and the start of the measurement, in case another trigger event occurs.

Range: 0 s to 1 s
Increment: 100 ns
*RST: 0 s

Example: `PMET2:TRIG:HOLD 0.1`
Sets the holdoff time of the trigger to 100 ms

Manual control: See "Using the power sensor as an external trigger" on page 174
See "Trigger Holdoff" on page 175

[SENSe:]PMETer<p>:TRIGger:HYSTeresis <Hysteresis>

This command defines the trigger hysteresis for external power triggers.

The hysteresis in dB is the value the input signal must stay below the IF power trigger level in order to allow a trigger to start the measurement.

Suffix:

<p> 1...4
Power sensor index

Parameters:

<Hysteresis>

Range: 3 dB to 50 dB
Increment: 1 dB
*RST: 0 dB

Example: `PMET2:TRIG:HYST 10`
Sets the hysteresis of the trigger to 10 dB.

Manual control: See "Using the power sensor as an external trigger" on page 174
See "Hysteresis" on page 175

[SENSe:]PMETer<p>:TRIGger:LEVel <Level>

This command defines the trigger level for external power triggers.

This command requires the use of an R&S NRP-Z81 power sensor.

Suffix:

<p> 1...4
Power sensor index

Parameters:

<Level> -20 to +20 dBm

Range: -20 dBm to 20 dBm
*RST: -10 dBm

Example: `PMET2:TRIG:LEV -10 dBm`
Sets the level of the trigger

Manual control: See "Using the power sensor as an external trigger" on page 174
See "External Trigger Level" on page 174

[SENSe:]PMETer<p>:TRIGger:SLOPe <Edge>

This command selects the trigger condition for external power triggers.

Suffix:
<p> 1...4
Power sensor index

Parameters:
<Edge> **POSitive**
The measurement starts in case the trigger signal shows a positive edge.

NEGative
The measurement starts in case the trigger signal shows a negative edge.

*RST: POSitive

Example: `PMET2:TRIG:SLOP NEG`

Manual control: See "Using the power sensor as an external trigger" on page 174
See "Slope" on page 175

[SENSe:]PMETer<p>:TRIGger[:STATe] <State>

This command turns the external power trigger on and off.

This command requires the use of an R&S NRP-Z81 power sensor.

Suffix:
<p> 1...4
Power sensor index

Parameters:
<State> ON | OFF

*RST: OFF

Example: `PMET2:TRIG ON`
Switches the external power trigger on

Manual control: See "Using the power sensor as an external trigger" on page 174

10.5.6.3 Configuring the Outputs

Configuring trigger input/output is described in chapter 10.5.4.3, "Configuring the Trigger Output", on page 589.

DIAGnostic<n>:SERVice:NSOurce <State>

This command turns the 28 V supply of the BNC connector labeled NOISE SOURCE CONTROL on the front panel on and off.

For details see chapter 5.2.1.2, "Input from Noise Sources", on page 161.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `DIAG:SERV:NSO ON`

Manual control: See "Noise Source" on page 167

OUTPut:IF[:SOURce] <Source>

Defines the type of signal sent to the IF/VIDEO/DEMOD connector on the rear panel of the R&S FSW.

The command is only available in the time domain.

For restrictions and more information see chapter 5.2.1.4, "IF and Video Signal Output", on page 162.

Parameters:

<Source>

IF
Sends the measured IF value at the frequency defined using `OUTPut:IF:IFFRequency` to the IF/VIDEO/DEMOD output connector.

VIDeo
Sends the displayed video signal (i.e. the filtered and detected IF signal, 200mV) to the IF/VIDEO/DEMOD output connector. This setting is required to send demodulated audio frequencies to the output.

*RST: IF

Example: `OUTP:IF VID`
Selects the video signal for the IF output connector.

Manual control: See "IF/Video Output" on page 166

OUTPut:IF:IFFRequency <Frequency>

This command defines the frequency for the IF output. The IF frequency of the signal is converted accordingly.

This command is available in the time domain and if the IF/VIDEO/DEMOD output is configured for IF.

For more information see chapter 5.2.1.4, "IF and Video Signal Output", on page 162.

Parameters:
<Frequency> *RST: 50.0 MHz

Manual control: See "IF (Wide) Out Frequency" on page 166

OUTPut:UPORt:STATe <State>

This command toggles the control lines of the user ports for the **AUX PORT** connector. This 9-pole SUB-D male connector is located on the rear panel of the R&S FSW.

Parameters:
<State>

ON
User port is switched to OUTPut

OFF
User port is switched to INPut

*RST: OFF

OUTPut:UPORt[:VALue] <Value>

This command sets the control lines of the user ports.

The assignment of the pin numbers to the bits is as follows:

Bit	7	6	5	4	3	2	1	0
Pin	N/A	N/A	5	3	4	7	6	2

Bits 7 and 6 are not assigned to pins and must always be 0.

The user port is written to with the given binary pattern. If the user port is programmed to input instead of output (see `INPut:UPORt:STATe` on page 597), the output value is temporarily stored.

Parameters:
<Value>

bit values in hexadecimal format

TTL type voltage levels (max. 5V)

Range: #B00000000 to #B00111111

Example: `OUTP:UPOR #B00100100`
Sets pins 5 and 7 to 5 V.

10.6 Analyzing Measurements (Basics)

The commands for general analysis tasks are described here.

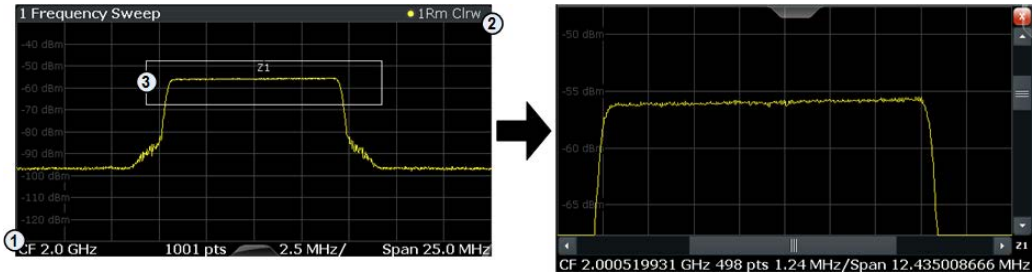
10.6.1 Zooming into the Display

10.6.1.1 Using the Single Zoom

DISPlay[:WINDow<n>]:ZOOM:AREA <x1>,<y1>,<x2>,<y2>

This command defines the zoom area.

To define a zoom area, you first have to turn the zoom on.



1 = origin of coordinate system (x1 = 0, y1 = 0)
2 = end point of system (x2 = 100, y2= 100)
3 = zoom area (e.g. x1 = 60, y1 = 30, x2 = 80, y2 = 75)

Parameters:

<x1>,<y1>, <x2>,<y2>
Diagram coordinates in % of the complete diagram that define the zoom area.
The lower left corner is the origin of coordinate system. The upper right corner is the end point of the system.

Range: 0 to 100
Default unit: PCT

Manual control: See "Single Zoom" on page 233

DISPlay[:WINDow<n>]:ZOOM:STATe <State>

This command turns the zoom on and off.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `DISP:ZOOM ON`
Activates the zoom mode.

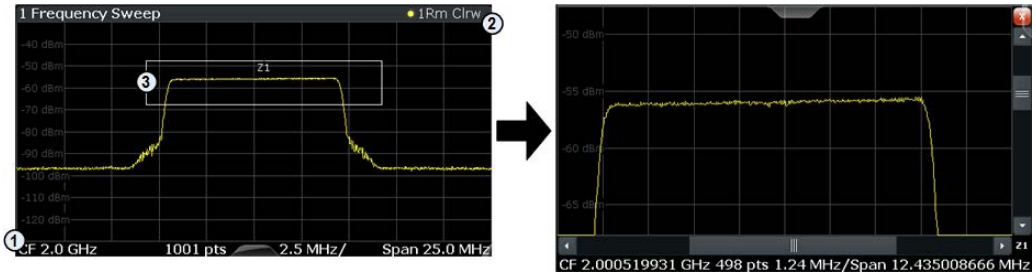
Manual control: See "Single Zoom" on page 233
See "Restore Original Display" on page 233
See "Deactivating Zoom (Selection mode)" on page 233

10.6.1.2 Using the Multiple Zoom

DISPlay[:WINDow<n>]:ZOOM:MULTiple<zoom>:AREA <x1>,<y1>,<x2>,<y2>

This command defines the zoom area for a multiple zoom.

To define a zoom area, you first have to turn the zoom on.



1 = origin of coordinate system (x1 = 0, y1 = 0)
2 = end point of system (x2 = 100, y2= 100)
3 = zoom area (e.g. x1 = 60, y1 = 30, x2 = 80, y2 = 75)

Suffix:

<zoom> 1...4
Selects the zoom window.

Parameters:

<x1>,<y1>, <x2>,<y2> Diagram coordinates in % of the complete diagram that define the zoom area.
The lower left corner is the origin of coordinate system. The upper right corner is the end point of the system.

Range: 0 to 100
Default unit: PCT

Manual control: See "Multiple Zoom" on page 233

DISPlay[:WINDow<n>]:ZOOM:MULTiple<zoom>:STATe <State>

This command turns the mutliple zoom on and off.

Suffix:

<zoom> 1...4
Selects the zoom window.
If you turn off one of the zoom windows, all subsequent zoom windows move up one position.

Parameters:

<State> ON | OFF

*RST: OFF

Manual control: See "Multiple Zoom" on page 233
See "Restore Original Display" on page 233
See "Deactivating Zoom (Selection mode)" on page 233

10.6.2 Configuring the Trace Display and Retrieving Trace Data

The commands required to work with traces are described here.

10.6.2.1 Configuring Standard Traces

Useful commands for trace configuration described elsewhere

- `DISPlay[:WINDow<n>]:TRACe:Y:SPACing` on page 581
- `DISPlay[:WINDow<n>]:TRACe:Y[:SCALe]` on page 580

Remote commands exclusive to trace configuration

DISPlay[:WINDow<n>]:TRACe<t>:MODE <Mode>

This command selects the trace mode.

In case of max hold, min hold or average trace mode, you can set the number of single measurements with `[SENSe:]SWEep:COUNt`. Note that synchronization to the end of the measurement is possible only in single sweep mode.

Parameters:

<Mode>

WRITe
Overwrite mode: the trace is overwritten by each sweep. This is the default setting.

AVERage
The average is formed over several sweeps. The "Sweep/Average Count" determines the number of averaging procedures.

MAXHold
The maximum value is determined over several sweeps and displayed. The R&S FSW saves the sweep result in the trace memory only if the new value is greater than the previous one.

MINHold
The minimum value is determined from several measurements and displayed. The R&S FSW saves the sweep result in the trace memory only if the new value is lower than the previous one.

VIEW
The current contents of the trace memory are frozen and displayed.

BLANk
Hides the selected trace.

*RST: Trace 1: WRITe, Trace 2-6: BLANk

Example:

```
INIT:CONT OFF
```
Switching to single sweep mode.
```
SWE:COUN 16
```
Sets the number of measurements to 16.
```
DISP:TRAC3:MODE WRIT
```
Selects clear/write mode for trace 3.
```
INIT;*WAI
```
Starts the measurement and waits for the end of the measurement.

Manual control: See "Trace Mode" on page 249

DISPlay[:WINDow<n>]:TRACe<t>:MODE:HCONtinuous <State>

This command turns an automatic reset of a trace on and off after a parameter has changed.

The reset works for trace modes min hold, max hold and average.

Note that the command has no effect if critical parameters like the span have been changed to avoid invalid measurement results

Parameters:

<State>

ON
The automatic reset is off.

OFF
The automatic reset is on.

*RST: OFF

Example: `DISP:WIND:TRAC3:MODE:HCON ON`
Switches off the reset function.

Manual control: See "Hold" on page 250

DISPlay[:WINDow<n>]:TRACe<t>[:STATe] <State>

This command turns a trace on and off.

The measurement continues in the background.

Parameters:

<State> ON | OFF

*RST: ON for TRACe1, OFF for TRACe2 to 6

Example: `DISP:TRAC3 ON`

Usage: SCPI confirmed

Manual control: See "Trace 1/Trace 2/Trace 3/Trace 4 (Softkeys)" on page 252

[SENSe:]AVERage<n>:COUNt <AverageCount>

This command defines the number of sweeps that the R&S FSW uses to average traces.

In case of continuous sweeps, the R&S FSW calculates the moving average over the average count.

In case of single sweep measurements, the R&S FSW stops the measurement and calculates the average after the average count has been reached.

The average count is valid for all measurement traces in a particular measurement window.

Parameters:

<AverageCount>

If you set a average count of 0 or 1, the R&S FSW performs one single sweep in single sweep mode.
In continuous sweep mode, if the average count is set to 0, a moving average over 10 sweeps is performed.

Range: 0 to 200000
*RST: 0

Usage: SCPI confirmed

Manual control: See "Sweep/Average Count" on page 203
See "Average Count" on page 251

[SENSe:]AVERage<n>[:STATe<t>] <State>

This command turns averaging for a particular trace in a particular window on and off.

Parameters:
<State> ON | OFF

Usage: SCPI confirmed

[SENSe:]AVERage<n>:TYPE <Mode>

This command selects the trace averaging mode.

Parameters:
<Mode>
VIDeo
The logarithmic power values are averaged.
LINear
The power values are averaged before they are converted to logarithmic values.
POWer
The power level values are converted into unit Watt prior to averaging. After the averaging, the data is converted back into its original unit.
*RST: VIDeo

Example: `AVER:TYPE LIN`
Switches to linear average calculation.

Usage: SCPI confirmed

Manual control: See "Average Mode" on page 250

[SENSe:][WINDow:]DETector<trace>[:FUNCtion] <Detector>

This command selects the detector.

Parameters:
<Detector> APEak | NEGative | POSitive | SAMPle | RMS | AVERage
*RST: APEak

Example: `DET POS`
Sets the detector to "positive peak".

Manual control: See "Detector" on page 250

[SENSe:][WINDow:]DETector<trace>[:FUNCtion]:AUTO <State>

This command couples and decouples the detector to the trace mode.

Parameters:
<State> ON | OFF
*RST: ON

Example: `DET:AUTO OFF`
The selection of the detector is not coupled to the trace mode.

Manual control: See "Detector" on page 250

TRACe<n>:COPY <TraceNumber>, <TraceNumber>

This command copies data from one trace to another.

Parameters:

<TraceNumber>, <TraceNumber> **TRACE1 | TRACE2 | TRACE3 | TRACE4 | TRACE5 | TRACE6**
The first parameter is the destination trace, the second parameter is the source.

Example: `TRAC:COPY TRACe1,TRACe2`
Copies the data from trace 2 to trace 1.

Usage: SCPI confirmed

Manual control: See "Copy Trace" on page 252

10.6.2.2 Configuring Spectrograms

In addition to the standard "level versus frequency" or "level versus time" spectrum traces, the R&S FSW also provides a spectrogram display of the measured data. A spectrogram shows how the spectral density of a signal varies over time. The x-axis shows the frequency, the y-axis shows the time. The commands required to configure spectrograms in a remote environment are described here. For details and manual operation see chapter 6.3.1.6, "Spectrograms", on page 242.

When configuring spectrograms, the window suffix is irrelevant. The settings are always applied to the spectrogram window, or to all spectrogram windows, if several are active for the same measurement channel.

For commands to set markers in spectrograms, see chapter 10.6.3.6, "Marker Search (Spectrograms)", on page 644.

Configuring a Spectrogram Measurement

CALCulate:SGRam:CLEar[:IMMediate]

This command resets the spectrogram and clears the history buffer.

Example: `CALC:SGR:CLE`
Resets the result display and clears the memory.

Usage: Event

Manual control: See "Spectrogram Frames" on page 205
See "Clear Spectrogram" on page 206

CALCulate:SGRam:CONT <State>

This command determines whether the results of the last measurement are deleted before starting a new measurement in single sweep mode.

Parameters:
<State> ON | OFF
*RST: OFF

Example: `INIT:CONT OFF`
Selects single sweep mode.
`INIT;*WAI`
Starts the sweep and waits for the end of the sweep.
`CALC:SGR:CONT ON`
Repeats the single sweep measurement without deleting the results of the last measurement.

Manual control: See "Spectrogram Frames" on page 205
See "Continue Frame" on page 205
See "State" on page 256

CALCulate:SGRam:FRAMe:COUNt <Frames>

This command defines the number of frames to be recorded in a single sweep.

Parameters:
<Frames> The maximum number of frames depends on the history depth.
Range: 1 to history depth
Increment: 1
*RST: 1

Example: `INIT:CONT OFF`
Selects single sweep mode.
`CALC:SGR:FRAM:COUN 200`
Sets the number of frames to 200.

Manual control: See "Spectrogram Frames" on page 205
See "Frame Count" on page 205

CALCulate:SGRam:FRAMe:SELect <Frame> | <Time>

This command selects a specific frame for further analysis.

The command is available if no measurement is running or after a single sweep has ended.

Parameters:

<Frame> Selects a frame directly by the frame number. Valid if the time stamp is off.
The range depends on the history depth.

<Time> Selects a frame via its time stamp. Valid if the time stamp is on. The number is the distance to frame 0 in seconds. The range depends on the history depth.

Example:
```
INIT:CONT OFF
```
Stop the continuous sweep.
```
CALC:SGR:FRAM:SEL -25
```
Selects frame number -25.

Manual control: See "Spectrogram Frames" on page 205
See "Select frame" on page 205

CALCulate:SGRam:HDEPth <History>

This command defines the number of frames to be stored in the R&S FSW memory.

Parameters:

<History> The maximum number of frames depends on the number of sweep points.

Range: 781 to 20000
Increment: 1
*RST: 3000

Example:
```
CALC:SGR:SPEC 1500
```
Sets the history depth to 1500.

Manual control: See "History Depth" on page 256

CALCulate:SGRam:TSTamp:DATA? <Frames>

This command queries the time stamp of the frames.

The frame results themselves are returned with `TRACe<n>[:DATA]`.

Query parameters:

<Frames>

CURRent
Returns the time stamp of the current frame.

ALL
Returns the time stamps of all frames. The results are sorted in descending order, beginning with the current frame.

Return values:

<Date> The return values consist of four values for each frame.
• date of the measurement in seconds that have passed since 01.01.1970
• milliseconds of the date for a higher resolution
These numbers are appropiate for relative uses, but you can also calculate the absolute date and time as displayed on the screen.
The third and fourth value are reserved for future uses.
If the Spectrogram is empty, the command returns '0,0,0,0'

Example: `CALC:SGR:TST ON`
Activates the time stamp.
`CALC:SGR:TST:DATA? ALL`
Returns the time stamp of all frames sorted in a descending order.

Usage: Query only

Manual control: See "Time Stamp" on page 257

CALCulate:SGRam:TSTamp[:STATe] <State>

This command activates and deactivates the time stamp.

If the time stamp is active, some commands do not address frames as numbers, but as (relative) time values:

- `CALCulate:DELTamarker<m>:SGRam:FRAMe` on page 648
- `CALCulate:MARKer<m>:SGRam:FRAMe` on page 644
- `CALCulate:SGRam:FRAMe:SELect` on page 619

Parameters:

<State> ON | OFF
*RST: OFF

Example: `CALC:SGR:TST ON`
Activates the time stamp.

Manual control: See "Time Stamp" on page 257

CALCulate:SGRam[:STATe] <State>

This command turns the spectrogram on and off.

Parameters:

<State> ON | OFF
*RST: OFF

Example: `CALC:SGR ON`
Activates the Spectrogram result display.

Manual control: See "State" on page 256

Configuring the Color Map

DISPlay:WINDow:SGRam:COLor:DEFault

This command restores the original color map.

Usage: Event

Manual control: See "Set to Default" on page 259

DISPlay:WINDow:SGRam:COLor:LOWer <Percentage>

This command defines the starting point of the color map.

Parameters:

<Percentage> Statistical frequency percentage.

Range: 0 to 66
*RST: 0
Default unit: %

Example: `DISP:WIND:SGR:COL:LOW 10`
Sets the start of the color map to 10%.

Manual control: See "Start / Stop" on page 258

DISPlay:WINDow:SGRam:COLor:SHAPe <Shape>

This command defines the shape and focus of the color curve for the spectrogram result display.

Parameters:

<Shape> Shape of the color curve.

Range: -1 to 1
*RST: 0

Manual control: See "Shape" on page 258

DISPlay:WINDow:SGRam:COLor:UPPer <Percentage>

This command defines the end point of the color map.

Parameters:

<Percentage> Statistical frequency percentage.

Range: 0 to 66
*RST: 0
Default unit: %

Example: DISP:WIND:SGR:COL:UPP 95
Sets the start of the color map to 95%.

Manual control: See "Start / Stop" on page 258

DISPlay:WINDow:SGRam:COLor[:STYLe] <ColorScheme>

This command selects the color scheme.

Parameters:

<ColorScheme>

HOT
Uses a color range from blue to red. Blue colors indicate low levels, red colors indicate high ones.

COLD
Uses a color range from red to blue. Red colors indicate low levels, blue colors indicate high ones.

RADar
Uses a color range from black over green to light turquoise with shades of green in between.

GRAYscale
Shows the results in shades of gray.

*RST: HOT

Example: DISP:WIND:SPEC:COL GRAY
Changes the color scheme of the spectrogram to black and white.

Manual control: See "Hot/Cold/Radar/Grayscale" on page 259

10.6.2.3 Using Trace Mathematics

The following commands control trace mathematics.

CALCulate<n>:MATH[:EXPression][:DEFine] <Expression>

This command selects the mathematical expression for trace mathematics.

Before you can use the command, you have to turn trace mathematics on.

Parameters:

<Expression>

(TRACE1-TRACE2)
Subtracts trace 2 from trace 1.

(TRACE1-TRACE3)
Subtracts trace 3 from trace 1.

(TRACE1-TRACE4)
Subtracts trace 4 from trace 1.

(TRACE1-TRACE5)
Subtracts trace 5 from trace 1.

(TRACE1-TRACE6)
Subtracts trace 6 from trace 1.

Example:

```
CALC:MATH:STAT ON
```

Turns trace mathematics on.

```
CALC:MATH:EXPR:DEF (TRACE1-TRACE3)
```

Subtracts trace 3 from trace 1.

Usage: SCPI confirmed

Manual control: See "Trace Math Function" on page 253

CALCulate<n>:MATH:MODE <Mode>

This command selects the way the R&S FSW calculates trace mathematics.

Parameters:

<Mode>

For more information on the way each mode works see Trace Math Mode.

LINear
Linear calculation.

LOGarithmic
Logarithmic calculation.

POWer
Linear power calculation.

*RST: LOGarithmic

Example:

```
CALC:MATH:MODE LIN
```

Selects linear calculation.

Manual control: See "Trace Math Mode" on page 254

CALCulate<n>:MATH:POSition <Position>

This command defines the position of the trace resulting from the mathematical operation.

Parameters:

<Position> Vertical position of the trace in % of the height of the diagram area. 100 PCT corresponds to the upper diagram border.

Range: -100 to 200
*RST: 50
Default unit: PCT

Example: `CALC:MATH:POS 100`
Moves the trace to the top of the diagram area.

Manual control: See "Trace Math Position" on page 254

CALCulate<n>:MATH:STATe <State>

This command turns the trace mathematics on and off.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CALC:MATH:STAT ON`
Turns on trace mathematics.

Usage: SCPI confirmed

Manual control: See "Trace Math Function" on page 253
See "Trace Math Off" on page 253

10.6.2.4 Retrieving Trace Results

This chapter describes how to retrieve data from standard traces.

For spectrograms see also chapter 10.6.3.6, "Marker Search (Spectrograms)", on page 644.

For details on the format of the retrieved trace data see also chapter 10.6.2.5, "Formats for Returned Values: ASCII Format and Binary Format", on page 627.

FORMat[:DATA] <Format>

This command selects the data format that is used for transmission of trace data from the R&S FSW to the controlling computer.

Note that the command has no effect for data that you send to the R&S FSW. The R&S FSW automatically recognizes the data it receives, regardless of the format.

For details on data formats see chapter 10.6.2.5, "Formats for Returned Values: ASCII Format and Binary Format", on page 627.

Parameters:

<Format>

ASCii
ASCii format, separated by commas.
This format is almost always suitable, regardless of the actual data format. However, the data is not as compact as other formats may be.

REAL,32
32-bit IEEE 754 floating-point numbers in the "definite length block format".
In the Spectrum application, the format setting `REAL` is used for the binary transmission of trace data.

*RST: ASCII

Example: `FORM REAL,32`

Usage: SCPI confirmed

TRACe<n>[:DATA] <Trace>,<Data> | <ResultType>

This command queries current trace data and measurement results.

If you use it as a setting command, it transfers trace data from an external source to the R&S FSW.

The data format depends on `FORMat[:DATA]`.

Parameters:

<Trace>

Selects the trace to write the data to.

TRACE1 | ... | TRACE6

<Data>

Contains the data to transfer.

Query parameters:

<ResultType>

Selects the type of result to be returned.

TRACE1 | ... | TRACE6
Returns the trace data for the corresponding trace.
For details see table 10-3.

LIST
Returns the results of the peak list evaluation for Spurious Emission and Spectrum Emission Mask measurements.
For details see table 10-4.

SPURious
Returns the peak list of Spurious Emission measurements.

SPECtrogram | SGRam
Returns the results of the spectrogram result display.
For details see table 10-5.

Return values:

<TraceData>

For more information see tables below.

Example: `TRAC TRACE1,+A$`
Transfers trace data ('+A$') to trace 1.

Example: TRAC? TRACE3
Queries the data of trace 3.

Usage: SCPI confirmed

Manual control: See "List Evaluation State" on page 93
See "List Evaluation State" on page 113

Table 10-3: Return values for TRACE1 to TRACE6 parameter

The trace data consists of a list of power levels that have been measured. The number of power levels in the list depends on the currently selected number of sweep points. The unit depends on the measurement and on the unit you have currently set. If you are measuring with the auto peak detector, the command returns positive peak values only. For SEM or Spurious Emission measurement results, the x-values should be queried as well, as they are not equi-distant (see TRACe<n>[:DATA]:X? on page 627).

Table 10-4: Return values for LIST parameter

For every measurement range you have defined (range 1...n), the command returns eight values in the following order. <No>,<StartFreq>,<StopFreq>,<RBW>,<PeakFreq>,<PowerAbs>,<PowerRel>,<PowerDelta>,<LimitCheck>,<Unused1>,<Unused2> • <No>: range number • <StartFreq>,<StopFreq>: start and stop frequency of the range • <RBW>: resolution bandwidth • <PeakFreq>: frequency of the peak in a range • <PowerAbs>: absolute power of the peak in dBm • <PowerRel>: power of the peak in relation to the channel power in dBc • <PowerDelta>: distance from the peak to the limit line in dB, positive values indicate a failed limit check • <LimitCheck>: state of the limit check (0 = PASS, 1 = FAIL) • <Unused1>,<Unused2>: reserved (0.0)

Table 10-5: Return values for SPECtrogram parameter

For every frame in the spectrogram, the command returns the power levels that have been measured, one for each sweep point. The number of frames depends on the size of the history depth. The power level depends on the unit you have currently set.

TRACe<n>[:DATA]:MEMory? <Trace>,<OffsSwPoint>,<NoOfSwPoints>

This command queries the previously captured trace data for the specified trace from the memory. As an offset and number of sweep points to be retrieved can be specified, the trace data can be retrieved in smaller portions, making the command faster than the TRAC:DATA? command. This is useful if only specific parts of the trace data are of interest.

If no parameters are specified with the command, the entire trace data is retrieved; in this case, the command is identical to TRAC:DATA? TRACE1

For details on the returned values see the TRAC:DATA? <TRACE...> command.

Query parameters:

<Trace> TRACE1 | TRACE2 | TRACE3 | TRACE4 | TRACE5 | TRACE6

<OffsSwPoint> The offset in sweep points related to the start of the measurement at which data retrieval is to start.

