TDS7000 Series
GPIB Programmer Online Guide

Printable version 1.0
Getting Started

Introduction

This programmer online guide provides you with the information you need to use GPIB commands for remotely controlling your instrument. With this information, you can write computer programs that will perform functions such as setting the front-panel controls, taking measurements, performing statistical calculations, and exporting data for use in other programs, such as spreadsheets.

The programmer guide is divided into the following major topics (books):

- **Getting Started.** This topic introduces you to the online help and provides basic information about setting up your instrument for remote control.
- **Command Syntax.** This topic provides an overview of the command syntax that you will use to communicate with the instrument and other general information about commands, such as how commands and queries are constructed, how to enter commands, constructed mnemonics, and argument types.
- **Command Groups.** This topic contains all the commands listed in functional groups. Each group consists of an overview of the commands in that group and a table that lists all the commands and queries for that group. You can click a command in the listing and a detailed description of the command will be displayed.
- **Status and Events.** This topic discusses the status and event reporting system for the GPIB interface. This system informs you of certain significant events that occur within the instrument. Topics that are discussed include registers, queues, event handling sequences, synchronization methods, and messages that the instrument may return, including error messages.
- **Miscellaneous.** This topic contains miscellaneous information, such as a list of reserved words, a table of the factory initialization (default) settings, and GPIB interface specifications that may be helpful when using GPIB commands to remotely control the instrument.

Setting Up Remote Communications

Before setting up your instrument for remote communications, you should familiarize yourself with the following GPIB requirements:

- A unique device address must be assigned to each device on the bus. No two devices can share the same device address.
- No more than 15 devices can be connected to any one line.
- One device should be connected for every 6 feet (2 meters) of cable used.
- No more than 65 feet (20 meters) of cable should be used to connect devices to a bus.
- At least two-thirds of the devices on the network should be powered on while using the network.
- Connect the devices on the network in a star or linear configuration. Do not use loop or parallel configurations.
Connecting to the Instrument
Your instrument has a 24-pin GPIB connector on its rear panel. This connector has a D-type shell and conforms to IEEE Std 488.1–1987. Attach an IEEE Std 488.1–1987 GPIB cable to this connector and to your controller as shown in the following figure.

If necessary, the GPIB connectors can be stacked as shown in the figure below.

Setting the GPIB Address
To function correctly, your instrument must have a unique device address. The default settings for the GPIB configuration are:

- GPIB Address 1
- GPIB Mode GPIB Talk/Listen

To change either of the GPIB settings, do the following:
1. Select GPIB Configuration… from the Utilities menu.
2. Click the Configuration Talk/Listen button.

3. Change the GPIB Address to a unique address.

4. Click the Close button.
The instrument is set up for bi-directional communication with your controller.

Documentation

In addition to this TDS7000 Series Programmer Online Guide, the following documentation is included with this instrument.

**User Manual.** The User Manual has information about installing and operating the Oscilloscope. It also provides concepts and theories about using the oscilloscope that are not covered in the online help.

**Quick Reference Guide.** A quick reference guide provides basic information on connecting a signal to the oscilloscope and displaying the results.

**TDS 7000 Series Online Help.** This is an online help system that is integrated with the User Interface application that ships with this product.

**Optional Service Manual.** A service manual is available as an optional accessory; it includes procedures to service the oscilloscope to module levels. It also includes performance verification procedures so you can verify performance to advertised specifications.
Command Syntax

Syntax Overview
You can control the operations and functions of the instrument through the GPIB interface using commands and queries. The related topics listed below describe the syntax of these commands and queries. The topics also describe the conventions that the instrument uses to process them. See the Command Groups topic in the table of contents for a listing of the commands by command group or use the index to locate a specific command.

Backus-Naur Form Notation
This documentation describes the commands and queries using Backus-Naur Form (BNF) notation. Refer to the following table for the symbols that are used.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;&gt;</td>
<td>Defined element</td>
</tr>
<tr>
<td>::=</td>
<td>Is defined as</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>{}</td>
<td>Group; one element is required</td>
</tr>
<tr>
<td>[]</td>
<td>Optional; can be omitted</td>
</tr>
<tr>
<td>. . .</td>
<td>Previous element(s) may be repeated</td>
</tr>
<tr>
<td>()</td>
<td>Comment</td>
</tr>
</tbody>
</table>
Command and Query Structure
Commands consist of set commands and query commands (usually called commands and queries). Commands modify instrument settings or tell the instrument to perform a specific action. Queries cause the instrument to return data and status information.
Most commands have both a set form and a query form. The query form of the command differs from the set form by its question mark on the end. For example, the set command ACQuire:MODe has a query form ACQuire:MODe?. Not all commands have both a set and a query form. Some commands have set only and some have query only.
Messages
A command message is a command or query name followed by any information the instrument needs to execute the command or query. Command messages may contain five element types, defined in the following table.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;Header&gt;</td>
<td>This is the basic command name. If the header ends with a question mark, the command is a query. The header may begin with a colon (:) character. If the command is concatenated with other commands, the beginning colon is required. Never use the beginning colon with command headers beginning with a star (*).</td>
</tr>
<tr>
<td>&lt;Mnemonic&gt;</td>
<td>This is a header subfunction. Some command headers have only one mnemonic. If a command header has multiple mnemonics, a colon (:) character always separates them from each other.</td>
</tr>
<tr>
<td>&lt;Argument&gt;</td>
<td>This is a quantity, quality, restriction, or limit associated with the header. Some commands have no arguments while others have multiple arguments. A &lt;space&gt; separates arguments from the header. A &lt;comma&gt; separates arguments from each other.</td>
</tr>
<tr>
<td>&lt;Comma&gt;</td>
<td>A single comma is used between arguments of multiple-argument commands. Optionally, there may be white space characters before and after the comma.</td>
</tr>
<tr>
<td>&lt;Space&gt;</td>
<td>A white space character is used between a command header and the related argument. Optionally, a white space may consist of multiple white space characters.</td>
</tr>
</tbody>
</table>
Commands
Commands cause the instrument to perform a specific function or change one of the settings. Commands have the structure:

[:]<Header>[<Space><Argument>[<Comma><Argument>]...]

A command header consists of one or more mnemonics arranged in a hierarchical or tree structure. The first mnemonic is the base or root of the tree and each subsequent mnemonic is a level or branch off the previous one. Commands at a higher level in the tree may affect those at a lower level. The leading colon (:) always returns you to the base of the command tree.
Queries
Queries cause the instrument to return status or setting information. Queries have the structure:

- [:]<Header>?
- [:]<Header>?[<Space><Argument>|<Comma><Argument>]
  ...

You can specify a query command at any level within the command tree unless otherwise noted. These branch queries return information about all the mnemonics below the specified branch or level. For example, HIStogram:STATistics:STDdev? returns the standard deviation of the histogram, while HIStogram:STATistics? returns all the histogram statistics, and HIStogram? returns all the histogram parameters.
Headers
You can control whether the instrument returns headers as part of the query response. Use the HEADer command to control this feature. If header is on, the query response returns command headers, then formats itself as a valid set command. When header is off, the response includes only the values. This may make it easier to parse and extract the information from the response. The table below shows the difference in responses.

<table>
<thead>
<tr>
<th>Query</th>
<th>Header Off</th>
<th>Header On</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIME?</td>
<td>&quot;14:30:00&quot;</td>
<td>:TIME &quot;14:30:00&quot;</td>
</tr>
<tr>
<td>ACQuire:NUMAVg?</td>
<td>100</td>
<td>:ACQUIRE:NUMAVG 100</td>
</tr>
</tbody>
</table>
Command Entry

Rules
The following rules apply when entering commands:

• You can enter commands in upper or lower case.
• You can precede any command with white space characters. White space characters include any combination of the ASCII control characters 00 through 09 and 0B through 20 hexadecimal (0 through 9 and 11 through 32 decimal).
• The instrument ignores commands consisting of any combination of white space characters and line feeds.
Abbreviating
You can abbreviate many instrument commands. Each command in this documentation shows the abbreviations in capitals. For example, you can enter the command ACQuire:NUMAvg simply as ACQ:NUMA or acq:numa.

Abbreviation rules may change over time as new instrument models are introduced. Thus, for the most robust code, use the full spelling.

If you use the HEADer command to have command headers included as part of query responses, you can further control whether the returned headers are abbreviated or are full-length with the VERBose command.
**Concatenating**

You can concatenate any combination of set commands and queries using a semicolon (;). The instrument executes concatenated commands in the order received.

When concatenating commands and queries, you must follow these rules:

1. Separate completely different headers by a semicolon and by the beginning colon on all commands except the first one. For example, the commands TRIGger:MODE NORMAL and ACQuire:NUMAVg 10, can be concatenated into the following single command:
   
   TRIGger:MODE NORMAL;ACQuire:NUMAVg 10

2. If concatenated commands have headers that differ by only the last mnemonic, you can abbreviate the second command and eliminate the beginning colon. For example, you can concatenate the commands ACQuire:MODE ENVelope and ACQuire:NUMAVg 10 into a single command:

   ACQuire:MODE ENVelope; NUMAVg 10
   The longer version works equally well:
   ACQuire:MODE ENVelope;:ACQuire:NUMAVg 10

3. Never precede a star (*) command with a colon:

   ACQuire:MODE ENVelope;*OPC

   Any commands that follow will be processed as if the star command was not there so the commands, ACQuire:MODE ENVelope;*OPC;NUMAVg 10 will set the acquisition mode to envelope and set the number of acquisitions for averaging to 10.

4. When you concatenate queries, the responses to all the queries are concatenated into a single response message. For example, if the display background color is white and the display foreground color is black, the concatenated query DISplay:COLOR:BACKGROUND?;FOREGround? will return the following.

   If the header is on:
   :DISPLAY:COLOR:BACKGROUND 7;:DISPLAY:COLOR:FOREGROUND 0
   If the header is off:
   7;0

5. Set commands and queries may be concatenated in the same message. For example, ACQuire:MODE SAMple;NUMAVg?:STATE?

   is a valid message that sets the acquisition mode to sample. The message then queries the number of acquisitions for averaging and the acquisition state. Concatenated commands and queries are executed in the order received.

Here are some invalid concatenations:

- DISPlay:STYle:NORMal;ACQuire:NUMAVg 10
  (no colon before ACQuire)
- DISPlay:COlor:CURSor1 1;CURSor2 5
  (extra colon before CURSor2; use DISPlay:COlor:CURSor1 1:CURSor2 5 instead)
- DISPlay:STYle:NORMal:*OPC
  (colon before a star (*) command)
- DISPlay:COlor:CURSor1 1;COlor:CURSor2 5
  (levels of the mnemonics are different; either remove the second use of COlor or place :DISPlay: in front of COlor:CURSor2 5)
Terminating
This documentation uses <EOM> (End of message) to represent a message terminator.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;EOM&gt;</td>
<td>Message terminator</td>
</tr>
</tbody>
</table>

The end-of-message terminator may be the END message (EOI asserted concurrently with the last data byte), the ASCII code for line feed (LF) sent as the last data byte, or both. The instrument always terminates messages with LF and EOI. It allows white space before the terminator. For example, it allows CR LF.
Clearing the Instrument

You can clear the Output Queue and reset the instrument to accept a new command or query by using the selected Device Clear (DCL) GPIB function. Refer to your GPIB library documentation for further details about the selected Device Clear operation.
Argument Types

Numeric
Many instrument commands require numeric arguments. The syntax shows the format that the instrument returns in response to a query. This is also the preferred format when sending the command to the instrument though any of the formats will be accepted. This documentation represents these arguments as follows:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;NR1&gt;</td>
<td>Signed integer value</td>
</tr>
<tr>
<td>&lt;NR2&gt;</td>
<td>Floating point value without an exponent</td>
</tr>
<tr>
<td>&lt;NR3&gt;</td>
<td>Floating point value with an exponent</td>
</tr>
</tbody>
</table>

Most numeric arguments will be automatically forced to a valid setting, either by rounding or truncating, when an invalid number is input unless otherwise noted in the command description.

Quoted String
Some commands accept or return data in the form of a quoted string, which is simply a group of ASCII characters enclosed by a single quote (') or double quote ("'). For example: "this is a quoted string". This documentation represents these arguments as follows:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;QString&gt;</td>
<td>Quoted string of ASCII text</td>
</tr>
</tbody>
</table>

A quoted string can include any character defined in the 7-bit ASCII character set. Follow these rules when you use quoted strings:
1. Use the same type of quote character to open and close the string. For example: "this is a valid string".
2. You can mix quotation marks within a string as long as you follow the previous rule. For example, "this is an 'acceptable' string".
3. You can include a quote character within a string simply by repeating the quote. For example: "here is a ""mark"".
4. Strings can have upper or lower case characters.
5. If you use a GPIB network, you cannot terminate a quoted string with the END message before the closing delimiter.
6. A carriage return or line feed embedded in a quoted string does not terminate the string, but is treated as just another character in the string.
7. The maximum length of a quoted string returned from a query is 1000 characters.

Here are some invalid strings:
* "Invalid string argument' (quotes are not of the same type)
* "test<EOI>" (termination character is embedded in the string)
Block
Several instrument commands use a block argument form (see the following table).

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;NZDig&gt;</td>
<td>A nonzero digit character in the range of 1–9</td>
</tr>
<tr>
<td>&lt;Dig&gt;</td>
<td>A digit character, in the range of 0–9</td>
</tr>
<tr>
<td>&lt;DChar&gt;</td>
<td>A character with the hexadecimal equivalent of 00 through FF (0 through 255 decimal)</td>
</tr>
<tr>
<td>&lt;Block&gt;</td>
<td>A block of data bytes defined as:</td>
</tr>
</tbody>
</table>
|          | <Block> ::= {#<NZDig><Dig>[<Dig>...][<DChar>...]
|          | [#0]<DChar>...<terminator>}                                             |

<NZDig> specifies the number of <Dig> elements that follow. Taken together, the <Dig> elements form a decimal integer that specifies how many <DChar> elements follow.
**Constructed Mnemonics**

Some header mnemonics specify one of a range of mnemonics. For example, a channel mnemonic can be CH1, CH2, CH3, or CH4. You use these mnemonics in the command just as you do any other mnemonic. For example, there is a CH1:POSition command, and there is also a CH2:POSition command. In the command descriptions, this list of choices is abbreviated as CH<x>.

**Cursor Position Mnemonics**

When cursors are displayed, commands may specify which cursor of the pair to use.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>CURSOR&lt;x&gt;</td>
<td>A cursor selector; &lt;x&gt; is either 1 or 2.</td>
</tr>
<tr>
<td>POSITION&lt;x&gt;</td>
<td>A cursor selector; &lt;x&gt; is either 1 or 2.</td>
</tr>
<tr>
<td>HPOS&lt;x&gt;</td>
<td>A cursor selector; &lt;x&gt; is either 1 or 2.</td>
</tr>
</tbody>
</table>

**Math Specifier Mnemonics**

Commands can specify the mathematical waveform to use as a mnemonic in the header.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH&lt;x&gt;</td>
<td>A math waveform specifier; &lt;x&gt; is 1 through 4.</td>
</tr>
</tbody>
</table>

**Measurement Specifier Mnemonics**

Commands can specify which measurement to set or query as a mnemonic in the header. Up to eight automated measurements may be displayed.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEAS&lt;x&gt;</td>
<td>A measurement specifier; &lt;x&gt; is 1 through 8.</td>
</tr>
</tbody>
</table>

**Channel Mnemonics**

Commands specify the channel to use as a mnemonic in the header.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH&lt;x&gt;</td>
<td>A channel specifier; &lt;x&gt; is 1 through 4.</td>
</tr>
</tbody>
</table>

**Reference Waveform Mnemonics**

Commands can specify the reference waveform to use as a mnemonic in the header.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>REF&lt;x&gt;</td>
<td>A reference waveform specifier; &lt;x&gt; is 1 through 4.</td>
</tr>
</tbody>
</table>
Commands

Acquisition Command Group

Acquisition Overview

You use the commands in the Acquisition Command Group to set up the modes and functions that control how the instrument acquires the signals you input to the channels and processes them into waveforms.

Using these commands for acquiring waveforms, you can do the following:

- Start and stop acquisitions.
- Control whether each waveform is simply acquired, averaged, or enveloped over successive acquisitions of that waveform.
- Set the controls or conditions that start and stop acquisitions.
- Determine the action the system takes upon completing an acquisition, such as saving all waveforms and taking a measurement when the acquisition is stopped.
- Control acquisition of acquired channel waveforms.
- Set acquisition parameters.
### Acquisition Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACQquire?</td>
<td>Returns acquisition parameters</td>
</tr>
<tr>
<td>ACQquire:MODe?</td>
<td>Returns acquisition mode</td>
</tr>
<tr>
<td>ACQquire:MODe</td>
<td>Sets acquisition mode</td>
</tr>
<tr>
<td>ACQquire:NUMACq?</td>
<td>Returns the number of acquisitions that have occurred</td>
</tr>
<tr>
<td>ACQquire:NUMAVg?</td>
<td>Returns number of acquisitions for an averaged waveform</td>
</tr>
<tr>
<td>ACQquire:NUMAVg</td>
<td>Sets number of acquisitions for an averaged waveform</td>
</tr>
<tr>
<td>ACQquire:NUMEnv?</td>
<td>Returns number of acquisitions for envelope waveform</td>
</tr>
<tr>
<td>ACQquire:NUMEnv</td>
<td>Sets number of acquisitions for envelope waveform</td>
</tr>
<tr>
<td>ACQquire:REPEt?</td>
<td>Returns whether repetitive signal acquisition mode on</td>
</tr>
<tr>
<td>ACQquire:REPEt</td>
<td>Enables or disables repetitive signal acquisition mode</td>
</tr>
<tr>
<td>ACQquire:STATE?</td>
<td>Returns acquisition state</td>
</tr>
<tr>
<td>ACQquire:STATE</td>
<td>Starts or stops acquisitions</td>
</tr>
<tr>
<td>ACQquire:STOPAfter?</td>
<td>Returns whether the acquisition is continuous or single sequence</td>
</tr>
<tr>
<td>ACQquire:STOPAfter</td>
<td>Sets whether the acquisition is continuous or single sequence</td>
</tr>
<tr>
<td>FASTAcq?</td>
<td>Returns the Fast Acquisition state</td>
</tr>
<tr>
<td>FASTAcq:STATE?</td>
<td>Returns the Fast Acquisition state</td>
</tr>
<tr>
<td>FASTAcq:STATE</td>
<td>Enables or disables Fast Acquisition mode</td>
</tr>
</tbody>
</table>
**ACQuire:MODe**

**Description**
This command sets or queries the acquisition mode of the oscilloscope. This affects all live waveforms. This command is equivalent to selecting Horizontal/Acquisition from the Horiz/Acq menu and then choosing the desired mode from the Acquisition Mode group box.

Waveforms are the displayed data point values taken from acquisition intervals. Each acquisition interval represents a time duration set by the horizontal scale (time per division). The oscilloscope sampling system always samples at the maximum rate and so an acquisition interval may include more than one sample. The acquisition mode (which you set using this ACQuire:MODe command) determines how the final value of the acquisition interval is generated from the many data samples.

**Group**
Acquisition

**Related Commands**
ACQuire:NUMAVg (see page 23), ACQuire:NUMEnv (see page 24), CURVe? (see page 467)

**Syntax 1**
`ACQuire:MODe{SAMple|PEAKdetect|HIRes|AVErage|ENVelope}

**Syntax 2**
`ACQuire:MODe?`

**Arguments**

- **SAMPle**
  Specifies that the displayed data point value is simply the first sampled value that is taken during the acquisition interval. In sample mode, all waveform data has 8 bits of precision. You can request 16 bit data with a CURVe? query but the lower-order 8 bits of data will be zero. **SAMPle** is the default mode. For more information about the CURVe query, see page 467.

- **PEAKdetect**
  Specifies the display of high-low range of the samples taken from a single waveform acquisition. The high-low range is displayed as a vertical column that extends from the highest to the lowest value sampled during the acquisition interval. **PEAKdetect** mode can reveal the presence of aliasing or narrow spikes.

- **HIRes**
  Specifies Hi Res mode where the displayed data point value is the average of all the samples taken during the acquisition interval. This is a form of averaging, where the average comes from a single waveform acquisition. The number of samples taken during the acquisition interval determines the number of data values that compose the average.

- **AVErage**
  Specifies averaging mode, in which the resulting waveform shows an average of SAMPle data points from several separate waveform acquisitions. The oscilloscope processes the number of waveforms you specify into the acquired waveform, creating a running exponential average of the input signal. The number of waveform acquisitions that go into making up the average waveform is set or queried using the ACQuire:NUMAVg command. For more information about the ACQuire:NUMACg command, see page 23.

- **ENVelope**
  Specifies envelope mode, where the resulting waveform shows the PEAKdetect range of data points from several separate waveform acquisitions. The number of waveform acquisitions that go into making up the envelope waveform is set or queried using the ACQuire:NUMENV command. For more information about the ACQuire:NUMENV command, see page 24.

**Example 1**
`ACQuire:MODe ENVelope`

Sets the acquisition mode to display a waveform that is an envelope of many individual waveform acquisitions.

**Example 2**

---
ACQuire:MODe?

This command might return :ACQuire:MODe AVERAGE, indicating that the displayed waveform is the average of the specified number of waveform acquisitions.
**ACQuire:NUMACq?**

**Description**
This query-only command returns the number of waveform acquisitions that have occurred since starting acquisition with the ACQuire:STATE RUN command. This value is reset to zero when any acquisition, horizontal, or vertical arguments that affect the waveform are changed. The maximum number of acquisitions that can be counted is $2^{63} - 1$. The oscilloscope stops counting when this number is reached. This is the same value that displays in the upper center of the screen when the acquisition system is stopped.

**Note:** In FastFrame or InstaVu modes, the oscilloscope updates the acquisition count in groups of counts.

**Group**
Acquisition

**Related Commands**
ACQuire:STATE (see page 26)

**Syntax**
ACQuire:NUMACq?

**Example**
ACQuire:NUMACq?
This command might return `:ACQUIRE:NUMACQ 350`, indicating that 350 acquisitions have occurred since executing the ACQuire:STATE RUN command.
ACQuire:NUMAVg

Description
This command sets or queries the number of waveform acquisitions that make up an averaged waveform. Use the ACQuire:MODe command to enable the Average mode. Sending this command is equivalent to selecting Horizontal/Acquisition Setup from the Horiz/Acq menu, selecting the Acquisition tab, and then choosing Average from the Acquisition Mode group box. Then enter the desired number of waveforms that will be used to make up an averaged waveform in the # of Wfms box.

Group
Acquisition

Related Commands
ACQuire:MODe (see page 20)

Syntax 1
ACQuire:NUMAVg <NRf>

Syntax 2
ACQuire:NUMAVg?

Arguments
- **NRf**
  This is the number of waveform acquisitions to average.

Example 1
ACQuire:NUMAVg 10

This command specifies that 10 waveform averages will be performed before exponential averaging starts.

Example 2
ACQuire:NUMAVg?

This command might return :ACQUIRE:NUMAVG 75, indicating that there are 75 acquisitions specified for averaging.
ACQuire:NUMEnv

Description
This command sets or queries the number of waveform acquisitions that make up an envelope waveform. Sending this command is equivalent to setting the Envelope count in the Acquisition Mode side menu.

Group
Acquisition

Syntax 1
ACQuire:NUMEnv {<NRf> | INFINite}

Syntax 2
ACQuire:NUMEnv?

Arguments
• NRf
  This is the number of waveform acquisitions to be enveloped.

Example 1
ACQuire:NUMenv 10
This command specifies that an enveloped waveform will show the result of combining 10 separately acquired waveforms.

Example 2
ACQuire:NUMenv?
This command might return :ACQUIRE:NUMENV 0, indicating that acquisitions are acquired infinitely for enveloped waveforms.
**ACQuire:REPEt**

**Description**
This command sets or queries whether repetitive mode is on or off. This is equivalent to setting Equivalent Time Auto/Off in the Acquisition control window. When the oscilloscope is in real-time operation, this setting has no effect.

The ACQuire:REPEt command specifies the behavior of the acquisition system during equivalent-time operation. When repetitive mode is on, the acquisition system will continue to acquire waveform data until the waveform record is filled with acquired data. When repetitive mode is off, horizontal scale and record length settings will be restricted to those settings that will be achievable with real-time acquisition.

**Group**
Acquisition

**Syntax 1**
ACQuire:REPEt {OFF|ON|<NR1>}

**Syntax 2**
ACQuire:REPEt?

**Arguments**
- **OFF**
  This argument disables repetitive mode.
- **ON**
  This argument enables repetitive mode.
- **NR1**
  A 0 disables repetitive mode; any other value enables repetitive mode.

**Example 1**
ACQUIRE:REPEt 1
This command enables repetitive mode.

**Example 2**
ACQuire:REPEt?
This query might return :ACQUIRE:REPEt OFF, indicating that repetitive mode is disabled.
ACQuire:STATE

Description
This command starts or stops acquisitions. When state is set to ON or RUN, a new acquisition will be started. If the last acquisition was a single acquisition sequence, a new single sequence acquisition will be started. If the last acquisition was continuous, a new continuous acquisition will be started.

If RUN is issued in the middle of completing a single sequence acquisition (for examples, averaging or enveloping), the acquisition sequence is restarted, and any accumulated data is discarded. Also, the oscilloscope resets the number of acquisitions. If the RUN argument is issued while in continuous mode, a reset occurs and acquired data continues to acquire.

Sending this command is equivalent to pressing the front-panel RUN/STOP button.

Group
Acquisition

Related Commands
ACQuire:STOPAfter (see page 27)

Syntax 1
ACQuire:STATE{OFF|ON|RUN|STOP|<NR1>}

Syntax 2
ACQuire:STATE?

Arguments
- OFF
  This argument stops acquisitions.
- STOP
  This argument stops acquisitions.
- ON
  This argument starts acquisitions.
- RUN
  This argument starts acquisitions.
- NR1
  0 stops acquisitions; any other value starts acquisitions.

Example 1
ACQuire:STATE RUN
This command starts the acquisition of waveform data and resets the count of the number of acquisitions.

Example 2
ACQuire:STATE?
This query might return :ACQUIRE:STATE 0, indicating that the acquisition is stopped
ACQuire:STOPAfter

Description
This command sets or queries whether the oscilloscope continually acquires acquisitions or acquires a single sequence. This command is equivalent to pressing SINGLE from the front-panel.

Group
Acquisition

Related Commands
ACQuire:STATE (see page 26), ACQuire:REPEt (see page 25)

Syntax 1
ACQuire:STOPAfter  {RUNSTop|SEQuence}

Syntax 2
ACQuire:STOPAfter?

Arguments
• RUNSTop
  Specifies that the oscilloscope will continually acquire data, if ACQuire:STATE is turned on.

• SEQuence
  Specifies that the next acquisition will be a single-sequence acquisition.

Example 1
ACQuire:STOPAfter RUNSTOP
This command sets the oscilloscope to continually acquire data.

Example 2
ACQuire:STOPAfter?
This query might return :ACQUIRE:STOPAFTER SEQUENCE, indicating that the next acquisition the oscilloscope makes will be of the single-sequence type.
**ACQuire?**

**Description**
This query-only command returns the following current acquisition parameters:

- Stop after
- Acquisition state
- Mode
- Number of envelopes
- Number of averages
- Repetitive signals

**Group**
Acquisition

**Related Commands**
ACQuire:MODE (see page 20), ACQuire:NUMACq (see page 22), ACQuire:NUMAVg (see page 23), ACQuire:NUMenv (see page 24), ACQuire:REPEt (see page 25), ACQuire:STATE (see page 26), ACQuire:STOPAfter (see page 27)

**Syntax**
ACQuire?

**Example**
ACQuire?
This query might return the following string for the current acquisition parameters:
:ACQUIRE:STOPAFTER RUNSTOP;STATE 1;MODE SAMPLE;NUMENV 10;NUMAVG 16;REPET ON
FASTAcq?

**Description**
This query-only command returns the state of Fast Acquisition. This command is equivalent to the FASTACQ button on the front panel.

**Group**
Acquisition

**Syntax**
FASTAcq?

**Example**
FASTAcq?

This query might return the following string for the current acquisition parameters:
:FASTACQ:STATE 0
**FASTAcq:STATE**

**Description**
This command sets or queries the state of Fast Acquisition. This command is equivalent to the FASTACQ button on the front panel.

**Group**
Acquisition

**Syntax 1**
`FASTAcq:STATE {ON|OFF|<NR1>}`

**Syntax 2**
`FASTAcq:STATE?`

**Arguments**
- **ON**
  This enables Fast Acquisition mode.
- **OFF**
  This disables Fast Acquisition mode.
- **<NR1>**
  A 0 disables Fast Acquisition mode; any other value enables Fast Acquisition mode.

**Example 1**
`FASTAcq:STATE ON`
This command enables the FastAcq operation.

**Example 2**
This query might return `:FASTACQ:STATE 1`, indicating that the Fast Acquisition state is currently active.
**Alias Command Group**

**Alias Overview**

Alias commands allow you to define new commands as a sequence of standard commands. You may find this useful when repeatedly using the same commands to perform certain tasks like setting up measurements.

Aliases are similar to macros but do not include the capability to substitute parameters into alias bodies. The alias mechanism obeys the following rules:

- The alias name must consist of a valid IEEE 488.2 message unit, which may not appear in a message preceded by a colon, comma, or a command or query program header.
- The alias name may not appear in a message followed by program date, a colon, comma, or question mark.
- An alias name must be distinct from any keyword or keyword short form.
- An alias name cannot be redefined without first being deleted using one of the alias deletion functions.
- Alias names do not appear in response messages.
- The Alias commands are defined in Tektronix Standard Codes and Formats. Deviations between that standard and what is specified here will be considered Phoenix errors unless specifically noted in the command description in this document.
## Alias Commands

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<th>Description</th>
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<td>ALIas:DELeTe:ALL</td>
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<td>ALIas:STATE?</td>
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</tr>
<tr>
<td>ALIas:STATE</td>
<td>Sets the alias state</td>
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</tbody>
</table>
**ALIas**

**Description**
This command sets or queries the state of alias functionality.

**Group**
Alias

**Related Commands**
ALIas:STATE (see page 39)

**Syntax 1**
ALIas {OFF|ON|<NR1>}

**Syntax 2**
ALIas?

**Arguments**
- **OFF**
  This turns Alias expansion off. If a defined alias is sent when ALIas:STATE is off, a command error (102) will be generated.

- **ON**
  This turns Alias expansion on. When a defined alias is received, the specified command sequence is substituted for the alias and executed.

- **NR1**
  A 0 disables Alias mode; any other value enables Alias mode.

**Example 1**
ALIas ON

This command turns the alias feature on. When a defined alias is received, the specified command sequence is substituted for the alias and executed.

**Example 2**
ALIas?

This query might return the following string for the current alias state:
:ALIAS:STATE 1
ALias:CATalog?

Description
This query-only command returns a list of the currently defined alias labels, separated by commas. If no aliases are defined, the query returns the string "".

Group
Alias

Syntax
ALIAS:CATalog?

Example
ALIAS:CATalog?

This query might return the string :ALIAS:CATALOG "SETUP1", "TESTMENU1", "DEFAULT", showing that there are three aliases named SETUP1, TESTMENU1, and DEFAULT.
Alias:DEFINE

Description
This command assigns a sequence of program messages to an alias label. These messages are then substituted for the alias whenever it is received as a command or query, provided that Alias:STATE has been turned on. The query form of this command returns the definitions of a selected alias.

Note: Attempting to give two aliases the same name causes an error. To give a new alias the name of an existing alias, the existing alias must first be deleted.

Group
Alias

Related Commands
Alias:STATE (see page 39)

Syntax 1
Alias:DEFINE <Qstring><,>{<Qstring>|<Block>}

Syntax 2
Alias:DEFINE?

Arguments
• The first <Qstring> is the alias label.
  This label cannot be a command name. Labels must start with a letter and can contain letters, numbers, and underscores; other characters are not allowed. The label must be less than or equal to 12 characters.

• The second <Qstring> or <Block> is a complete sequence of program messages.
  The messages can contain only valid commands that must be separated by semicolons and must follow all rules for concatenating commands. The sequence must be less than or equal to 256 characters.

Example 1
Alias:DEFINE "ST1",":RECALL:SETUP 5;:AUTOSET EXECUTE;:SELECT:CH1 ON"

This command defines an alias named "ST1" that sets up the oscilloscope.

Example 2
Alias:DEFINE? "ST1"

This command returns :ALIAS:DEFINE "ST1",#246
:RECALL:SETUP 5;:AUTOSET EXECUTE;:SELECT:CH1 ON
**ALias:DELEte**

**Description**
This command removes a specified alias and is identical to ALias:DELEte:NAME. An error message is generated if the named alias docs do not exist.

**Group**
Alias

**Related Commands**
*ESR? (see page 36), ALias:DELEte:ALL (see page 37)

**Syntax**
ALias:DELEte <Qstring>

**Argument**
- `<Qstring>`
  This is the name of the alias to be removed. Using ALias:DELEte without specifying an alias causes an execution error. `<Qstring>` must be a previously defined value.

**Example**
ALias:DELEte "SETUP1"

This command deletes the alias named SETUP1.
**ALIAS:DELETE:ALL**

**Description**
This command deletes all existing aliases.

**Group**
Alias

**Related Commands**
ALIAS:DELETE (see page 36), ALIAS:DELETE:NAME (see page 38)

**Syntax**
ALIAS:DELETE:ALL

**Example**
ALIAS:DELETE:ALL

This command deletes all existing aliases.
**ALIas:DELEte:NAMe**

**Description**
This command removes a specified alias. An error message is generated if the named alias does not exist. This command is identical to ALIas:DELEte.

**Group**
Alias

**Syntax**
ALIas:DELEte:NAMe <Qstring>

**Argument**
- `<Qstring>`
  
  This is the name of the alias to remove. Using ALIas:DELEte:NAMe without specifying an alias causes an exception error. `<Qstring>` must be a previously defined alias.

**Example**
ALIas:DELEte:NAMe "STARTUP"

This command deletes the alias named STARTUP.
** Alias:STATE **

**Description**
This command turns aliases on or off and is identical to the ALIas command. The query form of this command returns the state of the aliases.

**Group**
Alias

**Syntax 1**
```
ALIas:STATE {OFF|ON|<NR1>}
```

**Syntax 2**
```
ALIas:STATE?
```

**Arguments**
- **OFF**
  This turns alias expansion off. If a defined alias is sent when ALIas:STATE is OFF, the instrument generates a command error (102).
- **ON**
  This turns alias expansion on. When a defined alias is received, the specified command sequence is substituted for the alias and executed.
- **<NR1>**
  A 0 turns off aliases; any other value turns on aliases.

**Example 1**
```
ALIas:STATE OFF
```
This command turns off the alias feature.

**Example 2**
```
ALIas:STATE?
```
This query might return :ALIAS:STATE ON, indicating that alias expansion is currently turned on.
Calibration Command Group

Calibration Overview

The calibration commands provide information about the current state of calibration for the mainframe and all resident sampling head channels.

