VM2601

80 MSa/S, 14-BIT DIGITIZER/IF RECEIVER

VM2602

40 MSa/S, 14-BIT DIGITIZER

VM2603

20 MSa/S, 14-BIT DIGITIZER

USER'S MANUAL

P/N: 82-0063-000
Released September 14, 2006

VXI Technology, Inc.

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Irvine, CA 92614-6509
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VXI
Technology™

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CERTIFICATION

VXI Technology, Inc. certifies that this product met its published specifications at the time of shipment from the factory. VTI further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology (formerly National Bureau of Standards), to the extent allowed by that organization's calibration facility and to the calibration facilities of other International Standards Organization members.

WARRANTY

The product referred to herein is warranted against defects in material and workmanship for a period of three years from the receipt date of the product at customer's facility. The sole and exclusive remedy for breach of any warranty concerning these goods shall be repair or replacement of defective parts or a refund of the purchase price, to be determined at the option of VTI.

For warranty service or repair, this product must be returned to a VXI Technology authorized service center. The product shall be shipped prepaid to VTI and VTI shall prepay all returns of the product to the buyer. However, the buyer shall pay all shipping charges, duties, and taxes for products returned to VTI from another country.

VTI warrants that its software and firmware designated by VTI for use with a product will execute its programming when properly installed on that product. VTI does not however warrant that the operation of the product or software or firmware will be uninterrupted or error free.

LIMITATION OF WARRANTY

The warranty shall not apply to defects resulting from improper or inadequate maintenance by the buyer, buyer-supplied products or interfacing, unauthorized modification or misuse, operation outside the environmental specifications for the product or improper site preparation or maintenance.

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VXI Technology, Inc.
2031 Main Street
Irvine, CA 92614-6509 U.S.A.

DECLARATION OF CONFORMITY

Declaration of Conformity According to ISO/IEC Guide 22 and EN 45014

MANUFACTURER'S NAME	VXI Technology, Inc.
MANUFACTURER'S ADDRESS	2031 Main Street Irvine, California 92614-6509
PRODUCT NAME	**(**VM2601) 80 MSa/s Digitizer & IF Receiver **(**VM2602) 40 MSa/s Digitizer **(**VM2603) 20 MSa/s Digitizer
MODEL NUMBER(S)	VM2601/VM2602/VM2603
PRODUCT OPTIONS	All
PRODUCT CONFIGURATIONS	All

VXI Technology, Inc. declares that the aforementioned product conforms to the requirements of the Low Voltage Directive 73/23/EEC *and the* EMC Directive 89/366/EEC *(inclusive* 93/68/EEC*) and carries the "CE" mark accordingly. The product has been designed and manufactured according to the following specifications:*

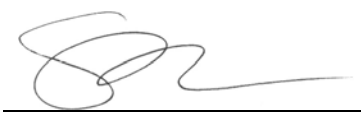
SAFETY	EN61010 (2001)
EMC	EN61326 (1997 w/A1:98) Class A CISPR 22 (1997) Class A VCCI (April 2000) Class A ICES-003 Class A (ANSI C63.4 1992) AS/NZS 3548 (w/A1 & A2:97) Class A FCC Part 15 Subpart B Class A EN 61010-1:2001

The product was installed into a C-size VXI mainframe chassis and tested in a typical configuration.

I hereby declare that the aforementioned product has been designed to be in compliance with the relevant sections of the specifications listed above as well as complying with all essential requirements of the Low Voltage Directive.

September 2006

CE



Steve Mauga, QA Manager

GENERAL SAFETY INSTRUCTIONS

Review the following safety precautions to avoid bodily injury and/or damage to the product. These precautions must be observed during all phases of operation or service of this product. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the product.

Service should only be performed by qualified personnel.

TERMS AND SYMBOLS

These terms may appear in this manual:

WARNING Indicates that a procedure or condition may cause bodily injury or death.

CAUTION Indicates that a procedure or condition could possibly cause damage to equipment or loss of data.

These symbols may appear on the product:

ATTENTION - Important safety instructions

Frame or chassis ground

Indicates that the product was manufactured after August 13, 2005. This mark is placed in accordance with *EN 50419, Marking of electrical and electronic equipment in accordance with Article 11(2) of Directive 2002/96/EC (WEEE)*. End-of-life product can be returned to VTI by obtaining an RMA number. Fees for take-back and recycling will apply if not prohibited by national law.

WARNINGS

Follow these precautions to avoid injury or damage to the product:

Use Proper Power Cord To avoid hazard, only use the power cord specified for this product.

Use Proper Power Source To avoid electrical overload, electric shock or fire hazard, do not use a power source that applies other than the specified voltage.

Use Proper Fuse To avoid fire hazard, only use the type and rating fuse specified for this product.

WARNINGS (CONT.)

Avoid Electric Shock

To avoid electric shock or fire hazard, do not operate this product with the covers removed. Do not connect or disconnect any cable, probes, test leads, etc. while they are connected to a voltage source. Remove all power and unplug unit before performing any service. ***Service should only be performed by qualified personnel.***

Ground the Product

This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth ground.

Operating Conditions

To avoid injury, electric shock or fire hazard:

- Do not operate in wet or damp conditions.
- Do not operate in an explosive atmosphere.
- Operate or store only in specified temperature range.
- Provide proper clearance for product ventilation to prevent overheating.
- DO NOT operate if any damage to this product is suspected. ***Product should be inspected or serviced only by qualified personnel.***

Improper Use

The operator of this instrument is advised that if the equipment is used in a manner not specified in this manual, the protection provided by the equipment may be impaired.
Conformity is checked by inspection.

SUPPORT RESOURCES

Support resources for this product are available on the Internet and at VXI Technology customer support centers.

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SECTION 1

INTRODUCTION

OVERVIEW

The VM2601, VM2602, and VM2603 (refered to as the VM260x) modules are high-resolution, high-speed digitizers. All three modules have Digital Storage Oscilloscope (DSO) functionality. In addition, the VM2601 also incorporates an Intermediate Frequency Receiver (IFR) function. This makes it ideal for applications in medical, automotive, semi-conductor, avionics, and communication test. The VM260x modules are a message-based device with a SCPI command set to simplify programming and configuration and register access to provide high-speed data throughput. Each module has either an 80 MSample/s (MSa/s) (VM2601), 40 MSa/s (VM2602), or 20 MSa/s (VM2603) ADC to support DSO applications. In addition, the DSO input can be routed to a 10 MSa/s ADC to support DC accurate low-frequency voltage measurements. A 16 MSa memory provides ample storage for even the most demanding test program. The DSO input features programmable impedance, ac, or dc coupling and a low-pass filter (LPF) with programmable corner frequencies.

This module is part of the VMIP™ family of instruments and can be combined with up to two other modules (e.g., 6.5 digit DMM, 50 MSa/s AWG, 1 ns counter/timer) to form a high-density VXIbus instrument. Three VM2601/2/3s can be installed in a single-wide C-size module providing three independent 80/40/20 MSa/s digitzer channels.

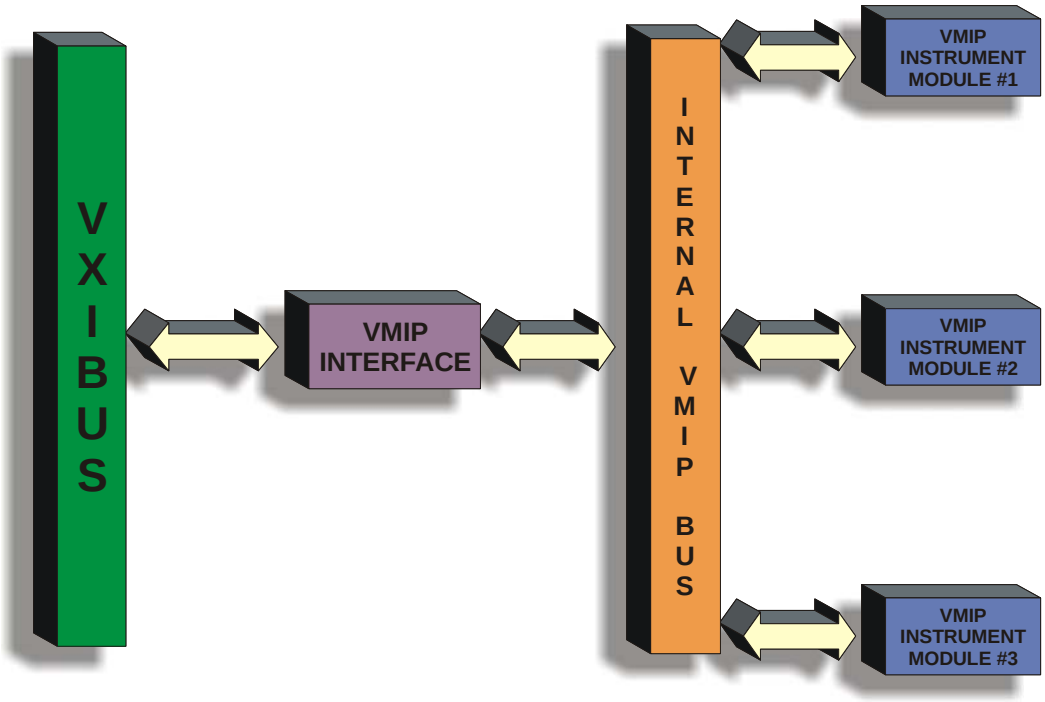


FIGURE 1-1: VMIP™ PLATFORM

NOTE	With the exception of sample rate and IF receiver capabilities, all three VM260x modules perform in the same manner. The VM2601 will be referenced thoughout the manual and, when exceptions exist, they will be noted.

DATA ACQUISITION

The input data is acquired when a conversion trigger event occurs from one of the four following methods:

1. ***Trigger source from the front panel input***: This input has a ±4 V input range and may be programmed to trigger on either the rising or falling edge of this signal and at specified voltage levels with 12-bit resolution and accurate to 1% of full scale.

2. ***Trigger source from the VXI TTL trigger bus***: Any one of the eight TTL trigger bus lines may be selected as the trigger source. The unit may be programmed to trigger on either the rising or falling edge of this signal.

3. ***Trigger upon receipt of a word serial command***: When this mode is selected, the ADC will convert when a word-serial command is received by the instrument.

4. ***Trigger from the input channel***: The input channel can be selected to trigger the board. It can be programmed to trigger during a rising or falling edge and may also trigger at specified voltage levels with 12-bit resolution and accurate to 1% of full scale.

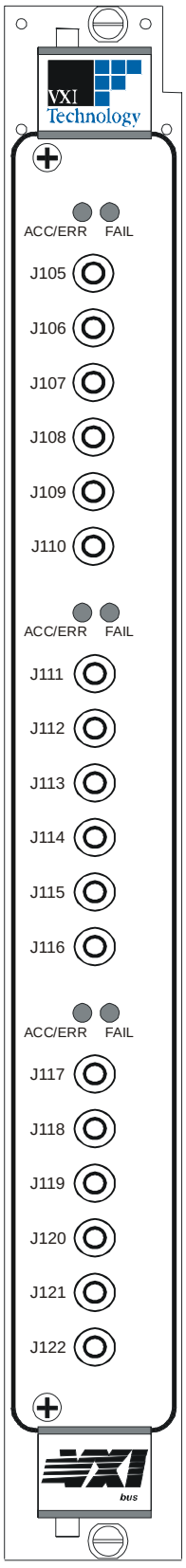
Memory can be segmented such that sequential trigger events can be stored without forcing the device to rearm via software or waiting for the previous samples to be offloaded. Both pre-trigger and post-trigger samples can be acquired in up to eight segments. When the instrument is configured for greater than eight segments, only post-trigger samples will be stored. The device can support up to 65,536 segments. Since three VM2601 modules can be accommodated on a single C-size VXIbus card, three differential channels can all be operating and triggering independently. For example, one can be acquiring data while another is waiting for a trigger.

PROGRAMMING AND DATA ACCESS

As is true with most complex VXI Technology instrumentation, the VM2601give the user the ability to access the device using the VXI message-based interface as well as utilizing direct register access for fast data throughput. The SCPI (message based) command set is used for instrument configuration, measurement configuration, and to query the results of the measurements. Register access is used to transfer the raw digitizer data from the instrument to the host. With modern host computers and interfaces, all 16 MSa can be transferred in just a few seconds. Measurements are configured and initiated by SCPI commands from the host. Measurement data is output in response to a query from the host. This considerably reduces test program development and improves overall test times.

CALIBRATION

The calibration constants used to correct the data values are stored in non-volatile memory. These constants are determined when the instrument is calibrated and can be set or queried by word serial command. This eliminates the need for removing covers from the unit and allows for automated calibration.



FRONT PANEL CONNECTORS

+ INPUT (J111)

Positive differential input for DSO channel (channel A+)

- INPUT (J112)

Negative differential input for DSO channel (channel A-)

IF INPUT (J113)

Single-ended IFR input (channel B)

NOTE This connector is covered on the VM2602 and VM2603 modules.

TRIGGER/GP0 INPUT (J114)

External Trigger Input/GP0 marker input

ARM/GP1 INPUT (J115)

External Arm Input/GP1 marker input

EXTERNAL CLOCK INPUT (J116)

External Sample Clock

***Note**: Front panel J designators vary with the type(s) of module(s) installed and with the instrument's position in the VMIP carrier.*

FIGURE 1-2: FRONT PANEL LAYOUT

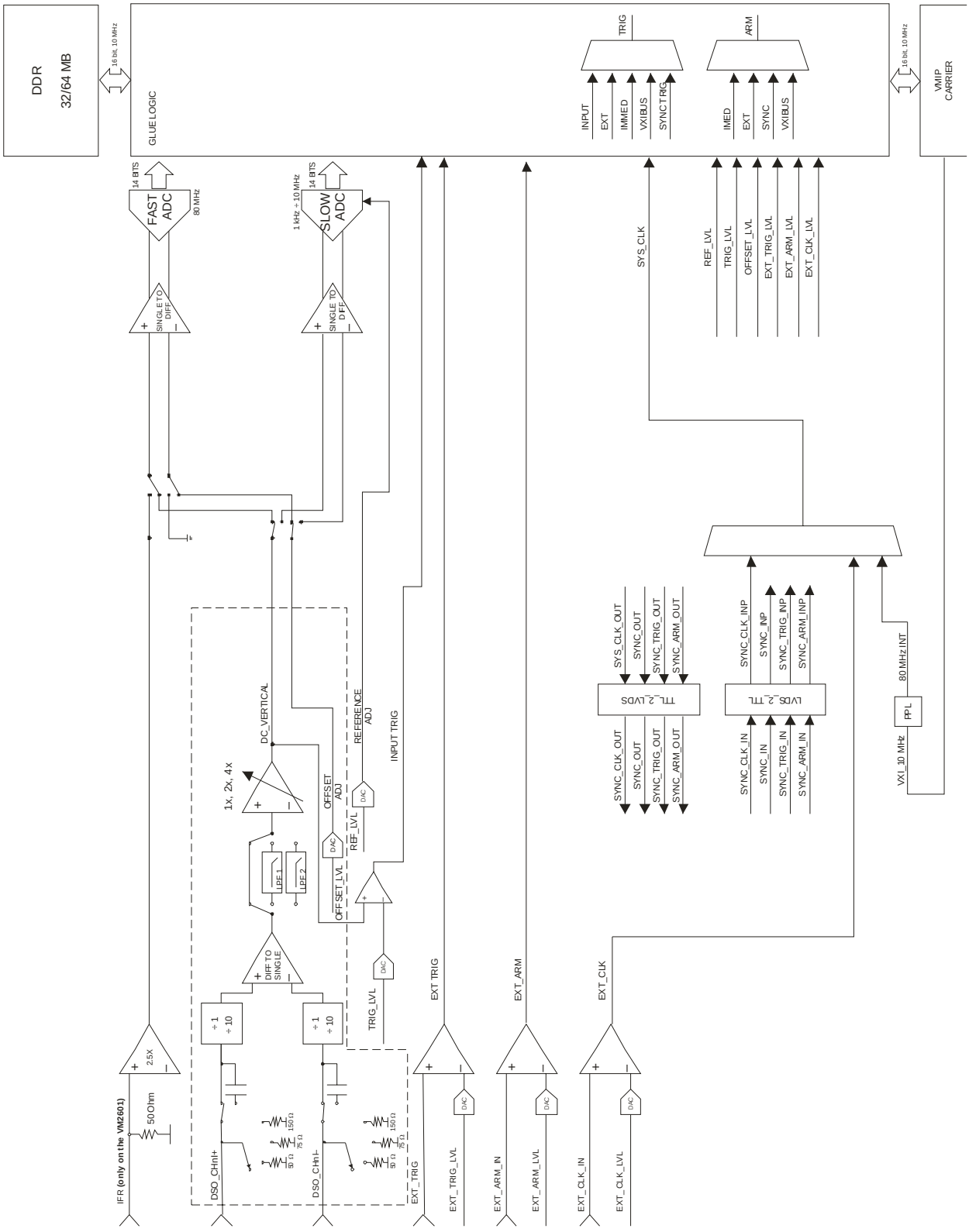


FIGURE 1-3: VM260X BLOCK DIAGRAM

GENERAL

FEATURES

- Up to 80 MHz bandwidth for DSO (no filter) and 100 MHz for IFR (VM2601 only) – ideal for HF and IF frequencies
- Up to 80 MSa/s sample rate with pre and post trigger capability
- ±0.5 V, ±1.0 V, ±2 V, ±5.0 V, ±10.0 V, and ±20 V input ranges (DSO input)
- 50 Ω, 75 Ω, 150 Ω, or 1 MΩ input impedance, with ac or dc coupling (DSO input)
- Software selectable low-pass filter (DSO input)
- Built-in pulse parameter measurements
- Up to three independent channels per C-size card
- Auto re-arm capability for storing multiple waveforms with pre-trigger data
- Sleep mode reduces power consumption when not in use
- Dual channel synchronization for precise I/O

ANALOG INPUT

CHANNELS	
DSO	1 Differential or Single-Ended (channels A+ and A-)
IFR (VM2601 only)	1 Single-Ended (channel B)
CONNECTORS	
VM2601	6 SMB Connectors
VM2602/3	5 SMB Connectors
RESOLUTION	
	14 bits
FULL-SCALE INPUT RANGES	
DSO input	±0.5 V, ±1.0 V and ±2.0 V; ±5.0 V, ±10 V, and ±20 V[•]
IFR input	±0.5 V
MAXIMUM SAMPLE RATE (SR_{MAX})	
DSO input	
VM2601	80 MSa/s
VM2602	40 MSa/s
VM2603	20 MSa/s
IFR input (VM2601 only)	80 MSa/s
SAMPLE RATE RESOLUTION	
	$\frac{(SR_{MAX})}{n}$, where *n* is an integer divider set by SAMPle:CLOCk:FREQuency
BANDWIDTH	
40 MHz, LPF On (VM2601)	40 MHz
20 MHz, LPF On (VM2601/2)	20 MHz
10 MHz, LPF On (VM2602/3)	10 MHz
5 MHz, LPF On (VM2603)	5 MHz
MEMORY	
Standard (VM2601/2/3)	16 MSa
Option (VM2601/2/3)	32 MSa
MEMORY SEGMENTS	
With pre-trigger data	8 segments
Without pre-trigger data	64k segments
SHARED MEMORY SPACE	
	A32
IMPEDANCE	
DSO input	50 Ω, 75 Ω, 150 Ω, or 1 MΩ
IFR input	50 Ω
INPUT COUPLING	
DSO input	ac/dc
IFR input	dc
CAPACITANCE	
	40 pF maximum

[•] ***Note that the input voltage should not exceed 8 V dc or 8 V rms when the 50 Ω, 75 Ω, or 150 Ω input impedance is selected.***

ANALOG INPUT (CONTINUED)

COMMON MODE REJECTION RATIO (CMRR)	
DC to 20 kHz @ ±0.5 V input range	≥ 60 dB
All other input ranges up to $SR_{MAX}/2$	≥ 30 dB
OVERVOLTAGE PROTECTION	
Low ranges	±5 V dc maximum
High ranges	±50 V dc maximum
OFFSET ADJUSTMENT	
	±50% of full scale
DC ACCURACY	
DSO FAST*	±1% of range
DSO SLOW*	±0.5% of input, ±0.1% of range
IF (VM2601 only)	±1% of range
	**50 Ω/75 Ω/150 Ω/1 MΩ impedance*
AC AMPLITUDE ACCURACY	
< 1 MHz	±0.1 dB
1 MHz to 20 MHz	±0.5 dB
20 MHz to 40 MHz	±2.5 dB
FREQUENCY FLATNESS	
Low Input Ranges (All)	No filter, -1 dB (full scale) @ 50 Ω
dc to 5 MHz	±0.1 dB
5 MHz to 30 MHz	±0.5 dB
High Input Ranges	No filter, -1 dB (full scale) @ 50 Ω
dc to 5 MHz	±0.5 dB
5 MHz to 30 MHz	±1 dB
LOW-PASS FILTER	
Filter Type	3-pole Bessel
VM2601	None, 20 MHz, 40 MHz
VM2602	None, 10 MHz, 20 MHz
VM2603	None, 5 MHz, 10 MHz
INTEGRAL NON-LINEARITY	
	±0.5 LSB typical
MISSING CODES	
	Guaranteed no missing codes

DYNAMIC CHARACTERISTICS

SIGNAL-TO-NOISE PLUS DISTORTION RATIO (S/[N+D])*	
0.5 V, 1.0 V & 2.0 V input ranges	69 dB typical, 63 dB minimum
5 V, 10 V & 20 V input ranges	65 dB typical, 60 dB minimum
	**20 Hz to 30 MHz, SR_{MAX} low jitter clock*
SPURIOUS FREE DYNAMIC RANGE (SFDR)	
0.5 V, 5.0 V input ranges*	> 77 dB typical, 75 dB minimum
1.0 V, 10 V input ranges*	> 80 dB typical, 77 dB minimum
2.0 V, 20 V input ranges*	> 80 dB typical, 75 dB minimum
0.5 V, 5.0 V input ranges**	> 77 dB typical, 75 dB minimum
1.0 V, 10 V input ranges**	> 77 dB typical, 75 dB minimum
2.0 V, 20 V input ranges**	> 77 dB typical, 75 dB minimum
IF input (excluding harmonics) (VM2601 only)	> 80 dB typical, 75 dB minimum

** 20 Hz to 1 MHz, 10 MSa/s, 20 MHz LPF on, FFT size = 16,384 (VM2601/2)*

*** 1 MHz to 10 MHz, SR_{MAX}, ($SR_{MAX}/2$) low-pass Filter ON (VM2602/3)*

RMS NOISE	
($SR_{MAX}/2$) bandwidth @ 50 Ω	250 µV rms maximum (IFR) (exclusive of any offset)*
Source impedance, 0.5 V range	
SIGNAL-TO-NOISE RATIO (SNR)	
All inputs, all ranges	> 62 dB

* ***See Appendix A for information on calculating RMS noise.***

ARMING, TRIGGERING, AND CLOCKING

TRIGGER SOURCE

Channel Input, EXT input, Serial Word Command, TTLT bus, Sync

EXTERNAL TRIGGER

Impedance	10 kΩ
Amplitude	±4 V
Level Accuracy	±5 mV

MAXIMUM PRE-TRIGGER SAMPLES

Available memory – 1

TRIGGER DELAY

0 – 3,600 seconds

INTERNAL CLOCK SOURCE

CLK10

INTERNAL CLOCK ACCURACY

CLK10

EXTERNAL CLOCK MAXIMUM FREQUENCY

VM2601	80 MHz
VM2602	40 MHz
VM2603	20 MHz

EXTERNAL CLOCK IMPEDANCE

50 Ω

ARM SOURCE

EXT, IMM, SYNC, TTLT<0-7>

EXTERNAL ARM

Impedance	10 kΩ
Amplitude	± 4 V
Resolution	5 mV

BUILT-IN MEASUREMENT FUNCTIONS

MEASUREMENT FUNCTION

- Period
- Rise/Fall Time
- Negative/Positive Pulse Width
- V rms/V cycle rms
- V mean
- V high
- V max
- Frequency
- Negative/Positive Duty Cycle
- Negative/Positive Overshoot/Preshoot
- V peak
- V amplitude
- V low
- V min

ENVIRONMENTAL

OPERATING TEMPERATURE RANGE

0 °C – 60 °C

CALIBRATION TEMPERATURE

25 °C

POWER AND COOLING REQUIREMENTS

VOLTAGE

+5 V	1.86 A	(0.6 A)*
-5.2 V	0.062 A	(0.03 A)
+2 V	0 A	(0 A)
+24 V	0 A	(0 A)
-24 V	2 A	(0 A)
+12 V	0.25 A	(0 A)
-12 V	0.24 A	(0 A)

** Values in parenthesis represent values in stand by mode*

SECTION 2

PREPARATION FOR USE

INSTALLATION

When the VM2601 is unpacked from its shipping carton, the contents should include the following items:

(1) VM2601/2/3 VXIbus module
(1) VM2601/2/3 Module User's (this manual)

All components should be immediately inspected for damage upon receipt of the unit.

Once the VM2601 is assessed to be in good condition, it may be installed into an appropriate C-size or D-size VXIbus chassis in any slot other than slot 0. The chassis should be checked to ensure that it is capable of providing adequate power and cooling for the VM2601. Once the chassis is found adequate, the VM2601's logical address and the backplane jumpers of the chassis should be configured before the VM2601's installation.

CALCULATING SYSTEM POWER AND COOLING REQUIREMENTS

The power and cooling requirements of the VM2601 are given in the specification table in Section 1 of this manual. It is imperative that the chassis provide adequate power and cooling for this module. Referring to the chassis user manual, confirm that the power budget for the system (the chassis and all modules installed therein) is not exceeded and that the cooling system can provide adequate airflow at the specified backpressure.

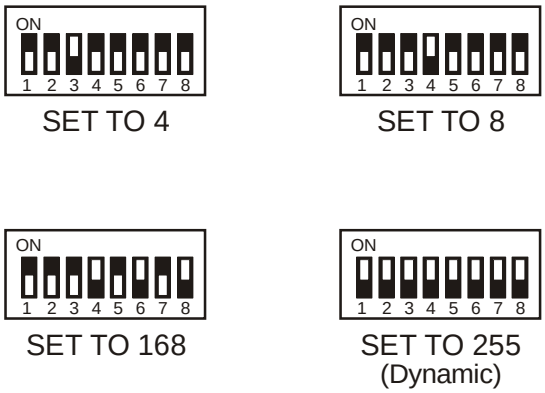
It should be noted that if the chassis cannot provide adequate power to the module, the instrument may not perform to specification or possibly not operate at all. In addition, if adequate cooling is not provided, the reliability of the instrument will be jeopardized and permanent damage may occur. Damage found to have occurred due to inadequate cooling voids the warranty on the instrument in question.

SETTING THE CHASSIS BACKPLANE JUMPERS

Please refer to the chassis user manual for further details on setting the backplane jumpers.

SETTING THE LOGICAL ADDRESS

The logical address of the VM2601 is set by a single 8-position DIP switch located near the module's backplane connectors (this is the only switch on the module). The switch is labeled with positions 1 through 8 and with an ON position. A switch pushed toward the ON legend will signify logic 1; switches pushed away from the ON legend will signify logic 0. The switch located at position 1 is the least significant bit while the switch located at position 8 is the most significant bit. See Figure 2-1 for examples of setting the logical address switch.



Switch Position	Switch Value
1	1
2	2
3	4
4	8
5	16
6	32
7	64
8	128

FIGURE 2-1: LOGICAL ADDRESS SWITCH-SETTING EXAMPLES

The VMIP may contain three separate instruments and will allocate logical addresses as required by the VXIbus specification (revisions 1.3 and 1.4). The logical address of the instrument is set on the VMIP carrier. The VMIP logical addresses must be set to an even multiple of 4 *unless dynamic addressing is used*. Switch positions 1 and 2 must always be set to the OFF position. Therefore, only addresses of 4, 8, 12, 16, ... 252 are allowed. The address switch should be set for one of these legal addresses and the address for the second instrument (the instrument in the center position) will automatically be set to the switch set address plus one; while the third instrument (the instrument in the lowest position) will automatically be set to the switch set address plus two. If dynamic address configuration is desired, the address switch should be set for a value of 255 (all switches set to ON). Upon power-up, the slot 0 resource manager will assign the first available logical addresses to each instrument in the VMIP module.

If dynamic address configuration is desired, the address switch should be set for a value of 255. Upon power-up, the slot 0 resource manager will assign logical addresses to each instrument in the VMIP module.

SECTION 3

PROGRAMMING

INTRODUCTION

The VM2601 is a VXIbus message-based device whose command set is compliant with the Standard Commands for Programmable Instruments (SCPI) programming language.

All module commands are sent over the VXIbus backplane to the module. Commands may be in upper, lower, or mixed case. All numbers are sent in ASCII decimal unless otherwise noted.

The module recognizes SCPI commands. SCPI is a tree-structured language based on IEEE Std 488.2 specifications. It uses the IEEE Std 488.2 Standard command and the device dependent commands are structured to allow multiple branches off the same trunk to be used without repeating the trunk. To use this facility, end each branch with a semicolon. For example, **SLOPe** and **SOURce** are both branches off the **TRIGger:** command trunk and can be combined as follows:

```
TRIGger:SLOPe <slope>;SOURce <source>
```

The above command is the same as these two commands:

```
TRIGger:SLOPe <slope>
TRIGger:SOURce <source>
```

See the *Standard Commands for Programmable Instruments (SCPI) Manual, Volume 1: Syntax & Style, Section 6*, for more information.

The SCPI commands in this section are listed in upper and lower case. Character case is used to indicate different forms of the same command. Keywords can have both a short form and a long form (some commands only have one form). The short form uses just the keyword characters in uppercase. The long form uses the keyword characters in uppercase plus the keyword characters in lowercase. Either form is acceptable. Note that there are no intermediate forms. All characters of the short form or all characters of the long form must be used. Short forms and long forms may be freely intermixed. The actual commands sent can be in upper case, lower case, or mixed case (case is only used to distinguish short and long form for the user). As an example, these commands are all correct and all have the same effect:

```
TRIGger:SLOPe <slope>
trigger:slope <slope>
TRIGGER:SLOPE <slope>
TRIG:SLOPe <slope>
TRIGger:SLOP <slope>
TRIG:SLOP <slope>
trig:slop <slope>
```

The following command is **not** correct because it uses part of the long form of **TRIGger**, but not all the characters of the long form:

trigg:slop <slope> ***incorrect syntax - extra "g"***

All of the SCPI commands also have a query form unless otherwise noted. Query forms contain a question mark (?). The query form allows the system to ask what the current setting of a parameter is. The query form of the command generally replaces the parameter with a question mark (?). Query responses do not include the command header. This means only the parameter is returned: no part of the command or "question" is returned.

