Math Command Group

Math Overview

You use the commands in the Math Command Group to create and define math waveforms. You can define and display up to four math waveforms simultaneously. Use the available math functions to define your math waveform.

The math waveform you create depends on sources listed in the math expression. If you change these sources, the math waveforms you previously defined will be affected.

Math expressions can be simple, containing no mathematical computation (such as CH1, which specifies that a waveform shows the signal source of channel 1). Math expressions can also be complex, consisting of 100 plus characters and comprising many sources, functions, and operands.

The acquisition of a live waveform can stop for several reasons: You can turn off the channel, stop the waveform (via Run/Stop from the Horiz/Acq menu), or stop the trigger (via Run/Stop from the Trig menu). When you turn off the channel, math continues and data is acquired but not displayed. When you stop either the waveform or the trigger, the math no longer calculates but the last math calculation performed is displayed.

When a live waveform update or reference waveform is altered, math waveforms containing those waveforms as sources are also updated to reflect the changes. Also, sources must exist but do not need to be displayed to be used in and to update math waveforms.

Math Commands

Command	Description
MATH<x>?	Returns the specified math waveform settings
MATH<x>:DEFine?	Returns the math<x> definition for the specified waveform
MATH<x>:DEFine	Sets the math<x> waveform definition
MATH<x>:LABEL:NAMe?	Returns the label string used for annotating the displayed math waveform
MATH<x>:LABEL:NAMe	Sets the label string used for annotating the displayed math waveform
MATH<x>:LABEL:XPOS?	Returns the X screen offset where the math waveform label is displayed
MATH<x>:LABEL:XPOS	Sets the X screen offset where the math waveform label is displayed
MATH<x>:LABEL:YPOS?	Returns the Y screen offset where the math waveform label is displayed
MATH<x>:LABEL:YPOS	Sets the Y screen offset where the math waveform label is displayed
MATH<x>:NUMavg?	Returns the acquisition number at which the averaging algorithm will begin exponential averaging
MATH<x>:NUMavg	Sets the acquisition number at which the averaging algorithm will begin exponential averaging
MATH<x>:POSition?	Returns the specified math waveform vertical position
MATH<x>:POSition	Sets the specified math waveform vertical position
MATH<x>:SCAle?	Returns the specified math waveform vertical scale (per div)
MATH<x>:SCAle	Sets the specified math waveform vertical scale (per div)
MATH<x>:SPECTral?	Returns the specified math waveform spectral setups
MATH<x>:SPECTral:CENTER?	Returns the center frequency of the spectral analyzer output data span
MATH<x>:SPECTral:CENTER	Sets the center frequency of the spectral analyzer output data span
MATH<x>:SPECTral:GATEPOS?	Returns the position of the center of the gate
MATH<x>:SPECTral:GATEPOS	Sets the position of the center of the gate
MATH<x>:SPECTral:GATEWIDTH?	Returns the gate width input to the spectral analyzer
MATH<x>:SPECTral:GATEWIDTH	Sets the gate width input to the spectral analyzer
MATH<x>:SPECTral:LOCk?	Returns the state of spectral locking for the specified math waveform
MATH<x>:SPECTral:LOCk	Sets the state of the math spectral locking for the specified math waveform