Calibration Commands

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<td>Returns status of all calibration subsystems without performing an SPC operation</td>
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<tr>
<td>CALibrate:RESULTS:SPC?</td>
<td>Returns the results of the last SPC operation</td>
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</tbody>
</table>
*CAL?

Description
This query-only command instructs the digitizing oscilloscope to perform a signal path compensation and returns its calibration status. This command is equivalent to selecting Instrument Calibration from the Utilities menu and then clicking the Calibrate button.

   Note:  The self-calibration can take several minutes to respond. No other commands will be executed until calibration is complete.

Group
Calibration

Related Commands
CALibrate:RESuIts_SPC? (see page 44)

Syntax
*CAL?

Example
*CAL?

This query performs an internal self-calibration that returns *CAL 0 to indicate that the calibration was successful or nonzero to indicate a failure.
CALibrate:RESults?

Description
This query-only command returns the status of all the calibration subsystems, without performing an SPC operation. The results returned do not include the calibration status of attached probes. The CALibration:RESults? Query is intended to support GO/NoGO testing of the oscilloscope’s calibration readiness: all returned results should indicate Pass status if the oscilloscope is "fit for duty". It is quite common, however, to use uncalibrated probes (particularly when the oscilloscope inputs are connected into a test system with coax cables). Not including the probe cal results prompts the instrument to perform a simple "every returned status field must be Pass" test.

This command is equivalent to selecting Instrument Calibration from the Utilities menu and then viewing the contents of the Status field.

Group
Calibration

Related Commands
*CAL? (see page 41)

Syntax
CALibrate:RESults?

Example
CALibrate:RESults?

This query returns the status of all the calibration subsystems. The query might return
:CALIBRATE:RESULTS:SPC PASS;VOLTAGE PASS;FREQUENCY PASS;TRIGGER PASS
CALibrate:PRObestate:CH<x>?

Description
This query-only command returns the status of probe calibration of a given channel's probe, which can be Pass (0), Initialized (1), Fail (-1), or Running (2). This command is equivalent to selecting Probe Cal from the Vertical menu.

Group
Calibration

Related Commands
CH<x>:PROBECal? (see page 439)

Syntax
CALibrate:PRObestate:CH<x>?

Example
CALibrate:PRObestate:CH1?

This query returns the status of the probe calibration of a given channel's probe. A query might return :CALIBRATE:PROBESTATE:CH1 0, indicating that the probe calibration passed.
CALibrate:RESults:SPC?

Description
This query-only command returns the results of the last SPC operation. However, this query does not cause an SPC to be run. This command is equivalent to selecting Instrument Calibration from the Utilities menu.

Group
Calibration

Related Commands
*CAL? (see page 41)

Syntax
CALibrate:RESults:SPC?

Arguments
None.

Example
CALibrate:RESults:SPC?
This query returns the results of the last SPC operation.
Cursor Command Group

Cursor Overview

You use the commands in the Cursor Command Group to control the cursor display and readout. You can use these commands to control the setups for cursor 1 and cursor 2, such as waveform source, cursor position, and cursor color.

You can also use the commands to select one of the following cursor functions:

- Off—shuts off the display of all cursors.
- Vertical Bars—displays vertical bar cursors, which provide traditional horizontal unit readouts for Cursor 1 (bar1), Cursor 2 (bar2), the delta between them, and 1/delta (results in frequency when the horizontal unit is time).
- Horizontal Bars—displays horizontal bar cursors, which provide traditional vertical unit readouts for Cursor 1 (bar1), Cursor 2 (bar2), and the delta between them.
- Paired Cursors—displays measurement of horizontal (time) and vertical (voltage) difference between paired cursors; voltage at the vertical position of the specified paired cursor; horizontal position of the specified paired cursor; and measurement units for the paired cursors.
- Split Cursors—displays measurement of horizontal (time) and vertical (voltage) difference between split cursors; voltage at the vertical position of the specified split cursor; horizontal position of the specified split cursor; and measurement units for the split cursors.
## Cursor Commands

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<tr>
<td>Command</td>
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<tr>
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<td>Returns difference between vbar cursors</td>
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<tr>
<td>CURSor:VBArS:POSITION&lt;x&gt;</td>
<td>Returns vbar and paired cursor&lt;x&gt; positions</td>
</tr>
<tr>
<td>CURSor:VBArS:POSITION&lt;x&gt;</td>
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<tr>
<td>CURSor:VBArS:UNIts</td>
<td>Sets the units for the vbar cursors</td>
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</tbody>
</table>
CURSor?

Description
This query-only command returns all of the current cursor settings.

Group
Cursor

Syntax
CURSor?

Example: CURSOR?
This query might return the following as the current cursor settings:

;CURSOR:STATE OFF;FUNCTION VBARS;MODE INDEPENDENT
;SOURCE CH1;VBARS:UNITS SECONDS;POSITION1 -8.0000E-07
;POSITION2 8.0000E-07;CURSOR:HBARS:POSITION1 3.0000E-01
;POSITION2 -3.0000E-01;UNITS BASE;CURSOR:PAIRED
;POSITION1 -8.0000E-07;POSITION2 8.0000E-07;UNITS BASE;
;CURSOR:SPLIT:POSITION1 -8.0000E-07;POSITION2 8.0000E-07
;SOURCE2 CH1;UNITS BASE
CURSor:FUNCtion

Description
This command selects or queries the cursor type. Sending this command is equivalent to selecting Cursor Type from the Cursor menu and then choosing from the drop-down list.

Group
Cursor

Related Commands
CURSor:STAte (see page 59)

Syntax 1
CURSor:FUNCtion {HBArs|OFF|VBArs|PAIred|SPLit}

Syntax 2
CURSor:FUNCtion?

Arguments
- HBArs
  Specifies horizontal bar cursors, which measure in vertical units.
- OFF
  Removes the cursors from the display but does not change the cursor type.
- VBArs
  Specifies vertical bar cursors, which measure in horizontal units.
- PAIred
  Specifies paired cursors that measure in both horizontal and vertical units.
- SPLit
  Specifies split cursors, which measure horizontal and vertical units across two waveforms.

Example 1
CURSOR:FUNCtion VBARS
This command selects vertical bar type cursors.

Example 2
CURSOR:FUNCtion?
This query might return :CURSOR:FUNCTION HBARS, indicating that the horizontal bar cursors are currently selected.
CURSor:HBArs?

Description
This query-only command returns the current settings for the horizontal bar cursors.

Group
Cursor

Syntax
CURSor:HBArs?

Example
CURSor:HBArs?

This command might return :CURSOR:HBARS:POSITION1 320.0000E-03;POSITION2-320.0000E-03;UNITS BASE
CURSor:HBArs:DELTa?

Description
This query-only command returns the vertical difference between the two horizontal bar cursors.

Group
Cursor

Syntax
CURSor:HBArs:DELTa?

Returns
<NR3>

Example
CURSOR:HBArs:DELTa?
This command might return CURSOR:HBARs:DELTA 5.0800E+00, indicating that the voltage difference between the two cursors is 5.08 V.
CURSor:HBArs:POSITION<x>

**Description**
This command specifies or queries the horizontal bar cursor position relative to ground, which is expressed in vertical units (usually volts). This command is the equivalent of selecting Cursor Position from the Cursors menu, selecting the H Bars Cursor Type and then viewing or editing the desired cursor position.

**Group**
Cursor

**Syntax 1**
CURSor:HBArs:POSITION<x> <NRf>

**Syntax 2**
CURSor:HBArs:POSITION<x>?

**Argument**
- <NR3>
  Specifies the cursor position relative to ground.

**Example 1**
CURSOR:HBARS:POSITION1 25.0E-3
Positions one of the horizontal cursors at 25 mV.

**Example 2**
CURSOR:HBARS:POSITION2?
This query might return :CURSOR:HBARS:POSITION2 -64.0000E-03, indicating that one of the horizontal bar cursors is at -64 mV.
CURSor:HBArs:UNIts?

Description
This query-only command returns the units for the horizontal bar cursors.

Group
Cursor

Syntax
CURSor:HBArs:UNIts?

Example
CURSor:HBArs:UNIts?

This query might return :CURSOR:HBAR:UNITS BASE indicating that the units for the horizontal bar cursors are base.
CURSor:MODe

Description
This command sets or queries whether the two cursors move together in unison or separately. This command is the equivalent of selecting Cursor Mode from the Cursor menu and then choosing from the drop-down list.

Group
Cursor

Syntax 1
CURSor:MODe {TRACk|INDependent}

Syntax 2
CURSor:MODe?

Arguments
• TRACk
  This ties the navigational functionality of these two cursors together.
  For cursor 1 adjustments, this ties the movement of the two cursors together. However, cursor 2 continues to move independently of cursor 1.

• INDependent
  This frees the two cursors to be independently adjusted.

Example 1
CURSor:MODe TRACk
Specifies that the cursor positions move in unison.

Example 2
CURSor:MODe?
This query might return :CURSOR:MODE TRACK indicating that the two cursors move in unison.
CURSor:PAIred

Description
This command positions the active paired cursor to the position defined by the DATa:STARt or DATa:STOP command. This query returns the current paired cursor settings.

Group
Cursor

Related Commands
DATa:STARt (see page 473), DATa:STOP (see page 474)

Syntax 1
CURSor:PAIred SNAP

Syntax 2
CURSor:PAIred?

Arguments
• SNAP
This positions the paired cursors at DATa:STARt and DATa:STOP.

Returns
A string for horizontal units and two floating point values with an exponent for cursor1 position and cursor2 position.

Example 1
CURSor:PAIred SNAP

Specifies the positions of the cursors at the current DATa:STARt and DATa:STOP values.

Example 2
CURSor:PAIred?

This query might return: CURSOR:PAIRED:POSITION1 -2.0000E-03; POSITION2 2.0000E-03; UNITS BASE
CURSor:PAIred:HDELTA?

Description
This query-only command returns the vertical difference between the cursor1 and cursor2 paired cursors. This is the absolute value of the vertical position for cursor1 minus the vertical position for cursor2.

Group
Cursor

Related Commands
CURSor:SPLit:HDELTA? (see page 63)

Syntax
CURSor:PAIred:HDELTA?

Returns
<NR3>

Example
CURSor:PAIred:HDELTA?
This query might return CURSOR:PAIRED:HDELTA 5.0800E+00, indicating that the voltage difference between the two cursors is 5.08 V.
CURSor:PAIred:HPOS<x>?  

Description  
This query-only command returns the voltage at the vertical position of the cursor<x> paired cursor. The paired cursor can be either 1 or 2.  

Group  
Cursor  

Related Commands  
CURSor:FUNCtion (see page 49)  

Syntax  
CURSor:PAIred:HPOS<x>?  

Returns  
A floating point value that indicates the vertical position of the selected paired cursor.  

Example  
CURSor:PAIred:HPOS1?  
This query might return CURSOR:PAIRED:HPOS1 -64.0000E-03, indicating that the vertical position of cursor1 is at -64 mV.
CURSor:PAIred:POSITION<x>

Description
This command sets or queries the horizontal position (typically in time) of the cursor<x> paired cursor. This command is equivalent to selecting Cursor Position from the Cursors menu and then viewing or editing the desired cursor position.

Group
Cursor

Related Commands
CURSor:FUNCtion (see page 49)

Syntax 1
CURSor:PAIred:POSITION<x> <NRF>

Syntax 2
CURSor:PAIred:POSITION<x>?

Argument
• <NRF>
  This specifies the horizontal position of the cursor<x> paired cursor, which ranges from 1 to 2. The cursor position can appear in units of base or 1/base.

Example 1
CURSor:PAIred:POSITION1 9.0000E-06

This command specifies that the first paired cursor is at 9 µs.

Example 2
CURSor:PAIred:POSITION1?

This query might return :CURSOR:PAIRED:POSITION 1.0000E-06, indicating that the first paired cursor is at 1 µs.
CURSor:PAIred:UNIts?

Description
This query-only command requests the units for the paired cursors.

Group
Cursor

Syntax
CURSor:PAIred:UNIts?

Returns
The unit of measurement.

Example
CURSor:PAIred:UNIts?

This query might return: :CURSOR:PAIRED:UNITS BASE, indicating that base is the unit of measure.
CURSor:PAIred:VDELTA?

Description
This query-only command requests the Vbar (time) distance between paired cursors. It returns the absolute value of the first cursor less the second cursor horizontal positions. The position can appear in units of base and 1/base.

Group
Cursor

Syntax
CURSor:PAIred:VDELTA?

Returns
<NR3>

Example
CURSor:PAIred:VDELTA?

This query might return :CURSOR:PAIRED:VDELTA 1.0640E+00, indicating that time between the paired cursors is 1.064 s.
CURSor:SOUrce

Description
This command sets and queries the source for horizontal bar, vertical bar and paired cursors, and both sets and queries the source for split cursor1. This command is equivalent to selecting Cursor Setup from the Cursor menu and then choosing the desired cursor source.

Group
Cursor

Related Commands
CURSor:SPLit:SOURCE2 (see page 56)

Syntax 1
CURSor:SOUrce {CH<x>|MATH<x>|REF<x>}

Syntax 2
CURSor:SOUrce?

Arguments
- CH<x>
  This is an input channel waveform. The valid channel waveform range is from 1 through 4.

- MATH<x>
  This is a math waveform. The valid math waveform range is from 1 through 4.

- REF<x>
  This is a reference waveform. The valid reference waveform range is from 1 through 4.

Returns
Any valid waveform.

Example 1
CURSor:SOUrce CH2
This command sets the cursor source to channel2.

Example 2
CURSor:SOUrce?
This query might return CURSor:SOURce CH2, indicating that the cursor source is channel2.
CURSor:SPLit

Description
This command positions the Split cursors to positions defined by DATa:STARt and DATa:STOP (or maximum record length, if DATa:STOP is greater than the maximum record length). The query form of this command returns the units, positions and second source of the split cursors.

Group
Cursor

Related Commands
DATa:STARt (see page 473), DATa:STOP (see page 474)

Syntax 1
CURSor:SPLit SNAP

Syntax 2
CURSor:SPLit?

Argument

• SNAP
  This specifies that the vertical bar cursor positions will snap to DATa:STARt and DATa:STOP.

Example 1
CURSor:SPLit SNAP
This command specifies that the cursor positions will snap to DATa:STARt and DATa:STOP positions.

Example 2
CURSor:SPLit?
This query might return: :CURSOR:SPLIT:POSITION1 -1.9992E+01
:POSITION2 -1.7996E+01;SOURCE2 CH1;UNITS BASE.
CURSor:SPLit:HDELTA?

Description
This query-only command returns the vertical (volts) difference between cursor1 and cursor2. These values are represented on screen by the "X" markers (placed where the cursor marker and the waveform intersect).

Group
Cursor

Syntax
CURSor:SPLit:HDELTA?

Example
CURSor:SPLit:HDELTA?

This query might return :CURSOR:SPLIT:HDELTA 3.1400E+00, indicating that the vertical difference between two split cursors is 3.14 V.
CURSor:SPLit:HPOS<x>?

Description
This query-only command returns the vertical position of cursor<x> (i.e., that point where the Vbar intersects with the waveform), which can be specified as 1 or 2.

Group
Cursor

Related Commands
CURSor:SPLit:HDELTA (see page 63)

Syntax
CURSor:SPLit:HPOS<x>?

Example
CURSor:SPLit:HPOS1?

This query might return :CURSOR:SPLIT:HPOS1 2.5400E+00, indicating that the vertical position of cursor1 and cursor2 is 2.54 V.
CURSor:SPLit:POSITION<x>

Description
This command returns or sets the horizontal position of the cursor<x> vertical bar markers. This command is equivalent to selecting Cursor Setup from the Cursors menu and then entering the desired Cursor Position.

Group
Cursor

Syntax 1
CURSor:SPLit:POSITION<x>; <NRf>

Syntax 2
CURsor:SPLit:POSITION<x>?

Argument

• <NRf>
This specifies the horizontal position of the cursor<x> cursor, which ranges from 1 to 2. The cursor position can appear in units of base or 1/base.

Example 1
CURSor:SPLit:POSITION2 350E-6
This command sets the position of cursor2 to 350 µs.

Example 2
CURSor:SPLit:POSITION1?
This query might return :CURSOR:SPLIT:POSITION1 -204.0000E-09, indicating the position of cursor1 is 204 ns.
CURSor:SPLit:SOURCE2

This command sets or returns the source waveform associated with split cursor2. This command is equivalent to selecting Cursor Setup from the Cursors menu and then entering the desired Cursor 2 Source.

**Group**
Cursor

**Related Commands**
CURSor:SOUrce (see page 61)

**Syntax 1**
CURSor:SPLit:SOURCE2

**Syntax 2**
CURSor:SPLit:SOURCE2?

**Arguments**

- CH<x>
  This is an input channel. The valid channel waveform range is from 1 through 4.

- MATH<x>
  This is a math waveform. The valid math waveform range is from 1 through 4.

- REF<x>
  This is a reference waveform. The valid reference waveform range is from 1 through 4.

**Example 1**
CURSor:SPLit:SOURCE2 CH3

This command sets cursor2 source to Channel3.

**Example 2**
CURSor:SPLit:SOURCE2?

This query might return :CURSOR:SPLIT:SOURCE2 MATH2, indicating that the source associated with cursor2 is Math2.
CURSor:SPLit:UNIts

**Description**
This command returns or sets the amplitude units of the split cursors.

**Group**
Cursor

**Syntax 1**
CURSor:SPLit:UNIts

**Syntax 2**
CURsor:SPLit:UNIts?

**Example 1**
CURSor:SPLit:UNIts BASE
This command sets the amplitude units of the split cursors to base.

**Example 2**
CURSor:SPLit:UNIts?
This query would return :CURSOR:SPLIT:UNITS BASE, indicating that base is the current setting for split cursor amplitude units.
CURSOr:SPLit:VDELTA?

Description
This command returns the horizontal (time) difference between the split cursors. It returns the absolute value of the first cursor less the second cursor horizontal positions. Note that the split cursor values are for source1 and source2, and the sources can be located on different waveforms. The position can appear in units of base and 1/base.

Group
Cursor

Syntax
CURsor:SPLit:VDELTA?

Example
CURSor:SPLit:VDELTA?

This command might return :CURSOR:SPLIT:VDELTA 1.0640E+00, indicating that the time between the vertical bar cursors is 1.064 s.
CURSor:STATE

Description
This command sets or returns the state of the cursor. The cursor can either be turned on or off. Note that setting the cursor state does not modify the cursor type. This command is equivalent to pressing the CURSOR button on the front panel.

Cursor

Related Commands
CURSor:FUNCtion OFF (see page 49)

Syntax 1
CURSor:STATE {ON|OFF}

Syntax 2
CURSor:STATE?

Arguments

• ON
  This activates the cursor on display.

• OFF
  This removes the cursor from display.

Example 1
CURSor:STATE ON
This command displays the cursor.

Example 2
CURSor:STATE?
This query might return :CURSOR:STATE ON, indicating that the cursor is active on the display.
CURSor:VBArS

Description
This command positions the vertical bar cursor to the position defined by DATa:STARt or DATa:STOP. This query returns the current vertical bar settings for horizontal position and units.

Group
Cursor

Related Commands
DATa:STARt (see page 473), DATa:STOP (see page 474)

Syntax 1
CURSor:VBArS?

Syntax 2
CURSor:VBArS SNAP

Argument
• SNAP
This positions the vertical bar cursors at DATa:STARt and DATa:STOP.

Example 1
CURSor:VBArS?
This query might return :CURSOR:VBARS:UNITS SECONDS;POSITION1 1.0000E-06;POSITION2 9.0000E-06

Example 2
CURSor:VBArS SNAP
This command positions the vertical bar cursor to the position defined by DATa:STARt or DATa:STOP.
CURSor:VBArs:DELTa?

Description
This query-only command returns the difference between the two vertical bar cursors. The units are specified by the CURSor:VBArs:UNIts command. The position can appear in units of Base or 1/Base.

Group
Cursor

Related Commands
CURSor:VBArs:UNIts (see page 73)

Syntax
CURSor:VBArs:DELTa?

Returns
A floating point value with an exponent.

Example
CURSor:VBArs:DELTa?
This command might return :CURSOR:VBARS:DELTA 1.0640E+00, indicating that the time between the vertical bar cursors is 1.064 s.
CURSor:VBAr:s:POSITION<x>

Description
This command sets or queries the horizontal position for both vertical bar and paired cursors. Values are with respect to trigger position or the zero reference point for the designated waveform (if horizontal units are not set to Time). Use the CURSor:VBAr:s:UNIts command to specify units. The position can appear in units of base or 1/base.

This command is the equivalent of selecting Cursor Setup from the Cursors menu, selecting the V Bars Cursor Type and then viewing or editing the desired cursor position.

Group
Cursor

Related Commands
CURSor:VBAr:s:UNIts (see page 73)

Syntax 1
CURSor:VBAr:s:POSITION<x> <NRf>

Syntax 2
CURSor:VBAr:s:POSITION<x>?

Argument
<NRf>
Specifies the cursor position.

Returns
A floating point value with an exponent.

Example 1
CURSor:VBAr:s:POSITION2 9.00E-6
Positions the cursor2 vertical bar cursors at 9 ms.

Example 2
CURSor:VBAr:s:POSITION1?
This command might return CURSOR:VBARS:POSITION1 1.0000E-06, indicating the cursor1 vertical bar is at 1 ms.
CURSor:VBArs:UNIts

**Description**
This command sets or queries the units for the vertical bar cursors.

**Group**
Cursor

**Syntax 1**
CURSor:VBArs:UNIts

**Syntax 2**
CURSor:VBArs:UNIts?

**Arguments**
- **SECOnds**
  Fix the units for the VBArs for time domain.

- **HERtz**
  Fix the units for the VBArs for frequency domain.

**Returns**
A string for SECOnds or HERTz, depending upon current vertical bar cursor units.

**Example 1**
CURSor:VBArs:UNIts HERTz
Sets the units for the VBArs cursors to 1/seconds.

**Example 2**
CURSor:VBArs:UNIts?
This command might return :CURSOR:VBAR: UNITS SECONDS, indicating that the units for the vertical bar cursor are currently set to seconds.
Diagnostics Command Group

Diagnostics Overview

You use the commands in the Diagnostic Command Group to control the selection and execution of diagnostic tests. You can use Test functions to select and execute an item at any level of the test hierarchy. Control functions allow controls for diagnostic execution to be set. RSI-like functions provide the same capability of selecting and running diagnostic tests that are normally available from the RSI.
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<td>Returns a more explanatory message about the results of the last test execution</td>
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<td>TEST:STOP</td>
<td>Terminates the execution of the test</td>
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**DIAg:CONTROL:HALT**

**Description**
This command (no query form) determines whether the next execution of diagnostics will stop on the first diagnostic failure that occurs or will execute the selected set of diagnostic functions. This command is equivalent to selecting Instrument Diagnostics from the Utilities menu and then enabling Halt on Fail.

**Group**
Diagnostics

**Related Commands**
DIAg:CONTROL:LOOP (see page 78)

**Syntax**
DIAg:CONTROL:HALT (ON|OFF|<NR1>)

**Arguments**
- **ON**
  - This enables the halt function, causing the execution of diagnostics to halt at the first diagnostic failure that occurs.
- **OFF**
  - This disables the halt function, allowing the oscilloscope to execute the entire set of diagnostics before halting, even if diagnostic failure occurs.
- **<NR1>**
  - A 0 enables the halt function; any other value disables the halt function.

**Example**
DIAg:CONTROL:HALT ON

This command enables the halt function, causing the execution of diagnostics to halt at the first diagnostic failure that occurs.
DIAg:CONTROL:LOOP

Description
This command (no query form) determines whether the next execution of diagnostics executes once or continuously loops on the selected set of diagnostics (assuming the halt control is set to off using the DIAg:CONTROL:HALT command or that the halt control is set to ON but no failures occur). This command is equivalent to selecting Instrument Diagnostics from the Utilities menu and then enabling Loop Control.

Group
Diagnostics

Related Commands
DIAg:CONTROL:HALT (see page 77), DIAg:STOP (see page 101)

Syntax
DIAg:CONTROL:LOOP {ON|OFF|<NR1>}

Arguments
• ON
  This enables the loop function, causing the execution of diagnostics to continuously loop.

• OFF
  This disables the loop function, causing the oscilloscope to execute the entire set of diagnostics once and then halt.

• <NR1>
  A 0 enables the loop function; any other value disables the loop function.

Example
DIAg:CONTROL:LOOP ON
This command enables the loop function.
DIAg:EXECUTE

Description
This command (no query form) starts the execution of the currently selected set of diagnostics. This command is equivalent to selecting Instrument Diagnostics from the Utilities menu and then pressing Run.

Group
Diagnostics

Related Commands
DIAg:STATE (see page 100)

Syntax
DIAg:EXECUTE

Example
DIAg:EXECUTE
This command starts the execution of the entire set of diagnostics.
**DIAg:ITEM?**

**Description**
This query-only command returns all the data associated with a particular item from the RSI menu (level of test hierarchy). This command is equivalent to selecting Instrument Diagnostics from the Utilities menu and then reviewing the diagnostics settings.

**Group**
Diagnostics

**Related Commands**
DIAg:ITEM:FAILURES? (see page 81), DIAg:ITEM:NAME? (see page 82), DIAg:ITEM:RESULT? (see page 83), DIAg:ITEM:SUBITEMS? (see page 84)

**Syntax**
DIAg:ITEM?

**Arguments**
- `<NR1>`
  This sets the index item about which data will be returned, which ranges from 0 through 14.

**Example**
DIAg:ITEM 2?
This query might return :DIAG:ITEM "TRIGGER","FAIL",2,7
DIAg:ITEM:FAILURES?

Description
This query-only command returns the total number of failures. This command is equivalent to selecting Instrument Diagnostics from the Utilities menu and then reviewing the Diagnostic Status.

Group
Diagnostics

Related Commands
DIAg:ITEM? (see page 80), DIAg:ITEM:NAME? (see page 82), DIAg:ITEM:RESULT? (see page 83), DIAg:ITEM:SUBITEMS? (see page 84)

Syntax
DIAg:ITEM:FAILURES?

Example
DIAg:ITEM:FAILURES?

This query might return :DIAg:ITEM:FAILURES 2, indicating the number of failures.
DIAg:ITEM:NAMe?

Description
This query-only command returns the name of the selected menu item. This command is equivalent to selecting Instrument Diagnostics from the Utilities menu and then reviewing the Subsystem, Area and Test settings.

Group
Diagnostics

Related Commands
DIAg:ITEM? (see page 80), DIAg:ITEM:FAILURES? (see page 81), DIAg:ITEM:RESULT? (see page 83), DIAg:ITEM:SUBITEMS? (see page 84)

Syntax
DIAg:ITEM:NAMe?

Example
DIAg:ITEM:NAMe?

This query might return :DIAg:ITEM:NAMe "TRIGGER", indicating that the selected menu item is Trigger.
DIAg:ITEM:RESULT?

Description
This query-only command returns the result from the last execution of the item. This command is equivalent to selecting Instrument Diagnostics from the Utilities menu and then reviewing the Diagnostic Status.

Group
Diagnostics

Related Commands
DIAg:ITEM? (see page 80), DIAg:ITEM:NAMe? (see page 82), DIAg:ITEM:FAILURES? (see page 81), DIAg:ITEM:SUBITEMS? (see page 84)

Syntax
DIAg:ITEM:RESULT?

Example 1
DIAg:ITEM:RESULT?
This query might return :DIAg:ITEM:RESULT "PASS", indicating that the item passed during the last execution.

Example 2
DIAg:ITEM:RESULT?
This query might return :DIAg:ITEM:RESULT "FAIL", indicating that the item failed during the last execution.

Example 3
DIAg:ITEM:RESULT?
This query might return :DIAg:ITEM:RESULT "*****", indicating that the item was not run.
DIAg:ITEM:SUBITEMS?

Description
This query-only command returns the number of sub-items associated with the item. This command is equivalent to selecting Instrument Diagnostics from the Utilities menu, choosing the Subsystem, Area or Test setting and then reviewing the resulting sub-items.

Group
Diagnostics

Related Commands
DIAg:ITEM? (see page 80), DIAg:ITEM:NAME? (see page 82), DIAg:ITEM:FAILURES? (see page 81), DIAg:ITEM:RESULT? (see page 83)

Syntax
DIAg:ITEM:SUBITEMS?

Example
DIAg:ITEM:SUBITEMS?

This query might return :DIAg:ITEM:SUBITEMS 15, indicating that there are 15 sub-items associated with the selected item.
DIAg:LEVEL

Description
This command sets or returns the currently selected level of diagnostic test hierarchy. This command is equivalent to selecting Instrument Diagnostics from the Utilities menu and then reviewing the Diagnostic Status.

Group
Diagnostics

Syntax 1
DIAg:LEVEL (SUBSYS|AREA|TEST)

Syntax 2
DIAg:LEVEL?

Arguments
• SUBSYS
  This sets diagnostic testing to the subsystem level.

• AREA
  This sets diagnostic testing to the area level.

• TEST
  This sets diagnostic testing to the test level.

Example 1
DIAg:LEVEL AREA
This command sets the level of diagnostic test hierarchy to Area.

Example 2
DIAg:LEVEL?
This query might return :DIAg:LEVEL:SUBSYS, indicating that the current level of diagnostic test hierarchy is Subsys.
DIAg:LOOPS?

Description
This query-only command returns the number of times that the selected diagnostics set was completed during the last diagnostic execution. This command is equivalent to selecting Instrument Diagnostics from the Utilities menu and then reviewing the Loop Count.

Group
Diagnostics

Syntax
DIAg:LOOPS?

Example
DIAg:LOOPS?

This query might return :DIAG:LOOPS 5, indicating that the selected set of diagnostics was completed five times during the last diagnostic execution.
DIAg:NAMe?

Description
This query-only command returns the names of the subsystem, area, and test of the current diagnostic test.

Group
Diagnostics

Related Commands
DIAg:NAMe:AREA? (see page 88), DIAg:NAMe:SUBSYS? (see page 89), DIAg:NAMe:TEST? (see page 90)

Syntax
DIAg:NAMe?

Example
DIAg:NAMe?

This query might return :DIAg:NAME:SUBSYS "Acquisition";AREA "Memory";TEST "diag Data Format", indicating the subsystem name, area name, and test name of the currently selected diagnostic test.
DIAg:NAME:AREA?

Description
This query-only command returns the selected area of the current diagnostic test. There are three levels of diagnostic test hierarchy: subsystem, area and test. This command is equivalent to selecting Instrument Diagnostics from the Utilities menu and then reviewing the Diagnostic Status.

Group
Diagnostics

Related Commands
DIAg:NAME? (see page 82), DIAg:NAME:SUBSYS? (see page 89), DIAg:NAME:TEST? (see page 90)

Syntax
DIAg:NAME:AREA?

Example
DIAg:NAME:AREA?
This query might return :DIAg:NAME:AREA "Memory", indicating the selected area name of the current diagnostic test.
DIAg:NAMe:SUBSYS?

Description
This query-only command returns the subsystem of the current diagnostic test. This command is equivalent to selecting Instrument Diagnostics from the Utilities menu and then reviewing the Diagnostic Status.

Group
Diagnostics

Related Commands
DIAg:NAMe? (see page 87), DIAg:NAMe:AREA? (see page 88), DIAg:NAMe:TEST? (see page 90)

Syntax
DIAg:NAMe:SUBSYS?

Example
DIAg:NAMe:SUBSYS?

This query might return :DIAG:NAME:SUBSYS "Acquisition", indicating the subsystem name of the current diagnostic test.
DIAg:NAMe:TEST?

Description
This query-only command returns the name of the current diagnostic test. This command is equivalent to selecting Instrument Diagnostics from the Utilities menu and then reviewing the Diagnostic Status.

Group
Diagnostics

Related Commands
DIAg:NAMe? (see page 57), DIAg:NAMe:AREA? (see page 68), DIAg:NAMe:SUBSYS? (see page 89)

Syntax
DIAg:NAMe:TEST?

Example
DIAg:NAMe:TEST?
This query might return :DIAG:NAMe:TEST "diagDataFormatConf", indicating the test name of the current diagnostic test.
DIAg:NUMITEMS?

Description
This query-only command returns the number of items on the currently selected level of test hierarchy, which ranges from 0 through 15. This command is equivalent to selecting Instrument Diagnostics from the Utilities menu and then reviewing the Diagnostic Status.

Group
Diagnostics

Syntax
DIAg:NUMITEMS?

Example
DIAg:NUMITEMS?
This query might return :DIAg:NUMITEMS 7, indicating the number of items on the currently selected level of test hierarchy.
**DIAg:PUMODE**

**Description**
This command sets or returns the current diagnostic mode of the instrument.

**Group**
Diagnostics

**Syntax 1**
```
DIAg:PUMODE {USER|FACTORY}
```

**Syntax 2**
```
DIAg:PUMODE?
```

**Arguments**
- **USER**
  This sets the instrument to user diagnostic mode.
- **FACTORY**
  This sets the instrument to factory diagnostic mode.

**Example 1**
```
DIAg:PUMODE FACTORY
```
This command sets the instrument to the factory diagnostic mode.

**Example 2**
```
DIAg:PUMODE?
```
This query might return `:DIAG:PUMODE USER`, indicating that instrument is currently set to user diagnostic mode.
DIAg:RESUIt?ts?

Description
This query-only command returns an abbreviated status about the results of the last diagnostic (or test) execution. For a more explanatory status message, use the DIAg:RESUIt:VERBose? query. This command is equivalent to selecting Instrument Diagnostics from the Utilities menu and then reviewing the Diagnostic Status.

Group
Diagnostics

Related Commands
DIAg:RESUIt:VERBose? (see page 94)

Syntax
DIAg:RESUIt?

Example 1
DIAg:RESUIt?
This query might return :DIAG:RESULT "135", indicating the specific failure code of the first test failure that occurred.

Example 2
DIAg:RESUIt?
This query might return :DIAG:RESULT "Pass", indicating that the last diagnostic test passed.

Example 3
DIAg:RESUIt?
This query might return :DIAG:RESULT "*****", indicating that the diagnostic test was not run.
DIAg:RESULT:VERBOSE?

Description
This query-only command returns a more explanatory message about the results of the last diagnostic (or test) execution than the DIAg:RESULT? query. This command is equivalent to selecting Instrument Diagnostics from the Utilities menu and then reviewing the Diagnostic Status.

Group
Diagnostics

Related Commands
DIAg:RESULT (see page 93)

Syntax
DIAg:RESULT:VERBOSE?

Example
DIAg:RESULT:VERBOSE?

This query might return :DIAg:RESULT:VERBOSE "DIAG ABORTED, ERROR 15 in A2D-Dmux 1 interconnects"
DIAg:SELect:ALL

Description
This command (no query form) selects all available diagnostics. This command is equivalent to selecting Instrument Diagnostics from the Utilities menu and then choosing ALL from the Subsystem, Area and Test pull-down lists.