NOTATION

Keywords or parameters enclosed in square brackets ([ ]) are optional. If the optional part is a keyword, the keyword can be included or left out. Omitting an optional parameter will cause its default to be used. If using the optional parameter, the square brackets are omitted from the command or query.

Parameters are enclosed by angle brackets (< >). Braces ({ }) or curly brackets, are used to enclose one or more parameters that may be included zero or more times. A vertical bar (|), read as "or," is used to separate parameter alternatives.

APPLICATION EXAMPLES

SCPI PROGRAMMING EXAMPLE

This section contains examples of using SCPI command strings for programming the VM2601 module. The code is functional and will contain a brief description of the operation. Note, the SCPI commands used by the VM2601 are explained in detail in Section 4.

In this example, VM2601 sets the sweep points, sample clock frequency, input range, and trigger source. It returns the average, maximum, minimum, peak-to-peak voltage, and rms voltage of the data collected from a previous run.

SWE:POIN 32768	*Sets the number of post trigger samples to 32 k.*
SAMP:CLOC:FREQ 1E4	*Sets the sample rate to 10 kHz.*
INP:RANG 20	*Sets the input voltage range to ±20 V.*
TRIG:SOUR IMM	*Sets the input trigger source to IMMediate.*
INIT:IMM	*Puts the VM2601 into the "waiting for arm" state.*
ARM	*Arms the VM2601 module immediately.*
TRIG:IMM	*Triggers the VM2601 module immediately.*

At this point, after 32,768/10,000 seconds, the samples are in the buffer and the CALCulate commands can be executed.

CALC:VOLT:MEAN? 15.107537	*Returns the average data value.*
CALC:VOLT:MAX? 19.234100	*Returns the maximum data value collected.*
CALC:VOLT:MIN? -12.693521	*Returns the minimum data value collected.*
CALC:VOLT:PTP? 13.451500	*Returns the peak-to-peak value starting at the trigger point and continuing to the end of data collected.*
CALC:VOLT:RMS? 4.653781	*Returns the true rms value starting at the trigger point and continuing to the end of the data collected.*

REGISTER ACCESS EXAMPLE

The VM2601 module provides hardware register access for fast data transfers. The register map is shown in Table 3-1.

In order to read the samples, execute an INITiate, ARM, TRIGger sequence as seen in the SCPI Programming Example above. Then, use viIn16(instHndl, VI_A32_SPACE, offset, &var16bit) for a single sample or viMoveIn16(instHndl, VI_A32_SPACE, offset, number_of_samples, array16bit) for multiple samples.

To determine the dc voltage value of any sample:

1) Obtain the ADC gain and offset values from the instrument using the commands CAL:ADC:GAIN <FAST|SLOW> and CAL:ADC:OFFS? <FAST|SLOW>.
2) Calculate the voltage as follows:

$$voltage = \frac{((double)(sample\ value - ADC\_Offset) \times ADC\_Gain \times 2.0 \times range}{16383.0}$$

where '*range*' is the current input range that has been programmed.

For example, in the 5 V range, for a sample value of 12,684, where *ADC_Gain* is 1.237854 and *ADC_Offset* is 8183:

$$voltage = \frac{(12684 - 8183) \times 1.237854 \times 2.0 \times 0.5}{16383.0} = 0.340083\ volts$$

The VM2601 digitizer's sample memory is mapped into the VXI A32 address space by the VISA resource manager. When accessing the sample data through a call to viIn16() or viMoveIn16(), it is not necessary to know the absolute address assigned to the module. VISA uses the session handle to reference the assigned address space.

TABLE 3-1: A16 MEMORY MAP

3E	
3C	
3A	
38	
36	
34	
32	
30	
2E	
2C	
2A	
28	
26	
24	
22	
20	
1E	
1C	
1A	
18	
16	[A32 Pointer Low]
14	[A32 Pointer High]
12	
10	
E	Data Low
C	Data High
A	Response [/Data Extended]
8	Protocol [/Signal] Register
6	[Offset Register]
4	Status / Control Register
2	Device Type
0	ID Register

VXI*PLUG&PLAY* DRIVER EXAMPLE

This example shows how to access the instrument using the VXI*plug&play* driver.

```
// - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
//    vtvm2601_appFunc()        Example of how to access the instrument using the driver
//    Parameters:
//          ViSession     instHndl        Session handle issued by the resource manager
//          ViInt16       inputSelect     Selects DSO or IFR input
                                          (For the VM2602 and VM2603, DSO is the only valid selection)
//          ViInt16       adcSelect       If DSO, selects fast or slow ADC
//          ViInt16       rangeSelect     If DSO, selects input range
//          ViInt16       inputCoupling   If DSO, selects input coupling
//          ViReal64      sampleRate      sets the sample rate
//          ViInt32       sampleCount     sets the sample count
//          ViInt16       dPointer[]      points to storage for the data
//    Returns:                     VI_SUCCESS or error code
// - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
ViStatus _VI_FUNC vtvm2601_appFunc(ViSession instHndl, ViInt32 inputSelect, ViInt32 adcSelect,
                                   ViInt32 rangeSelect, ViInt32 inputCoupling, ViReal64 sampleRate,
                                   ViInt32 sampleCount, ViInt16 _VI_FAR dPointer[])
{   ViStatus    iStatus;
    ViInt32     segNmbr, ramOffs, ptrgCnt;
    ViInt32     loopCnt, operCond, daqState;

    iStatus = vtvm2601_setInpSour(instHndl, inputSelect);          // select the input
    if(iStatus < VI_SUCCESS)       return(iStatus);
    iStatus = vtvm2601_setAdcType(instHndl, adcSelect);            // select the ADC
    if(iStatus < VI_SUCCESS)       return(iStatus);
    iStatus = vtvm2601_setInpRange(instHndl, rangeSelect);         // set the range
    if(iStatus < VI_SUCCESS)       return(iStatus);
    iStatus = vtvm2601_setInpCoup(instHndl, inputCoupling);        // set the input coupling
    if(iStatus < VI_SUCCESS)       return(iStatus);
    iStatus = vtvm2601_setSclkFreq(instHndl, sampleRate);          // set the sample rate
    if(iStatus < VI_SUCCESS)       return(iStatus);
    iStatus = vtvm2601_setSampCnt(instHndl, sampleCount);          // set the sample count
    if(iStatus < VI_SUCCESS)       return(iStatus);

    ptrgCnt = sampleCount;                                         // make pre-trigger = sampleCount
    iStatus = vtvm2601_setPreTrig(instHndl, ptrgCnt);
    if(iStatus < VI_SUCCESS)       return(iStatus);

    iStatus = vtvm2601_initiate(instHndl);                         // initiate the operation
    if(iStatus < VI_SUCCESS)       return(iStatus);
    iStatus = vtvm2601_cmdArmImme(instHndl);
    if(iStatus < VI_SUCCESS)       return(iStatus);
    lclDelay((double)ptrgCnt / sampleRate);                        // WAIT at least long enough for pre-trig

    iStatus = vtvm2601_cmdTrigImme(instHndl);
    if(iStatus < VI_SUCCESS)       return(iStatus);
    lclDelay((double)sampleCount / sampleRate);                    // WAIT at least long enough for samples

    //  now, query the machine state
    for(loopCnt = 0; loopCnt < 1000; loopCnt++)
    {   iStatus = vtvm2601_qryOperCondReg(instHndl, &operCond);
        if(iStatus < VI_SUCCESS)       return(iStatus);
        if((operCond & vtvm2601_OPER_MEAS) != vtvm2601_OPER_MEAS)
```

```
                break;
        }

        iStatus = vtvm2601_abort(instHndl);                     // ready or not, abort the operation!
        if(iStatus < VI_SUCCESS)        return(iStatus);
        if(daqState != vtvm2601_DAS_IDLE)                       // didn't make it to idle, data not ready!
                return(vtvm2601_ERR_NOT_READY);

        segNmbr = 0;                                            // segment number = 0, use the first segment
        ramOffs = 0;                                            // ram offset = 0, first sample from the trigger point
        //      Now, get the samples!
        iStatus = vtvm2601_a32Fetch(instHndl, segNmbr, ramOffs, sampleCount, dPointer);
        return(iStatus);
}
```

SECTION 4

COMMAND DICTIONARY

INTRODUCTION

This section presents the instrument command set. It begins with an alphabetical list of all the commands supported by the VM2601 divided into three sections: IEEE 488.2 commands, the instrument specific SCPI commands, and the required SCPI commands. Each command provides a brief description of the command's function, whether the command's value is affected by the *RST command, and, if applicable, its *RST value.

The remainder of this section is devoted to describing each command, one per page, in detail. The description is presented in a regular and systematic manner, assisting the user in the use of each command. Every command entry describes the exact command and query syntax, the use and range of parameters, and a complete description of the command's purpose.

ALPHABETICAL COMMAND LISTING

The following tables provide an alphabetical listing of each command supported by the VM2601 along with a brief description. If an X is found in the column titled *RST, then the value or setting controlled by this command is possibly changed by the execution of the *RST command. If no X is found, then *RST has no effect. The *RST column gives the value of each command's setting when the unit is powered up or when an *RST command is executed.

TABLE 4-1: IEEE 488.2 COMMON COMMANDS

Command	Description	*RST	*RST Value
*CLS	Clears the Status Register		N/A
*ESE	Sets the Event Status Enable Register		N/A
*ESR?	Query the Standard Event Status Register		N/A
*IDN?	Query the module identification string		N/A
*OPC	Set the OPC bit in the Event Status Register		N/A
*RST	Resets the module to a known state		N/A
*SRE	Set the Service Request Enable Register		N/A
*STB?	Query the Status Byte Register		N/A
*TRG	Causes a trigger event to occur		N/A
*TST?	Starts and reports a self-test procedure		N/A
*WAI	Halts execution of commands and queries		N/A

TABLE 4-2: INSTRUMENT SPECIFIC SCPI COMMANDS

Command	Description	*RST	*RST Value
ABORt	Disarms the VM2601 and stops data sampling.		N/A
ARM:AUTO	Enables or disables automatic advancing to the next buffer and rearming.	X	OFF
ARM:LEVel	Sets the comparator level of the Arm Signal.	X	0.0
ARM:SLOPe	Specifies the slope of the Arm Signal.	X	POS
ARM:SOURce	Sets the Arm Source.	X	IMMediate
ARM:STATe?	Query returns whether or not the VM2601 is armed.		
ARM[:IMMediate]	Advances to the next buffer and arms the unit.		N/A
CALCulate:FALL:TIMe?	Instructs the device to return the fall time measurement for the acquired data.		
CALCulate:FREQuency?	Query that instructs the device to return the frequency of the digitized data.		
CALCulate:NDUTy?	Instructs the device to calculate and return the negative duty cycle for the acquired data.		
CALCulate:NWIDth?	Returns the negative pulse width measurement for the acquired data.		
CALCulate:PDUTy?	Instructs the device to calculate and return the positive duty cycle for the acquired data.		
CALCulate:PERCent:NOVershoot?	Returns the negative overshoot as percent of amplitude		
CALCulate:PERCent:NPReshoot?	Returns the negative preshoot as percent of amplitude		
CALCulate:PERCent:NRINging?	Returns the negative ringing as percent of amplitude		
CALCulate:PERCent:POVershoot?	Returns the positive overshoot as percent of amplitude		
CALCulate:PERCent:PPReshoot?	Returns the positive preshoot as percent of amplitude		
CALCulate:PERCent:PRINging?	Returns the positive ringing as percent of amplitude		
CALCulate:PERiod?	Returns the period measurement for the acquired data.		
CALCulate:PWIDth?	Query that returns a positive pulse width measurement.		
CALCulate:RISE:TIMe?	Returns the rise-time measurement for the acquired data.		
CALCulate:VOLTage:AMPLitude?	Returns the amplitude measurement for the data being acquired.		
CALCulate:VOLTage:HIGH?	Returns the high voltage value for the acquired data.		
CALCulate:VOLTage:LOW?	Returns the low voltage value for the acquired data.		
CALCulate:VOLTage:MAXimum?	Returns the maximum voltage value for the acquired data.		
CALCulate:VOLTage:MEAN?	Returns the mean voltage value for the acquired data.		
CALCulate:VOLTage:MINimum?	Returns the minimum voltage value for the acquired data.		
CALCulate:VOLTage:NOVershoot?	Returns the negative overshoot value for the acquired data.		
CALCulate:VOLTage:NPReshoot?	Returns the negative preshoot value for the acquired data.		
CALCulate:VOLTage:NRINging?	Returns the negative ringing as peak-to-peak volts		
CALCulate:VOLTage:POVershoot?	Returns the positive overshoot value for the acquired data.		
CALCulate:VOLTage:PPReshoot?	Returns the positive preshoot value for the acquired data.		

Command	Description	*RST	*RST Value
CALCulate:VOLTage:PRINging?	Returns the positive ringing as peak-to-peak volts		
CALCulate:VOLTage:PTPeak?	Returns the peak-to-peak voltage value for the acquired data.		
CALCulate:VOLTage:RMS?	Returns the root-mean-square (rms) voltage value of the data being acquired.		
CALibration:ADC:GAIN	To provide an ADC gain factor for measurement compensation.		1.000
CALibration:ADC:OFFSet	To provide an ADC offset value for measurement compensation.		8192
CALibration:COUNt?	Tracks the number of times calibration memory has been written.		
CALibration:DAC:GAIN	To set the calibration factor that compensates for DAC gain inaccuracies.		1.000 or Cal Value
CALibration:DAC:OFFSet	To set the calibration factor that compensates for DAC offset inaccuracies.		2047 or Cal Value
CALibration:DEFault	Sets all calibration factors to their default values.		
CALibration:RESet	Resets all calibration factors to the values stored in the non-volatile memory (EEPROM).		
CALibration:SECure:CODE	Sets the code required to disable calibration security.		
CALibration:SECure[:STATe]	Enable or disable calibration security.	X	ON
CALibration:STORe	Stores calibration data into non-volatile memory.		
COMBine:FEED	Sets a marker for specified events allowing for easy reference after acquisition is complete.	X	GND
CONFigure:ADC	Selects between the fast and slow ADCs.	X	FAST
CONFigure:FALL:TIMe	Defines the fall time parameters that will govern corresponding CALCulate and MEASure commands.		
CONFigure:FREQuency	Defines the frequency parameters that will govern corresponding CALCulate and MEASure commands.		
CONFigure:HORizontal:RESolution	Sets the sample period for the ADC	X	100.0 ns
CONFigure:NDUTy	Defines the negative duty cycle parameters that will govern corresponding CALCulate and MEASure commands.		
CONFigure:NWIDth	Defines the negative pulse width parameters that will govern corresponding CALCulate and MEASure commands.		
CONFigure:PDUTy	Defines the positive duty cycle parameters that will govern corresponding CALCulate and MEASure commands.		
CONFigure:PERCent:NOVershoot	configure to measure negative overshoot as percent of amplitude		
CONFigure:PERCent:NPReshoot	configure to measure negative preshoot as percent of amplitude		
CONFigure:PERCent:NRINging	configure to measure negative ringing as percent of amplitude		
CONFigure:PERCent:POVershoot	configure to measure positive overshoot as percent of amplitude		
CONFigure:PERCent:PPReshoot	configure to measure positive preshoot as percent of amplitude		
CONFigure:PERCent:PRINging	configure to measure positive ringing as percent of amplitude		
CONFigure:PERiod	Defines the period parameters that will govern corresponding CALCulate and MEASure commands.		

Command	Description	*RST	*RST Value
CONFigure:PWIDth	Defines the positive pulse width parameters that will govern corresponding CALCulate and MEASure commands.		
CONFigure:RISE:TIMe	Defines the rise time parameters that will govern corresponding CALCulate and MEASure commands.		
CONFigure:SAR:TIMe	configure the Signal Aberration Region size in seconds		
CONFigure:SAR:TIMe?	query the Signal Aberration Region size		
CONFigure:VOLTage:AMPLitude	Defines the amplitude parameters that will govern corresponding CALCulate and MEASure commands.		
CONFigure:VOLTage:HIGH	Defines the high voltage parameters that will govern corresponding CALCulate and MEASure commands.		
CONFigure:VOLTage:LOW	Defines the low voltage parameters that will govern corresponding CALCulate and MEASure commands.		
CONFigure:VOLTage:MAXimum	Defines the maximum voltage parameters that will govern corresponding CALCulate and MEASure commands.		
CONFigure:VOLTage:MEAN	Defines the mean voltage parameters that will govern corresponding CALCulate and MEASure commands.		
CONFigure:VOLTage:MINimum	Defines the minimum voltage parameters that will govern corresponding CALCulate and MEASure commands.		
CONFigure:VOLTage:NOVershoot	Defines the negative overshoot parameters that will govern corresponding CALCulate and MEASure commands.		
CONFigure:VOLTage:NPReshoot	Defines the negative preshoot parameters that will govern corresponding CALCulate and MEASure commands.		
CONFigure:VOLTage:NRINging	configure to measure negative ringing as peak-to-peak volts		
CONFigure:VOLTage:POVershoot	Defines the positive overshoot parameters that will govern corresponding CALCulate and MEASure commands.		
CONFigure:VOLTage:PPReshoot	Defines the positive preshoot parameters that will govern corresponding CALCulate and MEASure commands.		
CONFigure:VOLTage:PRINging	configure to measure positive ringing as peak-to-peak volts		
CONFigure:VOLTage:PTPeak	Defines the peak-to-peak voltage parameters that will govern corresponding CALCulate and MEASure commands.		
CONFigure:VOLTage:RMS	Defines the root-mean-square voltage parameters that will govern corresponding CALCulate and MEASure commands.		
CONFigure?	Outputs the current measurement configuration.		
CONTrol:IPOWer	This command applies power to or removes power from the instrument.	X	ON
FETCh?	Retrieves the measurements taken by the INITiate command and places it in the output buffer.		
INITiate:DELay	Set the pre-trigger sample count.	X	1024
INITiate[:IMMediate]	Arms the VM2601 upon receipt of the command.		
INPut:COUPling	Selects ac or dc coupling on the specified input channel.	X	DC

Command	Description	*RST	*RST Value
INPut:FILTer:FREQuency	Selects the low-pass filter corner frequency for the specified channel.	X	20e6 Hz
INPut:FILTer:STATe	For the specified input channel, turns the currently selected low-pass filter ON or OFF.	X	OFF
INPut:IMPedance	Sets the input impedance for the selected input channel.	X	High
INPut:OFFSet	This command allows the user to compensate for input signal offset.	X	0.0
INPut:RANGe	Sets the input range to ±0.5 V, ±1.0 V, ±2.0 V, ±5.0 V, ±10.0 V, or ±20.0 V full scale	X	20.0 V
INPut:SOURce	Select the input source, single-ended IFR or differential DSO.	X	DSO
MEASure:FALL:TIMe?	Performs a sequence of commands to provide a fall time measurement for the input.		
MEASure:FREQuency?	Performs a sequence of commands to provide a frequency measurement for the input.		
MEASure:NDUTy?	Performs a sequence of commands to provide the negative duty cycle measurement for the input.		
MEASure:NWIDth?	Performs a sequence of commands to provide a negative pulse width measurement for the input.		
MEASure:PDUTy?	Performs a sequence of commands to provide a positive duty cycle measurement for the input.		
MEASure:PERCent:NOVershoot?	measure negative overshoot as percent of amplitude		
MEASure:PERCent:NPReshoot?	measure negative preshoot as percent of amplitude		
MEASure:PERCent:NRINging?	measure negative ringing as percent of amplitude		
MEASure:PERCent:POVershoot?	measure positive overshoot as percent of amplitude		
MEASure:PERCent:PPReshoot?	measure positive preshoot as percent of amplitude		
MEASure:PERCent:PRINging?	measure positive ringing as percent of amplitude		
MEASure:PERiod?	Performs a sequence of commands to provide a period measurement for the input.		
MEASure:PWIDth?	Performs a sequence of commands to provide a positive pulse width measurement for the input.		
MEASure:RISE:TIMe?	Performs a sequence of commands to provide a rise time measurement for the input.		
MEASure:VOLTage:AMPLitude?	Performs a sequence of commands to provide an amplitude measurement for the acquired data.		
MEASure:VOLTage:HIGH?	Performs a sequence of commands to provide the high voltage value for the acquired data.		
MEASure:VOLTage:LOW?	Performs a sequence of commands to provide the low voltage value for the acquired data.		
MEASure:VOLTage:MAXimum?	Performs a sequence of commands to provide the maximum voltage value for the acquired data.		
MEASure:VOLTage:MEAN?	Performs a sequence of commands to provide the mean voltage value for the acquired data.		
MEASure:VOLTage:MINimum?	Performs a sequence of commands to provide the minimum volgage value for the acquired data.		
MEASure:VOLTage:NOVershoot?	Performs a sequence of commands to provide the negative overshoot value for the acquired data.		
MEASure:VOLTage:NPReshoot?	Performs a sequence of commands to provide the negative preshoot value for the acquired data.		
MEASure:VOLTage:NRINging?	measure negative ringing as peak-to-peak volts		
MEASure:VOLTage:POVershoot?	Performs a sequence of commands to provide the positive overshoot value for the acquired data		

Command	Description	*RST	*RST Value
MEASure:VOLTage:PPReshoot?	Performs a sequence of commands to provide the positive preshoot value for the acquired data.		
MEASure:VOLTage:PRINging?	measure positive ringing as peak-to-peak volts		
MEASure:VOLTage:PTPeak?	Performs a sequence of commands to provide the peak-to-peak voltage value for the acquired data.		
MEASure:VOLTage:RMS?	Performs a sequence of commands to provide the root-mean-square value for the acquired data.		
READ?	Initiates, arms, triggers, and fetches a previously configured measurement.		
ROSCillator:FREQuency	Sets the reference oscillator frequency.	X	10 MHz
ROSCillator:SOURce	Selects the reference oscillator source.	X	BUS
SAMPle:CLOCk:FREQuency	Outputs the selected sample clock frequency.	X	10 MHz
SAMPle:CLOCk:SOURce	Selects the sample clock source.	X	INTernal
SWEep:COUNt	Set the number of segments.	X	1
SWEep:POINts	Set the post-trigger sample count.	X	1024
SWEep:TINTerval	This command sets the sample rate for the ADC.	X	100 ns (Fast)
SYNChronize:MODE	Sets the instrument to function as a synchronized master or slave.	X	OFF
SYNChronize:STATe	Enables/disables synchronization operations.	X	OFF
TRIGger:LEVel	Sets the comparator level of the trigger signal.	X	0.0 V
TRIGger:SLOPe	Specifies the slope of the Trigger Signal for the VM2601.	X	POS
TRIGger:SOURce	Selects the source for triggering the VM2601.	X	IMMediate
TRIGger:STATe?	Query returns whether or not the VM2601 has been triggered.	X	0
TRIGger[:IMMediate]	Triggers the instrument on receipt of the command.		

TABLE 4-3: SCPI REQUIRED COMMANDS

Command	Description	*RST	*RST Value
STATus:OPERation:CONDition?	Queries the Operation Status Condition Register.		N/A
STATus:OPERation:ENABle	Sets the Operation Status Enable Register.		N/A
STATus:OPERation[:EVENt]?	Queries the Operation Status Event Register.		N/A
STATus:PRESet	Presets the Status Register.		N/A
STATus:QUEStionable:CONDition?	Queries the Questionable Status Condition Register.		N/A
STATus:QUEStionable:ENABle	Sets the Questionable Status Enable Register.		N/A
STATus:QUEStionable[:EVENt]?	Queries the Questionable Status Event Register.		N/A
SYSTem:ERRor?	Queries the Error Queue.	X	Clears queue
SYSTem:VERSion?	Queries which version of the SCPI standard the module complies with.		N/A

COMMAND DICTIONARY

The remainder of this section is devoted to the actual command dictionary. Each command is fully described on its own page. In defining how each command is used, the following items are described:

Purpose	Describes the purpose of the command.
Type	Describes the type of command such as an event or setting.
Command Syntax	Details the exact command format.
Command Parameters	Describes the parameters sent with the command and their legal range.
Reset Value	Describes the values assumed when the *RST command is sent.
Query Syntax	Details the exact query form of the command.
Query Parameters	Describes the parameters sent with the command and their legal range. The default parameter values are assumed the same as in the command form unless described otherwise.
Query Response	Describes the format of the query response and the valid range of output.
Description	Describes in detail what the command does and refers to additional sources.
Examples	Present the proper use of each command and its query (when available).
Related Commands	Lists commands that affect the use of this command or commands that are affected by this command.

COMMON SCPI COMMANDS

*CLS

Purpose	Clears all status and event registers.	
Type	IEEE 488.2 Common Command	
Command Syntax	*CLS	
Command Parameters	None	
***RST Value**	N/A	
Query Syntax	None	
Query Parameters	N/A	
Query Response	N/A	
Description	This command clears the Status Event Register, Operation Status Register, and the Questionable Data/Signal Register. It also clears the Operation Complete flag and clears all queues (except the output queue).	
Examples	**Command / Query**	**Response *(Description)***
	*CLS	*(Clears all status and event registers)*
Related Commands	N/A	

*ESE

Purpose	Sets the bits of the Event Status Enable Register.
Type	IEEE 488.2 Common Command
Command Syntax	*ESE <mask>
Command Parameters	<mask> = numeric ASCII value
***RST Value**	N/A, the parameter is required
Query Syntax	*ESE?
Query Parameters	N/A
Query Response	Numeric ASCII value from 0 to 255
Description	The Event Status Enable (ESE) command is used to set the bits of the Event Status Enable Register. See ANSI/IEEE 488.2-1987 section 11.5.1 for a complete description of the ESE register. A value of 1 in a bit position of the ESE register enables generation of the Event Status Bit (ESB) in the Status Byte by the corresponding bit in the Event Status Register (ESR). If the ESB is set in the Service Request Enable (SRE) register, then an interrupt will be generated. See the *ESR? query for details regarding the individual bits. The ESE register layout is: Bit 0 - Operation Complete Bit 1 - Request Control Bit 2 - Query Error Bit 3 - Device Dependent Error Bit 4 - Execution Error Bit 5 - Command Error Bit 6 - User Request Bit 7 - Power On The Event Status Enable query reports the current contents of the Event Status Enable Register.

Examples	**Command / Query**	**Response *(Description)***
	*ESE 36 *ESE?	36 *(Returns the value of the event status enable register)*

Related Commands	*ESR?

*ESR?

Purpose	Queries and clears the Standard Event Status Register.	
Type	IEEE 488.2 Common Command	
Command Syntax	None	
Command Parameters	N/A	
***RST Value**	N/A	
Query Syntax	*ESR?	
Query Parameters	None	
Query Response	Numeric ASCII value from 0 to 255	
Description	The Event Status Register (ESR) query - queries and clears the contents of the Standard Event Status Register. This register is used in conjunction with the ESE register to generate the Event Status Bit (ESB) in the Status Byte. The layout of the ESR is: Bit 0 - Operation Complete Bit 1 - Request Control Bit 2 - Query Error Bit 3 - Device Dependent Error Bit 4 - Execution Error Bit 5 - Command Error Bit 6 - User Request Bit 7 - Power On The Operation Complete bit is set when it receives an *OPC command. The Query Error bit is set when data is over-written in the output queue. This could occur if one query is followed by another without reading the data from the first query. The Execution Error bit is set when an execution error is detected. Errors that range from -200 to -299 are execution errors. The Command Error bit is set when a command error is detected. Errors that range from -100 to -199 are command errors. The Power On bit is set when the module is first powered on or after it receives a reset via the VXI Control Register. Once the bit is cleared (by executing the *ESR? command) it will remain cleared.	
Examples	**Command / Query**	**Response *(Description)***
	*ESR?	4
Related Commands	*ESE	

*IDN?

Purpose	Queries the module for its identification string.	
Type	IEEE 488.2 Common Command	
Command Syntax	None	
Command Parameters	N/A	
***RST Value**	N/A	
Query Syntax	*IDN?	
Query Parameters	None	
Query Response	ASCII character string	
Description	The Identification (IDN) query returns the identification string of the module. The response is divided into four fields separated by commas. The first field is the manufacturer's name, the second field is the model number, the third field is an optional serial number, and the fourth field is the firmware revision number. If a serial number is not supplied, the third field is set to 0 (zero).	
Examples	**Command / Query**	**Response *(Description)***
	*IDN?	VXI Technology, Inc.,VM2601,0,1.0 *(The revision listed here is for reference only; the response will always be the current revision of the instrument.)*
Related Commands	N/A	

*OPC

Purpose	Sets the OPC bit in the Event Status Register.	
Type	IEEE 488.2 Common Command	
Command Syntax	*OPC	
Command Parameters	None	
***RST Value**	N/A	
Query Syntax	*OPC?	
Query Parameters	None	
Query Response	1	
Description	The Operation Complete (OPC) command sets the OPC bit in the Event Status Register when all pending operations have completed. The OPC query will return a 1 to the output queue when all pending operations have completed.	
Examples	**Command / Query**	**Response *(Description)***
	*OPC	*(Sets the OPC bit in the Event Status Register)*
	*OPC?	1 *(Returns the value of the Event Status Register)*
Related Commands	*WAI	

*RST

Purpose	Resets the module's hardware and software to a known state.	
Type	IEEE 488.2 Common Command	
Command Syntax	*RST	
Command Parameters	None	
***RST Value**	N/A	
Query Syntax	None	
Query Parameters	N/A	
Query Response	N/A	
Description	The Reset (RST) command resets the module's hardware and software to a known state. See the Alphabetical Command Listing at the beginning of this chapter for the default parameter values used with this command.	
Examples	**Command / Query**	**Response *(Description)***
	*RST	*(Resets the module)*
Related Commands	N/A	

*SRE

Purpose	Sets the service request enable register.
Type	IEEE 488.2 Common Command
Command Syntax	*SRE <mask>
Command Parameters	<mask> = Numeric ASCII value from 0 to 255
***RST Value**	TBD
Query Syntax	*SRE?
Query Parameters	None
Query Response	Numeric ASCII value from 0 to 255
Description	The Service Request Enable (SRE) mask is used to control which bits in the status byte generate back plane interrupts. If a bit is set in the mask that newly enables a bit set in the status byte and interrupts are enabled, the module will generate a REQUEST TRUE event via an interrupt. See the *STB? query for the layout of bits. **Note:** Bit 6 is always internally cleared to zero as required by IEEE 488.2 section 11.3.2.3. The layout of the Service Request Enable Register is: Bit 0 - Unused Bit 1 - Unused Bit 2 - Error Queue Has Data Bit 3 - Questionable Status Summary (Not Used) Bit 4 - Message Available Bit 5 - Event Status Summary Bit 6 - 0 (per IEEE 488.2 section 11.3.2.3) Bit 7 - Operation Status Summary

Examples	**Command / Query**	**Response *(Description)***
	*SRE 4	*(Sets the service request enable register)*
	*SRE?	4 *(Returns the value of the SRE register)*
Related Commands	N/A	

*STB?