MATH<x>:SPECTral:MAG?	Returns the units of the SpectralMag function in the specified math string
MATH<x>:SPECTral:MAG	Sets the units of the SpectralMag function in the specified math string
MATH<x>:SPECTral:PHASE?	Returns the units of the SpectralPhase function in the specified math string
MATH<x>:SPECTral:PHASE	Sets the units of the SpectralPhase function in the specified math string
MATH<x>:SPECTral:REFLEVEL?	Returns the vertical position of the output data from the spectral analyzer
MATH<x>:SPECTral:REFLEVEL	Sets the vertical position of the output data from the spectral analyzer
MATH<x>:SPECTral :REFLEVELOffset?	Returns the spectral reference level offset used for calculating the dB value
MATH<x>:SPECTral REFLEVELOffset	Sets the spectral reference level offset used for calculating the dB value
MATH<x>:SPECTral:RESBw?	Returns the resolution bandwidth of the spectral analyzer
MATH<x>:SPECTral:RESBw	Sets the resolution bandwidth of the spectral analyzer
MATH<x>:SPECTral:SPAN?	Returns the specified math waveform's current span value
MATH<x>:SPECTral:SPAN	Sets the top of the span to a value that is closest to the specified value
MATH<x>:SPECTral:SUPPress?	Returns the phase suppression threshold
MATH<x>:SPECTral:SUPPress	Sets the phase suppression threshold
MATH<x>:SPECTral:UNWRap?	Returns whether or not phase unwrap of the spectral analyzer output data is enabled
MATH<x>:SPECTral:UNWRap	Enables or disables phase unwrap of the spectral analyzer output data
MATH<x>:SPECTral:WINdow?	Returns the window function used to multiply the input data to the spectral analyzer
MATH<x>:SPECTral:WINdow	Sets the window function used to multiply the input data to the spectral analyzer

MATH<x>?

Description

This query-only command returns the definition for the math waveform specified by <x>, which ranges from 1 through 4.

Group

Math

Related Commands

SELect:<wfm> (see page 460)

Syntax

```
MATH<x>?
```

Example

```
MATH1?
```

This query might return `:MATH1 DEFINE "PROBE POINT7"`

```
;NUMAVG 2;SCALE 1.0000E+00;POSITION 0.0000E+00
;LABEL:NAME "Math1";XPOS 5;YPOS 65;;MATH1:SPECTRAL:MAG DB
;PHASE DEGREES;GATEPOS 0.0000E+00;GATEWIDTH 1.9996E-06
;REFLEVEL 2.0000E+01;REFLEVELOFFSET 2.2360E-01
;SPAN 1.2500+09;CENTER 6.2500E+08;RESBW 1.0002E+06
;WINDOW GAUSSIAN;SUPPRESS -3.5000EE+01;UNWRAP 0;LOCK 0
```

MATH<x>:DEFIne

Description

This command allows you to define new waveforms using mathematical expressions. Sending this command is equivalent to selecting Math Setup from the Math menu, selecting a math waveform (Math 1 through Math 4) and then entering a math expression in the Math<x> box. The query form of this command returns the math definition for the specified math waveform.

You can specify a math expression from waveforms, measurements and scalar sources, functions, operands, and numerical constants. You can define and display up to four math waveforms simultaneously.

Math expressions can be simple, such as Ch 1, which specifies that a waveform should show the signal source of channel 1 with no mathematical computation. Math expressions can also be complex, consisting of 100 plus characters and comprising many sources, functions, and operands. As an example, you can enter the expression Log(Ch 1+Ch 2), which specifies that the signals from channels 1 and 2 are to be algebraically added, and the base 10 log of the sum is to be shown as the final math waveform.

For information about constructing mathematical expressions, see *Creating and Using Math Waveforms* in the User's Guide for this oscilloscope.

Group

Math

Syntax 1

```
MATH<x>:DEFIne <QString>
```

Syntax 2

```
MATH<x>:DEFIne?
```

Argument

- `<QString>`

  This quoted string argument is the mathematical expression that defines the waveform.

Example 1

```
MATH2:DEFIne "Ch1+Ch2"
```

This command adds the Ch 1 waveform and Ch 2 waveforms, storing the results in Math 2.

Example 2

```
MATH2:DEFIne?
```

This query might return `:MATH1:DEFINE "CH2*REF2"` as the expression that defines Math 1.

MATH<x>:LABEL:NAMe

Description

This command sets or returns the label string, which is used for annotating the math waveform on the screen. This command is equivalent to selecting Math Setup from the Math menu and then entering a label in the Label box.

Group

Math

Syntax 1

```
MATH<x>:LABEL:NAMe <string>
```

Syntax 2

```
MATH<x>:LABEL:NAMe?
```

Argument

- `<string>`

  This specifies the label to annotate the math waveform.

Example 1

```
MATH2:LABEL:NAMe "Probe point7"
```

This command assigns Probe point7 as the label that annotates Math2.