Group
Diagnostics

Related Commands
DIAg:NAMe:AREA? (see page 88), DIAg:NAMe:SUBSYS? (see page 89), DIAg:NAMe:TEST? (see page 90), DIAg:EXECUTE (see page 79)

Syntax
DIAg:SELect:ALL

Example
DIAg:SELect:ALL

This command selects all available diagnostics.
**DIAg:SELect:AREA**

**Description**
This command (no query form) selects one of the available areas. This command is equivalent to selecting Instrument Diagnostics from the Utilities menu and then selecting an Area from the pull-down list.

**Note:** This command should be executed only if DIAg:LEVEL is currently set to AREA.

**Group**
Diagnostics

**Related Commands**
DIAg:SELect:SUBSYS (see page 98), DIAg:SELect:TEST (see page 99), DIAg:SELect:LAST (see page 97), DIAg:NUMITEMS (see page 91)

**Syntax**
DIAg:SELect:AREA <NR1>

**Argument**

- `<NR1>`
  
  This selects an area by number, which can range from 1 through 15 (as specified by DIAg:NUMITEMS).

**Example**
DIAg:SELect:AREA 1

This command selects Area 1 as the area to be diagnosed.
DIAg:SELect:LAST

Description
This command (no query form) selects one or more diagnostic menu items to be executed via the DIAg:EXECUTE command. If you specify DIAg:LEVEL SUBSYS, then menu items come from this diagnostic level and are limited to the value returned by the DIAg:NUMITEMS? query. For example, specifying DIAg:SELECT:SUBSYS 2 and DIAg:NUMITEMS 5 indicates that diagnostics will start from subsystem 2 and that you can specify a range from 2 through 5 for DIAg:SELect:LAST.

If you enter:
  - DIAg:SELect:LAST 2, only subsystem 2 will be executed.
  - DIAg:SELect:LAST 4, subsystems 2 through 4 will be executed.

Group
Diagnostics

Related Commands
DIAg:EXECUTE (see page 79), DIAg:LEVEL (see page 85), DIAg:NAME:AREA? (see page 88), DIAg:NAME:SUBSYS? (see page 89), DIAg:NAME:TEST? (see page 90), DIAg:NUMITEMS? (see page 91), DIAg:SELect:SUBSYS (see page 98)

Syntax
DIAg:SELect:LAST <NR1>

Arguments
• <NR1>
  This selects an integer that identifies the number of the last item that will be executed when the DIAg:EXECUTE command is run.

Example
DIAg:SELect:LAST 2

This command specifies that (based on the previous example) only subsystem 2 will be executed.
**DIAg:SELect:SUBSYS**

**Description**
This command (no query form) selects one of the available subsystems. This command is equivalent to selecting Instrument Diagnostics from the Utilities menu and then choosing a Subsystem from the drop-down list.

**Note:** This command should be executed only if DIAg:LEVEL is currently set to SUBSYS.

**Group**
Diagnostics

**Related Commands**
DIAg:SELect:AREA (see page 96), DIAg:SELect:TEST (see page 99), DIAg:SELect:LAST (see page 97), DIAg:NUMITEMS (see page 91)

**Syntax**
DIAg:SELect:SUBSYS <NR1>

**Argument**

• **<NR1>**

  This selects a subsystem by number, which can range from 1 through 15 (as specified by DIAg:NUMITEMS).

**Example**
DIAg:SELect:SUBSYS
This command selects Subsystem 1 as the subsystem to be diagnosed.
DIAg:SELog:TEST

Description
This command (no query form) selects one of the available tests. This command is equivalent to selecting Instrument Diagnostics from the Utilities menu and then choosing a Test from the drop-down list.

Note: This command should be executed only if DIAg:LEVEL is currently set to TEST.

Group
Diagnostics

Related Commands
DIAg:SELog:AREA (see page 96), DIAg:SELog:SUBSYS (see page 98), DIAg:SELog:LAST (see page 97), DIAg:NUMITEMS (see page 91)

Syntax
DIAg:SELog:TEST <NR1>

Arguments
• <NR1>
  This selects a test by number, which can range from 1 through 15 (as specified by DIAg:NUMITEMS).

Example
DIAg:SELog:TEST 1
This command selects Test 1 as the test to be executed.
**DIAg:STATE**

**Description**
This command (no query form) changes the oscilloscope operating state. Depending on the argument, diagnostics capabilities are either turned on or off. This command is equivalent to opening the DIAg:STATE dialog (ON) or closing it (OFF).

**Group**
Diagnostics

**Related Commands**
TEST:STOP (see page 105)

**Syntax**
DIAg:STATE {ON|OFF}

**Arguments**

- **ON**
  This puts the instrument into the state in which diagnostics can be run. This argument is thrown automatically if either the DIAg:EXECUTE or DIAg:TEST commands are executed.

- **OFF**
  This disables diagnostics capabilities and returns the oscilloscope to a normal operating state.

**Example**
DIAg:STATE OFF

This command turns off diagnostics capabilities and returns the instrument to a normal operating state.
DIAg:STOP

Description
This command (no query form) causes diagnostics (or test) execution to terminate at the end of the next low-level test. This command is equivalent to selecting Instrument Diagnostics from the Utilities menu and then clicking Abort.

Group
Diagnostics

Related Commands
TEST:STOP (see page 105)

Syntax
DIAg:STOP

Example
DIAg:STOP

This command terminates diagnostics (or test) execution at the end of the next low-level test.
TEST

Description
This command (no query form) provides the ability to select and execute an item at any level of the test hierarchy (Test, Area or Subsystem). This command is equivalent to selecting Instrument Diagnostics from the Utilities menu, choosing a test and then pressing Run.

Note: Turning off both DIAg:CONTROL:HALT and DIAg:CONTROL:LOOP before executing the TEST command is recommended.

Group
Diagnostics

Related Commands
DIAg:CONTROL:HALT (see page 77), DIAg:CONTROL:LOOP (see page 78), TEST:RESults? (see page 103), TEST:RESults:VERBose? (see page 104), TEST:STOP (see page 105)

Syntax
TEST

Argument
• <NR3>
  This sets the test ID, which ranges from 0 through 3 characters. If no test ID is specified, all available diagnostics are executed.

Example 1
TEST "1"
This command executes all Acquisition tests (Subsystem:Acquisition).

Example 2
TEST "11"
This command executes all Acquisition Memory tests (Subsystem:Acquisition, Area:Memory)

Example 3
TEST "113"
This command executes a specific Acquisition Memory test (Subsystem:Acquisition, Area:Memory, Test:Address Lines).
TEST:RESULTS?

Description
This query-only command returns an abbreviated status about the results of the last TEST execution. This command is equivalent to selecting Instrument Diagnostics from the Utilities menu and then reviewing the Diagnostic Status.

Group
Diagnostics

Related Commands
TEST (see page 102), TEST:RESULTS:VERBose? (see page 104)

Syntax
TEST:RESULTS?

Example 1
TEST:RESULTS?
This query might return :TEST:RESULTS "135", indicating the specific failure code of the first test failure.

Example 2
TEST:RESULTS?
This query might return :TEST:RESULTS "PASS", indicating that the previously executed test passed.

Example 3
TEST:RESULTS?
This query might return :TEST:RESULTS "*****", indicating that the test was not run.
TEST:RESults:VERBose?

Description
This query-only command returns a more explanatory message about the results of the last TEST execution than the TEST:RESults query. This command is equivalent to selecting Instrument Diagnostics from the Utilities menu and then clicking the Error Log button.

Group
Diagnostics

Related Commands
TEST (see page 102), TEST:RESults? (see page 103)

Syntax
TEST:RESults:VERBose?

Example
TEST:RESults:VERBose?

This query might return :TEST:RESULTS:VERBOSE DIAG ABORTED, ERROR 15 in A2D-Dmux 1 interconnects"
TEST:STOP

Description
This command (no query form) causes test (or diagnostics) execution to terminate at the end of the next low-level test. This command is equivalent to selecting Instrument Diagnostics from the Utilities menu and then clicking Abort.

Group
Diagnostics

Related Commands
DIAg:STOP (see page 101)

Syntax
TEST:STOP

Example
TEST:STOP

This command terminates test (or diagnostics) execution at the end of the next low-level test.
**ERRLOG CLEAR**

**Description**
This command (no query form) deletes all entries in the log and zeroes the test sequence count. This command is equivalent to selecting Instrument Diagnostics from the Utilities menu, clicking Error Log and then clicking Clear Log.

**Group**
Diagnostics

**Related Commands**
- ERRLOG-FIRST? (see page 107)
- ERRLOG:NEXT? (see page 108)
- ERRLOG:NUMENTRIES? (see page 109)

**Syntax**

```
ERRLOG CLEAR
```

**Arguments**
- CLEAR
  
  This removes all entries in the error log and zeroes the test sequence count.

**Example**

```
ERRLOG CLEAR
```

This command deletes all entries in the log and zeroes the test sequence count.
ERRLOG:FIRST?

Description
This command query returns the first message in the error log. This command is equivalent to selecting Instrument Diagnostics from the Utilities menu and then clicking the Error Log button.

Group
Diagnostics

Related Commands
ERRLOG CLEAR (see page 106), ERRLOG:NEXT? (see page 108), ERRLOG:NUMENTRIES? (see page 109)

Syntax
ERRLOG:FIRST?

Example
ERRLOG:FIRST?

This command might return: ERRLOG:FIRST "01JAN70 00:00:41 P Pu=1 T=26 Test id=323
digSpeedMemConf: ""U406 addr(0x4cff5) = 0x04e8b5 act/exp = 0x7e00/0x5e00"", which is the first message in the error log.
ERRLOG:NEXT?

Description
This command query returns the next message in the error log. This command is equivalent to selecting Instrument Diagnostics from the Utilities menu and then clicking the Error Log button.

Group
Diagnostics

Related Commands
ERRLOG CLEAR (see page 106), ERRLOG:FIRST? (see page 107), ERRLOG:NUMENTRIES? (see page 109)

Syntax
ERRLOG:NEXT?

Example
ERRLOG:NEXT?

This command might return :ERRLOG:NEXT "01JAN70 00:00:41 P Pu=1 T=26 Test id=323 digSpeedMemConf: ""U406 addr(0x4cff5) = 0x04e8b5 act/exp = 0x7e00/0x5e00"", which is the next message in the error log.
ERRLOG:NUMENTRIES?

Description
This command query returns the total number of messages in the error log. This command is equivalent to selecting Instrument Diagnostics from the Utilities menu and then viewing the Error Log.

Group
Diagnostics

Related Commands
ERRLOG CLEAR (see page 106), ERRLOG:FIRST? (see page 107), ERRLOG:NEXT? (see page 108)

Syntax
ERRLOG:NUMENTRIES?

Example
ERRLOG:NUMENTRIES?

This query might return :ERRLOG:NUMENTRIES 3, indicating the total number of entries in the error log.
Display Control Command Group

Display Overview

You use the commands in the Display Control Command Group to change the graticule style, the displayed intensities, and to set the characteristics of the waveform display.

You can set the following:

- Background and foreground color as well as cursor, histogram, mask, and measurement annotation colors.
- Display of date and time; cursor, histogram, mask, and measurement readouts; measurement annotations, and the mode in which waveforms are displayed.
- Interpolation to increase sample density of waveform for high acquisition rates

Use the commands to set the style that best displays your waveforms and graticule display properties. Note that the mode you choose globally affects all displayed waveforms.
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</table>
**DISPLAY?**

**Description**
This query-only command returns the current display settings. This command is equivalent to selecting Display Setup from the Display menu and then viewing the contents of each tab.

**Group**
Display Control

**Syntax**

```
DISPLAY?
```

**Example**

```
DISPLAY?
```

This query might return:

```
:DISPLAY:CLOCK 1
;COLOR:PALETTE NORMAL;MATHCOLOR DEFAULT
;REFCOLOR DEFAULT;DISPLAY:FILTER SINX;FORMAT Y
;GRATICULE FULL;INTENSITY:WAVEFORM 6.0000E+01
;AUTOBRIGHT 1;SCREENSAVER 1;SCREENSAVERDELAY 28800,
;DISPLAY:PERSISTENCE OFF;STYLE VECTORS;TRIGBAR SHORT
;TRIGT 0;VARPERSIST 5.0000E-01
```
**DISplay:CLOCk**

**Description**
This command sets or queries the display of the date and time. This is equivalent to selecting Display Date & Time from the Display menu. The query form of this command returns an ON (1) or an OFF (0).

**Group**
Display Control

**Syntax 1**
DISplay:COLCk {ON|OFF|<NR1>}

**Syntax 2**
DISplay:COLCk?

**Arguments**

- **ON**
  This enables display of date and time.

- **OFF**
  This disables display of date and time.

- **<NR1>**
  A 0 disables display of date and time; any other value enables display of date and time.

**Example 1**
DISplay:COLCk ON
This command enables display of date and time.

**Example 2**
DISplay:COLCk?
This query might return :DISP:COLCk 1, indicating that the display of date and time is currently enabled.
DISplay:COLOR?

Description
This query-only command returns the settings from the PALETTE, MATHCOLOR and REFCOLOR commands. This is equivalent to selecting Colors from the Display menu.

Group
Display Control

Syntax
DISplay:COLOR?

Arguments
None.

Example
DISplay:COLOR?

This query might return:

:DISPLAY:COLOR:PALETTE NORMAL;MATHCOLOR DEFAULT;REFCOLOR INHERIT
DISplay:COLOr:PALETTE

Description
This command sets or queries the palette to be used for trace display. This is equivalent to selecting Colors from the Display menu and choosing from the displayed color palette options.

Group
Display Control

Related Commands
DISplay:COLOr (see page 115), DISplay:COLOr:MATHCOLOr (see page 117), DISplay:COLOr:REFCOLOr (see page 118)

Syntax 1
DISplay:COLOr:PALETTE {NORMal|MONOGREEN|MONOGRAY|TEMPErature|SPECTral}

Syntax 2
DISplay:COLOr:PALETTE?

Arguments
• NORMal
  This colors traces according to their channel. This is the default color palette.

• MONOGREEN
  This colors traces green, emulating a traditional oscilloscope color palette.

• MONOGRAY
  This colors traces gray, emulating a monochrome TDS instrument.

• TEMPErature
  All traces share a multi-colored palette, where "intensity" is represented by hue; blue for least frequently hit, red for most frequently hit.

• SPECTral
  All traces share a multi-colored palette, where "intensity" is represented by hue; red for least frequently hit, blue for most frequently hit.

Example 1
DISplay:COLOr:PALETTE MONOGRAY
This command sets the palette for all display types.

Example 2
DISplay:COLOr:PALETTE?
This query might return :DISPLAY:COLOR:PALETTE NORMal, indicating that the Normal color palette is currently selected, which colors traces according to their channel.
**DISplay:COLOR:MATHCOLOR**

**Description**
This command sets or queries the color to be used for math traces, either in the palette's nominal Math color, or according to the color of the source waveform. This command is equivalent to selecting Display Setup from the Display menu and then choosing the Colors tab.

**Group**
Display Control

**Related Commands**
DISplay:COLOR:PALETTE (see page 116)

**Syntax 1**
```
DISplay:COLOR:MATHCOLOR {DEFAULT|INHERIT}
```

**Syntax 2**
```
DISplay:COLOR:MATHCOLOR?
```

**Arguments**
- **DEFAULT**
  This sets color math traces in nominal palette math color, which is red.

- **INHERIT**
  This sets color math traces in the source waveform color. Math waveforms are drawn in the same color as their primary source waveform.

**Example 1**
```
DISplay:COLOR:MATHCOLOR DEFAULT
```
This command sets the color math traces in the nominal palette math color.

**Example 2**
```
DISplay:COLOR:MATHCOLOR?
```
This query might return :DISPLAY:COLOR:MATHCOLOR INHERIT, indicating that the primary source waveform color is used for each math trace.
DISplay:COLOR:REFCOLOR

Description
This command sets or queries the color to be used for reference traces, either in the palette's nominal REF color or according to the color of the source waveform. This command is equivalent to selecting Display Setup from the Display menu and then choosing the Colors tab.

Group
Display Control

Related Commands
DISplay:COLOR:PALETTE (see page 116)

Syntax 1
DISplay:COLOR:REFCOLOR {DEFAULT|INHERIT}

Syntax 2
DISplay:COLOR:REFCOLOR?

Arguments
- DEFAULT
  This assigns color reference traces in nominal palette reference color, which is off-white.
- INHERIT
  This assigns color reference traces in the source waveform color.

Example 1
DISplay:COLOR:REFCOLOR DEFAULT
This command assigns color reference traces in nominal palette reference color, which is off-white.

Example 2
DISplay:COLOR:REFCOLOR?
This query might return :DISPLAY:COLOR:REFCOLOR INHERIT, indicating that source waveform color is used for reference traces.
**DISplay:FILTer**

**Description**
This command sets or queries the type of interpolation to use for the display. Filtering only applies to normal-mode acquisition. DPO never interpolates. The **DISplay:FILTer** command also provides selection for acquisition interpolation type. This command is equivalent to selecting Waveform Interpolation from the Display menu.

**Group**
Display Control

**Syntax 1**

DISplay:FILTer {LINEAr|SINX}

**Syntax 2**

DISplay:FILTer?

**Arguments**

- **LINEAr**
  This specifies linear interpolation where acquired points are connected with straight lines.

- **SINX**
  This specifies \( \sin(x)/x \) interpolation where acquired points are fit to a curve.

**Example 1**

DISplay:FILTer SINX

This command specifies sine-curve interpolation when magnifying waveforms.

**Example 2**

DISplay:FILTer?

This query might return :DISPLay:FILTER LINEAR, indicating that straight-line interpolation is specified for magnifying waveforms.
DISplay:FORMat

Description
This command sets or queries the display format. This command is equivalent to setting Format from the Display menu.

Group
Display Control

Syntax 1
DISplay:FORMat {YT|XY|XYZ}

Syntx 2
DISplay:FORMat?

Arguments
• YT
  This sets the display to a voltage versus time format and is the normal mode.

• XY
  This displays one waveform against another. The source pairs that make up an XY trace are predefined and are listed in the following table. Selecting one source causes its corresponding source to be implicitly selected, producing a single trace from the two input waveforms.

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</tbody>
</table>

Note: Selecting XY or XYZ forces a switch to FASTAcq mode.

• XYZ
  This combines channel 1 and channel 2 for X and Y coordinates and uses channel 3 to provide the intensity value for the sample. XYZ groups channels 1, 2 and 3 to form a single trace. Other channel, math and reference waveforms are turned off.

Example 1
DISplay:FORMat YT

This command selects a voltage versus time format for the display.

Example 2
DISplay:FORMat?

This query might return :DISPLAY:FORMAT XY for the display format.
**DISPLAY:GRATicule**

**Description**
This command selects or queries the type of graticule that is displayed. This command is equivalent to selecting Graticule Style from the Display menu.

**Group**
Display Control

**Syntax 1**
```
DISPLAY:GRATICULE {CROSSHair|FRAME|FULL|GRID}
```

**Syntax 2**
```
DISPLAY:GRATICULE?
```

**Arguments**
- **CROSSHair**
  This specifies a frame and cross hairs.
- **FRAME**
  This specifies just a frame.
- **FULL**
  This specifies a frame, a grid and cross hairs.
- **GRID**
  This specifies a frame and grid only.

**Example 1**
```
DISPLAY:GRATICULE FRAME
```
This command sets the graticule type to display the frame only.

**Example 2**
```
DISPLAY:GRATICULE?
```
This query might return :DISPLAY:GRATICULE FULL, indicating that all graticule elements are selected.
**Display:INTENSITY?**

**Description**
This query-only command returns the waveform saturation level, autobright state and screensaver settings. This command is equivalent to selecting Display Setup from the Display menu and then choosing the Appearance tab.

**Group**
Display Control

**Related Commands**
DISplay:INTENSITY:AUToBright (see page 123), DISplay:INTENSITY:WAVEform (see page 124), DISplay:INTENSITY:SCREENSAVER (see page 125), DISplay:INTENSITY:SCREENSAVERDELAY (see page 126)

**Syntax**
DISplay:INTENSITY?

**Arguments**
None

**Example**
DISplay:INTENSITY?

This query might return :DISPLAY:INTENSITY:WAVEFORM 7.5000E+01; AUTOBRIGHT 1; SCREENSAVER 1; SCREENSAVERDELAY 120
DISPLAY:INTENSITY:AUTOBright

Description
This command enables automatic, ongoing adjustment of the hi-res to 4-bit-display mapping transform for converting DPO or RecordVu images to display images. The query form returns an ON (1) or OFF (0). This command is equivalent to selecting Display Setup from the Display menu and then choosing the Appearance tab.

Group
Display Control

Related Commands
DISPLAY:INTENSITY:WAVEform (see page 124)

Syntax 1
DISPLAY:INTENSITY:AUTOBright {OFF|ON|<NR1>}

Syntax 2
DISPLAY:INTENSITY:AUTOBright?

Arguments
- OFF
  This allows the system to use the manually set waveform intensity value against an absolute scale.

- ON
  This allows the system to adjust settings with the user-defined waveform intensity value in concert with the maximum and minimum non-zero acquired pixel intensity.

- <NR1>
  A 0 allows the system to use the manually set waveform intensity value against an absolute scale; any other value allows the system to adjust settings.

Example 1
DISPLAY:INTENSITY:AUTOBright ON
This command allows the system to adjust settings using the waveform intensity value and the pixel intensity found in the acquired waveform.

Example 2
This query might return :DISPLAY:INTENSITY:AUTOBRIGHT 1, indicating that system adjustment of waveform intensity is enabled.
DISplay:INTENSITy:WAVEform

Description
This command sets or queries the intensity saturation of the waveforms. This command is equivalent to adjusting the INTENSITY knob on the front panel.

Group
Display Control

Related Commands
DISplay:INTENSITy:AUTOBright (see page 123)

Syntax 1
DISplay:INTENSITy:WAVEform <NR1>

Syntax 2
DISplay:INTENSITy:WAVEform?

Arguments
• <NR1>

This is the waveform intensity and ranges from 10 to 100 percent.

Example 1
DISplay:INTENSITy:WAVEform 100

This command sets the waveform intensity to 100 percent.

Example 2
DISplay:INTENSITy:WAVEform?

This query might return :DISPLAY:INTENSITY:WAVEFORM 6.0000E+01, indicating that the intensity of the waveforms is currently set to 60 percent.
**DISplay:INTENSITy:SCREENSAVER**

**Description**
This command sets and queries the screen protection features of the underlying MS Windows operating system. When enabled, a delay timer (set in seconds by the DISplay:INTENSITy:SCREENSAVERDELAY command) begins counting down. When this screensaver delay times out, the screen low-power mode engages. This causes the LCD backlight to switch off and clears both waveform and text displays. Any control (front panel, mouse or keyboard) or touch screen activity resets the delay timer and restores normal scope display. This command is equivalent to selecting Screen Saver Enabled from the Display menu.

**Group**
Display Control

**Related Commands**
DISplay:INTENSITy:SCREENSAVERDELAY (see page 126)

**Syntax 1**

```
DISplay:INTENSITy:SCREENSAVER {OFF|ON|<NR1>}
```

**Syntax 2**

```
DISplay:INTENSITy:SCREENSAVER?
```

**Arguments**

- **OFF**
  - This disables the screen saver feature.

- **ON**
  - This enables the protection after the specified screen saver delay seconds of control activity have passed.

- **<NR1>**
  - A 0 disables the screensaver feature; a 1 enables the screen saver protection features.

**Example 1**

```
DISplay:INTENSITy:SCREENSAVER OFF
```

This command disables the screen saver feature.

**Example 2**

```
DISplay:INTENSITy:SCREENSAVER?
```

This query might return :DISPLAY:INTENSITy:SCREENSAVER 0, indicating that the screensaver feature is disabled.
DISplay:INTENSITY:SCREENSAVERDELAY

Description
This command sets or queries the timeout of the screen protection features of the display system. When enabled (after the specified screen saver delay seconds of control activity and when the screensaver feature is enabled) the instrument activates the screensaver feature. Normal scope displays are restored and the delay timer is reset upon any control activity. The oscilloscope continues to acquire and process data normally while in screensaver mode; only the display is disabled. This command is equivalent to selecting Display Setup from the Display menu and then choosing the Objects tab.

Group
Display Control

Related Commands
DISplay:INTENSITY:SCREENSAVER (see page 125)

Syntax 1
DISplay:INTENSITY:SCREENSAVERDELAY {<NR1>}

Syntax 2
DISplay:INTENSITY:SCREENSAVERDELAY?

Arguments
• <NR1>
  This sets the screensaver timeout, which ranges from 30 through 28800 seconds.

Example 1
DISplay:INTENSITY:SCREENSAVERDELAY 120
This command sets the screen saver delay feature to activate after 120 seconds of control inactivity.

Example 2
DISplay:INTENSITY:SCREENSAVERDELAY?
This query might return :DISPLAY:INTENSITY:SCREENSAVERDELAY 300, indicating that the screen saver delay feature is set to 300 seconds of control inactivity.
**DISplay:PERSistence**

**Description**
This command sets or queries the persistence aspect of the display. This affects the display only and is equivalent to selecting Display Persistence from the Display menu.

**Group**
Display Control

**Related Commands**
DISplay:VARPersist (see page 131)

**Syntax 1**
DISplay:PERSistence {OFF|INFPersist|VARPersist}

**Syntax 2**
DISplay:PERSistence?

**Arguments**

- • **OFF**
  This disables the persistence aspect of the display.

- • **INFPersist**
  This sets a display mode where any pixels, once touched by samples, remain set until cleared by a mode change.

- • **VARPersist**
  This sets a display mode where set pixels are gradually dimmed.

**Example 1**
DISplay:PERSistence VARPersist
This command sets the persistence aspect of the display to fade set pixels according to the time set in the DISplay:VARPersist command.

**Example 2**
DISplay:PERSistence?
This query might return :DISPLAY:PERSISTENCE OFF, indicating that the persistence aspect of the display is disabled.
DISplay:STYle

Description
This command sets or queries how the data is displayed for normal and FastAcq modes. This command is equivalent to setting Display Style from the Display menu.

Group
Display Control

Syntax 1
DISplay:STYle {VECTors|DOTs|INTENSIFied}

Syntax 2
DISplay:STYle?

Arguments
• VECTors
  This connects adjacent data points. New points immediately replace old ones.

• DOTs
  This displays individual data points. New points immediately replace old ones.

• INTENSIFied
  This causes the display to show interpolated samples with dark spaces (Only the "real" samples are displayed).

  When FastAcq mode is enabled, intensified samples display as dots. However, turning off FastAcq mode causes the display style to snap back to its previous setting.

Example 1
DISplay:STYle VECTors

This command sets the display to connect adjacent data points.

Example 2
DISplay:STYle?

This query might return :DISPLAY:STYLE INTENSIFIED, indicating that interpolated samples are not displayed.
DISplay:TRIGBar

Description
This command controls or queries the display of the trigger-level indicator bar/s. Indicator bars show where the trigger voltage level is set. The oscilloscope will only display the bar if the associated trigger source is also displayed. If both a main and a delayed trigger are displayed, then two bars will appear. One will accompany each source. If a logic trigger is selected, then multiple bars may appear. One will show the upper threshold and one will show the lower threshold. This command is equivalent to selecting Display Setup from the Display menu and then choosing the Objects tab.

Group
Display Control

Syntax 1
DISplay:TRIGBar {OFF|SHORT|LONG}

Syntax 2
DISplay:TRIGBar?

Arguments
- OFF
  This removes the trigger indicator bar from the display.
- SHORT
  This displays, as the indicator, a short arrow at the right side of the graticule for each displayed trigger signal.
- LONG
  This displays, as the indicator, a horizontal line across the width of the graticule for each displayed trigger signal.

Example 1
DISplay:TRIGBar LONG
This command sets the display to show a long trigger indicator bar (or bars).

Example 2
DISplay:TRIGBar?
This query might return :DISPLAY:TRIGBAR OFF, indicating that the indicator bar is removed from the display.
**DISplay:TRIGT**

**Description**
This command controls or queries the display of the trigger point indicator. This is equivalent to selecting Objects from the Display menu. The query form returns an ON (1) or an OFF (0).

**Group**
Display Control

**Syntax 1**
```plaintext
DISplay:TRIGT {ON|OFF|<NR1>}
```

**Syntax 2**
```plaintext
DISplay:TRIGT?
```

**Arguments**
- **ON**
  This displays a trigger indicator on each of the displayed waveforms. The trigger indicator is in reverse video for the selected waveform.

- **OFF**
  This removes the trigger indicator from the display.

- **<NR1>**
  A 0 removes the trigger indicator from the display; a 1 displays a trigger indicator on each of the displayed waveforms.

**Example 1**
```plaintext
DISplay:TRIGT ON
```
This command sets the display to show a trigger indicator.

**Example 2**
```plaintext
DISplay:TRIGT?
```
This query might return `:DISPLAY:TRIGT 0`, indicating that the trigger indicator is removed from the display.
**DISplay:VARPersist**

**Description**
This command sets or queries persistence decay time, which is the approximate decay time for a freshly struck persistence sample. This command is equivalent to selecting Display Setup from the Display menu, selecting the Appearance tab and then entering the desired Persist Time.

**Group**
Display Control

**Related Commands**
DISplay:PERSistence (see page 127)

**Syntax 1**
DISplay:VARPersist <NR3>

**Syntax 2**
DISplay:VARPersist?

**Arguments**
- **<NR3>**
  This indicates the persistence decay time setting in numeric seconds. The persistence time ranges from 32 ms to 10 s.

**Example 1**
DISplay:VARPersist 5E-1
This command sets the persistence decay time to 500 ms.

**Example 2**
DISplay:VARPersist?
This query might return :DISPLAY:VARPERSIST 5.0000E-01, indicating that persistence decay time is currently set to 500 ms.
File System Command Group

File System Overview

You use the commands in the File System Command Group to help you use the built-in hard disk drive and floppy disk drive. You can use the commands to do the following:

• List the contents of the default directory
• Create and delete directories
• Create, copy, read, rename, or delete a file
## File System Commands

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</table>
**FILESystem?**

**Description**
This query-only command returns the state of the file system.

**Group**
File System

**Related Commands**
FILESystem:COpy (see page 135), FILESystem:DELete (see page 136), FILESystem:DIR? (see page 137), FILESystem:PRInt (see page 139), FILESystem:READFile (see page 140), FILESystem:REName (see page 141), FILESystem:WRITEFile (see page 143)

**Syntax**
FILESystem?

**Arguments**
None.

**Example**
FILESystem?

This query might return :FILESYSTEM:DIR, indicating that a list of files and directories exist in the default directory.
**FILESystem:COPy**

**Description**
This command (no query form) copies a named file or files to a new file. The new file may be in a totally separate directory than the old file. Also, you can use wild card characters (*.*) to copy multiple files with one command.

**Group**
File System

**Related Commands**
FILESystem:DELEte (see page 136)

**Syntax**
FILESystem:COPy {<source file path>,<destination file path>|<source directory path>,<destination file path>|<source directory path>,<destination directory path>}

**Arguments**
- **<file path>**
  This is a quoted string that defines the file name and path. Input the file path using the form <drive>/<dir>/<filename>.<drive> and one or more <dir>s are optional. <filename> stands for a filename of up to 128 characters. While filename extensions are not required, they are highly recommended. You can also use the inclusive filename *.* in the source file path to copy all files.

- **<directory path>**
  This is a quoted string that defines the directory. Input the directory using the form <drive>/<dir>/<directory name>.<drive> and one or more <dir>s are optional.<directory name> stands for a directory name of up to 128 characters. While filename extensions are not required, they are highly recommended.

**Example**
FILESystem:COPy C:/MYDIR/"TEK00001,SET","C:/TEK00001.SET"

This command copies the file named TEK00001.SET, located in the MYDIR directory on the C drive to a file named TEK00001.SET in the root directory.
FILESystem:DELEte

Description
This command (no query form) deletes a named file or directory.

Group
File System

Related Commands
FILESystem:COPy (see page 135)

Syntax
FILESystem:DELEte <file path>

Arguments
• <file path>
  This is a quoted string that defines the file name and path. Input the file path using the form
  <drive>/<dir>/<filename>.<drive> and one or more <dir>s are optional. If you do not specify
  them, the oscilloscope will delete the file in the current directory. <filename> stands for a filename of
  up to 128 characters. While filename extensions are not required, they are highly recommended. You
  can also use the inclusive filename *.* to delete all files.

Example 1
FILESystem:DELEte "NOT_MINE.SET"

This command deletes the file named NOT_MINE.SET on the default drive and directory.
**FILESystem:DIR?**

**Description**
This query-only command returns a list quoted string. Each string contains the name of a file or directory in the current directory.

**Group**
File System

**Related Commands**
FILESystem:MKDir (see page [138](#))

**Syntax**
FILESystem:DIR?

**Arguments**
None.

**Example**
FILESystem:DIR?
This query returns a list of files and directories in the default directory.
FILESystem:MKDir

Description
This command (no query form) creates a new directory.

Group
File System

Related Commands
FILESystem:DIR? (see page 137)

Syntax
FILESystem:MKDir <directory path>

Arguments
• <directory path>

This is a quoted string that defines the directory. Input the directory using the form
<drive>/<dir>/<directory name>.<drive> and one or more <dir>s are optional.

<directory name> stands for a directory name of up to 128 characters. While filename extensions
are not required, they are highly recommended.

The current directory refers to the name of a directory as returned to the FILESystem:CWD? query.

Example
FILESystem:MKDir C:/*NEATPICS"

This command creates the directory named NEATPICS on the current drive.
**FILESystem:PRInt**

**Description**
This command (no query form) prints a named file to a named port.

**Group**
File System

**Related Commands**
FILESystem:READFile (see page 140)

**Syntax**
FILESystem:PRInt <filepath>, GPIb

**Arguments**
- `<filepath>`
  This is a quoted string that defines the file name and path. Input the file path using the form `<drive>/<dir>/<filename>`, `<drive>` and one or more `<dir>`s are optional. `<filename>` stands for a filename of up to 128 characters. While filename extensions are not required, they are highly recommended. You can also use the inclusive filename `*.*` to print all files.

- `GPIb`
  This specifies that the hardcopy is sent out the GPIB port.

**Example**
```
FILESystem:PRInt C:"TEK00000.IBM", GPIb
```
This command sends the file named `TEK00000.IBM` out the GPIB port.
**FILESystem:READFile**

**Description**
This command (no query form) copies a named file to the GPIB port.

**Group**
File System

**Related Commands**
FILESystem:PRInt (see page 139)

**Syntax**
FILESystem:READFile <filepath>

**Arguments**
• <file path>
  
  This is a quoted string that defines the file name and path. Input the file path using the form
  <drive>/<dir>/<filename>.<drive> and one or more <dir>s are optional. <filename>
  stands for a filename of up to 128 characters. While filename extensions are not required, they are
  highly recommended. You can also use the inclusive filename *.* to read all files.

**Example**
FILESystem:READFile C:"ABC.DEF"

This command reads a file named "ABC.DEF" on the C drive and sends it to the GPIB port.
FILESystem:REName

Description
This command (no query form) assigns a new name to an existing file.