Purpose	Queries the Status Byte Register.	
Type	IEEE 488.2 Common Command	
Command Syntax	None	
Command Parameters	N/A	
***RST Value**	N/A	
Query Syntax	*STB?	
Query Parameters	None	
Query Response	Numeric ASCII value from 0 to 255	
Description	The Read Status Byte (STB) query fetches the current contents of the Status Byte Register. See the IEEE 488.2 specification for additional information regarding the Status byte Register and its use. The layout of the Status Register is: Bit 0 - Unused Bit 1 - Unused Bit 2 - Error Queue Has Data Bit 4 - Questionable Status Summary (not used) Bit 5 - Message Available Bit 6 - Master Summary Status Bit 7 - Operation Status Summary	
Examples	**Command / Query**	**Response *(Description)***
	*STB?	16 (*Queries the Status Byte Register)*
Related Commands	N/A	

*TRG

Purpose	Causes a trigger event to occur.	
Type	IEEE 488.2 Common Command	
Command Syntax	*TRG	
Command Parameters	None	
***RST Value**	N/A	
Query Syntax	None	
Query Parameters	N/A	
Query Response	N/A	
Description	The Trigger command causes a trigger event to occur.	
Examples	**Command / Query**	**Response *(Description)***
	*TRG	*(Triggers an event)*
Related Commands	N/A	

*TST?

Purpose	Causes a self-test procedure to occur and queries the results.	
Type	IEEE 488.2 Common Command	
Command Syntax	None	
Command Parameters	N/A	
***RST Value**	N/A	
Query Syntax	*TST?	
Query Parameters	N/A	
Query Response	Numeric ASCII value from 0 to 1.	
Description	Initiates the digitizer self-test operation. If the test fails, an error message is placed in the error queue and then the error LED blinks. The self test tests the following: 0 = Passed 1 = Failed sample RAM test	
Examples	**Command / Query**	**Response *(Description)***
	*TST?	0 (*Begins the self-test procedure returns the result)*
Related Commands	N/A	

*WAI

Purpose	Halts execution of additional commands and queries until the No Operation Pending message is true.	
Type	IEEE 488.2 Common Command	
Command Syntax	*WAI	
Command Parameters	None	
***RST Value**	N/A	
Query Syntax	None	
Query Parameters	N/A	
Query Response	N/A	
Description	The Wait to Continue command halts the execution of commands and queries until the No Operation Pending message is true. This command makes sure that all previous commands have been executed before proceeding. It provides a way of synchronizing the module with its commander.	
Examples	**Command / Query**	**Response *(Description)***
	*WAI	*(Pauses the execution of additional commands until the No Operation Pending message is true.)*
Related Commands	*OPC	

INSTRUMENT SPECIFIC SCPI COMMANDS

ABORt

Purpose	Aborts any active measurement process.	
Type	Event	
Command Syntax	ABORt	
Command Parameters	None	
***RST Value**	N/A	
Query Syntax	None	
Query Parameters	N/A	
Query Response	N/A	
Description	The Abort command disarms the VM2601 and stops data sampling (if active).	
Examples	**Command / Query**	**Response *(Description)***
	ABOR	*(Stops data sampling and disarms the module)*
Related Commands	INITiate[:IMMediate]	

ARM:AUTO

Purpose	Enables or disables the automatic rearm process.	
Type	Command	
Command Syntax	ARM:AUTO <boolean>	
Command Parameters	<boolean> = 0 | 1 | OFF | ON	
***RST Value**	OFF	
Query Syntax	ARM:AUTO?	
Query Parameters	None	
Query Response	Returns the value currently selected for the <boolean> parameter	
Description	This command enables or disables the automatic re-arm process. This applies to multiple segment acquisitions only (see SWEep:COUNt for more information on segments). As an example, assume that the VM2601 is configured for 64 segments, auto-rearm is enabled, the input trigger source is selected, and the input signal is a repetetive pulse burst with a duration of [0.1 * (sample rate * number of samples)] occurring at random intervals. If an "INIT" command is sent followed by an "ARM" command, it will set up the instrument to acquire a "snapshot" of each burst, which is triggered by the input signal, and each "snapshot" will be stored in separate segment. If auto-rearm were disabled, it would be necessary to rearm the instrument between bursts with an external signal or a software command.	
Examples	**Command / Query**	**Response *(Description)***
	ARM:AUTO 1	*(Enables the automatic rearm process.)*
	ARM:AUTO?	1 (*Indicates that the automatic rearm process is enabled.*)
Related Commands	ARM ARM:IMMediate ARM:LEVel ARM:SLOPe ARM:SOURce SWEep:COUNt	

ARM[:IMMediate]

Purpose	Arms the instrument on receipt of the command.	
Type	Command	
Command Syntax	ARM[:IMMediate]	
Command Parameters	None	
***RST Value**	N/A	
Query Syntax	None	
Query Parameters	N/A	
Query Response	N/A	
Description	Arms the instrument on receipt of the command and puts the device into Waiting For Trigger mode.	
Examples	**Command / Query**	**Response *(Description)***
	ARM:IMM	*(Arms VM2601)*
Related Commands	ARM ARM:LEVel ARM:SLOPe ARM:SOURce	

ARM:LEVel

Purpose	Sets the level at which the instrument will be armed (external input).	
Type	Command	
Command Syntax	ARM:LEVel <arm_level>	
Command Parameters	<arm_level> = -4 V to +4 V	
***RST Value**	<arm_level> = 0.0	
Query Syntax	ARM:LEVel?	
Query Parameters	None	
Query Response	Returns the value currently set for the <arm_level> parameter.	
Description	Sets the level at which the instrument will be armed by a signal present at the ARM/GP1 input, assuming that ARM:SOURce EXT has been selected. The range is approximately ±4 V.	
Examples	**Command / Query**	**Response *(Description)***
	ARM:LEV 2.56	*(Sets the comparator level to 2.56 V)*
Related Commands	ARM ARM:IMMediate ARM:SLOPe ARM:SOURce	

ARM:SLOPe

Purpose	Specifies the slope of the arm signal.	
Type	Command	
Command Syntax	ARM:SLOPe <arm_slope>	
Command Parameters	<arm_slope> = POSitive | NEGative	
***RST Value**	<arm_slope> = POSitive	
Query Syntax	ARM:SLOPe?	
Query Parameters	None	
Query Response	POS | NEG	
Description	Specifies the slope of the arm signal when the arm source is set to EXTernal or TTL.	
Examples	**Command / Query**	**Response *(Description)***
	ARM:SLOP NEG	*(Sets the VM2601 to arm on a negative slope.)*
	ARM:SLOP?	NEG *(Indicates that the VM2601 will arm on a negative slope.)*
Related Commands	ARM ARM:IMMediate ARM:LEVel ARM:SOURce	

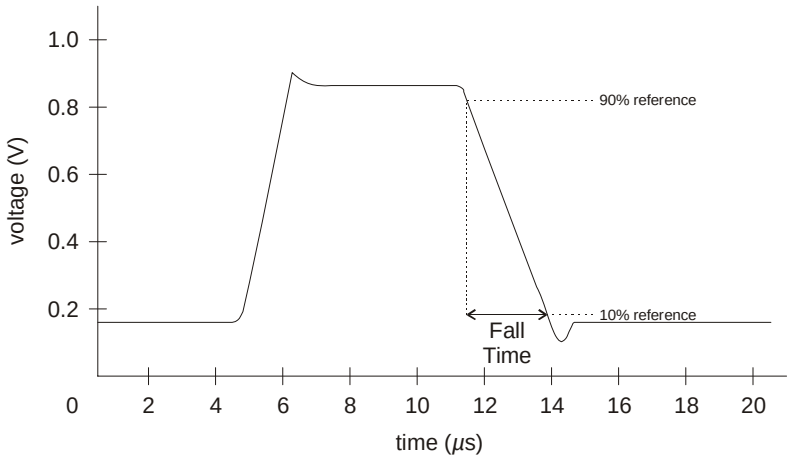
ARM:SOURce

Purpose	Sets the arm source.
Type	Command
Command Syntax	ARM:SOURce <arm_source>
Command Parameters	<arm_source> = EXTernal | IMMediate | SYNC | TTLT<0-7>
***RST Value**	<arm_source> = IMMediate
Query Syntax	ARM:SOURce?
Query Parameters	None
Query Response	Returns the value currently selected for the <arm_source> parameter.
Description	Sets the arm source: EXT : ARM/GP1 input IMM : software command (ARM:IMM) SYNC : Master/Slave SYNC subsystem TTLT : VXIbus TTL backplane trigger

Examples	**Command / Query**	**Response *(Description)***
	ARM:SOUR TTLT3	*(Sets the arm source to TTLT3.)*
	ARM:SOUR?	TTLT3 *(Indicates that the arm source is the TTLT3 line.)*

Related Commands	ARM ARM:IMMediate ARM:LEVel ARM:SLOPe

CALCulate:FALL:TIMe

Purpose	Query that instructs the device to calculate and return fall time measurement.
Type	Query
Command Syntax	None
Command Parameters	N/A
***RST Value**	N/A
Query Syntax	CALCulate:FALL:TIMe? or CALCultate:FTIMe?
Query Parameters	None
Query Response	ASCII number representing fall-time measurement
Description	The CALCulate:FALL:TIME query instructs the instrument to calculate and return the amount of time it takes a signal to make a negative transition from the high reference to the low reference. The high reference defaults to 90% of the signal amplitude, and the low reference defaults to 10% of the signal amplitude.  To correctly perform a CALCulate function, a data set must be acquired (INITiate, ARM, TRIGger), and the data may be transferred to the host (register access) before the execution CALC query. This sequence is not a prerequisite for sending a CALCulate query, but is required for valid data to be returned.
Examples	**Command / Query**: CALC:FTIM? **Response *(Description)***: *(Returns the fall time measurement.)*
Related Commands	CONFigure:FALL:TIMe MEASure:FALL:TIMe

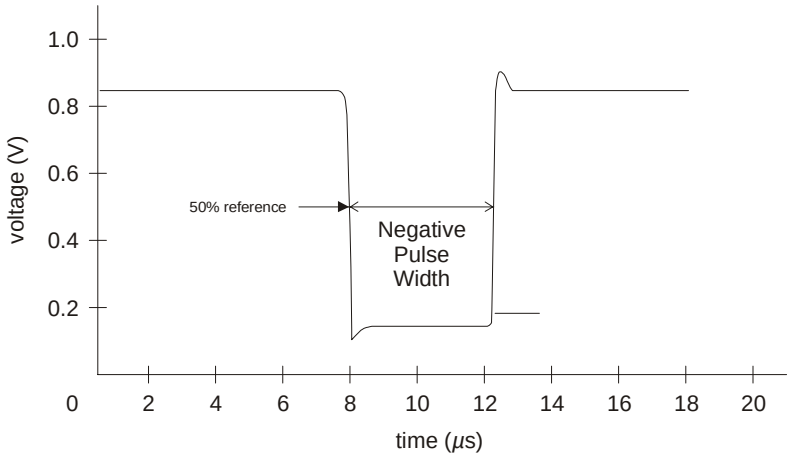
CALCulate:FREQuency?

Purpose	Query that instructs the device to calculate and return the frequency of the digitized data.	
Type	Query	
Command Syntax	None	
Command Parameters	N/A	
***RST Value**	N/A	
Query Syntax	CALCulate:FREQuency?	
Query Parameters	None	
Query Response	ASCII number representing frequency measurement in Hz.	
Description	The CALCulate:FREQuency query instructs the device to calculate and return the frequency of the digitized data. Frequency (*f*) is a measure of how many times a signal repeats in one second (1/s = Hz). This is also equal to 1/period (or 1/T). To correctly perform a CALCulate function, a data set must be acquired (INITiate, ARM, TRIGger), and the data may be transferred to the host (register access) before the execution CALC query. This sequence is not a prerequisite for sending a CALCulate query, but is required for valid data to be returned.	
Examples	**Command / Query**	**Response *(Description)***
	CALC:FREQ?	*(Returns the frequency measurement.)*
Related Commands	CONFigure:FREQuency MEASure:FREQuency	

CALCulate:NDUTy?

Purpose	Query that instructs the device to calculate and return the negative duty cycle.	
Type	Query	
Command Syntax	None	
Command Parameters	N/A	
***RST Value**	N/A	
Query Syntax	CALCulate:NDUTy?	
Query Parameters	None	
Query Response	ASCII number representing negative duty cycle measurement as a percentage	
Description	The CALCulateNDUTy query instructs the device to calculate and return the negative duty cycle of the digitized data. The negative duty cycle is defined as the negative pulse width divided by the period and is expressed as a percentage. To correctly perform a CALCulate function, a data set must be acquired (INITiate, ARM, TRIGger), and the data may be transferred to the host (register access) before the execution CALC query. This sequence is not a prerequisite for sending a CALCulate query, but is required for valid data to be returned.	
Examples	**Command / Query**	**Response *(Description)***
	CALC:NDUT?	*(Returns the negative duty cycle measurement.)*
Related Commands	CONFigure:NDUTy MEASure:NDUTy	

CALCulate:NWIDth?

Purpose	Query that returns a negative pulse width measurement.
Type	Query
Command Syntax	None
Command Parameters	N/A
***RST Value**	N/A
Query Syntax	CALCulate:PWIDth?
Query Parameters	None
Query Response	ASCII number representing a negative pulse width measurement in seconds.
Description	The CALCulate:NWIDth query instructs the devuce to calculate and return a negative pulse width measurement. The negative pulse width is a measure of the time required to go from the 50% reference of the falling edge of one wave to the 50% reference of the rising edge on the next wave on a negative pulse.  To correctly perform a CALCulate function, a data set must be acquired (INITiate, ARM, TRIGger), and the data may be transferred to the host (register access) before the execution CALC query. This sequence is not a prerequisite for sending a CALCulate query, but is required for valid data to be returned.

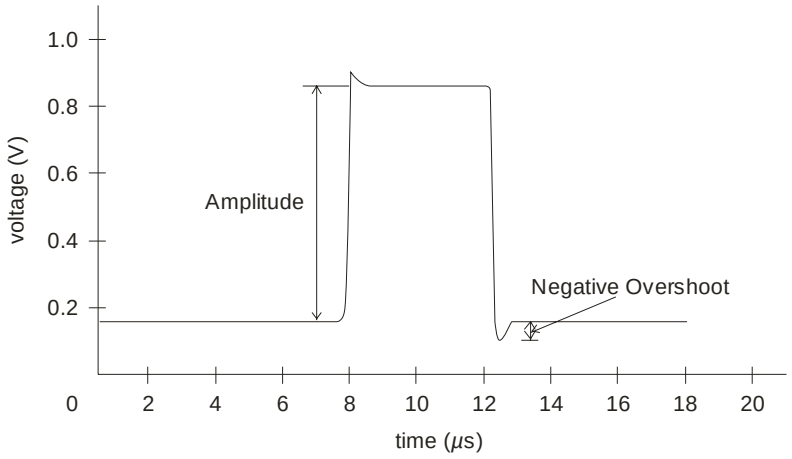
Examples	**Command / Query**	**Response *(Description)***
	CALC:PWID?	*(Returns the positive pulse width measurement.)*

Related Commands	CONFigure:NWIDth MEASure:NWIDth

CALCulate:PDUTy?

Purpose	Query that instructs the device to calculate and return the positive duty cycle.	
Type	Query	
Command Syntax	None	
Command Parameters	N/A	
***RST Value**	N/A	
Query Syntax	CALCulate:PDUTy?	
Query Parameters	None	
Query Response	ASCII number representing positive duty cycle measurement as a percentage.	
Description	The CALCulate:PDUTy query instructs the device to calculate and return the positive duty cycle of the digitized data. The positive duty cycle is defined as the positive pulse width divided by the period and is expressed as a percentage. To correctly perform a CALCulate function, a data set must be acquired (INITiate, ARM, TRIGger), and the data may be transferred to the host (register access) before the execution CALC query. This sequence is not a prerequisite for sending a CALCulate query, but is required for valid data to be returned.	
Examples	**Command / Query**	**Response *(Description)***
	CALC:PDUT?	*(Returns the positive duty cycle measurement.)*
Related Commands	CONFigure:PDUTy MEASure:PDUTy	

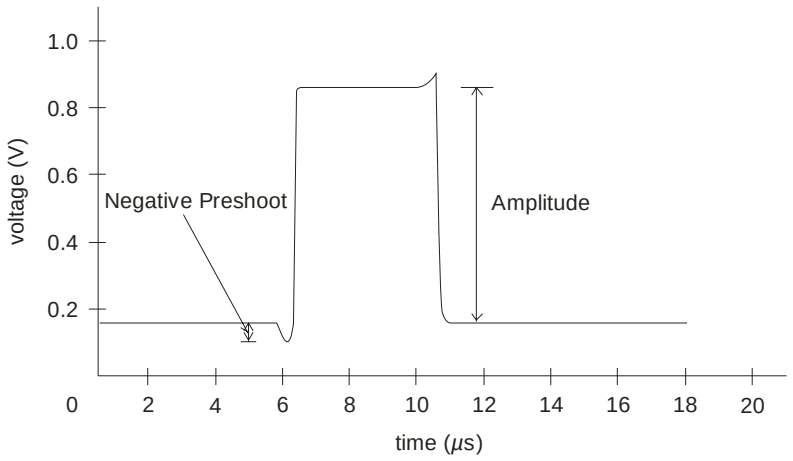
CALCulate:PERCent:NOVershoot?

Purpose	Returns the negative overshoot as a percent of the signal amplitude.
Type	Query
Command Syntax	None
Command Parameters	N/A
***RST Value**	N/A
Query Syntax	CALCulate: PERCent:NOVershoot?
Query Parameters	None
Query Response	ASCII value representing a voltage measurement.
Description	The CALCulate:PERCent:NOVershoot query instructs the device to calculate and return the value corresponding to the negative overshoot as a percentage of the signal amplitude from the selected input range. The negative overshoot is defined as the amount of voltage by which a post-transitional aberration negatively exceeds a state boundary.  To correctly perform a CALCulate function, a data set must be acquired (INITiate, ARM, TRIGger), and the data may be transferred to the host (register access) before the execution CALC query. This sequence is not a prerequisite for sending a CALCulate query, but is required for valid data to be returned.

Examples	**Command / Query**	**Response *(Description)***
	CALC:PERC:NOV?	*(Returns the negative overshoot voltage as a percentage of the signal amplitude.)*

Related Commands	CONFigure:PERC:NOV MEASure:PERC:NOV

CALCulate:PERCent:NPReshoot?

Purpose	Returns the negative preshoot value for the acquired data as a percent of the signal amplitude.
Type	Query
Command Syntax	None
Command Parameters	N/A
***RST Value**	N/A
Query Syntax	CALCulate:PERCent:NPReshoot?
Query Parameters	None
Query Response	ASCII value representing a voltage measurement in volts.
Description	The CALCulate:PERCent:NPReshoot query instructs the device to calculate and return a voltage value corresponding to the negative preshoot from the selected input range. The negative preshoot is defined as the amount of voltage by which a pre-transitional aberration negatively exceeds a state boundary.  To correctly perform a CALCulate function, a data set must be acquired (INITiate, ARM, TRIGger), and the data may be transferred to the host (register access) before the execution CALC query. This sequence is not a prerequisite for sending a CALCulate query, but is required for valid data to be returned.

Examples	**Command / Query**	**Response *(Description)***
	CALC:PERC:NPR?	*(Returns the negative pershoot value as a percent of the signal amplitude.)*

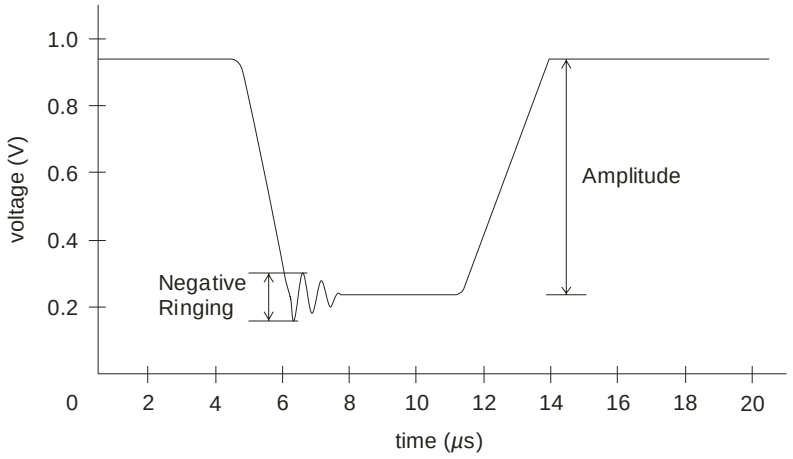
Related Commands	CONFigure:PERC:NPR MEASure:PERC:NPR

CALCulate:PERCent:NRINging?

Purpose	Returns the negative ringing as a percent of the signal amplitude.
Type	Query
Command Syntax	None
Command Parameters	N/A
***RST Value**	N/A
Query Syntax	CALCulate:PERCent:NRINging?
Query Parameters	None
Query Response	ASCII value representing a voltage measurement.

Description

The CALCulate:PERCent:NRINGing query instructs the device to calculate and return a value corresponding to the negative ringing of an signal on the selected input range as a percent of the signal amplitude. Negative ringing is defined as the peak-to-peak voltage of a negative post-transitional aberration.



To correctly perform a CALCulate function, a data set must be acquired (INITiate, ARM, TRIGger), and the data may be transferred to the host (register access) before the execution CALC query. This sequence is not a prerequisite for sending a CALCulate query, but is required for valid data to be returned.

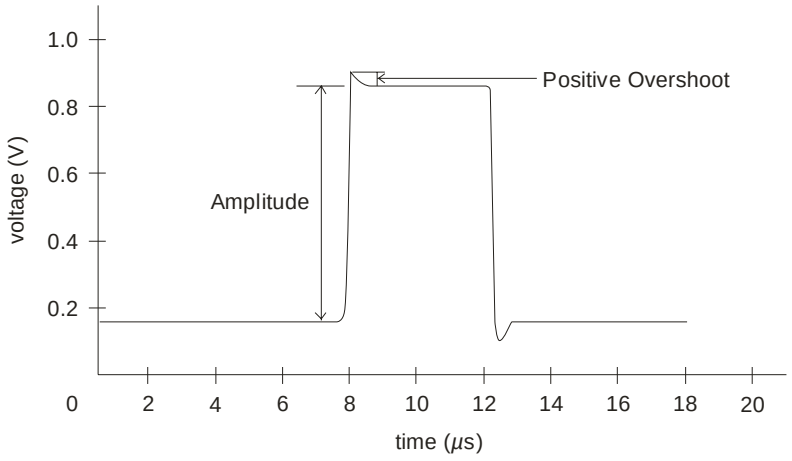
Examples

Command / Query	**Response *(Description)***
CALC:PERC:NRIN?	*(Returns the negative ringing value as a percent of the signal amplitude.)*

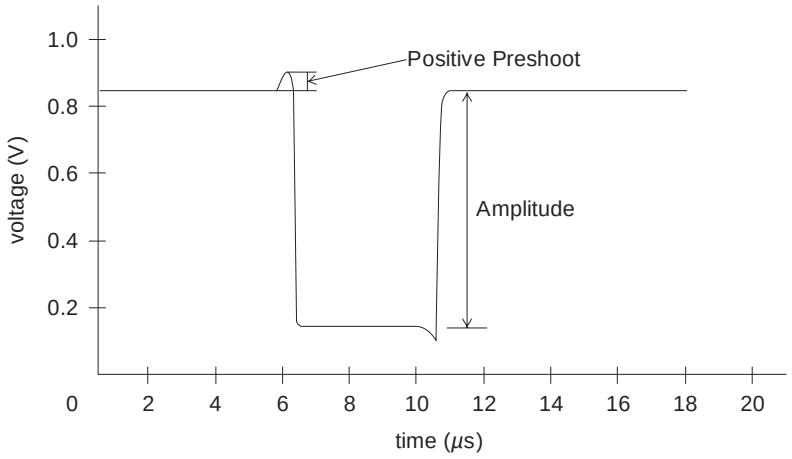
Related Commands

CONFigure:PERC:NRIN
MEASure:PERC:NRIN

CALCulate:PERCent:POVershoot?

Purpose	Returns the positive overshoot value for the acquired data as a percent of the signal amplitude.
Type	Query
Command Syntax	None
Command Parameters	N/A
***RST Value**	N/A
Query Syntax	CALCulate:PERCent:POVershoot?
Query Parameters	None
Query Response	ASCII value representing a voltage measurement in volts.
Description	The CALCulate:PERCent:POVershoot query instructs the device to calculate and return a voltage value corresponding to the positive overshoot from the selected input range as a percent of the signal amplitude. The positive overshoot is defined as the amount of voltage by which a post-transitional aberration positively exceeds the state boundary.  To correctly perform a CALCulate function, a data set must be acquired (INITiate, ARM, TRIGger), and the data may be transferred to the host (register access) before the execution CALC query. This sequence is not a prerequisite for sending a CALCulate query, but is required for valid data to be returned.
Examples	**Command / Query**: CALC:PERC:POV? **Response *(Description)***: *(Returns the positive overshoot as a percent of the signal amplitude.)*
Related Commands	CONFigure:PERC:POV MEASure:PERC:POV

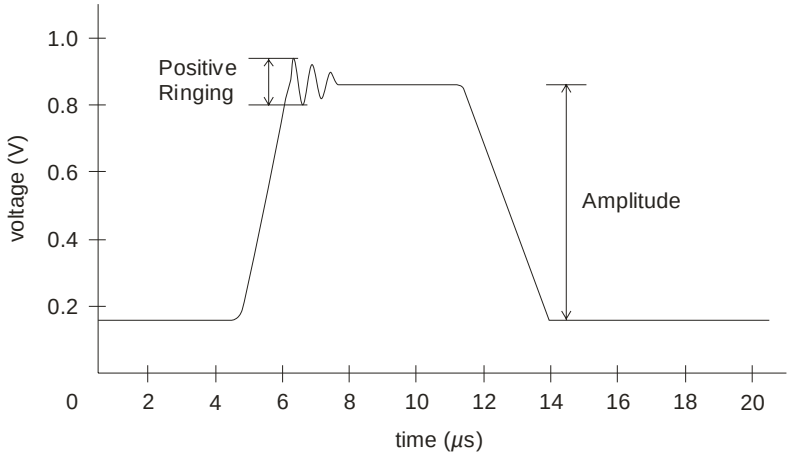
CALCulate:PERCent:PPReshoot?

Purpose	Returns the positive preshoot value for the aquried data as a percent of the signal amplitude.
Type	Query
Command Syntax	None
Command Parameters	N/A
***RST Value**	N/A
Query Syntax	CALCulate:PERCent:PPReshoot?
Query Parameters	None
Query Response	ASCII value representing a voltage measurement in volts.
Description	The CALCulate:PERCent:PPReshoot query instructs the device to calculate and return a voltage value corresponding to the positive preshoot from the selected input range as a percent of the signal amplitude. The positive preshoot is defined as the amount of voltage by which a pre-transitional aberration positively exceeds the state boundary.  To correctly perform a CALCulate function, a data set must be acquired (INITiate, ARM, TRIGger), and the data may be transferred to the host (register access) before the execution CALC query. This sequence is not a prerequisite for sending a CALCulate query, but is required for valid data to be returned.

Examples	**Command / Query**	**Response *(Description)***
	CALC:PERC:PPR?	*(Returns the positive preshoot measurement as a percent of the signal amplitude.)*

Related Commands	CONFigure:PERC:PPR MEASure:PERC:PPR

CALCulate:PERCent:PRINging?

Purpose	Returns the positive ringing as a percent of the signal amplitude.
Type	Query
Command Syntax	None
Command Parameters	N/A
***RST Value**	N/A
Query Syntax	CALCulate:PERCent:PRINging?
Query Parameters	None
Query Response	ASCII value representing a voltage measurement in volts.
Description	The CALCulate:PERCent:PRINGing query instructs the device to calculate and return a value corresponding to the negative ringing of an signal on the selected input range as a percent of the signal amplitude. The CALCulate:VOLTage:PRINGing query instructs the device to calculate and return a value corresponding to the positive ringing of an signal on the selected input range. Positive ringing is defined as the peak-to-peak voltage of a positive post-transitional aberration.  To correctly perform a CALCulate function, a data set must be acquired (INITiate, ARM, TRIGger), and the data may be transferred to the host (register access) before the execution CALC query. This sequence is not a prerequisite for sending a CALCulate query, but is required for valid data to be returned.

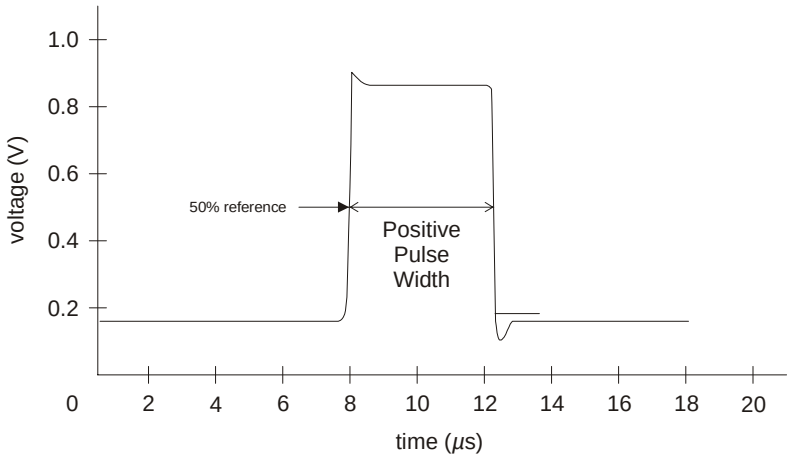
Examples	**Command / Query**	**Response *(Description)***
	CALC:PERC:PRIN?	*(Returns the positive ringing value as a percent of the signal amplitude.)*

Related Commands	CONFigure:PERC:PRIN MEASure: PERC:PRIN

CALCulate:PERiod?