Example 2

```
MATH2:LABEL:NAMe?
```

This query might return `:MATH2:LABEL:NAME "Probe point7"` as the label that annotates Math 2.

MATH<x>:LABEL:XPOS

Description

This command sets or queries the X screen offset at which the label attached to the displayed math waveform is displayed, relative to the left edge of the screen. Channels are specified by x, which ranges from 1 through 4. This command is equivalent to selecting Math Label from the Math menu and entering a value in the X Position box.

Group

Math

Related Commands

MATH<x>:LABEL:YPOS (see page 204)

Syntax 1

```
MATH<x>:LABEL:XPOS <NR1>
```

Syntax 2

```
MATH<x>:LABEL:XPOS?
```

Argument

- `<NR1>`

  This is the location (in pixels) where the waveform label for the selected math is displayed, relative to the left edge of the screen. Arguments should be integers ranging from 0 to 500.

Example 1

```
MATH2:LABEL:XPOS 50
```

This command moves the waveform label for the MATH3 waveform, so that it begins 50 pixels to the right of the screen's left edge.

Example 2

```
MATH2:LABEL:XPOS?
```

This query might return `:MATH2:LABEL:XPOS 50`, indicating that the waveform label for the MATH2 waveform is currently 50 pixels to the right of the screen's left edge.

MATH<x>:LABEL:YPOS

Description

This command sets or queries the Y screen offset at which the label attached to the displayed math waveform is displayed, relative to the top edge of the screen. Channels are specified by x, which ranges from 1 through 4. This command is equivalent to selecting Math Label from the Math menu and entering a value in the Y Position box.

Group

Math

Related Commands

MATH<x>:LABEL:XPOS (see page 203)

Syntax 1

```
MATH<x>:LABEL:YPOS <NR1>
```

Syntax 2

```
MATH<x>:LABEL:YPOS?
```

Argument

- `<NR1>`

  This is the location (in pixels) where the waveform label for the selected math is displayed, relative to the top edge of the screen. Arguments should be integers ranging from 0 to 400.

Example 1

```
MATH2:LABEL:YPOS -25
```

This command moves the waveform label for the MATH2 waveform to just beneath (25 pixels below) the top of the screen.

Example 2

```
MATH2:LABEL:YPOS?
```

This query might return `:MATH2:LABEL:YPOS 0`, indicating that the waveform label for the MATH2 waveform is currently located just beneath the top of the screen.

MATH<x>:NUMAVg

Description

This command sets or returns the acquisition number at which the averaging algorithm will begin *exponential averaging*. Prior to that acquisition number, the algorithm uses *stable averaging*. This has no affect unless the AVG() function is used in the specified math. If so, it affects all AVG() functions in this math. This command is equivalent to selecting Set Math Averages from the Math menu and then entering an averaging value for the math waveform.

Group

Math

Related Commands

ACQuire:NUMAVg (see page 23)

Syntax 1

```
MATH<x>:NUMAVg <NR1>
```

Syntax 2

```
MATH<x>:NUMAVg?
```

Argument

- `<NR1>`

  This specifies the number of acquisitions over which exponential averaging is performed.

Example 1

```
MATH2:NUMAVg 10
```

This command successively averages Math 2 by 10 times.

Example 2

```
MATH2:NUMAVg?
```

This query might return `:MATH2:NUMAVG 10`, indicating 10 Math 2 waveforms are successively averaged before a single acquisition occurs.

MATH<x>:POSition

Description

This command sets or queries the vertical position of the specified Math waveform. The Math waveform is specified by x, which can range from 1 through 4. The position value is usually applied to the signal before it is digitized. The highest three units/div scale ranges of a given math are implemented by changing the way the acquired data is displayed. When the instrument is operating in any of these highest three scale ranges, the position control operates only on the signal after it is digitized. Note that if a signal that exceeds the range of the digitizer in one of these three scale ranges is repositioned, the displayed waveform will contain clipped values on-screen. This command is equivalent to selecting Position/Scale from the Math menu and then entering a Vert Pos value or adjusting the front-panel Vertical **POSITION** knob.