<NoOfSwPoints> Number of sweep points to be retrieved from the trace.

Example: `TRAC:DATA:MEM? TRACE1,25,100`
Retrieves 100 sweep points from trace 1, starting at sweep point 25.

Usage: Query only

TRACe<n>[:DATA]:X? <TraceNumber>

This command queries the horizontal trace data. This is especially useful for traces with non-equidistant x-values, e.g. for SEM or Spurious Emissions measurements.

Query parameters:

<TraceNumber> Trace number.
TRACE1 | ... | TRACE6

Example: `TRAC:X? TRAC1`
Returns the x-values for trace 1.

Usage: Query only

10.6.2.5 Formats for Returned Values: ASCII Format and Binary Format

When trace data is retrieved using the `TRAC:DATA` or `TRAC:IQ:DATA` command, the data is returned in the format defined using the `FORMat[:DATA]`. The possible formats are described here.

- ASCII Format (FORMat ASCII):
  The data is stored as a list of comma separated values (CSV) of the measured values in floating point format.
- Binary Format (FORMat REAL,32):
  The data is stored as 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 schema of the result string is 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>	4-byte floating point value

Reading out data in binary format is quicker than in ASCII format. Thus, binary format is recommended for large amounts of data.

10.6.3 Working with Markers

The commands required to work with markers and marker functions in a remote environment are described here. The tasks for manual operation are described in chapter 6.4, "Marker Usage", on page 265.

In the Spectrum application, markers are identical in all windows. Thus, the suffix <n> for the window is generally irrelevant.

10.6.3.1 Setting Up Individual Markers

The following commands define the position of markers in the diagram.

CALCulate<n>:DELTamarker:AOFF

This command turns all delta markers off.

Example: `CALC:DELT:AOFF`
Turns all delta markers off.

Usage: Event

CALCulate<n>:DELTamarker<m>:LINK <State>

This command links delta marker <m> to marker 1.

If you change the horizontal position (stimulus, x-value) of marker 1, delta marker <m> changes its horizontal position to the same value.

Tip: to link any marker to a different marker than marker 1, use the `CALCulate<n>:DELTamarker<m1>:LINK:TO:MARKer<m2>` or `CALCulate<n>:MARKer<m1>:LINK:TO:MARKer<m2>` commands.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CALC:DELT2:LINK ON`

Manual control: See "Linking to Another Marker" on page 277

CALCulate<n>:DELTamarker<m1>:LINK:TO:MARKer<m2> <State>

This command links delta marker <m1> to any active normal marker <m2>.

If you change the horizontal position of marker <m2>, delta marker <m1> changes its horizontal position to the same value.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CALC:DELT4:LINK:TO:MARK2 ON`
Links the delta marker 4 to the marker 2.

Manual control: See "Linking to Another Marker" on page 277

CALCulate<n>:DELTamarker:MODE <Mode>

This command selects the delta marker mode.

Parameters:

<Mode>

ABSolute
Delta marker position in absolute terms.

RELative
Delta marker position in relation to a reference marker.

*RST: RELative

Example: `CALC:DELT:MODE ABS`
Absolute delta marker position.

CALCulate<n>:DELTamarker<m>:MREF <Reference>

This command selects a reference marker for a delta marker other than marker 1.

The reference may be another marker or the fixed reference.

Parameters:

<Reference>

1 to 16
Selects markers 1 to 16 as the reference.

FIXed
Selects the fixed reference as the reference.

Example:
```
CALC:DELT3:MREF 2
```
Specifies that the values of delta marker 3 are relative to marker 2.

Manual control: See "Reference Marker" on page 277

CALCulate<n>:DELTamarker<m>[:STATe] <State>

This command turns delta markers on and off.

If necessary, the command activates the delta marker first.

No suffix at DELTamarker turns on delta marker 1.

Parameters:

<State>

ON | OFF

*RST: OFF

Example:
```
CALC:DELT2 ON
```
Turns on delta marker 2.

Manual control: See "Marker State" on page 276
See "Marker Type" on page 277

CALCulate<n>:DELTamarker<m>:TRACe <Trace>

This command selects the trace a delta marker is positioned on.

Note that the corresponding trace must have a trace mode other than "Blank".

If necessary, the command activates the marker first.

Parameters:

<Trace>

Trace number the marker is assigned to.

Example:
```
CALC:DELT2:TRAC 2
```
Positions delta marker 2 on trace 2.

CALCulate<n>:DELTamarker<m>:X <Position>

This command moves a delta marker to a particular coordinate on the x-axis.

If necessary, the command activates the delta marker and positions a reference marker to the peak power.

Parameters:

<Position> Numeric value that defines the marker position on the x-axis.
The position is relative to the reference marker.
To select an absolute position you have to change the delta marker mode with `CALCulate<n>:DELTamarker:MODE` on page 629.
A query returns the absolute position of the delta marker.

Range: The value range and unit depend on the measurement and scale of the x-axis.

Example: `CALC:DELT:X?`
Outputs the (absolute) x-value of delta marker 1.

Manual control: See "Marker 1/2/3/4" on page 148
See "Marker 1/2/3" on page 153
See "Marker Position (Stimulus)" on page 277

CALCulate<n>:MARKer<m>:AOFF

This command turns all markers off.

Example: `CALC:MARK:AOFF`
Switches off all markers.

Usage: Event

Manual control: See "All Markers Off" on page 278

CALCulate<n>:MARKer<m1>:LINK:TO:MARKer<m2> <State>

This command links normal marker <m1> to any active normal marker <m2>.

If you change the horizontal position of marker <m2>, marker <m1> changes its horizontal position to the same value.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CALC:MARK4:LINK:TO:MARK2 ON`
Links marker 4 to marker 2.

Manual control: See "Linking to Another Marker" on page 277

CALCulate<n>:MARKer<m>[:STATe] <State>

This command turns markers on and off. If the corresponding marker number is currently active as a deltamarker, it is turned into a normal marker.

Parameters:

<State> ON | OFF

*RST: OFF

Example: CALC:MARK3 ON
Switches on marker 3.

Manual control: See "Marker State" on page 276
See "Marker Type" on page 277

CALCulate<n>:MARKer<m>:TRACe <Trace>

This command selects the trace the marker is positioned on.

Note that the corresponding trace must have a trace mode other than "Blank".

If necessary, the command activates the marker first.

Parameters:
<Trace> **1 to 6**
Trace number the marker is assigned to.

Example: CALC:MARK3:TRAC 2
Assigns marker 3 to trace 2.

Manual control: See "Assigning the Marker to a Trace" on page 278

CALCulate<n>:MARKer<m>:X <Position>

This command moves a marker to a particular coordinate on the x-axis.

If necessary, the command activates the marker.

If the marker has been used as a delta marker, the command turns it into a normal marker.

Parameters:
<Position> Numeric value that defines the marker position on the x-axis.
The unit is either Hz (frequency domain) or s (time domain) or dB (statistics).
Range: The range depends on the current x-axis range.

Example: CALC:MARK2:X 1.7MHz
Positions marker 2 to frequency 1.7 MHz.

Manual control: See "Marker 1/2/3/4" on page 148
See "Marker 1/2/3" on page 153
See "Marker Position (Stimulus)" on page 277

10.6.3.2 General Marker Settings

The following commands control general marker functionality.

Remote commands exclusive to general marker functionality

DISPlay:MTABle <DisplayMode>

This command turns the marker table on and off.

Parameters:

<DisplayMode>

ON
Turns the marker table on.

OFF
Turns the marker table off.

AUTO
Turns the marker table on if 3 or more markers are active.

*RST: AUTO

Example:
```
DISP:MTAB ON
```
Activates the marker table.

Manual control: See "Marker Table Display" on page 279

CALCulate:MARKer:X:SSIZe <StepSize>

This command selects the marker step size mode.

The step size defines the distance the marker moves when you move it with the rotary knob. It therefore takes effect in manual operation only.

Parameters:

<StepSize>

STANdard
the marker moves from one pixel to the next

POINts
the marker moves from one sweep point to the next

*RST: POINts

Example:
```
CALC:MARK:X:SSIZ STAN
```
Sets the marker step size to one pixel.

Manual control: See "Marker Stepsize" on page 279

10.6.3.3 Configuring and Performing a Marker Search

The following commands control the marker search.

CALCulate:MARKer:LOEXclude <State>

This command turns the suppression of the local oscillator during automatic marker positioning on and off.

Parameters:

<State> ON | OFF

*RST: ON

Example: `CALC:MARK:LOEX ON`

Manual control: See "Exclude LO" on page 281

CALCulate<n>:MARKer:PEXCursion <Excursion>

This command defines the peak excursion.

The peak excursion sets the requirements for a peak to be detected during a peak search.

The unit depends on the measurement.

Application/Result display	Unit
Spectrum	dB

Parameters:

<Excursion> The excursion is the distance to a trace maximum that must be attained before a new maximum is recognized, or the distance to a trace minimum that must be attained before a new minimum is recognized

*RST: 6 dB in the Spectrum application and RF displays

Example: `CALC:MARK:PEXC 10dB`
Defines peak excursion as 10 dB.

Manual control: See "Peak Excursion" on page 282

CALCulate:MARKer:X:SLIMits[:STATe] <State>

This command turns marker search limits on and off.

If you perform a measurement in the time domain, this command limits the range of the trace to be analyzed.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CALC:MARK:X:SLIM ON`
Switches on search limitation.

Manual control: See "Search Limits (Left / Right)" on page 71
See "Deactivating All Search Limits" on page 71
See "Limit State" on page 134
See "Search Limits" on page 282
See "Search Limits" on page 286

CALCulate:MARKer:X:SLIMits:LEFT <SearchLimit>

This command defines the left limit of the marker search range.

If you perform a measurement in the time domain, this command limits the range of the trace to be analyzed.

Parameters:

<SearchLimit> The value range depends on the span or sweep time.
The unit is Hz for frequency domain measurements and s for time domain measurements.

*RST: left diagram border

Example: `CALC:MARK:X:SLIM ON`
Switches the search limit function on.
`CALC:MARK:X:SLIM:LEFT 10MHz`
Sets the left limit of the search range to 10 MHz.

Manual control: See "Search Limits (Left / Right)" on page 71
See "Left Limit / Right Limit" on page 134
See "Search Limits" on page 282
See "Search Limits" on page 286

CALCulate:MARKer:X:SLIMits:RIGHT <SearchLimit>

This command defines the right limit of the marker search range.

If you perform a measurement in the time domain, this command limits the range of the trace to be analyzed.

Parameters:

<Limit> The value range depends on the span or sweep time.
The unit is Hz for frequency domain measurements and s for time domain measurements.

*RST: right diagram border

Example: `CALC:MARK:X:SLIM ON`
Switches the search limit function on.
`CALC:MARK:X:SLIM:RIGH 20MHz`
Sets the right limit of the search range to 20 MHz.

Manual control: See "Search Limits (Left / Right)" on page 71
See "Left Limit / Right Limit" on page 134
See "Search Limits" on page 282
See "Search Limits" on page 286

CALCulate:MARKer:X:SLIMits:ZOOM[:STATe] <State>

This command adjusts the marker search range to the zoom area.

Parameters:
<State> ON | OFF
*RST: OFF

Example: `CALC:MARK:X:SLIM:ZOOM ON`
Switches the search limit function on.
`CALC:MARK:X:SLIM:RIGH 20MHz`
Sets the right limit of the search range to 20 MHz.

Manual control: See "Search Limits" on page 282
See "Using Zoom Limits" on page 283
See "Search Limits" on page 286

CALCulate:THReshold <Level>

This command defines a threshold level for the marker peak search.

Parameters:
<Level> Numeric value. The value range and unit are variable.
*RST: -120 dBm

Example: `CALC:THR -82DBM`
Sets the threshold value to -82 dBm.

Manual control: See "Search Limits" on page 282
See "Search Threshold" on page 282
See "Search Limits" on page 286

CALCulate:THReshold:STATe <State>

This command turns a threshold for the marker peak search on and off.

Parameters:
<State> ON | OFF
*RST: OFF

Example: `CALC:THR:STAT ON`
Switches on the threshold line.

Manual control: See "Deactivating All Search Limits" on page 71
See "Search Limits" on page 282
See "Search Limits" on page 286

10.6.3.4 Positioning the Marker

This chapter contains remote commands necessary to position the marker on a trace.

Positioning Normal Markers

The following commands position markers on the trace.

CALCulate<n>:MARKer<m>:MAXimum:AUTO <State>

This command turns an automatic marker peak search for a trace maximum on and off. The R&S FSW performs the peak search after each sweep.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CALC:MARK:MAX:AUTO ON`
Activates the automatic peak search function for marker 1 at the end of each particular sweep.

Manual control: See "Automatic Peak Search" on page 282

CALCulate<n>:MARKer<m>:MAXimum:LEFT

This command moves a marker to the next lower peak.

The search includes only measurement values to the left of the current marker position.

In the spectrogram, the vertical marker position remains the same.

Usage: Event

Manual control: See "Search Mode for Next Peak" on page 281
See "Search Mode for Next Peak in X Direction" on page 284

CALCulate<n>:MARKer<m>:MAXimum:NEXT

This command moves a marker to the next lower peak.

In the spectrogram, the vertical marker position remains the same.

Usage: Event

Manual control: See "Search Mode for Next Peak" on page 281
See "Search Mode for Next Peak in X Direction" on page 284
See "Search Next Peak" on page 287

CALCulate<n>:MARKer<m>:MAXimum[:PEAK]

This command moves a marker to the highest level.

In the spectrogram, the command moves a marker horizontally to the highest level in the currently selected frame. The vertical marker position remains the same.

If the marker hasn't been active yet, the command first activates the marker.

Usage: Event

Manual control: See "Marker Search Type" on page 284
See "Peak Search" on page 287

CALCulate<n>:MARKer<m>:MAXimum:RIGHt

This command moves a marker to the next lower peak.

The search includes only measurement values to the right of the current marker position.

In the spectrogram, the vertical marker position remains the same.

Usage: Event

Manual control: See "Search Mode for Next Peak" on page 281
See "Search Mode for Next Peak in X Direction" on page 284

CALCulate<n>:MARKer<m>:MINimum:AUTO <State>

This command turns an automatic marker peak search for a trace minimum on and off. The R&S FSW performs the peak search after each sweep.

Parameters:
<State> ON | OFF
*RST: OFF

Example: `CALC:MARK:MIN:AUTO ON`
Activates the automatic minimum value search function for marker 1 at the end of each particular sweep.

Manual control: See "Automatic Peak Search" on page 282

CALCulate<n>:MARKer<m>:MINimum:LEFT

This command moves a marker to the next minimum value.

The search includes only measurement values to the right of the current marker position.

In the spectrogram, the vertical marker position remains the same.

Usage: Event

Manual control: See "Search Mode for Next Peak" on page 281
See "Search Mode for Next Peak in X Direction" on page 284

CALCulate<n>:MARKer<m>:MINimum:NEXT

This command moves a marker to the next minimum value.

In the spectrogram, the vertical marker position remains the same.

Usage: Event

Manual control: See "Search Mode for Next Peak" on page 281
See "Search Mode for Next Peak in X Direction" on page 284
See "Search Next Minimum" on page 287

CALCulate<n>:MARKer<m>:MINimum[:PEAK]

This command moves a marker to the minimum level.

In the spectrogram, the command moves a marker horizontally to the minimum level in the currently selected frame. The vertical marker position remains the same.

If the marker hasn't been active yet, the command first activates the marker.

Usage: Event

Manual control: See "Marker Search Type" on page 284
See "Search Minimum" on page 287

CALCulate<n>:MARKer<m>:MINimum:RIGHt

This command moves a marker to the next minimum value.

The search includes only measurement values to the right of the current marker position.

In the spectrogram, the vertical marker position remains the same.

Usage: Event

Manual control: See "Search Mode for Next Peak" on page 281
See "Search Mode for Next Peak in X Direction" on page 284

Positioning Delta Markers

The following commands position delta markers on the trace.

CALCulate<n>:DELTamarker<m>:MAXimum:LEFT

This command moves a delta marker to the next higher value.

The search includes only measurement values to the left of the current marker position.

In the spectrogram, the vertical marker position remains the same.

Usage: Event

Manual control: See "Search Mode for Next Peak" on page 281

CALCulate<n>:DELTamarker<m>:MAXimum:NEXT

This command moves a marker to the next higher value.

In the spectrogram, the vertical marker position remains the same.

Usage: Event

Manual control: See "Search Mode for Next Peak" on page 281
See "Search Next Peak" on page 287

CALCulate<n>:DELTamarker<m>:MAXimum[:PEAK]

This command moves a delta marker to the highest level.

In the spectrogram, the command moves a marker horizontally to the highest level in the currently selected frame. The vertical marker position remains the same.

If the marker hasn't been active yet, the command first activates the marker.

Usage: Event

Manual control: See "Marker Search Type" on page 284
See "Peak Search" on page 287

CALCulate<n>:DELTamarker<m>:MAXimum:RIGHt

This command moves a delta marker to the next higher value.

The search includes only measurement values to the right of the current marker position.

In the spectrogram, the vertical marker position remains the same.

Usage: Event

Manual control: See "Search Mode for Next Peak" on page 281

CALCulate<n>:DELTamarker<m>:MINimum:LEFT

This command moves a delta marker to the next higher minimum value.

The search includes only measurement values to the right of the current marker position.

In the spectrogram, the vertical marker position remains the same.

Usage: Event

Manual control: See "Search Mode for Next Peak" on page 281

CALCulate<n>:DELTamarker<m>:MINimum:NEXT

This command moves a marker to the next higher minimum value.

In the spectrogram, the vertical marker position remains the same.

Usage: Event

Manual control: See "Search Mode for Next Peak" on page 281
See "Search Next Minimum" on page 287

CALCulate<n>:DELTamarker<m>:MINimum[:PEAK]

This command moves a delta marker to the minimum level.

In the spectrogram, the command moves a delta marker horizontally to the minimum level in the currently selected frame. The vertical marker position remains the same.

If the marker hasn't been active yet, the command first activates the marker.

Usage: Event

Manual control: See "Marker Search Type" on page 284
See "Search Minimum" on page 287

CALCulate<n>:DELTamarker<m>:MINimum:RIGHt

This command moves a delta marker to the next higher minimum value.

The search includes only measurement values to the right of the current marker position.

In the spectrogram, the vertical marker position remains the same.

Usage: Event

Manual control: See "Search Mode for Next Peak" on page 281

10.6.3.5 Retrieving Marker Results

The following commands are used to retrieve the results of markers.

You can use the marker values to position the center frequency or reference level directly using the following commands:

- `CALCulate<n>:MARKer<m>:FUNCtion:CENTer` on page 563
- `CALCulate<n>:MARKer<m>:FUNCtion:REFerence` on page 575

Useful commands for retrieving results described elsewhere:

- `CALCulate<n>:DELTamarker<m>:X` on page 630
- `CALCulate<n>:MARKer<m>:X` on page 632
- `CALCulate:MARKer:FUNCtion:FPEaks:COUNt?` on page 652
- `CALCulate:MARKer:FUNCtion:FPEeaks:X?` on page 654

- CALCulate:MARKer:FUNCtion:FPEeaks:Y? on page 654
- CALCulate<n>:MARKer<m>:FUNCtion:NOISe:RESult? on page 655
- CALCulate<n>:DELTamarker<m>:FUNCtion:PNOise:RESult? on page 656
- CALCulate<n>:DELTamarker<m>:FUNCtion:BPOWer:RESult? on page 659
- CALCulate<n>:MARKer<m>:FUNCtion:BPOWer:RESult? on page 657
- CALCulate<n>:MARKer<m>:FUNCtion:NDBDown:RESult? on page 660
- CALCulate<n>:MARKer<m>:FUNCtion:NDBDown:FREQuency? on page 660
- CALCulate:MARKer:FUNCtion:NDBDown:QFACtor? on page 660
- CALCulate<n>:MARKer<m>:COUNt:FREQuency? on page 662

Remote commands exclusive to retrieving marker results

CALCulate<n>:DELTamarker<m>:X:RELative?

This command queries the relative position of a delta marker on the x-axis.

If necessary, the command activates the delta marker first.

Return values:

<Position> Position of the delta marker in relation to the reference marker or the fixed reference.

Example: CALC:DELT3:X:REL?
Outputs the frequency of delta marker 3 relative to marker 1 or relative to the reference position.

Usage: Query only

Manual control: See "Marker 1/2/3/4" on page 148
See "Marker 1/2/3" on page 153

CALCulate<n>:DELTamarker<m>:Y?

This command queries the relative position of a delta marker on the y-axis.

If necessary, the command activates the delta marker first.

To get a valid result, you have to perform a complete measurement with synchronization to the end of the measurement before reading out the result. This is only possible for single sweeps. See also INITiate:CONTinuous on page 460.

The unit depends on the application of the command.

Table 10-6: Base unit

Parameter, measuring function or result display	Output unit
DBM | DBPW | DBUV | DBMV | DBUA	dB (lin/log)
WATT | VOLT | AMPere	dB (lin), % (log)
statistics function (APD or CCDF) on	dimensionless output

Return values:

<Position> Position of the delta marker in relation to the reference marker or the fixed reference.

Example:

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

Usage: Query only

CALCulate<n>:MARKer<m>:Y?

This command queries the position of a marker on the y-axis.

If necessary, the command activates the marker first.

To get a valid result, you have to perform a complete measurement with synchronization to the end of the measurement before reading out the result. This is only possible for single sweeps. See also `INITiate:CONTinuous` on page 460.

Return values:

<Result> Result at the marker position.
The unit is variable and depends on the one you have currently set.

Example:

```
INIT:CONT OFF
```
Switches to single measurement mode.
```
CALC:MARK2 ON
```
Switches marker 2.
```
INIT;*WAI
```
Starts a measurement and waits for the end.
```
CALC:MARK2:Y?
```
Outputs the measured value of marker 2.

Usage: Query only

10.6.3.6 Marker Search (Spectrograms)

The following commands automatically define the marker and delta marker position in the spectrogram.

Using Markers

The following commands control spectrogram markers.

Useful commands for spectrogram markers described elsewhere

The following commands define the horizontal position of the markers.

- `CALCulate<n>:MARKer<m>:MAXimum:LEFT` on page 637
- `CALCulate<n>:MARKer<m>:MAXimum:NEXT` on page 637
- `CALCulate<n>:MARKer<m>:MAXimum[:PEAK]` on page 638
- `CALCulate<n>:MARKer<m>:MAXimum:RIGHt` on page 638
- `CALCulate<n>:MARKer<m>:MINimum:LEFT` on page 638
- `CALCulate<n>:MARKer<m>:MINimum:NEXT` on page 639
- `CALCulate<n>:MARKer<m>:MINimum[:PEAK]` on page 639
- `CALCulate<n>:MARKer<m>:MINimum:RIGHt` on page 639

Remote commands exclusive to spectrogram markers

CALCulate:MARKer<m>:SGRam:FRAMe <Frame> | <Time>

This command positions a marker on a particular frame.

Parameters:

<Frame> Selects a frame directly by the frame number. Valid if the time stamp is off.
The range depends on the history depth.

<Time> Selects a frame via its time stamp. Valid if the time stamp is on. The number is the (negative) distance to frame 0 in seconds. The range depends on the history depth.

Example: `CALC:MARK:SGR:FRAM -20`
Sets the marker on the 20th frame before the present.
`CALC:MARK2:SGR:FRAM -2s`
Sets second marker on the frame 2 seconds ago.

Manual control: See "Frame (Spectrogram only)" on page 277

CALCulate:MARKer:SGRam:SARea <SearchArea>

This command defines the marker search area for all markers.

Parameters:
<SearchArea>

VISible
Performs a search within the visible frames.
Note that the command does not work if the spectrogram is not visible for any reason (e.g. if the display update is off).

MEMory
Performs a search within all frames in the memory.

*RST: VISible

Manual control: See "Marker Search Area" on page 285

CALCulate:MARKer<m>:SGRam:XY:MAXimum[:PEAK]

This command moves a marker to the highest level of the spectrogram.

Usage: Event

Manual control: See "Marker Search Type" on page 284

CALCulate:MARKer<m>:SGRam:XY:MINimum[:PEAK]

This command moves a marker to the minimum level of the spectrogram.

Usage: Event

Manual control: See "Marker Search Type" on page 284

CALCulate:MARKer<m>:SGRam:Y:MAXimum:ABOVe

This command moves a marker vertically to the next lower peak level for the current frequency.

The search includes only frames above the current marker position. It does not change the horizontal position of the marker.

Usage: Event

Manual control: See "Search Mode for Next Peak in Y Direction" on page 284

CALCulate:MARKer<m>:SGRam:Y:MAXimum:BELow

This command moves a marker vertically to the next lower peak level for the current frequency.

The search includes only frames below the current marker position. It does not change the horizontal position of the marker.

Usage: Event

Manual control: See "Search Mode for Next Peak in Y Direction" on page 284

CALCulate:MARKer<m>:SGRam:Y:MAXimum:NEXT

This command moves a marker vertically to the next lower peak level for the current frequency.

The search includes all frames. It does not change the horizontal position of the marker.

Usage: Event

Manual control: See "Search Mode for Next Peak in Y Direction" on page 284

CALCulate:MARKer<m>:SGRam:Y:MAXimum[:PEAK]

This command moves a marker vertically to the highest level for the current frequency.

The search includes all frames. It does not change the horizontal position of the marker.

If the marker hasn't been active yet, the command looks for the peak level in the whole spectrogram.

Usage: Event

Manual control: See "Marker Search Type" on page 284

CALCulate:MARKer<m>:SGRam:Y:MINimum:ABOVe

This command moves a marker vertically to the next higher minimum level for the current frequency.

The search includes only frames above the current marker position. It does not change the horizontal position of the marker.

Usage: Event

Manual control: See "Search Mode for Next Peak in Y Direction" on page 284

CALCulate:MARKer<m>:SGRam:Y:MINimum:BELow

This command moves a marker vertically to the next higher minimum level for the current frequency.

The search includes only frames below the current marker position. It does not change the horizontal position of the marker.

Usage: Event

Manual control: See "Search Mode for Next Peak in Y Direction" on page 284

CALCulate:MARKer<m>:SGRam:Y:MINimum:NEXT

This command moves a marker vertically to the next higher minimum level for the current frequency.

The search includes all frames. It does not change the horizontal position of the marker.

Usage: Event

Manual control: See "Search Mode for Next Peak in Y Direction" on page 284

CALCulate:MARKer<m>:SGRam:Y:MINimum[:PEAK]

This command moves a marker vertically to the minimum level for the current frequency.

The search includes all frames. It does not change the horizontal position of the marker.

If the marker hasn't been active yet, the command first looks for the peak level for all frequencies and moves the marker vertically to the minimum level.

Usage: Event

Manual control: See "Marker Search Type" on page 284

Using Delta Markers

The following commands control spectrogram delta markers.

Useful commands for spectrogram markers described elsewhere

The following commands define the horizontal position of the delta markers.

- `CALCulate<n>:DELTamarker<m>:MAXimum:LEFT` on page 639
- `CALCulate<n>:DELTamarker<m>:MAXimum:NEXT` on page 640
- `CALCulate<n>:DELTamarker<m>:MAXimum[:PEAK]` on page 640
- `CALCulate<n>:DELTamarker<m>:MAXimum:RIGHt` on page 640
- `CALCulate<n>:DELTamarker<m>:MINimum:LEFT` on page 640
- `CALCulate<n>:DELTamarker<m>:MINimum:NEXT` on page 641
- `CALCulate<n>:DELTamarker<m>:MINimum[:PEAK]` on page 641
- `CALCulate<n>:DELTamarker<m>:MINimum:RIGHt` on page 641

Remote commands exclusive to spectrogram markers

CALCulate:DELTamarker<m>:SGRam:FRAMe <Frame> | <Time>

This command positions a delta marker on a particular frame. The frame is relative to the position of marker 1.

The command is available for the spectrogram.