Purpose	Query that returns a period measurement from the device.	
Type	Query	
Command Syntax	None	
Command Parameters	N/A	
***RST Value**	N/A	
Query Syntax	CALCulate:PERiod?	
Query Parameters	None	
Query Response	ASCII number representing a period measurement in seconds.	
Description	Query that returns a period measurement from the device. The period (T) is defined as the amount of time required for the signal to generate one signal cycle. This is also defined as 1/frequency (or 1/*f*). To correctly perform a CALCulate function, a data set must be acquired (INITiate, ARM, TRIGger), and the data may be transferred to the host (register access) before the execution CALC query. This sequence is not a prerequisite for sending a CALCulate query, but is required for valid data to be returned.	
Examples	**Command / Query**	**Response *(Description)***
	CALC:PER?	*(Returns the period measurement.)*
Related Commands	CONFigure:PERiod MEASure:PERiod	

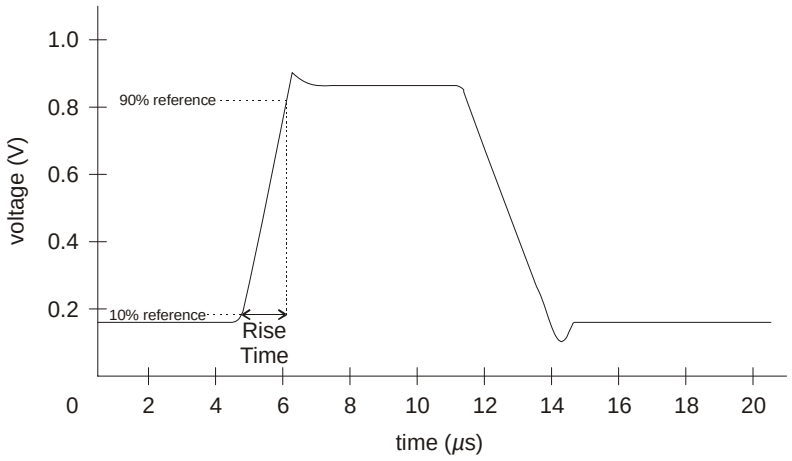
CALCulate:PWIDth?

Purpose	Query that returns a positive pulse width measurement.
Type	Query
Command Syntax	None
Command Parameters	N/A
***RST Value**	N/A
Query Syntax	CALCulate:PWIDth?
Query Parameters	None
Query Response	ASCII number representing a positive pulse width measurement in seconds.
Description	The CALCulate:PWIDth query returns a positive pulse width measurement. The positive pulse width is a measure of the time required to go from the 50% reference of the rising edge of one wave to the 50% reference of the next falling edge.  To correctly perform a CALCulate function, a data set must be acquired (INITiate, ARM, TRIGger), and the data may be transferred to the host (register access) before the execution CALC query. This sequence is not a prerequisite for sending a CALCulate query, but is required for valid data to be returned.

Examples	**Command / Query**	**Response *(Description)***
	CALC:PWID?	*(Returns the positive pulse width measurement.)*

Related Commands	CONFigure:FREQuency MEASure:PWIDth

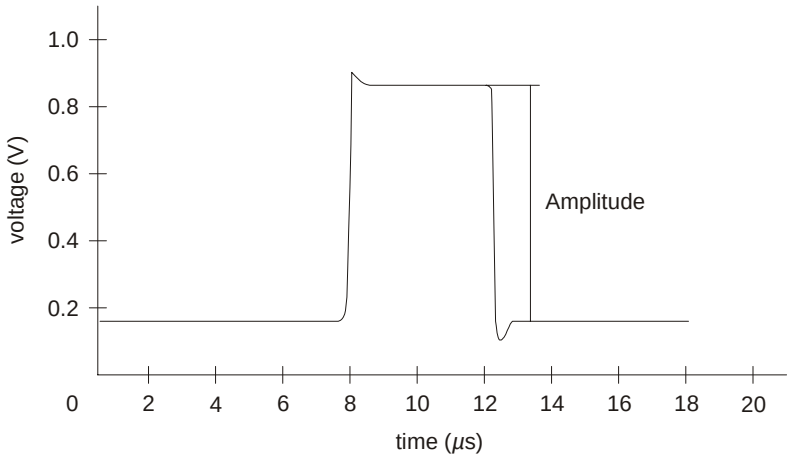
CALCulate:RISE:TIMe?

Purpose	Query that returns a rise-time measurement.
Type	Query
Command Syntax	None
Command Parameters	N/A
***RST Value**	N/A
Query Syntax	CALCulate:RISE:TIMe? or CALCulate:RTIMe?
Query Parameters	None
Query Response	ASCII number representing a rise time measurement in seconds.
Description	The CALCulate:RISE:TIME query instructs the instrument to calculate and return the amount of time it takes a signal to make a positive transition from the low reference to the high reference. The high reference defaults to 90% of the signal amplitude, and the low reference defaults to 10% of the signal amplitude.  To correctly perform a CALCulate function, a data set must be acquired (INITiate, ARM, TRIGger), and the data may be transferred to the host (register access) before the execution CALC query. This sequence is not a prerequisite for sending a CALCulate query, but is required for valid data to be returned.

Examples	**Command / Query**	**Response *(Description)***
	CALC:RISE:TIM?	*(Returns the rise time measurement.)*

Related Commands	CONFigure:RISE:TIMe MEASure:RISE:TIMe

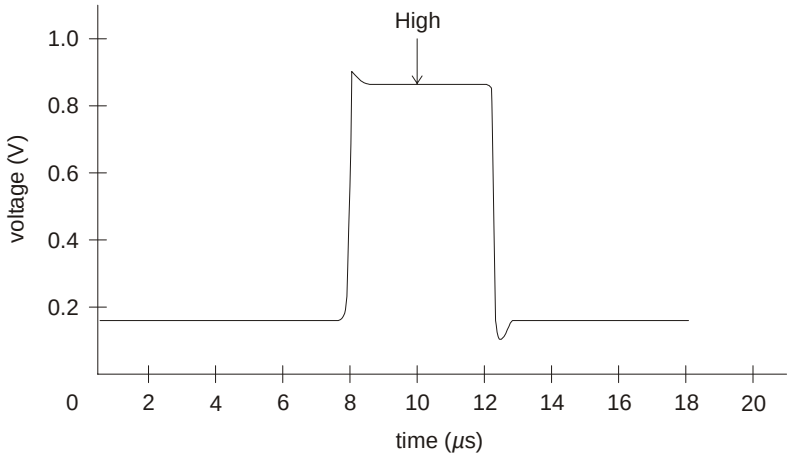
CALCulate:VOLTage:AMPLitude?

Purpose	Returns the amplitude measurement for the data being acquired.
Type	Query
Command Syntax	None
Command Parameters	N/A
***RST Value**	N/A
Query Syntax	CALCulate:VOLTage:AMPLitude?
Query Parameters	None
Query Response	ASCII value representing a voltage amplitude measurement in volts.
Description	The CALCulate:VOLTage:AMPlitude query instructs the device to calculate and return an amplitude measurement for the data being acquired. Amplitude is defined as the voltage difference between the high and low states.  To correctly perform a CALCulate function, a data set must be acquired (INITiate, ARM, TRIGger), and the data may be transferred to the host (register access) before the execution CALC query. This sequence is not a prerequisite for sending a CALCulate query, but is required for valid data to be returned.

Examples	**Command / Query**	**Response *(Description)***
	CALC:VOLT:AMPL?	*(Returns the voltage amplitude measurement.)*

Related Commands	CONFigure:VOLTage:AMPLitude MEASure: VOLTage:AMPLitude

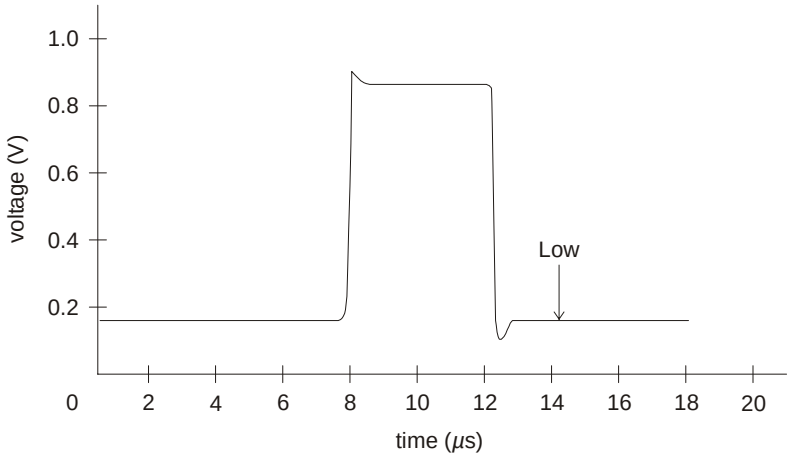
CALCulate:VOLTage:HIGH?

Purpose	Returns the high voltage value for the acquired data.
Type	Query
Command Syntax	None
Command Parameters	N/A
***RST Value**	N/A
Query Syntax	CALCulate:VOLTage:HIGH?
Query Parameters	None
Query Response	ASCII value representing a voltage measurement in volts.
Description	The CALCulate:VOLTage:HIGH query instructs the device to calculate and return a voltage value from the data representing the high state.  To correctly perform a CALCulate function, a data set must be acquired (INITiate, ARM, TRIGger), and the data may be transferred to the host (register access) before the execution CALC query. This sequence is not a prerequisite for sending a CALCulate query, but is required for valid data to be returned.

Examples	**Command / Query**	**Response *(Description)***
	CALC:VOLT:HIGH?	*(Returns the high input voltage value.)*

Related Commands	CONFigure:VOLTage:HIGH MEASure:VOLTage:HIGH

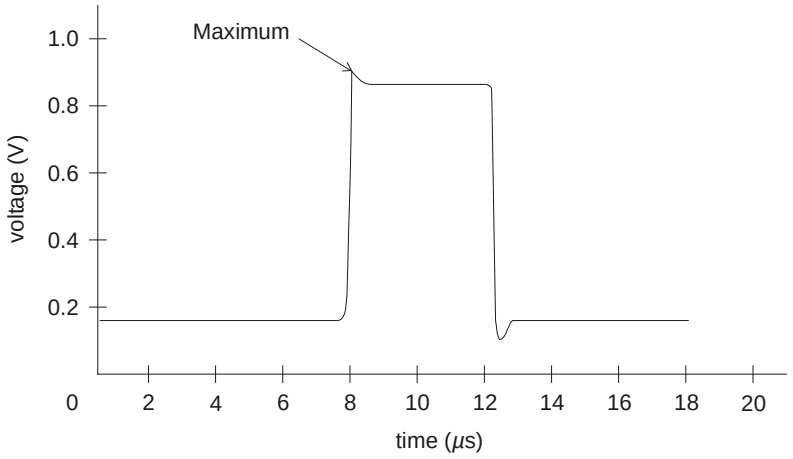
CALCulate:VOLTage:LOW?

Purpose	Returns the low voltage value for the acquired data.
Type	Query
Command Syntax	None
Command Parameters	N/A
***RST Value**	N/A
Query Syntax	CALCulate:VOLTage:LOW?
Query Parameters	None
Query Response	ASCII value representing a voltage measurement in volts.
Description	The CALCulate:VOLTage:LOW query instructs the device to calculate and return a voltage value from the data representing the low state.  To correctly perform a CALCulate function, a data set must be acquired (INITiate, ARM, TRIGger), and the data may be transferred to the host (register access) before the execution CALC query. This sequence is not a prerequisite for sending a CALCulate query, but is required for valid data to be returned.

Examples	**Command / Query**	**Response *(Description)***
	CALC:VOLT:LOW?	*(Returns the low input voltage value.)*

Related Commands	CONFigure:VOLTage:LOW MEASure: VOLTage:LOW

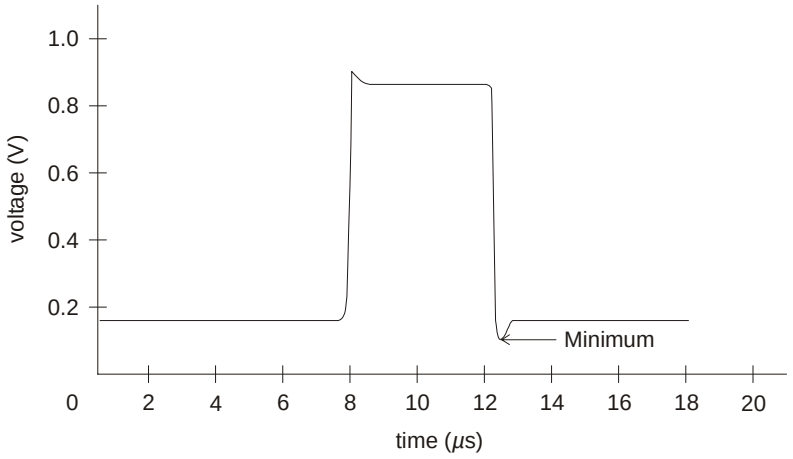
CALCulate:VOLTage:MAXimum?

Purpose	Returns the maximum voltage value for the acquired data.
Type	Query
Command Syntax	None
Command Parameters	N/A
***RST Value**	N/A
Query Syntax	CALCulate:VOLTage:MAXimum?
Query Parameters	None
Query Response	ASCII value representing a voltage measurement in volts.
Description	The CALCulate:VOLTage:MAXimum query instructs the device to calculate and return a maximum voltage value from the acquired data set.  To correctly perform a CALCulate function, a data set must be acquired (INITiate, ARM, TRIGger), and the data may be transferred to the host (register access) before the execution CALC query. This sequence is not a prerequisite for sending a CALCulate query, but is required for valid data to be returned.
Examples	**Command / Query**: CALC:VOLT:MAX? **Response *(Description)***:
Related Commands	CONFigure:VOLTage:MAXimum MEASure: VOLTage:MAXimum

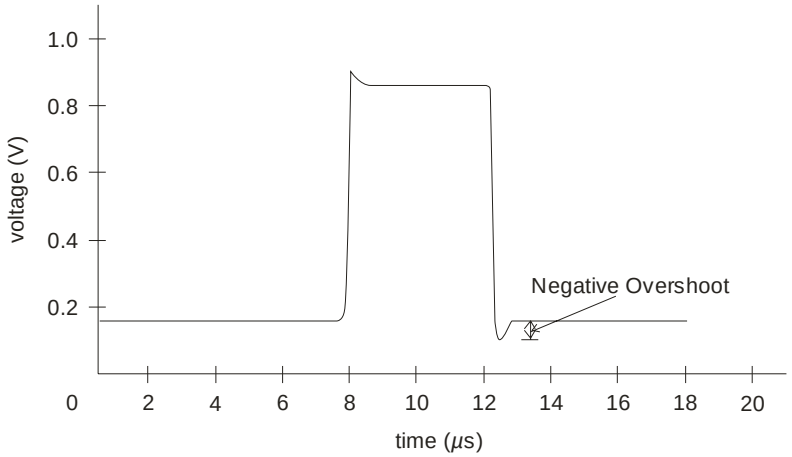
CALCulate:VOLTage:MEAN?

Purpose	Returns the mean voltage value for the acquired data.	
Type	Query	
Command Syntax	None	
Command Parameters	N/A	
***RST Value**	N/A	
Query Syntax	CALCulate:VOLTage:MEAN?	
Query Parameters	None	
Query Response	ASCII value representing a voltage measurement in volts.	
Description	The CALCulate:VOLTage:MEAN query instructs the device to calculate and return the mean (average) voltage value from the acquired data set. To correctly perform a CALCulate function, a data set must be acquired (INITiate, ARM, TRIGger), and the data may be transferred to the host (register access) before the execution CALC query. This sequence is not a prerequisite for sending a CALCulate query, but is required for valid data to be returned.	
Examples	**Command / Query**	**Response *(Description)***
	CALC:VOLT:MEAN?	
Related Commands	CONFigure:VOLTage:MEAN MEASure: VOLTage:MEAN	

CALCulate:VOLTage:MINimum?

Purpose	Returns the minimum voltage value for the acquired data.
Type	Query
Command Syntax	None
Command Parameters	N/A
***RST Value**	N/A
Query Syntax	CALCulate:VOLTage:MINimum?
Query Parameters	None
Query Response	ASCII value representing a voltage measurement in volts.
Description	The CALCulate:VOLTage:MINimum query instructs the device to calculate and return a minimum voltage value from the acquired data set.  To correctly perform a CALCulate function, a data set must be acquired (INITiate, ARM, TRIGger), and the data may be transferred to the host (register access) before the execution CALC query. This sequence is not a prerequisite for sending a CALCulate query, but is required for valid data to be returned.
Examples	**Command / Query**: CALC:VOLT:MIN? **Response *(Description)***:
Related Commands	CONFigure:VOLTage:MINimum MEASure: VOLTage:MINimum

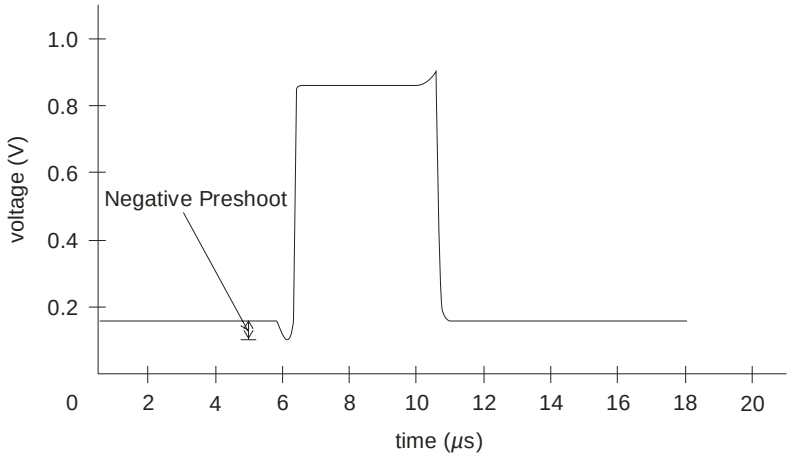
CALCulate:VOLTage:NOVershoot?

Purpose	Returns the negative overshoot value for the acquired data.
Type	Query
Command Syntax	None
Command Parameters	N/A
***RST Value**	N/A
Query Syntax	CALCulate:VOLTage:NOVershoot?
Query Parameters	None
Query Response	ASCII value representing a voltage measurement in volts.
Description	The CALCulate:VOLTage:NOVershoot query instructs the device to calculate and return the voltage value corresponding to the negative overshoot from the selected input range. The negative overshoot is defined as the amount of voltage by which a post-transitional aberration negatively exceeds a state boundary.  To correctly perform a CALCulate function, a data set must be acquired (INITiate, ARM, TRIGger), and the data may be transferred to the host (register access) before the execution CALC query. This sequence is not a prerequisite for sending a CALCulate query, but is required for valid data to be returned.

Examples	**Command / Query**	**Response *(Description)***
	CALC:VOLT:NOV?	*(Returns the voltage of the negative overshoot.)*

Related Commands	CONFigure:VOLTage:NOVershoot MEASure: VOLTage:NOVershoot

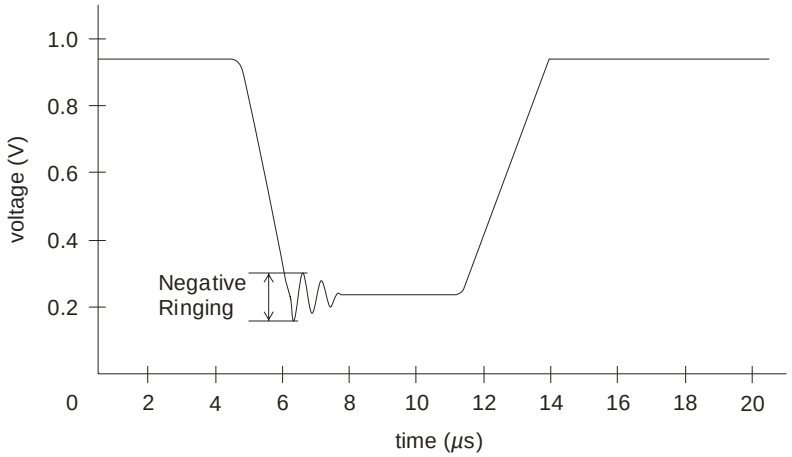
CALCulate:VOLTage:NPReshoot?

Purpose	Returns the negative preshoot value for the acquired data.
Type	Query
Command Syntax	None
Command Parameters	N/A
***RST Value**	N/A
Query Syntax	CALCulate:VOLTage:NPReshoot?
Query Parameters	None
Query Response	ASCII value representing a voltage measurement in volts.
Description	The CALCulate:VOLTage:NPReshoot query instructs the device to calculate and return a voltage value corresponding to the negative preshoot from the selected input range. The negative preshoot is defined as the amount of voltage by which a pre-transitional aberration negatively exceeds a state boundary.  To correctly perform a CALCulate function, a data set must be acquired (INITiate, ARM, TRIGger), and the data may be transferred to the host (register access) before the execution CALC query. This sequence is not a prerequisite for sending a CALCulate query, but is required for valid data to be returned.

Examples	**Command / Query**	**Response *(Description)***
	CALC:VOLT:NPR?	*(Returns the negative preshoot voltage.)*

Related Commands	CONFigure:VOLTage:NPReshoot MEASure: VOLTage:NPReshoot

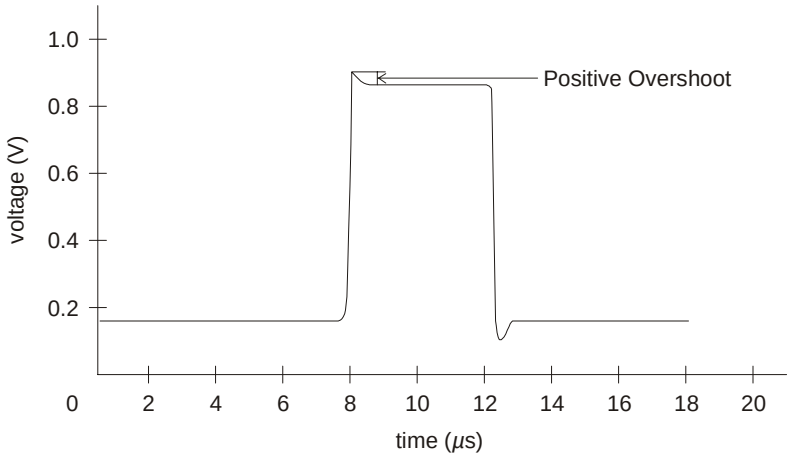
CALCulate:VOLTage:NRINging?

Purpose	Returns the negative ringing measurement of the data being acquired.
Type	Query
Command Syntax	None
Command Parameters	N/A
***RST Value**	N/A
Query Syntax	CALCulate:VOLTage:NRINging?
Query Parameters	None
Query Response	ASCII value representing a voltage measurement in volts.
Description	The CALCulate:VOLTage:NRINGing query instructs the device to calculate and return a value corresponding to the negative ringing of an signal on the selected input range. Negative ringing is defined as the peak-to-peak voltage of a negative post-transitional aberration.  To correctly perform a CALCulate function, a data set must be acquired (INITiate, ARM, TRIGger), and the data may be transferred to the host (register access) before the execution CALC query. This sequence is not a prerequisite for sending a CALCulate query, but is required for valid data to be returned.

Examples	**Command / Query**	**Response *(Description)***
	CALC:VOLT:NRIN?	*(Returns the value of the negative ringing voltage.)*

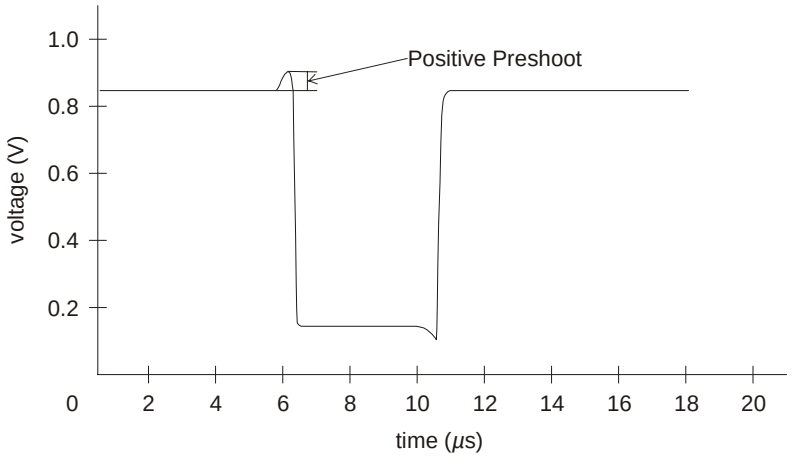
Related Commands	CONFigure:VOLTage:NRINging MEASure:VOLTage:NRINging

CALCulate:VOLTage:POVershoot?

Purpose	Returns the positive overshoot value for the acquired data.
Type	Query
Command Syntax	None
Command Parameters	N/A
***RST Value**	N/A
Query Syntax	CALCulate:VOLTage:POVershoot?
Query Parameters	None
Query Response	ASCII value representing a voltage measurement in volts.
Description	The CALCulate:VOLTage:POVershoot query instructs the device to calculate and return a voltage value corresponding to the positive overshoot from the selected input range. The positive overshoot is defined as the amount of voltage by which a post-transitional aberration positively exceeds the state boundary.  To correctly perform a CALCulate function, a data set must be acquired (INITiate, ARM, TRIGger), and the data may be transferred to the host (register access) before the execution CALC query. This sequence is not a prerequisite for sending a CALCulate query, but is required for valid data to be returned.

Examples	**Command / Query**	**Response *(Description)***
	CALC:VOLT:POV?	*(Returns the positive overshoot voltage.)*
Related Commands	CONFigure:VOLTage:POVershoot MEASure: VOLTage:POVershoot	

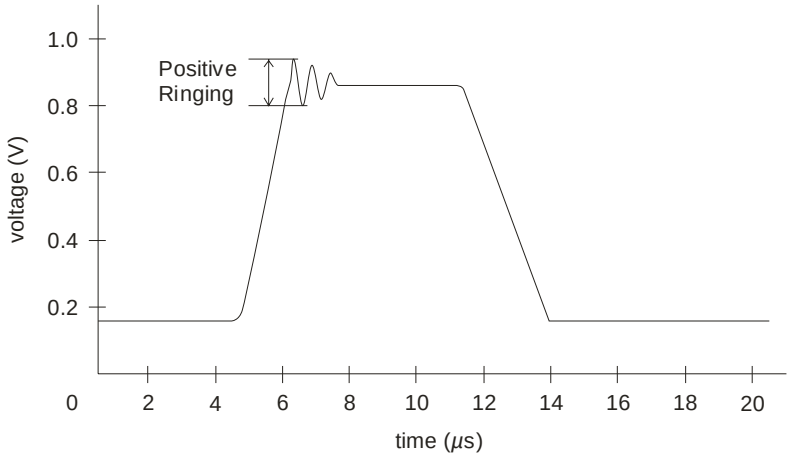
CALCulate:VOLTage:PPReshoot?

Purpose	Returns the positive preshoot value for the aquried data.
Type	Query
Command Syntax	None
Command Parameters	N/A
***RST Value**	N/A
Query Syntax	CALCulate:VOLTage:PPReshoot?
Query Parameters	None
Query Response	ASCII value representing a voltage measurement in volts.
Description	The CALCulate:VOLTage:PPReshoot query instructs the device to calculate and return a voltage value corresponding to the positive preshoot from the selected input range. The positive preshoot is defined as the amount of voltage by which a pre-transitional aberration positively exceeds the state boundary.  To correctly perform a CALCulate function, a data set must be acquired (INITiate, ARM, TRIGger), and the data may be transferred to the host (register access) before the execution CALC query. This sequence is not a prerequisite for sending a CALCulate query, but is required for valid data to be returned.

Examples	**Command / Query**	**Response *(Description)***
	CALC:VOLT:PPR?	

Related Commands	CONFigure:VOLTage:PPReshoot MEASure: VOLTage:PPReshoot

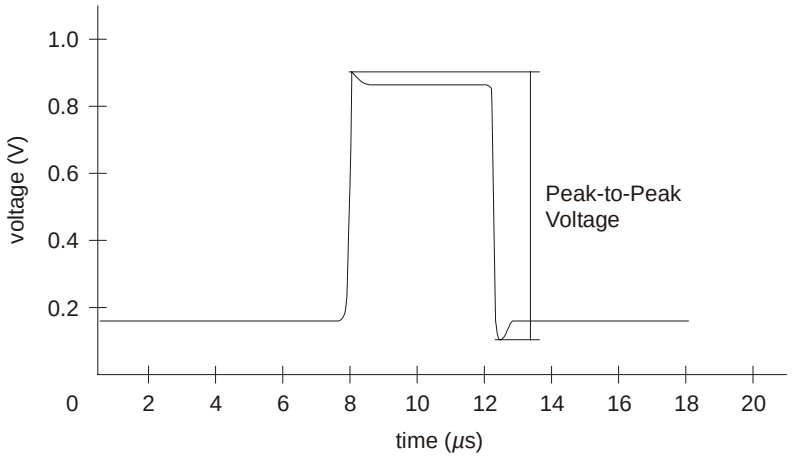
CALCulate:VOLTage:PRINging?

Purpose	Returns the positive ringing measurement of the data being acquired.
Type	Query
Command Syntax	None
Command Parameters	N/A
***RST Value**	N/A
Query Syntax	CALCulate:VOLTage:PRINging?
Query Parameters	None
Query Response	ASCII value representing a voltage measurement in volts.
Description	The CALCulate:VOLTage:PRINGing query instructs the device to calculate and return a value corresponding to the positive ringing of an signal on the selected input range. Positive ringing is defined as the peak-to-peak voltage of a positive post-transitional aberration.  To correctly perform a CALCulate function, a data set must be acquired (INITiate, ARM, TRIGger), and the data may be transferred to the host (register access) before the execution CALC query. This sequence is not a prerequisite for sending a CALCulate query, but is required for valid data to be returned.

Examples	**Command / Query**	**Response *(Description)***
	CALC:VOLT:PRIN?	*(Returns the positive ringing voltage.)*

Related Commands	CONFigure:VOLTage:PRINging MEASure:VOLT:PRINging

CALCulate:VOLTage:PTPeak?