Group
File System

Syntax
FILESystem:REName <old file path>,<new file path>

Arguments
• <old file path>
  This is a quoted string that defines the file to rename. Input the file path using the form
  <drive>/<dir>/<filename>.<drive> and one or more <dir>s are optional. <filename> stands for a filename of up to 128 characters. While filename extensions are not required, they are highly recommended.

• <new file path>
  This is a quoted string that defines the new name of the file. Input the file path using the form
  <drive>/<dir>/<filename>.<drive> and one or more <dir>s are optional. <filename> stands for a filename of up to 128 characters. While filename extensions are not required, they are highly recommended.

Example
FILESystem:REName C:"TEK00000.SET",C:"MYSETTING.SET"

This command gives the file named TEK00000.SET the new name of MYSETTING.SET. The file remains in the root directory on the C drive.
**FILESystem:RMDir**

**Description**
This command (no query form) deletes a named directory. The directory and all of the files and subdirectories it contains are deleted.

**Group**
File System

**Syntax**
FILESystem:RMDir <directory path>

**Arguments**
- `<directory path>`
  This is a quoted string that defines the directory. Input the directory using the form `<drive>/<dir>/<directory name>.<drive>` and one or more `<dir>`s are optional.
  `<directory name>` stands for a directory name of up to 128 characters. While filename extensions are not required, they are highly recommended.
  The current directory refers to the name of a directory as returned to the FILESystem:CWD? query.

**Example**
FILESystem:RMDir C:/*NOT-MINE*

This command creates the directory named NOT-MINE on the C drive.
FILESystem:WRITEFile

Description
This command (no query form) copies the GPIB port block data to a named file.

Group
File System

Syntax
FILESystem:WRITEFile <file path>,<data>

Arguments
• <file path>
  This is a quoted string that defines the file name and path. Input the file path using the form
  <drive>/<dir>/<filename>.<drive> and one or more <dir>s are optional. <filename>
  stands for a filename of up to 128 characters. While filename extensions are not required, they are
  highly recommended.

• <data>
  This is sent in the indefinite format of ARBITRARY BLOCK PROGRAM DATA encoding as described
  in IEEE 488.2.

Example
FILESystem:WRITEFile C:/'ABC.DEF',#0123<NL+EOL>
This command creates a file named "ABC.DEF" on the C drive, containing the three bytes (in hex
format) 31, 32, and 33.
Hard Copy Command Group

Hard Copy Overview

Hard copy commands enable you to make hard copies of data files or send the data to a specified file. In addition, these commands provide you with information about (and the ability to set) file path settings.
# Hard Copy Commands

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<td>HARDCopy:PORT?</td>
<td>Returns the data format that will be used on the next hardcopy command</td>
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<tr>
<td>HARDCopy:PORT</td>
<td>Sets whether the data will be sent to a file or printed on the next hardcopy command</td>
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</table>
HARDCopy

Description
This command sends a copy of the screen display followed by an EOI to the port specified by
HARDCopy:PORT. The format and layout of the output is specified with the HARDCopy:FORMat and
HARDCopy:LAYout commands. This command is equivalent to pressing the PRINT button on the front
panel.
The HARDCopy query returns format, layout and port information.

Group
Hardcopy

Related Commands
*WAI (see page 328), *CLS? (see page 318)

Syntax 1
HARDCopy STArt

Syntax 2
HARDCopy?

Arguments
• START
  This initiates a screen copy that is sent to the controller where it can be stored in a file or redirected to
  a printing device.
  
  Note: Use the *WAI command between HARDCopy STARt commands to ensure that the first
  hardcopy is complete before starting another.

Example 1
HARDCopy STArt

This command initiates a screen copy that can either be stored in file format or printed.

Example 2
HARDCopy?

This query returns format, layout and port information.
**HARDCopy:FILENAME**

**Description**
This command sets or returns the file that will be sent hardcopy data on the next HARDCopy command.

**Group**
Hardcopy

**Related Commands**
HARDCopy (see page 146)

**Syntax 1**
HARDCopy:FILENAME <file path>

**Syntax 2**
HARDCopy:FILENAME?

**Argument**

- **<file path>**
  
  This specifies that the hardcopy is sent to the named file. `<file path>` is a quoted string that defines the file name and path. Input the file path using the form `<drive>\<dir>\<filename>`. `<drive>` and one or more `<dir>`s are optional. `<filename>` stands for a filename of up to 128 characters. While filename extensions are not required, they are highly recommended.

  You can automatically create different names for files. You do this by using the question mark (?) as a special wildcard character. These stand for numbers the oscilloscope will insert sequentially in the filename. For example, if you placed two question marks at the end of the filename, then the oscilloscope would append 00 to the first file created, 01 to the next, and 02 to the next. This helps you automatically create different names for files. It is particularly useful in automated testing situations.

**Example 1**
HARDCopy:FILENAME "TEK.IBM"

This command sets TEK.IBM as the selected file name.

**Example 2**
HARDCopy:FILENAME?

This query might return `HARDCOPY:FILENAME "TEK.IBM"` as the selected file.

**Example 3**
HARDCopy:FILENAME "TEK??..IBM"

This command sets TEK as the selected file name with a numeric, two-digit suffix. The oscilloscope might return `HARDCOPY:FILENAME "TEK00.IBM"; "TEK01.IBM"`, indicating TEK.00.IBM as the first file and TEK.01.IBM as the second file.
HARDCopy:PORT

Description
This command selects or returns whether the hardcopy data will be sent to a file or printed on the next hardcopy command (i.e. HARDCopy START command). This is equivalent to selecting Print in the File menu and then either choosing Print to file or specifying the default printer.

Group
Hardcopy

Related Commands
HARDCopy (see page 146), HARDCopy:FILENAME (see page 147)

Syntax 1
HARDCopy:PORT {FILE|PRINTER}

Syntax 2
HARDCopy:PORT?

Arguments
• FILE
  This specifies that the hardcopy is stored in the file specified in the HARDCopy:FILENAME command.
• PRINTER
  This specifies that the hardcopy is sent to the printer specified in the Print dialog box.

Example 1
HARDCopy:PORT FILE
This command stores the hardcopy in the file specified in the HARDCopy:FILENAME command.

Example 2
HARDCopy:PORT?
This query might return HARDCOPY:PORT FILE, indicating that hardcopies are sent to the specified file.
Histogram Command Group

Histogram Overview

Histogram commands let you select the type of histogram, what part of the waveform should go into the histogram, and histogram statistics. You can use commands from this group to do the following:

- Create a histogram of vertical or horizontal values for a channel, math or reference waveform
- Adjust the limits of the waveform area from which the histogram data is obtained.
- Clear histogram count and restart.
### Histogram Commands

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<tr>
<td>HIStogram:BOX</td>
<td>Sets the left, top, right, and bottom positions of the histo box, in source waveform coordinates</td>
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<td>Returns same as HIStogram:BOX, but in percentage coordinates, with 0,0 upper left and 100,100 lower right</td>
</tr>
<tr>
<td>HIStogram:BOXPcnt</td>
<td>Sets same as HIStogram:BOX, but in percentage coordinates, with 0,0 upper left and 100,100 lower right</td>
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<td>HIStogram:DISPLAY</td>
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HIStogram?

Description
This query-only command returns all histogram parameters; it queries the state of all histogram parameters that the user can set. This command is equivalent to selecting Waveform Histograms from the Measure menu.

Group
Histogram

Related Commands
MEASUrement:METHod (see page 258)

Syntax 1

Arguments
None,

Example 1

This query might return:

HISTOGRAM:BOXPCNT 3.0000E+01, 2.5100E+01, 7.0000E+01, 7.5200E+01; DISPLAY LINEAR; STATE 0; FUNCTION HORIZONTAL; SIZE 2.0000E+00; SOURCE CH1
**HIStogram:Box**

**Description**
This command defines or returns the left, top, right, and bottom boundaries of the histogram box, in source waveform coordinates. This command is equivalent to selecting Waveform Histograms from the Measure menu and then setting Limits for Left, Right, Top, and Bottom in the appropriate boxes. This command is similar to the HIStogram:BOXPcnt command except that command uses percentage coordinates to define the boundaries of the histogram box. This command is equivalent to selecting Waveform Histograms from the Measure menu and reviewing the histogram Left, Right, Top, and Bottom Limits.

**Note:** This command implicitly clears the histogram count and statistics for the histogram and histogram source data when HIStogram:STATE is turned on.

**Group**
Histogram

**Related Commands**
HIStogram:BOXPcnt (see page 153), HIStogram:STATE (see page 160)

**Syntax 1**
HIStogram:Box <NR3>,<NR3>,<NR3>,<NR3>

**Syntax 2**
HIStogram:Box?

**Arguments**
- **<NR3>**
  This specifies the left position of the histogram box in source waveform coordinates.
- **<NR3>**
  This specifies the top position of the histogram box in source waveform coordinates.
- **<NR3>**
  This specifies the right position of the histogram box in source waveform coordinates.
- **<NR3>**
  This specifies the bottom position of the histogram box in source waveform coordinates.

**Example 1**
HIStogram:Box 1E-9, 0.250, 2E-9, 0.500

This command defines the coordinates of the histogram box in source waveform coordinates.

**Example 2**
HIStogram:Box?

This query might return HISTOGRAM:BOX 1.0000E-09, 0.2500, 2.0000E-09, 0.5000, which identifies the coordinates of the histogram box in source waveform coordinates.
HIStogram:BOXPcnt

Description
This command defines or queries the left, top, right, and bottom positions of the histogram box, in percentage coordinates. The upper left has the value 0.0 and the lower right has the value 100, 100. Any value outside the range of 0 to 100 is clipped. This command is similar to the HIStogram:Box command except that this command uses percentage coordinates to define the boundaries of the histogram box.

Note: This command implicitly clears the histogram count and statistics for the histogram and histogram source data when HIStogram:STATE is turned on.

Group
HIStogram

Related Commands
HIStogram:Box (see page 152), HIStogram:STATE (see page 160)

Syntax 1
HIStogram:BOXPcnt <NR3>, <NR3>, <NR3>, <NR3>

Syntax 2
HIStogram:BOXPcnt?

Arguments
• <NR3>
This specifies the left position of the histogram box in percentage coordinates. The default value is 30.0.

• <NR3>
This specifies the top position of the histogram box in percentage coordinates. The default value is 25.1.

• <NR3>
This specifies the right position of the histogram box in percentage coordinates. The default value is 70.0.

• <NR3>
This specifies the bottom position of the histogram box in percentage coordinates. The default value is 75.2.

Example 1
HIStogram:BOXPct 30.0,25.1,70.0,75.2
This command sets the hardcopy page-layout format to default values.

Example 2
HIStogram:BOXPct?
This query might return :HISTOGRAM:BOXPCT
3.0000E+01,25.1000E+01,7.0000E+01,7.5200E+01.
**HIStogram:COUNt**

**Description**
This command (no query form) clears the count and statistics for the histogram and the histogram source data. If the histogram is on, then counting restarts. This command is equivalent selecting Waveform Histograms from the Measure menu and then clicking the Reset button.

**Group**
HIStogram

**Related Commands**
HIStogram:Box (see page 152), HIStogram:BOXPcnt (see page 153)

**Syntax**
HIStogram:COUNt RESET

- **RESET**
  This zeros the histogram count.

**Example**
HIStogram:COUNt RESET

This command clears the count and statistics for the histogram and the histogram source data.
HIStogram:DISplay

Description
This command sets the format of the histogram displayed or whether the histogram is displayed. The query form of this command either returns the histogram display format or that histogram display is disabled. This command is equivalent to selecting Waveform Histogram from the Measure menu and then ensuring that Display is set to On.

Group
HIStogram

Related Commands
HIStogram:MODe (see page 157), HIStogram:STATE (see page 160)

Syntax 1
HIStogram:DISplay {OFF|LOG|LINEAr}

Syntax 2
HIStogram:DISplay?

Arguments
• <OFF>
  This disables the histogram display but allows the histogram data to accumulate.
• <LOG>
  This specifies that the histogram display type is set to Log format.
• <LINEAr>
  This sets the histogram display type to Linear format.

Example 1
HIStogram:DISplay OFF
This command disables the histogram display.

Example 2
HIStogram:DISplay?
This query might return :HISTOGRAM:DISPLAY LOG, indicating that the current histogram type being displayed is in Log format.
**HIStogram:FUNCtion**

**Description**
This command either selects the type of histogram to create or returns the current histogram type. This command is equivalent to selecting Waveform Histogram from the Measure menu and then choosing either **Horizontal** or **Vertical** from the Histogram Mode group box.

**Group**
HIStogram

**Related Commands**
HIStogram:MODe (see page 157), HIStogram:STATE (see page 160)

**Syntax 1**
HIStogram:FUNCtion {HORizontal|VERTical}

**Syntax 2**
HIStogram:FUNCtion?

**Arguments**
- **HORizontal**
  - This displays a horizontally positioned histogram that shows time distribution.
- **VERTical**
  - This displays a vertically positioned histogram that shows a voltage distribution (or another distribution such as amperes).

**Example 1**
HIStogram:FUNCtion HORizontal

This command sets the histogram mode to the horizontal display mode.

**Example 2**
HIStogram:FUNCtion?

This query might return :HISTOGRAM:FUNCTION VERTICAL, indicating that the vertical display mode is selected for the histogram.
**Histogram:MODE**

**Description**
This command selects the type of histogram to create or disables the histogram display. The query form of this command query returns the current histogram type or that histogram display functionality is disabled. This command is equivalent to selecting Waveform Histogram from the Measure menu and then choosing from the Histogram Mode group box.

**Histogram:MODE** is functionally equivalent to the **Histogram:FUNCTION** and **Histogram:STATE** commands and is included for compatibility purposes.

**Group**
Histogram

**Related Commands**
**Histogram:FUNCTION** (see page 156), **Histogram:STATE** (see page 160), **Histogram:DISPLAY** (see page 155)

**Syntax 1**
```
Histogram:MODE {HORizontal|VERTical|OFF}
```

**Syntax 2**
```
Histogram:MODE?
```

**Arguments**
- **HORizontal**
  This enables a horizontally positioned histogram that shows time distribution.

- **VERTical**
  This enables a vertically positioned histogram that shows a voltage distribution (or another distribution such as amperes).

- **OFF**
  This disables collection of the histogram measurement.

**Example 1**
```
Histogram:MODE HORizontal
```
This command sets the type of histogram created to horizontal, which displays a horizontally positioned histogram that shows time distribution.

**Example 2**
```
Histogram:MODE?
```
This query might return :HISTOGRAM:MODE OFF, indicating that histogram display is disabled.
**HIStogram:SIZe**

**Description**
This command sets or queries the width or height of the histogram on the screen. This is equivalent to selecting Waveform Histograms from the Measure menu and then entering a value in the Histo Size box.

**Group**
HIStogram

**Related Commands**
HIStogram:DISplay (see page 155)

**Syntax 1**
```
HIStogram:SIZe <NR3>
```

**Syntax 2**
```
HIStogram:SIZe?
```

**Arguments**
- `<NR3>`
  This specifies the histogram size. The value can vary from 0.1 to 8.0 divisions in HORizontal mode and from 0.1 to 10.0 divisions in VERTical mode. Resolution is to the nearest pixel.

**Example 1**
```
HIStogram:SIZe 2.0
```
This command sets the size of the histogram to 2.0 divisions.

**Example 2**
```
HIStogram:SIZe?
```
This query might return `:HISTOGRAM:SIZE 2.0000E+01`, indicating the histogram size is set to 2.0 divisions.
**HIStogram:SOUrce**

**Description**
This command sets or queries which source will be compared against the histogram box when the histogram testing is enabled. This is equivalent to selecting Waveform Histograms from the Measure menu and then choosing the desired waveform source. The waveform need not be displayed for histograms to run. You might want the channel displays disabled so you can see a full-screen histogram and not have waveform data confuse the display.

**Group**
HIStogram

**Related Commands**
HIStogram:DISplay (see page [155](#))

**Syntax 1**
```
HIStogram:SOUrce {CH<x>|MATH<x>|REF<x>}
```

**Syntax 2**
```
HIStogram:SOUrce?
```

**Arguments**
- **CH<x>**
  This selects a channel waveform as the source for the histogram. The channel waveform range is from 1 through 4.

- **MATH<x>**
  This selects a math waveform as the source for the histogram. The valid math waveform range is from 1 through 4.

- **REF<x>**
  This selects a reference waveform as the source for the histogram. The valid reference waveform range is from 1 through 4.

**Example 1**
```
HIStogram:SOUrce CH1
```
This command enables the channel 1 waveform to be compared against the histogram box. The default time base, Main, is used for the histogram display.

**Example 2**
```
HIStogram:SOUrce?
```
This query might return `:HISTOGRAM:SOURCE CH1`, indicating that the waveform for channel 1 is the source for the histogram.
**HIStogram:STATE**

**Description**
This command sets or queries whether the histogram calculations are enabled. This is equivalent to selecting Waveform Histograms from the Measure menu.

**Group**
HIStogram

**Related Commands**
HIStogram:MODe (see page 157), MEASUrement:METHod (see page 258)

**Syntax 1**
HIStogram:STATE {ON|OFF|NR1}

**Syntax 2**
HIStogram:STATE?

**Arguments**
- **<ON>**
  This enables histogram calculations.
- **<OFF>**
  This disables the histogram calculations.
- **<NR1>**
  A 0 disables histogram calculations; any other value enables histogram calculations.

**Example 1**
HIStogram:STATE ON
This command enables histogram calculations.

**Example 2**
HIStogram:STATE?
This query might return :HISTOGRAM:STATE 0, indicating that histogram calculations are currently disabled.
Horizontal Command Group

Horizontal Overview

Horizontal commands control the time bases of the instrument. You can set the time per division (or time per point) of the main time base. You can use the Horizontal commands to do the following:

- Set the scale, horizontal position and reference, and units of the time base
- Get the screen resolution, time of first point and time of last point, or get all the horizontal settings
- Enable or disable the display of the time base

You may substitute SECdiv for SCAle in the horizontal commands. This provides program compatibility with earlier models of Tektronix oscilloscopes.

Horizontal Fastframe (also known as memory segmentation) commands are designed for situations where you want to capture a series of triggered acquisitions with minimal dead time between them. You can use the Horizontal Fastframe commands to do the following:

- Maintain Fastframe acquisitions with time stamp information for channel-based waveforms (in Sample, Peak Defect, and Hi Res modes)
- Display a list of time stamp and basic delta information on a Fastframe waveform, or Fastframe waveforms within a single frame (in either YT or XY format)
- Zoom Fastframe waveforms within a single frame
## Horizontal Commands

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</table>
HORizontal?

Description
This query-only command returns all learnable settings for the horizontal commands.

Group
HORizontal

Syntax
HORizontal?

Example
HORizontal?

This query might return:
:HORIZONTAL:DELAY:MODE 1
;POSITION 5.0000E+01;TIME 0.0000E+00;
:HORIZONTAL:MAIN:SCALE 2.0000E-07;POSITION 5.0000E+01
;UNITS:VALUE 1.0000E+00;STRING "s";OFFSET 0.0000E+00;
:HORIZONTAL:RECORDLENGTH 5000;ROLL AUTO;FASTFRAME:STATE 0
;LENGTH 5000;COUNT 2;SELECTED:CH1 2;CH2 2;CH3 2;CH4 2
;MATH1 2;MATH2 2;MATH3 2;MATH4 2;REF1 2;REF2 2;REF3 2
;REF4 2;:HORIZONTAL:FASTFRAME:REF:SOURCE CH1;FRAME 1;
:HORIZONTAL:FASTFRAME:TRACK LIVE
HORIZontal:DIVisions?

Description
This query-only command returns the number of graticule divisions over which the waveform is displayed.

Group
Horizontal

Syntax
HORIZontal:DIVisions?

Arguments
None.

Example
HORIZontal:DIVisions?

This query might return :HORIZONTAL:DIVISIONS 1.0000E-01, indicating that the waveform is displayed across one division.
HORizontal:FASTframe:COUNt

Description
This command sets or queries FastFrame frame count. This is equivalent to selecting FastFrame Setup from the Horiz/Acq menu and entering a value in the Frame Count box. FastFrame, also known as memory segmentation, captures a series of triggered acquisitions with minimal intervening time. This command is equivalent to selecting Fast Frame Setup from the Horiz/Acq menu and entering a value in the Frame Count box.

Group
Horizontal

Related Commands
HORizontal:RECOrdlength (see page 192)

Syntax 1
HORizontal:FASTframe:COUNt <NR1>

Syntax 2
HORizontal:FASTframe:COUNt?

Arguments
• <NR1>
  This indicates the number of frames to acquire.

Example 1
HORizontal:FASTframe:COUNt 2
This command sets up FastFrame mode to acquire two frames (segments) of data.

Example 2
HORizontal:FASTframe:COUNt?
This query might return :HORIZONTAL:FASTFRAME:COUNT 4, indicating that FastFrame mode is currently set to acquire 4 frames (segments) of data.
HORizontal:FASTframe:REF:FRAME

Description
This command sets or queries the FastFrame reference frame number. The Reference Frame number is used to calculate time differences for each frame and displays those differences in the graticule. This command is equivalent to selecting FastFrame Setup in the Horiz/Acq menu and entering a value in the Time Stamps/Frame box.

Group
Horizontal

Related Commands
HORizontal:FASTframe:REF:SOUrce (see page 170),
HORizontal:FASTframe:TIMEstamp:DELTa:<wfm>? (see page 175),
HORizontal:FASTframe:TIMEstamp:REF? (see page 177), HORizontal:FASTframe:TRACk (see page 179)

Syntax 1
HORizontal:FASTframe:REF:FRAME <NR1>

Syntax 2
HORizontal:FASTframe:REF:FRAME?

Argument
• <NR1>
  This specifies the FastFrame reference frame.

Example 1
HORizontal:FASTframe:REF:FRAME 2
This command sets the FastFrame reference frame to 2.

Example 2
HORizontal:FASTframe:REF:FRAME?
This query might return :HORIZONTAL:FASTFRAME:REF:FRAME 3, indicating that the FastFrame reference frame is currently set to 3.
HORizontal:FASTframe:LENgth

Description
This command sets or queries the horizontal record length to the number of sample points in each frame. This command is equivalent to selecting FastFrame Setup from the Horiz/Acq menu and entering a value in the Rec Length box. FastFrame, also known as memory segmentation, captures a series of triggered acquisitions with minimal intervening time between them.

Group
Horizontal

Syntax 1
HORizontal:FASTframe:LENgth <NR1>

Syntax 2
HORizontal:FASTframe:LENgth?

Argument
• <NR1>
  This represents the supported values for horizontal record lengths, which can range from 500 through 400000. For more information about valid data point ranges, select Specifications from the Help menu and choose the Horizontal & Acquisition tab.

Example 1
HORizontal:FASTframe:LENgth 5000
This command sets the horizontal record length to 5000 sample points in each frame.

Example 2
HORizontal:FASTframe:LENgth?
This query might return :HORIZONTAL:FASTFRAME:LENGTH 25000, indicating that the FastFrame record length is set to 25000 sample points in each frame.
HORizontal:FASTframe:REF:SOUrce

Description
This command sets or queries FastFrame Reference waveform source. This is equivalent to selecting FastFrame Setup from the Horiz/Acq menu and choosing the reference source.

Group
Horizontal

Related Commands
HORizontal:FASTframe:REF:FRAme (see page 168),
HORizontal:FASTframe:TIMEstamp:DELTa:<wfm>? (see page 175),
HORizontal:FASTframe:TIMEstamp:REF? (see page 177), HORizontal:FASTframe:TRACk (see page 179)

Syntax 1
HORizontal:FASTframe:REF:SOUrce <wfm>

Syntax 2
HORizontal:FASTframe:REF:SOUrce?

Argument
- <wfm>
  This specifies the FastFrame Reference waveform source. Valid waveforms include CH<x>, MATH<x>, and REF<x>; the x variable can be expressed as an integer ranging from 1 through 4.

Example 1
HORizontal:FASTframe:REF:SOUrce CH2
This command sets the horizontal FastFrame waveform reference source to CH2.

Example 2
HORizontal:FASTframe:REF:SOUrce?
This query might return :HORIZONTAL:FASTFRAME:REF:SOURCE CH2, indicating that the FastFrame waveform source is currently set to CH2.
HORizontal:FASTframe:SELECTED:<wfm>

Description
This command sets or returns the FastFrame Selected frame number on the specified waveform. This is equivalent to selecting FastFrame Setup from the Horiz/Acq menu and then choosing the waveform source and frame. Valid waveforms include CH<x>, MATH<x> and REF<x>; the x variable can be expressed as an integer ranging from 1 through 4.

Group
Horizontal

Related Commands
HORizontal:FASTframe:TRACk (see page 179), HORizontal:FASTframe:TIMEstamp:DELTa:<wfm>? (see page 175), HORizontal:FASTframe:TIMEstamp:REF? (see page 177)

Syntax 1
HORizontal:FASTframe:SELECTED:<wfm> <NR1>

Syntax 2
HORizontal:FASTframe:SELECTED?

Argument
• <NR1>
   This specifies the selected frame number on the specified waveform.

Example 1
HORizontal:FASTframe:SELECTED:CH2 33
This command sets the FastFrame Selected frame number on channel 2 to 33.

Example 2
HORizontal:FASTframe:SELECTED:CH4?
This query might return :HORIZONTAL:FASTFRAME:SELECTED:CH4 25, indicating that the FastFrame frame number on channel 4 is set to 25.

Example 3
HORizontal:FASTframe:SELECTED?
This query might return :HORIZONTAL:FASTFRAME:SELECTED:CH1 2; CH2 2; CH3 2; CH4 2; MATH1 2; MATH2 2; MATH3 2; MATH4 2; REF1 8; REF2 8; REF3 8; REF4 8, indicating all waveforms' Fastframe selected frame numbers.
**HORizontal:FASTframe:STATE**

**Description**
This command sets or returns the state of FastFrame acquisition. This is equivalent to setting FastFrame On in the FastFrame Setup menu. FastFrame, also known as memory segmentation, lets users capture a series of triggered acquisitions with minimal time between them.

The digitizing oscilloscope in FastFrame mode is ready to accept a continuous burst of triggers 400 ms after the controller sends the ACQuire:STATE RUN command.

**Group**
Horizontal

**Related Commands**
ACQuire:STATE RUN (see page 26)

**Syntax 1**
HORizontal:FASTframe:STATE {ON|OFF|<NR1>}

**Syntax 2**
HORizontal:FASTframe:STATE?

**Arguments**
- **<ON>**
  This turns on horizontal FastFrame.
- **<OFF>**
  This turns off horizontal FastFrame.
- **<NR1>**
  A 0 turns off horizontal FastFrame; any other value turns on horizontal FastFrame.

**Example 1**
HORizontal:FASTframe:STATE ON
This command turns on horizontal FastFrame.

**Example 2**
HORizontal:FASTframe:STATE?
This query might return :HORIZONTAL:FASTFRAME:STATE 0, indicating that the current state of FastFrame is off.
HORizontal:FASTframe:TIMEStamp:ALL:<wfm>?  

Description  
This query-only command returns the frame number and time stamp for each frame between requested frames, inclusive, within the specified waveform. Argument order is unimportant. Valid waveforms include CH<x>, MATH<x> and REF<x>; the x variable can be expressed as an integer ranging from 1 through 4.

Group  
Horizontal

Syntax  
HORizontal:FASTframe:TIMEStamp:ALL:<wfm>? <NRF>, <NRF>

Arguments  
• <NRF>  
  This specifies the selected "from" frame number within the specified waveform.
• <NRF>  
  This specifies the selected "to" frame number within the specified waveform.

Example  
HORizontal:FASTframe:TIMEStamp:ALL:CH2 4,1?

This query might return :HORIZONTAL:FASTFRAME:TIMESTAMP:ALL:CH1 4,1,"02 Mar 2000 20:10:54.542 037 272 620", which is the list of time stamps from frame 1 through frame 4 on channel 1.
HORizontal:FASTframe:TIMEStamp:BETWeen:<wfm>?

Description
This query-only command returns the relative trigger for the delta time between the specified frames, within the specified waveform. Valid waveforms include CH<x>, MATH<x> and REF<x>; the x variable can be expressed as an integer ranging from 1 through 4.

Group
Horizontal

Syntax
HORizontal:FASTframe:TIMEStamp:BETWeen:<wfm>? <NRF>, <NRF>

Arguments
• <NRF>
  This specifies the selected "from" frame number within the specified waveform.
• <NRF>
  This specifies the selected "to" frame number within the specified waveform.

Example
HORizontal:FASTframe:TIMEStamp:BETWeen:CH1? 5,2

This query might return :HORIZONTAL:FASTFRAME:TIMESTAMP:BETWEEN:CH1 5,2,"00:00:00.010 000 540 624", which is the delta of channel 1's Time Stamp frame 5 - Time Stamp frame 2 (TS[5]-TS[2]).
HORizontal:FASTframe:TIMEStamp:DELTa:<wfm>?  

**Description**  
This query-only command returns the relative time between the triggers of the FastFrame Selected and the FastFrame Reference, within the specified waveform. Valid waveforms include CH<x>, MATH<x> and REF<x>; the x variable can be expressed as an integer ranging from 1 through 4.

**Group**  
Horizontal

**Syntax**  
HORizontal:FASTframe:TIMEStamp:DELTa:<wfm>?

**Example**  
HORizontal:FASTframe:TIMEStamp:DELTa:CH1?  
This query might return 

```
:HORIZONTAL:FASTFRAME:TIMESTAMP:DELTA:CH1 "00:00:00.006 000 306 556"
```

which is the delta time stamp of FastFrame Selected Frame on channel 1 - FastFrame Reference Frame (TS[C1 Selected]-TS[Reference]).
**HORizontal:FASTframe:TIMEStamp:FRAME:<wfm>?**

**Description**
This query-only command returns the absolute trigger date and time for the specified frame and waveform. Valid waveforms include CH<x>, MATH<x> and REF<x>; the x variable can be expressed as an integer ranging from 1 through 4.

**Group**
Horizontal

**Syntax**
HORizontal:FASTframe:TIMEStamp:FRAME:<wfm>? <NR1>

**Argument**
• <NR1>
The frame number for which the timestamp will be returned on the specified waveform.

**Example**
HORizontal:FASTframe:TIMEStamp:FRAME:CH1? 10

This query might return :HORIZONTAL:FASTFRAME:TIMESTAMP:FRAME:CH1 10,"02 Mar 2000 20:10:54.536 036 928 432", which is the time stamp of channel 1, frame 10.
HORizontal:FASTframe:TIMEStamp:REF?

Description
This query-only command returns the absolute trigger date and time for FastFrame reference.

Group
Horizontal

Related Commands
HORizontal:FASTframe:REF:FRAmes (see page 168), HORizontal:FASTframe:REF:SOURce (see page 170)

Syntax
HORizontal:FASTframe:TIMEStamp:REF?

Example
HORizontal:FASTframe:TIMEStamp:REF?

This query might return :HORIZONTAL:FASTFRAME:TIMESTAMP:REF "02 Mar 2000 20:10:54.533 036 838 784", which is the time stamp of FastFrame Reference.
HORizontal:FASTframe:TIMEStamp:SELECTED:<wfm>?

Description
This query-only command returns the absolute trigger date and time for the FastFrame Selected, within the specified waveform. Valid waveforms include CH<x>, MATH<x> and REF<x>; the x variable can be expressed as an integer ranging from 1 through 4.

Group
Horizontal

Related Commands
HORizontal:FASTframe:SELECTED:<wfm>? (see page 171)

Syntax
HORizontal:FASTframe:TIMEstamp:SELECTED:<wfm>?

Example
HORizontal:FASTframe:TIMEStamp:SELECTED:REF1?

This query might return :HORIZONTAL:FASTFRAME:TIMESTAMP:SELECTED:REF1 "02 MAR 2000 20:10:54 539 037 145 340", which is the time stamp of FastFrame Selected on reference 1.
HORizontal:FASTframe:TRACk

**Description**
This command sets up or returns the state of FastFrame tracking feature. This command is equivalent to selecting FastFrame Setup from the Horiz/Acq menu and then clicking the desired Frame Tracking state. When FastFrame Track is set to "live", the channel and math waveforms are locked together. Adjusting a channel waveform also adjusts a related math waveform. All reference waveforms are also locked together but they are separate from channel and math waveforms.

For example, when you set the Selected Frame Source Ch1 to Frame 3, then Selected Frame Ch2, Ch3, Ch4, Math1, Math2, Math3 and Math4 are also set to Frame 3.

When you set the Selected Frame Source Ref1 to Frame 2, then Selected Frame Ref2, Ref3 and Ref4 are also set to Frame 2. If the Frame Tracking is set to Live, changing Selected Frame Ch1 will not affect the Selected Frame Ref1 frame of the Reference Frame setting.

When FastFrame Track is set to "all", the channel, math and reference waveforms are locked together. Adjusting a channel waveform also adjusts the related math and reference waveforms.

For example, when you set the Selected Frame Source Ch1 to Frame 3, then Selected Frame Ch2, Ch3, Ch4, Math1, Math2, Math3, Math4, Ref1, Ref2, Ref3 and Ref4 are also set to Frame 3.

**Group**
Horizontal

**Related Commands**
HORizontal:FASTframe:REF:FRAme (see page 168), HORizontal:FASTframe:REF:SOUrce (see page 170), HORizontal:FASTframe:SELECTED:<wfm>? (see page 171)

**Syntax 1**
HORizontal:FASTframe:TRACk {LIVE|ALL}

**Syntax 2**
HORizontal:FASTframe:TRACk?

**Arguments**
- **LIVE**
  This sets FastFrame Track to Live.
- **ALL**
  This sets FastFrame Track to All.

**Example 1**
HORizontal:FASTframe:TRACk LIVE
This command sets FastFrame Track to Live.

**Example 2**
HORizontal:FASTframe:TRACk?
This query might return :HORIZONTAL:FASTFRAME:TRACK ALL, indicating that all FastFrame Selected Frames and the FastFrame Reference will be locked together.
HORizontal:MAIn?

Description
This query-only command returns the time per division of the time base. This command is equivalent to selecting Position/Scale from the Horiz/Acq menu.

Group
Horizontal

Related Commands
HORizontal:SCALE (see page 195)

Syntax
HORizontal:MAIn?

Example
HORizontal:MAIn?

This query might return :HORIZONTAL:MAIN:SCALE 1.0000E-04;POSITION 5.0000E+01;UNITS:VALUE 1.0000E+00;STRING "s";OFFSET 0.0000E+01
**HORizontal[:MAIn]:POSition**

This command either positions the waveform horizontally on the display or returns the horizontal position on the display and is identical to the HORizontal:POSition command. When Horizontal Delay mode is turned off, this command is equivalent to adjusting the HORIZONTAL POSITION knob on the front-panel. When Horizontal Delay mode is turned on, this command is equivalent to selecting Horizontal/Acquisition from the Horiz/Acq menu and then choosing a Horizontal Ref Point value.