Increasing the position value of a waveform causes the waveform to move up, and decreasing the position value causes the waveform to move down. Position adjusts only the display position of a waveform, whether channel, math, or reference waveform. The position value determines the vertical graticule coordinate at which input signal values, equal the present offset setting for that reference, are displayed. For example, if the position for Math 3 is set to 2.0 and the offset is set to 3.0, then the input signals equal to 3.0 are displayed 2.0 divisions above the center of the screen.

Group

Math, Vertical

Related Commands

CH<x>POSition (see page 437), REF<x>:POSition (see page 457)

Syntax 1

```
MATH<x>:POSition <NR3>
```

Syntax 2

```
MATH<x>:POSition?
```

Argument

- `<NR3>`

  This is the desired position in divisions from the center graticule.

Example 1

```
MATH2:POSition 1.3E+00
```

This command positions the Math 2 input signal 1.3 divisions higher than a position of 0.

Example 2

```
MATH1:POSition?
```

This query might return `:MATH1:POSITION -1.3000E+00`, indicating that the current position of Math 1 is 1.3 divisions below the center graticule.

MATH<x>:SCAle

Description

This command sets or queries the vertical scale of the specified math waveform. The math waveform is specified by x, which can range from 1 through 4. This command is equivalent to selecting Position/Scale from the Math menu and then entering a Vert Scale value or adjusting the front-panel Vertical **SCALE** knob.

Each waveform has its own vertical scale parameter. For a signal with constant amplitude, increasing the Scale causes the waveform to be displayed smaller. Decreasing the scale causes the waveform to be displayed larger.

Scale affects all waveforms. For reference and math waveforms, the scale setting controls the display only, graphically scaling these waveforms and having no affect on the acquisition hardware.

In addition to using the MATH<x>:SCAle command, autoscaling occurs when a math is first defined and enabled, or when a math string changes. After the math is calculated for the first time, the instrument determines the min + max of that waveform data. Then, the math position is set so that (min + max)/2 is in the center of the screen. In addition, the instrument sets the math scale so that the range of the min and max cover 6 divisions.

Group

Math, Vertical

Related Commands

CH<x>:SCAle (see page 449), REF<x>:SCAle (see page 458)

Syntax 1

```
MATH<x>:SCAle <NR3>
```

Syntax 2

```
MATH<x>:SCAle?
```

Argument

- `<NR3>`

  This is the scale, in volts, amps or watts per division. The range is from 100.0E-36 through 100.0E+36.

Example 1

```
MATH4:SCAle 100E-03
```

This command sets the Math 4 scale to 100 mV per division.

Example 2

```
CH2:SCAle?
```

This query might return `:MATH2:SCALE 1.0000E+00`, indicating that the current scale setting of Math 2 is 1 volt per division.

MATH<x>:SPECTral?

Description

This query-only command returns the current spectral setups for the specified math waveform. This command is equivalent to selecting Spectral Setup from the Math menu and viewing the current spectral setup values.

Group

Math

Syntax

```
MATH<x>:SPECTral?
```

Example

```
MATH1:SPECTral?
```

This query might return `:MATH1:SPECTRAL:MAG DB;PHASE DEGREES ;GATEPOS 0.0000E+00;GATEWIDTH 1.9996E-06;REFLEVEL 4.4587+01 ;REFLEVELOFFSET 2.2360E-01;SPAN 1.2500E+09;CENTER 6.2500E+08 ;RESBW 1.0002E=06;WINDOW GAUSSIAN;SUPPRESS -3.5000E+01 ;UNWRAP 0;LOCK 0`

MATH<x>:SPECTral:CENTER

Description

This command specifies or returns the center frequency of the spectral analyzer output data span. This command is equivalent to selecting Spectral Setup from the Math menu and then entering a Center Freq value.

Group

Math

Related Commands

MATH<x>:SPECTral:SPAN (see page 218)

Syntax 1

```
MATH<x>:SPECTral:CENTER <NR3>
```

Syntax 2

```
MATH<x>:SPECTral:CENTER?
```

Argument

- `<NR3>`

  This is the desired frequency of the spectral analyzer output data span. Units are represented in hertz.