Purpose	Returns the peak-to-peak voltage value for the acquired data.
Type	Query
Command Syntax	None
Command Parameters	N/A
***RST Value**	N/A
Query Syntax	CALCulate:VOLTage:PTPeak?
Query Parameters	None
Query Response	ASCII value representing a voltage measurement in volts.
Description	The CALCulate:VOLTage:PTPeak query instructs the device to calculate and return a peak-to-peak voltage measurement from the selected input range. The peak-to-peak voltage (V_{P-P}) is defined as the voltage measured between the signal's maximum and minimum points.  To correctly perform a CALCulate function, a data set must be acquired (INITiate, ARM, TRIGger), and the data may be transferred to the host (register access) before the execution CALC query. This sequence is not a prerequisite for sending a CALCulate query, but is required for valid data to be returned.

Examples	**Command / Query**	**Response *(Description)***
	CALC:VOLT:PTP?	

Related Commands	CONFigure:VOLTage:PTPeak MEASure: VOLTage:PTPeak

CALCulate:VOLTage:RMS?

Purpose	Returns the root-mean-square (rms) voltage value of the data being acquired.	
Type	Query	
Command Syntax	None	
Command Parameters	N/A	
***RST Value**	N/A	
Query Syntax	CALCulate:VOLTage:RMS?	
Query Parameters	None	
Query Response	ASCII value representing a voltage measurement in volts.	
Description	The CALCulate:VOLTage:RMS query instructs the device to calculate and return the root-mean-square (rms) voltage from the selected input range. The root-mean-square voltage is defined by the following formula: $V_{rms} = \sqrt{\frac{\sum_{0}^{n-1} v^2}{n}}$, where v = voltage and n = number of samples To correctly perform a CALCulate function, a data set must be acquired (INITiate, ARM, TRIGger), and the data may be transferred to the host (register access) before the execution CALC query. This sequence is not a prerequisite for sending a CALCulate query, but is required for valid data to be returned.	
Examples	**Command / Query**	**Response *(Description)***
	CALC:VOLT:RMS?	
Related Commands	CONFigure:VOLTage:RMS MEASure: VOLTage:RMS	

CALibration:ADC:GAIN

Purpose	To provide an ADC gain factor for measurement compensation.
Type	Command
Command Syntax	CALibration:ADC:GAIN <adc_type>, <adc_gain>
Command Parameters	<adc_type> = FAST or SLOW <adc_gain> = for FAST, 1.15 – 1.35; for SLOW: 1.12 – 1.32
***RST Value**	<adc_gain> = 1.0000
Query Syntax	CALibration:ADC:GAIN <adc_type>
Query Parameters	<adc_type> = FAST or SLOW
Query Response	Returns the value currently set for the <adc_gain> parameter for the given <adc_type>.
Description	Sets the gain factor for the indicated ADC. CALibration:ADC:GAIN compensates for gain errors due to component tolerances. This factor is calculated using the following formula: $$Gain\ Factor = \frac{(cal\_volts \times 16{,}383)}{(2 \times range \times (sample - offset))}$$ This command is 'context sensitive', i.e. it sets the ADC gain factor for the specified ADC in the currently selected input range. On the ***VM2601***, if the IFR input is selected, the only valid value for the <adc_type> parameter is FAST and only one range (±0.5 V) is applicable for the FAST ADC. Note that the IFR input is not installed on the ***VM2602*** and ***VM2603***. The valid entries for the <adc_type> parameter are: FAST SLOW  **Calibration commands should only be executed by qualified personnel. Changing these values incorrectly can cause the instrument to perform improperly.**

Examples	**Command / Query**	**Response *(Description)***
	CAL:ADC:GAIN 2,1.25	
Related Commands		

CALibration:ADC:OFFSet

Purpose	To provide an ADC offset value for measurement compensation.
Type	Command
Command Syntax	CALibration:ADC:OFFSet <adc_type>, <adc_offset>
Command Parameters	<adc_type> = FAST or SLOW <adc_offset> = 8092 – 8292
***RST Value**	<adc_offset> = 8192
Query Syntax	CALibration:ADC:OFFSet? <adc_type>
Query Parameters	<adc_type> = FAST, SLOW
Query Response	Returns the value currently set for the <adc_offset> parameter for the given <adc_offset>.
Description	Sets the offset value for the indicated ADC. The offset value compensates for offsets in the signal path and converting the raw data from straight binary to signed (twos complement) binary. The offset value is calibrated by applying 0 V to the input and determining the offset required for the measurement to read 0 V: $Offset\ value\ (volts) = (sample - offset)(volts / count)(gain)$ where $volts / count = \frac{2(voltage\ range)}{16{,}383}$ This command is 'context sensitive', i.e. it sets the ADC offset factor for the specified ADC in the currently selected input range. On the ***VM2601***, if the IFR input is selected, the only valid value for the <adc_type> parameter is FAST and only one range (±0.5 V) is applicable for the FAST ADC. Note that the IFR input is not installed on the ***VM2602*** and ***VM2603***. The valid entries for the <adc_type> parameter are: FAST SLOW **Calibration commands should only be executed by qualified personnel. Changing these values incorrectly can cause the instrument to perform improperly.**

Examples	**Command / Query**	**Response *(Description)***
	CAL:ADC:OFFS 8207	
Related Commands		

CALibration:COUNt?

Purpose	Tracks the number of times calibration memory has been written.
Type	Query
Command Syntax	None
Command Parameters	N/A
***RST Value**	N/A
Query Syntax	CALibration:COUNt?
Query Parameters	None
Query Response	Returns a numeric value from 0 to 16,777,215 (after the maximum value, it will wrap to 0)
Description	The CALibration:COUNt query returns the number of times the CALibration:STORe operation has been performed. This provides some indication of EEPROM wear.  **Calibration commands should only be executed by qualified personnel. Changing these values incorrectly can cause the instrument to perform improperly.**

Examples	**Command / Query**	**Response *(Description)***
	CAL:COUN?	24 *(Returns the number of times the CAL:STOR command has been performed.)*
Related Commands		

CALibration:DAC:GAIN

Purpose	To set the calibration factor that compensates for DAC gain inaccuracies.
Type	Command
Command Syntax	CALibration:DAC:GAIN <dac_chan>, <dac_gain>
Command Parameters	<dac_chan> = 0 – 5 <dac_gain> = range depends on channel
***RST Value**	<dac_gain> = 1.000 (or Cal Value)
Query Syntax	CALibration:DAC:GAIN? <dac_chan>
Query Parameters	<dac_chan> = 0 – 5
Query Response	Returns the value currently set for the <dac_gain> parameter for the given <dac_chan>.
Description	Sets the gain factor for the indicated DAC. CALibration:DAC:GAIN compensates for deviations from the ideal slope for the DAC. Prior to calibration, the <dac_gain> parameter will read "1" after a reset condition. After calibration has been performed, this value changes and is stored in non-volatile memory. When a reset condition occurs after calibration, the value stored in non-volatile memory is returned.  **Calibration commands should only be executed by qualified personnel. Changing these values incorrectly can cause the instrument to perform improperly.**

Examples	**Command / Query**	**Response *(Description)***
	CAL:DAC:GAIN 2,.98	

Related Commands	

CALibration:DAC:OFFSet

Purpose	To set the calibration factor that compensates for DAC offset inaccuracies
Type	Command
Command Syntax	CALibration:DAC:OFFSet <dac_chan>, <dac_offset>
Command Parameters	<dac_chan> = 0 - 5 <dac_offset> = approximately 1947 - 2147
***RST Value**	<dac_offs> = 2047 (or Cal Value)
Query Syntax	CALibration:DAC:OFFSet <dac_chan>
Query Parameters	<dac_chan> = 0 - 5
Query Response	Returns the value currently set for the <dac_offset> parameter for the given <dac_chan>.
Description	Sets the offset value for the indicated DAC. The offset value compensates for conversion of data from sine binary to straight binary. Prior to calibration, the <dac_offs> parameter will read "2047" after a reset condition. After calibration has been performed, this value changes and is stored in non-volatile memory. When a reset condition occurs after calibration, the value stored in non-volatile memory is returned.  **Calibration commands should only be executed by qualified personnel. Changing these values incorrectly can cause the instrument to perform improperly.**

Examples	**Command / Query**	**Response *(Description)***
	CAL:DAC:OFFS 2,1900	
Related Commands		

CALibration:DEFault

Purpose	Sets all calibration factors to their default values.
Type	Command
Command Syntax	CALibration:DEFault
Command Parameters	None
***RST Value**	N/A
Query Syntax	N/A
Query Parameters	N/A
Query Response	N/A
Description	Sets all calibration factors to their default values. The values assumed are as follows: <adc_gain>: 1.000 <adc_offset>: 8192 <dac_gain>: 1.000 <dac_offset>: 2047  **Calibration commands should only be executed by qualified personnel. Changing these values incorrectly can cause the instrument to perform improperly.**

Examples	**Command / Query**	**Response *(Description)***
	CAL:DEF	*(Resets the ADC and DAC gain and offset settings to thei default/*RST values.)*
Related Commands		

CALibration:RESet

Purpose	Resets all calibration factors to the values stored in the non-volatile memory (EEPROM).	
Type	Command	
Command Syntax	CALibration:RESet	
Command Parameters	None	
***RST Value**	N/A	
Query Syntax	None	
Query Parameters	N/A	
Query Response	N/A	
Description	Resets all calibration factors to the values stored in the non-volatile memory (EEPROM).  **Calibration commands should only be executed by qualified personnel. Changing these values incorrectly can cause the instrument to perform improperly.**	
Examples	**Command / Query**	**Response *(Description)***
	CAL:RES	*(Resets all calibration factors to the values stored in non-volatile memory.)*
Related Commands	CALibration:DEFault:GAIN CALibration:DEFault:OFFSet CALibration:SECure	

CALibration:SECure:CODE

Purpose	Sets the code required to disable calibration security.
Type	Instrument specific command
Command Syntax	CALibration:SECure:CODE <string>
Command Parameters	<string> = the code string can be from 1 to 15 ASCII characters in length entered in IEEE 488.2 definite or indefinite length arbitrary block format.
***RST Value**	None
Query Syntax	CALibration:SECure:CODE?
Query Parameters	None
Query Response	Returns the security code in IEEE 488.2 definite block format.
Description	The calibration security code command sets the code required to disable calibration security. Calibration security must first be disabled before the code can be changed. Definite length arbitrary block format is used to define the <string> parameter. This format contains, essentially, four parts: # 2 06 VM2601 #1 #2 #3 #4 #1: a pound sign header. #2: indicates how many digits are used in #3. #3: indicates the number of characters that are used in #4 (the security code). Valid numbers for the third section are 1 through 15. #4: the security code. It may be up to 15 characters long and is case sensitive. Before shipping the instrument, the default security code is the module's model number (i.e. VM2601, VM2602, or VM2603). **Calibration commands should only be executed by qualified personnel. Changing these values incorrectly can cause the instrument to perform improperly.**

Examples	**Command / Query**	**Response *(Description)***
	CAL:SEC:CODE #206VM2601	*(Sets the factory code setting of VM2601)*

Related Commands	CALibration:SECure:STATe CALibration:STORe

CALibration:SECure[:STATe]

Purpose	Enable or disable calibration security.
Type	Command
Command Syntax	CALibration:SECure[:STATe] <boolean> or CALibration:SECure[:STATe] <boolean>, <string>
Command Parameters	<boolean> = 0 | 1 | OFF | ON <string> = the code string can be from 1 to 15 ASCII characters in length entered in IEEE 488.2 definite or indefinite length arbitrary block format.
***RST Value**	<boolean> = ON
Query Syntax	CALibration:SECure[:STATe]?
Query Parameters	None
Query Response	Returns the value currently selected for the <boolean> parameter
Description	The CALibration:SECurity[:STATe] command enables or disables calibration security. While security is on, the calibration factors ADC gain, ADC offset, DAC gain and DAC offset cannot be changed. In addition, the CAL:STORe command is disabled, effectively write protecting the non-volatile memory. In order to disable the security state, the security code must be supplied. The factory default security code is VM2601 (see CALibration:SECure:CODE for more information). To enable security, the code does not need to be supplied. The security state is enabled by default. Security can also be enabled without entering the <string> parameter by sending the CALibration:SECure[:STATe] 1 | ON command. Security cannot, however, be disabled using a CALibration:SECure[:STATe] 0 | OFF command. If this command is sent, a "Missing Parameter" error will be returned.  **Calibration commands should only be executed by qualified personnel. Changing these values incorrectly can cause the instrument to perform improperly.**

Examples	**Command / Query**	**Response *(Description)***
	CAL:SEC:STAT OFF,#206VM2601	*(Disables calibration security.)*
	CAL:SEC:STAT 1	*(Enables calibration security.)*
	CAL:SEC:STAT?	1 *(Indicates that calibration security is enabled.)*

Related Commands	CALibration:STORe

CALibration:STORe

Purpose	Stores calibration data into non-volatile memory.
Type	Command
Command Syntax	CALibration:STORe
Command Parameters	None
***RST Value**	N/A
Query Syntax	None
Query Parameters	N/A
Query Response	N/A
Description	The CALibration:STORe command stores correction data into non-volatile memory. The correction data is calibration data that has been downloaded via the program messages in the Calibration Data subsystem. The CALibration:STORe command should only be performed after all the correction data has been finalized. **Note**: Security must be turned off in order to use this command. **Calibration commands should only be executed by qualified personnel. Changing these values incorrectly can cause the instrument to perform improperly.**

Examples	**Command / Query**	**Response *(Description)***
	CAL:SEC OFF,#206VM2601	*(Disables calibration security.)*
	CAL:STOR	*(Stores correction data into non-volatile memory.)*
	CAL:SEC 1	*(Enables calibration security.)*

Related Commands	CALibration:COUNt CALibration:SECure:CODE CALibration:SECure:STATe

COMBine:FEED

Purpose	Sets a marker for specified events allowing for easy reference after acquisition is complete.	
Type	Command	
Command Syntax	COMBine:FEED <mark_source_1>, <mark_source_2>	
Command Parameters	<mark_source_1> = GND | GP0 | GP1 | OVR <mark_source_2> = GND | GP0 | GP1 | OVR	
***RST Value**	<mark_source_1> & <mark_source_2> = GND	
Query Syntax	COMBine:FEED? <mark>	
Query Parameters	<mark> = 1 | 2	
Query Response	Returns the value currently selected for the <mark_source> for the indicated <mark>	
Description	Feeds <mark_source_1> to D14 and <mark_source_2> to D15 with each sample taken during data acquisition. The markers are retrieved with the raw data.	
Examples	**Command / Query**	**Response *(Description)***
	COMB:FEED GP0,GP1	
Related Commands	None	

CONFigure?

Purpose	Outputs the currently configured measurement.	
Type	Query	
Command Syntax	None	
Command Parameters	N/A	
***RST Value**	PERiod	
Query Syntax	CONFigure?	
Query Parameters	None	
Query Response	Outputs the currently configured measurement.	
Description	Outputs the currently configured measurement. No configuration information is returned with this query. PERiod is the default setting.	
Examples	**Command / Query**	**Response *(Description)***
	MEAS:VOLT:RTIM? 0,1024,10,90,5.0	*(Takes a rise time measurement between the 10 and 90 percent reference levels)*
	CONF?	RTIM? *(Returns the currently configured measurement.)*
Related Commands	None	

CONFigure:ADC

Purpose	Selects between the fast and slow ADCs.	
Type	Command	
Command Syntax	CONFigure:ADC <conf_adc>	
Command Parameters	<conf_adc> = FAST | SLOW | AUTO	
***RST Value**	FAST	
Query Syntax	CONFigure:ADC?	
Query Parameters	None	
Query Response	Returns the value currently selected for the <conf_adc> parameter	
Description	This command selects between the two converters. The fast ADC converts at up to 80 MSa/s for the VM2601, 40 MSa/s for the VM2602, and 20 MSa/s for the VM2603. The slow ADC converts at up to 10 MSa/s for all three modules. The slow converter provides improved dc accuracy for low-frequency measurements. When AUTO is selected, the module selects the best converter to be used based upon the sample rate, with the slow converter being used if possible. The following criteria is used to determine which ADC is selected: If the sample rate is between 4.7 Hz and 1 kHz, then the FAST ADC is selected. If the sample rate is between 1 kHz and 10 MHz, then the SLOW ADC is selected. If the sample rate is between 10 MHz and the maximum ADC rate, then the FAST ADC is selected. This command only applies to the DSO. The IFR input will always utilize the FAST ADC (VM2601 only).	
Examples	**Command / Query**	**Response *(Description)***
	CONF:ADC SLOW	*(Selects the slow ADC)*
	CONF:ADC?	SLOW *(Indicates that the slow ADC is selected)*
Related Commands	None	

CONFigure:FALL:TIMe

Purpose	Defines the fall time parameters that will govern corresponding CALCulate and MEASure commands.
Type	Command
Command Syntax	CONFigure:FALL:TIMe <start_samp>, <#_samp>, <lo_ref>, <hi_ref>, <expected_val> or CONFigure:FTIMe <start_samp>, <#_samp>, <lo_ref>, <hi_ref>, <expected_val>
Command Parameters	<start_samp> = typically 0 <#_samp> = 8 – 16,777,216 <lo_ref> = 0 to 100 (percent). The default is 10% and it must be less than <hi_ref> <hi_ref> = 0 to 100 (percent). The default is 90% and it must be greater than <lo_ref> <expected_val> = depends on input
Reset Value	<start_samp> = 0 <#_samp> = 1,024 <lo_ref> = 10 (percent) <hi_ref> = 90 (percent)
Query Syntax	None
Query Parameters	N/A
Query Response	N/A
Description	This command defines the parameters used by the CALCulate:FTIMe query. Fall time is defined as the time interval that occurs between the 90% reference and 10% reference of the signal amplitude. The parameters for this command are defined as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<lo_ref> =** fall time ends when a negative transition of the input signal crosses this reference point. • **<hi_ref> =** fall time begins when a negative transition of the input signal crosses this reference point. • **<expected_val> =** the value that is expected to be returned by the instruement.
Examples	**Command / Query** / **Response *(Description)***
	CONF:FTIM 0,2048,10,90,x
Related Commands	CALCulate:FALL:TIME? CALCulate:FTIMe?

CONFigure:FREQuency

Purpose	Defines the frequency parameters that will govern corresponding CALCulate and MEASure commands.	
Type	Command	
Command Syntax	CONFigure:FREQuency <start_samp>, <#_samples>, <expected_val>	
Command Parameters	<start_samp> = typically 0 <#_samp> = 8 to 16,777,216 <expected_val> = depends on input	
Default Value	<start_samp> = 0 <#_samp> = 1,024	
Query Syntax	None	
Query Parameters	N/A	
Query Response	N/A	
Description	This command defines the parameters used by the CALCulate:FREQuency query. Frequency (*f*) is a measure of how often a signal repeats in one second (1/s = Hz). This is also equal to 1/period (or 1/T). The parameters for this command are defined as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<expected_val> =** the value that is expected to be returned by the instruement.	
Examples	**Command / Query**	**Response *(Description)***
	CONF:FREQ 0,65536,x	
Related Commands	CALCulate:FREQuency?	

CONFigure:HORizontal:RESolution

Purpose	Sets the sample period for the ADC.	
Type	Command	
Command Syntax	CONFigure:HORizontal:RESolution <hrz_reso>	
Command Parameters	<hrz_reso> = 12.5 ns/Sa – 209.7 ms/Sa (Fast ADC) 100 ns/Sa – 1 ms/Sa (Slow ADC)	
***RST Value**	100 ns/Sa for both the Fast and Slow ADC	
Query Syntax	CONFigure:HORizontal:RESolution?	
Query Parameters	None	
Query Response	Returns the value currently selected for the <hrz_reso> parameter.	
Description	Sets the sample period (period = 1/rate). The minimum and maximum sample times for each ADC type are defined below: FAST ADC Minimum = 1 / SR_{MAX} = 12.5 ns/sample for the VM2601 = 25 ns/sample for the VM2602 = 50 ns/sample for the VM2603 Maximum = 16,777,216 / SR_{MAX} = 209.7 ms/sample = 419.4 ms/sample = 838.8 ms/sample Where SR_{MAX} is the maximum sample rate for module being used. SLOW ADC Minimum = 100 ns/sample (1 / 10 MHz) Maximum = 1 ms/sample (10,000 /10 MHz)	
Examples	**Command / Query**	**Response *(Description)***
	CONF:HOR RES 25.0e-9 CONF:HOR:RES?	*(Sets the sample rate to 25 ns/Sa)* 2.500000000000000e-08 *(Indicates that the sample rate for the ADC is 25 ns/Sa)*
Related Commands		

CONFigure:NDUTy

Purpose	Defines the negative duty cycle parameters that will govern corresponding CALCulate and MEASure commands.
Type	Command
Command Syntax	CONFigure:NDUTy <start_samp>, <#_samp>, <ref_level>, <expected_val>
Command Parameters	<start_samp> = typically 0 <#_samp> = 0 to 16,777,216 <ref_level> = 0 to 100 (percent) <expected_val> = the expected cycle time of the input signal.
Default Value	<start_samp> = 0 <#_samp> = 1,024 <ref_level> = 50 (percent)
Query Syntax	None
Query Parameters	N/A
Query Response	N/A
Description	This command defines the parameters used by the CALCulate:NDUTy query. A negative duty cycle is defined as the negative pulse width divided by the period and is expressed as a percentage. The parameters for this command are defined as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<ref_level> =** sets the reference point. Negative pulse width is the amount of time between one negative transition crossing this reference and the subsequent positive transition across this reference. • **<expected_val> =** the value that is expected to be returned by the instruement.

Examples	**Command / Query**	**Response *(Description)***
	CONF:NDUT 0,2048,50,x	

Related Commands	CALCulate:NDUTy?

CONFigure:NWIDth

Purpose	Defines the negative pulse width parameters that will govern corresponding CALCulate and MEASure commands.
Type	Command
Command Syntax	CONFigure:NWID <start_samp>, <#_samp>, <ref_level>, <expected_val>
Command Parameters	<start_samp> = typically 0 <#_samp> = 8 to 16,777,216 <ref_level> = 0 to 100 (percent) <expected_val> = the expected cycle time of the input signal
Default Value	<start_samp> = 0 <#_samp> = 1,024 <ref_level> = 50 (percent)
Query Syntax	None
Query Parameters	N/A
Query Response	N/A
Description	This command defines the parameters used by the CALCulate:NWIDth query. The negative pulse width is a measure of the time required to go from the 50% reference of the falling edge of one wave to the 50% reference of the next rising edge. The parameters for this command are defined as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<ref_level> =** sets the reference point. Negative pulse width is the amount of time between one negative transition crossing this reference and the subsequent positive transition across this reference. • **<expected_val> =** the value that is expected to be returned by the instruement.
Examples	**Command / Query** / **Response *(Description)***
	CONF:NWID 0,262144,50,x
Related Commands	CALCulate:NWIDth?

CONFigure:PDUTy

Purpose	Defines the positive duty cycle parameters that will govern corresponding CALCulate and MEASure commands.
Type	Command
Command Syntax	CONFigure:PDUTy <start_samp>, <#_samp>, <ref_level>, <expected_val>
Command Parameters	<start_samp> = typically 0 <#_samp> = 0 to 16,777,216 <ref_level> = 0 to 100 (percent) <expected_val> = the expected cycle time of the input signal
Default Value	<start_samp> = 0 <#_samp> = 1,024 <ref_level> = 50 (percent)
Query Syntax	None
Query Parameters	N/A
Query Response	N/A
Description	This command defines the parameters used by the CALCulate:PDUTy query. A positive duty cycle is defined as the positive pulse width divided by the period and is expressed as a percentage. The parameters for this command are defined as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<ref_level> =** sets the reference point. Positive pulse width is the amount of time between one positive transition crossing this reference and the subsequent negative transition across this reference. • **<expected_val> =** the value that is expected to be returned by the instruement.

Examples	**Command / Query**	**Response *(Description)***
	CONF:PDUT 100,1024,50,x	

Related Commands	CALCulate:PDUTy?

CONFigure:PERCent:NOVershoot

Purpose	Defines the negative overshoot parameters that will govern corresponding CALCulate and MEASure commands.	
Type	Command	
Command Syntax	CONFigure:PERCent:NOVershoot <start_samp>, <#_samples>, <expected_val>	
Command Parameters	<start_samp> = typically 0 <#_samp> = 0 to to 16,777,216 <expected_val> = depends on input	
Default Value	<start_samp> = 0 <#_samp> = 1,024	
Query Syntax	None	
Query Parameters	N/A	
Query Response	N/A	
Description	This command defines the parameters used by the CALCulate:PERCent:NOVershoot query. The negative overshoot is defined as the amount of voltage by which a post-transitional aberration negatively exceeds a state boundary. The parameters for this command are defined as follows: • **<start_samp>** = indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp>** = indicates the number of samples to be used in the measurement. • **<expected_val>** = the expected peak-to-peak signal voltage (if sent).	
Examples	**Command / Query**	**Response *(Description)***
	CONF:PERC:NOV 0,65536,x	
Related Commands	CALCulate: PERC:NOV?	

CONFigure:PERCent:NPReshoot

Purpose	Defines the negative preshoot parameters that will govern corresponding CALCulate and MEASure commands.	
Type	Command	
Command Syntax	CONFigure:PERCent:NPReshoot <start_samp>, <#_samples>, <expected_val>	
Command Parameters	<start_samp> = typically 0 <#_samp> = 0 to to 16,777,216 <expected_val> = depends on input	
Default Value	<start_samp> = 0 <#_samp> = 1,024	
Query Syntax	None	
Query Parameters	N/A	
Query Response	N/A	
Description	This command defines the parameters used by the CALCulate:VOLTage:NPReshoot query. The negative preshoot is defined as the amount of voltage by which a post-transitional aberration negatively exceeds a state boundary. The parameters for this command are defined as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<expected_val> =** the expected peak-to-peak signal voltage (if sent).	
Examples	**Command / Query**	**Response *(Description)***
	CONF:PERC:NPR 100,1024,50,x	
Related Commands	CALCulate: PERC:NPR?	

CONFigure:PERCent:NRINging

Purpose	Defines the negative ring parameters that will govern corresponding CALCulate and MEASure commands.	
Type	Command	
Command Syntax	CONFigure:VOLT:NRINging <start sample>,<#_samp>,<expected value>	
Command Parameters	<start_samp> = typically 0 <#_samp> = 0 to to 16,777,216 <expected_val> = depends on input	
Default Value	<start_samp> = 0 <#_samp> = 1,024	
Query Syntax	None	
Query Parameters	N/A	
Query Response	N/A	
Description	This command defines the parameters used by the CALCulate:PERC:NRINging query. Negative ringing is defined as the peak-to-peak voltage of a negative post-transitional aberration. The parameters for this command are defined as follows: • **<start_samp>** = indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp>** = indicates the number of samples to be used in the measurement. • **<expected_val>** = the expected peak-to-peak signal voltage (if sent).	
Examples	**Command / Query**	**Response *(Description)***
	CONF:PERC:NRIN 0,524288,x	
Related Commands	CALCulate:PERC:NRIN?	

CONFigure:PERCent:POVershoot

Purpose	Defines the positive overshoot parameters that will govern corresponding CALCulate and MEASure commands.	
Type	Command	
Command Syntax	CONFigure:PERCent:POVershoot <start_samp>, <#_samples>, <expected_val>	
Command Parameters	<start_samp> = typically 0 <#_samp> = 0 to to 16,777,216 <expected_val> = depends on input	
Default Value	<start_samp> = 0 <#_samp> = 1,024	
Query Syntax	None	
Query Parameters	N/A	
Query Response	N/A	
Description	This command defines the parameters used by the CALCulate:PERCent:POVershoot query. The positive overshoot is defined as the amount of voltage by which a post-transitional aberration negatively exceeds a state boundary. The parameters for this command are defined as follows: • **<start_samp>** = indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp>** = indicates the number of samples to be used in the measurement. • **<expected_val>** = the expected peak-to-peak signal voltage (if sent).	
Examples	**Command / Query**	**Response *(Description)***
	CONF:PERC:POV 0,524288,x	
Related Commands	CALCulate:PERC:POV?	

CONFigure:PERCent:PPReshoot

Purpose	Defines the positive preshoot parameters that will govern corresponding CALCulate and MEASure commands.	
Type	Command	
Command Syntax	CONFigure:PERCent:PPReshoot <start_samp>, <#_samples>, <expected_val>	
Command Parameters	<start_samp> = typically 0 <#_samp> = 0 to to 16,777,216 <expected_val> = depends on input	
Default Value	<start_samp> = 0 <#_samp> = 1,024	
Query Syntax	None	
Query Parameters	N/A	
Query Response	N/A	
Description	This command defines the parameters used by the CALCulate:PERCent:PPReshoot query. The positive preshoot is defined as the amount of voltage by which a post-transitional aberration negatively exceeds a state boundary. The parameters for this command are defined as follows: • **<start_samp>** = indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp>** = indicates the number of samples to be used in the measurement. • **<expected_val>** = the expected peak-to-peak signal voltage (if sent).	
Examples	**Command / Query**	**Response *(Description)***
	CONF:VOLT:PPR 0,524288,x	
Related Commands	CALCulate:PERCent:PPReshoot?	

CONFigure:PERCent:PRINging

Purpose	Defines the positive ring parameters that will govern corresponding CALCulate and MEASure commands.	
Type	Command	
Command Syntax	CONFigure:VOLT:PRINging <start sample>,<#_samp>,<expected value>	
Command Parameters	<start_samp> = typically 0 <#_samp> = 0 to to 16,777,216 <expected_val> = depends on input	
Default Value	<start_samp> = 0 <#_samp> = 1,024	
Query Syntax	None	
Query Parameters	N/A	
Query Response	N/A	
Description	This command defines the parameters used by the CALCulate:PERC:NRINging query. Positive ringing is defined as the peak-to-peak voltage of a positive post-transitional aberration. The parameters for this command are defined as follows: • **<start_samp>** = indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp>** = indicates the number of samples to be used in the measurement. • **<expected_val>** = the expected peak-to-peak signal voltage (if sent).	
Examples	**Command / Query**	**Response *(Description)***
	CONF:PERC:PRIN 0,524288,x	
Related Commands	CALCulate:PERCent::PRINging?	