**Group**
Horizontal

**Related Commands**
HORizontal[:MAIn]:DELay:MODe (see page 184)

**Syntax 1**
HORizontal:MAIn:POSition <NR3>

**Syntax 2**
HORizontal:MAIn:POSition?

**Arguments**
- **<NR3>**
  - This is from 0 to ≈100 and is the percent of the waveform that is displayed left of the center graticule.
  - **Note:** The upper limit of the waveform position is slightly limited by a value that is determined from the record length (upper limit = 100 - 1/record length).

**Example 1**
HORizontal:MAIn:POSition 5.000E+01

This command sets the horizontal position of the waveform such that 10 percent of the waveform is to the left of screen center.

**Example 2**
HORizontal:MAIn:POSition?

This query might return :HORIZONTAL:MAIN:POSITION 5.0000E+01, indicating that the horizontal position of the waveform on the screen is currently set to 50 percent.
HORizontal[:MAIn]:SCAle

Description
This command sets the time per division for the time base or returns its horizontal scale on the display and is identical to the HORizontal:SCAle command. The specified scale value is rounded to a valid scale setting. This command is equivalent to selecting Position/Scale from the Horiz/Acq menu and then choosing a Scale value.

Group
Horizontal

Related Commands
HORizontal:SCAle (see page 182)

Syntax 1
HORizontal:MAIn:SCAle <NR3>

Syntax 2
HORizontal:MAIn:SCAle?

Argument
• <NR3>

This is the time per division. The range is from 200 ps through 40 s.

Example 1
HORizontal:MAIn:SCAle 2E-6
This command sets the main scale to 2µs per division.

Example 2
HORizontal:MAIn:SCAle?
This query might return :HORIZONTAL:MAIN:SCALE 2.0000E-06, indicating that the main scale is currently set to 2 µs per division.
HORizontal[:MAIn]:DELay:POSition

Description
This command sets or queries the time base position when Horizontal Delay Mode is turned on. This command is equivalent to selecting Horizontal/Acquisition Setup from the Horiz/Acq menu and then entering a Ref Point value.

Group
Horizontal

Related Commands
HORizontal[:MAIn]:DELay:TIMe (see page 183)

Syntax 1
HORizontal[:MAIn]:DELay:POSition <NR3>

Syntax 2
HORizontal[:MAIn]:DELay:POSition?

Arguments
- <NR3>
  This is from 0 to ≈100 and is the percent of the waveform that is displayed left of the center graticule.

  Note: The upper limit of the waveform position is slightly limited by a value that is determined from the record length (upper limit = 100 - 1/record length).

Example 1
HORizontal:DELay:POSition 5E+1

This command sets the time base trigger delay position to 50 percent.

Example 2
HORizontal:DELay:POSition?

This query might return :HORIZONTAL:MAIN:DELAY:POSITION 5.0000E+01, indicating that the time base trigger delay position is currently set to 50 percent
HORizontal[:MAIn]:DELay:MODe

Description
This command sets or queries the time base trigger delay mode. This command is equivalent to choosing Delay Mode On from the Horiz/Acq menu.

Group
Horizontal

Related Commands
HORizontal[:MAIn]:DELay:TIEme (see page 185)

Syntax 1
HORizontal[:MAIn]:DELay:MODe [ON|OFF|<NR1>]

Syntax 2
HORizontal[:MAIn]:DELay:MODe?

Arguments
- **ON**
  This enables the time base trigger delay mode.
- **OFF**
  This disables the time base trigger delay mode.
- **<NR1>**
  A 0 disables the time base trigger delay mode, any other value enables the time base trigger delay mode.

Example 1
HORizontal:DELay:MODe ON
This command enables the time base trigger delay mode.

Example 2
HORizontal:DELay:MODe?
This query might return :HORIZONTAL:DELAY:MODE 1, indicating that the time base trigger delay mode is currently enabled.
HORizontal[:MAIn]:DELay:TIMe

Description
This command sets or queries the time base trigger delay time. This command is equivalent to selecting Position/Scale from the Horiz/Acq menu and choosing a value for Horiz Delay.

Group
Horizontal

Related Commands
HORizontal[:MAIn]:DELay:MODe (see page 184), HORizontal[:MAIn]:DELay:POSition (see page 183)

Syntax 1
HORizontal[:MAIn]:DELay:TIMe <NR3>

Syntax 2
HORizontal[:MAIn]:DELay:TIMe?

Argument
• <NR3>
  This specifies the time base trigger delay time setting, typically represented in seconds.

Example 1
HORizontal:DELay:TIMe 5.0E-3
This command sets the time base trigger delay time to 5 ms.

Example 2
HORizontal:DELay:TIMe?
This query might return :HORIZONTAL:MAIN:DELAY 5.0000E-05, indicating that the time delay setting is 5 µs.
HORizontal:MAIn:SAMPLERate

Description
This command sets the horizontal sample rate to the desired number of samples per second. The record length is automatically adjusted at the same time to maintain a constant number of data points in each frame. The query form of this command returns the current horizontal sample rate. This command is equivalent to selecting Horizontal/Acquisition Setup from the Horiz/Acq menu and then entering the desired Sample Rate.

Group
Horizontal

Related Commands
HORizontal:RESOlution (see page 193)

Syntax 1
HORizontal:MAIn:SAMPLERate <NR3>

Syntax 2
HORizontal:MAIn:SAMPLERate?

Arguments
• <NR3>

This represents the size of the sample rate, which ranges from 5 S/s to 250 GS/s.

Example 1
HORizontal:MAIn:SAMPLERate 125E6

This command sets the sample rate to the sample rate increment that is closest to 125 MS/s.

Example 2
HORizontal:MAIn:SAMPLERate?

This query might return :HORIZONTAL:MAIN:SAMPLERATE 2.5000E+09, indicating that the sample rate is currently set to 2.5 GS/s.
HORizontal:MAIn:UNIts

Description
This command sets or returns the units for the horizontal time base. It is equivalent to separately setting the following commands:

- HORizontal:MAIn:UNIts:VALue
- HORizontal:MAIn:UNIts:STRing
- HORizontal:MAIn:UNIts:OFFSet

Group
Horizontal

Related Commands
HORizontal:MAIn:UNIts:VALue (see page 190), HORizontal:MAIn:UNIts:STRing (see page 189), HORizontal:MAIn:UNIts:OFFSet (see page 188)

Syntax 1
HORizontal:MAIn:UNIts <NR3> [,<STRing>] [,<NR3>]

Syntax 2
HORizontal:MAIn:UNIts?

Arguments
- <NR3>
  This is the time base units multiplier. The instrument scales time/div using this multiplier.
- <STRing>
  This is the time base units string.
- <NR3>
  This is the time base units offset.

Example 1
HORizontal:MAIn:UNIts 5.5,"lum", 2.9
This command sets the time base multiplier to 5.5, the units to "lum" and the time base units offset to 2.9.

Example 2
HORizontal:MAIn:UNIts?
This query might return :HORIZONTAL:MAIN:UNITS:VALUE 5.5000E+00;STRING "lum", OFFSET 2.9000E+00
**HORizontal:MAIn:UNIts:OFFset**

**Description**
This command sets or returns the offset units for the horizontal time base trigger delay.

**Group**
Horizontal

**Related Commands**
HORizontal:MAIn:UNIts (see page 187)

**Syntax 1**
HORizontal:MAIn:UNIts:OFFSet <NR3>

**Syntax 2**
HORizontal:MAIn:UNIts:OFFSet?

**Argument**

- **<NR3>**
  This is the time base unit offset.

**Example 1**
HORizontal:MAIn:UNIts:OFFSet 2.9

This command sets the horizontal time base trigger delay offset units to 2.9 s.

**Example 2**
HORizontal:MAIn:UNIts:OFFSet?

This query might return :HORIZONTAL:MAIN:UNITS:OFFSET 2.9000E+00, indicating that the offset units for the horizontal time base trigger delay is set to 2.9 s.
HORizontal:MAIn:UNIts:STRing

Description
This command sets or returns the units string for the horizontal time base trigger delay.

Group
Horizontal

Related Commands
HORizontal:MAIn:UNIts (see page 187)

Syntax 1
HORizontal:MAIn:UNIts <STRING>

Syntax 2
HORizontal:MAIn:UNIts:STRING?

Argument
• <STRING>
  This is the time base units string.

Example 1
HORizontal:MAIn:UNIts:STRING lum

This command sets the units string for the time base trigger delay to lumens.

Example 2
HORizontal:MAIn:UNIts:STRING?

This query might return :HORIZONTAL:MAIN:UNITS:STRING "lum", indicating that the units string for the time base trigger delay is set to lumens.
HORizontal:MAIn:UNIts:VALue

Description
This command sets or returns the unit value for the horizontal time base trigger delay.

Group
Horizontal

Related Commands
HORizontal:MAIn:UNIts (see page 187)

Syntax 1
HORizontal:MAIn:UNIts:VALue <NR3>

Syntax 2
HORizontal:MAIn:UNIts:VALue?

Argument
• <NR3>

This is the time base unit value.

Example 1
HORizontal:MAIn:UNIts:VALue 5.5

This command sets the unit value for the time base trigger delay to 5.5.

Example 2
HORizontal:MAIn:UNIts:VALue?

This query might return :HORIZONTAL:MAIN:UNITS:VALUE 5.5000E+00, indicating that the unit value for the time base trigger delay is set to 5.5.
HORizontal:POSition

Description
This command either positions the waveform horizontally on the display or returns its horizontal position on the display. When Horizontal Delay Mode is turned off, this command is equivalent to adjusting the HORIZONTAL POSITION knob on the front panel.

Group
Horizontal

Related Commands
HORizontal[:MAIn]:DElay:MODe

Syntax 1
HORizontal:POSition <NR3>

Syntax 2
HORizontal:POSition?

Argument
• <NR3>
  This is from 0 to ≈100 and is the percent of the waveform that is displayed left of the center graticule.

  Note: The upper limit of the waveform position is slightly limited by a value that is determined from the record length (upper limit = 100 - 1/record length).

Example 1
HORizontal:POSition 10
This command sets the horizontal position of the waveform such that 10% of the waveform is to the left of screen center.

Example 2
HORizontal:POSition?
This query might return :HORIZONTAL:POSITION 5.0000E+01, indicating the horizontal position of the waveform on the screen.
HORizontal:RECORDlength

Description
This command sets the horizontal record length to the number of data points in each frame. The query form of this command returns the current horizontal record length. This command is equivalent to selecting Resolution from the Horiz/Acq menu and then entering the desired Rec Length.

Group
Horizontal
Syntax 1
HORizontal:RECORDlength <NR1>
Syntax 2
HORizontal:RECORDlength?

Argument
• <NR1>
  This represents the supported values for horizontal record lengths, which range from 500 through 400K data points. For more information about valid data point ranges, select Specifications from the Help menu and choose the Horizontal & Acquisition tab.

Example 1
HORizontal:RECORDlength 50000
This command specifies that 50000 data points will be acquired for each record.

Example 2
HORizontal:RECORDlength?
This query might return :HORIZONTAL:RECORDlength 5000, indicating that the horizontal record length is equal to 5000 data points.
**HORizontal:RESOlution**

**Description**
This command sets the horizontal record length to the number of data points in each frame. The sample rate is automatically adjusted at the same time to maintain a constant time per division. The query form of this command returns the current horizontal record length. This command is equivalent to adjusting the RESOLUTION knob on the front panel.

**Group**
Horizontal

**Syntax 1**

HORizontal:RESOlution <NR1>

**Syntax 2**

HORizontal:RESOlution?

**Argument**

- `<NR1>`
  This represents the supported values for horizontal record lengths, which range from 500 through 400K data points. For more information about valid data point ranges, select Specifications from the Help menu and choose the Horizontal & Acquisition tab.

**Example 1**

HORizontal:RESOlution 50000

This command specifies that 50000 data points will be acquired for each record.

**Example 2**

HORizontal:RESOlution?

This query might return :HORIZONTAL:RESOLUTION 5000, indicating that the horizontal record length is equal to 5000 data points.
**HORizontal:ROLL**

**Description**
This command sets or queries the Roll Mode status. Use Roll Mode when you want to view data at very slow sweep speeds. It is useful for observing data samples on the screen as they occur. This command is equivalent to selecting Horizontal/Acquisition Setup from the Horiz/Acq menu, selecting the Acquisition tab and then choosing the desired Roll Mode.

**Group**
Horizontal

**Syntax 1**
```
HORizontal:ROLL {AUTO|OFF|ON}
```

**Syntax 2**
```
HORizontal:ROLL?
```

**Arguments**
- **AUTO**
  This enables Roll Mode, if the time/division is set appropriately.
- **OFF**
  This disables Roll Mode.
- **ON**
  This enables Roll Mode, if the time/division is set appropriately.

**Example 1**
```
HORizontal:ROLL ON
```
This command enables Roll Mode.

**Example 2**
```
HORizontal:RECOrdlength?
```
This query might return :HORIZONTAL:ROLL OFF, indicating that the roll mode is disabled.
HORizontal:SCAle

Description
This command sets or queries the time per division for the time base and is identical to the
HORizontal:MAIn:SCAle command. It is provided to maintain program compatibility with some older
models of Tektronix oscilloscopes. This command is equivalent to selecting Position/Scale from the
Horiz/Acq menu and then entering the desired Scale value.

Group
Horizontal

Related Commands
HORizontal[:MAIn]:SCAle (see page 182)

Syntax
1
HORizontal:SCAle <NR3>

Syntax 2
HORizontal:SCAle?

Argument
• <NR3>

This is the time per division. The range is from 200 ps to 40 s.

Example 1
HORizontal:SCAle 2E-6

This command sets the main scale to 2 µs per division.

Example 2
HORizontal:SCAle?

This query might return :HORIZONTAL:SCALE 2.0000E-06, indicating that the time per division is
currently set to 2 µs.
HORizontal:TRIGger:POSition

Description
This command sets or queries the position of the trigger and is identical to the HORizontal:MAIn:POSition command. It is provided to maintain program compatibility with some older models of Tektronix oscilloscopes. This command is equivalent to selecting Position/Scale from the Horiz/Acq menu and then entering the desired Position.

Group
Horizontal

Related Commands
HORizontal:MAIn:POSition (see page 181)

Syntax 1
HORizontal:TRIGger:POSition <NR1>

Syntax 2
HORizontal:TRIGger:POSition?

Argument
• <NR1>
  This is the amount of pre-trigger information in the waveform. The range is from 0 to 100%.

Example 1
HORizontal:TRIGger:POSition 50
This command sets the pre-trigger information in the waveform to 50%.

Example 2
HORizontal:TRIGger:POSition?
This query might return :HORIZONTAL:TRIGGER:POSITION 50
Math Command Group

Math Overview

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

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

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

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

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

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<td>MATH&lt;x&gt;:NUMavg?</td>
<td>Returns the acquisition number at which the averaging algorithm will begin exponential averaging</td>
</tr>
<tr>
<td>MATH&lt;x&gt;:NUMavg</td>
<td>Sets the acquisition number at which the averaging algorithm will begin exponential averaging</td>
</tr>
<tr>
<td>MATH&lt;x&gt;:POSition?</td>
<td>Returns the specified math waveform vertical position</td>
</tr>
<tr>
<td>MATH&lt;x&gt;:POSition</td>
<td>Sets the specified math waveform vertical position</td>
</tr>
<tr>
<td>MATH&lt;x&gt;:SCAle?</td>
<td>Returns the specified math waveform vertical scale (per div)</td>
</tr>
<tr>
<td>MATH&lt;x&gt;:SCAle</td>
<td>Sets the specified math waveform vertical scale (per div)</td>
</tr>
<tr>
<td>MATH&lt;x&gt;:SPECTral?</td>
<td>Returns the specified math waveform spectral setups</td>
</tr>
<tr>
<td>MATH&lt;x&gt;:SPECTral:CENTER?</td>
<td>Returns the center frequency of the spectral analyzer output data span</td>
</tr>
<tr>
<td>MATH&lt;x&gt;:SPECTral:CENTER</td>
<td>Sets the center frequency of the spectral analyzer output data span</td>
</tr>
<tr>
<td>MATH&lt;x&gt;:SPECTral:GATEPOS?</td>
<td>Returns the position of the center of the gate</td>
</tr>
<tr>
<td>MATH&lt;x&gt;:SPECTral:GATEPOS</td>
<td>Sets the position of the center of the gate</td>
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<tr>
<td>MATH&lt;x&gt;:SPECTral:GATEWIDTH?</td>
<td>Returns the gate width input to the spectral analyzer</td>
</tr>
<tr>
<td>MATH&lt;x&gt;:SPECTral:GATEWIDTH</td>
<td>Sets the gate width input to the spectral analyzer</td>
</tr>
<tr>
<td>MATH&lt;x&gt;:SPECTral:LOCK?</td>
<td>Returns the state of spectral locking for the specified math waveform</td>
</tr>
<tr>
<td>MATH&lt;x&gt;:SPECTral:LOCK</td>
<td>Sets the state of the math spectral locking for the specified math waveform</td>
</tr>
<tr>
<td>Command</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>MATH&gt;:SPECTral:MAG?</td>
<td>Returns the units of the SpectralMag function in the specified math string</td>
</tr>
<tr>
<td>MATH&gt;:SPECTral:MAG</td>
<td>Sets the units of the SpectralMag function in the specified math string</td>
</tr>
<tr>
<td>MATH&gt;:SPECTral:PHASE?</td>
<td>Returns the units of the SpectralPhase function in the specified math string</td>
</tr>
<tr>
<td>MATH&gt;:SPECTral:PHASE</td>
<td>Sets the units of the SpectralPhase function in the specified math string</td>
</tr>
<tr>
<td>MATH&gt;:SPECTral:REFLEVEL?</td>
<td>Returns the vertical position of the output data from the spectral analyzer</td>
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<td>MATH&gt;:SPECTral:REFLEVEL</td>
<td>Sets the vertical position of the output data from the spectral analyzer</td>
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<td>MATH&gt;:SPECTral:REFLEVELOffset?</td>
<td>Returns the spectral reference level offset used for calculating the dB value</td>
</tr>
<tr>
<td>MATH&gt;:SPECTral:REFLEVELOffset</td>
<td>Sets the spectral reference level offset used for calculating the dB value</td>
</tr>
<tr>
<td>MATH&gt;:SPECTral:RESBw?</td>
<td>Returns the resolution bandwidth of the spectral analyzer</td>
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<tr>
<td>MATH&gt;:SPECTral:RESBw</td>
<td>Sets the resolution bandwidth of the spectral analyzer</td>
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<tr>
<td>MATH&gt;:SPECTral:SPAN?</td>
<td>Returns the specified math waveform’s current span value</td>
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<tr>
<td>MATH&gt;:SPECTral:SPAN</td>
<td>Sets the top of the span to a value that is closest to the specified value</td>
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<tr>
<td>MATH&gt;:SPECTral:SUPPress?</td>
<td>Returns the phase suppression threshold</td>
</tr>
<tr>
<td>MATH&gt;:SPECTral:SUPPress</td>
<td>Sets the phase suppression threshold</td>
</tr>
<tr>
<td>MATH&gt;:SPECTral:UNWRap?</td>
<td>Returns whether or not phase unwrap of the spectral analyzer output data is enabled</td>
</tr>
<tr>
<td>MATH&gt;:SPECTral:UNWRap</td>
<td>Enables or disables phase unwrap of the spectral analyzer output data</td>
</tr>
<tr>
<td>MATH&gt;:SPECTral:WINdow?</td>
<td>Returns the window function used to multiply the input data to the spectral analyzer</td>
</tr>
<tr>
<td>MATH&gt;:SPECTral:WINdow</td>
<td>Sets the window function used to multiply the input data to the spectral analyzer</td>
</tr>
</tbody>
</table>
MATH<\text{x}>? 

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

Group
Math

Related Commands
SELect:<wfm> (see page 460)

Syntax
MATH<\text{x}>?

Example
This query might return:

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

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

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

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

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

Group
Math

Syntax 1
MATH<x>:DEFIne <QString>

Syntax 2
MATH<x>:DEFIne?

Argument
• <QString>

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

Example 1
MATH2:DEFIne "Ch1+Ch2"
This command adds the Ch 1 waveform and Ch 2 waveforms, storing the results in Math 2.

Example 2
MATH2:DEFIne?
This query might return :MATH1:DEFINE "CH2*REF2" as the expression that defines Math 1.
MATH<x>:LABEL:NAME

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

Group
Math

Syntax 1
MATH<x>:LABEL:NAME <string>

Syntax 2
MATH<x>:LABEL:NAME?

Argument
• <string>
  This specifies the label to annotate the math waveform.

Example 1
MATH2:LABEL:NAME "Probe point7"
This command assigns Probe point7 as the label that annotates Math2.

Example 2
MATH2:LABEL:NAME?
This query might return :MATH2:LABEL:NAME "Probe point7" as the label that annotates Math 2.
MATH<x>:LABEL:XPOS

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

Group
Math

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

Syntax 1
MATH<x>:LABEL:XPOS <NR1>

Syntax 2
MATH<x>:LABEL:XPOS?

Argument
• <NR1>

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

Example 1
MATH2:LABEL:XPOS 50

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

Example 2
MATH2:LABEL:XPOS?

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

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

Group
Math

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

Syntax 1
MATH<x>:LABEL:YPOS <NR1>

Syntax 2
MATH<x>:LABEL:YPOS?

Argument
• <NR1>

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

Example 1
MATH2:LABEL:YPOS -25

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

Example 2
MATH2:LABEL:YPOS?

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

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

Group
Math

Related Commands
ACQuire:NUMAVg (see page 23)

Syntax 1
MATH<x>:NUMAVg <NR1>

Syntax 2
MATH<x>:NUMAVg?

Argument
• <NR1>
  This specifies the number of acquisitions over which exponential averaging is performed.

Example 1
MATH2:NUMAVg 10
This command successively averages Math 2 by 10 times.

Example 2
MATH2:NUMAVg?
This query might return :MATH2:NUMAVG 10, indicating 10 Math 2 waveforms are successively averaged
before a single acquisition occurs.
MATH<x>:POSition

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

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

Group
Math, Vertical

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

Syntax 1
MATH<x>:POSition <NR3>

Syntax 2
MATH<x>:POSition?

Argument
• <NR3>
  This is the desired position in divisions from the center graticule.

Example 1
MATH2:POSition 1.3E+00
This command positions the Math 2 input signal 1.3 divisions higher than a position of 0.

Example 2
MATH1:POSition?
This query might return :MATH1:POSITION -1.3000E+00, indicating that the current position of Math 1 is 1.3 divisions below the center graticule.
MATH<x>:SCAle

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

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

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

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

Group
Math, Vertical

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

Syntax 1
MATH<x>:SCAle <NR3>

Syntax 2
MATH<x>:SCAle?

Argument
• <NR3>
  This is the scale, in volts, amps or watts per division. The range is from 100.0E-36 through 100.0E+36.

Example 1
MATH4:SCAle 100E-03
This command sets the Math 4 scale to 100 mV per division.

Example 2
CH2:SCAle?
This query might return :MATH2:SCALE 1.0000E+00, indicating that the current scale setting of Math 2 is 1 volt per division.
MATH<x>:SPECTral?

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

Group
Math

Syntax
MATH<x>:SPECTral?

Example
MATH1:SPECTral?

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

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

Group
Math

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

Syntax 1
MATH<x>:SPECTral:CENTER <NR3>

Syntax 2
MATH<x>:SPECTral:CENTER?

Argument
• <NR3>
  This is the desired frequency of the spectral analyzer output data span. Units are represented in hertz.

Example 1
MATH3:SPECTral:CENTER 10.09E6
This command sets the center frequency to the closest value it can attain to 10.09 MHz.

Example 2
MATH2:SPECTral:CENTER?
This query might return :MATH2:SPECTral:CENTER 10.0900E+06, indicating that the center frequency is currently set at 10.09 MHz.
MATH<x>:SPECTral:GATEPOS

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

Group
Math

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

Syntax 1
MATH<x>:SPECTral:GATEPOS <NRf>

Syntax 2
MATH<x>:SPECTral:GATEPOS?

Argument
• <NRf>
   This is the gate position. Units are represented in seconds, with respect to trigger position.

Example 1
MATH1:SPECTral:GATEPOS 0
This command specifies the position of the center edge of the gate used as the data input to the spectral analyzer.

Example 2
MATH2:SPECTral:GATEPOS?
This query might return :MATH2:SPECTRAL:GATEPOS 0.0000E+00
MATH<x>:SPECTral:GATEWIDTH

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

Group
Math

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

Syntax 1
MATH<x>:SPECTral:GATEWIDTH <NR3>

Syntax 2
MATH<x>:SPECTral:GATEWIDTH?

Argument
• <NR3>

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

Example 1
MATH1:SPECTral:GATEWIDTH 1.0E-3

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

Example 2
MATH3:SPECTral:GATEWIDTH?

This query might return MATH3:SPECTRAL:GATEWIDTH 1.0000E-03, indicating that the gate width to the spectral analyzer is set to 1 ms.
MATH<x>:SPECTral:LOCk

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

<table>
<thead>
<tr>
<th>MATH1</th>
<th>MATH2</th>
<th>MATH3</th>
<th>Locked Math Waveforms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>None</td>
</tr>
<tr>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>Math3 and Math4 locked</td>
</tr>
<tr>
<td>Off</td>
<td>On</td>
<td>Off</td>
<td>Math2 and Math3 locked</td>
</tr>
<tr>
<td>Off</td>
<td>On</td>
<td>On</td>
<td>Math2, Math3 and Math4 locked</td>
</tr>
<tr>
<td>On</td>
<td>Off</td>
<td>Off</td>
<td>Math1 and Math2 locked</td>
</tr>
<tr>
<td>On</td>
<td>Off</td>
<td>On</td>
<td>Math1 and Math 2 locked, Math3 and Math4 locked</td>
</tr>
<tr>
<td>On</td>
<td>On</td>
<td>Off</td>
<td>Math1, Math2 and Math3 locked</td>
</tr>
<tr>
<td>On</td>
<td>On</td>
<td>On</td>
<td>Math1, Math2, Math3 and Math4 locked</td>
</tr>
</tbody>
</table>

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

Group
Math

Syntax 1
MATH<x>:SPECTral:LOCk {ON|OFF}

Syntax 2
MATH<x>:SPECTral:LOCk?

Arguments
- **ON**
  This turns on the parameter lock for the specified math waveform.
- **OFF**
  This turns off the parameter lock for the specified math waveform.
- **<NR1>**
  A 0 disables the parameter lock for the specified math waveform; any other value enables the parameter lock.

Example 1
MATH1:SPECTral:LOCk ON
This command turns on the parameter Lock1, which causes the parameter for Math1 and Math2 to be locked together.

Example 2
MATH1:SPECTral:LOCk?
This query might return :MATH1:SPECTRAL:LOCK 0, indicating that the parameter Lock1 is turned off.
MATH<x>:SPECTral:MAG

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

Group
Math

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

Syntax 1
MATH<x>:SPECTral:MAG {LINEAR|DB|DBM}

Syntax 2
MATH<x>:SPECTral:MAG?

Arguments
- **LINEAR**
  This sets the SpectralMag units to linear.

- **DB**
  This sets the SpectralMag units to decibels.

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

Example 1
MATH2:SPECTral:MAG DB
This command sets the SpectralMag units for Math2 to decibels.

Example 2
MATH2:SPECTral:MAG?
This query might return :MATH2:SPECTRAL:MAG DB, indicating that the SpectralMag units for Math2 are set to decibels.
MATH<x>:SPECTral:PHASE

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

Group
Math

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

Syntax 1
MATH<x>:SPECTral:PHASE {DEGREES|RADIANS|GROUPDELAY}

Syntax 2
MATH<x>:SPECTral:PHASE?

Arguments
• DEGREES
  This sets the SpectralPhase units to degrees.

• RADIANS
  This sets the SpectralPhase units to radians.

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

Example 1
MATH2:SPECTral:PHASE DEGREES
This command sets the SpectralPhase units for Math2 to degrees.

Example 2
MATH2:SPECTral:PHASE?
This query might return :MATH2:SPECTRAL:PHASE RADIANS, indicating that the SpectralPhase units for
Math2 are set to radians.
MATH<x>:SPECTral:REFLevel

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

Group
Math

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

Syntax 1
MATH<x>:SPECTral:REFLevel <NR3>

Syntax 2
MATH<x>:SPECTral:REFLevel?

Argument
• <NR3>
  This is the position that represents the top of the display screen graticule. The range depends on the units and both the MATH<x>:SCAle and MATH<x>:POSition settings.

Example 1
MATH1:SPECTral:REFLevel -10
This sets the top of the display screen to be a reference level of -10 dB. If the vertical scale is LINEAR, then the vertical units will be the same as the input waveform.

Example 2
MATH1:SPECTral:REFLevel?
This query might return :MATH1:SPECTRAL:REFLEVEL 2.0000E+01, indicating that the top of the display screen is set to a reference level of 20 dB.
MATH<x>:SPECTral:REFLEVELOffset

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

Group
Math

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

Syntax 1
MATH<x>:SPECTral:REFLEVELOffset {DBM|<NR3>}

Syntax 2
MATH<x>:SPECTral:REFLEVELOffset?

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

• <NR3>
  This specifies the reference level used for calculation of the decibel value when the output units are Log.

Example 1
MATH1:SPECTral:REFLEVELOffset 0.5
This sets the reference level for the Log calculation for decibel to be 0.5. dB = A x Log(y/<NR3>) where A is 10 if the input units are watts and A is 20 if the input units are otherwise.

Example 2
MATH1:SPECTral:REFLEVELOffset DBM
This sets the decibel reference to be equivalent to 1 mW into 50 ohms. The reference level numerical value will depend on the input units. If the units are volts, the value is set to 0.2236 V; if the units are amperes, the value is set to 40 µA; if the units are watts, the value is set to 0.001 W.

Example 3
MATH1:SPECTral:REFLEVELOffset?
This query might return :MATH1:SPECTRAL:REFLEVELOFFSET 2.23360E-01, indicating that the spectral reference level offset is 223.6 mV.
MATH<x>:SPECTral:RESBw

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

Group
Math

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

Syntax 1
MATH<x>:SPECTral:RESBw <NR3>

Syntax 2
MATH<x>:SPECTral:RESBw?

Argument
• <NR3>
  This is the desired resolution bandwidth value. Units are represented in hertz.

Example 1
MATH1:SPECTral:RESBw 250E3
This command sets the resolution bandwidth to the attainable value that is close to 250 KHz.

Example 2
MATH1:SPECTral:RESBw?
This query might return :MATH1:SPECTRAL:RESBW 1.0002E+06, indicating the actual resolution bandwidth value obtained from the spectral analyzer.
MATH<x>:SPECTral:SPAN

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

Group
Math

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

Syntax 1
MATH<x>:SPECTral:SPAN {<NR3>|FULL}

Syntax 2
MATH<x>:SPECTral:SPAN?

Arguments
• <NR3>
  This specifies the frequency span of the output data vector from the spectral analyzer.

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

Example 1
MATH1:SPECTral:SPAN FULL

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

Example 2
MATH1:SPECTral:SPAN 2.56E6

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

Example 3
MATH1:SPECTral:SPAN?

This query might return :MATH1:SPECTRAL:SPAN 1.2500E+09, indicating the actual span value obtained by the spectral analyzer.
**MATH<x>:SPECTral:SUPPress**

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

**Group**
Math

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

**Syntax 1**
MATH<x>:SPECTral:SUPPress <NR3>

**Syntax 2**
MATH<x>:SPECTral:SUPPress?

**Argument**
- <NR3>
  This is the level under which all data with magnitudes are displayed as zero phase.

**Example 1**
MATH1:SPECTral:SUPPress -62
This command specifies that any magnitude values less than -62 dB will have their phase output set to zero.

**Example 2**
MATH1:SPECTral:SUPPress?
This query might return :MATH1:SPECTRAL:SUPPRESS -3.5000E+01, indicating that the phase suppression threshold is currently set to -35 dB.
MATH<x>:SPECTral:UNWRap

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

Group
Math

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

Syntax 1
MATH<x>:SPECTral:UNWRap <ON|OFF>

Syntax 2
MATH<x>:SPECTral:UNWRap?

Arguments
• ON
  This enables phase unwrap.

• OFF
  This disables phase wrap.

• <NRi>
  A 0 disables phase wrap; any other value enables phase wrap.

Example 1
MATH1:SPECTral:UNWRap ON
This command enables phase wrap of the spectral analyzer output data.

Example 2
MATH1:SPECTral:UNWRap?
This query might return :MATH1:SPECTRAL:UNWRAP 0, indicating that phase unwrap of the spectral analyzer output data is disabled.
MATH<x>:SPECTral:WINdow

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

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

Group
Math

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

Syntax 1
MATH<x>:SPECTral:WINdow {RECTANGULAR|HAMMING|HANNING|KAISERBESSEL|BLACKMANHARRIS|FLATTOP2|GAUSSIAN|TEKEXPONENTIAL}

Syntax 2
MATH<x>:SPECTral:WINdow?

Arguments

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

- **HAMMING**
  This type of window function is based on cosine series.

- **HANNING**
  This type of window function is based on cosine series.

- **KAISERBESSEL**
  This type of window function is based on cosine series.

- **BLACKMANHARRIS**
  This type of window function is based on cosine series.

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

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

- **FLATTOP2**
  This type of window function is a cosine series window with a flattened frequency response lobe.

Example 1
MATH2:SPECTral:WINdow HANNING
This command specifies to apply a Hanning window to the spectral analyzer input data.

Example 2
MATH2:SPECTral:WINdow?
This query might return :MATH2:SPECTRAL:WINDOW TEKEXPONENTIAL, indicating the window function used to multiply the spectral analyzer input data.
Measurement Command Group

Measurement Overview

You use the commands in the Measurement Command Group to control the automated measurement system.

Up to eight automated measurements can be displayed on the screen. In the commands, these measurement readouts are named MEAS<x>, where <x> can be 1 through 8.

In addition to the eight displayed measurements, the measurement commands let you specify an additional measurement, IMMed. The immediate measurement has no front-panel equivalent. Immediate measurements are never displayed. Because they are computed only when needed, immediate measurements slow the waveform update rate less than displayed measurements.

Whether you use displayed or immediate measurements, you use the VALue? query to obtain measurement results.