Example 1

```
MATH3:SPECTral:CENTER 10.09E6
```

This command sets the center frequency to the closest value it can attain to 10.09 MHz.

Example 2

```
MATH2:SPECTral:CENTER?
```

This query might return `:MATH2:SPECTral:CENTER 10.0900E+06`, indicating that the center frequency is currently set at 10.09 MHz.

MATH<x>:SPECTral:GATEPOS

Description

This command sets or returns the position of the center of the gate, which is used as the data input to the spectral analyzer. This command is equivalent to selecting Spectral Setup from the Math menu and then entering a Gate Pos value.

Group

Math

Related Commands

MATH<x>:SPECTral:GATEWIDTH (see page 211)

Syntax 1

```
MATH<x>:SPECTral:GATEPOS <NRf>
```

Syntax 2

```
MATH<x>:SPECTral:GATEPOS?
```

Argument

- `<NRf>`

  This is the gate position. Units are represented in seconds, with respect to trigger position.

Example 1

```
MATH1:SPECTral:GATEPOS 0
```

This command specifies the position of the center edge of the gate used as the data input to the spectral analyzer.

Example 2

```
MATH2:SPECTral:GATEPOS?
```

This query might return `:MATH2:SPECTRAL:GATEPOS 0.0000E+00`

MATH<x>:SPECTral:GATEWIDTH

Description

This command sets or returns the gate width input, in seconds, to the spectral analyzer. This command is equivalent to selecting Spectral Setup from the Math menu and then entering a value in the Duration box. This command is equivalent to selecting Spectral Setup from the Math menu and then entering a Gate Dur value.

Group

Math

Related Commands

MATH<x>:SPECTral:GATEPOS (see page 210)

Syntax 1

```
MATH<x>:SPECTral:GATEWIDTH <NR3>
```

Syntax 2

```
MATH<x>:SPECTral:GATEWIDTH?
```

Argument

- `<NR3>`

  This is the time across the 10-division screen. Units are represented in seconds.

Example 1

```
MATH1:SPECTral:GATEWIDTH 1.0E-3
```

This command sets the gate width input to the spectral analyzer at 1 ms.

Example 2

```
MATH3:SPECTral:GATEWIDTH?
```

This query might return `:MATH3:SPECTRAL:GATEWIDTH 1.0000E-03`, indicating that the gate width to the spectral analyzer is set to 1 ms.

MATH<x>:SPECTral:LOCk

Description

This command locks menus for Math<x> and Math<y> together as a group. The query form of this command returns an ON (1) or OFF (0), indicating whether spectral locking is turned on. This command is equal to selecting Spectral Setup from the Math menu, choosing the Control tab and then clicking the Time/Track Frequency Domain Controls button associated with the math waveforms that you want to lock. However, applying spectral locking functionality from the interface is limited to locking Math1 and Math2 and/or Math 3 and Math4.

MATH<x> Lock Combinations			
MATH1	MATH2	MATH3	Locked Math Waveforms
Off	Off	Off	None
Off	Off	On	Math3 and Math4 locked
Off	On	Off	Math2 and Math3 locked
Off	On	On	Math2, Math3 and Math4 locked
On	Off	Off	Math1 and Math2 locked
On	Off	On	Math1 and Math 2 locked, Math3 and Math4 locked
On	On	Off	Math1, Math2 and Math3 locked
On	On	On	Math1, Math2, Math3 and Math4 locked

Note: Executing MATH4:SPECTral:LOCk via the GPIB interface has no affect since there is no Math5 to which it can be locked.

Group

Math

Syntax 1

```
MATH<x>:SPECTral:LOCk {ON|OFF}
```

Syntax 2

```
MATH<x>:SPECTral:LOCk?
```

Arguments

- `ON`

  This turns on the parameter lock for the specified math waveform.

- `OFF`

  This turns off the parameter lock for the specified math waveform.