CONFigure:PERiod

Purpose	Defines the period parameters that will govern corresponding CALCulate and MEASure commands.	
Type	Command	
Command Syntax	CONFigure:PERiod <start_samp>, <#_samples>, <expected_val>	
Command Parameters	<start_samp> = typically 0 <#_samp> = 0 to 16,777,216 <expected_val> = depends on input	
Default Value	<start_samp> = 0 <#_samp> = 1,024	
Query Syntax	None	
Query Parameters	N/A	
Query Response	N/A	
Description	This command defines the parameters used by the CALCulate:PERiod query. The period (T) of a function is defined as the amount of time required for the signal to generate one signal cycle. This is also defined as 1/frequency (or 1/*f*). The parameters for this command are defined as follows: • **<start_samp>** = indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp>** = indicates the number of samples to be used in the measurement. • **<expected_val>** = the value that is expected to be returned by the instruement.	
Examples	**Command / Query**	**Response *(Description)***
	CONF:PER 0,256,x	
Related Commands	CALCulate:PERiod?	

CONFigure:PWIDth

Purpose	Defines the positive pulse width parameters that will govern corresponding CALCulate and MEASure commands.
Type	Command
Command Syntax	CONFigure:PWIDth <start_samp>, <#_samp>, <ref_level>, <expected_val>
Command Parameters	<start_samp> = typically 0 <#_samp> = 0 to 16,777,216 <ref_level> = 0 to 100 (percent) <expected_val> = the expected cycle time of the input signal
Default Value	<start_samp> = 0 <#_samp> = 1,024 <ref_level> = 50 (percent)
Query Syntax	None
Query Parameters	N/A
Query Response	N/A
Description	This command defines the parameters used by the CALCulate:PWIDth query. The positive pulse width is a measure of the time required to go from the 50% reference of the rising edge of one wave to the 50% reference of the next falling edge. The parameters for this command are defined as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<ref_level> =** sets the reference point. Positive pulse width is the amount of time between one positive transition crossing this reference and the subsequent negative transition across this reference. • **<expected_val> =** the value that is expected to be returned by the instruement.

Examples	**Command / Query**	**Response *(Description)***
	CONF:PWID 0,16384,50,x	
Related Commands	CALCulate:PWIDth?	

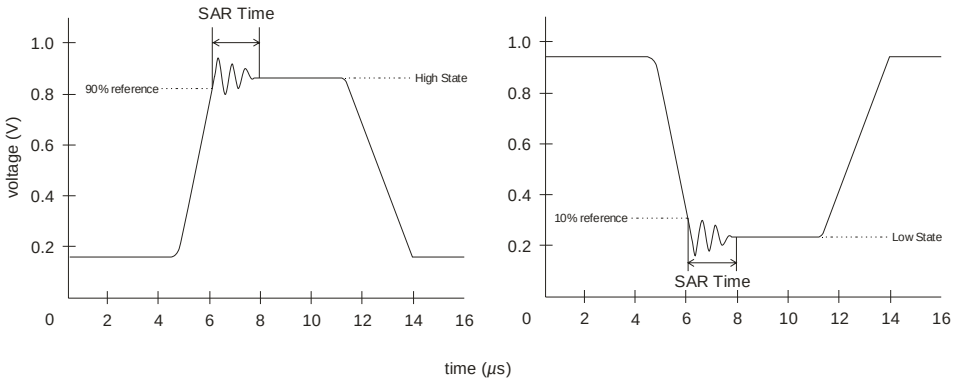
CONFigure:RISE:TIMe

Purpose	Defines the rise time parameters that will govern corresponding CALCulate and MEASure commands.
Type	Command
Command Syntax	CONFigure:RISE:TIMe <start_samp>, <#_samp>, <lo_ref>, <hi_ref>, <expected_val> or CONFigure:RTIMe <start_samp>, <#_samp>, <lo_ref>, <hi_ref>, <expected_val>
Command Parameters	<start_samp> = typically 0 <#_samp> = 0 to 16,777,216 <lo_ref> = 0 to 100 (percent). The default is 10% and it must be less than <hi_ref> <hi_ref> = 0 to 100 (percent). The default is 90% and it must be greater than <lo_ref> <expected_val> = depends on input
Default Value	<start_samp> = 0 <#_samp> = 1,024 <lo_ref> = 10 (percent) <hi_ref> = 90 (percent)
Query Syntax	None
Query Parameters	N/A
Query Response	N/A
Description	This command defines the parameters used by the CALCulate:RISE:TIMe query. Rise time is defined as the time interval that occurs between the 10% reference and 90% reference of the peak value. The parameters for this command are defined as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<lo_ref> =** rise time begins when a positive transition of the input signal crosses this reference point. • **<hi_ref> =** rise time ends when a positive transition of the input signal crosses this reference point. • **<expected_val> =** the value that is expected to be returned by the instruement.

Examples	**Command / Query**	**Response *(Description)***
	CONF:RTIM 0,16384,10,90,x	
Related Commands	CALCulate:RTIMe?	

CONFigure:SAR:TIMe

Purpose	Configures the signal aberration region (SAR) size in seconds.
Type	
Command Syntax	CONFiguire:SAR:TIME <sar_time>
Command Parameters	<sar_time> cannot be greater than the duration of the transition state.
Default Value	<sar_time> = -1
Query Syntax	CONFigure:SAR:TIMe?
Query Parameters	None
Query Response	Returns the value of the SAR size. If "-1.0" is returned, this indicates that the SAR time is set to three times the transition time.
Description	This command defines the duration of the signal aberration region (SAR) size in seconds. This region is defined as the time required for a signal to settle between its **<hi_ref>** level (90% default) and high state during a rise time measurement. Conversely, it is defined as the time required for a signal to settle between its **<lo_ref>** level (10% default) and its low state during a fall time measurement. By default, this value is set to "-1", which indicates that the SAR time is equal to three times the the duration of the transition state.



Examples	**Command / Query**	**Response *(Description)***
	CONF:SAR:TIM 0.001	*(Configures the SAR time to be 0.001 s.)*
Related Commands	CONF:SAR:TIM?	

CONFigure:SAR:TIMe?

Purpose	Queries and returns the signal aberration region (SAR) size in seconds.	
Type	Query	
Command Syntax	N/A	
Command Parameters	N/A	
Default Value	-1	
Query Syntax	CONFigure:SAR:TIMe?	
Query Parameters		
Query Response		
Description	This query returns the Signal Aberration Region (SAR) size in seconds. A return value of -1.0 indicates the SAR time is set to its default value of 3 times the transition time. (See CONFigure:SAR:TIMe for more information).	
Examples	**Command / Query**	**Response *(Description)***
	CONF:SAR:TIM?	0.001 *(Indicates that the SAR time is set to 0.001 s.)*
Related Commands	CONF:SAR:TIM	

CONFigure:VOLTage:AMPLitude

Purpose	Defines the amplitude parameters that will govern corresponding CALCulate and MEASure commands.	
Type	Command	
Command Syntax	CONFigure:VOLTage:AMPLitude <start_samp>, <#_samples>, <expected_val>	
Command Parameters	<start_samp> = typically 0 <#_samp> = 0 to 16,777,216 <expected_val> = depends on input	
Default Value	<start_samp> = 0 <#_samp> = 1,024	
Query Syntax	None	
Query Parameters	N/A	
Query Response	N/A	
Description	This command defines the parameters used by the CALCulate:VOLTage:AMPlitude query. Amplitude is defined as the voltage difference between the high and low states. The parameters for this command are defined as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<expected_val> =** the value that is expected to be returned by the instruement.	
Examples	**Command / Query**	**Response *(Description)***
	CONF:VOLT:AMPL 0,65536,x	
Related Commands	CALCulate:VOLTage:AMPLitude?	

CONFigure:VOLTage:HIGH

Purpose	Defines the high voltage parameters that will govern corresponding CALCulate and MEASure commands.	
Type	Command	
Command Syntax	CONFigure:VOLTage:HIGH <start_samp>, <#_samples>, <expected_val>	
Command Parameters	<start_samp> = typically 0 <#_samp> = 0 to to 16,777,216 <expected_val> = depends on input	
Default Value	<start_samp> = 0 <#_samp> = 1,024	
Query Syntax	None	
Query Parameters	N/A	
Query Response	N/A	
Description	This command defines the parameters used by the CALCulate:VOLTage:HIGH query. The volgate high defines the high state of the data. The parameters for this command are defined as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<expected_val> =** the value that is expected to be returned by the instruement.	
Examples	**Command / Query**	**Response *(Description)***
	CONF:VOLT:HIGH 0,65536,x	
Related Commands	CALCulate:VOLTage:HIGH?	

CONFigure:VOLTage:LOW

Purpose	Defines the low voltage parameters that will govern corresponding CALCulate and MEASure commands.	
Type	Command	
Command Syntax	CONFigure:VOLTage:LOW <start_samp>, <#_samples>, <expected_val>	
Command Parameters	<start_samp> = typically 0 <#_samp> = 0 to to 16,777,216 <expected_val> = depends on input	
Default Value	<start_samp> = 0 <#_samp> = 1,024	
Query Syntax	None	
Query Parameters	N/A	
Query Response	N/A	
Description	This command defines the parameters used by the CALCulate:VOLTage:LOW query. The volgate low defines the low state of the data. The parameters for this command are defined as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<expected_val> =** the value that is expected to be returned by the instruement.	
Examples	**Command / Query**	**Response *(Description)***
	CONF:VOLT:LOW 500,32768,x	
Related Commands	CALCulate:VOLTage:LOW?	

CONFigure:VOLTage:MAXimum

Purpose	Defines the maximum voltage parameters that will govern corresponding CALCulate and MEASure commands.	
Type	Command	
Command Syntax	CONFigure:VOLTage:MAXimum <start_samp>, <#_samples>, <expected_val>	
Command Parameters	<start_samp> = typically 0 <#_samp> = 0 to to 16,777,216 <expected_val> = depends on input	
Default Value	<start_samp> = 0 <#_samp> = 1,024	
Query Syntax	None	
Query Parameters	N/A	
Query Response	N/A	
Description	This command defines the parameters used by the CALCulate:VOLTage:MAXimum query. The parameters for this command are defined as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<expected_val> =** the value that is expected to be returned by the instruement.	
Examples	**Command / Query**	**Response *(Description)***
	CONF:VOLT:MAX 0,32768,x	
Related Commands	CALCulate:VOLTage:MAXimum?	

CONFigure:VOLTage:MEAN

Purpose	Defines the mean voltage parameters that will govern corresponding CALCulate and MEASure commands.	
Type	Command	
Command Syntax	CONFigure:VOLTage:MEAN <start_samp>, <#_samples>, <expected_val>	
Command Parameters	<start_samp> = typically 0 <#_samp> = 0 to to 16,777,216 <expected_val> = depends on input	
Default Value	<start_samp> = 0 <#_samp> = 1,024	
Query Syntax	None	
Query Parameters	N/A	
Query Response	N/A	
Description	This command defines the parameters used by the CALCulate:VOLTage:MEAN query. The parameters for this command are defined as follows: • **<start_samp>** = indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp>** = indicates the number of samples to be used in the measurement. • **<expected_val>** = the value that is expected to be returned by the instruement.	
Examples	**Command / Query**	**Response *(Description)***
	CONF:VOLT:MEAN 0,131072,x	
Related Commands	CALCulate:VOLTage:MEAN?	

CONFigure:VOLTage:MINimum

Purpose	Defines the minimum voltage parameters that will govern corresponding CALCulate and MEASure commands.	
Type	Command	
Command Syntax	CONFigure:VOLTage:MINimum <start_samp>, <#_samples>, <expected_val>	
Command Parameters	<start_samp> = typically 0 <#_samp> = 0 to to 16,777,216 <expected_val> = depends on input	
Default Value	<start_samp> = 0 <#_samp> = 1,024	
Query Syntax	None	
Query Parameters	N/A	
Query Response	N/A	
Description	This command defines the parameters used by the CALCulate:VOLTage:MINimum query. The parameters for this command are defined as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<expected_val> =** the value that is expected to be returned by the instruement.	
Examples	**Command / Query**	**Response *(Description)***
	CONF:VOLT:MIN 0,65536,x	
Related Commands	CALCulate:VOLTage:MINimum?	

CONFigure:VOLTage:NOVershoot

Purpose	Defines the negative overshoot parameters that will govern corresponding CALCulate and MEASure commands.	
Type	Command	
Command Syntax	CONFigure:VOLTage:NOVershoot <start_samp>, <#_samples>, <expected_val>	
Command Parameters	<start_samp> = typically 0 <#_samp> = 0 to to 16,777,216 <expected_val> = depends on input	
Default Value	<start_samp> = 0 <#_samp> = 1,024	
Query Syntax	None	
Query Parameters	N/A	
Query Response	N/A	
Description	This command defines the parameters used by the CALCulate:VOLTage:NOVershoot query. The negative overshoot is defined as the amount of voltage by which a post-transitional aberration negatively exceeds a state boundary. The parameters for this command are defined as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<expected_val> =** the value that is expected to be returned by the instruement.	
Examples	**Command / Query**	**Response *(Description)***
	CONF:VOLT:NOV 0,65536,x	
Related Commands	CALCulate:VOLTage:NOVershoot?	

CONFigure:VOLTage:NPReshoot

Purpose	Defines the negative preshoot parameters that will govern corresponding CALCulate and MEASure commands.	
Type	Command	
Command Syntax	CONFigure:VOLTage:NPReshoot <start_samp>, <#_samples>, <expected_val>	
Command Parameters	<start_samp> = typically 0 <#_samp> = 0 to to 16,777,216 <expected_val> = depends on input	
Default Value	<start_samp> = 0 <#_samp> = 1,024	
Query Syntax	None	
Query Parameters	N/A	
Query Response	N/A	
Description	This command defines the parameters used by the CALCulate:VOLTage:NPReshoot query. The negative preshoot is defined as the amount of voltage by which a post-transitional aberration negatively exceeds a state boundary. The parameters for this command are defined as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<expected_val> =** the value that is expected to be returned by the instruement.	
Examples	**Command / Query**	**Response *(Description)***
	CONF:VOLT:NPR 1000,65536,x	
Related Commands	CALCulate:VOLTage:NPReshoot?	

CONFigure:VOLTage:NRINging

Purpose	Defines the fall time parameters that will govern corresponding CALCulate and MEASure commands.	
Type	Command	
Command Syntax	CONFigure:VOLTage:NRINging <start_samp>, <#_samples>, <expected_val>	
Command Parameters	<start_samp> = typically 0 <#_samp> = 8 – 16,777,216 <expected_val> = depends on input	
Default Value	<start_samp> = 0 <#_samp> = 1,024	
Query Syntax	None	
Query Parameters	N/A	
Query Response	N/A	
Description	This command defines the parameters used by the CALCulate:VOLTage:NRINging query. Negative ringing is defined as the peak-to-peak voltage of a negative post-transitional aberration. The parameters for this command are defined as follows: • **<start_samp>** = indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp>** = indicates the number of samples to be used in the measurement. • **<expected_val>** = expected peak-to-peak signal voltage (if sent).	
Examples	**Command / Query**	**Response *(Description)***
	CONF:VOLT:NRIN 64,2048,	
Related Commands	CALCulate:VOLTage:NRINging?	

CONFigure:VOLTage:POVershoot

Purpose	Defines the positive overshoot parameters that will govern corresponding CALCulate and MEASure commands.	
Type	Command	
Command Syntax	CONFigure:VOLTage:POVershoot <start_samp>, <#_samples>, <expected_val>	
Command Parameters	<start_samp> = typically 0 <#_samp> = 0 to to 16,777,216 <expected_val> = depends on input	
Default Value	<start_samp> = 0 <#_samp> = 1,024	
Query Syntax	None	
Query Parameters	N/A	
Query Response	N/A	
Description	This command defines the parameters used by the CALCulate:VOLTage:POVershoot query. The positive overshoot is defined as the amount of voltage by which a post-transitional aberration negatively exceeds a state boundary. The parameters for this command are defined as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<expected_val> =** the value that is expected to be returned by the instruement.	
Examples	**Command / Query**	**Response *(Description)***
	CONF:VOLT:POV 0,524288,x	
Related Commands	CALCulate:VOLTage:POVershoot?	

CONFigure:VOLTage:PPReshoot

Purpose	Defines the positive preshoot parameters that will govern corresponding CALCulate and MEASure commands.	
Type	Command	
Command Syntax	CONFigure:VOLTage:PPReshoot <start_samp>, <#_samples>, <expected_val>	
Command Parameters	<start_samp> = typically 0 <#_samp> = 0 to to 16,777,216 <expected_val> = depends on input	
Default Value	<start_samp> = 0 <#_samp> = 1,024	
Query Syntax	None	
Query Parameters	N/A	
Query Response	N/A	
Description	This command defines the parameters used by the CALCulate:VOLTage:PPReshoot query. The positive preshoot is defined as the amount of voltage by which a post-transitional aberration negatively exceeds a state boundary. The parameters for this command are defined as follows: • **<start_samp>** = indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp>** = indicates the number of samples to be used in the measurement. • **<expected_val>** = the value that is expected to be returned by the instruement.	
Examples	**Command / Query**	**Response *(Description)***
	CONF:VOLT:PPR 0,524288,x	
Related Commands	CALCulate:VOLTage:PPReshoot?	

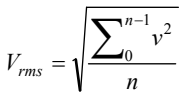
CONFigure:VOLTage:PRINging

Purpose	Defines the fall time parameters that will govern corresponding CALCulate and MEASure commands.	
Type	Command	
Command Syntax	CONFigure:VOLTage:PRINging <start_samp>, <#_samples>, <expected_val>	
Command Parameters	<start_samp> = typically 0 <#_samp> = 8 – 16,777,216 <expected_val> = depends on input	
Default Value	<start_samp> = 0 <#_samp> = 1,024	
Query Syntax	None	
Query Parameters	N/A	
Query Response	N/A	
Description	This command defines the parameters used by the CALCulate:VOLTage:NRINging query. Positive ringing is defined as the peak-to-peak voltage of a positive post-transitional aberration. The parameters for this command are defined as follows: • **<start_samp>** = indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp>** = indicates the number of samples to be used in the measurement. • **<expected_val>** = expected peak-to-peak signal voltage (if sent).	
Examples	**Command / Query**	**Response *(Description)***
	CONF:VOLT:PRIN 64,2048,	
Related Commands	CALCulate:VOLTage:PRINging?	

CONFigure:VOLTage:PTPeak

Purpose	Defines the peak-to-peak voltage parameters that will govern corresponding CALCulate and MEASure commands.	
Type	Command	
Command Syntax	CONFigure:VOLTage:PTPeak <start_samp>, <#_samples>, <expected_val>	
Command Parameters	<start_samp> = typically 0 <#_samp> = 0 to to 16,777,216 <expected_val> = depends on input	
Default Value	<start_samp> = 0 <#_samp> = 1,024	
Query Syntax	None	
Query Parameters	N/A	
Query Response	N/A	
Description	This command defines the parameters used by the CALCulate:VOLTage:PTPeak query. The peak-to-peak voltage (V_{p-p}) is defined as the voltage measured between the signal's maximum and minimum points. The parameters for this command are defined as follows: • **<start_samp>** = indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp>** = indicates the number of samples to be used in the measurement. • **<expected_val>** = the value that is expected to be returned by the instruement.	
Examples	**Command / Query**	**Response *(Description)***
	CONF:VOLT:PTP 0,1048576,x	
Related Commands	CALCulate:VOLTage:PTPeak?	

CONFigure:VOLTage:RMS

Purpose	Defines the root-mean-square voltage parameters that will govern corresponding CALCulate and MEASure commands.
Type	Command
Command Syntax	CONFigure:VOLTage:RMS <start_samp>, <#_samples>, <expected_val>
Command Parameters	<start_samp> = typically 0 <#_samp> = 0 to to 16,777,216 <expected_val> = depends on input
Default Value	<start_samp> = 0 <#_samp> = 1,024
Query Syntax	None
Query Parameters	N/A
Query Response	N/A
Description	This command defines the parameters used by the CALCulate:VOLTage:PTP query. The root-mean-square voltage is defined by the following formula:  , where v = voltage and n = number of samples The parameters for this command are defined as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<expected_val> =** the value that is expected to be returned by the instruement.

Examples	**Command / Query**	**Response *(Description)***
	CONF:VOLT:RMS 0,8192,x	

Related Commands	CALCulate:VOLTage:RMS?

CONTrol:IPOWer?

Purpose	This command applies power to or removes power from the instrument.	
Type	Setting	
Command Syntax	CONTrol:IPOWer <boolean>	
Command Parameters	<boolean> = 0 | 1 | OFF | ON	
***RST Value**	ON	
Query Syntax	CONTrol:IPOWer?	
Query Parameters	None	
Query Response	0 | 1	
Description	This command applies power to or removes power from the instrument.c Note that, following a power off/power on cycle, a five second period of time exists where the instrument cannot be used. This interval allows the instrument to complete the process of initialization.	
Examples	**Command / Query**	**Response *(Description)***
	CONT:IPOW 1	*(Turns the instrument power ON)*
	CONT:IPOW 1	1 *(Indicates that instrument power is ON)*
Related Commands	None	

FETCh?

Purpose	Retrieves the measurements taken by the INITiate command and places it in the output buffer.	
Type	Query	
Command Syntax	None	
Command Parameters	None	
***RST Value**	None	
Query Syntax	FETCh?	
Query Parameters	None	
Query Response	Returns the measurements taken by a previously performed INITiate command.	
Description	Retrieves the measurements taken by the INITiate command and places it in the output buffer.	
Examples	**Command / Query**	**Response *(Description)***
	FETC?	
Related Commands		

INITiate:DELay

Purpose	Sets the pre-trigger count.
Type	Event
Command Syntax	INITiate:DELay <delay_count>
Command Parameters	<delay_count> = 0 – 17,179,869,184
***RST Value**	<delay_count> = 1,024
Query Syntax	INITiate:DELay?
Query Parameters	N/A
Query Response	Returns the value currently selected for the <delay_count> parameter
Description	The INITiate:DELay command sets the pre-trigger count. This defines the number of samples that must be acquired before the digitizer can be triggered. The maximum pre-trigger count is: [MEMORY SIZE] – [POST TRIGGER COUNT] where MEMORY SIZE is 16,777,216 samples (small memory) or 33,554,432 samples (optional large memory.)

Examples	**Command / Query**	**Response *(Description)***
	INIT:DEL 7.5e5	*(Sets the pre-trigger sample count to 750,000.)*
	INIT:DEL?	7.5e5 *(Indicates that the pre-trigger sample count is set to 750,000.)*

Related Commands	ABORt SWEep:POINts

INITiate[:IMMediate]

Purpose	Transitions the instrument from the “initiated” state to the “waiting for arm” state.	
Type	Event	
Command Syntax	INITiate[:IMMediate]	
Command Parameters	None	
***RST Value**	N/A	
Query Syntax	N/A	
Query Parameters	N/A	
Query Response	N/A	
Description	Transitions the instrument from the “initiated” state to the “waiting for arm” state of the SCPI ARM-TRIGger model.	
Examples	**Command / Query**	**Response *(Description)***
	INIT	*(Arms the VM2601)*
Related Commands	ABORt	

INPut:COUPling

Purpose	Selects ac or dc coupling on the specified input channel.	
Type	Command	
Command Syntax	INPut:COUPling <input_coup>	
Command Parameters	<input_coup> = ac | dc	
***RST Value**	<input_coup> = dc	
Query Syntax	INPut:COUPling?	
Query Parameters	None	
Query Response	ac | dc	
Description	Selects ac or dc coupling on the specified input channel. This command only applies to the DSO input, as the IFR input is always dc coupled. Note, the IFR input is only available on the **VM2601**..	
Examples	**Command / Query**	**Response *(Description)***
	INP:COUP AC	*(Sets the input coupling to ac)*
	INP:COUP?	AC *(Indicates that input coupling is set to ac)*
Related Commands	INPut:IMPedance	

INPut:FILTer:FREQuency

Purpose	Selects the low-pass filter corner frequency for the specified channel.	
Type	Command	
Command Syntax	INPut:FILTer:FREQuency <filt_freq>	
Command Parameters	<filt_freq> = 20e6 | 40e6 (VM2601) 10e6 | 20e6 (VM2602) 5e6 | 10e6 (VM2603)	
***RST Value**	20e6 (VM2601) or 10e6 (VM2602) or 5e6 (VM2603)	
Query Syntax	INPut:FILTer:FREQuency?	
Query Parameters	None	
Query Response	Returns the value of the <filt_freq> parameter.	
Description	Selects the low-pass filter corner frequency for the specified channel. The selectable values are 20 MHz or 40 MHz. **NOTE**: This command only applies to the DSO input.	
Examples	**Command / Query**	**Response *(Description)***
	INP:FILT:FREQ 20e6	*(Selects the 20 MHz input filter)*
	INP:FILT:FREQ?	20e6 *(Indicates that the 20 MHz input filter is selected)*
Related Commands	INPut:FILTer:STATe	

INPut:FILTer:STATe

Purpose	For the specified input channel, turns the currently selected low-pass filter ON or OFF.	
Type	Command	
Command Syntax	INPut:FILTer:STATe <boolean>	
Command Parameters	<boolean> = 0 | 1 | OFF | ON	
***RST Value**	OFF	
Query Syntax	INPut:FILTer:STATe?	
Query Parameters	None	
Query Response	0 | 1	
Description	For the specified input channel, turns the currently selected low-pass filter ON or OFF.	
Examples	**Command / Query**	**Response *(Description)***
	INP:FILT:STAT 1	*(Enable the input filter state)*
	INP:FILT:STAT?	1 *(Indicates that the input filter is enabled)*
Related Commands	INPut:FILTer:FREQuency	

INPut:IMPedance

Purpose	Sets the input impedance for the selected input channel.	
Type	Command	
Command Syntax	INPut:IMPedance <input_imp>	
Command Parameters	<input_imp> = 50 | 75 | 150 | HIGH	
***RST Value**	HIGH	
Query Syntax	INPut:IMPedance?	
Query Parameters	None	
Query Response	Returns the value currently selected for the <input_imp> parameter	
Description	Sets the input impedance to 50 Ω, 75 Ω, 150 Ω, or HIGH (1 MΩ). Any value input greater than 200 results in the <input_imp> parameter being set to HIGH. This command only applies to the DSO input. **NOTE: The input voltage should not exceed 8 V dc or 8 V rms when the 50 Ω, 75 Ω, or 150 Ω input impedance is selected.**	
Examples	**Command / Query**	**Response *(Description)***
	INP:IMP 50	*(Sets the input impedance to 50 Ω)*
	INP:IMP?	50 *(Indicates that the input impedance is set to 50 Ω)*
Related Commands	None	

INPut:OFFSet

Purpose	This command allows the user to compensate for input signal offset.	
Type	Command	
Command Syntax	INPut:OFFSet <input_offs>	
Command Parameters	<input_offset> = 0.5 | 1.0 | 2.0 | 5.0 | 10.0 | 20.0 (approximately equal to the selected input range, e.g. ±0.5 V in the 0.5 V range)	
***RST Value**	0.0	
Query Syntax	INPut:OFFSet?	
Query Parameters	None	
Query Response	Returns the value currently selected for the <input_offset> parameter	
Description	This command allows the user to compensate for input signal offset. The range is approximately equal to the selected input range. This command applies to the DSO input only.	
Examples	**Command / Query**	**Response *(Description)***
	INP:OFFS 5	*(Sets the input offset to 5 V)*
	INP:OFFS?	*5 (Indicates that the input offset is set to 5 V)*
Related Commands	None	

INPut:RANGe

Purpose	Sets the input range to ±0.5 V, ±1.0 V, ±2.0 V, ±5.0 V, ±10.0 V, or ±20.0 V full scale.
Type	Command
Command Syntax	INPut:RANGe <input_rang>
Command Parameters	<input_range> = 0.5 | 1.0 | 2.0 | 5.0 | 10.0 | 20.0
***RST Value**	20
Query Syntax	INPut:RANGe?
Query Parameters	None
Query Response	Returns the value currently selected for the <input_range> parameter
Description	Sets the input range to ±0.5 V, ±1.0 V, ±2.0 V, ±5.0 V, ±10.0 V, or ±20.0 V full scale. This command applies to the DSO input only. **NOTE: The input voltage should not exceed 8 V dc or 8 V rms when the 50 Ω, 75 Ω, or 150 Ω input impedance is selected.**

Examples	**Command / Query**	**Response *(Description)***
	INP:RANG 5	*(Sets the input range to 5 V)*
	INP:RANG?	5 *(Indicates that the input range is set to 5 V)*

Related Commands	None

INPut:SOURce

Purpose	Selects the input source for the instrument.	
Type	Command	
Command Syntax	INPut:SOURce <input_source>	
Command Parameters	<input_source> = DSO | IFR | DEFault NOTE: For the VM2602 and VM2603, the only valid setting is DSO. IFR or DEFault will both generate errors.	
***RST Value**	DSO	
Query Syntax	INPut:SOURce?	
Query Parameters	None	
Query Response	DSO | IFR	
Description	This command selects the input source used by the ***VM2601***. The user can select either the differential DSO (*Digital Storage Oscilloscope*) or single ended IFR (*Intermediate Frequency Receiver*). ***This command does not pertain to the VM2602 or VM2603, as the IFR input is not installed on these modules.***	
Examples	**Command / Query**	**Response *(Description)***
	INP:SOUR IFR	*(Selects the IFR input source.)*
	INP:SOUR?	IFR *(Indicates that the input source selected is IFR.)*
Related Commands	None	

MEASure:FALL:TIMe?

Purpose	Performs a sequence of commands to provide a fall time measurement for the input.
Type	Query
Command Syntax	None
Command Parameters	None
Default Value	<start_samp> = 0 <#_samp> = 1,024 <lo_ref> = 10 (percent) <hi_ref> = 90 (percent)
Query Syntax	MEASure:FALL:TIMe? <start_samp>, <#_samp>, <lo_ref>, <hi_ref>, <expected_val> or MEASure:FTIMe? <start_samp>, <#_samp>, <lo_ref>, <hi_ref>, <expected_val>
Query Parameters	<start_samp> = typically 0 <#_samp> = 0 to 16,777,216 <lo_ref> = 0 to 100 (percent). The default is 10% and it must be less than <hi_ref> <hi_ref> = 0 to 100 (percent). The default is 90% and it must be greater than <lo_ref> <expected_val> = depends on input
Query Response	Returns a fall time measurement as defined by the <start_samp>, <#_samp>, <lo_ref>, <hi_ref>, and and <expected_val> parameters.
Description	MEASure:FALL:TIME? causes the instrument to execute an INIT, ARM, TRIGger, (acquire), (calculate), and fetch sequence to provide a fall time measurement for the input. Fall time is defined as the time interval that occurs between the 90% reference and 10% reference of the peak value. The parameters for this query are as follows: • **<start_samp>** = indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp>** = indicates the number of samples to be used in the measurement. • **<lo_ref>** = fall time ends when a negative transition of the input signal crosses this reference point. • **<hi_ref>** = fall time begins when a negative transition of the input signal crosses this reference point. • **<expected_val>** = the value that is expected to be returned by the instruement.