Parameters:

<Frame> Selects a frame directly by the frame number. Valid if the time stamp is off.
The range depends on the history depth.

<Time> Selects a frame via its time stamp. Valid if the time stamp is on. The number is the distance to frame 0 in seconds. The range depends on the history depth.

Example:
```
CALC:DELT4:SGR:FRAM -20
```
Sets fourth deltamarker 20 frames below marker 1.
```
CALC:DELT4:SGR:FRAM 2 s
```
Sets fourth deltamarker 2 seconds above the position of marker 1.

CALCulate:DELTamarker<m>:SGRam:SAREa <SearchArea>

This command defines the delta marker search area.

Parameters:

<SearchArea>

VISible
Performs a search within the visible frames.
Note that the command does not work if the spectrogram is not visible for any reason (e.g. if the display update is off).

MEMory
Performs a search within all frames in the memory.

*RST: VISible

Manual control: See "Marker Search Area" on page 285

CALCulate:DELTamarker<m>:SGRam:XY:MAXimum[:PEAK]

This command moves a marker to the highest level of the spectrogram over all frequencies.

Usage: Event

Manual control: See "Marker Search Type" on page 284

CALCulate:DELTamarker<m>:SGRam:XY:MINimum[:PEAK]

This command moves a delta marker to the minimum level of the spectrogram over all frequencies.

Usage: Event

Manual control: See "Marker Search Type" on page 284

CALCulate:DELTamarker<m>:SGRam:Y:MAXimum:ABOVe

This command moves a marker vertically to the next higher level for the current frequency.

The search includes only frames above the current marker position. It does not change the horizontal position of the marker.

Usage: Event

Manual control: See "Search Mode for Next Peak in Y Direction" on page 284

CALCulate:DELTamarker<m>:SGRam:Y:MAXimum:BELow

This command moves a marker vertically to the next higher level for the current frequency.

The search includes only frames below the current marker position. It does not change the horizontal position of the marker.

Usage: Event

Manual control: See "Search Mode for Next Peak in Y Direction" on page 284

CALCulate:DELTamarker<m>:SGRam:Y:MAXimum:NEXT

This command moves a delta marker vertically to the next higher level for the current frequency.

The search includes all frames. It does not change the horizontal position of the marker.

Usage: Event

Manual control: See "Search Mode for Next Peak in Y Direction" on page 284

CALCulate:DELTamarker<m>:SGRam:Y:MAXimum[:PEAK]

This command moves a delta marker vertically to the highest level for the current frequency.

The search includes all frames. It does not change the horizontal position of the marker.

If the marker hasn't been active yet, the command looks for the peak level in the whole spectrogram.

Usage: Event

Manual control: See "Marker Search Type" on page 284

CALCulate:DELTamarker<m>:SGRam:Y:MINimum:ABOVe

This command moves a delta marker vertically to the next minimum level for the current frequency.

The search includes only frames above the current marker position. It does not change the horizontal position of the marker.

Usage: Event

Manual control: See "Search Mode for Next Peak in Y Direction" on page 284

CALCulate:DELTamarker<m>:SGRam:Y:MINimum:BELow

This command moves a delta marker vertically to the next minimum level for the current frequency.

The search includes only frames below the current marker position. It does not change the horizontal position of the marker.

Usage: Event

Manual control: See "Search Mode for Next Peak in Y Direction" on page 284

CALCulate:DELTamarker<m>:SGRam:Y:MINimum:NEXT

This command moves a delta marker vertically to the next minimum level for the current frequency.

The search includes all frames. It does not change the horizontal position of the marker.

Usage: Event

Manual control: See "Search Mode for Next Peak in Y Direction" on page 284

CALCulate:DELTamarker<m>:SGRam:Y:MINimum[:PEAK]

This command moves a delta marker vertically to the minimum level for the current frequency.

The search includes all frames. It does not change the horizontal position of the marker.

If the marker hasn't been active yet, the command first looks for the peak level in the whole spectrogram and moves the marker vertically to the minimum level.

Usage: Event

Manual control: See "Marker Search Type" on page 284

10.6.3.7 Fixed Reference Marker Settings

The following commands configure a fixed reference marker.

CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:MAXimum[:PEAK]

This command moves the fixed reference marker to the peak power.

Example: `CALC:DELT:FUNC:FIX:RPO:MAX`
Sets the reference point level for delta markers to the peak of the selected trace.

Usage: Event

Manual control: See "Defining a Fixed Reference" on page 279
See "Defining a Reference Point" on page 292

CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:X <RefPoint>

This command defines the horizontal position of the fixed delta marker reference point. The coordinates of the reference may be anywhere in the diagram.

Parameters:
<RefPoint> Numeric value that defines the horizontal position of the reference.
For frequency domain measurements, it is a frequency in Hz.
For time domain measurements, it is a point in time in s.
*RST: Fixed Reference: OFF

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

Manual control: See "Defining a Fixed Reference" on page 279
See "Defining a Reference Point" on page 292

CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:Y <RefPointLevel>

This command defines the vertical position of the fixed delta marker reference point. The coordinates of the reference may be anywhere in the diagram.

Parameters:
<RefPoint> Numeric value that defines the vertical position of the reference.
The unit and value range is variable.
*RST: Fixed Reference: OFF

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

Manual control: See "Defining a Fixed Reference" on page 279
See "Defining a Reference Point" on page 292

CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:Y:OFFSet <Offset>

This command defines a level offset for the fixed delta marker reference point.

Parameters:
<Offset> Numeric value
*RST: 0
Default unit: dB

10.6.3.8 Marker Peak Lists

Useful commands for peak lists described elsewhere

- `CALCulate<n>:MARKer:PEXCursion` on page 634
- `MMEMory:STORe:LIST` on page 696

Remote commands exclusive to peak lists

CALCulate<n>:MARKer<m>:FUNCtion:FPEaks:ANNotation:LABel[:STATe]
<State>

This command turns labels for peaks found during a peak search on and off.

The labels correspond to the marker number in the marker peak list.

Parameters:
<State> ON | OFF
*RST: ON

Example: `CALC:MARK:FUNC:FPE:ANN:LAB:STAT OFF`
Removes the peak labels from the diagram

Manual control: See "Displaying Marker Numbers" on page 299

CALCulate:MARKer:FUNCtion:FPEaks:COUNt?

This command queries the number of peaks that have been found during a peak search.

The actual number of peaks that have been found may differ from the number of peaks you have set to be found because of the peak excursion.

Return values:
<NumberOfPeaks>

Example: `CALC:MARK:FUNC:FPE:COUN?`
Queries the number of peaks.

Usage: Query only

CALCulate<n>:MARKer<m>:FUNCtion:FPEaks[:IMMediate] <Peaks>

This command initiates a peak search.

Parameters:
<Peaks> This parameter defines the number of peaks to find during the search.
Note that the actual number of peaks found during the search also depends on the peak excursion you have set with `CALCulate<n>:MARKer:PEXCursion`.

Range: 1 to 200

Example: `CALC:MARK:PEXC 5`
Defines a peak excursion of 5 dB, i.e. peaks must be at least 5 dB apart to be detected as a peak.
`CALC:MARK:FUNC:FPE 10`
Initiates a search for 10 peaks on the current trace.

CALCulate<n>:MARKer<m>:FUNCtion:FPEaks:LIST:SIZE <MaxNoPeaks>

This command defines the maximum number of peaks that the R&S FSW looks for during a peak search.

Parameters:
<MaxNoPeaks> Maximum number of peaks to be determined.

Range: 1 to 200
*RST: 50

Example: `CALC:MARK:FUNC:FPE:LIST:SIZE 10`
The marker peak list will contain a maximum of 10 peaks.

Manual control: See "Maximum Number of Peaks" on page 299

CALCulate<n>:MARKer<m>:FUNCtion:FPEaks:SORT <SortMode>

This command selects the order in which the results of a peak search are returned.

Parameters:

<SortMode>

X
Sorts the peaks according to increasing position on the x-axis.

Y
Sorts the peaks according to decreasing position on the y-axis.

*RST: X

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

Manual control: See "Sort Mode" on page 299

CALCulate<n>:MARKer<m>:FUNCtion:FPEaks:STAT <State>

This command turns a peak search on and off.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CALC:MARK:FUNC:FPE:STAT ON`
Activates marker peak search

Manual control: See "Peak List State" on page 298

CALCulate:MARKer:FUNCtion:FPEeaks:X?

This command queries the position of the peaks on the x-axis.

The order depends on the sort order that has been set with `CALCulate<n>:MARKer<m>:FUNCtion:FPEaks:SORT`.

Return values:

<PeakPosition> Position of the peaks on the x-axis. The unit depends on the measurement.

Usage: Query only

CALCulate:MARKer:FUNCtion:FPEeaks:Y?

This command queries the position of the peaks on the y-axis.

The order depends on the sort order that has been set with `CALCulate<n>:MARKer<m>:FUNCtion:FPEaks:SORT`.

Return values:

<PeakPosition> Position of the peaks on the y-axis. The unit depends on the measurement.

Usage: Query only

10.6.3.9 Noise Measurement Marker

The following commands control the noise measurement marker function.

CALCulate<n>:MARKer<m>:FUNCtion:NOISe:RESult?

This command queries the result of the noise measurement.

To get a valid result, you have to perform a complete measurement with synchronization to the end of the measurement before reading out the result. This is only possible for single sweeps. See also `INITiate:CONTinuous` on page 460.

Return values:

<NoiseLevel> Current noise level. The unit is the one currently active.

Example:

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

Usage: Query only

Manual control: See "Noise Measurement State" on page 291

CALCulate<n>:MARKer<m>:FUNCtion:NOISe[:STATe] <State>

This command turns the noise measurement at the marker position on and off.

Parameters:

<State> ON | OFF

*RST: OFF

Example:

```
CALC:MARK:FUNC:NOIS ON
```
Switches on the noise measurement.

Manual control: See "Noise Measurement State" on page 291
See "Switching All Noise Measurements Off" on page 291

10.6.3.10 Phase Noise Measurement Marker

The following commands control the phase noise measurement marker function.

Useful commands for phase noise markers described elsewhere

- CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:MAXimum[:PEAK]
- CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:X
- CALCulate<n>:DELTamarker<m>:FUNCtion:FIXed:RPOint:Y

Remote commands exclusive to phase noise markers

CALCulate<n>:DELTamarker<m>:FUNCtion:PNOise:AUTO <State>

This command turns an automatic peak search for the fixed reference marker at the end of a sweep on and off.

Parameters:
<State> ON | OFF
*RST: OFF

Example: CALC:DELT:FUNC:PNO:AUTO ON
Activates an automatic peak search for the reference marker in a phase-noise measurement.

Manual control: See "Defining a Reference Point" on page 292

CALCulate<n>:DELTamarker<m>:FUNCtion:PNOise:RESult?

This command queries the result of a phase noise measurement.

If necessary, the command activates the measurement first.

Return values:
<PhaseNoise>

Example: CALC:DELT2:FUNC:PNO:RES?
Outputs the result of phase-noise measurement of the delta-marker 2.

Usage: Query only

Manual control: See "Phase Noise Measurement State" on page 292

CALCulate<n>:DELTamarker<m>:FUNCtion:PNOise[:STATe] <State>

This command turns the phase noise measurement at the delta marker position on and off.

The reference marker for phase noise measurements is either a normal marker or a fixed reference. If necessary, the command turns on the reference marker.

The correction values for the bandwidth and the log amplifier are taken into account in the measurement.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CALC:DELT:FUNC:PNO ON`
Switches on the phase-noise measurement with all delta markers.
`CALC:DELT:FUNC:FIX:RPO:X 128 MHZ`
Sets the frequency reference to 128 MHz.
`CALC:DELT:FUNC:FIX:RPO:Y 30 DBM`
Sets the reference level to +30 dBm

Manual control: See "Phase Noise Measurement State" on page 292
See "Switching All Phase Noise Measurements Off" on page 293

10.6.3.11 Band Power Marker

The following commands control the marker for band power measurements.

Using Markers

CALCulate<n>:MARKer<m>:FUNCtion:BPOWer:MODE <Mode>

This command selects the way the results for a band power marker are displayed.

Parameters:

<Mode> **POWer**
Result is displayed as a power in dBm.
DENSity
Result is displayed as a density in dBm/Hz.
*RST: POWer

Example: `CALC:MARK4:FUNC:BPOW:MODE DENS`
Configures marker 4 to show the measurement results in dBm/Hz.

Manual control: See "Power Mode" on page 296

CALCulate<n>:MARKer<m>:FUNCtion:BPOWer:RESult?

This command queries the results of the band power measurement.

Return values:

<Power> Signal power over the marker bandwidth.

Example: Activate the band power marker:
```
CALC:MARK:FUNC:BPOW:STAT ON
```
Select the density mode for the result:
```
CALC:MARK:FUNC:BPOW:MODE DENS
```
Query the result:
```
CALC:MARK:FUNC:BPOW:RES?
```
Response:
```
20dBm/Hz
```

Usage: Query only

CALCulate<n>:MARKer<m>:FUNCtion:BPOWer:SPAN <Span>

This command defines the bandwidth around the marker position.

Parameters:

<Span> Frequency. The maximum span depends on the marker position and R&S FSW model.

*RST: 5% of current span
Default unit: Hz

Example:
```
CALC:MARK:FUNC:BPOW:SPAN 2MHz
```
Measures the band power over 2 MHz around the marker.

Manual control: See "Span" on page 296

CALCulate<n>:MARKer<m>:FUNCtion:BPOWer[:STATe] <State>

This command turns markers for band power measurements on and off.

Parameters:

<State> ON | OFF

*RST: OFF

Example:
```
CALC:MARK4:FUNC:BPOW:STAT ON
```
Activates or turns marker 4 into a band power marker.

Manual control: See "Band Power Measurement State" on page 295
See "Switching All Band Power Measurements Off" on page 296

Using Delta Markers

CALCulate<n>:DELTamarker<m>:FUNCtion:BPOWer:MODE <Mode>

This command selects the way the results for a band power delta marker are displayed.

Parameters:

<Mode>

POWer
Result is displayed as a power in dBm.

DENSity
Result is displayed as a density in dBm/Hz.

*RST: POWer

CALCulate<n>:DELTamarker<m>:FUNCtion:BPOWer:RESult?

This command queries the results of the band power measurement.

Return values:

<Power> Signal power over the delta marker bandwidth.

Usage: Query only

CALCulate<n>:DELTamarker<m>:FUNCtion:BPOWer:SPAN <Span>

This command defines the bandwidth around the delta marker position.

Parameters:

<Span> Frequency. The maximum span depends on the marker position and R&S FSW model.

*RST: 5% of current span
Default unit: Hz

CALCulate<n>:DELTamarker<m>:FUNCtion:BPOWer[:STATe] <State>

This command turns delta markers for band power measurements on and off.

If neccessary, the command also turns on a reference marker.

Parameters:

<State> ON | OFF

*RST: OFF

10.6.3.12 n dB Down Marker

The following commands control the n dB down markers.

CALCulate<n>:MARKer<m>:FUNCtion:NDBDown <Distance>

This command defines the distance of the n dB down markers to the reference marker.

Parameters:

<Distance> Distance of the temporary markers to the reference marker in dB.

*RST: 6dB

Example: `CALC:MARK:FUNC:NDBD 3dB`
Sets the distance to the reference marker to 3 dB.

CALCulate<n>:MARKer<m>:FUNCtion:NDBDown:FREQuency?

This command queries the position of the n dB down markers on the x-axis when measuring in the frequency domain.

To get a valid result, you have to perform a complete measurement with synchronization to the end of the measurement before reading out the result. This is only possible for single sweeps. See also `INITiate:CONTinuous` on page 460.

Return values:

<Frequency> **<frequency 1>**
absolute frequency of the n dB marker to the left of the reference marker in Hz

<frequency 2>
absolute frequency of the n dB marker to the right of the reference marker in Hz.

Example: `INIT:CONT OFF`
Switches to single sweep mode.
`CALC:MARK:FUNC:NDBD ON`
Switches on the n dB down function.
`INIT;*WAI`
Starts a sweep and waits for the end.
`CALC:MARK:FUNC:NDBD:FREQ?`
This command would return, for example, 100000000, 200000000, meaning that the first marker position is at 100 MHz, the second marker position is at 200 MHz

Usage: Query only

Manual control: See "n dB down Delta Value" on page 294

CALCulate:MARKer:FUNCtion:NDBDown:QFACtor?

This command queries the Q factor of n dB down measurements.

Return values:

<QFactor>

Usage: Query only

CALCulate<n>:MARKer<m>:FUNCtion:NDBDown:RESult?

This command queries the distance of the n dB down markers from each other.

To get a valid result, you have to perform a complete measurement with synchronization to the end of the measurement before reading out the result. This is only possible for single sweeps. See also `INITiate:CONTinuous` on page 460.

Return values:

<Distance> The result depends on the span.
In case of frequency domain measurements, the command returns the bandwidth between the two n dB down markers in Hz.
In case of time domain measurements, the command returns the pulse width between the two n dB down markers in seconds.

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

Usage: Query only

Manual control: See "n dB down Marker State" on page 293

CALCulate<n>:MARKer<m>:FUNCtion:NDBDown:STATe <State>

This command turns the n dB Down marker function on and off.

Parameters:

<State> ON | OFF
*RST: OFF

Example:
```
CALC:MARK:FUNC:NDBD:STAT ON
```
Turns the n dB Down marker on.

Manual control: See "n dB down Marker State" on page 293

CALCulate<n>:MARKer<m>:FUNCtion:NDBDown:TIME

This command queries the position of the n dB down markers on the x-axis when measuring in the time domain.

To get a valid result, you have to perform a complete measurement with synchronization to the end of the measurement before reading out the result. This is only possible for single sweeps. See also `INITiate:CONTinuous` on page 460.

Return values:

<Time> **<time 1>**
absolute position in time of the n dB marker to the left of the reference marker in seconds

<time 2>
absolute position in time of the n dB marker to the right of the reference marker in seconds

Example:
```
INIT:CONT OFF
```
Switches to single sweep mode
```
CALC:MARK:FUNC:NDBD ON
```
Switches on the n dB down function.
```
INIT;*WAI
```
Starts a sweep and waits for the end.
```
CALC:MARK:FUNC:NDBD:TIME?
```
Outputs the time values of the temporary markers.

Manual control: See "n dB down Delta Value" on page 294

10.6.3.13 Signal Count Marker

The following commands control the frequency counter.

CALCulate<n>:MARKer<m>:COUNt <State>

This command turns the frequency counter at the marker position on and off.

The frequency counter works for one marker only. If you perform a frequency count with another marker, the R&S FSW deactivates the frequency count of the first marker.

To get a valid result, you have to perform a complete measurement with synchronization to the end of the measurement before reading out the result. This is only possible for single sweeps. See also `INITiate:CONTinuous` on page 460.

Parameters:

<State> ON | OFF

*RST: OFF

Example:
```
INIT:CONT OFF
```
Switches to single sweep mode.
```
CALC:MARK ON
```
Switches on marker 1.
```
CALC:MARK:COUN ON
```
Switches on the frequency counter for marker 1.
```
INIT;*WAI
```
Starts a sweep and waits for the end.
```
CALC:MARK:COUN:FREQ?
```
Outputs the measured value.

Manual control: See "Signal Count Marker State" on page 289

CALCulate<n>:MARKer<m>:COUNt:FREQuency?

This command queries the frequency at the marker position.

To get a valid result, you have to perform a complete measurement with synchronization to the end of the measurement before reading out the result. This is only possible for single sweeps. See also `INITiate:CONTinuous` on page 460.

Before you can use the command, you have to turn on the frequency counter.

Return values:

<Frequency> Frequency at the marker position.

Example:

```
INIT:CONT OFF
```
Switches to single sweep mode.
```
CALC:MARK ON
```
Switches on marker 2.
```
CALC:MARK:COUN ON
```
Activates the frequency counter for marker 1.
```
INIT;*WAI
```
Starts a sweep and waits for the end.
```
CALC:MARK:COUN:FREQ?
```
Outputs the measured value of marker 1.

Usage: Query only

Manual control: See "Signal Count Marker State" on page 289

CALCulate<n>:MARKer<m>:COUNt:RESolution <Resolution>

This command defines the resolution of the frequency counter.

Parameters:

<Resolution> 0.001 | 0.01 | 0.1 | 1 | 10 | 100 | 1000 | 10000 Hz

*RST: 0.1 Hz

Example:

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

Manual control: See "Resolution" on page 289

10.6.3.14 Marker Demodulation

The following commands control the demodulation of AM and FM signals at the marker position.

CALCulate<n>:MARKer<m>:FUNCtion:DEModulation:CONTinuous <State>

This command turns continuous demodulation of the signal at the marker position in the frequency domain on and off.

In the time domain continuous demodulation is always on.

Parameters:
<State> ON | OFF
*RST: OFF

Example: `CALC2:MARK3:FUNC:DEM:CONT ON`
Switches on the continuous demodulation.

Manual control: See "Continuous Demodulation" on page 297

CALCulate<n>:MARKer<m>:FUNCtion:DEModulation:HOLDoff <Duration>

This command defines for how long the the signal at the marker position is demodulated.

In the time domain continuous demodulation is always on.

Parameters:
<Duration> Range: 10 ms to 1000 s
*RST: Marker demodulation = OFF

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

Manual control: See "Marker Stop Time" on page 297

CALCulate<n>:MARKer<m>:FUNCtion:DEModulation:SELect <DemodMode>

This command selects the demodulation mode at the marker position.

Parameters:
<DemodMode> **AM**
AM demodulation
FM
FM demodulation
*RST: AM

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

Manual control: See "Modulation" on page 297

CALCulate<n>:MARKer<m>:FUNCtion:DEModulation[:STATe] <State>

This command turns the audio demodulator on and off when the measurement reaches a marker position.

Parameters:
<State> ON | OFF
*RST: OFF

Example: `CALC:MARK3:FUNC:DEM ON`
Switches on the demodulation for marker 3.

Manual control: See "Marker Demodulation State" on page 297

[SENSe:]DEMod:SQUelch:LEVel <Threshold>

This command defines the threshold for selective demodulation.

All signals below the threshold are not demodulated.

Parameters:

<Threshold> Percentage of the display height.

Range: 0 to 100
*RST: 50

Example: `DEM:SQU:LEV 80`
Sets the squelch level to 80% of the displayed signal.

Manual control: See "Squelch level" on page 298

[SENSe:]DEMod:SQUelch[:STATe] <State>

This command turns selective demodulation at the marker position on and off.

For selective demodulation, the R&S FSW turns on a video trigger whose level corresponds to the squelch level. Therefore it turns other triggers or gates off.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `DEM:SQU ON`
Signals below the level threshold are not sent to the audio output.

Manual control: See "Squelch" on page 297

10.6.4 Configuring Display and Limit Lines

The commands required to configure display and limit lines in a remote environment are described here. The tasks for manual operation are described in chapter 6.5.4, "How to Work with Display and Limit Lines", on page 314.

10.6.4.1 Configuring Display Lines

The following commands configure vertical and horizontal display lines.

CALCulate<n>:DLINe<k> <Position>

This command defines the (vertical) position of a display line.

Parameters:

<Position> The value range is variable.
You can use any unit you want, the R&S FSW then converts the unit to the currently selected unit. If you omit a unit, the R&S FSW uses the currently selected unit.

*RST: (state is OFF)

Example: `CALC:DLIN -20dBm`
Positions the display line at -20 dBm.

Manual control: See "Horizontal Line 1/2" on page 308

CALCulate<n>:DLINe<k>:STATe <State>

This command turns a display line on and off

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CALC:DLIN2:STAT ON`
Turns on display line 2.

CALCulate<n>:FLINe<k> <Frequency>

This command defines the position of a frequency line.

Parameters:

<Frequency> Note that you can not set a frequency line to a position that is outside the current span.

Range: 0 Hz to Fmax
*RST: (STATe to OFF)

Example: `CALC:FLIN2 120MHz`
Sets frequency line 2 to a frequency of 120 MHz.

Manual control: See "Vertical Line 1/2" on page 308

CALCulate<n>:FLINe<k>:STATe <State>

This command turns a frequency line on and off

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CALC:FLIN2:STAT ON`
Turns frequency line 2 on.

CALCulate<n>:TLINe<Line> <Time>

This command defines the position of a time line.

Parameters:

<Time> Note that you can not set a time line to a position that is higher than the current sweep time.

Range: 0 s to 1600 s
*RST: (STATe to OFF)

Example: `CALC:TLIN 10ms`
Sets the first time line to 10 ms.

Manual control: See "Vertical Line 1/2" on page 308

CALCulate<n>:TLINe<Line>:STATe <State>

This command turns a time line on and off

Parameters:

<State> ON | OFF

*RST: OFF

Example: `CALC:TLIN:STAT ON`
Turns the first time line on.

10.6.4.2 Defining Limit Checks

Note that in remote control, upper and lower limit lines are configured using separate commands. Thus, you must decide in advance which you want to configure. The x-values for both upper and lower limit lines are defined as a common control line. This control line is the reference for the y-values for both upper and lower limit lines.

Configuring Limit Lines

CALCulate:LIMit:COMMent <Comment>

This command defines a comment for a limit line.

Parameters:

<Comment> String containing the description of the limit line. The comment may have up to 40 characters.

Manual control: See "Comment" on page 312

CALCulate:LIMit<k>:CONTrol[:DATA] <LimitLinePoints>

This command defines the horizontal definition points of a lower limit line.

Parameters:

<LimitLinePoints> Variable number of x-axis values.
Note that the number of horizontal values has to be the same as the number of vertical values set with `CALCulate:LIMit<k>:LOWer[:DATA]` or `CALCulate:LIMit<k>:UPPer[:DATA]`. If not, the R&S FSW either adds missing values or ignores surplus values.
The unit is Hz or s.

*RST: Limit line state is OFF

Usage: SCPI confirmed

Manual control: See "Data points" on page 313

CALCulate:LIMit<k>:CONTrol:DOMain <SpanSetting>

This command selects the domain of the limit line.

Parameters:

<SpanSetting> FREQuency | TIME

*RST: FREQuency

Manual control: See "X-Axis" on page 313

CALCulate<n>:LIMit<k>:CONTrol:MODE <Mode>

This command selects the horizontal limit line scaling.

Parameters:

<Mode>

ABSolute
Limit line is defined by absolute physical values (Hz or s).

RELative
Limit line is defined by relative values related to the center frequency (frequency domain) or the left diagram border (time domain).

*RST: ABSolute

CALCulate:LIMit<k>:CONTrol:OFFSet <Offset>

This command defines an offset for a complete limit line.

Compared to shifting the limit line, an offset does not actually change the limit line definition points.

Parameters:

<Offset>

Numeric value.
The unit depends on the scale of the x-axis.

*RST: 0

Manual control: See "X-Offset" on page 310

CALCulate:LIMit<k>:CONTrol:SHIFt <Distance>

This command moves a complete limit line horizontally.

Compared to defining an offset, this command actually changes the limit line definition points by the value you define.

Parameters:

<Distance>

Numeric value.
The unit depends on the scale of the x-axis.

Manual control: See "Shift x" on page 314

CALCulate:LIMit<k>:CONTrol:SPACing <InterpolMode>

This command selects linear or logarithmic interpolation for the calculation of limit lines from one horizontal point to the next.

Parameters:

<InterpolMode>

LINear | LOGarithmic

*RST: LIN

Example:

```
CALC:LIM:CONT:SPAC LIN
```

CALCulate:LIMit<k>:LOWer[:DATA] <LimitLinePoints>

This command defines the vertical definition points of a lower limit line.

Parameters:

<LimitLinePoints> Variable number of level values.
Note that the number of vertical values has to be the same as the number of horizontal values set with `CALCulate:LIMit<k>:CONTrol[:DATA]`. If not, the R&S FSW either adds missing values or ignores surplus values.
The unit depends on `CALCulate:LIMit<k>:UNIT` on page 672.