- `<NR1>`

  A 0 disables the parameter lock for the specified math waveform; any other value enables the parameter lock.

Example 1

```
MATH1:SPECTral:LOCk ON
```

This command turns on the parameter Lock1, which causes the parameter for Math1 and Math2 to be locked together.

Example 2

```
MATH1:SPECTral:LOCk?
```

This query might return `:MATH1:SPECTRAL:LOCK 0`, indicating that the parameter Lock1 is turned off.

MATH<x>:SPECTral:MAG

Description

This command controls or returns the units of a SpectralMag function in the math string. This command is equal to selecting Spectral Setup from the Math menu, choosing the Mag tab and then clicking the desired Scale button.

Group

Math

Related Commands

MATH<x>:SPECTral:PHASE (see page 214)

Syntax 1

`MATH<x>:SPECTral:MAG {LINEAR|DB|DBM}`

Syntax 2

`MATH<x>:SPECTral:MAG?`

Arguments

- `LINEAR`

  This sets the SpectralMag units to linear.

- `DB`

  This sets the SpectralMag units to decibels.

- `DBM`

  This sets the SpectralMag units to decibels. It also sets the Ref Level Offset to a value that is the equivalent of 1mW into 50Ω.

Example 1

```
MATH2:SPECTral:MAG DB
```

This command sets the SpectralMag units for Math2 to decibels.

Example 2

```
MATH2:SPECTral:MAG?
```

This query might return `:MATH2:SPECTRAL:MAG DB`, indicating that the SpectralMag units for Math2 are set to decibels.

MATH<x>:SPECTral:PHASE

Description

This command controls or returns the units of a SpectralPhase function in the math string. This command is equal to selecting Spectral Setup from the Math menu, choosing the Phase tab and then clicking the desired Scale button.

Group

Math

Related Commands

MATH<x>:SPECTral:MAG (see page 213)

Syntax 1

```
MATH<x>:SPECTral:PHASE {DEGREES|RADIANS|GROUPDELAY}
```

Syntax 2

```
MATH<x>:SPECTral:PHASE?
```

Arguments

- `DEGREES`

  This sets the SpectralPhase units to degrees.

- `RADIANS`

  This sets the SpectralPhase units to radians.

- `GROUPDELAY`

  This sets the SpectralPhase units to groupdelay, which commutes the derivative of unwrapped phase spectrum. Units are expressed in seconds.

Example 1

```
MATH2:SPECTral:PHASE DEGREES
```

This command sets the SpectralPhase units for Math2 to degrees.

Example 2

```
MATH2:SPECTral:PHASE?
```

This query might return `:MATH2:SPECTRAL:PHASE RADIANS`, indicating that the SpectralPhase units for Math2 are set to radians.

MATH<x>:SPECTral:REFLevel

Description

This command specifies the vertical position of the output data from the spectral analyzer on the display screen. The numerical value represents the position at the top of the display graticule. This command is equal to selecting Spectral Setup from the Math menu, choosing the Mag tab and then entering a value in the Reference Level box.

Group

Math

Related Commands

MATH<x>:SPECTral:REFLEVELOffset (see page 216), MATH<x>:SCAle (see page 207), MATH<x>:POSition (see page 206)

Syntax 1

```
MATH<x>:SPECTral:REFLevel <NR3>
```

Syntax 2

```
MATH<x>:SPECTral:REFLevel?
```

Argument

- `<NR3>`

  This is the position that represents the top of the display screen graticule. The range depends on the units and both the MATH<x>:SCAle and MATH<x>:POSition settings.

Example 1

```
MATH1:SPECTral:REFLevel -10
```

This sets the top of the display screen to be a reference level of -10 dB. If the vertical scale is LINEAR, then the vertical units will be the same as the input waveform.

Example 2

```
MATH1:SPECTral:REFLevel?
```

This query might return `:MATH1:SPECTRAL:REFLEVEL 2.0000E+01`, indicating that the top of the display screen is set to a reference level of 20 dB.