Examples	**Command / Query**	**Response *(Description)***
	MEAS:FTIM? 0,100,10,90,x	

Related Commands	CONFigure:FALL:TIME CONFigure:FTIME CALCulate:FALL:TIME? CALCulate:FTIME?

MEASure:FREQuency?

Purpose	Performs a sequence of commands to provide a frequency measurement for the input.	
Type	Query	
Command Syntax	None	
Command Parameters	None	
Default Value	<start_samp> = 0 <#_samp> = 1,024	
Query Syntax	MEASure:FREQuency? <start_samp>, <#_samples>, <expected_val>	
Query Parameters	<start_samp> = typically 0 <#_samp> = 0 to 16,777,216 <expected_val> = depends on input	
Query Response	Returns a frequency measurement as defined by the <start_samp>, <#_samples>, and <expected_val> parameters.	
Description	MEASure:FREQuency? causes the instrument to execute an INIT, ARM, TRIGger, (acquire), (calculate), and fetch sequence to provide a fall time measurement for the input. Frequency is a measure of how often a signal repeats in one second (1/s = Hz). The parameters for this query are as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<expected_val> =** the value that is expected to be returned by the instruement.	
Examples	**Command / Query**	**Response *(Description)***
	MEAS:FREQ? 0,65536,x	
Related Commands	CONFigure:FREQuency CALCulate:FREQuency?	

MEASure:NDUTy?

Purpose	Performs a sequence of commands to provide the negative duty cycle measurement for the input.	
Type	Query	
Command Syntax	None	
Command Parameters	None	
Default Value	<start_samp> = 0 <#_samp> = 1,024 <ref_level> = 50 (percent)	
Query Syntax	MEASure:NDUTy? <start_samp>, <#_samp>, <ref_level>, <expected_val>	
Query Parameters	<start_samp> = typically 0 <#_samp> = 0 to 16,777,216 <ref_level> = 0 to 100 (percent, typically 50%) <expected_val> = depends on input	
Query Response	Returns a negative duty cycle measurement as defined by the <start_samp>, <#_samp>, <ref_level>, and <expected_val> parameters.	
Description	MEASure:NDUTY? causes the instrument to execute an INIT, ARM, TRIGger, (acquire), (calculate), and fetch sequence to provide a negative duty cycle measurement for the input. A negative duty cycle is defined as the negative pulse width divided by the period and is expressed as a percentage. The parameters for this query are as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<ref_level> =** sets the reference point. Negative pulse width is the amount of time between one negative transition crossing this reference and the subsequent positive transition across this reference. • **<expected_val> =** the value that is expected to be returned by the instrument.	
Examples	**Command / Query**	**Response *(Description)***
	MEAS:NDUT? 0,2048,50,x	
Related Commands	CONFigure:NDUTy CALCulate:NDUTy?	

MEASure:NWIDth?

Purpose	Performs a sequence of commands to provide a negative pulse width measurement for the input.
Type	Query
Command Syntax	None
Command Parameters	None
Default Value	<start_samp> = 0 <#_samp> = 1,024 <ref_level> = 50 (percent)
Query Syntax	MEASure:NWIDth? <start_samp>, <#_samp>, <ref_level>, <expected_val>
Query Parameters	<start_samp> = typically 0 <#_samp> = 0 to <ref_level> = 0 to 100 (percent, typically 50%) <expected_val> = depends on input
Query Response	Returns a negative pulse width measurement as defined by the <start_samp>, <#_samp>, <ref_level>, and <expected_val> parameters.
Description	MEASure:NWIDth? causes the instrument to execute an INIT, ARM, TRIGger, (acquire), (calculate), and fetch sequence to provide a negative pulse width measurement for the input. The negative pulse width is a measure of the time required to go from the 50% reference of the falling edge of one wave to the 50% reference of the next rising edge. The parameters for this query are as follows: • **<start_samp>** = indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp>** = indicates the number of samples to be used in the measurement. • **<ref_level>** = sets the reference point. Negative pulse width is the amount of time between one negative transition crossing this reference and the subsequent positive transition across this reference. • **<expected_val>** = the value that is expected to be returned by the instruement.

Examples	**Command / Query**	**Response *(Description)***
	MEAS:NWID? 0,262144,50,x	

Related Commands	CONFigure:NWIDth CALCulate:NWIDth?

MEASure:PDUTy?

Purpose	Performs a sequence of commands to provide a positive duty cycle measurement for the input.
Type	Query
Command Syntax	None
Command Parameters	None
Default Value	<start_samp> = 0 <#_samp> = 1,024 <ref_level> = 50 (percent)
Query Syntax	MEASure:PDUTy? <start_samp>, <#_samp>, <ref_level>, <expected_val>
Query Parameters	<start_samp> = typically 0 <#_samp> = 0 to 16,777,216 <ref_level> = 0 to 100 (percent, typically 50%) <expected_val> = depends on input
Query Response	Returns a positive duty cycle measurement as defined by the <start_samp>, <#_samp>, <ref_level>, and <expected_val> parameters.
Description	MEASure:PDUTy? causes the instrument to execute an INIT, ARM, TRIGger, (acquire), (calculate), and fetch sequence to provide a fall time measurement for the input. A positive duty cycle is defined as the positive pulse width divided by the period and is expressed as a percentage. The parameters for this query are as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<ref_level> =** sets the reference point. Positive pulse width is the amount of time between one positive transition crossing this reference and the subsequent negative transition across this reference. • **<expected_val> =** the value that is expected to be returned by the instruement.

Examples	**Command / Query**	**Response *(Description)***
	MEAS:PDUT? 100,1024,50,x	
Related Commands	CONFigure:PDUTy CALCulate:PDUTy?	

MEASure:PERCent:NOVershoot?

Purpose	Performs a sequence of commands to provide a negative overshoot percentage measurement for the input.
Type	Query
Command Syntax	None
Command Parameters	N/A
***RST Value**	<start_samp> = 0 <#_samp> = 1,024
Query Syntax	MEASure: PERCent:NOVershoot? <start_samp>, <#_samp>, <expected_val>
Query Parameters	<start_samp> = typically 0 <#_samp> = 0 to 16,777,216 <expected_val> = depends on input
Query Response	Returns a negative overshoot percentage as defined by the <start_samp>, <#_samp>, and <expected_val> parameters.
Description	MEASure:PERCent:NOVershoot? causes the instrument to execute an INIT, ARM, TRIGger, (acquire), (calculate), and fetch sequence to provide a fall time measurement for the input. The negative overshoot percentage is defined as the amount of voltage by which a post-transitional aberration negatively exceeds a state boundary divided by the signal amplitude. The parameters for this query are as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<expected_val> =** expected peak-to-peak signal voltage (if sent).

Examples	**Command / Query**	**Response *(Description)***
	MEAS:PERC:NOV?	*(Returns the negative overshoot percentage.)*

Related Commands	CALCulate:PERCent:NOVershoot? CONFigure:PERCent:NOVershoot

MEASure:PERCent:NPReshoot?

Purpose	Performs a sequence of commands to provide a negative preshoot percentage measurement for the input.
Type	Query
Command Syntax	None
Command Parameters	N/A
***RST Value**	<start_samp> = 0 <#_samp> = 1,024
Query Syntax	MEASure: PERCent:NPReshoot? <start_samp>, <#_samp>, <expected_val>
Query Parameters	<start_samp> = typically 0 <#_samp> = 0 to 16,777,216 <expected_val> = depends on input
Query Response	Returns a negative preshoot percentage as defined by the <start_samp>, <#_samp>, and <expected_val> parameters.
Description	MEASure:PERCent:NPReshoot? causes the instrument to execute an INIT, ARM, TRIGger, (acquire), (calculate), and fetch sequence to provide a fall time measurement for the input. The negative preshoot percentage is defined as the amount of voltage by which a pre-transitional aberration negatively exceeds a state boundary divided by the signal amplitude. The parameters for this query are as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<expected_val> =** expected peak-to-peak signal voltage (if sent).

Examples	**Command / Query**	**Response *(Description)***
	MEAS:PERC:NPR?	*(Returns the negative preshoot percentage.)*

Related Commands	CONFigure:PERCent:NPReshoot? MEASure:PERCent:NPReshoot

MEASure:PERCent:NRINging?

Purpose	Performs a sequence of commands to provide a negative ringing percentage measurement for the input.
Type	Query
Command Syntax	None
Command Parameters	N/A
***RST Value**	<start_samp> = 0 <#_samp> = 1,024
Query Syntax	MEASure: PERCent:NRINging? <start_samp>, <#_samp>, <expected_val>
Query Parameters	<start_samp> = typically 0 <#_samp> = 0 to 16,777,216 <expected_val> = depends on input
Query Response	Returns a negative preshoot percentage as defined by the <start_samp>, <#_samp>, and <expected_val> parameters.
Description	MEASure:PERCent:NRINging? causes the instrument to execute an INIT, ARM, TRIGger, (acquire), (calculate), and fetch sequence to provide a fall time measurement for the input. The negative ringing percentage is defined as the amount of voltage by which a pre-transitional aberration exceeds a state boundary divided by the signal amplitude. The parameters for this query are as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<expected_val> =** expected peak-to-peak signal voltage (if sent).

Examples	**Command / Query**	**Response *(Description)***
	CALC:PERC:NRIN?	*(Returns the negative ringing percentage.)*

Related Commands	CONFigure:PERCent:NRINging? MEASure:PERCent:NRINging

MEASure:PERCent:POVershoot?

Purpose	Performs a sequence of commands to provide a positive overshoot percentage measurement for the input.
Type	Query
Command Syntax	None
Command Parameters	N/A
***RST Value**	<start_samp> = 0 <#_samp> = 1,024
Query Syntax	MEASure: PERCent:POVershoot? <start_samp>, <#_samp>, <expected_val>
Query Parameters	<start_samp> = typically 0 <#_samp> = 0 to 16,777,216 <expected_val> = depends on input
Query Response	Returns a positive overshoot percentage as defined by the <start_samp>, <#_samp>, and <expected_val> parameters.
Description	MEASure:PERCent:NOVershoot? causes the instrument to execute an INIT, ARM, TRIGger, (acquire), (calculate), and fetch sequence to provide a fall time measurement for the input. The positive overshoot percentage is defined as the amount of voltage by which a post-transitional aberration positively exceeds a state boundary divided by the signal amplitude. The parameters for this query are as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<expected_val> =** expected peak-to-peak signal voltage (if sent).

Examples	**Command / Query**	**Response *(Description)***
	MEAS:PERC:POV?	*(Returns the positive overshoot percentage.)*

Related Commands	CALCulate:PERCent:NOVershoot? CONFigure:PERCent:NOVershoot

MEASure:PERCent:PPReshoot?

Purpose	Performs a sequence of commands to provide a positive preshoot percentage measurement for the input.
Type	Query
Command Syntax	None
Command Parameters	N/A
***RST Value**	<start_samp> = 0 <#_samp> = 1,024
Query Syntax	MEASure: PERCent:PPReshoot? <start_samp>, <#_samp>, <expected_val>
Query Parameters	<start_samp> = typically 0 <#_samp> = 0 to 16,777,216 <expected_val> = depends on input
Query Response	Returns a positive preshoot percentage as defined by the <start_samp>, <#_samp>, and <expected_val> parameters.
Description	MEASure:PERCent:PPReshoot? causes the instrument to execute an INIT, ARM, TRIGger, (acquire), (calculate), and fetch sequence to provide a fall time measurement for the input. The positive preshoot percentage is defined as the amount of voltage by which a pre-transitional aberration positively exceeds a state boundary divided by the signal amplitude. The parameters for this query are as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<expected_val> =** expected peak-to-peak signal voltage (if sent).

Examples	**Command / Query**	**Response *(Description)***
	MEAS:PERC:NPR?	*(Returns the negative preshoot percentage.)*

Related Commands	CONFigure:PERCent:PPReshoot? MEASure:PERCent:PPReshoot

MEASure:PERCent:PRINging?

Purpose	Performs a sequence of commands to provide a positive ringing percentage measurement for the input.
Type	Query
Command Syntax	None
Command Parameters	N/A
***RST Value**	<start_samp> = 0 <#_samp> = 1,024
Query Syntax	MEASure: PERCent:PRINging? <start_samp>, <#_samp>, <expected_val>
Query Parameters	<start_samp> = typically 0 <#_samp> = 0 to 16,777,216 <expected_val> = depends on input
Query Response	Returns a positive preshoot percentage as defined by the <start_samp>, <#_samp>, and <expected_val> parameters.
Description	MEASure:PERCent:PRINging? causes the instrument to execute an INIT, ARM, TRIGger, (acquire), (calculate), and fetch sequence to provide a fall time measurement for the input. The positive ringing percentage is defined as the amount of voltage by which a pre-transitional aberration exceeds a state boundary divided by the signal amplitude. The parameters for this query are as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<expected_val> =** expected peak-to-peak signal voltage (if sent).
Examples	**Command / Query**: CALC:PERC:PRIN? **Response *(Description)***: *(Returns the positive ringing percentage.)*
Related Commands	CONFigure:PERCent:PRINging MEASure:PERCent:PRINging

MEASure:PERiod?

Purpose	Performs a sequence of commands to provide a period measurement for the input.
Type	Query
Command Syntax	None
Command Parameters	None
Default Value	<start_samp> = 0 <#_samp> = 1,024
Query Syntax	MEASure:PERiod? <start_samp>, <#_samples>, <expected_val>
Query Parameters	<start_samp> = typically 0 <#_samp> = 0 to 16,777,216 <expected_val> = depends on input
Query Response	Returns a period measurement as defined by the <start_samp>, <#_samples>, and <expected_val> parameters.
Description	MEASure:PERiod? causes the instrument to execute an INIT, ARM, TRIGger, (acquire), (calculate), and fetch sequence to provide a period measurement for the input. The period of a function is defined as the amount of time required for the signal to generate one signal cycle. The parameters for this query are as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<expected_val> =** the value that is expected to be returned by the instruement.
Examples	**Command / Query** | **Response *(Description)***
	MEAS:PER? 0,256,x |
Related Commands	CONFigure:PERiod CALCulate:PERiod?

MEASure:PWIDth?

Purpose	Performs a sequence of commands to provide a positive pulse width measurement for the input.
Type	Query
Command Syntax	None
Command Parameters	None
Default Value	<start_samp> = 0 <#_samp> = 1,024 <ref_level> = 50 (percent)
Query Syntax	MEASure:PWIDth? <start_samp>, <#_samp>, <ref_level>, <expected_val>
Query Parameters	<start_samp> = typically 0 <#_samp> = 0 to 16,777,216 <ref_level> = 0 to 100 (percent, typically 50%) <expected_val> = depends on input
Query Response	Returns a positive pulse width measurement as defined by the <start_samp>, <#_samp>, <ref_level>, and <expected_val> parameters.
Description	MEASure:PWIDth? causes the instrument to execute an INIT, ARM, TRIGger, (acquire), (calculate), and fetch sequence to provide a fall time measurement for the input. The positive pulse width is a measure of the time required to go from the 50% reference of the rising edge of one wave to the 50% reference of the next falling edge. The parameters for this query are as follows: • **<start_samp>** = indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp>** = indicates the number of samples to be used in the measurement. • **<ref_level>** = sets the reference point. Positive pulse width is the amount of time between one positive transition crossing this reference and the subsequent negative transition across this reference. • **<expected_val>** = the value that is expected to be returned by the instruement.

Examples	**Command / Query**	**Response *(Description)***
	MEAS:PWID? 0,16384,50,x	

Related Commands	CONFigure:PWIDth CALCulate:PWIDth?

MEASure:RISE:TIMe?

Purpose	Performs a sequence of commands to provide a rise time measurement for the input.
Type	Query
Command Syntax	None
Command Parameters	None
Default Value	<start_samp> = 0 <#_samp> = 1,024 <lo_ref> = 10 (percent) <hi_ref> = 90 (percent)
Query Syntax	MEASure:RISE:TIMe? <start_samp>, <#_samp>, <lo_ref>, <hi_ref>, <expected_val> or MEASure:RTIMe? <start_samp>, <#_samp>, <lo_ref>, <hi_ref>, <expected_val>
Query Parameters	<start_samp> = typically 0 <#_samp> = 0 to 16,777,216 <lo_ref> = 0 to 100 (percent). The default is 10% and it must be less than <hi_ref> <hi_ref> = 0 to 100 (percent). The default is 90% and it must be greater than <lo_ref> <expected_val> = depends on input
Query Response	Returns a rise time measurement as defined by the <start_samp>, <#_samp>, <lo_ref>, <hi_ref>, and and <expected_val> parameterss.
Description	MEASure:RISE:TIME? causes the instrument to execute an INIT, ARM, TRIGger, (acquire), (calculate), and fetch sequence to provide a fall time measurement for the input. Rise time is defined as the time interval that occurs between the 10% reference and 90% reference of the peak value. The parameters for this query are as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<lo_ref> =** rise time begins when a positive transition of the input signal crosses this reference point. • **<hi_ref> =** rise time ends when a positive transition of the input signal crosses this reference point. • **<expected_val> =** the value that is expected to be returned by the instruement.

Examples	**Command / Query**	**Response *(Description)***
	MEAS:RISE:TIM? 0,16384,10,90,x	

Related Commands	CONFigure:RISE:TIME CONFigure:RTIME CALCulate:RISE:TIME? CALCulate:RTIME?

MEASure:VOLTage:AMPLitude?

Purpose	Performs a sequence of commands to provide an amplitude measurement for the input.	
Type	Query	
Command Syntax	None	
Command Parameters	None	
Default Value	<start_samp> = 0 <#_samp> = 1,024	
Query Syntax	MEASure:VOLTage:AMPLitude? <start_samp>, <#_samples>, <expected_val>	
Query Parameters	<start_samp> = typically 0 <#_samp> = 0 to 16,777,216 <expected_val> = depends on input	
Query Response	Returns an amplitude measurement for the input as defined by the <start_samp>, <#_samples>, and <expected_val> parameters.	
Description	MEASure: VOLTage:AMPLitude? causes the instrument to execute an INIT, ARM, TRIGger, (acquire), (calculate), and fetch sequence to provide an amplitude measurement for the input. Amplitude is defined as the voltage difference between the high and low states. The parameters for this query are as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<expected_val> =** the value that is expected to be returned by the instruement.	
Examples	**Command / Query**	**Response *(Description)***
	MEAS:VOLT:AMPL? 0,65536,x	
Related Commands	CONFigure:VOLTage:AMPLitude CALCulate:VOLTage:AMPLitude?	

MEASure:VOLTage:HIGH?

Purpose	Performs a sequence of commands to provide the high voltage measurement for the input.	
Type	Query	
Command Syntax	None	
Command Parameters	None	
Default Value	<start_samp> = 0 <#_samp> = 1,024	
Query Syntax	MEASure:VOLTage:HIGH? <start_samp>, <#_samples>, <expected_val>	
Query Parameters	<start_samp> = typically 0 <#_samp> = 0 to 16,777,216 <expected_val> = depends on input	
Query Response	Returns a voltage measurement as defined by the <start_samp>, <#_samples>, and <expected_val> parameters.	
Description	MEASure:VOLTage:HIGH? causes the instrument to execute an INIT, ARM, TRIGger, (acquire), (calculate), and fetch sequence to provide a high voltage measurement for the input. The parameters for this query are as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<expected_val> =** the value that is expected to be returned by the instruement.	
Examples	**Command / Query**	**Response *(Description)***
	MEAS:VOLT:HIGH? 0,65536,x	
Related Commands	CONFigure:VOLTage:HIGH CALCulate: VOLTage:HIGH?	

MEASure:VOLTage:LOW?

Purpose	Performs a sequence of commands to provide the low voltage measurement for the input.
Type	Query
Command Syntax	None
Command Parameters	None
Default Value	<start_samp> = 0 <#_samples> = 1,024
Query Syntax	MEASure:VOLTage:LOW? <start_samp>, <#_samples>, <expected_val>
Query Parameters	<start_samp> = typically 0 <#_samples> = 0 to 16,777,216 <expected_val> = depends on input
Query Response	Returns a voltage measurement as defined by the <start_samp>, <#_samples>, and <expected_val> parameters.
Description	MEASure:VOLTage:LOW? causes the instrument to execute an INIT, ARM, TRIGger, (acquire), (calculate), and fetch sequence to provide a low voltage measurement for the input. The parameters for this query are as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<expected_val> =** the value that is expected to be returned by the instrument.
Examples	**Command / Query** / **Response *(Description)***
	MEAS:VOLT:LOW? 500,32768,x
Related Commands	CONFigure:VOLTage:LOW CALCulate: VOLTage:LOW?

MEASure:VOLTage:MAXimum?

Purpose	Performs a sequence of commands to provide the maximum voltage measurement for the input.	
Type	Query	
Command Syntax	None	
Command Parameters	None	
Default Value	<start_samp> = 0 <#_samp> = 1,024	
Query Syntax	MEASure:VOLTage:MAXimum? <start_samp>, <#_samples>, <expected_val>	
Query Parameters	<start_samp> = typically 0 <#_samp> = 0 to 16,777,216 <expected_val> = depends on input	
Query Response	Returns a voltage measurement as defined by the <start_samp>, <#_samples>, and <expected_val> parameters.	
Description	MEASure:VOLTage:MAXimum? causes the instrument to execute an INIT, ARM, TRIGger, (acquire), (calculate), and fetch sequence to provide a maximum voltage measurement for the input. The parameters for this query are as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<expected_val> =** the value that is expected to be returned by the instruement.	
Examples	**Command / Query**	**Response *(Description)***
	MEAS:VOLT:MAX? 0,32768,x	
Related Commands	CONFigure:VOLTage:MAXimum CALCulate: VOLTage:MAXimum?	

MEASure:VOLTage:MEAN?

Purpose	Performs a sequence of commands to provide the mean voltage measurement for the input.
Type	Query
Command Syntax	None
Command Parameters	None
Default Value	<start_samp> = 0 <#_samp> = 1,024
Query Syntax	MEASure:VOLTage:MEAN? <start_samp>, <#_samples>, <expected_val>
Query Parameters	<start_samp> = typically 0 <#_samp> = 0 to 16,777,216 <expected_val> = depends on input
Query Response	Returns a voltage measurement as defined by the <start_samp>, <#_samples>, and <expected_val> parameters.
Description	MEASure:VOLTage:MEAN? causes the instrument to execute an INIT, ARM, TRIGger, (acquire), (calculate), and fetch sequence to provide a mean voltage measurement for the input. The parameters for this query are as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<expected_val> =** the value that is expected to be returned by the instruement.
Examples	**Command / Query** / **Response *(Description)***
	MEAS:VOLT:MEAN? 0,131072,x
Related Commands	CONFigure:VOLTage:MEAN CALCulate: VOLTage:MEAN?

MEASure:VOLTage:MINimum?

Purpose	Performs a sequence of commands to provide the minimum voltage measurement for the input.
Type	Query
Command Syntax	None
Command Parameters	None
Default Value	<start_samp> = 0 <#_samp> = 1,024
Query Syntax	MEASure:VOLTage:MINimum? <start_samp>, <#_samples>, <expected_val>
Query Parameters	<start_samp> = typically 0 <#_samp> = 0 to 16,777,216 <expected_val> = depends on input
Query Response	Returns a voltage measurement as defined by the <start_samp>, <#_samples>, and <expected_val> parameters.
Description	MEASure:VOLTage:MINimum? causes the instrument to execute an INIT, ARM, TRIGger, (acquire), (calculate), and fetch sequence to provide a minimum voltage measurement for the input. The parameters for this query are as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<expected_val> =** the value that is expected to be returned by the instruement.
Examples	**Command / Query** / **Response *(Description)***
	MEAS:VOLT:MIN? 0,65536,x
Related Commands	CONFigure:VOLTage:MINimum CALCulate: VOLTage:MINimum?

MEASure:VOLTage:NOVershoot?

Purpose	Performs a sequence of commands to provide a negative overshoot measurement for the input.
Type	Query
Command Syntax	None
Command Parameters	None
Default Value	<start_samp> = 0 <#_samp> = 1,024
Query Syntax	MEASure:VOLTage:NOVershoot? <start_samp>, <#_samples>, <expected_val>
Query Parameters	<start_samp> = typically 0 <#_samp> = 0 to 16,777,216 <expected_val> = depends on input
Query Response	Returns a voltage measurement as defined by the <start_samp>, <#_samples>, and <expected_val> parameters.
Description	MEASure:VOLTage:NOVershoot? causes the instrument to execute an INIT, ARM, TRIGger, (acquire), (calculate), and fetch sequence to provide a netagive overshoot measurement for the input. The negative overshoot is defined as the amount of voltage by which a post-transitional aberration negatively exceeds a state boundary. The parameters for this query are as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<expected_val> =** the value that is expected to be returned by the instruement.

Examples	**Command / Query**	**Response *(Description)***
	MEAS:VOLT:NOV? 0,65536,x	

Related Commands	CONFigure:VOLTage:NOVershoot CALCulate: VOLTage:NOVershoot?

MEASure:VOLTage:NPReshoot?

Purpose	Performs a sequence of commands to provide a negative preshoot measurement for the input.
Type	Query
Command Syntax	None
Command Parameters	None
Default Value	<start_samp> = 0 <#_samp> = 1,024
Query Syntax	MEASure:VOLTage:NPReshoot? <start_samp>, <#_samples>, <expected_val>
Query Parameters	<start_samp> = typically 0 <#_samp> = 0 to 16,777,216 <expected_val> = depends on input
Query Response	Returns a voltage measurement as defined by the <start_samp>, <#_samples>, and <expected_val> parameters.
Description	MEASure:VOLTage:NPREshoot? causes the instrument to execute an INIT, ARM, TRIGger, (acquire), (calculate), and fetch sequence to provide negative preshoot measurement for the input. The negative preshoot is defined as the amount of voltage by which a pre-transitional aberration negatively exceeds a state boundary. The parameters for this query are as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<expected_val> =** the value that is expected to be returned by the instruement.

Examples	**Command / Query**	**Response *(Description)***
	MEAS:VOLT:NPR? 1000,65536,x	

Related Commands	CONFigure:VOLTage:NPReshoot CALCulate: VOLTage:NPReshoot?

MEASure:VOLTage:NRINging?

Purpose	Performs a sequence of commands to provide a negative ringing measurement for the input.
Type	Query
Command Syntax	None
Command Parameters	None
***RST Value**	<start_samp> = 0 <#_samp> = 1,024
Query Syntax	MEASure:VOLTage:NRINging? <start_samp>, <#_samples>, <expected_val>
Query Parameters	<start_samp> = typically 0 <#_samp> = 0 to 16,777,216 <expected_val> = depends on input
Query Response	Returns a negative ringing measurement for the input as defined by the <start_samp>, <#_samples>, and <expected_val> parameters.
Description	MEASure: VOLTage:NRINging? causes the instrument to execute an INIT, ARM, TRIGger, (acquire), (calculate), and fetch sequence to provide an negative ringing measurement for the input. Negative ringing is defined as the peak-to-peak voltage of a negative post-transitional aberration. The parameters for this query are as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<expected_val> =** the expected peak-to-peak voltage (if sent).
Examples	**Command / Query**: MEAS:VOLT:NRIN? 0,16384,x **Response *(Description)***: *(Returns the negative ringing measurement.)*
Related Commands	CONFigure:VOLTage:NRINging? MEASure:VOLTage:NRINging

MEASure:VOLTage:POVershoot?

Purpose	Performs a sequence of commands to provide a positive overshoot measurement for the input.
Type	Query
Command Syntax	None
Command Parameters	None
Default Value	<start_samp> = 0 <#_samp> = 1,024
Query Syntax	MEASure:VOLTage:POVershoot? <start_samp>, <#_samples>, <expected_val>
Query Parameters	<start_samp> = typically 0 <#_samp> = 0 to 16,777,216 <expected_val> = depends on input
Query Response	Returns a voltage measurement as defined by the <start_samp>, <#_samples>, and <expected_val> parameters.
Description	MEASure:VOLTage:POVershoot? causes the instrument to execute an INIT, ARM, TRIGger, (acquire), (calculate), and fetch sequence to provide a positive overshoot measurement for the input. The positive overshoot is defined as the amount of voltage by which a post-transitional aberration positively exceeds the state boundary. The parameters for this query are as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<expected_val> =** the value that is expected to be returned by the instruement.

Examples	**Command / Query**	**Response *(Description)***
	MEAS:VOLT:POV? 0,524288,x	

Related Commands	CONFigure:VOLTage:POVershoot CALCulate: VOLTage:POVershoot?

MEASure:VOLTage:PPReshoot?

Purpose	Performs a sequence of commands to provide a positive preshoot measurement for the input.	
Type	Query	
Command Syntax	None	
Command Parameters	None	
Default Value	<start_samp> = 0 <#_samp> = 1,024	
Query Syntax	MEASure:VOLTage:PPReshoot? <start_samp>, <#_samples>, <expected_val>	
Query Parameters	<start_samp> = typically 0 <#_samp> = 0 to 16,777,216 <expected_val> = depends on input	
Query Response	Returns a voltage measurement as defined by the <start_samp>, <#_samples>, and <expected_val> parameters.	
Description	MEASure:VOLTage:PPReshoot? causes the instrument to execute an INIT, ARM, TRIGger, (acquire), (calculate), and fetch sequence to provide a positive preshoot measurement for the input. The positive preshoot is defined as the amount of voltage by which a pre-transitional aberration positively exceeds the state boundary. The parameters for this query are as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<expected_val> =** the value that is expected to be returned by the instruement.	
Examples	**Command / Query**	**Response *(Description)***
	MEAS:VOLT:PPR? 0,524288,x	
Related Commands	CONFigure:VOLTage:NPReshoot CALCulate: VOLTage:NPReshoot?	

MEASure:VOLTage:PRINging?