*RST: Limit line state is OFF

Usage: SCPI confirmed

Manual control: See "Data points" on page 313

CALCulate:LIMit<k>:LOWer:MARGin <Margin>

This command defines an area around a lower limit line where limit check violations are still tolerated.

Parameters:

<Margin> **numeric value**

*RST: 0
Default unit: dB

Manual control: See "Margin" on page 313

CALCulate:LIMit<k>:LOWer:MODE <Mode>

This command selects the vertical limit line scaling.

Parameters:

<Mode> **ABSolute**
Limit line is defined by absolute physical values.
The unit is variable.

RELative
Limit line is defined by relative values related to the reference level (dB).

*RST: ABSolute

Manual control: See "X-Axis" on page 313

CALCulate:LIMit<k>:LOWer:OFFSet <Offset>

This command defines an offset for a complete lower limit line.

Compared to shifting the limit line, an offset does not actually change the limit line definition points.

Parameters:

<Offset> Numeric value.

*RST: 0
Default unit: dB

Manual control: See "Y-Offset" on page 311

CALCulate:LIMit<k>:LOWer:SHIFt <Distance>

This command moves a complete lower limit line vertically.

Compared to defining an offset, this command actually changes the limit line definition points by the value you define.

Parameters:

<Distance> Defines the distance that the limit line moves.
The unit depends on `CALCulate:LIMit<k>:UNIT` on page 672.

Manual control: See "Shift y" on page 314

CALCulate:LIMit<k>:LOWer:SPACing <InterpolType>

This command selects linear or logarithmic interpolation for the calculation of a lower limit line from one horizontal point to the next.

Parameters:

<InterpolType> LINear | LOGarithmic

*RST: LIN

Manual control: See "X-Axis" on page 313
See "Y-Axis" on page 313

CALCulate:LIMit<k>:LOWer:STATe <State>

This command turns a lower limit line on and off.

Before you can use the command, you have to select a limit line with `CALCulate:LIMit<k>:NAME` on page 672.

Parameters:

<State> ON | OFF

*RST: OFF

Usage: SCPI confirmed

Manual control: See "Visibility" on page 310

CALCulate:LIMit<k>:LOWer:THReshold <Threshold>

This command defines a threshold for relative limit lines.

The R&S FSW uses the threshold for the limit check, if the limit line violates the threshold.

Parameters:

<Threshold> Numeric value.
The unit depends on `CALCulate:LIMit<k>:UNIT` on page 672.
*RST: -200 dBm

Manual control: See "Threshold" on page 312

CALCulate:LIMit<k>:NAME <Name>

This command selects a limit line that already exists or defines a name for a new limit line.

Parameters:

<Name> String containing the limit line name.
*RST: REM1 to REM8 for lines 1 to 8

Manual control: See "Name" on page 312

CALCulate:LIMit<k>:UNIT <Unit>

This command defines the unit of a limit line.

Parameters:

<Unit> DBM | DBPW | WATT | DBUV | DBMV | VOLT | DBUA | AMPere | DB | DBUV_M | DBUA_M | (unitless)
If you select dB as the limit line unit, the command automatically turns the limit line into a relative limit line.
*RST: DBM

Manual control: See "Y-Axis" on page 313

CALCulate:LIMit<k>:UPPer[:DATA] <LimitLinePoints>

This command defines the vertical definition points of an upper limit line.

Parameters:

<LimitLinePoints> Variable number of level values.
Note that the number of vertical values has to be the same as the number of horizontal values set with `CALCulate:LIMit<k>:CONTrol[:DATA]`. If not, the R&S FSW either adds missing values or ignores surplus values.
The unit depends on `CALCulate:LIMit<k>:UNIT` on page 672.
*RST: Limit line state is OFF

Usage: SCPI confirmed

Manual control: See "Data points" on page 313

CALCulate:LIMit<k>:UPPer:MARGin <Margin>

This command defines an area around an upper limit line where limit check violations are still tolerated.

Parameters:

<Margin> **numeric value**

*RST: 0
Default unit: dB

Manual control: See "Margin" on page 313

CALCulate:LIMit<k>:UPPer:MODE <Mode>

This command selects the vertical limit line scaling.

Parameters:

<Mode> **ABSolute**
Limit line is defined by absolute physical values.
The unit is variable.

RELative
Limit line is defined by relative values related to the reference level (dB).

*RST: ABSolute

Manual control: See "X-Axis" on page 313

CALCulate:LIMit<k>:UPPer:OFFSet <Offset>

This command defines an offset for a complete upper limit line.

Compared to shifting the limit line, an offset does not actually change the limit line definition points.

Parameters:

<Offset> Numeric value.

*RST: 0
Default unit: dB

Manual control: See "Y-Offset" on page 311

CALCulate:LIMit<k>:UPPer:SHIFt <Distance>

This command moves a complete upper limit line vertically.

Compared to defining an offset, this command actually changes the limit line definition points by the value you define.

Parameters:

<Distance> Defines the distance that the limit line moves.
The unit depends on `CALCulate:LIMit<k>:UNIT` on page 672.

Usage: Event

Manual control: See "Shift y" on page 314

CALCulate:LIMit<k>:UPPer:SPACing <InterpolType>

This command selects linear or logarithmic interpolation for the calculation of an upper limit line from one horizontal point to the next.

Parameters:
<InterpolType> LINear | LOGarithmic
*RST: LIN

Manual control: See "X-Axis" on page 313
See "Y-Axis" on page 313

CALCulate:LIMit<k>:UPPer:STATe <State>

This command turns an upper limit line on and off.

Before you can use the command, you have to select a limit line with `CALCulate:LIMit<k>:NAME` on page 672.

Parameters:
<State> ON | OFF
*RST: OFF

Usage: SCPI confirmed

Manual control: See "Visibility" on page 310

CALCulate:LIMit<k>:UPPer:THReshold <Limit>

This command defines an absolute limit for limit lines with a relative scale.

The R&S FSW uses the threshold for the limit check, if the limit line violates the threshold.

Parameters:
<Limit> Numeric value.
The unit depends on `CALCulate:LIMit<k>:UNIT` on page 672.
*RST: -200
Default unit: dBm

Manual control: See "Threshold" on page 312

Managing Limit Lines

CALCulate:LIMit:ACTive?

This command queries the names of all active limit lines.

Return values:

<LimitLines> String containing the names of all active limit lines in alphabetical order.

Example: `CALC:LIM:ACT?`
Queries the names of all active limit lines.

Usage: Query only

Manual control: See "Visibility" on page 310

CALCulate:LIMit<k>:COPY <Line>

This command copies a limit line.

Parameters:

<Line> **1 to 8**
number of the new limit line

<name>
String containing the name of the limit line.

Example: `CALC:LIM1:COPY 2`
Copies limit line 1 to line 2.
`CALC:LIM1:COPY 'FM2'`
Copies limit line 1 to a new line named FM2.

Manual control: See "Copy Line" on page 311

CALCulate:LIMit<k>:DELete

This command deletes a limit line.

Usage: Event

Manual control: See "Delete Line" on page 311

CALCulate:LIMit<k>:TRACe <TraceNumber>

This command links a limit line to one or more traces.

Parameters:

<TraceNumber> 1 to 6
*RST: 1

Example: `CALC:LIM2:TRAC 3`
Assigns limit line 2 to trace 3.

Manual control: See "Traces to be Checked" on page 310

Checking the Results of a Limit Check

CALCulate:LIMit:CLEar[:IMMediate]

This command deletes the result of the current limit check.

The command works on all limit lines in all measurement windows at the same time.

Example: `CALC:LIM:CLE`
Deletes the result of the limit check.

Usage: SCPI confirmed

CALCulate<n>:LIMit<k>:FAIL

This command queries the result of a limit check.

Note that for SEM measurements, the limit line suffix <k> is irrelevant, as only one specific SEM limit line is checked for the currently relevant power class.

To get a valid result, you have to perform a complete measurement with synchronization to the end of the measurement before reading out the result. This is only possible for single sweeps. See also `INITiate:CONTinuous` on page 460.

Return values:
<Result> **0**
PASS
1
FAIL

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

Usage: SCPI confirmed

Manual control: See "Limit Check 1-4" on page 85
See "Limit Check" on page 112

CALCulate:LIMit<k>:STATe <State>

This command turns the limit check on and off.

To query the limit check result, use `CALCulate<n>:LIMit<k>:FAIL`.

Parameters:
<State> ON | OFF
*RST: OFF

Example: `CALC:LIM:STAT ON`
Switches on the limit check for limit line 1.

Usage: SCPI confirmed

Manual control: See "Disable All Lines" on page 311

10.7 Managing Settings and Results

The commands required to store and load instrument settings and import and export measurement results in a remote environment are described here. The tasks for manual operation are described in chapter 7, "Data Management", on page 318.

Addressing drives

The various drives can be addressed via the "mass storage instrument specifier" <msis> using the conventional Windows syntax. The internal hard disk is addressed by "C:". For details on storage locations refer to chapter 7.2.2.2, "Storage Location and File Name", on page 323.

The file names (<FileName> parameter) are given as string parameters enclosed in quotation marks. They also comply with Windows conventions. Windows file names do not distinguish between uppercase and lowercase notation.

Wildcards

The two characters "*" and "?" can be used as "wildcards", i.e., they are variables for a selection of several files. The question mark "?" replaces exactly one character, the asterisk replaces any of the remaining characters in the file name. "*.*" thus means all files in a directory.

Path names

Storage locations can be specified either as absolute (including the entire path) or relative paths (including only subfolders of the current folder). Use the `MMEM:CDIR?` query to determine the current folder.

10.7.1 General Data Storage and Loading Commands

See also:

- `FORMat[:DATA]` on page 624

FORMat:DEXPort:DSEParator <Separator>

This command selects the decimal separator for data exported in ASCII format.

Parameters:

<Separator>

COMMa
Uses a comma as decimal separator, e.g. *4,05*.

POINt
Uses a point as decimal separator, e.g. *4.05*.

*RST: *RST has no effect on the decimal separator. Default is POINt.

Example:
```
FORM:DEXP:DSEP POIN
```
Sets the decimal point as separator.

Manual control:
See "Saving the Evaluation List" on page 93
See "Saving the Evaluation List" on page 114
See "Decimal Separator" on page 255
See "Exporting the Peak List" on page 299
See "Export" on page 330

MMEMory:CATalog?

This command returns the contents of a particular directory.

Query parameters:

<Path>

String containing the path and directory.
If you leave out the path, the command returns the contents of the directory selected with `MMEMory:CDIRectory`.
The path may be relative or absolute. Using wildcards ('*') is possible to query a certain type of files only.

Return values:

<FileNames> List of file and directory names, separated by commas

Example: `MMEM:CAT? 'C:\R_S\Instr\user\SPOOL?.PNG'`
Returns all files in C:\R_S\Instr\user whose names start with SPOOL, have 6 letters and the extension ".PNG", e.g.:
`SPOOL1.PNG,SPOOL2.PNG,SPOOL3.PNG`

Usage: Query only
SCPI confirmed

Manual control: See "Selecting the Storage Location - Drive/ Path/ Files" on page 91

MMEMory:CATalog:LONG? <Path>

This command returns the contents of a particular directory with additional information about the files.

Query parameters:

<Path> String containing the path and directory.
If you leave out the path, the command returns the contents of the directory selected with `MMEMory:CDIRectory`.
The path may be relative or absolute. Using wildcards ('*') is possible to query a certain type of files only.

Return values:

<UsedDiskSpace> Byte size of all files in the directory.

<FreeDiskSpace> Remaining disk space in bytes.

<FileInfo> <NameFileN>,<SuffixFileN>,<SizeFileN>

Describes the individual file.

<NameFileN>
Name of the file.

<SuffixFileN>
Type of the file. Possible suffixes are: ASCii, BINary, DIRectory, STAT

<SizeFileN>
Size of the file in bytes.

Usage: Query only

MMEMory:CDIRectory <Directory>

This command changes the current directory.

Parameters:

<Directory> String containing the path to another directory.
The path may be relative or absolute.

Usage: SCPI confirmed

MMEMory:COMMent <Comment>

This command defines a comment for the stored settings.

Parameters:

<Comment> String containing the comment.

Example: `MMEMory:COMMent "ACP measurement with Standard Tetra from 23.05."`
`MMEMory::MMEMory:STORe1:STATe 1, "ACP_T"`
As a result, in the selection list for recall settings, the comment `"ACP measurement with Standard Tetra from 23.05."` is added to the ACP entry.

Manual control: See "Comment" on page 325

MMEMory:COPY <SourceFile>,<DestinationFile>

This command copies one or more files to another directory.

Parameters:

<SourceFile> String containing the path and file name of the source file.

<DestinationFile> String containing the path and name of the target file.
The path may be relative or absolute.

Usage: SCPI confirmed

MMEMory:DATA <FileName>, [<Block>]

This command writes block data into a file. The delimiter must be set to EOI to obtain error-free data transfer.

When you query the contents of a file, you can save them in a file on the remote control computer.

The command is useful for reading stored settings files or trace data from the instrument or for transferring them to the instrument.

Parameters:

<FileName> String containing the path and name of the target file.

<Block> Data block with the following structure.
#
Hash sign.
<number>
Length of the length information.
<number>
Length information of the binary data (number of bytes).
<data>
Binary data with the indicated <number> of bytes.

Example: `MMEM:NAME '\Public\User\Testfile.txt'`
Creates a new file called 'testfile.txt'.
`MMEM:DATA 'Testfile.txt',#220Contents of the file`
The parameter means:
#2: hash sign and length of the length information (20 bytes = 2 digits)
20: indicates the number of subsequent binary data bytes.
Contents of the file: store 20 binary bytes (characters) to the file.

Usage: SCPI confirmed

MMEMory:DELete <FileName>

This command deletes a file.

Parameters:

<FileName> String containing the path and file name of the file to delete.
The path may be relative or absolute.

Usage: Event
SCPI confirmed

MMEMory:MDIRectory <Directory>

This command creates a new directory.

Parameters:

<Directory> String containing the path and new directory name
The path may be relative or absolute.

Usage: Event

MMEMory:MOVE <SourceFile>,<NewFileName>

This command moves a file to another directory.

The command also renames the file if you define a new name in the target directory.

If you do not include a path for <NewFileName>, the command just renames the file.

Parameters:

<SourceFile> String containing the path and file name of the source file.

<NewFileName> String containing the path and name of the target file.

Example: `MMEM:MOVE 'C:\TEST01.CFG','SETUP.CFG'`
Renames TEST01.CFG in SETUP.CFG in directory C:\.

Usage: Event
SCPI confirmed

MMEMory:MSIS <Device>

This command selects the default storage device used by all MMEMory commands.

Parameters:

<Device> 'A:' | 'C:' | … | 'Z:'
String containing the device drive name
*RST: 'C:'

Usage: SCPI confirmed

MMEMory:NAME <FileName>

This command creates a new and empty file.

It also sets the file name for screenshots taken with `HCOPy[:IMMediate<device>]` on page 693. Note that you have to route the printer output to a file.

Parameters:

<FileName> String containing the path and name of the target file.

Example: `MMEM:NAME 'C:\R_S\instr\user\PRINT1.BMP'`
Selects the file name.

Usage: Event
SCPI confirmed

MMEMory:NETWork:DISConnect <Drive>

This command disconnects a network drive.

Parameters:

<Drive> String containing the drive name.

Usage: Event

MMEMory:NETWork:MAP <Drive>, <HostName> [, <UserName>, <Password>][, <Reconnect>]

This command maps a drive to a server or server directory of the network.

Note that you have to allow sharing for a server or folder in Microsoft networks first.

Parameters:

<Drive> String containing the drive name or path of the directory you want to map.

<HostName> String containing the host name of the computer or the IP address and the share name of the drive.
'<\host name or IP address\share name>'

<UserName> String containing a user name in the network.
The user name is optional.

<Password> String containing the password corresponding to the <UserName>. The password is optional.

<Reconnect> ON | OFF

ON
Reconnects at logon with the same user name.

OFF
Doe not reconnect at logon.

Usage: Event

MMEMory:NETWork:UNUSeddrives?

This command returns a list of unused network drives.

Return values:

<DriveName> List of network drives in alphabetically descending order, e.g. 'W:,V:,U:,...'

Usage: Query only

MMEMory:NETWork:USEDdrives? <State>

This command returns a list of all network drives in use.

Parameters:

<State> You do not have to use the parameter. If you do not include the parameter, the command returns a list of all drives in use.
This is the same behavior as if you are using the parameter OFF.

ON
Returns a list of all drives in use including the folder information.

OFF
Returns al list of all drives in use.

Usage: Query only

MMEMory:RDIRectory <Directory>

This command deletes the indicated directory.

Parameters:

<Directory> String containing the path of the directory to delete.
Note that the directory you want to remove may contain no contents.

Usage: Event

10.7.2 Selecting the Items to Store

The following commands select the items to be included in the configuration file.

Depending on the used command, either the items from the entire instrument (`MMEMory:SELect[:ITEM]...`), or only those from the currently selected channel (`MMEM:SELect:CHANnel[:ITEM]...`) are stored.

MMEMory:SELect:CHANnel[:ITEM]:ALL
MMEMory:SELect[:ITEM]:ALL

This command includes all items when storing or loading a configuration file.

The items are:

- Hardware configuration: `MMEMory:SELect[:ITEM]:HWSettings`
- Limit lines: `MMEMory:SELect[:ITEM]:LINes:ALL`
- Spectrogram data: `MMEMory:SELect[:ITEM]:SGRam`
- Trace data: `MMEMory:SELect[:ITEM]:TRACe[:ACTive]`
- Transducers: `MMEMory:SELect[:ITEM]:TRANsducer:ALL`

Example: `MMEM:SEL:ALL`

Usage: Event

Manual control: See "Items" on page 325

MMEMory:SELect:CHANnel[:ITEM]:DEFault
MMEMory:SELect[:ITEM]:DEFault

This command selects the current settings as the only item to store to and load from a configuration file.

Manual control: See "Items" on page 325

MMEMory:SELect:CHANnel[:ITEM]:HWSettings <State>
MMEMory:SELect[:ITEM]:HWSettings <State>

This command includes or excludes hardware settings when storing or loading a configuration file.

Hardware settings include:

- general instrument configuration
- measurement hardware configuration including markers
- limit lines
  Note that a configuration may include no more than 8 limit lines. This number includes active limit lines as well as inactive limit lines that were used last.
  Therefore the combination of inactivate limit lines depends on the sequence of use with `MMEMory:LOAD:STATe`.
- color settings
- configuration for the hardcopy output

Parameters:
<State> ON | OFF
*RST: ON

Example: `MMEM:SEL:HWS ON`

Manual control: See "Items" on page 325

MMEMory:SELect:CHANnel[:ITEM]:LINes:ALL <State>
MMEMory:SELect[:ITEM]:LINes:ALL <State>

This command includes or excludes all limit lines (active and inactive) when storing or loading a configuration file.

Parameters:
<State> ON | OFF
*RST: OFF

Example: `MMEM:SEL:LIN:ALL ON`

Manual control: See "Items" on page 325

MMEMory:SELect:CHANnel[:ITEM]:NONE
MMEMory:SELect[:ITEM]:NONE

This command does not include any of the following items when storing or loading a configuration file.

- Hardware configuration: `MMEMory:SELect[:ITEM]:HWSettings`
- Limit lines: `MMEMory:SELect[:ITEM]:LINes:ALL`
- Trace data: `MMEMory:SELect[:ITEM]:TRACe[:ACTive]`
- Transducers: `MMEMory:SELect[:ITEM]:TRANsducer:ALL`

Example: `MMEM:SEL:NONE`

Usage: Event

Manual control: See "Items" on page 325

MMEMory:SELect:CHANnel[:ITEM]:SGRam <boolean>
MMEMory:SELect[:ITEM]:SGRam <boolean>

This command includes or excludes spectrogram data when storing or loading a configuration file.

Parameters:
<State> **ON | OFF**
*RST: OFF

Example: `MMEM:SEL:SGR ON`
Adds the spectrogram data to the list of data subsets.

MMEMory:SELect:CHANnel[:ITEM]:TRACe[:ACTive] <State>
MMEMory:SELect[:ITEM]:TRACe[:ACTive] <State>

This command includes or excludes trace data when storing or loading a configuration file.

Parameters:
<State> ON | OFF
*RST: OFF, i.e. no traces is stored

Example: `MMEM:SEL:TRAC ON`

Manual control: See "Items" on page 325

MMEMory:SELect:CHANnel[:ITEM]:TRANsducer:ALL <State>
MMEMory:SELect[:ITEM]:TRANsducer:ALL <State>

This command includes or excludes transducer factors when storing or loading a configuration file.

Parameters:
<State> ON | OFF
*RST: OFF

Example: `MMEM:SEL:TRAN:ALL ON`

Manual control: See "Items" on page 325
See "Save" on page 351

10.7.3 Storing and Loading Instrument Settings

See also:

- `INSTrument[:SELect]` on page 453 to select the channel.

MMEMory:CLEar:ALL

This command deletes all instrument configuration files in the current directory.

You can select the directory with `MMEMory:CDIRectory`.

Example: `MMEM:CLE:ALL`

Usage: Event

MMEMory:CLEar:STATe 1,<FileName>

This command deletes a instrument configuration file.

Parameters:
1

<FileName> String containing the path and name of the file to delete.
The string may or may not contain the file's extension.

Example: `MMEM:CLE:STAT 1,'TEST'`

Usage: Event

MMEMory:LOAD:AUTO 1, 'Factory' | <FileName>

This command restores an instrument configuration and defines that configuration as the default state.

The default state is restored after a preset (`*RST`) or after you turn on the R&S FSW.

Parameters:
1

'Factory' | <FileName>
'Factory'
Restores the factory settings as the default state.
'<file_name>
String containing the path and name of the configuration file.

Example: `MMEM:LOAD:AUTO 1,'C:\R_S\Instr\user\TEST'`

Usage: Event

Manual control: See "Startup Recall" on page 327

MMEMory:LOAD:STATe 1, <FileName>

This command restores and activates an instrument configuration stored in a `*.dfl` file.

Note that files with other formats cannot be loaded with this command.

Parameters:
1

<FileName> String containing the path and name of the file to delete.
The string may or may not include the file's extension.

Example: `MMEM:LOAD:STAT 1,'C:\R_S\Instr\user\TEST01'`

Usage: SCPI confirmed

Manual control: See "Recall" on page 322
See "Recall in New Channel / Recall in Current Channel" on page 325

MMEMory:LOAD:TYPe:[CHANnel] <Mode>

This command defines whether the channel-specific settings that will be loaded with the subsequent `MMEM:LOAD:STAT` command will replace the current channel or activate a new channel.

Parameters:
<Mode> NEW | REPLace

NEW
The loaded settings will be activated in a new channel.

REPLace
The loaded settings will replace the currently active channel.

*RST: NEW

Example: `INST:SEL 'SPECTRUM2'`
Selects measurement channel `'SPECTRUM2'`.
`MMEM:STOR:TYP CHAN`
Specifies that channel-specific data is to be stored.
`MMEM:STOR:STAT 1, 'C:\R_S\Instr\user\Spectrum'`
Stores the settings from channel `'SPECTRUM2'` to the file `'C:\R_S\Instr\user\Spectrum'`.
`MMEM:LOAD:TYP NEW`
Specifies that channel-specific settings are to be activated in a new channel.
`MMEM:LOAD:STAT 1, 'C:\R_S\Instr\user\Spectrum'`
Loads the channel-specific settings from the file `'C:\R_S\Instr\user\Spectrum'` to the new channel `'SPECTRUM2*'`.

MMEMory:STORe:STATe 1,<FileName>

This command saves the current instrument configuration in a *.dfl file.

Parameters:
1

<FileName> String containing the path and name of the target file.
The file extension is .dfl.

Example: `MMEM:STOR:STAT 1,'Save'`
Saves the current device settings in the file `Save.dfl`.

Usage: Event
SCPI confirmed

Manual control: See "Save File" on page 325
See "Save" on page 351

MMEMory:STORe:STATe:NEXT

This command saves the current instrument configuration in a *.dfl file.

The file name depends on the one you have set with `MMEMory:STORe:STATe`. This command adds a consecutive number to the file name.

Example: `MMEM:STOR:STAT 1,'Save'`
Saves the current device settings in the file `Save.dfl`.
`MMEM:STOR:STAT:NEXT`
Saves the current device settings in the file `Save_001.dfl`
`MMEM:STOR:STAT:NEXT`
Saves the current device settings in the file `Save_002.dfl`

Usage: Event

Manual control: See "Save File" on page 325

MMEMory:STORe:TYPe <Mode>

This command defines whether the data from the entire instrument or only from the current channel is stored with the subsequent `MMEM:STOR`... command.

Parameters:
<Mode> INSTrument | CHANnel
*RST: INST

Example: `INST:SEL 'SPECTRUM2'`
Selects measurement channel `'SPECTRUM2'`.
`MMEM:STOR:TYP CHAN`
Specifies that channel-specific data is to be stored.
`MMEM:STOR:PEAK 'SpectrumPeaks'`
Stores the peak list from channel `'SPECTRUM2'` to the file `'SpectrumPeaks'`.

SYSTem:PRESet

This command presets the R&S FSW.

Example: SYST:PRES

Usage: Event
SCPI confirmed

SYSTem:PRESet:CHANnel[:EXECute]

This command restores the default instrument settings in the current channel.

Use INST:SEL to select the channel.

For details see chapter 7.1.1, "Factory Default Configuration", on page 319.

Example: INST 'Spectrum2'
Selects the channel for "Spectrum2".
SYST:PRES:CHAN:EXEC
Restores the factory default settings to the "Spectrum2" channel.

Usage: Event

Manual control: See "Preset Channel" on page 160

10.7.4 Storing or Printing Screenshots

Useful commands to configure screenshots described elsewhere

- MMEMory:NAME on page 682

Remote commands exclusive to configure screenshots

HCOPy:ABORt

This command aborts a running hardcopy output.

Example: HCOP:ABOR

Usage: Event
SCPI confirmed

HCOPy:CMAP<item>:DEFault<colors>

This command defines the color scheme for print jobs.

Suffix:
<item> Selects the item for which the color scheme is to be defined.
For more information see chapter 10.8.5.3, "CMAP Suffix Assignment", on page 713.

<colors> 1...4
1
Current colors with a white background and a black grid.
2
Optimized colors.
3
Customized colors.
4
Current screen colors (setting for hardcopies).

Example: `HCOP:CMAP:DEF2`
Selects the optimized color set for the color settings of a printout or a hardcopy.

Usage: Event

Manual control: See "Print colors" on page 370

HCOPy:CMAP<item>:HSL <Color>

This command selects the color for various screen elements in print jobs.

Suffix:
<item> Selects the item for which the color scheme is to be defined.
For more information see chapter 10.8.5.3, "CMAP Suffix Assignment", on page 713.

Parameters:
<Color> **hue**
tint
sat
saturation
lum
brightness
The value range is 0 to 1 for all parameters.

Example: `HCOP:CMAP2:HSL 0.3,0.8,1.0`
Changes the grid color

Manual control: See "Defining User-specific Colors" on page 371

HCOPy:CMAP<item>:PDEFined <Color>

This command selects a predefined color for various screen elements in print jobs.

Suffix:
<item> Selects the item for which the color scheme is to be defined.
For more information see chapter 10.8.5.3, "CMAP Suffix Assignment", on page 713.

Parameters:
<Color> BLACk | BLUE | BROWn | GREen | CYAN | RED | MAGenta | YELLow | WHITe | DGRAy | LGRAy | LBLUe | LGREen | LCYan | LRED | LMAGenta

Example: `HCOP:CMAP2:PDEF GRE`

Manual control: See "Modifying User-Defined Colors" on page 370
See "Predefined Colors" on page 371

HCOPy:DESTination<device> <Destination>

This command selects the destination of a print job.

Suffix:
<device> 1 | 2
Printing device.

Parameters:
<Destination> **'MMEM'**
Sends the hardcopy to a file.
You can select the file name with `MMEMory:NAME`.
You can select the file format with `HCOPy:DEVice:LANGuage<device>`.