MATH<x>:SPECTral:REFLEVELOffset

Description

This command sets or returns the spectral level offset used for calculating the dB value. Changing the reference level offset causes the spectral waveform to move vertically, with respect to zero dB. This command is equal to selecting Spectral Setup from the Math menu, choosing the Mag tab and then entering a value in the Reference Level Offset box.

Group

Math

Related Commands

MATH<x>:SPECTral:REFLevel (see page 215)

Syntax 1

```
MATH<x>:SPECTral:REFLEVELOffset {DBM|<NR3>}
```

Syntax 2

```
MATH<x>:SPECTral:REFLEVELOffset?
```

Arguments

- `DBM`

  This specifies the reference level used for calculation to be equivalent to 1 mW into 50 ohms (Zero dB will occur at this level).

- `<NR3>`

  This specifies the reference level used for calculation of the decibel value when the output units are Log.

Example 1

```
MATH1:SPECTral:REFLEVELOFFset 0.5
```

This sets the reference level for the Log calculation for decibel to be 0.5. dB = A x Log(y/<NR3>) where A is 10 if the input units are watts and A is 20 if the input units are otherwise.

Example 2

```
MATH1:SPECTral:REFLEVELOffset DBM
```

This sets the decibel reference to be equivalent to 1 mW into 50 ohms. The reference level numerical value will depend on the input units. If the units are volts, the value is set to 0.2236 V; if the units are amperes, the value is set to 40 μA; if the units are watts, the value is set to 0.001 W.

Example 3

```
MATH1:SPECTral:REFLEVELOffset?
```

This query might return `:MATH1:SPECTRAL:REFLEVELOFFSET 2.23360E-01`, indicating that the spectral reference level offset is 223.6 mV.

MATH<x>:SPECTral:RESBw

Description

This command sets or returns the resolution bandwidth of the spectral analyzer. This command is equivalent to selecting Spectral Setup from the Math menu and then entering a value in the Res BW box.

Group

Math

Related Commands

MATH<x>:SPECTral:GATEWIDTH (see page 211), MATH<x>:SPECTral:CENTER (see page 209), MATH<x>:SPECTral:SPAN (see page 218), MATH<x>:SPECTral:WINdow (see page 221)

Syntax 1

```
MATH<x>:SPECTral:RESBw <NR3>
```

Syntax 2

```
MATH<x>:SPECTral:RESBw?
```

Argument

- `<NR3>`

  This is the desired resolution bandwidth value. Units are represented in hertz.

Example 1

```
MATH1:SPECTral:RESBw 250E3
```

This command sets the resolution bandwidth to the attainable value that is close to 250 KHz.

Example 2

```
MATH1:SPECTral:RESBw?
```

This query might return `:MATH1:SPECTRAL:RESBW 1.0002E+06`, indicating the actual resolution bandwidth value obtained from the spectral analyzer.

MATH<x>:SPECTral:SPAN

Description

This command sets the ceiling of the span to a value that is closest to the specified value. The query form of this command returns the current span value of the specified math waveform. This command is equal to selecting Spectral Setup from the Math menu and then entering a value in the Freq Span box.

Group

Math

Related Commands

MATH<x>:SPECTral:CENTER (see page 209)

Syntax 1

```
MATH<x>:SPECTral:SPAN {<NR3>|FULL}
```

Syntax 2

```
MATH<x>:SPECTral:SPAN?
```

Arguments

- `<NR3>`

  This specifies the frequency span of the output data vector from the spectral analyzer.

- `FULL`

  This sets the top of the span to 1/2 the sample rate and sets the Center frequency to 1/2 the span.

Example 1

```
MATH1:SPECTral:SPAN FULL
```

This command sets the top of the span to 1/2 the sample rate and sets the Center frequency to 1/2 the span.

Example 2

```
MATH1:SPECTral:SPAN 2.56E6
```

This command sets the top of the span to a value that is closest to 2.56 MHz.

Example 3

```
MATH1:SPECTral:SPAN?
```

This query might return `:MATH1:SPECTRAL:SPAN 1.2500E+09`, indicating the actual span value obtained by the spectral analyzer.