Measurement commands can set and query measurement parameters. You can assign some parameters, such as waveform sources, differently for each measurement. Other parameters, such as reference levels, have only one value, which applies to all measurements.
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statistical reset

MEASUrement:MEAS<n>:MAXimum? Returns the maximum value found since the last statistical reset

MEASUrement:MEAS<n>:MEAN? Returns the mean value accumulated since the last statistical reset

MEASUrement:MEAS<n>:MINimum? Returns the minimum value found since the last statistical reset

MEASUrement:MEAS<n>:STDdev? Returns the standard deviation of values accumulated since the last statistical reset

MEASUrement:MEAS<x>? Returns all measurement parameters for the displayed measurement

MEASUrement:MEAS<x>:DELay? Returns the delay measurement parameters for specified measurement

MEASUrement:MEAS<x>:DELay:DIREction? Returns the search direction used for delay measurements

MEASUrement:MEAS<x>:DELay:DIREction Sets the search direction to use for delay measurements

MEASUrement:MEAS<x>:DELay:EDGE[1]? Returns the slope of the edge used for delay “from” waveform measurements

MEASUrement:MEAS<x>:DELay:EDGE[1] Sets the slope of the edge to use for delay “from” waveform measurements

MEASUrement:MEAS<x>:DELay:EDGE2? Returns the slope of the edge used for “delay “to” waveform measurements

MEASUrement:MEAS<x>:DELay:EDGE2 Sets the slope of the edge to use for delay “to” waveform measurements

MEASUrement:MEAS<x>:SOURCE[1]? Returns the channel from which measurements are taken

MEASUrement:MEAS<x>:SOURCE[1] Sets the channel from which measurements are taken

MEASUrement:MEAS<x>:SOURCE[2]? Returns the channel to which measurements are sent

MEASUrement:MEAS<x>:SOURCE[2] Sets the channel to which measurements are sent

MEASUrement:MEAS<x>:STATE? Returns whether the specified measurement slot is computed and displayed

MEASUrement:MEAS<x>:STATE Sets whether the specified measurement slot is computed and displayed

MEASUrement:MEAS<x>:TYPe? Returns the measurement<x> type

MEASUrement:MEAS<x>:TYPe Sets the measurement<x> type
MEASurement:MEAS<x>:UNIts? Returns measurement<x> units
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MEASurement:METHod Sets the method used for calculating reference levels
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MEASurement:REFLevel:ABSolute:HIGH Sets the top reference level for rise time
MEASurement:REFLevel:ABSolute:LOW? Returns the low reference level for rise time
MEASurement:REFLevel:ABSolute:LOW Sets the low reference level for rise time
MEASurement:REFLevel:ABSolute:MID? Returns the mid reference level for measurements
MEASurement:REFLevel:ABSolute:MID Sets the mid reference level for measurements
MEASurement:REFLevel:ABSolute:MID2? Returns the mid reference level for delay "to" measurements
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MEASurement:REFLevel:MET hod Sets the method for assigning high and low reference levels
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MEASurement:REFLevel:PERCent:HIGH Sets the top reference percent level for rise time
MEASurement:REFLevel:PERCent:LOW? Returns the low reference percent level for rise time
MEASurement:REFLevel:PERCent:LOW Sets the low reference percent level for rise time
MEASurement:REFLevel:PERCent:MID? Returns the mid reference percent level for waveform measurements
MEASurement:REFLevel:PERCent:MID Sets the mid reference percent level for waveform measurements
MEASurement:REFLevel:PERCent:MID2? Returns the mid reference percent level for second waveform measurements
MEASurement:REFLevel:PERCent:MID2 Sets the mid reference percent level for second waveform measurements
MEASurement:STATIstics:COUNT Clears existing measurement
MEASUrement:STATistics:MODE?
statistics from memory

MEASUrement:STATistics:MODE
Returns which pair of statistical accumulations is displayed

MEASUrement:STATistics:WEIghting?
Returns the 'time constant' for mean and standard deviation statistical accumulations

MEASUrement:STATistics:WEIghting
Sets the 'time constant' for mean and standard deviation statistical accumulations
MEASUrement?

Description
This query-only command returns all measurement parameters in the following order: MEAS1, MEAS2, MEAS3, MEAS4, MEAS5, MEAS6, MEAS7, MEAS8, IMMED.

Group
Measurement

Syntax
MEASUrement?

Example
MEASUrement?

This query might return:
:MEASUREMENT:GATING OFF
;METHOD HISTOGRAM;IMMED:TYPE UNDEFINED;UNITS "V"
;SOURCE1 CH1;SOURCE2 CH1;DELAY:EDGE1 RISE;EDGE2 RISE
;DIRECTION FORWARDS;

:MEASUREMENT:MEAS1:STATE 0
;TYPE UNDEFINED;UNITS "V";SOURCE1 CH1;SOURCE2 CH1;DELAY:EDGE1 RISE;EDGE2 RISE
;DIRECTION FORWARDS;

:MEASUREMENT:MEAS2:STATE 0;TYPE UNDEFINED;UNITS "V"
;SOURCE1 CH1;SOURCE2 CH1;DELAY:EDGE1 RISE;EDGE2 RISE
;DIRECTION FORWARDS;

:MEASUREMENT:MEAS3:STATE 0
;TYPE UNDEFINED;UNITS "V";SOURCE1 CH1;SOURCE2 CH1;DELAY:EDGE1 RISE;EDGE2 RISE
;DIRECTION FORWARDS;

:MEASUREMENT:MEAS4:STATE 0;TYPE UNDEFINED;UNITS "V"
;SOURCE1 CH1;SOURCE2 CH1;DELAY:EDGE1 RISE;EDGE2 RISE
;DIRECTION FORWARDS;

:MEASUREMENT:MEAS5:STATE 0
;TYPE UNDEFINED;UNITS "V";SOURCE1 CH1;SOURCE2 CH1;DELAY:EDGE1 RISE;EDGE2 RISE
;DIRECTION FORWARDS;

:MEASUREMENT:MEAS6:STATE 0;TYPE UNDEFINED;UNITS "V"
;SOURCE1 CH1;SOURCE2 CH1;DELAY:EDGE1 RISE;EDGE2 RISE
;DIRECTION FORWARDS;

:MEASUREMENT:MEAS7:STATE 0
;TYPE UNDEFINED;UNITS "V";SOURCE1 CH1;SOURCE2 CH1;DELAY:EDGE1 RISE;EDGE2 RISE
;DIRECTION FORWARDS;

:MEASUREMENT:MEAS8:STATE 0;TYPE UNDEFINED;UNITS "V"
;SOURCE1 CH1;SOURCE2 CH1;DELAY:EDGE1 RISE;EDGE2 RISE
;DIRECTION FORWARDS;

:MEASUREMENT:REFLEVEL:METHOD PERCENT
;ABSOLUTE:HIGH 0.0000;LOW 0.0000;MID1 0.0000;MID2 0.0000;

:MEASUREMENT:REFLEVEL:PERCENT:HIGH 90.0000;LOW 10.0000
;MID1 50.0000;MID2 50.0000;

:MEASUREMENT:STATISTICS:MODE OFF;WEIGHTING 32
MEASUrement:GATING

Description
This command specifies or returns the measurement gating setting. This command is equivalent to selecting Gating from the Measure menu and then clicking the desired Measurement Gating setting.

Group
Measurement

Syntax 1
MEASUrement:GATING {ON|OFF|<Nrf>|ZOOM|CURSOR}

Syntax 2
MEASUrement:GATING?

Arguments

- **ON**
  This turns on measurement gating.

- **OFF**
  This turns off measurement gating.

- **<Nrf>**
  A 0 turns off measurement gating; any other value turns on measurement gating.

- **ZOOM**
  This turns on gating, using the left and right edges of the zoom box.

- **CURSOR**
  This limits measurements to the portion of the waveform between the vertical bar cursors, even if they are off screen.

Example 1
MEASUrement:GATING ON
This command turns on measurement gating.

Example 2
MEASUrement:GATING?
This query might return :MEASUREMENT:GATING CURSOR, indicating that measurements are limited to the portion of the waveform between the vertical bar cursors.
**MEASUrement:IMMed?**

**Description**
This query-only command returns all immediate measurement setup parameters.

**Group**
Measurement

**Syntax**
MEASUrement:IMMed?

**Example**
MEASUrement:IMMed?

This query might return

```
:MEASUREMENT:IMMED:TYPE PERIOD;UNITS "s";SOURCE1 CH1;SOURCE2 CH1;DELAY:EDGE1 RISE;EDGE2 RISE;DIRECTION FORWARDS
```
MEASUrement:IMMed:DELay?

Description
This query-only command returns information about the immediate delay measurement. This command is equivalent to selecting Measurement Setup from the Measure menu, choosing the Time tab and then clicking the Delay button.

Group
Measurement

Syntax
MEASUrement:IMMed:DELay?

Example
MEASUrement:IMMed:DELay?

This query might return :MEASUREMENT:IMMED:DELAY:EDGE1 RISE;EDGE2 RISE; DIRECTION FORWARDS
MEASUrement:IMMed:DELay:DIREction

Description
This command sets or returns the starting point and direction that determines the delay "to" edge when taking an immediate delay measurement. Use the MEASUrement:IMMed:SOURCE2 command to specify the delay "to" waveform. This command is equivalent to selecting Measurement Setup from the Measure menu, choosing the Time tab, clicking the Delay button to display the delay settings and then clicking the desired Search Direction setting.

Group
Measurement

Related Commands
MEASUrement:IMMed:SOURCE2 (see page 235)

Syntax 1
MEASUrement:IMMed:DELay:DIREction {BACKWards|FORWards}

Syntax 2
MEASUrement:IMMed:DELay:DIREction?

Arguments
• BACKWards
  This starts the search at the end of the waveform and looks for the last rising or falling edge in the waveform.
• FORWards
  This starts the search at the beginning of the waveform and looks for the first rising or falling edge in the waveform.

Example 1
MEASUrement:IMMed:DELay:DIREction FORWards
This command starts searching from the beginning of the waveform record and looks for the first rising or falling edge.

Example 2
MEASUrement:IMMed:DELay:DIREction?
This query might return :MEASUREMENT:IMMED:DELAY:DIRECTION BACKWARDS, indicating that searching begins at the end of the waveform record and looks for the last rising or falling edge.
**MEASUrement:IMMed:DELay:EDGE[1]**

**Description**
This command sets or queries the slope of the edge that is used for the delay “from” waveform when taking an immediate delay measurement. Use the **MEASUrement:IMMed:SOURCE1** command to specify the waveform. This command is equivalent to selecting Measurement Setup from the Measure menu, choosing the Time tab, clicking the Delay button to display the delay settings and then clicking the desired Delay Edge1 setting.

**Group**
Measurement

**Related Commands**
**MEASUrement:IMMed:SOURCE1** (see page 234)

**Syntax 1**

**Syntax 2**
MEASUrement:IMMed:DELay:EDGE[1]?

**Arguments**
- **FALL**
  - This specifies the falling edge.
- **RISe**
  - This specifies the rising edge.

**Example 1**
This command specifies that the rising edge be used for the immediate delay measurement.

**Example 2**
MEASUrement:IMMed:DELay:EDGE[1]?
This query might return **MEASUREMENT :IMMED :DELAY :EDGE1 FALL**, indicating that the falling edge or negative edge of the waveform is used for the immediate delay measurement.
**MEASUrement:IMMed:DELay:EDGE2**

**Description**
This command sets or queries the slope of the edge that is used for the delay "to" waveform when taking an immediate delay measurement. Use the MEASUrement:IMMed:SOURCE2 command to specify the waveform. This command is equivalent to selecting Measurement Setup from the Measure menu, choosing the Time tab, clicking the Delay button to display the delay settings and then clicking the desired Delay Edge2 setting.

**Group**
Measurement

**Related Commands**
MEASUrement:IMMed:SOURCE2 (see page 235)

**Syntax 1**
MEASUrement:IMMed:DELay:EDGE2 {FALL|RISe}

**Syntax 2**
MEASUrement:IMMed:DELay:EDGE2?

**Arguments**
- **FALL**
  This specifies the falling edge.
- **RISe**
  This specifies the rising edge.

**Example 1**
MEASUrement:IMMed:DELay:EDGE2 RISe
This command specifies that the rising edge be used for the immediate delay measurement.

**Example 2**
MEASUrement:IMMed:DELay:EDGE2?
This query might return MEASUREMENT:IMMED:DELAY:EDGE2 FALL, indicating that the falling edge or negative edge of the waveform is used for the immediate delay measurement.
MEASUrement:IMMed:SOURCE[1]

Description
This command sets or queries the source for all single channel immediate measurements and specifies
the source to measure "from" when taking an immediate delay measurement or phase measurement.
This command is equivalent to selecting Measurement Setup from the Measure menu, choosing the Time
tab, clicking the Delay button to display the delay settings and then clicking the desired Source1 (From)
setting.

Group
Measurement

Related Commands
MEASUrement:IMMed:SOURCE2 (see page 235)

Syntax 1
MEASUrement:IMMed:SOURCE[1] {CH<x>|MATH<y>|REF<x>|HIStogram}

Syntax 2
MEASUrement:IMMed:SOURCE[1]?

Arguments
• CH<x>
  This is an input channel. The valid channel waveform range is from 1 through 4.
• MATH<y>
  This is a math waveform. The valid math waveform range is from 1 through 4.
• REF<X>
  This is a reference waveform. The valid reference waveform range is from 1 through 4.
• HIStogram
  This indicates histogram as the object to be measured.

Example 1
MEASUrement:IMMed:SOURCE[1] MATH1
This command specifies Math1 as the immediate measurement source.

Example 2
MEASUrement:IMMed:SOURCE[1]?
This query might return :MEASUREMENT:IMMED:SOURCE1 CH3, indicating that channel 3 is the immediate
measurement source.
MEASUrement:IMMed:SOURCE2

Description
This command sets or queries the source for all single channel immediate measurements and specifies the source to measure "to" when taking an immediate delay measurement or phase measurement. This command is equivalent to selecting Measurement Setup from the Measure menu, choosing the Time tab, clicking the Delay button to display the delay settings and then clicking the desired Source2 (To) setting.

Group
Measurement

Related Commands
MEASUrement:IMMed:SOURCE[1] (see page 234)

Syntax 1
MEASUrement:IMMed:SOURCE2 {CH<x>|MATH<y>|REF<x>}

Syntax 2
MEASUrement:IMMed:SOURCE2?

Arguments
• CH<x>
  This is an input channel. The valid channel waveform range is from 1 through 4.

• MATH<y>
  This is a math waveform. The valid math waveform range is from 1 through 4.

• REF<X>
  This is a reference waveform. The valid reference waveform range is from 1 through 4.

Example 1
MEASUrement:IMMed:SOURCE2 REF3

This command sets the waveform in reference memory location 3 as the delay "to" source when making delay measurements.

Example 2
MEASUrement:IMMed:SOURCE2?

This query might return :MEASUREMENT:IMMED:SOURCE2 MATH1, indicating that Math1 is the immediate measurement source.
MEASUrement:IMMed:TYPe

Description
This command sets or queries the immediate measurement type.

Group
Measurement

Syntax 1
MEASUrement:IMMed:TYPE {AMPLitude|AREa|BURst|CARea|CMEan|CRMs|DELay|FALL|FREQuency|HIGH|LOW|MAXimum|MEAN|MINimum|NDUty|NOVershoot|NWIdth|PDUty|PERIod|PHAse|PK2Pk|POVershoot|PWIdth|RISe|RMS}

Syntax 2
MEASUrement:IMMed:TYPe?

Arguments

- AMPlitude
  This is the high value minus the low value.

- AREa
  This is the area between the curve and ground over the entire waveform.

- BURst
  This is the time from the first MidRef crossing to the last MidRef crossing.

- CARea
  This is the area between the curve and ground over one cycle.

- CMEan
  This is the arithmetic mean over one cycle.

- CRMs
  This is the true Root Mean Square voltage over one cycle.

- DELay
  This is the time between the MidRef crossings of two different waveforms.

- FALL
  This is the time that it takes for the falling edge of a pulse to fall from a HighRef value to a LowRef value of its final value.

- FREQuency
  This is the reciprocal of the period measured in hertz.

- HIGH
  This is the 100% reference level.

- LOW
  This is the 0% reference level.

- MAXimum
  This is the highest amplitude (voltage).

- MINimum
  This is the lowest amplitude (voltage).

- NDUty
  This is the ratio of the negative pulse width to the signal period expressed as a percentage.

- NOVershoot
This is the negative overshoot, expressed as 100 x (Low - Minimum/Amplitude).

- **NWIth**: This is the distance (time) between MidRef (usually 50%) amplitude points of a negative pulse.
- **PDuty**: This is the ratio of the positive pulse width to the signal period, expressed as a percentage.
- **PERIod**: This is the time, in seconds, it takes for one complete signal cycle to happen.
- **PHAse**: This is the amount of shift, expressed in degrees, from the selected waveform to the designated waveform.
- **PK2Pk**: This is the absolute difference between the maximum and minimum amplitude.
- **POVershoot**: This is the positive overshoot, expressed as 100 x (Maximum-High/Amplitude).
- **PWIdth**: This is the distance (time) between MidRef (usually 50%) amplitude points of a positive pulse.
- **RISe**: This is the time that it takes for the leading edge of a pulse to rise from a low reference value to a high reference value of its final value.
- **RMS**: This is the true Root Mean Square voltage.

**Example 1**

```plaintext
MEASUrement:IMMed:TYPe FREQuency
```

This defines the immediate measurement to be a frequency measurement.

**Example 2**

```plaintext
MEASUrement:IMMed:TYPe?
```

This query might return `:MEASUREMENT:IMMED:TYPe RMS`, that the immediate measurement is the true Root Mean Square voltage.
MEASUrement:IMMed:UNIts?

Description
This query-only command returns the units of the immediate measurement.

Group
Measurement

Syntax
MEASUrement:IMMed:UNIts?

Example
MEASUrement:IMMed:UNIts?
This query might return :MEASUREMENT:IMMED:UNIts "s", indicating that units for the immediate measurement are represented in seconds.
MEASUrement:IMMed:VALue?

Description
This query-only command returns the value of the measurement specified by the MEASUrement:IMMed:TYPe command. The measurement is immediately taken on the source(s) specified by a MEASUrement:IMMed:SOURCE command.

Note: A change to HORIZontal:MAIn:SCALe or CH<x>:SCALe will not necessarily have taken affect if followed by this command.

Group
Measurement

Related Commands

Syntax
MEASUrement:IMMed:VALue?

Example
MEASUrement:IMMed:VALue?

This query might return :MEASUREMENT:IMMED:VALUE 9.9000E+37. If the measurement has an error or warning associated with it, then an item is added to the error queue. The error can be checked for with the *ESR? and ALLEV? commands.
MEASUrement:MEAS<n>:COUNT?

Description
This query-only command returns the number of values accumulated for this measurement since the last statistical reset. Some values may have been ignored because they generated an error.

Group
Measurement

Syntax
MEASUrement:MEAS<n>:COUNT?

Example
MEASUrement:MEAS3:COUNT?
This query might return :MEASUREMENT:MEAS3:COUNT 3.247000000E+03
MEASUrement:MEAS<n>:MAXimum?

Description
This query-only command returns the maximum value found for this measurement since the last statistical reset.

Group
Measurement

Syntax
MEASUrement:MEAS<n>:MAXimum?

Example
MEASUrement:MEAS3:MAXimum?

This query might return:MEASUREMENT:MEAS3:MAXIMUM 4.18E-9
MEASUrement:MEAS<n>:MEAN?

Description
This query-only command returns the mean value accumulated for this measurement since the last statistical reset.

Group
Measurement

Syntax
MEASUrement:MEAS<n>:MEAN?

Example
MEASUrement:MEAS1:MEAN?

This query might return :MEASUREMENT:MEAS1:MEAN 514.71E-09
MEASUrement:MEAS<n>:MINImum?

Description
This query-only command returns the minimum value found for this measurement since the last statistical reset.

Group
Measurement

Syntax
MEASUrement:MEAS<n>:MINImum?

Example
MEASUrement:MEAS1:MINImum?

This query might return :MEASUREMENT:MEAS1:MINIMUM 1.75E-09
MEASUrement:MEAS<n>:STDdev?

Description
This query-only command returns the standard deviation of values accumulated for this measurement since the last statistical reset.

Group
Measurement

Syntax
MEASUrement:MEAS<n>:STDdev?

Example
MEASUrement:MEAS1:STDdev?

This query might return :MEASUREMENT:MEAS1:STDDEV 21.0E-12
MEASUrement:MEAS<x>?

Description
This query-only command returns all measurement parameters for the displayed measurement specified by x, which can range from 1 through 8. This query command is equivalent to selecting Measurement Setup from the Measure menu and viewing the Measurements table; then choosing the Time tab, clicking the Delay button and viewing the Delay Edge and Search Direction settings.

Group
Measurement

Syntax
MEASUrement:MEAS<x>?

Example
MEASUrement:MEAS3?

This query might return :MEASUREMENT:MEAS3:STATE 0;TYPE PERIOD;UNITS "s";SOURCE1 CH1;DELAY:EDGE1 RISE;EDGE2 RISE;DIRECTION FORWARDS
MEASUrement:MEAS<x>:DELay?

Description
This query-only command returns the delay measurement parameters for the measurement specified by
<x>, which ranges from 1 through 8. Measurement parameters are presented in the following order:
Edge1, Edge2 and Direction. This query command is equivalent to selecting Time from the Measure
menu, choosing Delay and then viewing the Delay Edge and Search Direction settings.

Group
Measurement

Syntax 1
MEASUrement:MEAS<x>:DELay?

Example
MEASUrement:MEAS3?

This query might return: MEASUREMENT:MEAS3:DELAY:EDGE1 RISE;EDGE2 RISE;DIRECTION FORWARDS
MEASUrement:MEAS<x>:DELay:DIREction

Description
This command sets or queries the starting point and direction that determines the delay "to" edge when taking a delay measurement. Use the MEASUrement:MEAS<x>:SOURCE2 command to specify the waveform. This command is equivalent to selecting Time from the Measure menu, choosing Delay from the drop-down list and then clicking the desired Search Direction setting.

Group
Measurement

Related Commands
MEASUrement:MEAS<x>:SOURCE2 (see page 251), MEASUrement:MEAS<x>:DELay:EDGE2 (see page 249)

Syntax 1
MEASUrement:MEAS<x>:DELay:DIREction {BACKWards|FORWards}

Syntax 2
MEASUrement:MEAS<x>:DELay:DIREction?

Arguments
• BACKwards
  This means that the search starts at the end of the waveform and looks for the last rising or falling edge in the waveform. Use the MEASUrement:MEAS<x>:DELay:EDGE2 command to specify the slope of the edge.
• FORWards
  This means that the search starts at the beginning of the waveform and looks for the first rising or falling edge in the waveform. Use the MEASUrement:MEAS<x>:DELay:EDGE2 command to specify the slope of the edge.

Example 1
MEASUrement:MEAS3:DELay:DIREction BACKWards
This command starts searching from the end of the waveform record.

Example 2
MEASUrement:MEAS3:DELay:DIREction?
This query might return :MEASUREMENT:MEAS3:DELAY:DIRECTION BACKWARDS indicating the current search direction.
MEASUREment:MEAS<x>:DElay:EDGE[1]

Description
This command sets or queries the slope of the edge that is used for the delay “from” waveform when taking a delay measurement. Use the MEASUREment:MEAS<x>:SOURCE[1] command to specify the waveform. This command is equivalent to selecting Time from the Measure menu, choosing Delay from the drop-down list and then clicking the desired Delay Edge1 setting.

Group
Measurement

Related Commands
MEASUREment:MEAS<x>:SOURCE[1] (see page 250)

Syntax 1
MEASUREment:MEAS<x>:DElay:EDGE[1] {FALL|RISe}

Syntax 2
MEASUREment:MEAS<x>:DElay:EDGE[1]?

Arguments
• FALL
  This specifies the falling edge of the waveform.
• RISE
  This specifies the rising edge of the waveform.

Example 1

This command specifies that the rising edge of the waveform be used for measurement 3.

Example 2
MEASUREment:MEAS1:DElay:EDGE[1]?

This query might return :MEASUREMENT:MEAS1:DElay:EDGE[1] FALL, indicating that the falling edge of the waveform is being used for measurement 1.
**MEASUrement:MEAS<x>:DELay:EDGE2**

**Description**
This command sets or queries the slope of the edge that is used for the delay "to" waveform when taking a delay measurement. Use the MEASUrement:MEAS<x>:SOURCE2 command to specify the waveform. This command is equivalent to selecting Time from the Measure menu, choosing Delay from the drop-down list and then clicking the desired Delay Edge2 setting.

**Group**
Measurement

**Related Commands**
MEASUrement:MEAS<x>:SOURCE2 (see page 251)

**Syntax 1**
```plaintext
MEASUrement:MEAS<x>:DELay:EDGE2 \{FALL|RISe\}
```

**Syntax 2**
```plaintext
MEASUrement:MEAS<x>:DELay:EDGE2?
```

**Arguments**
- **FALL**
  - This specifies the falling edge of the waveform.
- **RISe**
  - This specifies the rising edge of the waveform.

**Example 1**
```plaintext
MEASUrement:MEAS3:DELay:EDGE2 RISe
```
This command specifies that the rising edge of the waveform be used for measurement 3.

**Example 2**
```plaintext
MEASUrement:MEAS1:DELay:EDGE2?
```
This query might return **MEASUREMENT:MEAS1:DELAY:EDGE2 FALL**, indicating that the falling edge of the waveform is being used for measurement 1.
**MEASUrement:MEAS<x>:SOURCE[1]**

**Description**
This command sets or queries the source for all single channel measurements and specifies the source to measure "from" when taking a delay measurement or phase measurement. Measurements are specified by x, which ranges from 1 through 8. This command is equivalent to selecting Measurement Setup from the Measure menu and then choosing the desired measurement source.

**Group**
Measurement

**Syntax 1**
MEASUREMENT:MEAS<x>:SOURCE[1] {CH<x>|MATH<y>|REF<x>|HISTogram}

**Syntax 2**
MEASUREMENT:MEAS<x>:SOURCE[1]?

**Arguments**
- **CH<x>**
  This is an input channel. The valid channel waveform range is from 1 through 4.
- **MATH<y>**
  This is a math waveform. The valid math waveform range is from 1 through 4.
- **REF<x>**
  This is a reference waveform. The valid reference waveform range is from 1 through 4.
- **HISTogram**
  This is a histogram.

**Example 1**
MEASUREMENT:MEAS2:SOURCE[1] MATH1
This command specifies Math 1 as the measurement 2 source.

**Example 2**
MEASUREMENT:MEAS1:SOURCE[1]?
This query might return :MEASUREMENT:MEAS1:SOURCE[1] MATH1, indicating that Math1 is the measurement 2 source.
**MEASUrement:MEAS<x>:SOURCE2**

**Description**
This command sets or queries the source for all single channel measurements and specifies the reference source to measure "to" when taking a delay measurement or phase measurement. Measurements are specified by x, which ranges from 1 through 8. This command is equivalent to selecting Measurement Setup from the Measure menu, selecting a measurement type of either Phase or Delay, and then choosing the desired measurement source.

**Tip:** Source2 measurements only apply to phase and delay measurement types, which require both a target (Source1) and reference (Source2) source.

**Group**
Measurement

**Related Commands**
MEASU:MEAS<x>:TYPe (see page 253)

**Syntax 1**
MEASUrement:MEAS<x>:SOURCE2 {CH<x>|MATH<y>|REF<x>}

**Syntax 2**
MEASUrement:MEAS<x>:SOURCE2?

**Arguments**
- **CH<x>**
  This is an input channel. The valid channel waveform range is from 1 through 4.
- **MATH<y>**
  This is a math waveform. The valid math waveform range is from 1 through 4.
- **REF<x>**
  This is a reference waveform. The valid reference waveform range is from 1 through 4.

**Example 1**
MEASUrement:MEAS4:SOURCE2 CH1
This command specifies CH1 as the delay "to" source when making delay measurement.

**Example 2**
MEASUrement:MEAS2:SOURCE2?
This query might return :MEASUREMENT:MEAS2:SOURCE2 MATH1, indicating that Math 1 is the measurement 2 source.
MEASUrement:MEAS<x>:STATE

Description
This command sets or queries whether the specified measurement slot is computed and displayed. The measurement slot is specified by x, which ranges from 1 through 8. This command is equivalent to selecting Measurement Setup from the Measure menu and then clicking the Display button.

For a measurement to display, you must have selected a source waveform and defined the measurement you want to take and display. You select the measurement using the MEASUrement:MEAS<x>:SOURCE[1] command. You define the measurement type using the MEASUrement:MEAS<x>:TYPe command.

Group
Measurement

Related Commands
MEASUrement:MEAS<x>:SOURCE[1] (see page 250), MEASUrement:MEAS<x>:TYPe (see page 253)

Syntax 1
MEASUrement:MEAS<x>:STATE {OFF|ON|<NR1>}

Syntax 2
MEASUrement:MEAS<x>:STATE?

Arguments
• OFF
  This disables calculation and display of the specified measurement slot.

• ON
  This enables calculation and display of the specified measurement slot.

• <NR1>
  A 0 disables calculation and display of the specified measurement slot; any other value enables calculation and display of the specified measurement slot.

Example 1
MEASUrement:MEAS2:STATE ON
This command computes and displays the measurement defined as measurement 2.

Example 2
MEASUrement:MEAS1:STATE?
This query might return :MEASUREMENT:MEAS1:STATE 0, indicating that measurement defined for measurement slot 1 is disabled.
MEASUrement:MEAS<x>:TYPe

Description
This command sets or queries the type of measurement that is defined for the specified measurement slot. The measurement slot is specified by x, which ranges from 1 through 4. This command is equivalent to selecting Measurement Setup from the Measure menu and then choosing the desired measurement type.

Group
Measurement

Syntax 1
MEASUrement:MEAS<x>:TYPe {AMPlitude|AREa|BURst|CARea|CMEam|CRMs|DElay|FALL
|FREQuency|HIGH|LOW|MAXimum|MINimum|NDUty|NOVershoot|NwIth|PDuty
|PERIod|PHAse|PK2Pk|POVershoot|PWIdth|RISe|RMS|UNDEFINED}

Syntax 2
MEASUrement:MEAS<x>:TYPe?

Arguments
• AMPlitude
  This measures the amplitude of the selected waveform.

• AREa
  This measures the voltage over time. The area is over the entire waveform or gated region and is measured in volt-seconds. The area measured above the ground is positive, while the area below ground is negative.

• BURst
  This measures the duration of a burst. The measurement is made over the entire waveform or gated region.

• CARea
  This measures the voltage over time. The area is over the first cycle in the waveform or the first cycle in the gated region and measured in volt-seconds. The area measured above ground is positive, while the area below ground is negative.

• CMEam
  This measures the arithmetic mean over the first cycle in the waveform or the first cycle in the gated region.

• CRMs
  This measures the true Root Mean Square voltage over the first cycle in the waveform or the first cycle in the gated region.

• DElay
  This measures the time between the middle reference point of the source waveform and the destination waveform.

• FALL
  This measures the time taken for the falling edge of the first pulse in the waveform or gated region to fall from a high reference value (default is 90%) to a low reference value (default is 10%).

• FREQuency
  This measures the first cycle in the waveform or gated region. Frequency is the reciprocal of the period and is measured in hertz (Hz), where 1 Hz = 1 cycle per second.

• HIGH
  This measures the High reference (100% level, sometimes called Topline) of a waveform.
  You can also limit the High measurement (normally taken over the entire waveform record) to a gated region on the waveform.
• **LOW**
  This measures the Low reference (0% level, sometimes called Baseline) of a waveform.

• **MAXimum**
  This finds the maximum amplitude. This value is the most positive peak voltage found. It is measured over the entire waveform or gated region.

• **MEAN**
  This amplitude measurement finds the arithmetic mean over the entire waveform or gated region.

• **MINImum**
  This amplitude measurement finds the minimum amplitude. This value is typically the most negative peak voltage. It is measured over the entire waveform or gated region.

• **NDUty**
  This measures the first cycle in the waveform or gated region. The negative duty cycle is the ratio of the negative pulse width to the signal period, expressed as a percentage.

• **NOVershoot**
  This amplitude measurement finds the negative overshoot value over the entire waveform or gated region.

• **NWIdth**
  This measures the first pulse in the waveform or gated region. This distance (time) is measured at the middle reference amplitude points of a negative pulse.

• **PDUty**
  This measures the first cycle in the waveform or gated region. The positive duty cycle is the ratio of the positive pulse width to the signal period, expressed as a percentage.

• **PERIod**
  This timing measurement finds the time it takes for the first complete waveform cycle to complete in the waveform or gated region. Period is the reciprocal of frequency and is measured in seconds.

• **PHase**
  This measures the phase difference (amount of time a waveform leads or lags the reference waveform) between two waveforms. The measurement is made between the middle reference amplitude points of the two waveforms and is expressed in degrees, where 360° represents one waveform cycle.

• **PK2Pk**
  This peak-to-peak amplitude measurement finds the absolute difference between the maximum and minimum amplitude in the entire waveform or gated region.

• **POVershoot**
  This amplitude measurement finds the positive overshoot value over the entire waveform or gated region.

• **PWIdth**
  This measures the first pulse in the waveform or gated region. The distance (time) is measured at the middle reference amplitude points of a positive pulse.

• **RISe**
  This timing measurement finds the rise time of the waveform. The rise time is the time it takes for the leading edge of the first pulse encountered to rise from a low reference value (default is 10%) to a high reference value (default is 90%).

  \[ \text{Rise time} = \text{TimeRef High} - \text{TimeRef Low} \]

  You can also limit the measurement (normally taken over the entire waveform record) to a gated region on the waveform.

• **RMS**
This amplitude measurement finds the true Root Mean Square voltage in the entire waveform or gated region.

- **UNDEFINED**
  
  This is the default measurement type, which indicates that a measurement type has not yet been chosen. Once a measurement type is chosen, measurements cannot be reset using this argument.

**Example 1**

```
MEASurement:MEAS2:TYPE FREQuency
```

This command defines measurement 2 as a measurement of the frequency of a waveform.

**Example 2**

```
MEASurement:MEAS1:TYPE?
```

This query might return `:MEASUREMENT:MEAS1:TYPE RMS`, indicating that measurement 1 is defined to measure the RMS value of a waveform.
MEASUrement:MEAS<x>:UNIts?

Description
This query-only command returns the units associated with the specified measurement.

Group
Measurement

Related Commands
MEASUrement:MEAS<x>:TYPe (see page 253)

Syntax
MEASUrement:MEAS<x>:UNIts?

Example
MEASUrement:MEAS1:UNIts?

This query might return :MEASUREMENT:MEAS1:UNIts %, indicating units for measurement 1 are set to percent.
**MEASUrement:MEAS<x>:VALue?**

**Description**
This query-only command returns the value that has been calculated for the measurement specified by `<x>`, which ranges from 1 through 8. This command is equivalent to selecting Display Statistics from the Measure menu and then choosing Value from the drop-down list to display all measurement values on-screen.

**Note:** This is the displayed value in the onscreen display. If measurement statistics are enabled, a new value is calculated with every waveform. In addition, this value is updated about every 1/3 second. If you are acquiring a long acquisition record, the oscilloscope may take longer to update.

**Group**
Measurement

**Related Commands**
MEASUrement:MEAS<x>:UNIts? (see page 256), *ESR? (see page 320), ALLEV? (see page 329)

**Syntax**
MEASUrement:MEAS<x>:VALue?

**Example**
MEASUrement:MEAS1:VALue?

This query might return :MEASUREMENT:MEAS1:VA1ue 2.8740E-06. If the measurement has an error or warning associated with it, then an item is added to the error queue. The error can be checked for with the *ESR? and ALLEV? commands.
MEASUrement:METhod

Description
This command sets or queries the method used to calculate the 0% and 100% reference level. This command is equivalent to selecting Reference Levels from the Measure menu and then choosing the desired Determine Base, Top Form setting.