'SYST:COMM:PRIN'
Sends the hardcopy to a printer.
You can select the printer with `SYSTem:COMMunicate:PRINter:SELect<device>`.

'SYST:COMM:CLIP'
Sends the hardcopy to the clipboard.
The format should be WEMF.

*RST: 'SYST:COMM:CLIP'

Usage: SCPI confirmed

Manual control: See "Device" on page 338

HCOPy:DEVice:COLor <State>

This command turns color printing on and off.

Parameters:

<State>

ON
Color printing

OFF
Black and white printing

*RST: OFF

Example: `HCOP:DEV:COL ON`

Usage: SCPI confirmed

HCOPy:DEVice:LANGuage<device> <Format>

This command selects the file format for a print job.

Suffix:

<device>

1 | 2
Printing device.

Parameters:

<Format>

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. Can be used for the output to a file. The printer driver configured under Windows is used in this case and a printer-specific file format is thus generated.

BMP, JPG, PNG
Data format for output to files only.

Usage: SCPI confirmed

Manual control: See "Device Setup" on page 337
See "Output Medium" on page 337

HCOPy[:IMMediate<device>]

This command initiates a print job.

If you are printing to a file, the file name depends on `MMEMory:NAME`.

Suffix:

<device>

1 | 2
Printing device.

Usage: Event
SCPI confirmed

Manual control: See "Printing or Storing a Screenshot (Print Screen)" on page 336

HCOPy[:IMMediate<device>]:NEXT

This command initiates a print job.

If you are printing to a file, the file name depends on `MMEMory:NAME`. This command adds a consecutive number to the file name.

Suffix:
<device> 1 | 2
Printing device.

Usage: Event

Manual control: See "Printing or Storing a Screenshot (Print Screen)" on page 336

HCOPy:ITEM:ALL

This command includes all screen elements in the printout.

The screen elements include comments, title, time and date.

Usage: SCPI confirmed

Manual control: See "Printing or Storing a Screenshot (Print Screen)" on page 336

HCOPy:ITEM:WINDow:TEXT <Comment>

This command defines a comment to be added to the printout.

Parameters:
<Comment> String containing the comment.

Usage: SCPI confirmed

Manual control: See "Comment" on page 339

HCOPy:PAGE:ORIentation<device> <Orientation>

The command selects the format of the print job.

The command is only available if the output device is a printer.

Suffix:
<device> 1 | 2
Printing device.

Parameters:
<Orientation> LANDscape | PORTrait
*RST: PORTrait

Usage: SCPI confirmed

Manual control: See "Device Setup" on page 337
See "Orientation" on page 338

HCOPy:TDSTamp:STATe<device> <State>

This command includes or excludes the time and date in the printout.

Suffix:
<device> 1 | 2
Printing device.

Parameters:
<State> ON | OFF
*RST: OFF

SYSTem:COMMunicate:PRINter:ENUMerate:FIRSt?

This command queries the name of the first available printer.

To query the name of other installed printers, use `SYSTem:COMMunicate:PRINter:ENUMerate[:NEXT]?`.

Return values:
<PrinterName> String containing the name of the first printer as defined in Windows.
If the command cannot find a printer, it returns an empty string (' ').

Usage: Query only

Manual control: See "Device Setup" on page 337
See "Printer Name" on page 338

SYSTem:COMMunicate:PRINter:ENUMerate[:NEXT]?

This command queries the name of available printers.

You have to use `SYSTem:COMMunicate:PRINter:ENUMerate:FIRSt?` for this command to work properly.

Return values:
<PrinterName> String containing the name of one printer as defined in Windows. To get a complete list of printers you have to send this query several times until no more printers could be found. In that case, the return value is an empty string (' '). Further queries after the empty string result in an error.

Usage: Query only

Manual control: See "Device Setup" on page 337
See "Printer Name" on page 338

SYSTem:COMMunicate:PRINter:SELect<device> <PrinterName>

This command selects the printer that processes jobs sent by the R&S FSW.

Use HCOPy:DESTination<device> to select another output destination.

Suffix:
<device> 1 | 2
Printing device.

Parameters:
<PrinterName> String containing the printer name.
Use
• SYSTem:COMMunicate:PRINter:ENUMerate:FIRSt? and
• SYSTem:COMMunicate:PRINter:ENUMerate[:NEXT]?
to query all available printers.

*RST: NONE

Manual control: See "Device Setup" on page 337
See "Printer Name" on page 338

10.7.5 Storing Measurement Results

MMEMory:STORe:LIST <FileName>

This command exports the SEM and spurious emission list evaluation to a file.

The file format is *.dat.

Parameters:
<FileName> String containing the path and name of the target file.

Example: MMEM:STOR:LIST 'test'
Stores the current list evaluation results in the test.dat file.

Manual control: See "Saving the Evaluation List" on page 93
See "Saving the Evaluation List" on page 114
See "Exporting the Peak List" on page 299

MMEMory:STORe:PEAK <FileName>

This command exports the marker peak list to a file.

The file format is *.dat.

Parameters:
<FileName> String containing the path and name of the target file.

Example: MMEM:STOR:PEAK 'test'
Saves the current marker peak list in the file test.dat.

Usage: Event

MMEMory:STORe:SGRam <FileName>

This command exports spectrogram data to an ASCii file.

The file contains the data for every frame in the history buffer. The data corresponding to a particular frame begins with information about the frame number and the time that frame was recorded.

Note that, depending on the size of the history buffer, the process of exporting the data can take a while.

Parameters:
<FileName> String containing the path and name of the target file.

Example: `MMEM:STOR:SGR 'Spectrogram'`
Copies the spectrogram data to a file.

Manual control: See "Export Trace to ASCII File" on page 255
See "Export" on page 330

MMEMory:STORe:SPURious <FileName>

This command exports the marker peak list available for spurious emission measurements to a file.

Parameters:
<FileName> String containing the path and name of the target file.

Example: `MMEM:STOR:SPUR 'test'`
Saves the current marker peak list in the file test.dat.

Usage: Event

MMEMory:STORe<n>:TRACe <Trace>, <FileName>

This command exports trace data from the specified window to an ASCII file.

For details on the file format see chapter 7.3.4.1, "Reference: ASCII File Export Format", on page 332.

Parameters:
<Trace> Number of the trace to be stored

<FileName> String containing the path and name of the target file.

Example: `MMEM:STOR1:TRAC 3,'TEST.ASC'`
Stores trace 3 from window 1 in the file `TEST.ASC`.

Usage: SCPI confirmed

Manual control: See "Export Trace to ASCII File" on page 255
See "Export" on page 330

10.7.6 Examples: Managing Data

10.7.6.1 Storing Data

```
MMEM:MSIS 'C:'
//Selects drive C: as the default storage device.
-----Connecting a network drive--------
MMEM:NETW:USED?
//Returns a list of all drives in use in the network.
MMEM:NETW:UNUS?
//Returns a list of free drive names in the network.
MMEM:NETW:MAP 'T:','Server\ACLRTest'
//Maps drive T: to the directory 'Server\ACLRTest'
-----Saving data on the instrument-----
MMEM:MDIR 'C:\R_S\INST\USER\ACLRTest'
//Creates a directory called 'ACLRTest' on drive C:
MMEM:NAME 'C:\R_S\INST\USER\Test001.txt'
//Creates a file called 'Test001.txt'
MMEM:COMM 'ACLR test results'
//Creates a comment for the file.
MMEM:DATA 'Test001.txt',#212FileContents
//Writes 12 characters to the file 'Test001.txt'
-----Copying the data to another location---
MMEM:COPY 'C:\R_S\INST\USER\Results\Test001.txt','T:'
//Copies the specified file to network drive T:.
MMEM:DEL 'C:\R_S\INST\USER\Results\Test001.txt'
//Deletes the specified file from the instrument hard disk.
//or
MMEM:MOVE 'C:\R_S\INST\USER\Results\Test001.xml','D:\TestResults.txt'//
//Moves the file 'Test001.txt' to drive T:, renames it to 'Testresults.txt'
//and removes it from the instrument hard disk.
MMEM:RDIR 'C:\R_S\INST\USER\Results'
//Deletes the directory called 'Results' from drive C:, unless it still contains any content.
-----Disconnecting the network drive---
MMEM:NETW:DISC 'T:'
//Disconnect drive T:.
```

10.7.6.2 Loading Data

```
MMEM:CDIR?
//Returns the path of the current directory.
//e.g.
```

```
C:\R_S\Instr\user\
MMEM:CDIR 'C:\R_S\INST\USER\Results'
//Changes the current directory.
MMEM:CAT? 'C:\R_S\INST\USER\Results\*.xml'
//or
MMEM:CAT? '*.xml'
//Returns a list of all xml files in the directory 'C:\R_S\INST\USER\Results'.
MMEM:CAT:LONG? '*.xml'
//Returns additional information about the xml files in the directory 'C:\R_S\INST\USER\Result
```

10.7.6.3 Storing Instrument Settings

In this example we will store the instrument settings for the "Spectrum" channel.

```
INST:SEL 'SPECTRUM'
//Selects measurement channel 'SPECTRUM'.
MEMM:STOR:TYPE CHAN
//Specifies that channel-specific data is to be stored.
MMEM:STOR:STAT 1, 'C:\R_S\Instr\user\Spectrum'
//Stores the channel settings from the 'Spectrum' channel
// to the file 'Spectrum.dfl'.
```

10.7.6.4 Loading Instrument Settings

In this example we will load the hardware settings from the configuration file `Spectrum.dfl` to a new "Spectrum2" channel.

```
Folgende zeile hat maximale länge
0123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789

MEMM:LOAD:TYPE NEW
//Specifies that settings will be loaded to a new channel besides the existing
//'Spectrum' channel.
MMEM:SEL:CHAN:HWS ON
//Selects only hardware settings to be loaded.
MMEM:LOAD:STAT 1, 'C:\R_S\Instr\user\Spectrum'
//Loads the channel-specific settings from the file 'C:\R_S\Instr\user\Spectrum.dfl'
//to a new channel. The new channel is named 'Spectrum2' to avoid a naming conflict
//with the existing 'Spectrum' channel.
INST:REN 'Spectrum2','Spectrum3'
//Renames the loaded channel to 'Spectrum3'.
```

10.7.6.5 Printing to a File

```
HCOP:DEST 'MMEM'
//Prints the data to a file.
HCOP:DEV:LANG BMP
//Selects bmp as the file format.
MMEM:NAME 'C:\R_S\INST\USER\Screenshot.bmp'
//Selects the file name for the printout.
```

```
HCOP:ITEM:ALL
//Prints all screen elements
HCOP:ITEM:WIND:TEXT 'ACLRResults'
//Adds a comment to the printout.
HCOP
//Stores the printout in a file called 'Screenshot.bmp'.
HCOP:NEXT
//Stores the printout in a file called 'Screenshot_001.bmp'.
```

10.7.6.6 Printing on a Printer

```
HCOP:DEST2 'SYST:COMM:PRIN'
//Prints the data on a printer.
SYST:COMM:PRIN:ENUM:FIRS?
SYST:COMM:PRIN:ENUM?
//Returns the available printers, e.g.
'LASER on LPT1'
''
//Means that one printer is available.
SYST:COMM:PRIN:SEL2 'LASER on LPT1'
//Selects the printer for the print job on device 2.
HCOP:PAGE:ORI2 LAND
//Selects the landscape format for the printout.
HCOP:TDST:STAT2 ON
//Includes date and time on the printout.
HCOP:ITEM:ALL
//Prints all screen elements
HCOP
//Initiates the printout.
```

10.8 Configuring the R&S FSW

The remote commands required to set up the R&S FSW are described here.

10.8.1 Basic Instrument Setup

SYSTem:CLOGging <State>

This command turns logging of remote commands on and off.

Parameters:

<State>
ON
Writes all remote commands that have been sent to a file. The destination is `C:\R_S\instr\ScpiLogging\ScpiLog.txt`.
OFF
*RST: OFF

Manual control: See "I/O Logging" on page 420

SYSTem:SHUTdown

This command shuts down the R&S FSW.

Usage: Event

10.8.2 Configuring the Reference Frequency

SOURce:EXTernal:ROSCillator:EXTernal:FREQuency <Frequency>

This command defines the frequency of the external reference oscillator.

If the external reference oscillator is selected, the reference signal must be connected to the rear panel of the instrument.

Parameters:

<Frequency> Range: 1 MHz to 20 MHz

Example: `ROSC:EXT:FREQ 13MHZ`
Sets the frequency to 13 MHz.
`SOUR:EXT:ROSC:EXT:FREQ 13MHZ`

Manual control: See "Reference Frequency Input" on page 345

[SENSe:]ROSCillator:SOURce <Source>

This command selects the reference oscillator.

If you want to select the external reference, it must be connected to the R&S FSW.

Parameters:

<Source>

INTernal
the internal reference is used (10 MHz)

EXTernal
the external reference from REF INPUT 1..20 MHZ connector is used with a variable frequency; if none is available, an error flag is displayed in the status bar

E10
the external reference from REF INPUT 1..20 MHZ connector is used with a fixed 10 MHZ frequency; if none is available, an error flag is displayed in the status bar

E100
the external reference from REF INPUT 100 MHZ connector is used; if none is available, an error flag is displayed in the status bar

EAUTo
the external reference is used as long as it is available, then the instrument switches to the internal reference

SYNC
the external reference is used; if none is available, an error flag is displayed in the status bar

Example: `ROSC:SOUR EXT`

Usage: SCPI confirmed

Manual control: See "Reference Frequency Input" on page 345
See "Behavior in case of missing external reference" on page 345

[SENSe:]ROSCillator:SOURce:EAUTo?

This command queries the current reference type in case you have activated an automatic switch to the internal reference if the external reference is missing.

Parameters:

<Reference>

INT
internal reference

EXT
external reference

Example: `SENS:ROSC:SOUR:EAUT?`
Queries the currently available reference type.

Usage: Query only

Manual control: See "Reference Frequency Input" on page 345
See "Behavior in case of missing external reference" on page 345

10.8.3 Calibration and Temperature Checks

The following commands control calibration and temperature checks on the R&S FSW.

DIAGnostic:SERVice:INPut:MC:DISTance <Bandwidth>

This command selects the distance of the peaks of the microwave calibration signal for calibration of the YIG filter.

Parameters:

<Bandwidth>

SMALl
Small offset of combline frequencies.

WIDE
Wide offset of combline frequencies.

Manual control: See "Calibration Frequency MW" on page 360

DIAGnostic:SERVice:INPut:PULSed:CFRequency <Frequency>

This command defines the frequency of the calibration signal.

Before you can use the command, you have to feed in a calibration signal with `DIAGnostic:SERVice:INPut[:SELect]`.

Parameters:

<Frequency>

Possible frequencies of the calibration signal are fix.
If you define a frequency that is not available, the R&S FSW uses the next available frequency. Example: a frequency of 20 MHz is rounded up to the next available frequency (21.33 MHz).

*RST: 64 MHz
Default unit: Hz

Manual control: See "Calibration Frequency RF" on page 360

DIAGnostic:SERVice:INPut:RF:SPECtrum <Bandwidth>

This command selects the bandwidth of the calibration signal.

Parameters:

<Bandwidth>

NARRowband
Narrowband signal for power calibration of the frontend.

BROadband
Broadband signal for calibration of the IF filter.

Manual control: See "Calibration Frequency RF" on page 360
See "Spectrum" on page 360

DIAGnostic:SERVice:INPut[:SELect] <Signal>

This command selects if the R&S FSW feeds in the signal from the RF input or the calibration signal.

Parameters:

<Signal>

CALibration
Feeds in the calibration signal.

MCALibration
Feeds in the calibration signal for the microwave range.

RF
Feeds in the signal from the RF input.

*RST: RF

Example: `DIAG:SERV:INP CAL`
Feeds in the the calibration signal.

Manual control: See "RF" on page 360

DIAGnostic:SERVice:STESt:RESult?

This command queries the self test results.

Return values:

<Results> String of data containing the results.
The rows of the self test result table are separated by commas.

Example: `DIAG:SERV:STES:RES?`
would return, e.g.
`"Total Selftest Status: PASSED", "Date (dd/mm/yyyy): 09/07/2004 TIME: 16:24:54", "Runtime: 00:06", "...`

Usage: Query only

SOURce:TEMPerature:FRONtend?

This command queries the current frontend temperature of the R&S FSW.

During self-alignment, the instrument's (frontend) temperature is also measured (as soon as the instrument has warmed up completely). This temperature is used as a reference for a continuous temperature check during operation. If the current temperature deviates from the stored self-alignment temperature by a certain degree, a warning is displayed in the status bar indicating the resulting deviation in the measured power levels. A status bit in the `STATUs:QUEStionable:TEMPerature` register indicates a possible deviation.

Return values:

<Temperature> Temperature in degrees Celsius.

Example: SOUR:TEMP:FRON?
Queries the temperature of the frontend sensor.

Usage: Query only

10.8.4 Working with Transducers

The following commands configure and control transducer factors.

Useful commands for transducer managament described elsewhere

- MMEMory:SELect[:ITEM]:TRANsducer:ALL on page 686

Remote commands exclusive to transducer management

[SENSe:]CORRection:TRANsducer:ADJust:RLEVel[:STATe] <State>

This command turns an automatic adjustment of the reference level to the transducer on and off.

Before you can use the command, you have to select and turn on a transducer.

Parameters:
<State> ON | OFF
*RST: OFF

Manual control: See "Adjusting the Reference Level" on page 349

[SENSe:]CORRection:TRANsducer:COMMent <Comment>

This command defines the comment for the selected transducer factor.

Before you can use the command, you have to select and turn on a transducer.

Parameters:
<Comment> *RST: (empty comment)

Manual control: See "Comment" on page 350

[SENSe:]CORRection:TRANsducer:DATA <Frequency>,<Level>

This command defines the shape of the transducer factor.

Parameters:

<Frequency>, <Level>
The unit for <Frequency> is Hz. Frequencies have to be sorted in ascending order.
The unit for <Level> depends on `[SENSe:]CORRection:TRANsducer:UNIT`.

Manual control: See "Data points" on page 351

[SENSe:]CORRection:TRANsducer:DELete

This command deletes the currently selected transducer factor.

Before you can use the command, you have to select a transducer.

Example: `CORR:TRAN:DEL`

Usage: Event

Manual control: See "Delete Line" on page 349

[SENSe:]CORRection:TRANsducer:SCALing <ScalingType>

This command selects the frequency scaling of the transducer factor.

Parameters:

<ScalingType>
LINear | LOGarithmic
*RST: LINear

Manual control: See "X-Axis Scaling" on page 351

[SENSe:]CORRection:TRANsducer:SELect <Name>

This command selects a transducer factor.

Parameters:

<Name>
String containing the name of the transducer factor.
If the name does not exist yet, the R&S FSW creates a transducer factor by that name.

Example: `CORR:TRAN:SEL 'FACTOR1'`

Manual control: See "Activating/Deactivating" on page 348
See "Create New Line" on page 349
See "Name" on page 350

[SENSe:]CORRection:TRANsducer[:STATe] <State>

This command turns the selected transducer factor on or off.

Before you can use the command, you have to select a transducer.

Parameters:
<State> ON | OFF
*RST: OFF

Manual control: See "Activating/Deactivating" on page 348

[SENSe:]CORRection:TRANsducer:UNIT <Unit>

This command selects the unit of the transducer factor.

Before you can use the command, you have to select and turn on a transducer.

Parameters:
<Unit> string as defined in table below
*RST: DB

Example: `CORR:TRAN:UNIT 'DBUV'`

Manual control: See "Unit" on page 350

String	Unit
'DB'	dB
'DBM'	dBm
'DBMV'	dBmV
'DBUV'	dBµV
'DBUV/M'	dBµV/m
'DBUA'	dBµA
'DBUA/M'	dBµA/m
'DBPW'	dBpW
'DBPT'	dBpT

10.8.5 Customizing the Screen Layout

The remote commands required to set up the display of the R&S FSW are described here.

10.8.5.1 General Display Settings and Items

The following commands add, remove or customize general display and screen elements.

Useful commands for general display settings described elsewhere

- `DISPlay:MTABle` on page 633

Remote commands exclusive to general display settings

DISPlay:ANNotation:FREQuency <State>

This command turns the label of the x-axis on and off.

Parameters:

<State> ON | OFF

*RST: ON

Example: `DISP:ANN:FREQ OFF`

Usage: SCPI confirmed

Manual control: See "Diagram Footer (Annotation)" on page 367

DISPlay:FORMat <Format>

This command determines which tab is displayed.

Parameters:

<Format> **SPLit**
Displays the MultiView tab with an overview of all active channels (See chapter 3.1, "R&S MultiView", on page 19).

SINGle
Displays the measurement channel that was previously focused.

*RST: SPL

Example: `DISP:FORM SING`

DISPlay:PSAVe:HOLDoff <Minutes>

This command defines the time until the R&S FSW turns the display power save mode on.

Parameters:

<Minutes> Minutes until power save mode starts. Note that the number you enter may have no dimension.

Range: 1 to 100
*RST: 15

Example: `DISP:PSAV:HOLD 30`

Manual control: See "Display Power Save Function" on page 365

DISPlay:PSAVe[:STATe] <State>

This command turns the power save mode of the display on and off.

Parameters:

<State> ON | OFF

*RST: OFF

Example: `DISP:PSAVe ON`
Switches on the power-save mode.

Manual control: See "Display Power Save Function" on page 365

DISPlay:SBAR[:STATe] <State>

This command turns the status bar on and off.

Parameters:

<State> ON | OFF

*RST: ON

Example: `DISP:SBAR:OFF`

Manual control: See "Status Bar" on page 366

DISPlay:SKEYs[:STATe] <State>

This command turns the softkey bar on and off.

Parameters:

<State> ON | OFF

*RST: ON

Example: `DISP:SKEY:OFF`

Manual control: See "Softkey Bar" on page 367

DISPlay:TBAR[:STATe] <State>

This command turns the toolbar on or off.

Parameters:
<State> ON | OFF
*RST: OFF

Example: `DISP:TOOL ON`

Manual control: See "Toolbar" on page 366

DISPlay:TOUChscreen:STATe <State>

This command controls the touch screen functionality.

Parameters:
<State>
ON
Touch screen is active for entire screen
OFF
Touch screen is inactivate for entire screen
FRAMe
Touch screen is inactivate for the diagram area of the screen, but active for softkeys, toolbars and menus.
*RST: ON

Example: `DISP:TOUC:STAT ON`

Manual control: See "Deactivating and Activating the Touch Screen" on page 364

DISPlay[:WINDow]:TIME <State>

This command adds or removes the date and time from the display.

Parameters:
<State> ON | OFF
*RST: OFF

Example: `DISP:TIME ON`

Manual control: See "Date and Time" on page 367

DISPlay[:WINDow]:TIME:FORMat <Format>

This command selects the time and date format.

Parameters:
<Format>
DE
dd.mm.yyyy hh:mm:ss
24 hour format.
US
mm/dd/yyyy hh:mm:ss
12 hour format.
*RST: DE

Example: `DISP:TIME ON`
Switches the screen display of date and time on.
`DISP:TIME:FORM US`
Switches the date and time format to US.

Manual control: See "Date and Time Format" on page 365

SYSTem:DISPlay:FPANel[:STATe] <State>

This command includes or excludes the front panel keys when working with the remote desktop.

Parameters:
<State> ON | OFF
*RST: ON

Manual control: See "Front Panel" on page 367
See "Mini Front Panel" on page 368

10.8.5.2 Colors and Themes

Useful commands to customize display colors described elsewhere

The HCOPY commands define the print colors and thus only take effect on the display colors, if the display shows the printing colors.

- `HCOPy:CMAP<item>:DEFault<colors>` on page 691
- `HCOPy:CMAP<item>:HSL` on page 691
- `HCOPy:CMAP<item>:PDEFined` on page 692

Remote commands exclusive to customize the display colors and themes

---

DISPlay:CMAP<item>:DEFault<colors>

This command resets the color scheme for the display.

Suffix:
<item> Selects the item for which the color scheme is to be defined.
For more information see chapter 10.8.5.3, "CMAP Suffix Assignment", on page 713.

<colors> 1...4
1
Current colors with a white background and a black grid.
2
Optimized colors.
3
Customized colors.
4
Current screen colors (setting for hardcopies).

Example: `DISP:CMAP:DEF2`
Selects default setting 2 for setting the colors.

Usage: Event
SCPI confirmed

Manual control: See "Screen colors" on page 370

DISPlay:CMAP<item>:HSL <Color>

This command selects the color for various screen elements in the display.

Suffix:
<item> Selects the item for which the color scheme is to be defined.
For more information see chapter 10.8.5.3, "CMAP Suffix Assignment", on page 713.

Parameters:
<Color> **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.

DISPlay:CMAP<item>:PDEFined <Color>

This command selects a predefined color for various screen elements.

Suffix:
<item> Selects the item for which the color scheme is to be defined.
For more information see chapter 10.8.5.3, "CMAP Suffix Assignment", on page 713.

Parameters:
<Color> BLACk | BLUE | BROWn | GREen | CYAN | RED | MAGenta | YELLow | WHITe | DGRAy | LGRAy | LBLUe | LGREen | LCYan | LRED | LMAGenta

Example: DISP:CMAP2:PDEF GRE

Manual control: See "Restoring the User Settings to Default Colors" on page 372

DISPlay:THEMe:CATalog?

This command queries all available display themes.

Parameters:

<Themes> String containing all available display themes.

Example: DISP:THEMe:CAT?

Usage: Query only

DISPlay:THEMe:SELect <Theme>

This command selects the display theme.

Parameters:

<Theme> String containing the name of the theme.

*RST: SPL

Example: DISP:THEM:SEL "OceanBlue"

Manual control: See "Theme" on page 370

10.8.5.3 CMAP Suffix Assignment

Several commands to change the color settings of individual items of the display or printout are available. Which item is to be configured is defined using a <CMAP> suffix. The following assignment applies:

Suffix	Description
CMAP1	Background
CMAP2	Grid
CMAP3 *)	Common Text
CMAP4 *)	Check Status OK
CMAP5 *)	Check Status Error
CMAP6 *)	Text Special 1
CMAP7 *)	Text Special 2
CMAP8	Trace 1
CMAP9	Trace 2
CMAP10	Trace 3
CMAP11	Marker Info Text
CMAP12	Limit Lines

Suffix	Description
CMAP13	Limit and Margin Check – "Pass"
CMAP14	Limit and Margin Check – "Fail"
CMAP15 *)	Softkey Text
CMAP16 *)	Softkey Background
CMAP17 *)	Selected Field Text
CMAP18 *)	Selected Field Background
CMAP19 *)	Softkey 3D Bright Part
CMAP20 *)	Softkey 3D Dark Part
CMAP21 *)	Softkey State "On"
CMAP22 *)	Softkey State "Dialog open"
CMAP23 *)	Softkey Text Disabled
CMAP24	Logo
CMAP25	Trace 4
CMAP26	Grid – Minorlines
CMAP27	Marker
CMAP28	Display Lines
CMAP29 *)	Sweepcount – Text
CMAP30	Limit and Margin Check – Text
CMAP31	Limit and Margin Check – \"Margin\"
CMAP32 *)	Table Overall – Title Text
CMAP33 *)	Table Overall – Title Background
CMAP34 *)	Table Overall – Text
CMAP35 *)	Table Overall – Background
CMAP36 *)	Table Value – Title Text
CMAP37 *)	Table Value – Title Background
CMAP38 *)	Table Value – Text
CMAP39 *)	Table Value – Background
CMAP40	Trace 5
CMAP41	Trace 6

*) these settings can only be defined via the theme (`DISPlay:THEMe:SELect`) and are thus ignored in the SCPI command

10.8.6 Configuring the Network and Remote Control

SYSTem:COMMunicate:GPIB[:SELF]:ADDRess <Address>

This command sets the GPIB address of the R&S FSW.