MATH<x>:SPECTral:SUPPress

Description

This command sets or returns the phase suppression threshold. This command is equal to selecting Spectral Setup from the Math menu, choosing the Phase tab and then entering a value in the Suppression Threshold box.

Group

Math

Related Commands

MATH<x>:SPECTral:UNWRap (see page 220)

Syntax 1

```
MATH<x>:SPECTral:SUPPress <NR3>
```

Syntax 2

```
MATH<x>:SPECTral:SUPPress?
```

Argument

- `<NR3>`

  This is the level under which all data with magnitudes are displayed as zero phase.

Example 1

```
MATH1:SPECTral:SUPPress -62
```

This command specifies that any magnitude values less than -62 dB will have their phase output set to zero.

Example 2

```
MATH1:SPECTral:SUPPress?
```

This query might return `:MATH1:SPECTRAL:SUPPRESS -3.5000E+01`, indicating that the phase suppression threshold is currently set to -35 dB.

MATH<x>:SPECTral:UNWRap

Description

This command specifies or returns whether or not phase unwrap of the spectral analyzer output data is enabled. This command is equal to selecting Spectral Setup from the Math menu, choosing the Phase tab and then clicking the Unwrap button.

Group

Math

Related Commands

MATH<x>:SPECTral:SUPPress (see page 219)

Syntax 1

```
MATH<x>:SPECTral:UNWRap <ON|OFF>
```

Syntax 2

```
MATH<x>:SPECTral:UNWRap?
```

Arguments

- `ON`

  This enables phase unwrap.

- `OFF`

  This disables phase wrap.

- `<NR1>`

  A 0 disables phase wrap; any other value enables phase wrap.

Example 1

```
MATH1:SPECTral:UNWRap ON
```

This command enables phase wrap of the spectral analyzer output data.

Example 2

```
MATH1:SPECTral:UNWRap?
```

This query might return `:MATH1:SPECTRAL:UNWRAP 0`, indicating that phase unwrap of the spectral analyzer output data is disabled.

MATH<x>:SPECTral:WINdow

Description

This command sets or returns the window function used to multiply the spectral analyzer input data. A spectral window determines what the filter shape of the spectral analyzer will be in the frequency domain. It can be described by a mathematical function that is multiplied point-by-point times the input data to the spectral analyzer. This command is equal to selecting Spectral Setup from the Math menu, and then choosing from the Window Type drop-down list.

Following is a list of arguments that specify the window function used to multiply the spectral analyzer input data. The windows are listed in the order of their ability to resolve frequencies (resolution bandwidth). For additional information about spectral windows, see *Selecting a Spectral Window* in the online help for this oscilloscope.

Group

Math

Related Commands

MATH<x>:SPECTral:RESBw (see page 217)

Syntax 1

```
MATH<x>:SPECTral:WINdow {RECTANGULAR|HAMMING|HANNING
|KAISERBESSEL|BLACKMANHARRIS|FLATTOP2|GAUSSIAN|TEKEXPONENTIAL}
```

Syntax 2

```
MATH<x>:SPECTral:WINdow?
```

Arguments

- `RECTANGULAR`

  This type of window function is equivalent to multiplying all gate data by one.

- `HAMMING`

  This type of window function is based on cosine series.

- `HANNING`

  This type of window function is based on cosine series.

- `KAISERBESSEL`

  This type of window function is based on cosine series.

- `BLACKMANHARRIS`

  This type of window function is based on cosine series.

- `GAUSSIAN`

  This type of window function has the best localization characteristics in the joint time/frequency plane.

- `TEKEXPONENTIAL`

  This type of window has an exponential non-symmetrical shape in the time domain and a triangular shape in the frequency domain.

- `FLATTOP2`

  This type of window function is a cosine series window with a flattened frequency response lobe.

Example 1

```
MATH2:SPECTral:WINdow HANNING
```

This command specifies to apply a Hanning window to the spectral analyzer input data.

Example 2

```
MATH2:SPECTral:WINdow?
```

This query might return `:MATH2:SPECTRAL:WINDOW TEKEXPONENTIAL`, indicating the window function used to multiply the spectral analyzer input data.