Group
Measurement

Related Commands
MEASUrement:REFLevel:PERCent:HIGH (see page 265), MEASUrement:REFLevel:PERCent:LOW (see page 266), MEASUrement:REFLevel:PERCent:MID (see page 267), MEASUrement:REFLevel:PERCent:MID2 (see page 268)

Syntax 1
MEASUrement:METhod {HIStogram|MINMax)

Syntax 2
MEASUrement:METhod?

Arguments
• HIStogram
  This sets the high and low reference levels statistically using a histogram algorithm.

• MINMax
  This sets the high and low waveform levels to MAX and MIN, respectively.

Example 1
MEASUrement:METhod HIStogram
This command specifies that the high and low reference levels are set statistically.

Example 2
MEASUrement:METhod?
This query might return :MEASUREMENT:METhod MINMAX, indicating that the reference levels are set to MIN and MAX.
MEASUREment:REFLevel?

Description
This query-only command returns the current reference level parameters. This command is equivalent to selecting Reference Levels from the Measure menu and then viewing the current Reference Levels settings.

Group
Measurement

Syntax
MEASUREMENT:REFLevel?

Example
MEASUREMENT:REFLevel?

This query might return:
:MEASUREMENT:REFLEVEL:METHOD ABSOLUTE;
ABSOLUTE:HIGH 0.0000E+00;LOW 0.0000E+00;MID1 0.0000E+00;
MID2 0.0000E+00;:MEASUREMENT:REFLEVEL:PERCENT:HIGH
9.0000E+01;LOW 1.0000E+01;MID1 5.0000E+01;MID2 5.0000E+01
MEASUrement:REFLevel:ABSolute:HIGH

Description
This command sets or queries the high reference level, and is the upper reference level when MEASUrement:REFLevel:METHod is set to Absolute. Note that this command affects the results of rise and fall measurements. This command is equivalent to selecting Reference Levels from the Measure menu and then entering the Absolute High Ref value.

Group
Measurement

Related Commands
MEASUrement:REFLevel:METHod (see page 264), MEASUrement:IMMed:TYPe (see page 236), MEASUrement:MEAS<x>:TYPe (see page 253)

Syntax 1
MEASUrement:REFLevel:ABSolute:HIGH <NR3>

Syntax 2
MEASUrement:REFLevel:ABSolute:HIGH?

Argument
• <NR3>
  This is the high reference level, in volts. The default is 0.0 V.

Example 1
MEASUrement:REFLevel:ABSolute:HIGH 1.71
This command sets the high reference level to 1.71 V.

Example 2
MEASUrement:REFLevel:ABSolute:HIGH?
This query might return :MEASUREMENT:REFLEVEL:ABSOLUTE:HIGH 1.7100E+00, indicating that the absolute high reference level is set to 1.71 V.
**MEASUrement:REFLevel:ABSolute:LOW**

**Description**
This command sets or queries the low reference level, and is the lower reference level when MEASUrement:REFLevel:METHod is set to Absolute. Note that this command affects the results of rise and fall measurements. This command is equivalent to selecting Reference Levels from the Measure menu and then entering the Absolute Low Ref value.

**Group**
Measurement

**Related Commands**
MEASUrement:REFLevel:METHod (see page 264), MEASUrement:IMMed:TYPe (see page 236), MEASUrement:MEAS<x>:TYPe (see page 253)

**Syntax 1**
MEASUrement:REFLevel:ABSolute:LOW <NR3>

**Syntax 2**
MEASUrement:REFLevel:ABSolute:LOW?

**Argument**

- `<NR3>`
  This is the low reference level, in volts. The default is 0.0 V.

**Example 1**
MEASUrement:REFLevel:ABSolute:LOW 0.0 V.

This command sets the low reference level to 0.0 V.

**Example 2**
MEASUrement:REFLevel:ABSolute:LOW?

This query might return :MEASUREMENT:REFLEVEL:ABSOLUTE:LOW 0.0000E+00, indicating that the absolute low reference level is set to 0.0 V.
**MEASUrement:REFLevel:ABSolute:MID**

**Description**
This command sets or queries the mid reference level, and is the 50% reference level when MEASUrement:REFLevel:METHod is set to Absolute. Note that this command affects the results of period, frequency, delay, and all cyclic measurements. This command is equivalent to selecting Reference Levels from the Measure menu and then entering the Absolute Mid Ref value.

**Group**
Measurement

**Related Commands**
MEASUrement:REFLevel:METHod (see page 264)

**Syntax 1**

**Syntax 2**
MEASUrement:REFLevel:ABSolute:MID[1]?

**Argument**
• <NR3>
  This is the mid reference level, in volts. The default is 0.0 V.

**Example 1**
This command sets the mid reference level to .71 V.

**Example 2**
MEASUrement:REFLevel:ABSolute:MID[1]?
This query might return :MEASUREMENT:REFLEVEL:ABSOLUTE:MID 0.7100E+00, indicating that the absolute mid1 reference level is set to .71 V.
MEASUrement:REFLevel:ABSolute:MID2

Description
This command sets or queries the mid reference level for the "to" waveform when taking a delay measurement, and is the 50% reference level when MEASUrement:REFLevel:METHod is set to Absolute. Note that this command affects the results of delay measurements. This command is equivalent to selecting Reference Levels from the Measure menu and then entering the Absolute Mid2 Ref value.

Group
Measurement

Related Commands
MEASUrement:REFLevel:METHod (see page 264)

Syntax 1
MEASUrement:REFLevel:ABSolute:MID2 <NR3>

Syntax 2
MEASUrement:REFLevel:ABSolute:MID2?

Argument
• <NR3>
  This is the mid reference level, in volts. The default is 0.0 V.

Example 1
MEASUrement:REFLevel:ABSolute:MID2 0.5
This command sets the mid reference level for the delay waveform to 0.5 V.

Example 2
MEASUrement:REFLevel:ABSolute:MID2?
This query might return :MEASUREMENT:REFLEVEL:ABSOLUTE:MID2 0.5000E+00, indicating that the absolute mid2 reference level is set to 0.5 V.
**MEASUrement:REFLevel:METHod**

**Description**
This command specifies or queries the reference level units used for measurement calculations. This command is equivalent to selecting Reference Levels from the Measure menu and then choosing the desired reference level from the Units group box.

**Group**
Measurement

**Syntax 1**
MEASUrement:REFLevel:METHod {ABSolute|PERCent}

**Syntax 2**
MEASUrement:REFLevel:METHod?

**Arguments**
- **ABSolute**
  
  This specifies that the reference levels are set explicitly using the MEASUrement:REFLevel:ABSolute commands. This method is useful when precise values are required. For instance, when designing to published interface specifications, such as RS-232-C.

- **PERCent**
  
  This specifies that the reference levels are calculated as a percent relative to HIGH and LOW. The percentages are defined using the MEASUrement:REFLevel:PERCent commands.

**Example 1**
MEASUrement:REFLevel:METHod ABSolute

This command specifies that explicit user-defined values are used for the reference levels.

**Example 2**
MEASUrement:REFLevel:METHod?

This query might return :MEASUREMENT:REFLEVEL:METHOD PERCENT, indicating that the reference level units used are calculated as a percent relative to HIGH and LOW.
**MEASUrement:REFLevel:PERCent:HIGH**

**Description**
This command sets or queries the percent (where 100% is equal to HIGH) that is used to calculate the high reference level when MEASUrement:REFLevel:METHod is set to Percent. Note that this command affects the results of rise and fall measurements. This command is equivalent to selecting Reference Levels from the Measure menu and then entering the Percentage High Ref value.

**Group**
Measurement

**Related Commands**
MEASUrement:REFLevel:METHod (see page 264), MEASUrement:IMMed:TYPe (see page 236), MEASUrement:MEAS<x>TYPe (see page 253)

**Syntax 1**
MEASUrement:REFLevel:PERCent:HIGH <NR3>

**Syntax 2**
MEASUrement:REFLevel:PERCent:HIGH?

**Argument**
- `<NR3>`
  This is the high reference level, ranging from 0 to 100%. The default high reference level is 90%.

**Example 1**
MEASUrement:REFLevel:PERCent:HIGH 95
This command sets the high reference level to 95% of HIGH.

**Example 2**
MEASUrement:REFLevel:PERCent:HIGH?
This query might return :MEASUREMENT:REFLEVEL:PERCENT:HIGH 90, indicating that the percentage high reference level is set to 90% of HIGH.
MEASUrement:REFLevel:PERCent:LOW

Description
This command sets or queries the percent (where 100% is equal to HIGH) that is used to calculate the low reference level when MEASUrement:REFLevel:METHod is set to Percent. Note that this command affects the results of rise and fall measurements. This command is equivalent to selecting Reference Levels from the Measure menu and then entering the Percentage Low Ref value.

Group
Measurement

Related Commands
MEASUrement:REFLevel:METHod (see page 264), MEASUrement:IMMed:TYPe (see page 236), MEASUrement:MEAS<x>:TYPe (see page 253)

Syntax 1
MEASUrement:REFLevel:PERCent:LOW <NR3>

Syntax 2
MEASUrement:REFLevel:PERCent:LOW?

Argument
• <NR3>
This is the low reference level, ranging from 0 to 100%. The default low reference level is 10%.

Example 1
MEASUrement:REFLevel:PERCent:LOW 15
This command sets the high reference level to 15% of HIGH.

Example 2
MEASUrement:REFLevel:PERCent:LOW?
This query might return :MEASUREMENT:REFLEVEL:PERCENT:LOW 10, indicating that the percentage high reference level is set to 10% of HIGH.
MEASUrement:REFLevel:PERCent:MID[1]

Description
This command sets or queries the percent (where 100% is equal to HIGH) that is used to calculate the
mid reference level when MEASUrement:REFLevel:METHod is set to Percent. Note that this command affects the results of period, frequency, delay, and all cyclic measurements. This command is equivalent to selecting Reference Levels from the Measure menu and then entering the Percentage Mid Ref value.

Group
Measurement

Related Commands
MEASUrement:REFLevel:METHod (see page 264)

Syntax 1

Syntax 2
MEASUrement:REFLevel:PERCent:MID[1]?

Argument
• <NR3>
  This is the mid reference level, ranging from 0 to 100%. The default mid reference level is 50%.

Example 1
MEASUrement:REFLevel:PERCent:MID[1] 60
This command sets the mid reference level to 60% of HIGH.

Example 2
MEASUrement:REFLevel:PERCent:MID[1]?
This query might return :MEASUREMENT:REFLEVEL:PERCENT:MID 65, indicating that the percentage mid reference level is set to 65% of HIGH.
**MEASUrement:REFLevel:PERCent:MID2**

**Description**
This command sets or queries the percent (where 100% is equal to HIGH) that is used to calculate the mid reference level for the second waveform specified when MEASUrement:REFLevel:METHod is set to Percent. Note that this command affects the results of delay measurements. This command is equivalent to selecting Reference Levels from the Measure menu and then entering the Percentage Mid2 Ref value.

**Group**
Measurement

**Related Commands**
MEASUrement:REFLevel:METHod (see page 264)

**Syntax 1**
MEASUrement:REFLevel:PERCent:MID2 <NR3>

**Syntax 2**
MEASUrement:REFLevel:PERCent:MID2?

**Argument**
- <NR3>
  This is the mid reference level, ranging from 0 to 100%. The default mid reference level is 50%.

**Example 1**
MEASUrement:REFLevel:PERCent:MID2 40
This command sets the mid2 reference level to 40% of HIGH.

**Example 2**
MEASUrement:REFLevel:PERCent:MID2?
This query might return :MEASUREMENT:REFLEVEL:PERCENT:MID2 45, indicating that the percentage mid2 reference level is set to 45% of HIGH.
MEASUrement:STATIstics:COUNt

Description
This command (no query form) clears existing measurement statistics from memory. This command is equivalent to selecting Reset Statistics from the Measure menu.

Group
Measurement

Related Commands
MEASUrement:STATIstics:MODe (see page 270)

Syntax
MEASUrement:STATIstics:COUNt {RESET}

Argument
• RESET
  This clears existing measurement statistics from memory.

Example
MEASUrement:STATIstics:COUNt RESET

This command clears existing measurement statistics from memory.
**MEASUrement:STATIstics:MODe**

**Description**
This command controls the operation and display of management statistics. This command is equivalent to selecting Measurement Setup from the Measure menu, clicking the Statistics button and then choosing the desired Measurement Format.

**Group**
Measurement

**Related Commands**
MEASUrement:STATIstics:WEIghting (see page [271](#))

**Syntax 1**
MEASUrement:STATIstics:MODe {OFF|ALL|VALUEMean}

**Syntax 2**
MEASUrement:STATIstics:MODe?

**Arguments**
- **OFF**
  This turns measurements off. This is the default value.
- **ALL**
  This turns on statistics and displays all statistics for each measurement.
- **VALUEMean**
  This turns on statistics and displays the value and the mean ($\mu$) of each measurement.

**Example 1**
MEASUrement:STATIstics:MODe OFF
This command turns statistic measurements off.

**Example 2**
MEASUrement:STATIstics:MODe?
This query might return :MEASUREMENT:STATISTICS:MODE ALL, indicating that measurement statistics are turned on and all statistics are being displayed for each measurement.
MEASUrement:STATIstics:WEIghting

Description
This command sets or queries the 'time constant' for mean and standard deviation statistical accumulations. This command is equivalent to selecting Measurement Setup from the Measure menu, clicking the Statistics button and then entering the desired Weight n= value.

Group
Measurement

Related Commands
MEASUrement:STATIstics:MODE (see page 270)

Syntax 1
MEASUrement:STATIstics:WEIghting <NR1>

Syntax 2
MEASUrement:STATIstics:WEIghting?

Argument
• <NR1>
  This is the time constant for the mean and standard deviation statistical accumulations.

Example 1
MEASUrement:STATIstics:WEIghting 4
This command sets statistical weighting to 4.

Example 2
MEASUrement:STATIstics:WEIghting?
This query might return :MEASUREMENT:STATISTICS:WEIGHTING 4, indicating that measurement statistics weighting is currently set to 4.
Miscellaneous Command Group

Miscellaneous Overview

Miscellaneous commands do not fit into other categories. Several commands and queries are common to all 488.2–1987 devices on the GPIB bus. The 488.2–1987 standard defines these commands. The common commands begin with an asterisk (*) character.
## Miscellaneous Commands

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**DDT**

**Description**
This command allows you to specify a command or a list of commands that are executed when the oscilloscope receives a *TRG command or the GET GPIB interface message. Define Device Trigger (*DDT) is a special alias that the *TRG command uses.

**Group**
Miscellaneous

**Related Commands**
ALIas (see page 33), *TRG (see page 279)

**Syntax 1**
*DDT {<Block>|<QString>}

**Syntax 2**
*DDT?

**Arguments**

- **<Block>**
  This is a complete sequence of program messages. The messages can contain only valid commands that must be separated by semicolons and must follow all rules for concatenating commands. The sequence must be less than or equal to 80 characters. The format of this argument is always returned as a query.

- **<QString>**
  This is a complete sequence of program messages. The messages can contain only valid commands that must be separated by semicolons and must follow all rules for concatenating commands. The sequence must be less than or equal to 80 characters.

**Example**
*DDT #OACQUIRE:STATE RUN

This command specifies that the acquisition system will be started each time a *TRG command is sent.
*IDN?\n
Description
This query-only command returns the oscilloscope identification code.

Group
Miscellaneous

Related Commands
ID? (see page 259)

Syntax
IDN?

Example
*IDN?
This query might return :TEKTRONIX,TDS7104,0,CF:91.1CT FV:01.00.912, indicating the oscilloscope model number, configured number, and firmware version number.
**LRN?**

**Description**
This query-only command returns the commands that list the oscilloscope settings (except for configuration information for the calibration values), allowing you to record or "learn" the current oscilloscope settings. You can use these commands to return the oscilloscope to the state it was in when you made the *LRN? query.

**Group**
Miscellaneous

**Related Commands**
SET?

**Syntax**
*LRN?

**Example**
This query might return the following response:
```
:ACQUIRE:STOPAFTER RUNSTOP;STATE 1;MODE SAMPLE;NUMENV 10;NUMAVG 16;REPET 1;FASTACQ:STATE 1;APPLICATION :GPKNOB1:ACTIVE 0;APPLICATION:GPKNOB2:ACTIVE 0;
:APPLICATION:WINDOW:HEIGHT 0;WIDTH 0;APPLICATION:SCOPEAPP:STATE NOTRUNNING;WINDOW FULLSCREEN;
:APPLICATION:EXTAPP:STATE NOTRUNNING;AUXOUT:SOURCE ATRIGGER;EDGE FALLING;:CMDBATCH 1;:HEADER 0;:LOCK NONE;:VERBOSE 1;:ALIAS:STATE 0;
:DISPLAY:FILTER SINX;FORMAT YT;GRATICULE FULL;INTENSITY:WAVEFORM 60.0000;AUTOBRIGHT 1
;SCREENSAVER 1;SCREENSAVERDELAY 28800;DISPLAY
:PERSISTENCE OFF;STYLE VECTORS;TRIGBAR SHORT;TRIGT 1;
:VARPERSIST 500.0000E-3;:HARDCOPY:FILENAME "";FORMAT BMP;
:LAYOUT PORTRAIT;PALETTE HARDCOPY;PORT FILE;:
:HORIZONTAL:DELAY:MODE 1;POSITION 50.0000;TIME 0.0000;HORIZONTAL:MAIN:SCALE 200.0000E-9;POSITION 50.0000;:HORIZONTAL:RECORDLENGTH 2500;ROLL AUTO
;FASTFRAME:STATE 0;LENGTH 2500;COUNT 2;SELECTED:CH1 2;
CH2 2;CH3 2;CH4 2;MATH1 2;MATH2 2;MATH3 2;MATH4 2;
:REF1 2;REF2 2;REF3 2;REF4 2;:HORIZONTAL:FASTFRAME:TRACK LIVE;:DIAG:LEVEL SUBSYS;:TRIGGER:A:MODE AUTO;TYPE EDGE;LEVEL 0.0000;HOLDOFF:BY DEFAULT;TIME 250.0000E-9;
:TRIGGER:A:EDGE:SOURCE CH1;COUPLING DC;SLOPE RISE;
:TRIGGER:A:LOGIC:CLASS PATTERN;FUNCTION AND;WHEN TRUE;
:THRESHOLD:CH1 1.4000;CH2 1.4000;CH3 1.4000;CH4 1.4000;
:TRIGGER:A:LOGIC:INPUT:CH1 HIGH;CH2 X;CH3 X;CH4 X;
:TRIGGER:A:LOGIC:STATE:WHEN TRUE;:TRIGGER:A:
:TRIGGER:A:LOGIC:CLASS GLITCH;SOURCE CH1;GLITCH:WIDTH 2.0000E-9;
:TRIGIF ACCEPT;POLARITY POSITIVE;:TRIGGER:A:PULSE:RUNT
:POLARITY POSITIVE;THRESHOLD:HIGH 1.2000;LOW 800.0000E-3;
:TRIGGER:A:PULSE:RUNT:WHEN OCCURS;WIDTH 2.0000E-9;
:WIDTH:LOWLIMIT 2.0000E-9;HIGHLIMIT 2.0000E-9;WHEN WITHIN
STAYSHIGH;TIME 2.0000E-9;:TRIGGER:B:STATE 0;TYPE EDGE
:LEVEL 0.0000;BY EVENTS;EDGE:SOURCE CH1;SLOPE RISE
:COUPLING DC;:TRIGGER:B:TIME 16.0000E-9;EVENTS:COUNT 2;
:MATHE:DEFINE " ";NUMAVG 2;SCALE 1.0000;POSITION 0.0000
:LABEL:NAME "";XPOS 5;YPOS 65;:MATHE:SPECTRAL:MAG DB
```
*TRG

Description
This command (no query form) performs the group execute trigger on commands defined by *DDT.

Group
Miscellaneous

Related Commands
*DDT (see page 274)

Syntax
*TRG

Example
*TRG

This command immediately executes all commands that have been defined by *DDT.
**TST?**

**Description**  
This query-only command tests (self-test) the GPIB interface and returns a 0.

**Group**  
Miscellaneous

**Syntax**  
*TST?

**Example**  
*TST?  
This query always returns 0.
**AUTOSet EXECute**

**Description**
This command causes the digitizing oscilloscope to adjust its vertical, horizontal, and trigger controls to provide a stable display of the selected waveform. This is equivalent to pressing the front-panel AUTOSET button. For a detailed description of autoset functionality, see Autoset in the index of your oscilloscope online help.

**Group**
Miscellaneous

**Syntax**
AUTOSet EXECute

**Argument**
- EXECute
  This autosets the displayed waveform.

**Example**
AUTOSet EXECute
This command adjusts the vertical, horizontal, and trigger controls to provide a stable display of the selected waveform.
AUXout?

**Description**
This query-only command returns the auxiliary out setup. This query command is equivalent to selecting AUX OUT Configuration from the Utilities menu and then viewing the current settings.

**Group**
Miscellaneous

**Related Commands**
AUXout:EDGe (see page 283), AUXout:SOURce (see page 284)

**Syntax**
AUXout?

**Example**
AUXout?

This query might return :AUXOUT:SOURCE ATRIGGER;EDGE RISING, indicating that the source at the BNC connector is set to the A trigger and that the polarity is set to the rising edge of the trigger output signal.
**AUXout:EDGE**

**Description**
This command sets or queries the direction in which the trigger output signal transitions when a trigger occurs. This command is equivalent to selecting AUX OUT Configuration from the Utilities menu and then clicking the desired Polarity setting.

**Group**
Miscellaneous

**Related Commands**
AUXout? (see page 282), AUXout:SOURce (see page 284)

**Syntax 1**
```
AUXout:EDGE {RISing|FALling}
```

**Syntax 2**
```
AUXout:EDGE?
```

**Arguments**
- **RISing**
  This sets the polarity to the rising edge of the trigger output signal.
- **FALling**
  This sets the polarity to the falling edge of the trigger output signal.

**Example 1**
```
AUXout:EDGE RISing
```
This command sets the polarity to the rising edge of the trigger output signal.

**Example 2**
```
AUXout:EDGE?
```
This query might return :AUXOUT:EDGE RISING, indicating that the polarity is set to the rising edge of the trigger output signal.
AUXout:SOUrce

Description
This command sets or queries the trigger source at the BNC connection. This command is equivalent to selecting AUX OUT Configuration from the Utilities menu and then selecting the desired Configuration setting.

Group
Miscellaneous

Related Commands
AUXout? (see page 282), AUXout:EDGe (see page 283)

Syntax 1
AUXout:SOUrce {ATRIGger|BTRIGger}

Syntax 2
AUXout:SOUrce?

Arguments
- ATRIGger
  This sets the source at the BNC connector to the main trigger.
- BTRIGger
  This sets the source at the BNC connector to the delayed trigger.

Example
AUXout:SOUrce?

This query might return :AUXOUT:SOURCE ATRIGGER, indicating that the source at the BNC connector is set to the A trigger.
BEL1

Description
This command was previously used to beep an audio indicator and is provided for backward compatibility.

Group
Miscellaneous

Syntax
BEL1

Example
BEL1
This command is accepted but does nothing.
CMDBatch

Description
This command sets or queries the state of command batching. By batching commands, database transactions can be optimized, increasing command throughput. Also, batching allows for ALL commands in an individual batch to be order independent and accomplish the same result as if the commands were coupled.

The Batch state is persistent and will be saved across power cycles, but will not be saved and recalled as part of a setup. In a setup scenario, the factory initial value is enabled.

Group
Miscellaneous

Syntax 1
CMDBatch {OFF|ON|<NR1>}

Syntax 2
CMDBatch?

Arguments
• OFF
  This turns command batching off.

• ON
  This turns command batching on.

• <NR1>
  A 0 turns command batching off; any other value turns command batching on.

Example 1
CMDBatch OFF
This command disables command batching.

Example 2
CMDBatch?
This query might return :CMDBATCH 1, indicating that command batching is turned on.
DATe

Description
This command sets or queries the date that the oscilloscope can display. This command is equivalent to selecting Set Date & Time from the Utilities menu and then setting the fields in the Date group box.

Group
Miscellaneous

Related Commands
TIMe (see page 298)

Syntax 1
DATe <QString>

Syntax 2
DATe?

Argument
• <QString>
  This is a date in the form "yyyy-mm-dd" where yyyy refers to a four-digit year number, mm refers to a two-digit month number from 01 to 12, and dd refers to a two-digit day number in the month.

Example 1
DATE "2000-01-24"
This command specifies that the date is set to January 24, 2000.

Example 2
DATE?
This query might return :DATE 2000-01-24, indicating the current date is set to January 24, 2000.
HDR

Description
This command is identical to the HEADer query and is included for backward compatibility purposes.

Group
Miscellaneous

Related Commands
HEADer (see page 289), VERBose (see page 300)

Syntax 1
HDR {OFF|ON|<NR1>}

Syntax 2
HDR?

Arguments

• OFF
  This sets the Response Header Enable State to false. This causes the oscilloscope to omit headers on query responses, so that only the argument is returned.

• ON
  This sets the Response Header Enable State to true. This causes the oscilloscope to include headers on applicable query responses. You can then use the query response as a command.

• <NR1>
  A 0 sets the Response Header Enable State to false; any other value sets this state to true, which causes the oscilloscope to omit headers on query responses.

Example 1
HDR OFF
This command specifies that the oscilloscope omits headers on query responses, so that only the argument is returned.

Example 2
HDR?
This query might return :HEADER 1, indicating that the oscilloscope is including headers on applicable query responses.
**HEADer**

**Description**
This command sets or queries the Response Header Enable State that causes the oscilloscope to either include or omit headers on query responses.

*Note:* This command does not affect IEEE Std 488.2-1987 Common Commands (those starting with an asterisk); they never return headers.

**Group**
Miscellaneous

**Related Commands**
HDR (see page 288), VERBose (see page 300)

**Syntax 1**
```
HEADer {OFF|ON|<NR1>}
```

**Syntax 2**
```
HEADer?
```

**Arguments**
- **OFF**
  This sets the Response Header Enable State to false. This causes the oscilloscope to omit headers on query responses, so that only the argument is returned.

- **ON**
  This sets the Response Header Enable State to true. This causes the oscilloscope to include headers on applicable query responses. You can then use the query response as a command.

- **<NR1>**
  A 0 sets the Response Header Enable State to false; any other value sets this state to true, which causes the oscilloscope to omit headers on query responses.

**Example 1**
```
HEADer OFF
```
This command specifies that the oscilloscope omits headers on query responses, so that only the argument is returned.

**Example 2**
```
HEADer?
```
This query might return `:HEADER 1`, indicating that the oscilloscope is including headers on applicable query responses.
**ID?**

**Description**
This query-only command returns identifying information about the oscilloscope and related firmware.

**Group**
Miscellaneous

**Related Commands**
IDN? (see page 275)

**Syntax**
ID?

**Example**
ID?
This query might return :TEK/TDS7104,CF:91.1CT,FV:01.00.912, indicating the oscilloscope model number, configured format, and firmware version number.
**LOk**

**Description**
This command enables or disables all front panel buttons and knobs, including the touch screen. There is no front panel equivalent.

**Group**
Miscellaneous

**Related Commands**
UNLock (see page 299)

**Syntax 1**
LOk {ALL|NONe}

**Syntax 2**
LOk?

**Arguments**
- **ALL**
  This disables all front panel controls.

- **NONe**
  This enables all front panel controls. This is equivalent to the UNLock ALL command.

**Note:** If the oscilloscope is in the Remote With Lockout State (RWLS), the LOk NONe command has no effect. For more information, see the ANSI/IEEE Std 488.1-1987 Standard Digital Interface for Programmable Instrumentation, section 2.8.3 on RL State Descriptions.

**Example 1**
LOk ALL
This command locks the front panel controls.

**Example 2**
LOk?
This query might return :LOCK NONE, indicating that the front panel controls are enabled by this command.
**NEWpass**

**Description**
This command (no query form) changes the password that enables access to password protected data. The PASSWord command must be successfully executed before using this command or an execution error will be generated.

**Group**
Miscellaneous

**Related Commands**
PASSWord (see page 293), *PUD (see page 324)

**Syntax**
NEWpass <QString>

**Argument**
- <QString>
  - This is the new password, which can contain up to 10 characters.

**Example**
NEWpass "mypassword"

This command creates a new password for accessing your protected data.
PASSWord

Description
This command (no query form) enables the *PUD and NEWpass set commands. Sending PASSWord without any arguments disables these same commands. Once the password is successfully entered, the *PUD and NEWpass commands are enabled until the oscilloscope is powered off, or until the FACTory command, the PASSWord command with no arguments, or the *RST command is issued.

To change the password, you must first enter the valid password with the PASSWord command and then change to your new password with the NEWpass command. Remember that the password is case sensitive.

Group
Miscellaneous

Related Commands
NEWpass (see page 292), *PUD (see page 324)

Syntax
PASSWord <QString>

Argument
• <QString>
   This is the password, which can contain up to 10 characters. The factory default password is “XYZZY” and is always valid.

Example 1
PASSWord "XYZZY"

This command enables the *PUD and NEWPass set commands.

Example 2
PASSWord

This command disables the *PUD and NEWPass set commands. You can still use the query version of *PUD.
**REM**

**Description**
This command (no query form) embeds a comment within GPIB programs as a means of internally documenting the programs. The oscilloscope ignores these embedded comment lines.

**Group**
Miscellaneous

**Related Commands**
NEWpass (see page 292), *PUD (see page 324)

**Syntax**
REM <QString>

**Argument**
- <QString>
  This is a string that can contain a maximum of 80 characters.

**Example**
REM "This is a comment"
The oscilloscope ignores this comment string.
SET?

Description
This query-only command returns the commands that list the oscilloscope settings, except for configuration information for the calibration values. You can use these commands to return the oscilloscope to the state it was in when you made the SET? query. This command is identical to the *LRN? command.

Group
Miscellaneous

Related Commands
HEADer (see page 289), *LRN? (see page 276), VERBose (see page 300)

Syntax
SET?

Note: The SET? query always returns command headers, regardless of the setting of the HEADer command. This is because the returned commands are intended to be sent back to the oscilloscope as a command string. The VERBose command can still be used to specify whether the returned headers should be abbreviated or full-length.

Example
SET?