Parameters:

<Address> Range: 0 to 30
*RST: (no influence on this parameter, factory default 20)

Example: `SYST:COMM:GPIB:ADDR 18`

Usage: SCPI confirmed

Manual control: See "GPIB Address" on page 420

SYSTem:COMMunicate:GPIB[:SELF]:RTERminator <Terminator>

This command selects 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.

Parameters:

<Terminator> LFEOI | EOI
*RST: (no influence on this parameter, factory default LFEOI)

Example: `SYST:COMM:GPIB:RTER EOI`

Manual control: See "GPIB Terminator" on page 420

SYSTem:COMPatible <Mode>

This command enables compatibility to other spectrum and signal analyzers by R&S.

Compatibility is necessary, for example, regarding the number of sweep points.

Parameters:
<Mode> DEFault | FSU | FSP | FSQ | FSV

Example: `SYST:COMP FSP`

Manual control: See "Compatible Mode" on page 422

SYSTem:DISPlay:UPDate <State>

This command turns the display during remote operation on and off.

If on, the R&S FSW updates the diagrams, traces and display fields only.

The best performance is obtained if the display is off during remote control operation.

Parameters:
<State> ON | OFF
*RST: OFF

Example: `SYST:DISP:UPD ON`

Manual control: See "Remote Display Update" on page 420

SYSTem:IDENtify:FACTory

This command resets the query to `*IDN?` to its default value.

Usage: Event

Manual control: See "Reset to Factory String" on page 420

SYSTem:IDENtify[:STRing] <String>

This command defines the response to `*IDN?`.

Parameters:
<String> String containing the description of the instrument.

Manual control: See "Identification String" on page 420

SYSTem:LXI:INFo?

This command queries the LXI settings.

Return values:
<LXIInfo> <current version> | <LXI class> | <Computername> | <MAC adress> | <IP adress> | <Auto MDIX>
String containing the current LXI parameters.
- <version>
- <LXIClass>
- <ComputerName>
- <MACAddress>
- <IPAddress>
- <AutoMDIX>

Usage: Query only

Manual control: See "Current LXI Configuration" on page 424

SYSTem:LXI:LANReset

This command resets the LAN configuration as required by the LXI standard. The command also resets the LXI password and instrument description.

Usage: Event

Manual control: See "LAN Reset" on page 425

SYSTem:LXI:MDEScription <Description>

This command defines the LXI instrument description.

Parameters:
<Description> String containing the instrument description.

Manual control: See "LXI Manufacturer Description" on page 425

SYSTem:LXI:PASSword <Password>

This command defines the LXI password.

Parameters:
<Password> String containing the password.

Return values:
<Password> The query returns the current password.

Manual control: See "LXI Password" on page 425

10.8.7 Checking the System Configuration

DIAGnostic:SERVice:BIOSinfo?

This command queries the BIOS version of the CPU board.

Return values:

<BiosInformation> String containing the BIOS version.

Example: `DIAG:SERV:BIOS?`
Returns the BIOS version.

Usage: Query only

DIAGnostic:SERVice:HWINfo?

This command queries hardware information.

Return values:

<Hardware> String containing the following information for every hardware component.
<component>: name of the hardware component
<serial#>: serial number of the component
<order#>: order number of the component
<model>: model of the component
<code>: code of the component
<revision>: revision of the component

Example: `DIAG:SERV:HWIN?`
Queries the hardware information.
`"FRONTEND|100001/003|1300.3009|03|01|00|00",`
`"MOTHERBOARD|123456/002|1300.3080|02|00|00|00",`
`...`

Usage: Query only

DIAGnostic:SERVice:VERSinfo?

This command queries information about the hardware and software components.

Return values:

<Information> String containing the version of hardware and software components including the types of licenses for installed firmware options.

Example: DIAG:SERV:VERS?
Queries the version information.
Response:

```
Instrument Firmware |1.10
BIOS |FSW Analyzer BIOS V1.03-1-32-4-3 IPC10
Image Version |1.2.0
PCI-FPGA |9.01
SA-FPGA |2.43
MB-FPGA |2.0.8.0
SYNTH-FPGA |3.9.0.0
REF-FPGA |3.4.0.0
Data Sheet Version |01.00
Time Control Management |active
High Pass Filter 1...3GHz B13 ||permanent
Analog Demod K7| |permanent
```

Usage: Query only
SCPI confirmed

SYSTem:ERRor:CLEar:ALL

This command deletes all contents of the "System Messages" table.

Example: SYST:ERR:CLE:ALL

Usage: Event

SYSTem:ERRor:LIST?

This command queries the system messages.

Return values:
<Messages> String containing all messages in the "System Messages" table.

Example: SYST:ERR:LIST?

Usage: Query only

SYSTem:ERRor[:NEXT]?

This command queries the most recent error queue entry and deletes it.

Positive error numbers indicate device-specific errors, negative error numbers are error messages defined by SCPI. If the error queue is empty, the error number 0, "No error", is returned.

For details on error queues see chapter 9.1.7, "Status Reporting System", on page 398.

Usage: Query only

SYSTem:FORMat:IDENt <IDNFormat>

This command selects the response format to the `*IDN?` query.

Parameters:

<IDNFormat>

LEGacy
Format is compatible to R&S FSP/FSU/FSQ/FSG family.

NEW | FSL
R&S FSW format
Format is also compatible to the R&S FSL and R&S FSV family

*RST: NEW

Example:
```
SYST:FORM:IDEN LEG
```
Adapts the return value of *IDN? to the R&S FSP/FSU/FSQ family.

Manual control: See "*IDN Format" on page 420

SYSTem:PRESet:COMPatible <OpMode>

This command defines the operating mode that is activated when you switch on the R&S FSW or press the PRESET key.

For details on operating modes see chapter 3, "Applications and Operating Modes", on page 18.

Parameters:

<OpMode>

MSRA
Defines MSRA as the default operating mode as the presetting.

SANalyzer
(Default:) Defines Signal and Spectrum Analyzer operating mode as the presetting.

*RST: SAN

Usage: Event

10.8.8 Using Service Functions

DIAGnostic:SERVice:SFUNction <ServiceFunction>

This command starts a service function.

The service functions are available after you have entered the level 1 or level 2 system password.

Parameters:

<ServiceFunction> String containing the ID of the service function.
The ID of the service function is made up out of five numbers, separated by a point.
- function group number
- board number
- function number
- parameter 1 (see the Service Manual)
- parameter 2 (see the Service Manual)

Usage: Event

Manual control: See "Service Function" on page 362
See "Send" on page 362

DIAGnostic:SERVice:SFUNction:LASTresult?

This command queries the results of the most recent service function you have used.

Usage: Query only

DIAGnostic:SERVice:SFUNction:RESults:DELete

This command deletes the results of the most recent service function you have used.

Usage: Event

Manual control: See "Clear Results" on page 362

DIAGnostic:SERVice:SFUNction:RESults:SAVE <FileName>

This command saves the results of the most recent service function you have used.

Parameters:

<FileName> String containing the file name.

Manual control: See "Save Results" on page 362

10.9 Using the Status Register

For more information on the contents of the status registers see:

- "STATus:QUEStionable:ACPLimit Register" on page 406
- "STATus:QUEStionable:FREQuency Register" on page 406
- "STATus:QUEStionable:LIMit Register" on page 407
- "STATus:QUEStionable:LMARgin Register" on page 408
- "STATus:QUEStionable:POWer Register" on page 408
- "STATus:QUEStionable:TEMPerature Register" on page 409

10.9.1 General Status Register Commands

STATus:PRESet

This command resets the edge detectors and `ENABle` parts of all registers to a defined value. All `PTRansition` parts are set to `FFFFh`, i.e. all transitions from 0 to 1 are detected. All `NTRansition` parts are set to 0, i.e. a transition from 1 to 0 in a `CONDition` bit is not detected. The `ENABle` part of the `STATus:OPERation` and `STATus:QUEStionable` registers are set to 0, i.e. all events in these registers are not passed on.

Usage: Event

STATus:QUEue[:NEXT?]?

This command queries the most recent error queue entry and deletes it.

Positive error numbers indicate device-specific errors, negative error numbers are error messages defined by SCPI. If the error queue is empty, the error number 0, "No error", is returned.

This command is identical to the `SYSTem:ERRor[:NEXT]?` command.

Usage: Query only

10.9.2 Reading Out the EVENt Part

For more information on the event part see chapter 9.1.7.2, "Structure of a SCPI Status Register", on page 400.

STATus:OPERation[:EVENt]?
STATus:QUEStionable[:EVENt]?
STATus:QUEStionable:ACPLimit[:EVENt]? <ChannelName>
STATus:QUEStionable:FREQuency[:EVENt]? <ChannelName>
STATus:QUEStionable:LIMit<n>[:EVENt]? <ChannelName>
STATus:QUEStionable:LMARgin<n>[:EVENt]? <ChannelName>
STATus:QUEStionable:POWer[:EVENt]? <ChannelName>

STATus:QUEStionable:TEMPerature[:EVENt]? <ChannelName>
STATus:QUEStionable:TIME[:EVENt]? <ChannelName>

These commands read out the EVENt section of the status register.

At the same time, the commands delete the contents of the EVENt section.

Query parameters:

<ChannelName> String containing the name of the channel.
The parameter is optional. If you omit it, the command works for the currently active channel.

Usage: Query only

10.9.3 Reading Out the CONDition Part

For more information on the condition part see chapter 9.1.7.2, "Structure of a SCPI Status Register", on page 400.

STATus:OPERation:CONDition?
STATus:QUEStionable:CONDition?
STATus:QUEStionable:ACPLimit:CONDition? <ChannelName>
STATus:QUEStionable:FREQuency:CONDition? <ChannelName>
STATus:QUEStionable:LIMit<n>:CONDition? <ChannelName>
STATus:QUEStionable:LMARgin<n>:CONDition? <ChannelName>
STATus:QUEStionable:POWer:CONDition? <ChannelName>
STATus:QUEStionable:TEMPerature:CONDition? <ChannelName>
STATus:QUEStionable:TIME:CONDition? <ChannelName>

These commands read out the CONDition section of the status register.

The commands do not delete the contents of the EVENt section.

Query parameters:

<ChannelName> String containing the name of the channel.
The parameter is optional. If you omit it, the command works for the currently active channel.

Usage: Query only

10.9.4 Controlling the ENABle Part

For more information on the enable part see chapter 9.1.7.2, "Structure of a SCPI Status Register", on page 400.

STATus:OPERation:ENABle <SumBit>
STATus:QUEStionable:ENABle <SumBit>
STATus:QUEStionable:ACPLimit:ENABle <SumBit>,<ChannelName>
STATus:QUEStionable:FREQuency:ENABle <SumBit>,<ChannelName>
STATus:QUEStionable:LIMit<n>:ENABle <SumBit>,<ChannelName>
STATus:QUEStionable:LMARgin<n>:ENABle <SumBit>,<ChannelName>
STATus:QUEStionable:POWer:ENABle <SumBit>,<ChannelName>

STATus:QUEStionable:TEMPerature:ENABle <SumBit>,<ChannelName>
STATus:QUEStionable:TIME:ENABle <SumBit>,<ChannelName>

These commands control the ENABle part of a register.

The ENABle part allows true conditions in the EVENt part of the status register to bereported in the summary bit. If a bit is 1 in the enable register and its associated event bit transitions to true, a positive transition will occur in the summary bit reported to the next higher level.

Parameters:

<SumBit> Range: 0 to 65535

<ChannelName> String containing the name of the channel.
The parameter is optional. If you omit it, the command works for the currently active channel.

10.9.5 Controlling the Negative Transition Part

For more information on the positive transition part see chapter 9.1.7.2, "Structure of a SCPI Status Register", on page 400.

STATus:OPERation:NTRansition <SumBit>
STATus:QUEStionable:NTRansition <SumBit>
STATus:QUEStionable:ACPLimit:NTRansition <SumBit>,<ChannelName>
STATus:QUEStionable:FREQuency:NTRansition <SumBit>,<ChannelName>
STATus:QUEStionable:LIMit<n>:NTRansition <SumBit>,<ChannelName>
STATus:QUEStionable:LMARgin<n>:NTRansition <SumBit>,<ChannelName>
STATus:QUEStionable:POWer:NTRansition <SumBit>,<ChannelName>
STATus:QUEStionable:TEMPerature:NTRansition <SumBit>,<ChannelName>
STATus:QUEStionable:TIME:NTRansition <SumBit>,<ChannelName>

These commands control the Negative TRansition part of a register.

Setting a bit causes a 1 to 0 transition in the corresponding bit of the associated register. The transition also writes a 1 into the associated bit of the corresponding EVENt register.

Parameters:

<SumBit> Range: 0 to 65535

<ChannelName> String containing the name of the channel.
The parameter is optional. If you omit it, the command works for the currently active channel.

10.9.6 Controlling the Positive Transition Part

For more information on the negative transition part see chapter 9.1.7.2, "Structure of a SCPI Status Register", on page 400.

STATus:OPERation:PTRansition <SumBit>
STATus:QUEStionable:PTRansition <SumBit>
STATus:QUEStionable:ACPLimit:PTRansition <SumBit>,<ChannelName>

STATus:QUEStionable:FREQuency:PTRansition <SumBit>,<ChannelName>
STATus:QUEStionable:LIMit<n>:PTRansition <SumBit>,<ChannelName>
STATus:QUEStionable:LMARgin<n>:PTRansition <SumBit>,<ChannelName>
STATus:QUEStionable:POWer:PTRansition <SumBit>,<ChannelName>
STATus:QUEStionable:TEMPerature:PTRansition <SumBit>,<ChannelName>
STATus:QUEStionable:TIME:PTRansition <SumBit>,<ChannelName>

These commands control the Positive TRansition part of a register.

Setting a bit causes a 0 to 1 transition in the corresponding bit of the associated register. The transition also writes a 1 into the associated bit of the corresponding EVENt register.

Parameters:

<SumBit> Range: 0 to 65535

<ChannelName> String containing the name of the channel.
The parameter is optional. If you omit it, the command works for the currently active channel.

10.10 Emulating Other Instruments' Commands

The R&S FSW analyzer family supports a subset of the GPIB commands of several HP and PSA instruments.

For details see chapter 9.2, "GPIB Languages", on page 414.

10.10.1 Setting up Instrument Emulation

The following commands are required to set up the use of commands to emulate other instruments.

SYSTem:HPCoupling <CouplingType>

Controls the default coupling ratios in the HP emulation mode for:

- span and resolution bandwidth (Span/RBW) and
- resolution bandwidth and video bandwidth (RBW/VBW)

For FSP (=FSW), the standard parameter coupling of the instrument is used. As a result, in most cases a shorter sweeptime is used than in case of HP.

This command is only available if a HP language is selected using `SYSTem:LANGuage` on page 726.

Parameters:

<CouplingType> HP | FSP

*RST: FSP

Example: `SYSTem:HPC HP`

Manual control: See "Coupling" on page 423

SYSTem:IFGain:MODE <Mode>

Configures the internal IF gain settings in HP emulation mode due to the application needs. This setting is only taken into account for resolution bandwidth < 300 kHz and is only available if a HP language is selected using `SYSTem:LANGuage`.

Parameters:

<Mode> NORM | PULS

NORM
Optimized for high dynamic range, overload limit is close to reference level.

PULS
Optimized for pulsed signals, overload limit up to 10 dB above reference level.

*RST: NORM

Example: `SYST:IFG:MODE PULS`

Manual control: See "IF Gain" on page 422

SYSTem:LANGuage <Language>

This command defines the system language.

For details see chapter 9.2, "GPIB Languages", on page 414.

Note: For PSA89600 emulation, the option is indicated as "B7J" for the `*OPT?` query ("B7J, 140" if Wideband is activated).

Parameters:

<Language> "SCPI" | "8560E" | "8561E" | "8562E" | "8563E" | "8564E" | "8565E" | "8566A" | "8566B" | "8568A" | "8568A_DC" | "8568B" | "8568B_DC" | "8591E" | "8594E" | "71100C" | "71200C" | "71209A" | "PSA89600" | "FSEA" | "FSEB" | "FSEM" | "FSEK"

*RST: SCPI

Example: `SYST:LANG '8560E'`
Sets the system language to 8560E to simulate the HP model.

Usage: SCPI confirmed

Manual control: See "Language" on page 422

SYST:PSA:WIDeband <State>

This command is only available for PSA89600 emulation.

If activated, the option is indicated as "B7J, 140" for the `*OPT?` query.

(If deactivated, the option is indicated as "B7J".)

Parameters:
<State> ON | OFF
*RST: OFF

Manual control: See "Wideband" on page 423

SYSTem:REVision:FACTory

Resets the response to the REV? query to the default value, e.g. after a user string was defined using the `SYSTem:REVision[:STRing]` command. (REV? query available for HP emulation only, see `SYSTem:LANGuage` on page 726.)

Example: Define the system language:
`SYST:LANG '8563E'`
Set the response back to factory setting:
`SYS:REV:FACT`
Query the revision:
`REV?`
Response:
`920528`

Manual control: See "Resetting the Factory Revision" on page 423

SYSTem:REVision[:STRing] <Name>

Sets the response to the `REV?` query to the defined string (HP emulation only, see `SYSTem:LANGuage` on page 726).

Parameters:
<Name>

Example: Define the system language:
`SYST:LANG '8563E'`
Query the revision:
`REV?`
Response:
`920528`
Set the response to 'NewRevision':
`SYST:REV:STR 'NewRevision'`
Query the response:
`SYST:REV:STR?`
Response:
`NewRevision`

Manual control: See "Revision String" on page 423

SYSTem:RSW <State>

Controls a repeated sweep of the E1 and MKPK HI HP model commands (for details on the commands refer to chapter 10.10.2, "Reference: GPIB Commands of Emulated HP Models", on page 728). If the repeated sweep is OFF, the marker is set without sweeping before.

This command is only available if a HP language is selected using `SYSTem:LANGuage` on page 726

Parameters:
<State> ON | OFF
*RST: OFF

Example: `SYSTem:RSW ON`

Manual control: See "Sweep Repeat" on page 423

10.10.2 Reference: GPIB Commands of Emulated HP Models

The R&S FSW analyzer family supports a subset of the GPIB commands of HP models 8560E, 8561E, 8562E, 8563E, 8564E, 8565E, 8566A, 8566B, 8568A, 8568B and 8594E.

Despite the differences in system architecture and device features, the supported commands have been implemented in a way to ensure a sufficiently high degree of correspondence with the original.

This includes the support of syntax rules for not only newer device families (B and E models) but for the previous A family as well.

In many cases the selection of commands supported by the R&S FSW is sufficient to run an existing GPIB program without adaptation.

After the introduction, this section includes the following topics:

10.10.2.1 Command Set of Models 8560E, 8561E, 8562E, 8563E, 8564E, 8565E, 8566A/B, 8568A/B, 8591E, 8594E, 71100C, 71200C, and 71209A

As with the original units, the R&S FSW includes the command set of the A models in the command set of the B models.

The HP model 8591E is compatible to HP model 8594E, the HP models 71100C, 71200C, and 71209A are compatible to HP models 8566A/B.

Command	Supported subset	Function	Corresp. HP-Models	Status
A1	A1	Clear/Write A	HP 8566A/ HP 8568A	available
A2	A2	Max Hold A	HP 8566A/ HP 8568A	available
A3	A3	View A	HP 8566A/ HP 8568A	available
A4	A4	Blank A	HP 8566A/ HP 8568A	available
ABORT [1)]	ABORT	Stop previous function	HP 856xE/ HP 8566B/HP 8568B/HP 8594E	available
ADD		Add	HP 8566B/ HP 8568B/ HP 8594E	available
ADJALL	ADJALL	Adjust all	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available

Command	Supported subset	Function	Corresp. HP-Models	Status
ADJCRT 2)	ADJCRT	Adjust CRT	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
ADJIF 2)	ADJIF	Auto adjust IF	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
AMB	AMB ON|OFF AMB 1|0 AMB?	Trace A – B -> Trace A	HP 856xE/ HP 8594E	available
AMBPL	AMBPL ON|OFF AMBPL 1|0 AMBPL?		HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
ANNOT	ANNOT ON|OFF ANNOT 1|0 ANNOT?	Annotation	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
APB	APB	Trace A + B -> Trace A	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
AT	AT <numeric_value> DB | DM AT DN AT UP AT AUTO AT?	Attenuation	HP 8566A/ HP 8568A/ HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
AUNITS	AUNITS DBM | DBMV | DBUV | AUNITS?	Amplitude Units	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
AUTOCPL	AUTOCPL	Coupling default	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available

Command	Supported subset	Function	Corresp. HP-Models	Status
AXB	AXB	Exchange trace A and B	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
B1	B1	Clear/Write B	HP 8566A/ HP 8568A	available
B2	B2	Max Hold B	HP 8566A/ HP 8568A	available
B3	B3	View B	HP 8566A/ HP 8568A	available
B4	B4	Blank B	HP 8566A/ HP 8568A	available
BL	BL	Trace B – Display Line -> Trace B	HP 8566A/ HP 8568A	available
BML	BML	Trace B – Display Line -> Trace B	HP 856xE/ HP8594E	available
BTC	BTC	Transfer Trace B -> C	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
BXC	BXC	Exchange Trace B and C	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
BLANK	BLANK TRA|TRB|TRC	Blank Trace	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
C1	C1	A-B off	HP 8566A/ HP 8568A	available
C2	C2	A-B -> A	HP 8566A/ HP 8568A	available
CA	CA	Couple Attenuation	HP 8566A/ HP 8568A	available
CAL [1)]	CAL ALL CAL ON CAL OFF	Start analyzer self alignment	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available

Command	Supported subset	Function	Corresp. HP-Models	Status
CF	CF <numeric_value> HZ|KHZ|MHZ|GHZ CF UP CF DN CF?	Center Frequency	HP 8566A/ HP 8568A/ HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
CHANPWR	CHANPWR TRA|TRB, <numeric_value>,?	Channel Power Measurement	HP 856xE/ HP 8594E	available
CHPWRBW	CHPWRBW <numeric_value> HZ|KHZ|MHZ|GHZ	Channel Power Bandwidth	HP 856xE/ HP 8594E	available
CLRW	CLRW TRA|TRB|TRC	Clear/Write Trace	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
CLS [1)]	CLS	Clear all status bits	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
CONTS	CONTS		HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
COUPLE	COUPLE AC|DC	Input coupling	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
CR	CR	Couple RBW	HP 8566A/ HP 8568A	available
CS	CS	Couple Step Size	HP 8566A/ HP 8568A	available
CT	CT	Couple SWT	HP 8566A/ HP 8568A	available
CTA		Convert to absolute units	HP 8566B/ HP 8568B/ HP 8594E	available
CV	CV	Couple VBW	HP 8566A/ HP 8568A	available
D1 [2)]	D1	Display Size normal	HP 8566A/ HP 8568A	available

Command	Supported subset	Function	Corresp. HP-Models	Status
DA [2]	DA	Display address		available
DEMOD [1]	DEMOD ON|OFF|AM|FM	AF Demodulator	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
DEMODAGC [2]	DEMODAGC ON|OFF|1|0 DEMODAGC?	Demodulation AGC	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
DEMODT	DEMODT <numeric_value> S|MS|US|SC DEMODT UP|DN DEMODT?	Demodulation time	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
DET	DET POS|SMP|NEG DET?	Detector	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
DISPOSE [2]	ONEOS | TRMATH | ONSWP | ALL | <numeric_value>			available
DIV		Divide	HP 8566B/ HP 8568B/ HP 8594E	available
DL	DL <numeric_value> DB|DM DL DN DL UP DL ON DL OFF DL?	Display Line	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
DLE	DLE ON|OFF	Display Line enable	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
DONE	DONE DONE?	Done query	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
DW [2]	DW	Write to display and increment address		available

Command	Supported subset	Function	Corresp. HP-Models	Status
E1	E1	Peak Search	HP 8566A/ HP 8568A	available
E2	E2	Marker to Center Freq.	HP 8566A/ HP 8568A	available
E3	E3	Deltamarker Step Size	HP 8566A/ HP 8568A	available
E4	E4	Marker to Ref. Level	available	available
EDITDONE		limit line edit done	HP 856xE	available
EDITLIML		edit limit line	HP 856xE	available
ERR	ERR 250 cal level error ERR 300 LO unlock ERR 472 cal error digital filter ERR 473 cal error analog filter ERR 552 cal error log amp ERR 902 unscale tracking generator ERR 906 oven cold ERR 117 numeric unit error ERR 112 Unrecognized Command	Now some FSx errors are mapped to HP errors.	HP8568A HP856xE	not yet available
ERR?	ERR?	Error queue query	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	not yet available
EX	EX	Exchange trace A and B	HP 8566A/ HP 8568A	available
FA	FA <numeric_value> HZ|KHZ|MHZ|GHZ FA UP FA DN FA?	Start Frequency	HP 8566A/ HP 8568A/ HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
FB	FB <numeric_value> HZ|KHZ|MHZ|GHZ FB UP FB DN FB?	Stop Frequency	HP 8566A/ HP 8568A/ HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available

Command	Supported subset	Function	Corresp. HP-Models	Status
FDSP		Frequency display off	8560E 8561E 8562E 8563E 8564E 8565E	available
FOFFSET [1)]	FOFFSET <numeric_value> HZ|KHZ|MHZ|GHZ FOFFSET?	Frequency Offset	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
FREF	FREF INT|EXT	Reference Frequency	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
FS	FS	Full Span	HP 8566A/ HP 8568A	available
FUNCDEF		Define Function Function must be in one line between delimiters @	HP 8594E/ HP 856xE/ HP 8566B	available
GATE [1)]	GATE ON|OFF GATE 1|0		HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
GATECTL [1)]	GATECTL EDGE|LEVEL GATECTL?		HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
GD [1)]	GD <numeric_value> US|MS|SC GD DN GD UP GD?		HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
GL [1)]	GL <numeric_value> US|MS|SC GL DN GL UP GL?		HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
GP [1)]	GP POS|NEG GP?		HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available

Command	Supported subset	Function	Corresp. HP-Models	Status
GRAT [2]	GRAT ON|OFF	Graticule	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
I1	I1		HP 8566A/ HP 8568A	available
I2	I2		HP 8566A/ HP 8568A	available
ID	ID ID?	Identify	HP 8566A/ HP 8568A/ HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
INZ [1]	INZ 75 INZ 50 INZ?	Input Impedance	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
IP	IP	Instrument preset	HP 8566A/ HP 8568A	available
KEYDEF	KEYDEF	Key definition	HP 8566B/ HP 856xE/ HP 859xE	available
KEYEXEC	KEYEXEC	Key execute	HP 8566B	available
KS=	KS= <numeric_value> HZ|KHZ|MHZ|GHZ KS= DN KS= UP KS=?	Marker Frequency Counter Resolution	HP 8566A/ HP 8568A	available
KS/	KS/	Manual Peaking	HP 8566A/ HP 8568A	available
KS(	KS(	Lock register	HP 8566A/ HP 8568A	available
KS)	KS)	Unlock register	HP 8566A/ HP 8568A	available
KS91	KS91	Read Amplitude Error	HP 8566A/ HP 8568A	available
KSA	KSA	Amplitude Units in dBm	HP 8566A/ HP 8568A	available