Purpose	Performs a sequence of commands to provide a negative ringing measurement for the input.
Type	Query
Command Syntax	None
Command Parameters	None
***RST Value**	<start_samp> = 0 <#_samp> = 1,024
Query Syntax	MEASure:VOLTage:PRINging? <start_samp>, <#_samples>, <expected_val>
Query Parameters	<start_samp> = typically 0 <#_samp> = 0 to 16,777,216 <expected_val> = depends on input
Query Response	Returns a positive ringing measurement for the input as defined by the <start_samp>, <#_samples>, and <expected_val> parameters.
Description	MEASure: VOLTage:PRINging? causes the instrument to execute an INIT, ARM, TRIGger, (acquire), (calculate), and fetch sequence to provide an positive ringing measurement for the input. Positive ringing is defined as the peak-to-peak voltage of a positive post-transitional aberration. The parameters for this query are as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<expected_val> =** the expected peak-to-peak voltage (if sent).

Examples	**Command / Query**	**Response *(Description)***
	MEAS:VOLT:PRIN? 0,16384,x	*(Returns the positive ringing measurement.)*

Related Commands	CONFigure:VOLTage:PRINging? MEASure:VOLTage:PRINging

MEASure:VOLTage:PTPeak?

Purpose	Performs a sequence of commands to provide the peak-to-peak measurement for the input.	
Type	Query	
Command Syntax	None	
Command Parameters	None	
Default Value	<start_samp> = 0 <#_samp> = 1,024	
Query Syntax	MEASure:VOLTage:PTPeak? <start_samp>, <#_samples>, <expected_val>	
Query Parameters	<start_samp> = typically 0 <#_samp> = 0 to 16,777,216 <expected_val> = depends on input	
Query Response	Returns a peak-to-peak voltage measurement as defined by the <start_samp>, <#_samples>, and <expected_val> parameters.	
Description	MEASure:VOLTage:PTPeak? causes the instrument to execute an INIT, ARM, TRIGger, (acquire), (calculate), and fetch sequence to provide a peak-to-peak voltage measurement for the input. The peak-to-peak voltage (V_{P-P}) is defined as the voltage measured between the signal's maximum and minimum points. The parameters for this query are as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<expected_val> =** the value that is expected to be returned by the instruement.	
Examples	**Command / Query**	**Response *(Description)***
	MEAS:VOLT:PTP? 0,1048576,x	
Related Commands	CONFigure:VOLTage:PTPeak CALCulate: VOLTage:PTPeak?	

MEASure:VOLTage:RMS?

Purpose	Performs a sequence of commands to provide a room mean square voltage of the input.
Type	Query
Command Syntax	None
Command Parameters	None
Default Value	<start_samp> = 0 <#_samp> = 1,024
Query Syntax	MEASure:VOLTage:RMS? <start_samp>, <#_samples>, <expected_val>
Query Parameters	<start_samp> = typically 0 <#_samp> = 0 to 16,777,216 <expected_val> = depends on input
Query Response	Returns a voltage measurement as defined by the <start_samp>, <#_samples>, and <expected_val> parameters.
Description	MEASure:VOLTage:RMS? causes the instrument to execute an INIT, ARM, TRIGger, (acquire), (calculate), and fetch sequence to provide the root-mean-square voltage of the input. The root-mean-square voltage is defined by the following formula: $V_{rms} = \sqrt{\frac{\sum_{0}^{n-1} v^2}{n}}$, where v= voltage and n = number of samples The parameters for this command are as follows: • **<start_samp> =** indicates the number of the sample, with respect to the trigger point, that will be the first sample used in the measurement. (0 = trigger point). If <start_samp> is negative, pre-trigger samples will be included in the measurement. • **<#_samp> =** indicates the number of samples to be used in the measurement. • **<expected_val> =** the value that is expected to be returned by the instruement.

Examples	**Command / Query**	**Response *(Description)***
	MEAS:VOLT:RMS? 0,8192,x	

Related Commands	CONFigure:VOLTage:RMS CALCulate: VOLTage:RMS?

READ?

Purpose	Initiates, arms, triggers, and fetches a previously configured measurement.	
Type	Query	
Command Syntax	None	
Command Parameters	N/A	
***RST Value**	None	
Query Syntax	READ?	
Query Parameters	None	
Query Response	Returns data previously acquired by a MEASure:…? query.	
Description	This query performs a sequence of commands which allows acquired data to be viewed. After performing a CONFigure:…? subsystem query, the READ? query performs an INITiate[:IMMediate] command and a FETCh? query.	
Examples	**Command / Query**	**Response *(Description)***
	CONF:VOLT:MAX? READ?	
Related Commands		

ROSCillator:FREQuency

Purpose	Sets the reference oscillator frequency.	
Type	Command	
Command Syntax	ROSCillator:FREQuency <osc_freq>	
Command Parameters	<osc_freq> = 1e6 | 5e6 | 1e7 (1 MHz, 5 MHz, and 10 MHz, respectively)	
***RST Value**	1e7	
Query Syntax	ROSCillator:FREQuency?	
Query Parameters	None	
Query Response	Returns the value currently selected for the <osc_freq> parameter	
Description	The ROSCillator:FREQuency command sets the reference oscillator frequency. This command only applies if ROSC:SOUR is set to EXT, in which case the reference clock source is the front panel clock input.	
Examples	**Command / Query**	**Response *(Description)***
	ROSC:FREQ 5e6	*(Sets the reference oscillator to 5 MHz.)*
	ROSC:FREQ?	5 *(Indicates that the reference oscillator is operating at 5 MHz.)*
Related Commands	ROSCillator:SOURce	

ROSCillator:SOURce

Purpose	Selects the reference oscillator source.	
Type	Command	
Command Syntax	ROSCillator:SOURce <osc_source>	
Command Parameters	<osc_source> = BUS | EXTernal	
***RST Value**	BUS (10 MHz VXI backplane)	
Query Syntax	ROSCillator:SOURce?	
Query Parameters	None	
Query Response	BUS | EXT	
Description	Selects the reference oscillator source.	
Examples	**Command / Query**	**Response *(Description)***
	ROSC:SOUR EXT ROSC:SOUR?	*(Sets the reference oscillator to be external).* EXT *(Indicates that the VM2601 is utilizing an external reference oscillator.)*
Related Commands	ROSCillator:FREQuency	

SAMPle:CLOCk:FREQuency

Purpose	Outputs the selected sample clock frequency.	
Type	Command	
Command Syntax	SAMPle:CLOCk:FREQuency <sample_clock_freq>	
Command Parameters	<sample_clock_freq> = SLOW ADC: 1 kHz – 10 MHz FAST ADC: 4.768 kHz – SR_{MAX} (see below)	
***RST Value**	10 MHz for SLOW and FAST ADC	
Query Syntax	SAMPle:CLOCk:FREQuency?	
Query Parameters	None	
Query Response	Returns the current value of the <sample_clock_freq> parameter	
Description	This command sets the sample clock frequency. The maximum sample rate (SR_{MAX}) of the FAST ADC is 80 MHz for the VM2601, 40 MHz for the VM2602, and 20 MHz for the VM2603.	
Examples	**Command / Query**	**Response *(Description)***
	CONF:ADC SLOW	*(Selects the SLOW ADC.)*
	SAMP:CLOC:FREQ 1e6	*(Selects a sample clock frequency of 1 MHz.)*
	SAMP:CLOC:FREQ?	1e6 *(Indicates that the sample clock frequency is set to 1 MHz.)*
Related Commands	None	

SAMPle:CLOCk:SOURce

Purpose	Routes the selected sample clock source to the data acquisition timing circuit.	
Type	Command	
Command Syntax	SAMPle:CLOCk:SOURce <clock_source>	
Command Parameters	<clock_source> = INTernal | EXTernal | SYNC	
***RST Value**	INTernal	
Query Syntax	SAMPle:CLOCk:SOURce?	
Query Parameters	None	
Query Response	Returns the value currently selected for the <clock_source> parameter.	
Description	Outputs the selected sample clock source. If set to SYNChronize:MODE is set to SLAVe and SYNChronize:STATe is set to ON, SAMPle:CLOCk:SOURce SYNC is automatically selected and need not be sent.	
Examples	**Command / Query**	**Response *(Description)***
	SAMP:CLOC:SOUR EXT SAMP:CLOC:SOUR?	*(Selects an external source as the sample clock.)* EXT *(Indicates that an external sample clock source is selected.)*
Related Commands	None	

SWEep:COUNt

Purpose	Set the number of segments.
Type	Command
Command Syntax	SWEep:COUNt <num_segments>
Command Parameters	<num_segments > = 1 – 65,536, where <num_segments> must be an integer power of 2 (i.e. 1, 2, 4, 8… 65,536)
***RST Value**	1
Query Syntax	SWEep:COUNt?
Query Parameters	None
Query Response	Returns the current value set for the <num_segments > parameter.
Description	This command sets the number of descrete segments sample memory will be partitioned into. If multiple segments are defined, the data will be stored in segment 0 following the first "INIT" command. The next "INIT" command will cause data to be stored in segment 1, and so on. Pre-trigger data acquisitions is supported when eight or fewer segments are defined. If more than eight segments are defined, only post-trigger samples will be acquired. The number of segments configured must be an even power of two (2^n). The maximum number of segments is 65,536. For standard units with 16 MSa RAM, the minimum segment size is 256 samples. For units equipped with the optional 32 MSa RAM, the minimum segment size is 512 samples. $\text{segment size} = \frac{\text{sample RAM size}}{\text{number of segments}}$

Examples	**Command / Query**	**Response *(Description)***
	SWE:COUN 3.2e4	*(Sets the number of segments to 32,000)*
	SWE:COUN?	3.2e4 *(Indicates that the number of segments has been set to 32,000.)*

Related Commands	None

SWEep:POINts

Purpose	Sets the post-trigger sample count.
Type	Command
Command Syntax	SWEep:POINts < post-trig_samples>
Command Parameters	<post-trig_samples> = number of samples to acquire
***RST Value**	1,024
Query Syntax	SWEep:POINts?
Query Parameters	None
Query Response	Returns the current value set for the <post-trig_samples> parameter.
Description	This command sets the post-trigger sample count. The following restrictions exist for this command: • Minimum post-triger samples = 8 • When configured for 1 to 8 segments: $\text{maximum post - trigger samples} = \left(\frac{\text{memory size}}{\text{number of segments}}\right) - \text{pre} - \text{trigger count}$ • When configured for 16 to 65,536 segments: $\text{maximum post - trigger samples} = \left(\frac{\text{memory size}}{\text{number of segments}}\right)$ • Memory size for the standard 16 MSa RAM =16,777,216. • Memory size for the optional 32 MSa RAM = 33,554,432.

Examples	**Command / Query**	**Response *(Description)***
	SWE:POIN 4	*(Sets the sample count to 4.)*
	SWE:POIN?	4 *(Indicates that the sample count size is set to 4.)*

Related Commands	INITiate:DELay

SWEep:TINTerval

Purpose	This command sets the sample rate for the ADC.	
Type	Command	
Command Syntax	SWEep:TINTerval <sample_time>	
Command Parameters	<sample_time> = 12.5 ns – 209.7 ms (Fast ADC) 100 ns – 1 ms (Slow ADC)	
***RST Value**	Fast or Slow ADC: 100 ns	
Query Syntax	SWEep:TINTerval?	
Query Parameters	None	
Query Response	Returns the current value set for the <sample_time> parameter.	
Description	This command sets the sample rate for the ADC.	
Examples	**Command / Query**	**Response *(Description)***
	CONFigure:ADC FAST	*(Selects the fast ADC)*
	SWE:TINT 1e-3	*(Sets the ADC sample rate to 1 ms)*
	SWE:TINT?	1e-3 *(Indicates that the ADC sample rate is 1 ms)*
Related Commands	None	

SYNChronize:MODE

Purpose	Sets the instrument to function as a synchronized master or slave.	
Type	Command	
Command Syntax	SYNChronize:MODE <sync_mode>	
Command Parameters	<sync_mode> = MASTer | SLAVe | OFF	
***RST Value**	OFF	
Query Syntax	SYNChronize:MODE?	
Query Parameters	None	
Query Response	Returns the value currently selected for the <sync_mode> parameter	
Description	This command sets the instrument to perform as either a MASTer or as a SLAVe when synchronized with other VM2601 modules.	
Examples	**Command / Query**	**Response *(Description)***
	SYNC:MODE SLAV SYNC:MODE?	*(Sets the module to act as a slave)* SLAV *(indicates that the module is functioning as a slave.)*
Related Commands	SYNChronize:STATe	

SYNChronize:STATe

Purpose	Enables/disables synchronization operations.	
Type	Command	
Command Syntax	SYNChronize:STATe <boolean>	
Command Parameters	<boolean> = 0 | 1 | OFF | ON	
***RST Value**	OFF	
Query Syntax	SYNChronize:STATe?	
Query Parameters	None	
Query Response	Returns the value currently selected for the <boolean> parameter	
Description	This command enables or disables the module's ability to synchronize with other VM2601 modules.	
Examples	**Command / Query**	**Response *(Description)***
	SYNC:STAT 1	*(Enables synchronization operation.)*
	SYNC:STAT?	1 *(Indicates that synchronization has been enabled.)*
Related Commands	SYCHronize:MODE	

TRIGger[:IMMediate]

Purpose	Triggers the instrument on receipt of the command.	
Type	Event	
Command Syntax	TRIGger[:IMMediate]	
Command Parameters	None	
***RST Value**	N/A	
Query Syntax	None	
Query Parameters	N/A	
Query Response	N/A	
Description	The Trigger Immediate command performs the same function as the ****TRG*** command. This command takes effect only when the module is armed for a trigger. This command must wait long enough for pre-trigger samples to be acquired after arming the instrument. If the arm source and the trigger source are set to immediate, the data acquisition sequence is: *INITiate[:IMM], ARM, TRIGger*.	
Examples	**Command / Query**	**Response *(Description)***
	TRIG	
Related Commands	INITiate:DELay INITiate[:IMMediate] *TRG	

TRIGger:LEVel

Purpose	Sets the comparator level of the trigger signal.	
Type	Setting	
Command Syntax	TRIGger:LEVel <trigger_level>	
Command Parameters	<trigger_level> = Numeric ASCII value	
***RST Value**	0.0 V	
Query Syntax	TRIGger:LEVel?	
Query Parameters	None	
Query Response	Numeric ASCII value	
Description	The Trigger Level command sets the trigger level for the selected trigger source, given that the source is either the front panel external trigger input or the DSO measurement input. If the input trigger source is selected, the valid range for the trigger level is the entire input range at the selected gain (i.e. the 1 V range can have a trigger level from -1.0 V to +1.0 V). The external input has a range of -4 V to +4 V. The input trigger source is only available on the DSO input.	
Examples	**Command / Query**	**Response *(Description)***
	TRIG:LEV 0.5	*(Sets the trigger level to 0.5 V)*
	TRIG:LEV?	0.5 (*Indicates that the trigger level is set to 0.5 V)*
Related Commands	TRIGger:SLOPe TRIGger:SOURce VOLTage:RANGe	

TRIGger:SLOPe

Purpose	Specifies the slope of the Trigger Signal for the VM2601.	
Type	Setting	
Command Syntax	TRIGger:SLOPe <trig_slope>	
Command Parameters	<trig_slope> = POSitive | NEGative	
***RST Value**	POS	
Query Syntax	TRIGger:SLOPe?	
Query Parameters	None	
Query Response	POS | NEG	
Description	The Trigger Slope command selects the active edge for triggering the VM2601. Selecting the positive slope will require that the trigger input make a negative to positive transition through the trigger level, while a negative slope requires the trigger input to make a positive to negative transition.	
Examples	**Command / Query**	**Response *(Description)***
	TRIG:SLOP NEG	
	TRIG:SLOP?	NEG
	TRIG:SLOP POS	
	TRIG:SLOP?	POS
Related Commands	TRIGger:LEVel TRIGger:SOURce	

TRIGger:SOURce

Purpose	Selects the trigger source for the VM2601.	
Type	Setting	
Command Syntax	TRIGger:SOURce <trig_source>	
Command Parameters	<trig_source> = EXTernal | IMMediate | INPut | SYNC | TTLT<0-7>	
***RST Value**	IMMediate	
Query Syntax	TRIGger:SOURce?	
Query Parameters	None	
Query Response	Returns the value currently selected for the <trig_source> parameter	
Description	The Trigger Source command selects the source of input trigger for data capture. The query returns the source of the input trigger used for data capture.	
Examples	**Command / Query**	**Response *(Description)***
	TRIG:SOUR TTLT0	*(This sets the input trigger source to TTL Trigger 0.)*
	TRIG:SOUR?	TTLT 0
	TRIG:SOUR EXT	*(This sets the input trigger source to an external source.)*
	TRIG:SOUR?	EXT
Related Commands	TRIGger:LEVel TRIGger:SLOPe	

TRIGger:STATe?

Purpose	Query returns whether or not the VM2601 has been triggered	
Type	Setting	
Command Syntax	TRIGger:STATe <boolean>	
Command Parameters	<boolean> = 1 | 0	
***RST Value**	0	
Query Syntax	TRIGger:STATe?	
Query Parameters	None	
Query Response	Boolean ASCII value	
Description	This command returns the current state of the trigger mode. The valid states are: 0: Waiting for Trigger 1: Trigger has occurred	
Examples	**Command / Query**	**Response *(Description)***
	TRIG:STAT?	0 *(Device in waiting for trigger mode.)*
Related Commands	TRIGger:SLOPe TRIGger:SOURce VOLTage:RANGe	

REQUIRED SCPI COMMANDS

STATus:OPERation:CONDition?

Purpose	The STATus:OPERation:CONDition query returns the current operational status of the digitizer.
Type	Required SCPI query
Command Syntax	N/A
Command Parameters	N/A
***RST Value**	0
Query Syntax	STATus:OPERation:CONDition?
Query Parameters	N/A
Query Response	This query returns the operational condition register value.
Description	The STATus:OPERation:CONDition query returns the current operational status of the digitizer. The bit definitions of the value are (bit ( ) = the least significant bit):

Bit	Definition	Function
0	Calibrating	Set when any CALibration operation is running. Cleared when the CALibration operation is complete.
1	Setting	Set when the instrument changes its function or range. Cleared when the all circuitry has settled.
2	Ranging	Set when the instrument is auto-ranging. Cleared when the input range has been found.
3	Sweeping	Not used.
4	Measuring	Set when an INITiate command is executed. Cleared when the command is complete or aborted
5	Triggering	Not used.
6	Arming	Set when the instrument is waiting for an arm signal. Cleared when the arm is received.
7	Correcting	Set when the instrument is performing an auto-zero operation. Cleared when the auto-zero operation is complete.
8	Testing (User 1)	Set when the instrument is performing a self-test. Cleared when the self-test is complete.
9	Testing (User 2)	Set when the instrument is in the process of aborting an operation. Cleared when the abort is complete.
10	User 3	Not used
11	User 4	Not used
12	User 5	Reserved
13	Instrument Summary	Not used
14	Program Running	Not used
15	Reserved	Always 0

Example	**Command / Query**	**Response *(Description)***
	STAT:OPER:COND?	16 *(Making a measurement (0x010 hex)*
	STAT:OPER:COND?	3072 *(Measurement complete because of ABORt (0xC00 hex)*
Related Commands	MEASure?, READ?, INITiate, ABORt	

STATus:OPERation:ENABle

Purpose	Sets the Operation Status Register's enable register.	
Type	Required SCPI command	
Command Syntax	STATus:OPERation:ENABle <NRf>	
Command Parameters	<NRf> = numeric ASCII value from 0 to 32767	
***RST Value**	<NRf> must be specified	
Query Syntax	STATus:OPERation:ENABle?	
Query Parameters	N/A	
Query Response	<NRf> = Numeric ASCII value from 0 to 32767	
Description	This command enables bits in the Operation Status Register's enable register to report to the summary bit; sets Status Bytes register bit 7 to true. The query reports the bits enabled in the Operation Status Register's enable register, then clears the register contents and enters the value into the computer.	
Examples	**Command / Query**	**Response *(Description)***
	STAT:OPER ENAB 33 STAT:OPER:ENAB?	*(Enables bit 0 and bit 5)* 33 *(Indicates that bit 0 and 5 are enabled)*
Related Commands	STATus:OPERation:CONDition? STATus:OPERation[:EVENt]	

STATus:OPERation[:EVENt]?

Purpose	Queries the Operation Status Register's event register.	
Type	Required SCPI query	
Command Syntax	N/A	
Command Parameters	N/A	
***RST Value**	N/A	
Query Syntax	STATus:OPERation[:EVENt]?	
Query Parameters	N/A	
Query Response	0	
Description	Queries the bits set in the event register of the Operation Status Register. This command clears all bits in the event register.	
Examples	**Command / Query**	**Response *(Description)***
	STAT:OPER?	0
Related Commands	STATus:OPERation:CONDition? STATus:OPERation:ENABle?	

STATus:PRESet

Purpose	Presets the Status Registers.	
Type	Required SCPI command	
Command Syntax	STATus:PRESet	
Command Parameters	N/A	
***RST Value**	N/A	
Query Syntax	N/A	
Query Parameters	N/A	
Query Response	N/A	
Description	The Status Preset command presets the Status Registers. The Operational Status Enable Register is set to 0 and the Questionable Status Enable Register is set to 0. This command is provided for SCPI compliance only.	
Examples	**Command / Query**	**Response *(Description)***
	STAT:PRES	
Related Commands	N/A	

STATus:QUEStionable:CONDition?

Purpose	Queries the Questionable Status Condition Register.	
Type	Required SCPI query	
Command Syntax	N/A	
Command Parameters	N/A	
***RST Value**	N/A	
Query Syntax	STATus:QUEStionable:CONDition?	
Query Parameters	N/A	
Query Response	0	
Description	The Questionable Status Condition Register query is provided for SCPI compliance only. The VM2601 does not alter any bits in this register and a query always reports a 0.	
Examples	**Command / Query**	**Response *(Description)***
	STAT:QUES:COND?	0
Related Commands	N/A	

STATus:QUEStionable:ENABle

Purpose	Sets the Questionable Status Enable Register.	
Type	Required SCPI command	
Command Syntax	STATus:QUEStionable:ENABle <NRf>	
Command Parameters	<NRf> = numeric ASCII value from 0 to 32767	
***RST Value**	<NRf> must be supplied	
Query Syntax	STATus:QUEStionable:ENABle?	
Query Parameters	N/A	
Query Response	<NRf> = Numeric ASCII value from 0 to 32767	
Description	The command sets the bits in the Questionable Data/Signal Register's enable register to be reported to the summary bit (sets Status Byte Register bit 3 to true). The Status Questionable Enable query reports the contents of the Questionable Data/Signal Register's enable register, then clears the register contents and enters the value into the computer.	
Examples	**Command / Query**	**Response *(Description)***
	STAT:QUES:ENAB 64 STAT:QUES:ENAB?	 64
Related Commands	N/A	

STATus:QUEStionable[:EVENt]?

Purpose	Queries the Questionable Status Event Register.	
Type	Required SCPI query	
Command Syntax	N/A	
Command Parameters	N/A	
***RST Value**	N/A	
Query Syntax	STATus:QUEStionable[:EVENt]?	
Query Parameters	N/A	
Query Response	Decimal number	
Description	The query reports the bits set in the event register of the Questionable Data/Signal register. This command reads the event register, then clears all bits in the event register and enters the value into the computer.	
Examples	**Command / Query**	**Response *(Description)***
	STAT:QUES?	0
Related Commands	N/A	

SYSTem:ERRor?

Purpose	Queries the Error Queue.	
Type	Required SCPI command	
Command Syntax	None - Query Only	
Command Parameters	N/A	
***RST Value**	N/A	
Query Syntax	SYSTem:ERRor?	
Query Parameters	None	
Query Response	ASCII string	
Description	The System Error query is used to retrieve error messages from the error queue. The error queue will maintain two error messages. If additional errors occur, the queue will overflow and the second and subsequent error messages will be lost. In the case of an overflow, an overflow message will replace the second error message. See the *SCPI standard Volume 2: Command Reference* for details on errors and reporting them.	
Examples	**Command / Query**	**Response *(Description)***
	SYS:ERR?	-350, “Queue overflow”
Related Commands	None	

SYSTem:VERSion?

Purpose	Queries which version of the SCPI standard with which this module complies.	
Type	Required SCPI command	
Command Syntax	None - Query Only	
Command Parameters	N/A	
***RST Value**	N/A	
Query Syntax	SYSTem:VERSion?	
Query Parameters	None	
Query Response	Numeric ASCII value	
Description	The System Version query reports the version of the SCPI standard with which the VM2601 complies.	
Examples	**Command / Query**	**Response *(Description)***
	SYST:VERS?	1994.0
Related Commands	None	

ERROR MESSAGES

In the event that an error occurs during operation, an error message will appear. The following error messages may appear for the reasons stated below:

Generic Error	*An error has occurred for a reason other than those stated below*
Invalid Manufacturer's ID	*The instrument has an invalid manufacturer's ID.*
Invalid Model Code	*The model code for this instrument is invalid.*
Instrument Error	*An error from the driver generated when a command sent to the instrument is, in some way, invalid (i.e. misspelling, invalid parameter value, etc.)*
Device Not Ready	*An error from the driver indicating that the instrument was not ready.*
Invalid Input Source	*The<input source> parameter is defined incorrectly for INPut:SOURce. Either DSO or IFR are acceptable for the VM2601. Only DSO is acceptable for the VM2602 or VM2603.*
Invalid ADC Type	*The <config_adc> parameter is defined incorrectly for the CONFigure:ADC command. Either FAST, SLOW, or AUTO is acceptable.*
Invalid Sync Mode	*The <sync_mode> parameter is defined incorrectly for the SYNChronnize:MODE command. Either MASTer or SLAVe is acceptable.*
Invalid Mark Source	*The <mark_source_x> parameters are defined incorrectly for the COMBine:FEED command. Either GND, GPO, GP1 or OVR is acceptable for either parameter.*
Invalid Auto Re-Arm Setting	*The <boolean> parameter is defined incorrectly for the ARM:AUTO command. Either 0, 1, OFF, or ON is acceptable.*
Invalid Arm Source	*The <arm_source> parameter is defined incorrectly for the ARM:SOURce command. Either EXTernal, IMMediate, SYNC, or TTLT<0-7> is acceptable.*
Invalid Arm Slope	*The <arm_slope> parameter is defined incorrectly for the ARM:SLOPe command. Either POSitive or NEGative is acceptable.*
Invalid Trigger Source	*The <arm_source> parameter is defined incorrectly for the ARM:SOURce command. Either EXTernal, IMMediate, INPut, SYNC, or TTLT<0-7> is acceptable.*

Invalid Gain Setting	*The <adc_gain> or <dac_gain> parameter is defined incorrectly for the CALibration:DEFault:GAIN command. For<adc_gain>, x is acceptable and for <dac_gain>, y is acceptable.*
Invalid Filter Frequency	*The <filter_freq> parameter is defined incorrectly for the INPut:FILTer:FREQuency command. Either 20e6 or 40e6 is acceptable.*
Invalid Filter State	*The <boolean> parameter is defined incorrectly for the INPut:FILTer:STATe command. Either 0, 1, OFF, or ON is acceptable.*
Invalid Input Range	*The <input_range> parameter is defined incorrectly for the INPut:RANGe command. Either 0.5, 1.0, 2.0, 5.0, 10.0, or 20.0 is acceptable.*
Invalid Reference Oscillator Frequency	*The <osc_freq> parameter is defined incorrectly for the ROSCillator:FREQuency command. Either 1e6, 5e6, or 1e7 is acceptable.*
Invalid Reference Oscillator Source	*The <osc_source> parameter is defined incorrectly for the ROSCillator:SOURce command. Either BUS or EXTernal is acceptable.*
Invalid Register Value	*Indicates that a write to a register exceeds the maximum value the register can accomidate (e.g. a number greater than 255 is written to an 8-bit register.)*
Invalid Transition Filter Value	*Indicates that a write to a register exceeds the maximum value the register can accomidate (e.g. a number greater than 255 is written to an 8-bit register.)*
Max Error String	*The maximum length of the <string> parameter was exceeded. This parameter must be 12 characters or less.*

APPENDIX A

NOISE SPECIFICATION

HOW RMS NOISE IS CALCULATED

The VM2601 calculates root-mean-square voltage (*V rms*) on an "ac + dc" basis, but the noise specification is an "ac only" measurement. When calculated, a 50 Ω load is applied to the front end of the VM2601 and then two measurements are taken using the following commands: CALCulate:VOLTage:RMS? and CALCulate:VOLTage:MEAN?. These values, *V rms* and V_{Mean}, respectively, can then be used to calculate the noise value.

The short version is:

$$V_{Noise} = \sqrt{V_{rms}{}^2 - V_{Mean}{}^2} \quad \text{or} \quad V_{Noise} = \sqrt{(V_{rms} * V_{rms}) - (V_{Mean} * V_{Mean})}$$

Here is the derivation:

$$V_{Noise} = \sqrt{\sum \frac{(x_i - \bar{x})^2}{n}}$$ (this removes the average or dc from each term before squaring)

Next, a binomial expansion on the squared term in the summation is performed:

$$V_{Noise} = \sqrt{\frac{\sum x_i^2 - \sum 2x_i\bar{x} + \sum \bar{x}^2}{n}}$$

Since $\bar{x}$ is a constant, the following simplifications can be performed:

$$\sum 2x_i\bar{x} = 2\bar{x}\sum x_i \quad \text{and} \quad \sum \bar{x}^2 = n\bar{x}^2$$

If these values are substituted into the equation and the position of the last two terms are changed, and if three separate terms are created, the equation becomes:

$$V_{Noise} = \sqrt{\frac{\sum x_i^2}{n} + \frac{n\bar{x}^2}{n} - \frac{2\bar{x}\sum x_i}{n}}$$

In the second term, the "*n*"s cancel ($\frac{n}{n} = 1$). In the last term, $\frac{\sum x_i}{n} = \bar{x}$, making the equation:

$$V_{Noise} = \sqrt{\frac{\sum x_i^2}{n} + \bar{x}^2 - 2\bar{x}^2}$$

Next, the the last two terms are combind to produce:

$$V_{Noise} = \sqrt{\frac{\sum x_i^2}{n} - \bar{x}^2}$$

When the VM2601 makes an rms measurement, it does so in this manner:

$$V_{rms} = \sqrt{\frac{\sum x^2}{n}}$$

When it takes a mean measurement, it does so in this manner:

$$V_{Mean} = \frac{\sum x_i}{n} = \bar{x}$$

This means that V_{Noise} can be calculated as:

$$V_{Noise} = \sqrt{V_{rms}^2 - V_{Mean}^2} \text{ or } V_{Noise} = \sqrt{(V_{rms} * V_{rms}) - (V_{Mean} * V_{Mean})}\ .$$

INDEX

Symbol

A

B

C

T

V

W