**LAYout<ly>:ZOOM<zo>:SSCReen**

Sets the zoom area to the whole screen.

**Suffix:**

| | |
|---|---|
| <ly> | 1 to 8, index of the SmartGrid layout |
| <zo> | 1 to 8, index of the zoom |
| **Usage:** | Setting only<br>Asynchronous command |
| **Manual operation:** | See "Set to screen" on page 209 |

## 17.10.2   Mathematics

For fast export of several waveforms at once, use `EXPort:WAVeform:DATA[:VALues]?` on page 856.

**CALCulate:MATH<m>:STATe** <First>

Activates the selected Math channel and displays the defined math waveforms.

**Suffix:**

| | |
|---|---|
| <m> | 1 to 8, index of the math waveform |

**Parameters:**

| | |
|---|---|
| <First> | OFF | ON |
| **Usage:** | Asynchronous command |
| **Manual operation:** | See "Display" on page 213 |

**CALCulate:MATH<m>[:EXPRession][:DEFine]** <Expression>

Defines the math expression to be calculated for the specified math channel.

| Operation | <Expression> | Comment |
|---|---|---|
| Addition | "C1+C2" | |
| Subtraction | "C1-C2" | |

| Operation | <Expression> | Comment |
|---|---|---|
| Multiplication | "C1*C2" | |
| Division | "C1/C2" | 0/0 = 0<br>+1 / 0 = Clip+<br>-1 / 0 = Clip- |
| Inverting | "-C1" | |
| Absolute value | "Abs(C1)" | |
| Derivation | "Derivation(C1,NoiseReject)" | NoiseReject can get any value between 1 and 5000 points<br>Default = 50 |
| Integral | "Integral(C1)" | |
| Logarithm (based on 10) | "Log(C1)" | Uses the absolute value of the source in calculation.<br>Log(0) = Clip - |
| Natural logarithm (based on e) | "Ln(C1)" | Uses the absolute value of the source in calculation.<br>Log(0) = Clip - |
| Binary logarithm (based on 2) | "Ld(C1)" | Uses the absolute value of the source in calculation.<br>Log(0) = Clip - |
| Square | "Pow(C1)" | |
| Square root | "Sqrt(C1)" | Uses the absolute value of the source in calculation. |
| Rescale | "Rescale(C1,a,b)" | a = scale, default = 1<br>b = offset, default = 0 |
| FIR | "FIR(Type,C1,Cut-Off,Characteristics)"<br><br>Examples:<br>"FIR(highpass,C1,10000000,Gaussian)"<br>"FIR(lowpass,C1,10000000,rectangle)" | Type = lowpass, highpass<br>Cut-Off = limit frequency<br>Characteristics = Gaussian, rectangle<br>Cut-Off can get any value between 4 GHz and 1 kHz |

**Suffix:**

<m>            1 to 8, index of the math waveform

**Parameters:**

<Expression>            String with regular expression for calculation

**Example:**            `CALC:MATH 'C1*C2'`

Defines the multiplication of waveforms channel 1 and channel 2.

**Usage:**            Asynchronous command

**Manual operation:**     See "Operator" on page 214

**CALCulate:MATH\<m>:LABel** \<Label>

Defines a label for the selected math waveform.

**Suffix:**

\<m>                    1 to 8, index of the math waveform

**Parameters:**

\<Label>               String with the label

**Example:**           CALCulate:MATH3:LABel 'M3AddC1C2'

**Usage:**            Asynchronous command

**Manual operation:**   See "Label" on page 213

---

**CALCulate:MATH\<m>:VERTical:SCALe[:VALue]** \<VerticalScale>

Sets the scale of the y-axis in the math function diagram. The value is defined as "\<unit> per division", e.g. *50 mV/div*. In this case, the horizontal grid lines are displayed in intervals of 50 mV.

**Suffix:**

\<m>                    1 to 8, index of the math waveform

**Parameters:**

\<VerticalScale>     Range:     1E-12 to 100E+12
                              Increment:  1E-05
                              *RST:      0.5
                              Default unit: V

**Usage:**            Asynchronous command

**Manual operation:**   See "[Scale]" on page 49

---

**CALCulate:MATH\<m>:UNIT** \<UserUnit>

Sets a user-defined unit for the math operation.