Command	Supported subset	Function	Corresp. HP-Models	Status
KSB	KSB	Amplitude Units in dBmV	HP 8566A/ HP 8568A	available
KSC	KSC	Amplitude Units in dBuV	HP 8566A/ HP 8568A	available
KSD	KSD	Amplitude Units in V	HP 8566A/ HP 8568A	available
KSE	KSE <numeric_value>| <char data>@	Title mode	HP 8566A/ HP 8568A	available
KSG	KSG KSG ON KSG <numeric_value>	Video Averaging on	HP 8566A/ HP 8568A	available
KSH	KSH	Video Averaging Off	HP 8566A/ HP 8568A	available
KSK		Marker to Next Peak	HP 8566A/ HP 8568A	available
KSL		Marker Noise off	HP 8566A/ HP 8568A	available
KSM		Marker Noise on	HP 8566A/ HP 8568A	available
KSO	KSO	Deltamarker to span	HP 8566A/ HP 8568A	available
KSP	KSP <numeric_value>	HPIB address	HP 8566A/ HP 8568A	available
KSQ [2)]	KSQ	Band lock off	HP 8566A/ HP 8568A	available
KST	KST	Fast Preset	HP 8566A/ HP 8568A	available
KSV	KSV <numeric_value> HZ|KHZ|MHZ|GHZ KSV?	Frequency Offset	HP 8566A/ HP 8568A	available
KSW	KSW	Error Correction Routine	HP 8566A/ HP 8568A	available
KSX	KSX	Correction Values On	HP 8566A/ HP 8568A	available
KSY	KSY	Correction Values Off	HP 8566A/ HP 8568A	available

Command	Supported subset	Function	Corresp. HP-Models	Status
KSZ	KSZ <numeric_value> DB KSZ?	Reference Value Offset	HP 8566A/ HP 8568A	available
KSa	KSa	Normal Detection	HP 8566A/ HP 8568A	available
KSb	KSb	Pos Peak Detection	HP 8566A/ HP 8568A	available
KSd	KSd	Neg Peak Detection	HP 8566A/ HP 8568A	available
KSe	KSe	Sample Detection	HP 8566A/ HP 8568A	available
KSg		CRT beam off		available
KSh		CRT beam on		available
KSj	KSj	View Trace C	HP 8566A/ HP 8568A	available
KSk	KSk	Blank Trace C	HP 8566A/ HP 8568A	available
KSl	KSl	Transfer B to C	HP 8566A/ HP 8568A	available
KSm	KSm	Graticule off	HP 8566A/ HP 8568A	available
KSn[2)]	KSn	Grid on	HP 8566A/ HP 8568A	available
KSo	KSn	Character display off	HP 8566A/ HP 8568A	available
KSp	KSp	Character display on	HP 8566A/ HP 8568A	available
KSr	KSr	Create service request	HP 8566A/ HP 8568A	available
KSt [2)]	KSt	Band lock on	HP 8566A/ HP 8568A	available
KSv [2)]	KSv	Signal ident on	HP 8566A/ HP 8568A	available
L0	L0	Display line off	HP 8566A/ HP 8568A	available
LB	LB <numeric_value>| <char data>@	Label	HP 8566A/ HP 8568A	available

Command	Supported subset	Function	Corresp. HP-Models	Status
LF	LF	Low frequency band preset	HP 8566A/ HP 8568A	available
LIMD		limit line delta	HP 856xE	available
LIMF		limit line frequency	HP 856xE	available
LIMIFAIL		limit fail query	HP 856xE	available
LIMIPURGE		purge limit line	HP 856xE	available
LIMIRCL		recall limit line	HP 856xE	available
LIMIREL		relative limit line	HP 856xE	available
LIMISAV		save limit line	HP 856xE	available
LIMITEST		limit line test	HP 856xE	available
LIML		lower limit line value	HP 856xE	available
LIMM		middle limit line value	HP 856xE	available
LIMTFL		flat limit line segment	HP 856xE	available
LIMTSL		slope limit line segment	HP 856xE	available
LIMU		upper limit line value	HP 856xE	available
LG	LG <numeric_value> DB | DM LG?	Amplitude Scale Log	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
LL [2)]	LL	Plot command	HP 8566A/ HP 8568A	available
LN	LN	Amplitude Scale Lin	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
M1	M1	Marker Off	HP 8566A/ HP 8568A	available
M2	M2 M2 <numeric_value> HZ|KHZ|MHZ|GHZ M2 DN M2 UP M2?	Marker Normal	HP 8566A/ HP 8568A	available

Command	Supported subset	Function	Corresp. HP-Models	Status
M3	M3 M3 <numeric_value> HZ|KHZ|MHZ|GHZ M3 DN M3 UP M3?	Delta Marker	HP 8566A/ HP 8568A	available
M4	M4 <numeric_value> HZ|KHZ|MHZ|GHZ	Marker Zoom	HP 8566A/ HP 8568A	available
MA	MA	Marker Amplitude	HP 8566A/ HP 8568A	available
MC0	MC0	Marker Count off	HP 8566A/ HP 8568A	available
MC1	MC1	Marker Count on	HP 8566A/ HP 8568A	available
MDS	MDS	Measurement data size	HP 8566B	available
MEAS		Measurement status	HP 856xE	available
MF	MF MF?	Marker Frequency	HP 8566A/ HP 8568A/ HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MINH[1)]	MINH TRC	Minimum Hold	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKA	MKA <numeric_value> MKA?	Marker Amplitude	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKACT	MKACT 1 MKACT?	Select the active marker	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	not available
MKBW [1)]	MKBW <numeric_value> MKBW ON MKBW OFF	N dB Down	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available

Command	Supported subset	Function	Corresp. HP-Models	Status
MKD	MKD MKD <numeric_value> HZ|KHZ| MHZ|GHZ MKD DN MKD UP MKD ON MKD OFF MKD?	Delta Marker	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKDR	MKDR <numeric_value> HZ|KHZ| MHZ|GHZ| S|SC|MS|MSEC| USMKDR?	Delta Marker reverse	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKDR?		Delta Marker reverse query		available
MKF	MKF <numeric_value> HZ|KHZ|MHZ|GHZ MKF?	Set Marker Frequency	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKFC	MKFC ON|OFF	Frequency Counter on/ off	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKFCR [1)]	MKFCR <numeric_value> HZ|KHZ| MHZ|GHZ MKFCR DN MKFCR UP MKFCR?	Frequency Counter Resolution	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKMIN	MKMIN	Marker -> Min	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKN	MKN MKN <numeric_value> HZ|KHZ|MHZ|GHZ MKN DN MKN UP MKN ON MKN OFF MKN?	Normal Marker	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available

Command	Supported subset	Function	Corresp. HP-Models	Status
MKNOISE	MKNOISE ON|OFF MKNOISE 1|0 MKNOISE?	Noise Measurement	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKOFF	MKOFF MKOFF ALL	Marker off	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKP	MKP <numeric_value> MKP?	Marker position	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKPK	MKPK MKPK HI MKPK NH MKPK NR MKPK NL	Marker Search	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKPT	MKPT MKPT HI MKPT NH MKPT NR MKPT NL	Marker Peak Threshold	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKPX	MKPX <numeric_value> DB MKPX DN MKPX UP MKPX?	Peak Excursion	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKRL	MKRL	Ref Level = Marker Level	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKSP	MKSP	Deltamarker to span	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKSS	MKSS	CF Stepsize = Marker Freq	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available

Command	Supported subset	Function	Corresp. HP-Models	Status
MKT	MKT <numeric_value> S|MS|US|SC MKT?	MKF = fstart + MKT/ SWT*Span	HP 856xE/ HP 8594E	available
MKTRACE	MKTRACE TRA|TRB|TRC	Marker to Trace	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKTRACK	MKTRACK ON|OFF MKTRACK 1|0 MKTRACK?	Signal Track	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MKTYPE	MKTYPE AMP MK TYPE?	Marker type	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
ML		Mixer level	HP 856xE	available
MOV	MOV TRA|TRB|TRC, TRA|TRB|T RC	Move Trace Contents	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
MPY		Multiply	HP 8566B/ HP 8568B/ HP 8594E	available
MT0	MT0	Marker Track Off	HP 8566A/ HP 8568A	available
MT1	MT1	Marker Track On	HP 8566A/ HP 8568A	available
MXMH	MXMH TRA|TRB	Maximum Hold	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
NORMALIZE	NORMALIZE	Normalize trace	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	not available available
NRL [1)]	NRL <numeric_value> DB | DM NRL?	Normalized Reference Level	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available

Command	Supported subset	Function	Corresp. HP-Models	Status
NRPOS	NRPOS <numeric_value> NRL?	Normalize position	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
O1	O1	Format ASCII, Values 0 to 4095	HP 8566A/ HP 8568A	available
O2	O2	Format Binary, Values 0 to 4095	HP 8566A/ HP 8568A	available
O3	O3	Format ASCII	HP 8566A/ HP 8568A	available
OA	OA	Output All	HP 8566A/ HP 8568A	available
OL	OL <80 characters> OL?	Output Learn String	HP 8566A/ HP 8568A	available
OT	OT	Output Trace Annotations	HP 8566A/ HP 8568A	available
PA	PA <numeric_value>, <numeric_value	Plot command	HP 8566A/ HP 8568A	available
PD	PD <numeric_value>, <numeric_value	Plot command	HP 8566A/ HP 8568A	available
PH_MKF		Spot frequency in Hz	HP 856xE	available
PH_FMIN		Min offset frequency to be measured	HP 856xE	available
PH_FMAX		Max offset frequency to be measured	HP 856xE	available
PH_MKA		Queries amplitude at the spot frequency	HP 856xE	available
PH_DRIFT		0: for stable signals, 1: for drifty	HP 856xE	available
PH_RLVL		Reference level for the log plot	HP 856xE	available
PH_SMTHV		Trace smoothing	HP 856xE	available
PH_VBR		Filtering	HP 856xE	available
PH_RMSPT		Amount of data points to skip when doing the integration	HP 856xE	available
PH_RMSFL		Lower integration frequency in Hz	HP 856xE	available
PH_RMSFU		Upper integration frequency in Hz	HP 856xE	available

Command	Supported subset	Function	Corresp. HP-Models	Status
PH_EXIT		Quits phase noise	HP 856xE	available
PH_F_UDT		Updates internal frequency variables	HP 856xE	available
PH_LMT_L		Apply limits to PH_FMIN and PH_FMAX	HP 856xE	available
PH_MEAS		Generates log frequency plot	HP 856xE	available
PH_MKF_D		Updates the spot frequency	HP 856xE	available
PH_RMS		Requests the rms phase noise	HP 856xE	available
PH_RMSFT		Updates internal frequency variables	HP 856xE	available
PH_RMSX		Calculates the rms phase noise	HP 856xE	available
PH_SPOTF		Executes the spot frequency measurement	HP 856xE	available
PLOTORG [2]	PLOTORG DSP|GRT	Plot command	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
PLOTSRC [2]	PLOTSRC ANNT|GRT| TRB| TRA|ALLDSP|GRT	Plot command	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
PP	PP	Preselector Peaking	HP 8566A/ HP 8568A	available
PRINT [1]	PRINT PRINT 1|0	Hardcopy	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
PSDAC [2]	PSDAC <numeric_value> PSDAC UP|DN	Preselector DAC value	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
PSTATE [2]	PSTATE ON|OFF|1|0	Protect State	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
PU	PU	Pen Up	HP 8566A/ HP 8568A	available

Command	Supported subset	Function	Corresp. HP-Models	Status
PWRBW	PWRBW	Power Bandwidth	HP 8566B/ HP 859x/ HP 856xE	available
R1	R1	Set Status Bit Enable	HP 8566A/ HP 8568A	available
R2	R2	Set Status Bit Enable	HP 8566A/ HP 8568A	available
R3	R3	Set Status Bit Enable	HP 8566A/ HP 8568A	available
R4	R4	Set Status Bit Enable	HP 8566A/ HP 8568A	available
RB	RB <numeric_value> HZ|KHZ|MHZ|GHZ RB DN RB UP RB AUTO RB?	Resolution Bandwidth	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
RBR	RBR <numeric_value> RBR DN RBR UP RBR?	Resolution Bandwidth Ratio	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
RC1…6	RC1…6	Recall Last State	HP 8566A/ HP 8568A	available
RCLS	RCLS <numeric_value>	Recall State Register	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
RCLT	RCLT TRA|TRB, <number>	Recall Trace	HP856xE/ HP8594E	available
RESET	RESET	Instrument preset	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
REV	REV REV?	Firmware revision	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available

Command	Supported subset	Function	Corresp. HP-Models	Status
RL	RL <numeric_value> DB|DM RL DN RL UP RL?	Reference Level	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
RLCAL	RLCAL <numeric_value> RL?	Reference Level Calibration	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
RCLOSCAL	RCLOSCAL	Recall Open/Short Average	HP 856xE/ HP 8594E	not available
RCLTHRU	RCLTHRU	Recall Thru	HP 856xE/ HP 8594E	not available
RLPOS [1)]	RLPOS <numeric_value> RLPOS DN RLPOS UP RLPOS?	Reference Level Position	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
ROFFSET	ROFFSET <numeric_value> DB | DM ROFFSET?	Reference Level Offset	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
RQS	RQS	Service Request Bit mask	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
S1	S1	Continuous Sweep	HP 8566A/ HP 8568A	available
S2	S2	Single Sweep	HP 8566A/ HP 8568A	available
SADD		add a limit line segment	HP 856xE	available
SAVES	SAVES <numeric_value>	Save State Register	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
SAVET	SAVET TRA|TRB,<number>	Save Trace	HP856xE/ HP8594E	available
SDEL		delete limit line segment	HP 856xE	available
SDON		limit line segment done	HP 856xE	available

Command	Supported subset	Function	Corresp. HP-Models	Status
SEDI		edit limit line segment	HP 856xE	available
SMOOTH	SMOOTH TRA|TRB|TRC, <number of points>	Smooth Trace	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
SNGLS	SNGLS	Single Sweep	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
SQUELCH [2]	SQUELCH <numeric_value> DM | DB SQUELCH UP|DN SQUELCH ON|OFF	Squelch	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
SP	SP <numeric_value> HZ|KHZ|MHZ|GHZ SP DN SP UP SP?	Span	HP 8566A/ HP 8568A/ HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
SRCNORM [1]	SRCNORM ON|OFF SRCNORM 1|0	Source Normalization	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	not available
SRCPOFS [1]	SRCPOFS <numeric_value> DB | DM SRCPOFS DN SRCPOFS UP SRCPOFS?	Source Power Offset	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	not available
SRCPWR [1]	SRCPWR <numeric_value> DB | DM SRCPWR DN SRCPWR UP SRCPWR ON SRCPWR OFF SRCPWR?	Source Power	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	not available

Command	Supported subset	Function	Corresp. HP-Models	Status
SS	SS <numeric_value> HZ|KHZ|MHZ|GHZ SS DN SS UP SS AUTO SS?	CF Step Size	HP 8566A/ HP 8568A/ HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
ST	ST <numeric_value> US|MS|SC ST DN ST UP ST AUTO ST?	Sweep Time	HP 8566A/ HP 8568A/ HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
STB	STB	Status byte query	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
STOREOPEN	STOREOPEN	Store Open	HP 856xE/ HP 8594E	not available
STORESHORT	STORESHORT	Store Short	HP 856xE/ HP 8594E	not available
STORETHRU	STORETHRU	Store Thru	HP 856xE/ HP 8594E	not available
SUB		Subtract	HP 8566B/ HP 8568B/ HP 8594E	available
SUM		sum of trace amplitudes	HP 8566B/ HP 8568B/ HP 8594E	available
SV1…6	SV1…6	Save State	HP 8566A/ HP 8568A	available
SWPCPL [2)]	SWPCPL SA | SR SWPCPL?	Sweep Couple	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
SWPOUT [2)]	SWPOUT FAV|FAVA|RAMP SWPOUT?	Sweep Output	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
T0	T0	Threshold off	HP 8566A/ HP 8568A	available

Command	Supported subset	Function	Corresp. HP-Models	Status
T1	T1	Free Run Trigger	HP 8566A/ HP 8568A	available
T2 [2)]	T2	Line Trigger	HP 8566A/ HP 8568A	available
T3	T3	External Trigger	HP 8566A/ HP 8568A	available
T4	T4	Video Trigger	HP 8566A/ HP 8568A	available
TA	TA	Transfer A	HP 8566A/ HP 8568A	available
TACL	TACL?	Returns instantaneous measurement results. See TRACe<trace #>:IMMediate:LEVel? for full description.		not available
TBCL	TBCL?			
TCCL	TCCL?			
TACR	TACR?	Returns instantaneous measurement results. See TRACe<trace #>:IMMediate:LEVel? for full description.		not available
TBCR	TBCR?			
TCCR	TCCR?			
TB	TB	Transfer B	HP 8566A/ HP 8568A	available
TDF	TDF P TDF M TDF B TDF A TDF I	Trace Data Format	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
TH	TH <numeric_value> DB|DM TH DN TH UP TH ON TH OFF TH AUTO TH?	Threshold	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available

Command	Supported subset	Function	Corresp. HP-Models	Status
THE	THE ON| OFF	Threshold Line enable	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
TIMEDSP [1)]	TIMEDSP ON|OFF TIMEDSP 1|0 TIMEDSP?	Time Display	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
TM	TM FREE|VID|EXT| LINE[2)] TM?	Trigger Mode	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
TM LINE [2)]	TM LINE	Trigger Line	HP 8566B	available
TRA	TRA B TRA A TRA I	Transfer A	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
TRB	TRB B TRB A TRB I	Transfer B	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
TRSTAT	TRSTAT?	Trace State Query	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
TS	TS	Take Sweep	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
UR [2)]	UR	Plot Command	HP 8566A/ HP 8568A	available
VARDEF	VARDEF	Variable definition, arrays are not supported	HP 8566B/ HP 8568B/ HP 8594E	available
VAVG	VAVG VAVG TRA|TRB|TRC	Video Averaging	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available

Command	Supported subset	Function	Corresp. HP-Models	Status
VB	VB <numeric_value> HZ|KHZ|MHZ|GHZ VB DN VB UP VB AUTO VB?	Video Bandwidth	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
VBR 1)	VBR <numeric_value> VBR DN VBR UP VBR?	Video Bandwidth Ratio	HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
VIEW	VIEW TRA|TRB|TRC		HP 856xE/ HP 8566B/ HP 8568B/ HP 8594E	available
VTL	VTL <numeric_value> DB|DM VTL DN VTL UP VTL?	Video Trigger Level	HP 856xE/ HP 8594E	not available
1) HP 8594E only				
2) Command is accepted without error message, but is ignored				

10.10.2.2 Special Features of the Syntax Parsing Algorithms for 8566A and 8568A Models

The command syntax is very different for models A and B. Different names are assigned to identical instrument functions, and the command structure likewise differs considerably between models A and models B.

The command structure for models A is as follows:

```
<command>::= <command
code>[<SPC>][<data>|<step>][<SPC>][<delimiter>][<command
code>]…<delimiter>
```

```
<data>::= <Value>[<SPC>][<units
code>][<SPC>][<delimiter>][<SPC>][<data>]…
```

```
<step>::= UP|DN
```

where

`<command code>` = see Table "Supported Commands"

`<Value>` = integer or floating-point numerical value

`<units code>` = DM | -DM | DB | HZ | KZ | MZ | GZ | MV | UV | SC | MS | US

`<delimiter>` = <CR> | <LF> | <,> | <;> | <ETX>

<SPC> = 32_{10}

<ETX> = 3_{10}

Command sections given in [ ] are optional.

The R&S FSW GPIB hardware differs from that used in the HP analyzers. Therefore, the following constraint exists:

<LF>| <EOI> are still used as delimiters since the GPIB hardware is able to identify them. The other delimiters are identified and evaluated during syntax analysis.

10.10.2.3 Special Behavior of Commands

Command	Known Differences
ABORT	Does not automatically set the command complete bit (bit 4) in the status byte. An additional DONE is required for that purpose.
ANNOT	Only frequency axis annotation is affected.
AT	AT DN/UP: Step size
CAL	The CAL commands do not automatically set the command complete bit (bit 4) in the status byte. An additional DONE command is required for that purpose.
CF	Default value, range, step size
CR	Default ratio Span/RBW
CT	Formula for coupled sweeptime
CV	Default ratio RBW/VBW
DEMOD	requires option R&S FSW-B3
DET	DET? returns SAMP instead of SMP on the R&S FSW. DET not automatically set the command complete bit (bit 4) in the status byte. An additional DONE is required for that purpose.
ERR?	Deletes the error bit in the status register but always returns a '0' in response.
FA	Default value, range, step size
FB	Default value, range, step size
ID	Query of instrument ID. The instrument ID defined in "SETUP > Network + Remote > GPIB > Identification String" is returned.
M2	Default value, range, step size
M3	Default value, range, step size
MKACT	Only marker 1 is supported as the active marker.
MKBW	Default value
MKPT	Step size
MKPX	Step size

Command	Known Differences
OL?	Storage of instrument settings: 80 characters are returned as information on the instrument settings. The contents of the 80 characters returned does not correspond to the original data contents of the 8566A/8568A family.
OL	Readout of instrument settings: The 80 characters read by means of OL? are accepted as information on the corresponding instrument settings. The contents of the 80 characters read does not correspond to the original data contents of the 8566A/8568A family.
RB	Default value, range, step size
RL	Default value, step size
RLPOS	Adapts the position of the reference level even if the tracking generator normalization is not active.
RQS	Supported bits:

1. (Units key pressed)
2. (End of Sweep)
3. (Device error)
4. (Command complete)
5. (Illegal command)

10.10.2.4 Model-Dependent Default Settings

If the GPIB language is switched over to an 85xx model, the GPIB address is automatically switched over to 18 provided that the default address of the R&S FSW (20) is still set. If a different value is set, this value is maintained. Upon return to SCPI, this address remains unchanged.

The following table shows the default settings obtained after a change of the GPIB language and for the commands IP, KST and RESET:

Model	# of Trace Points	Start Freq.	Stop Freq.	Ref Level	Input Coupling
8566A/B	1001	2 GHz	22 GHz	0 dBm	AC
8568A/B	1001	0 Hz	1.5 GHz	0 dBm	AC
8560E	601	0 Hz	2.9 GHz	0 dBm	AC
8561E	601	0 Hz	6.5 GHz	0 dBm	AC
8562E	601	0 Hz	13.2 GHz	0 dBm	AC
8563E	601	0 Hz	26.5 GHz	0 dBm	AC
8564E	601	0 Hz	40 GHz	0 dBm	AC

Model	# of Trace Points	Start Freq.	Stop Freq.	Ref Level	Input Coupling
8565E	601	0 Hz	50 GHz	0 dBm	AC
8594E	401	0 Hz	3 GHz	0 dBm	AC

Stop frequency

The stop frequency given in the table may be limited to the corresponding frequency range of the R&S FSW.

Command LF sets the stop frequency for 8566A/B to a maximum value of 2 GHz.

Test points (trace points)

The number of trace points is switched over only upon transition to the REMOTE state.

10.10.2.5 Data Output Formats

In the case of the SCPI and IEEE488.2 standards, the output formats for numerical data are flexible to a large extent. The output format for the HP units, by contrast, is accurately defined with respect to the number of digits. The memory areas for reading instrument data have therefore been adapted accordingly in the remote-control programs for instruments of this series.

Therefore, in response to a query, the R&S FSW returns data of the same structure as that used by the original instruments; this applies in particular to the number of characters returned.

Two formats are currently supported when trace data is output: Display Units (command O1) and physical values (command O2, O3 or TDF P). As to the "Display Units" format, the level data of the R&S FSW is converted to match the value range and the resolution of the 8566/8568 series. Upon transition to the **REMOTE** state, the R&S FSW is reconfigured such that the number of test points (trace points) corresponds to that of the 85xx families (1001 for 8566A/B and 8568A/B, 601 for 8560E to 8565E, 401 for 8594E).

10.10.2.6 Trace Data Output Formats

All formats are supported for trace data output: display units (command O1), display units in two byte binary data (command O2 or TDF B and MDS W), display units in one byte binary data (command O4 or TDF B and MDS B) and physical values (commands O3 or TDF P). With format "display units" the level data is converted into value range and resolution of the 8566/8568 models. On transition to REMOTE state the number of trace points are reconfigured in order to be conform to the selected instrument model (1001 for 8566A/B and 8568 A/B, 601 for 8560E to 8565E, 401 for 8594E).

10.10.2.7 Trace Data Input Formats

Trace data input is only supported for binary date (TDF B, TDF A, TDF I, MDS W, MDS B).

10.10.2.8 GPIB Status Reporting

The assignment of status bits by commands R1, R2, R3, R4, RQS is supported.

The STB command and the serial poll respond with an 8-bit value with the following assignment:

Bit enabled by RQS	Description
0	not used (value 0)
1	Units key pressed
2	End of Sweep
3	Device Error
4	Command Complete
5	Illegal Command
6	Service Request
7	not used (value 0)

Bits 0 and 7 are not used and always have the value 0.

Please note that the R&S FSW reports any key pressed on the front panel rather than only the unit keys if bit 1 was enabled.

Another difference is the behavior of bit 6 when using the STB? query. On the HP analyzers this bit monitors the state of the SRQ line on the bus. On the R&S FSW this is not possible. Therefore this bit is set, as soon as one of the bits 1 to 5 is set. It won't be reset by performing a serial poll.

10.10.3 Reference: Command Set of Emulated PSA Models

The R&S FSW analyzer family supports a subset of the GPIB commands of PSA89600 instruments.

Despite the differences in system architecture and device features, the supported commands have been implemented in a way to ensure a sufficiently high degree of correspondence with the original.

In many cases the selection of commands supported by the R&S FSW is sufficient to run an existing GPIB program without adaptation.

Supported 89600 commands
*CAL?
*CLS
*ESE
*ESR?
*IDN?

Supported 89600 commands
*IST?
*OPC
*OPT?
*PCB
*PRE
*PSC
*RST
*SRE
*STB?
*TRG
*TST?
*WAI
:CALibration:AUTO OFF|ON|ALERt
:CALibration:TCORrections AUTO|ON|OFF
:CONFigure:WAVeform
:DIAGnostic:EABY ON|OFF
:DIAGnostic:LATCh:VALue <numeric>
:DIAGnostic:LATCh:SELect <string>
:DISPlay:ANNotation:TITLe:DATA <string>
:DISPlay:ENABle OFF|ON
:DISPlay:WINDow:TRACe:Y:[SCALe]:PDIVision <numeric>
:DISPlay:WINDow:TRACe:Y:[SCALe]:RLEVel <numeric>
:DISPlay:WINDow:TRACe:Y:[SCALe]:RLEVel:OFFSet <numeric>
:FORMat:BORDer NORMal|SWAPped
:FORMat[:DATA] ASCii|REAL|UINT|MATLAB,<numeric>
:INITiate:CONTinuous OFF|ON
:INITiate[:IMMediate]
:INSTrument:CATalog?
:INSTrument:NSELect <numeric>
:MMEMory:CATalog? <dir_name>
:MMEMory:COPY <'file_name1'>,<'file_name2'>
:MMEMory:DATA <'file_name'>,<definite_length_block>
:MMEMory:DELete <'file_name'>

Supported 89600 commands
:MMEMory:LOAD:STATe 1,<'file_name'>
:MMEMory:LOAD:TRACe 1,<'file_name'>
:MMEMory:MDIRectory <'dir_name'>
:MMEMory:MOVE <'file_name1'>,<'file_name2'>
:MMEMory:STORe:STATe 1,<'file_name'>
:MMEMory:STORe:TRACe <numeric>,<'file_name'>
:READ:WAVform?
[:SENSe]:FREQuency:CENTer <numeric>
[:SENSe]:FREQuency:STARt <numeric>
[:SENSe]:FREQuency:STOP <numeric>
[:SENSe]:FREQuency:SPAN <numeric>
[:SENSe]:POWer:ATTenuation <numeric>
[:SENSe]:ROSCillator:EXTernal:FREQuency <numeric>
[:SENSe]:ROSCillator:OUTPut OFF|ON
[:SENSe]:ROSCillator:SOURce INTernal|EXTernal|EAUTo
[:SENSe]:SPECtrum:TRIGger:SOURce EXTernal<1|2>|IF|IMMediate
[:SENSe]:WAVeform:ADC:RANGe P6
[:SENSe]:WAVeform:APER?
[:SENSe]:WAVeform:AVERage:TACount <numeric>
[:SENSe]:WAVeform:BWIDth:ACTive?
[:SENSe]:WAVeform:BWIDth:TYPE FLAT|GAUSsian
[:SENSe]:WAVeform:IFGain <numeric>
[:SENSe]:WAVeform:IFPath NARRow|WIDE
[:SENSe]:WAVeform:NCPTrace ON|OFF
[:SENSe]:WAVeform:PDIT ON|OFF
[:SENSe]:WAVeform:SRATe <numeric>
[:SENSe]:WAVeform:SWEep:TIME <numeric>
[:SENSe]:WAVeform:TRIGger:EOFFset?
[:SENSe]:WAVeform:TRIGger:INTerpolation ON|OFF
[:SENSe]:WAVeform:TRIGger:SOURce EXTernal<1|2>|IF|IMMediate
:STATus:QUEStionable:CONDition?
:STATus:QUEStionable:ENABle <number>
:STATus:QUEStionable:NTRansition <number>

Supported 89600 commands
:STATus:QUEStionable:PTRansition <number>
:STATus:QUEStionable[:EVENt]?
:STATus:QUEStionable:CALibration:CONDition?
:STATus:QUEStionable:CALibration:ENABle <number>
:STATus:QUEStionable:CALibration:NTRansition <number>
:STATus:QUEStionable:CALibration:PTRansition <number>
:STATus:QUEStionable:CALibration[:EVENt]?
:STATus:QUEStionable:FREQuency:CONDition?
:STATus:QUEStionable:FREQuency:ENABle <number>
:STATus:QUEStionable:FREQuency:NTRansition <number>
:STATus:QUEStionable:FREQuency:PTRansition <number>
:STATus:QUEStionable:FREQuency[:EVENt]?
:STATus:QUEStionable:INTegrity:CONDition?
:STATus:QUEStionable:INTegrity:ENABle <number>
:STATus:QUEStionable:INTegrity:NTRansition <number>
:STATus:QUEStionable:INTegrity:PTRansition <number>
:STATus:QUEStionable:INTegrity[:EVENt]?
:STATus:OPERation:CONDition?
:STATus:OPERation:ENABle <integer>
:STATus:OPERation:NTRansition <integer>
:STATus:OPERation:PTRansition <integer>
:STATus:OPERation[:EVENt]?
:SYSTem:COMMunicate:GPIB[:SELF]:ADDRess <integer>
:SYSTem:DATE <year>,<month>,<day>
:SYSTem:ERRor[:NEXT]?
:SYSTem:KLOCK?
:SYSTem:MESSage <string>
:SYSTem:PRESet
:SYSTem:TIME <hour>,<minute>,<second>
:SYSTem:VERSion?
:TRACe:COPY <src_trace>,<dest_trace>
:TRACe[:DATA] TRACE1 | TRACE2 | TRACE3 | TRACE4 | TRACE5 | TRACE6, <definite_length_block> | <comma_separated_ASCII_data>
:TRACe:MODE WRITe|MAXHold|MINHold|VIEW|BLANk

Supported 89600 commands
:TRIGger[:SEQuence]:DELay <numeric>
:TRIGger[:SEQuence]:DELay:STATe OFF|ON|0|1
:TRIGger[:SEQuence]:EXTermal:DELay <numeric>
:TRIGger[:SEQuence]:EXTermal:LEVel <numeric>
:TRIGger[:SEQuence]:EXTermal:SLOPe POSitive|NEGative
:TRIGger[:SEQuence]:HOLDoff <numeric>
:TRIGger[:SEQuence]:IF:DELay <numeric>
:TRIGger[:SEQuence]:IF:LEVel <numeric>
:TRIGger[:SEQuence]:IF:SLOPe POSitive|NEGative
:TRIGger[:SEQuence]:SLOPe POSitive|NEGative
:TRIGger[:SEQuence]:SOURce IMMediate|VIDeo|EXTernal<1|2>
:TRIGger[:SEQuence]:VIDeo:LEVel <numeric>
:TRIGger[:SEQuence]:VIDeo:LEVel:FREQuency <freq>

10.11 Commands for Compatibility

The following commands are provided for compatibility to other signal analyzers only. For new remote control programs use the specified alternative commands.

DISPlay[:WINDow<n>]:STATe <State>

This command changes the display state of the selected measurement window.

Note that this command is maintained for compatibility reasons only. Use the `LAYout` commands for new remote control programs

(See chapter 10.4.2, "Working with Windows in the Display", on page 557).

Parameters:

<State> ON | OFF

OFF
The window is closed.

*RST: OFF

Usage: SCPI confirmed

DISPlay[:WINDow<n>]:TYPE <WindowType>

This command selects the results displayed in a measurement window.

Note that this command is maintained for compatibility reasons only. Use the `LAYout` commands for new remote control programs (see chapter 10.4.2, "Working with Windows in the Display", on page 557).

Parameters:

<WindowType>

DIAGram
Selects a diagram.

MTABle
Selects a marker table

PEAKlist
Selects a peak list

RSUMmary
Selects a result summary.

SGRam
Selects a spectrogram.

TRIGger[:SEQuence]:BBPower:HOLDoff <Period>

This command defines the holding time before the baseband power trigger event.

The command requires option R&S FSW-B17.

Note that this command is maintained for compatibility reasons only. Use the `TRIGger[:SEQuence]:IFPower:HOLDoff` on page 583 command for new remote control programs.

Parameters:

<Period>

Range: 150 ns to 1000 s
*RST: 150 ns

Example:

```
TRIG:SOUR BBP
```
Sets the baseband power trigger source.
```
TRIG:BBP:HOLD 200 ns
```
Sets the holding time to 200 ns.

TRIGger[:SEQuence]:RFPower:HOLDoff <Time>

This command defines the holding time before the next trigger event. Note that this command is available for any trigger source, not just RF Power.

Note that this command is maintained for compatibility reasons only. Use the `TRIGger[:SEQuence]:IFPower:HOLDoff` on page 583 command for new remote control programs.

Parameters:

<Time>

Default unit: S

10.12 Programming Examples

Some advanced programming examples for complex measurement tasks are provided here.

10.12.1 Service Request

The service request routine requires an extended initialization of the instrument in which the relevant bits of the transition and enable registers are set. In addition the service request event must be enabled in the VISA session.

10.12.1.1 Initiate Service Request

```
REM ---- Example of initialization of the SRQ in the case
' of errors -------
PUBLIC SUB SetupSRQ()
CALL InstrWrite (analyzer, "*CLS") 'Reset status reporting system
CALL InstrWrite (analyzer, "*SRE 168") 'Enable service request for
'STAT:OPER, STAT:QUES and ESR
'register
CALL InstrWrite (analyzer, "*ESE 60") 'Set event enable bit for
'command, execution, device-
'dependent and query error
CALL InstrWrite (analyzer, "STAT:OPER:ENAB 32767")
'Set OPERation enable bit for
'all events
CALL InstrWrite (analyzer, "STAT:OPER:PTR 32767")
'Set appropriate OPERation
'Ptransition bits
CALL InstrWrite (analyzer, "STAT:QUES:ENAB 32767")
'Set questionable enable bits
'for all events
CALL InstrWrite (analyzer, "STAT:QUES:PTR 32767")
'Set appropriate questionable
'Ptransition bits
CALL viEnableEvent(analyzer, VI_EVENT_SERVICE_REQ, VI_QUEUE, 0)
'Enable the event for service
'request
Status = viWaitOnEvent(analyzer, VI_EVENT_SERVICE_REQ, SRQWaitTimeout, VI_NULL,
 VI_NULL)
IF (status = VI_SUCCESS) THEN CALL Srq
'If SRQ is recognized =>
'subroutine for evaluation
END SUB
REM ***************************************************************************
```

```
Private mbSession As MessageBasedSession

Sub Main()
    Console.WriteLine("Example of initialization    _
                of the SRQ in the case of errors.")
    Dim SRQWaitTimeout = 4000 ' Timeout As Integer for WaitOnEvent
    'Opening session
    Try
        'FSW is alias, instead of use resource string.
                'For example on TCP use TCPIP0::192.168.1.2::inst0::INSTR
        mbSession = CType(ResourceManager.GetLocalManager().Open("FSW"), _
                                    MessageBasedSession)
        mbSession.TerminationCharacterEnabled = True
        Try
            mbSession.Write("*CLS") 'Reset status reporting system
            mbSession.Write("*SRE 168") 'Enable service request for
            'STAT:OPER, STAT:QUES and ESR register
            mbSession.Write("*ESE 60") 'Set event enable bit for
            'command, execution, device-dependent and query error
            mbSession.Write("STAT:OPER:ENAB 32767")
            'Set OPERation enable bit for all events
            mbSession.Write("STAT:OPER:PTR 32767")
            'Set appropriate OPERation Ptransition bits
            mbSession.Write("STAT:QUES:ENAB 32767")
            'Set questionable enable bits for all events
            mbSession.Write("STAT:QUES:PTR 32767")
            'Set appropriate questionable Ptransition bits
            Console.WriteLine("Wait on event - Blocking")
            mbSession.EnableEvent(MessageBasedSessionEventType.ServiceRequest, _
                                            EventMechanism.Queue)
            'Enable the event for service request

            '-------------------------------------------------
            ' Your command plase use here
            ' mbSession.Write("Your command")
            '-------------------------------------------------

            Dim Status = mbSession.WaitOnEvent( _
                                MessageBasedSessionEventType.ServiceRequest, SRQWaitTimeout)
            If (Status.EventType() = _
                                MessageBasedSessionEventType.ServiceRequest) Then
                Console.WriteLine("SRQ is recognized")
                'If SRQ is recognized => subroutine for evaluation
                Srq()
            End If
        Catch exp As Exception
            Console.WriteLine(exp.Message)
        End Try
    Catch exp As InvalidCastException
        Console.WriteLine("Resource selected must be a message-based session")
```

```
    Catch exp As Exception
        Console.WriteLine(exp.Message)
    End Try

    ' Close session
    mbSession.Dispose()
    ' Wait for end
    Console.WriteLine("Press any key to end")
    Console.ReadKey()
End Sub
```

10.12.1.2 Waiting for the Arrival of a Service Request

There are basically two methods of waiting for the arrival of a service request:

Blocking (user inputs not possible):

This method is appropriate if the waiting time until the event to be signaled by an SRQ is short (shorter than the selected timeout), if no response to user inputs is required during the waiting time, and if – as the main criterion – the event is absolutely certain to occur.

Reason:

From the time the viWaitOnEvent() function is called until the occurrence of the expected event, it does not allow the program to respond to mouse clicks or key entries during the waiting time. Moreover, it returns an error if the SRQ event does not occur within the predefined timeout period.

The method is, therefore, in many cases not suitable for waiting for measurement results, especially when using triggered measurements.

The following function calls are required:

```
Status = viWaitOnEvent(analyzer, VI_EVENT_SERVICE_REQ, SRQWaitTimeout, VI_NULL,
 VI_NULL)
'Wait for service request user
'inputs are not possible during
'the waiting time!
IF (status = VI_SUCCESS) THEN CALL Srq
'If SRQ is recognized =>
'subroutine for evaluation


'--------- Sweep in first Spectrum Tab and query marker --------------------
Dim Status = mbSession.WaitOnEvent( _
MessageBasedSessionEventType.ServiceRequest, SRQWaitTimeout)
'Wait for service request user inputs are not possible
'during the waiting time!
If (Status.EventType() = MessageBasedSessionEventType.ServiceRequest) Then
'If SRQ is recognized => subroutine for evaluation
    Srq()
End If
```

Non-blocking (user inputs possible):

This method is recommended if the waiting time until the event to be signaled by an SRQ is long (longer than the selected timeout), and user inputs should be possible during the waiting time, or if the event is not certain to occur. This method is, therefore, the preferable choice for waiting for the end of measurements, i.e. the output of results, especially in the case of triggered measurements.

The method necessitates a waiting loop that checks the status of the SRQ line at regular intervals and returns control to the operating system during the time the expected event has not yet occurred. In this way, the system can respond to user inputs (mouse clicks, key entries) during the waiting time.

It is advisable to employ the Hold() auxiliary function, which returns control to the operating system for a selectable waiting time (see section Waiting Without Blocking the Keyboard and Mouse), so enabling user inputs during the waiting time.

```
result% = 0
For i = 1 To 10 'Abort after max. 10 loop
'iterations
Status = viWaitOnEvent(analyzer, VI_EVENT_SERVICE_REQ, VI_TMO_IMMEDIATE, VI_NULL,
 VI_NULL)
'Check event queue
If (status = VI_SUCCESS) Then
result% = 1
CALL Srq 'If SRQ is recognized =>
'subroutine for evaluation
Else
CALL Hold(20) 'Call hold function with
'20 ms 'waiting time. User inputs
'are possible.
Endif
Next i
If result% = 0 Then
Debug.Print "Timeout Error; Program aborted"'Output error message
STOP 'Stop software
Endif
```

10.12.1.3 Waiting Without Blocking the Keyboard and Mouse

A frequent problem with remote control programs using Visual Basic is to insert waiting times without blocking the keyboard and the mouse.

If the program is to respond to user inputs also during a waiting time, control over the program events during this time must be returned to the operating system. In Visual Basic, this is done by calling the `DoEvents` function. This function causes keyboard-or mouse-triggered events to be executed by the associated elements. For example, it allows the operation of buttons and input fields while the user waits for an instrument setting to be completed.

The following programming example describes the `Hold()` function, which returns control to the operating system for the period of the waiting time selectable in milliseconds.

```
Rem ***********************************************************************
Rem The waiting function below expects the transfer of the desired
Rem waiting time in milliseconds. The keyboard and the mouse remain
Rem operative during the waiting period, thus allowing desired elements
Rem to be controlled
Rem ***********************************************************************
Public Sub Hold(delayTime As Single)
Start = Timer 'Save timer count on calling the
'function
Do While Timer < Start + delayTime/1000 'Check timer count
DoEvents 'Return control to operating
'system to enable control of
'desired elements as long as
'timer has not elapsed
Loop
End Sub
Rem ***********************************************************************
```

The waiting procedure is activated simply by calling `Hold(<Waiting time in milliseconds>)`.

10.12.1.4 Service Request Routine

A service request is processed in the service request routine.

The variables userN% and userM% must be pre-assigned usefully!

```
REM ------------ Service request routine ---------------------------------
Public SUB Srq()
ON ERROR GOTO noDevice 'No user existing
CALL viReadSTB(analyzer, STB%) 'Serial poll, read status byte
IF STB% > 0 THEN 'This instrument has bits set in
'the STB
SRQFOUND% = 1
IF (STB% AND 16) > 0 THEN CALL Outputqueue
IF (STB% AND 4) > 0 THEN CALL ErrorQueueHandler
IF (STB% AND 8) > 0 THEN CALL Questionablestatus
IF (STB% AND 128) > 0 THEN CALL Operationstatus
IF (STB% AND 32) > 0 THEN CALL Esrread
END IF
noDevice:
END SUB 'End of SRQ routine
REM ***********************************************************************

REM ---------- Subroutine for evaluation Service Request Routine ----------

Public Sub Srq()
    Try
```

```
        Dim mySTB As Short = mbSession.ReadStatusByte()
                                'Serial poll, read status byte
        Console.WriteLine("Reading Service Request Routine:" + mySTB.ToString())
        If mySTB > 0 Then 'This instrument has bits set in the STB
            If (mySTB And 16) > 0 Then Call Outputqueue()
            If (mySTB And 4) > 0 Then Call ErrorQueueHandler()
            If (mySTB And 8) > 0 Then Call Questionablestatus()
            If (mySTB And 128) > 0 Then Call Operationstatus()
            If (mySTB And 32) > 0 Then Call Esrread()
        End If
    Catch exp As Exception
        Console.WriteLine(exp.Message)
    End Try
End Sub 'End of SRQ routine
```

Reading out the status event registers, the output buffer and the error/event queue is effected in subroutines.

10.12.1.5 Reading Out the Output Buffer

```
REM -------- Subroutine for the individual STB bits -----------------------
Public SUB Outputqueue() 'Reading the output buffer
result$ = SPACE$(100) 'Make space for response
CALL InstrRead(analyzer, result$)
Debug.Print "Contents of Output Queue:"; result$
END SUB
REM ***************************************************************************

REM -------- Subroutine for the output queue -----------------------
Public Sub Outputqueue() 'Reading the output buffer
    Try
        Dim result As String = mbSession.ReadString()
        Console.WriteLine("Contents of Output Queue:" + result)
    Catch exp As Exception
        Console.WriteLine(exp.Message)
    End Try
End Sub
```

10.12.1.6 Reading Error Messages

```
REM -------- Subroutine for reading the error queue -----------------------
Public SUB ErrorQueueHandler()
ERROR$ = SPACE$(100) 'Make space for error variable
CALL InstrWrite (analyzer, "SYSTEM:ERROR?")
CALL InstrRead(analyzer, ERROR$)
Debug.Print "Error Description:"; ERROR$
END SUB
REM ***************************************************************************
```

```
REM -------- Subroutine for reading the error queue -----------------------
Sub ErrorQueueHandler()
    Dim result As String
    Dim hasErr As Boolean = True
    Do
        mbSession.Write("SYST:ERR?")
        result = mbSession.ReadString()
        Dim parts As String() = result.Split(",")
        If parts(0) = 0 Then
            hasErr = False
            Console.WriteLine(result)
        Else
            Console.WriteLine(result)
        End If
    Loop While hasErr
End Sub
```

10.12.1.7 Evaluation of SCPI Status Registers

```
REM ------ Subroutine for evaluating Questionable Status Register ---------
Public SUB Questionablestatus()
Ques$ = SPACE$(20)
'Preallocate blanks to text
'variable
CALL InstrWrite (analyzer, "STATus:QUEStionable:EVENt?")
CALL InstrRead(analyzer, Ques$)
Debug.Print "Questionable Status:"; Ques$
END SUB
REM *************************************************************************
REM ------ Subroutine for evaluating Operation Status Register ------------
Public SUB Operationstatus()
Oper$ = SPACE$(20) 'Preallocate blanks to text
'variable
CALL InstrWrite (analyzer, "STATus:OPERation:EVENt?")
CALL InstrRead(analyzer, Oper$)
Debug.Print "Operation Status:"; Oper$
END SUB
REM *************************************************************************

REM ------ Subroutine for evaluating Questionable Status Register ---------
Public Sub Questionablestatus()
    Dim myQSR As String = Nothing
    Try
        myQSR = mbSession.Query("STATus:QUEStionable:EVENt?") 'Read QSR
        Console.WriteLine("Questionable Status:" + myQSR)
    Catch exp As Exception
        Console.WriteLine(exp.Message)
    End Try
End Sub
```

```
REM ------ Subroutine for evaluating Operation Status Register ------------
Public Sub Operationstatus()
    Dim myOSR As String = Nothing
    Try
        myOSR = mbSession.Query("STATus:OPERation:EVENt?") 'Read OSR
        Console.WriteLine("Operation Status:" + myOSR)
    Catch exp As Exception
        Console.WriteLine(exp.Message)
    End Try
End Sub
```

10.12.1.8 Evaluation of Event Status Register

```
REM ------ Subroutine for evaluating the Event Status Register ------------
Public SUB Esrread()
Esr$ = SPACE$(20) 'Preallocate blanks to text
'variable
CALL InstrWrite (analyzer, "*ESR?") 'Read ESR
CALL InstrRead(analyzer, Esr$)
IF (VAL(Esr$) AND 1) > 0 THEN Debug.Print "Operation complete"
IF (VAL(Esr$) AND 2) > 0 THEN Debug.Print "Request Control"
IF (VAL(Esr$) AND 4) > 0
THEN Debug.Print "Query Error"
IF (VAL(Esr$) AND 8) > 0
THEN Debug.Print "Device dependent error"
IF (VAL(Esr$) AND 16) > 0
THEN Debug.Print "Execution Error; Program aborted"'Output error message
STOP 'Stop software
END IF
IF (VAL(Esr$) AND 32) > 0
THEN Debug.Print "Command Error; Program aborted"'Output error message
STOP 'Stop software
END IF
IF (VAL(Esr$) AND 64) > 0 THEN Debug.Print "User request"
IF (VAL(Esr$) AND 128) > 0 THEN Debug.Print "Power on"END SUB
REM ********************************************************************

REM ------ Subroutine for evaluating the Event Status Register ------------
Public Sub Esrread()
    Try
        Dim myESR As Short = mbSession.Query("*ESR?") 'Read ESR
        If (myESR And 1) > 0 Then Console.WriteLine("Operation complete")
        If (myESR And 2) > 0 Then Console.WriteLine("Request Control")
        If (myESR And 4) > 0 Then Console.WriteLine("Query Error")
        If (myESR And 8) > 0 Then Console.WriteLine("Device dependent error")
        If (myESR And 16) > 0 Then
            Console.WriteLine("Execution Error; Program aborted") 'Output error message
            Stop 'Stop software
        End If
        If (myESR And 32) > 0 Then
```

```
                Console.WriteLine("Command Error; Program aborted") 'Output error message
                Stop 'Stop software
            End If
            If (myESR And 64) > 0 Then Console.WriteLine("User request")
            If (myESR And 128) > 0 Then Console.WriteLine("Power on")
        Catch exp As Exception
            Console.WriteLine(exp.Message)
        End Try
    End Sub
```

11 Maintenance

The R&S FSW does not require regular maintenance. Maintenance is essentially restricted to cleaning the R&S FSW. It is however advisable to check the nominal data from time to time.

NOTICE

Instrument damage caused by cleaning agents

Cleaning agents contain substances that may damage the instrument, e.g. cleaning agents that contain a solvent may damage the front panel labeling or plastic parts.

Never use cleaning agents such as solvents (thinners, acetone, etc), acids, bases, or other substances.

The outside of the instrument can be cleaned sufficiently using a soft, lint-free dust cloth.

The storage temperature range for the R&S FSW is specified in thr data sheet. The instrument must be protected against dust if it is to be stored for a long period.

When transporting or shipping the instrument, it is advisable to use the original packing material (especially the two protective covers for the front and rear panel).

12 Troubleshooting

If problems arise during measurement, try the following methods to solve them.

Uncompleted sequential commands

If a sequential command cannot be completed, for example because a triggered sweep never receives a trigger, the remote control program will never finish and the remote channel (GPIB, LAN or other interface) to the R&S FSW is blocked for further commands. In this case, you must interrupt processing on the remote channel in order to abort the measurement.

To regain control over a blocked remote channel

1. Send a "Device Clear" command from the control instrument to the R&S FSW on a parallel channel to clear all currently active remote channels. Depending on the used interface and protocol, send the following commands:
   - **Visa**: `viClear()`
   - **GPIB**: `ibclr()`
   - **RSIB**: `RSDLLibclr()`

   The remote channel currently processing the uncompleted command is ready to receive further commands again.

   Note: When using the IECWIN tool directly on the R&S FSW (see chapter 9.3, "The IECWIN Tool", on page 416), no "parallel channels" are available. However, you can use an additional VISA tool, which is also provided on the R&S FSW, to send the "Device Clear" command.
2. On the remote channel performing the measurement, send the SCPI command `ABORt` to abort the current measurement and reset the trigger system.

Ignored commands

When a remote command attempts to define incompatible settings, the command is ignored and the instrument status remains unchanged, i.e. other settings are not automatically adapted. Therefore, control programs should always define an initial instrument status (e.g. using the *RST command) and then implement the required settings.

12.1 Error Information

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

If any error information is available for a measurement channel, the ! icon is displayed next to the channel name. This is particularly useful when the MultiView tab is displayed, as the status bar in the MultiView tab always displays the information for the currently selected measurement only.

The following keywords are used:

FIFO OVL	For Digital Baseband Interface (R&S FSW-B17) only: Input sample rate from connected instrument is too high For details on the Digital Baseband Interface (R&S FSW-B17) see the R&S FSW I/Q Analyzer User Manual.
IFOVL	Overload of the IF signal path after the input mixer. • Increase the reference level.
INPUT OVLD	The signal level at the RF input connector exceeds the maximum. The RF input is disconnected from the input mixer to protect the device. In order to re-enable measurement, decrease the level at the RF input connector and reconnect the RF input to the mixer input.
LOUNL	Error in the instrument's frequency processing hardware was detected.
NO REF	Instrument was set to an external reference but no signal was detected on the reference input.
OVEN	OCXO reference frequency (option R&S FSW-B4) has not yet reached its operating temperature. The message usually disappears a few minutes after power has beeen switched on.
OVLD	Overload of the input mixer. • Increase the RF attenuation (for RF input). • Reduce the input level (for digital input)
UNCAL	One of the following conditions applies: • Correction data has been switched off. • No correction values are available, for example after a firmware update. • Record the correction data by performing a self alignment
WRONG_FW	The firmware version is out-of-date and does not support the currently installed hardware. Until the firmware version is updated, this error message is displayed and self-alignment fails. (For details refer to chapter 8.3.4.4, "Firmware Updates", on page 355).

12.2 Error Messages in Remote Control Mode

In remote control mode error messages are entered in the error/event queue of the status reporting system and can be queried with the command `SYSTem:ERRor?`. The answer format of R&S FSW to the command is as follows:

```
<error code>, "<error text with queue query>;<remote control command concerned>"
```

The indication of the remote control command with prefixed semicolon is optional.

Example:

The command `TEST:COMMAND` generates the following answer to the query `SYSTem:ERRor?`

`-113,"Undefined header;TEST:COMMAND"`

There are two types of error messages:

- Error messages defined by SCPI are marked by negative error codes. These messages are defined and described in the SCPI standard and not listed here.
- Device-specific error messages use positive error codes. These messages are described below.

Table 12-1: Device-specific error messages

Error code	Error text in the case of queue poll Error explanation
1052	**Frontend LO is Unlocked** This message is displayed when the phase regulation of the local oscillator fails in the RF front-end.
1060	Trigger-Block Gate Delay Error- gate length < Gate Delay This message is displayed when the gate signal length is not sufficient for the pull-in delay with a predefined gate delay.
1064	**Tracking LO is Unlocked** This message is displayed when the phase regulation of the local oscillator fails on the tracking generator module.
2028	**Hardcopy not possible during measurement sequence** This message is displayed when a printout is started during scan sequences that cannot be interrupted. Such sequences are for example: • Recording the system error correction data (alignment) • Instrument self test In such cases synchronization to the end of the scan sequence should be performed prior to starting the printout.
2033	**Printer Not Available** This message is displayed when the selected printer is not included in the list of available output devices. A possible cause is that the required printer driver is missing or incorrectly installed.
2034	**CPU Temperature is too high** This message is displayed when the temperature of the processor exceeds 70 °C.

Table 12-2: Power Sensor errors

Status bar message	Description
Zeroing could not be performed	Zeroing could not be performed because the RF power applied is too high.
Power sensor zero failed	

12.3 Obtaining Technical Support

If problems occur, the instrument generates error messages which in most cases will be sufficient for you to detect the cause of an error and find a remedy.

Error messages are described in chapter 12, "Troubleshooting", on page 772.

In addition, our customer support centers are there to assist you in solving any problems that you may encounter with your R&S FSW. We will find solutions more quickly and efficiently if you provide us with the information listed below.

- **System Configuration:** The "System Configuration" dialog box (in the "Setup" menu) provides information on:
  - **Hardware Info:** hardware assemblies
  - **Versions and Options:** the status of all software and hardware options installed on your instrument
  - **System Messages:** messages on any errors that may have occurred

  An .xml file with information on the system configuration ("device footprint") can be created automatically.
- **Error Log:** The `RSError.log` file (in the log directory of the main installation directory) contains a chronological record of errors.
- **Support file:** a *.zip file with important support information can be created automatically. The *.zip file contains the system configuration information ("device footprint"), the current eeprom data and a screenshot of the screen display.

See also chapter 8.3.5, "Service Functions", on page 357.

To collect the support information

1. Press the SETUP key.
2. Select "Service > R&S Support" and then "Create R&S Support Information".

   The file is stored as `C:\R_S\instr\user\service.zip`.

   Attach the support file to an e-mail in which you describe the problem and send it to the customer support address for your region as listed at the beginning of the R&S FSW Getting Started manual.

List of remote commands (base unit)

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