**Suffix:**

\<m>                    1 to 8, index of the math waveform

**Parameters:**

\<UserUnit>          String with the base unit

**Example:**           CALCulate:MATH:UNIT 'A'

**Usage:**            Asynchronous command

**Manual operation:**   See "Unit" on page 223

---

**CALCulate:MATH\<m>:VERTical:OFFSet** \<VerticalOffset>

Sets a voltage offset to adjust the vertical position of the math function on the screen. Negative values move the waveform up, positive values move it down.

**Suffix:**

| | |
|---|---|
| <m> | 1 to 8, index of the math waveform |

**Parameters:**

| | |
|---|---|
| <VerticalOffset> | Range: -100E12 to 100E12 |
| | Increment: 0.01 |
| | *RST: 0 |
| | Default unit: div |

**Usage:**               Asynchronous command

**Manual operation:**    See "Vertical offset" on page 223

---

**CALCulate:MATH<m>:ENVSelection** <EnvelopeCurve>

Selects the upper or lower part of the input waveform for mathematic calculation, or a combination of both.

**Suffix:**

| | |
|---|---|
| <m> | 1 to 8, index of the math waveform |

**Parameters:**

| | |
|---|---|
| <EnvelopeCurve> | MIN | MAX | BOTH |
| | *RST: BOTH |

**Usage:**               Asynchronous command

**Manual operation:**    See "Envelope wfm selection" on page 215

---

**CALCulate:MATH<m>:VERTical:SCALe:MODE** <VertSclMd>

Sets how the vertical scale is adapted to the current measurement results. By default, scaling is done automatically to provide an optimal display. However, if necessary, you can define scaling values manually to suit your requirements.

**Suffix:**

| | |
|---|---|
| <m> | 1 to 8, index of the math waveform |

**Parameters:**

| | |
|---|---|
| <VertSclMd> | MANual | AUTO |
| | *RST: AUTO |

**Usage:**               Asynchronous command

**Manual operation:**    See "Scale mode" on page 223

---

**CALCulate:MATH<m>:DATA:HEADer?**

Returns the header of math waveform data, the attributes of the waveform.

**Suffix:**

| | |
|---|---|
| <m> | 1 to 8, index of the math waveform |

**Return values:**

| | |
|---|---|
| \<XStart\> | 1. header value: start time XStart in s |
| \<XStop\> | 2. header value: end time XStop in s |
| \<RecordLength\> | 3. header value: record length of the waveform in samples |
| \<ValuesPerSample\> | 4. header value: number of values per sample interval. For most waveforms, the result is 1. For envelope waveforms, it is 2. If the number is 2, the number of returned values is twice the number of samples (record length). |
| **Example:** | `CALC:MATH1:DATA:HEAD?`<br>`-9.477E-008,9.477E-008,20000,1`<br>Start time of the data is -9.477E-008 = - 94,77 ns, and stop time of the data is 9.477E-008 = 94,77 ns. The data stream has 20000 values with one value per sample interval. |
| **Usage:** | Query only<br>Asynchronous command |

---

### CALCulate:MATH\<m\>:DATA:STYPe?

Returns the signal type of the source of the math waveform.

**Suffix:**

| | |
|---|---|
| \<m\> | 1 to 8, index of the math waveform |

**Return values:**

| | |
|---|---|
| \<SignalType\> | SOUR \| CORR \| MEAS \| NONE |
| | SOURce = normal signal<br>CORRelation = correlated signal, specific math signal<br>MEAsurement = result of a measurement<br>NONE = undefined |
| **Usage:** | Query only<br>Asynchronous command |

---

### CALCulate:MATH\<m\>:DATA[:VALues]? [\<Offset\>[,\<Length\>]]

Returns the data of the math waveform points for transmission from the instrument to the controlling computer. The data can be used in MATLAB, for example.

Without parameters, the complete waveform is retrieved. Using the offset and length parameters, data can be retrieved in smaller portions, which makes the command faster. If you send only one parameter, it is interpreted as offset, and the data is retrieved from offset to the end of the waveform.

To set the export format, use `FORMat[:DATA]`.

**Suffix:**

| | |
|---|---|
| \<m\> | 1 to 8, index of the math waveform |

**Query parameters:**

| | |
|---|---|
| \<Offset\> | Number of offset waveform points to be skipped. |