This query might return the following response:

STAYSHIGH; TIME 2.0000E-9; TRIGGER:B:STATE 0; TYPE EDGE
; LEVEL 0.0000; BY EVENTS; EDGE: SOURCE CH1; SLOPE RISE
; COUPLING DC; TRIGGER:B: TIME 16.0000E-9; EVENTS: COUNT 2;
; MATH1: DEFINE " "; NUMAVG 2; SCALE 1.0000; POSITION 0.0000
; LABEL: NAME " "; XPOS 5; YPOS 65; MATH1: SPECTRAL: MAG DB
; PHASE DEGREES; GATEPOS -800.0000E-12; GATEWIDTH 1.9992E-6
; REFLEVEL 20.0000; REFLEVEL OFFSET 223.6000E-3; SPAN
600.0000E+6; CENTER 325.0000E+6; RESBW 1.0004E+6; WINDOW
GAUSSIAN; SUPPRESS -35000.0000E-3; UNWRAP 0; LOCK 0;
MATH2: DEFINE " "; NUMAVG 2; SCALE 1.0000; POSITION 0.0000
; LABEL: NAME " "; XPOS 5; YPOS 80; MATH2: SPECTRAL: MAG DB
; PHASE DEGREES; GATEPOS -800.0000E-12; GATEWIDTH 1.9992E-6
; REFLEVEL 20.0000; REFLEVEL OFFSET 223.6000E-3; SPAN
600.0000E+6; CENTER 325.0000E+6; RESBW 1.0004E+6; WINDOW
GAUSSIAN; SUPPRESS -35000.0000E-3; UNWRAP 0; LOCK 0;
MATH3: DEFINE " "; NUMAVG 2; SCALE 1.0000; POSITION 0.0000
; LABEL: NAME " "; XPOS 5; YPOS 95; MATH3: SPECTRAL: MAG DB
; PHASE DEGREES; GATEPOS -800.0000E-12; GATEWIDTH 1.9992E-6
; REFLEVEL 20.0000; REFLEVEL OFFSET 223.6000E-3; SPAN
600.0000E+6; CENTER 325.0000E+6; RESBW 1.0004E+6; WINDOW
GAUSSIAN; SUPPRESS -35000.0000E-3; UNWRAP 0; LOCK 0;
MATH4: DEFINE " "; NUMAVG 2; SCALE 1.0000; POSITION 0.0000
; LABEL: NAME " "; XPOS 5; YPOS 110; MATH4: SPECTRAL: MAG DB
; PHASE DEGREES; GATEPOS -800.0000E-12; GATEWIDTH 1.9992E-6
; REFLEVEL 20.0000; REFLEVEL OFFSET 223.6000E-3; SPAN
600.0000E+6; CENTER 325.0000E+6; RESBW 1.0004E+6; WINDOW
GAUSSIAN; SUPPRESS -35000.0000E-3; UNWRAP 0; LOCK 0;
HISTOGRAM: BOXPCNT 30.0000, 25.1000, 70.0000, 75.2000
; DISPLAY: LINEAR; STATE 0; FUNCTION HORIZONTAL; SIZE 2.0000
; SOURCE CH1; CH1: BANDWIDTH 1.0000E+9; COUPLING DC; DESKEW
0.0000; OFFSET 0.0000; POSITION 0.0000; SCALE 100.0000E-3
; TERMINATION 1.0000E+6; PROBE Func: EXTATTEN 1.0000
; EXTUNITS: " "; XPOS 5; YPOS 5;
; CH2: BANDWIDTH 1.0000E+9; COUPLING DC; DESKEW 0.0000
; OFFSET 0.0000; POSITION 0.0000; SCALE 100.0000E-3
; TERMINATION 1.0000E+6; PROBE Func: EXTATTEN 1.0000
; EXTUNITS: " "; XPOS 5; YPOS 20;
; CH3: BANDWIDTH 1.0000E+9; COUPLING DC; DESKEW 0.0000
; OFFSET 0.0000; POSITION 0.0000; SCALE 100.0000E-3
; TERMINATION 1.0000E+6; PROBE Func: EXTATTEN 1.0000
; EXTUNITS: " "; XPOS 5; YPOS 35;
; CH4: BANDWIDTH 1.0000E+9; COUPLING DC; DESKEW 0.0000
; OFFSET 0.0000; POSITION 0.0000; SCALE 100.0000E-3
; TERMINATION 1.0000E+6; PROBE Func: EXTATTEN 1.0000
; EXTUNITS: " "; XPOS 5; YPOS 50;
; SELECT: CH1; CH2 0; CH3 0; CH4 0; MATH1 0; MATH2 0
; MATH3 0; MATH4 0; REF1 0; REF2 0; REF3 0; REF4 0; CONTROL
CH1: STATE OFF; FUNCTION VBARS; MODE INDEPENDENT
; SOURCE CH1; VBARS: UNITS SECONDS; POSITION1 -800.0000E-9
; POSITION2 800.0000E-9; CURSOR: HBARS: POSITION1
300.0000E-3; POSITION2 -300.0000E-3; CURSOR: PAIRED
; POSITION1 -800.0000E-9; POSITION2 800.0000E-9; CURSOR
; SPLIT: POSITION1 -800.0000E-9; POSITION2 800.0000E-9
; SOURCE CH1; UNITS BASE; MEASUREMENT: GATING OFF; METHOD
HISTOGRAM; IMMEDIATELY UNDEFINED; SOURCE1 CH1; SOURCE2 CH1
; DELAY: EDGE1 RISE; EDGE2 RISE; DIRECTION FORWARDS;
; MEASUREMENT: MEAS1: STATE 0; TYPE UNDEFINED; SOURCE1 CH1
; SOURCE2 CH1; DELAY: EDGE1 RISE; EDGE2 RISE; DIRECTION
FORWARDS; MEASUREMENT: MEAS2: STATE 0; TYPE UNDEFINED
; SOURCE1 CH1; SOURCE2 CH1; DELAY: EDGE1 RISE; EDGE2 RISE;
; DIRECTION FORWARDS; MEASUREMENT: MEAS3: STATE 0; TYPE
UNDEFINED; SOURCE1 CH1; SOURCE2 CH1; DELAY: EDGE1 RISE
EDGE2 RISE;DIRECTION FORWARDS; :MEASUREMENT:MEAS8
;STATE 0;TYPE UNDEFINED;SOURCE1 CH1;SOURCE2 CH1;DELAY
;EDGE1 RISE;EDGE2 RISE;DIRECTION FORWARDS; :MEASUREMENT
;REFLEVEL:METHOD PERCENT;ABSOLUTE:HIGH 0.0000;LOW 0.0000
;HIGH 90.0000;LOW 10.0000;MID1 50.0000;MID2 50.0000;
;MEASUREMENT:STATISTICS:MODE OFF;WEIGHTING 32;ZOOM
;MODE 0;GRATICULE:SIZE 50; ZOOM:HORIZONTAL:LOCK ALL;
;ZOOM:CH1:HORIZONTAL:POSITION 50.0000;SCALE 2;
ZOOM:CH1:VERTICAL:POSITION 0.0000;SCALE 1.0000;
ZOOM:CH2:HORIZONTAL:POSITION 50.0000;SCALE 2;
ZOOM:CH2:VERTICAL:POSITION 0.0000;SCALE 1.0000;
ZOOM:CH3:HORIZONTAL:POSITION 50.0000;SCALE 2;
ZOOM:CH3:VERTICAL:POSITION 0.0000;SCALE 1.0000;
ZOOM:CH4:HORIZONTAL:POSITION 50.0000;SCALE 2;
ZOOM:CH4:VERTICAL:POSITION 0.0000;
ZOOM:MATH1:HORIZONTAL:POSITION 50.0000;SCALE 2;
ZOOM:MATH1:VERTICAL:POSITION 0.0000;SCALE 1.0000;
ZOOM:MATH2:HORIZONTAL:POSITION 50.0000;SCALE 2;
ZOOM:MATH2:VERTICAL:POSITION 0.0000;SCALE 1.0000;
ZOOM:MATH3:HORIZONTAL:POSITION 50.0000;SCALE 2;
ZOOM:MATH3:VERTICAL:POSITION 0.0000;SCALE 1.0000;
ZOOM:MATH4:HORIZONTAL:POSITION 50.0000;SCALE 2;
ZOOM:MATH4:VERTICAL:POSITION 0.0000;SCALE 1.0000;
ZOOM:REF1:HORIZONTAL:POSITION 50.0000;SCALE 2;
ZOOM:REF1:VERTICAL:POSITION 0.0000;SCALE 1.0000;
ZOOM:REF2:HORIZONTAL:POSITION 50.0000;SCALE 2;
ZOOM:REF2:VERTICAL:POSITION 0.0000;SCALE 1.0000;
ZOOM:REF3:HORIZONTAL:POSITION 50.0000;SCALE 2;
ZOOM:REF3:VERTICAL:POSITION 0.0000;SCALE 1.0000;
ZOOM:REF4:HORIZONTAL:POSITION 50.0000;SCALE 2;
ZOOM:REF4:VERTICAL:POSITION 0.0000;SCALE 1.0000;
REF1:LABEL:NAME "";XPOS 5;YPOS 125;
REF1:SCALE 1.0000;
REF2:LABEL:NAME "";XPOS 5;YPOS 140;
REF2:SCALE 1.0000;
REF3:LABEL:NAME "";XPOS 5;YPOS 155;
REF3:SCALE 1.0000;
REF4:LABEL:NAME "";XPOS 5;YPOS 170;
REF4:SCALE 1.0000;
MEASUREMENT:STATISTICS:MODE OFF;WEIGHTING 32;ZOOM
;MODE 0;GRATICULE:SIZE 50; ZOOM:HORIZONTAL:LOCK ALL;
;ZOOM:CH1:HORIZONTAL:POSITION 50.0000;SCALE 2;
ZOOM:CH1:VERTICAL:POSITION 0.0000;SCALE 1.0000;
SOURCE CH1;START 1;STOP 500;WIDTH 8
TIMe

Description
This command sets or queries the time that the oscilloscope can display. This command is equivalent to selecting Set Time & Date from the Utilities menu and then setting the fields in the Time group box.

Group
Miscellaneous

Related Commands
DATE (see page 287)

Syntax 1
TIMe <QString>

Syntax 2
TIMe?

Argument
- <QString>
  This is a time in the form "hh:mm:ss" where hh refers to a two-digit hour number, mm refers to a two-digit minute number from 01 to 60, and ss refers to a two-digit second number from 01 to 60.

Example 1
TIME "14:00:00"
This command specifies that the time is set to exactly 2:00 p.m..

Example 2
DATE?
This query might return :TIME "14:05:17", indicating the current time is set to 2:05 p.m.
UNLock

Description
This command (no query form) unlocks the front panel. The command is equivalent to LOck NONe.

Note: If the oscilloscope is in the Remote With Lockout State (RWLS), the UNLock command has no effect. For more information, see the ANSI-IEEE Std 488.1-1987 Standard Digital Interface for Programmable Instrumentation, section 2.8.3 on RL State Descriptions.

Group
Miscellaneous

Related Commands
LOck (see page 291)

Syntax
UNLock ALL

Argument
• ALL
  This specifies that all front-panel buttons and knobs are unlocked.

Example
UNLock ALL
This command unlocks all front-panel buttons and knobs.
VERBose

Description
This command sets and queries the Verbose state that controls the length of keywords on query responses. Keywords can be both headers and arguments. This command does not affect IEEE Std 488.2-1987 Common Commands (those starting with an asterisk).

Group
Miscellaneous

Related Commands
HEADer (see page 289), *LRN? (see page 276), SET? (see page 295)

Syntax
VERBose {OFF|ON|<NR1>}

Arguments
• OFF
  This sets the Verbose State to true, which returns full-length keywords for applicable setting queries.

• ON
  This sets the Verbose State to false, which returns minimum-length keywords for applicable setting queries.

• <NR1>
  A 0 returns minimum-length keywords for applicable setting queries; any other value returns full-length keywords.

Example 1
VERBose ON
This command enables the Verbose setting.

Example 2
VERBose?
This query might return :VERBOSE 0, indicating that the Verbose state is disabled.
Save and Recall Command Group

Save and Recall Overview
You use the commands in the Save and Recall Command Group to store and retrieve internal waveforms and settings. When you save a setup, you save all the settings of the oscilloscope. When you recall a setup, the oscilloscope restores itself to the state that it was in when you originally saved that setting.
# Save and Recall Commands

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<th>Description</th>
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<td>Stores the current oscilloscope state to a specified memory location</td>
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<td>Changes the specified setup to reference the factory setup instead of the user setup</td>
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<td>DELEte:SETUp</td>
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<td>SETUp:NAMe</td>
<td>Sets the user-defined setup label</td>
</tr>
</tbody>
</table>
**RCL**

**Description**
This command (no query form) restores the state of the oscilloscope from a copy of the settings stored in memory (The settings are stored using the *SAV command). If 'factory' is referenced (by specifying '0'), the factory default values will be restored. This command is equivalent to RECALL:SETUp and performs the same function as selecting Instrument Setup from the File menu and then choosing the Recall Setups tab.

**Group**
Save and Recall

**Related Commands**
DELEte:SETUp (see page 306), FACtory (see page 308), *LRN? (see page 278), RECALL:SETUp (see page 309), *RST (see page 325), *SAV (see page 304), SAVe:SETUp (see page 311)

**Syntax**
*RCL <NR1>

**Argument**
- <NR1>
  This specifies a setup storage location value, ranging from 0 through 10. Using an out-of-range value causes an execution error.

**Example**
*RCL 3
This command restores the oscilloscope from a copy of the settings stored in memory location 3.
*SAV

Description
This command (no query form) stores the state of the oscilloscope to a specified memory location. You can later use the *RCL command to restore the oscilloscope to this saved state. This is equivalent to selecting Instrument Setup from the File menu and then choosing the Save Setups tab.

Group
Save and Recall

Related Commands
*RCL (see page 303), RECALL:SETUp (see page 309), SAVe:SETUp (see page 311)

Syntax
*SAV <NR1>

Argument
• <NR1>

This specifies a location in which to save the state of the scope. Location values range from 1 through 10. Using an out-of-range location value causes an execution error. Any settings that have been stored previously at this location will be overwritten.

Example
*SAV 2

This command saves the current oscilloscope state in memory location 2.
*SDS

Description
This command (no query form) changes the specified setup to reference the factory setup instead of the specific user setup slot. The content of the setup slot is unchanged, but the data will no longer be accessible to you. This command is equivalent to selecting Instrument Setups from the File menu, choosing the Recall Setups tab and then clicking the Default button.

Group
Save and Recall

Related Commands
DELETE:SETUp (see page 306)

Syntax
*SDS <NR1>

Argument
• <NR1>
   This specifies a user setup location that will be redirected. The setup in that position, which ranges from 1 through 10, will now refer to the Factory setup when recalled.

Example
*SDS 2
This command changes setup slot 2 to reference the factory setup.
DELEte:SETUp

Description
This command (no query form) changes the setup to reference the factory setup instead of the specific user setup slot. The content of the setup slot is unchanged but the data will no longer be accessible to you. This command is equivalent to selecting Instrument Setup from the File menu, choosing the Delete tab and then clicking the Delete button.

Note: The setup information cannot be recovered once it has been deleted.

Group
Save and Recall

Related Commands
*RCL? (see page 303), RECall:SETUp (see page 309), *RST (see page 325), *SAV (see page 304), SAVe:SETUp (see page 311), *SDS (see page 305)

Syntax
DELEte:SETUp {ALL|<NR1>}

Arguments
• ALL
  This specifies to delete all the stored setups.

• <NR1>
  This specifies a setup storage location to delete. Setup storage location values range from 1 through 10; Using an out-of-range value causes an error.

Example
DELEte:SETUp ALL
This command removes all stored setups. All ten storage locations are initialized to the factory default setup.
DELEte:WAVEform

Description
This command (no query form) deletes one or all stored reference waveforms from memory. This command is equivalent to selecting Reference Waveforms from the File menu and choosing Reference Setup from the drop-down list (when deleting individual reference waveforms) or selecting Delete All Refs from the File menu (when deleting all reference waveforms).

Group
Save and Recall

Related Commands
RECALL:WAVEform (see page 310), Save:WAVEform (see page 312)

Syntax
DELEte:WAVEform {ALL|REF<x>}

Arguments
• ALL
  This specifies to delete all the stored reference waveforms.
• REF<x>
  This specifies to delete one of the reference memory locations. Reference memory location values range from 1 through 4.

Example 1
DELEte:WAVEform ALL
This command removes all waveforms stored in reference memory.

Example 2
DELEte:WAVEform REF2
This command removes the waveform stored at REF2.
FACtory

Description
This command (no query form) resets the oscilloscope to factory default settings. This command is equivalent to pressing the DEFAULT SETUP button located on the front panel.

Group
Save and Recall

Related Commands
*PSC (see page 323), *RCL? (see page 303), RECall:SETUp (see page 309), *RST (see page 325), *SAV (see page 304), SAVe:SETUp (see page 311)

Syntax
FACtory

Arguments
None

Example
FACtory
This command resets the oscilloscope settings to factory defaults:

- Clears the Event Status Enable Register.
- Clears the Service request Enable Register.
- Sets the Device Event Status Enable Register to 2555.
- Sets the Power On Status Clear Flag to TRUE
- Purges all defined aliases.
- Enables all Command Headers.
- Sets the macro defined by "DDT to a "zero-length field."
- Clears the pending operation flag and associated operations.

This command does not reset the following:

- The state of the GPIB (IEEE Std 488.1-1987) interface.
- The selected GPIB address.
- Calibration data that affects device specifications.
- Protected user data.
- Stored settings.
- The current password (if implemented).
RECALL:SETUp

Description
This command (no query form) restores a stored or factory front-panel setup of the oscilloscope from a copy of the settings stored in memory. If 'factory' is referenced (by specifying '0'), the factory default values will be restored. This command is equivalent to *RCL and performs the same function as selecting Instrument Setup from the File menu and then choosing the Recall Setups tab.

Group
Save and Recall

Related Commands
FACTory (see page 306), *RCL (see page 303), *RST (see page 325), *SAV (see page 304), SAVE:SETUp (see page 311)

Syntax
RECALL:SETUp {FACTory|<NR1>|<file path>}

Arguments
• FACTory
  This specifies to restore the factory setup.

• <NR1>
  This specifies a setup storage location to restore. Setup storage location values range from 0 through 10; Using an out of range value causes an error (222, "Data out of range").

• <file path>
  This is the location from where the setup will be recalled.
  <file path> is a quoted string that defines the file name and path. Input the file path using the form <drive>/<dir>/<filename>. <drive> and one or more <dir>es are optional. If you do not specify them, the instrument will read the file from the default directory. <filename> stands for a filename of up to 128 characters (use of wildcard characters in filenames is not supported). Filename extensions are not required but are highly recommended.

Example 1
RECALL:SETUp FACTory
This command recalls (and makes current) the front-panel setup to its factory defaults.

Example 2
RECALL:SETUp 2
This command recalls the front panel setup from setup 2.

Example 3
RECALL:SETUp "TEK00000.SET"
This command recalls the front panel setup from the file TEK00000.SET in the default directory and on the default drive.
RECALL:WAVEform

Description
This command (no query form) recalls a stored waveform to a reference location. This command is equivalent to selecting Reference Waveforms from the File menu and then choosing Recall Wfm.

Group
Save and Recall

Related Commands
DELETE:WAVEform (see page 307), SAVE:WAVEform (see page 312)

Syntax
RECALL:WAVEform {<file path>|REF<x>}

Arguments
- REF<x>
  This specifies the location in internal reference memory from where the waveform is recalled. Reference memory location values range from 1 through 4.

- <file path>
  This is the location from where the waveform will be recalled.
  <file path> is a quoted string that defines the file name and path. Input the file path using the form <drive>/<dir>/<filename>. <drive> and one or more <dir>s are optional. If you do not specify them, the instrument will read the waveform from the default directory. <filename> stands for a filename of up to 128 characters (use of wildcard characters in filenames is not supported). Filename extensions are not required but are highly recommended.

Example
RECALL:WAVEform "TEK00000.WFM",REF1

This command recalls the waveform stored in the file named TEK00000.WFM to reference location 1.
SAVe:SETUp

Description
This command (no query form) saves the current front-panel setup into the specified memory location or file. This is equivalent to selecting Instrument Setup from the File menu and then choosing the Save Setups tab.

Group
Save and Recall

Related Commands
*RCL (see page 303), RECAll:SETUp (see page 309), *SAV (see page 304)

Syntax
SAVe:SETUp {<file path>|<NR1>}

Arguments
• <file path>
  This is the location from where the waveform will be recalled.
  <file path> is a quoted string that defines the file name and path. Input the file path using the form <drive>/<dir>/<filename>. <drive> and one or more <dir>s are optional. If you do not specify them, the instrument will read the waveform from the default directory. <filename> stands for a filename of up to 125 characters, followed by a period (".") and the three-character extension "SET". The oscilloscope will generate an error if you use any other extension for saving a setup.

• <NR1>
  This specifies a location for saving the current front-panel setup. The front-panel setup value ranges from 1 to 10. Using an out-of-range value causes an execution error. Any settings that have been stored previously at this location will be overwritten.

Example 1
SAVe:SETUp 5
This command saves the current front-panel setup in memory location 5.

Example 2
SAVe:SETUp "TEK00000.SET"
This command saves the current front-panel setup in the file TEK00000.SET in the default directory and on the default drive.
SAVe:WAVEform

Description
This command (no query form) saves a waveform to one of four reference memory locations or a mass storage file. This command is equivalent to selecting Reference Waveforms from the File menu and then choosing Save Wfm from the drop-down list.

Group
Save and Recall

Related Commands
DELEte:WAVEform (see page 307), RECALL:WAVEform (see page 310)

Syntax
SAVe:WAVEform <wfm>,{<file path>|REF<x>}

Arguments
• <wfm>
  This is the waveform that will be saved. Valid waveforms include CH<x>, MATH<y>, and REF<x>.
• REF<x>
  This specifies the location in internal reference memory to where the waveform is stored.
• <file path>
  This is the location to where the waveform is stored.
  <file path> is a quoted string that defines the file name and path. Input the file path using the form <drive>/<dir>/<filename>. <drive> and one or more <dir>s are optional. If you do not specify them, the instrument will read the waveform from the default directory. <filename> stands for a filename of up to 125 characters, followed by a period (".") and the three-character extension. Internal format waveforms use the .wfm extension for spreadsheet format files or the .dat extension for MathCad format files. The oscilloscope will generate an error if you use any other extension for saving a waveform.

Example 1
SAVe:WAVEform MATH2,REF1
This command saves the Math2 waveform in reference memory location2.

Example 2
SAVe:WAVEform MATH1,"TEK0000.WFM"
This command saves the Math1 waveform to the file TEK0000.WFM in the default directory and on the default drive.
**SAVe:WAVEform:FILEFormat**

**Description**
This command specifies or returns the file format for saved waveforms. Waveform header and timing information is included in the resulting file of non-internal formats. The instrument saves DPO waveforms as a 500x200 matrix, with the first row corresponding to the most recently acquired data. The values specified by **DATa:STARt** and **DATa:STOP** determine the range of waveform data to output. In the event that **DATa:STOP** value is greater than the current record length, the current record length determines the value output.

This command is equivalent to selecting Export Setup from the File menu, clicking the Waveforms tab and then choosing the desired waveform file format from the Data destination drop-down list. Note that you choose the waveform file format after first selecting Select for Export from the File menu and then choosing Waveform (data) from the resulting drop-down list.

**Group**
Save and Recall

**Related Commands**
**DATa:STARt** (see page 473), **DATa:STOP** (see page 474)

**Syntax 1**
```
SAVe:WAVEform:FILEFormat {INTERNal|MATHCad|MATLab|SPREADSHEETCsv|SPREADSHEETTxt}
```

**Syntax 2**
```
SAVe:WAVEform:FILEFormat?
```

**Arguments**
- **INTERNal**
  This specifies that waveforms are saved in internal format, using a .wfm filename extension. These files can be recalled as reference waveforms.

- **MATHCad**
  This specifies that waveforms are saved in MathCad format, using a .dat filename extension. When saving in this format, waveform values are delimited with new lines. MathCad format enables easy import of waveform data into MathCad or Matlab.

  For FastAcq waveforms, data is imported as a matrix. For these formats, waveform header and timing information is saved in a separate file. MathCad format header files use a _hdr.dat extension.

- **MATLab**
  This specifies that waveforms are saved in Matlab format, using a .dat filename extension. When saving in this format, waveform values are delimited with new lines. Matlab format enables easy import of waveform data into MathCad or Matlab.

  For FastAcq waveforms, data is imported as a matrix. For these formats, waveform header and timing information is saved in a separate file. Matlab format header files use a _hdr.dat extension.

- **SPREADSHEETCsv**
  This specifies that waveform data is saved in a format that contains comma delimited values. These waveform data files are named using the .csv filename extension. Saving waveforms in CSV format enables spreadsheet programs to import the data.

- **SPREADSHEETTxt**
  This specifies that waveform data is saved in a format that contains tab delimited values. These waveform data files are named using the .txt filename extension. Saving waveforms in this format enables spreadsheet programs to import the data.

**Example 1**
```
SAVe:WAVEform:FILEFormat INTERNal
```
This command specifies that the internal file format is the format used for saving waveforms.

**Example 2**
```
SAVe:WAVEform:FILEFormat?
```
This query might return: `SAVE:WAVEFORM:FILEFORMAT INTERNAL`, indicating that waveforms are saved using the internal format.
SETUp:NAME

Description
This command sets and queries a Setup Label that you define. This command is equivalent to selecting Instrument Setup from the File menu, choosing the Save Setups tab and then adding a meaningful label to the selected setup.

Group
Save and Recall

Related Commands
SAVE:SETUp (see page 311)

Syntax 1
SETUp:NAME <NR1>,<QString>

Syntax 2
SETUp:NAME? <NR1>

Arguments
•  <NR1>
  This specifies a location in which the Setup Label is stored. Location values range from 1 through 10.

•  <QString>
  This is a string containing the Setup Label.

Example 1
SETUp:NAME 1 "My Setup"
This command changes the Setup Label for internal setup slot 1 to "My Setup".

Example 2
SETUp:NAME? 2
This query might return :SETUP:NAME 2,"My Setup", indicating the Setup Label that you defined for internal setup slot 2.
Status and Error Command Group

Status and Error Overview

You use the commands in the Status and Error command Group to determine the status of the oscilloscope and control events.

Several commands and queries used with the oscilloscope are common to all devices on the GPIB bus. The IEEE Std 488.2–1987 defines these commands and queries. The common commands begin with an asterisk (*) character.
### Status and Error Commands

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<th>Description</th>
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</tr>
<tr>
<td>*ESE?</td>
<td>Returns the bits in the Event Status Enable Register</td>
</tr>
<tr>
<td>*ESE</td>
<td>Sets the bits in the Event Status Enable Register</td>
</tr>
<tr>
<td>*ESR?</td>
<td>Returns the contents of the Standard Event Status Register</td>
</tr>
<tr>
<td>*OPC?</td>
<td>Returns &quot;1&quot; when all current operations are finished</td>
</tr>
<tr>
<td>*OPC</td>
<td>Generates the operation complete message in the standard event status register when all pending operations are finished</td>
</tr>
<tr>
<td>*OPT?</td>
<td>Returns a list of options installed in the oscilloscope</td>
</tr>
<tr>
<td>*PSC?</td>
<td>Returns the power on status flag setting</td>
</tr>
<tr>
<td>*PSC</td>
<td>Sets the power on status flag</td>
</tr>
<tr>
<td>*PUD?</td>
<td>Returns a string of protected user data</td>
</tr>
<tr>
<td>*PUD</td>
<td>Sets a string of protected user data</td>
</tr>
<tr>
<td>*RST</td>
<td>Resets the oscilloscope to factory default settings</td>
</tr>
<tr>
<td>*SRE?</td>
<td>Returns the bits in the Service Request Enable Register</td>
</tr>
<tr>
<td>*SRE</td>
<td>Sets the bits in the Service Request Enable Register</td>
</tr>
<tr>
<td>*STB?</td>
<td>Returns the contents of the Status Byte Register</td>
</tr>
<tr>
<td>*WAI</td>
<td>Prevents the oscilloscope from executing further commands until all pending operations finish</td>
</tr>
<tr>
<td>ALLEv?</td>
<td>Returns all events and their messages</td>
</tr>
<tr>
<td>BUSY?</td>
<td>Returns oscilloscope status</td>
</tr>
<tr>
<td>DESE?</td>
<td>Returns the bits in the Device Event Status Enable Register</td>
</tr>
<tr>
<td>DESE</td>
<td>Sets the bits in the Device Event Status Enable Register</td>
</tr>
<tr>
<td>EVENT?</td>
<td>Returns event code from the event queue</td>
</tr>
<tr>
<td>EVMsg?</td>
<td>Returns event code, message from the event queue</td>
</tr>
<tr>
<td>EVQty?</td>
<td>Returns number of events in the event queue</td>
</tr>
</tbody>
</table>
*CLS

Description
This command (no query form) clears the following:

- Event Queue
- Standard Event Status Register
- Status Byte Register (except the MAV bit)

If the *CLS command immediately follows an <EOI>, the Output Queue and MAV bit (Status Byte Register bit 4) are also cleared. MAV indicates that information is in the output queue. The device clear (DCL) GPIB control message will clear the output queue and thus MAV. *CLS does not clear the output queue or MAV.

*CLS can suppress a Service Request that is to be generated by an *OPC. This will happen if a single sequence acquisition operation is still being processed when the *CLS command is executed.

Group
Status and Error

Related Commands
DESE (see page 331), *ESE (see page 319), *ESR? (see page 320), EVENT? (see page 332), EVMsg? (see page 333), *SRE (see page 326), *STB? (see page 327)

Syntax
*CLS

Example
*CLS

This command clears the oscilloscope status data structures.
*ESE

Description
This command sets and queries the bits in the Event Status Enable Register (ESER). The ESER prevents events from being reported to the Status Byte Register (STB). For a more detailed discussion of the use of these registers, see Registers on page 522.

Group
Status and Error

Related Commands
*CLS (see page 318), DESE (see page 331), *ESR? (see page 320), EVENT? (see page 332), EVMsg? (see page 333), *SRE (see page 326), *STB? (see page 327)

Syntax 1
*ESE <NR1>

Syntax 2
*ESE?

Argument
• <NR1>
  This specifies the binary bits of the ESER according to this value, which ranges from 0 through 255.
  The power-on default for ESER is 0 if *PSC is 1. If *PSC is 0, the ESER maintains the previous power cycle value through the current power cycle.

Note: Setting the DESER and the ESER to the same values allows only those codes to be entered into the Event Queue and summarized on the ESB bit (bit 5) of the Status Byte Register. Use the DESE command to set the DESER.

Example 1
*ESE 209
This command sets the ESER to binary 11010001, which enables the PON, URQ, EXE and OPC bits.

Example 2
*ESE?
This query form of this command returns 186, showing that the ESER contains the binary value 10110010.
*ESR*

**Description**
This query-only command returns the contents of the Standard Event Status Register (SESR). *ESR? also clears the SESR (since reading the SESR clears it). For a more detailed discussion of the use of these registers, see Registers on page 522.

**Group**
Status and Error

**Related Commands**
ALLEv? (see page 329), *CLS (see page 318), DESE (see page 331), *ESE (see page 319), EVENT? (see page 332), EVMsg? (see page 333), *SRE (see page 326), *STB? (see page 327)

**Syntax**
*ESR?

**Example**
*ESR?

This query might return 213, showing that the SESR contains the binary value 11010101.
*OPC

Description
This command generates the operation complete message in the Standard Event Status Register (SESR) when all pending operations finish. The *OPC? query places the ASCII character “1” into the output queue when all pending operations are finished. The *OPC? response is not available to read until all pending operations finish. For a complete discussion of the use of these registers and the output queue, see Registers on page 522 and Queues on page 527.

The *OPC command allows you to synchronize the operation of the oscilloscope with your application program. For more information, see Synchronization Methods on page 542.

### Commands that Generate an OPC Message

<table>
<thead>
<tr>
<th>Operation</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single sequence acquisition</td>
<td>ACQuire:STATE ON or ACQuire:STATE RUN (when ACQuire:STOPAfter is set to SEQuence)</td>
</tr>
</tbody>
</table>

Group
Status and Error

Related Commands
BUSY? (see page 330), *WAI (see page 528)

Syntax 1
*OPC

Syntax 2
*OPC?

Example 1
*OPC

Upon completion of all pending operations, this command generates the operation complete message in the SESR.

Example 2
*OPC?

This query might return 1 to indicate that all pending operations are finished.
*OPT?

**Description**
This query-only command returns a list of the options installed in your oscilloscope.

**Group**
Status and Error

**Syntax**
*OPT?

**Example**
*OPT?

This query might return: 3M:16 Meg Max 4M/CH
*PSC

Description
This command sets and queries the power-on status flag that controls the automatic power-on handling of the DESER, SRER, and ESER registers. When *PSC is true, the DESER register is set to 255 and the SRER and ESER registers are set to 0 at power-on. When *PSC is false, the current values in the DESER, SRER, and ESER registers are preserved in nonvolatile memory when power is shut off and are restored at power-on.

Group
Status and Error

Related Commands
DESE (see page 331), *ESE (see page 319), FACTory (see page 308), *RST (see page 325), *SRE (see page 326)

Syntax 1
*PSC <NR1>

Syntax 2
*PSC?

Argument

• <NR1>
  A 0 sets the power-on status clear flag to false, disables the power-on clear and allows the oscilloscope to possibly assert SRQ after power-on; any other value sets the power-on status clear flag to true, enabling the power-on status clear and prevents any SRQ assertion after power on.

Example 1
*PSC 0
This command sets the power-on status clear flag to false.

Example 2
*PSC?
The query form of this command might return 1 to indicate that the power-on status clear flag is set to true.
*PUD

Description
This command sets or queries a string of Protected User Data. This data is protected by the PASSWord command. You can modify it only by first entering the correct password. This password is not necessary to query the data.

Group
Status and Error

Related Commands
PASSWord (see page 293)

Syntax 1
*PUD {<Block>|<String>}

Syntax 2
*PUD?

Argument
• <Block>
  This is a block containing up to 100 characters.

• <String>
  This is a string containing up to 100 characters.

Example 1
*PUD #229This oscilloscope belongs to me
This command stores the string "This oscilloscope belongs to me" in the user protected data area.

Example 2
*PUD?
This query might return #221Property of Company X
**Description**

This command (no query form) resets the oscilloscope to the factory default settings. The *RST command does not alter the following:

- The state of the IEEE Std 488.1-1987 interface
- The selected IEEE Std 488.1-1987 address of the oscilloscope
- Calibration data that affect device specifications
- The Output Queue
- The Service Request Enable Register setting
- The Power-on status clear flag setting
- Alias definitions
- Stored settings
- The *PUD? Response

This command is equivalent to pressing the **DEFAULT SETUP** button on the front-panel.

**Group**

Status and Error

**Related Commands**

FACTory (see page 308), RECALL:SETUp (see page 309), SAVe:SETUp (see page 311)

**Syntax**

*RST

**Argument**

None.

**Example**

*RST

This command resets the oscilloscope settings to factory defaults.
*SRE

Description
The *SRE (Service Request Enable) command sets and queries the bits in the Service Request Enable Register. For more information, refer to Registers on page 522.

Group
Status and Error

Related Commands
*CLS (see page 318), DESE (see page 331), *ESE (see page 319), *ESR? (see page 320), EVENT? (see page 332), EVMSg? (see page 333), FACtory (see page 308), *STB? (see page 327)

Syntax 1
*SRE <NR1>

Syntax 2
*SRE?

Argument
• <NR1>
  This is a value in the range from 0 through 255. The binary bits of the SRER are set according to this value. Using an out-of-range value causes an execution error. The power-on default for SRER is 0 if *PSC is 1. If *PSC is 0, the SRER maintains the previous power cycle value throughout the current power cycle.

Example 1
*SRE 48
This command sets the bits in the SRER to 00110000 binary.

Example 2
*SRE?
This query might return 32, showing that the bits in the SRER have the binary value of 00100000.
*STB*

**Description**
The *STB?* (Read Status Byte) query returns the contents of the Status Byte Register (SBR) using the Master Summary Status (MSS) bit. For more information, refer to Registers on page 522.

**Group**
Status and Error

**Related Commands**
CLS (see page 318), DESE (see page 331), *ESE (see page 319), *ESR? (see page 320), EVENT? (see page 332), EVMSg? (see page 333), FACTory (see page 308), *SRE? (see page 326)

**Syntax**
*STB?

**Returns**
<NR1>

**Example**
*STB?

This query might return 96, showing that the SBR contains the binary value 01100000.
*WAI

Description
The *WAI (Wait) command (no query form) prevents the oscilloscope from executing further commands or queries until all pending operations finish. This command allows you to synchronize the operation of the oscilloscope with your application program. For more information, refer to Synchronization Methods on page 542.

Group
Status and Error

Related Commands
BUSY? (see page 330), *OPC (see page 321)

Syntax
*WAI

Example
*WAI

This command prevents the oscilloscope from executing any further commands or queries until all pending operations finish.
**ALLEV?**

**Description**
This query-only command prompts the oscilloscope to return all events and their messages (delimited by commas), and removes the returned events from the Event Queue. Use the *ESR? query to enable the events to be returned. This command is similar to repeatedly sending *EVMsg? queries to the oscilloscope.

**Group**
Status and Error

**Related Commands**
*ESR? (see page 320), *EVMsg? (see page 333)

**Syntax**
ALLev?

**Example**
ALLev?

This query might return: ALLEV 2225,"Measurement error, No waveform to measure; "420,"Query UNTERMINATED;"
BUSY?

Description
This query-only command returns the status of the oscilloscope. This command allows you to synchronize the operation of the oscilloscope with your application program.

Group
Status and Error

Related Commands
*OPC (see page 321), *WAI (see page 328)

Syntax
BUSY?

Returns
<NR1>
If 0 is returned, it means that the oscilloscope is not busy processing a command whose execution time is extensive. If 1 is returned, it means that the oscilloscope is busy processing one of the commands listed in the table below.

<table>
<thead>
<tr>
<th>Commands that Affect BUSY? Response</th>
<th>Operation</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single sequence acquisition</td>
<td>ACQuire:STATE ON or ACQuire:STATE RUN (when ACQuire:STOPAfter is set to SEQuence)</td>
<td></td>
</tr>
</tbody>
</table>

Example

BUSY?
This query might return :BUSY 1, indicating that the oscilloscope is currently busy.
DESE

Description
This command sets and queries the bits in the Device Event Status Enable Register (DESER). The DESER is the mask that determines whether events are reported to the Standard Event Status Register (SESR), and entered into the Event Queue. For a more detailed discussion of the use of these registers, see Registers on page 522.

Group
Status and Error

Related Commands
*CLS (see page 318), *ESE (see page 319), *ESR? (see page 320), *EVENT? (see page 332), EVMsg? (see page 333), *SRE (see page 326), *STB? (see page 327)

Syntax 1
DESE <NR1>

Syntax 2
DESE?

Argument
• <NR1>

The binary bits of the DESER are set according to this value, which ranges from 1 through 255. For example, DESE 209 sets the DESER to the binary value 11010001 (that is, the most significant bit in the register is set to 1, the next most significant bit to 1, the next bit to 0, etc.).

The power-on default for DESER is all bits set if *PSC is 1. If *PSC is 0, the DESER maintains the previous power cycle value through the current power cycle.

Note: Setting the DESER and ESER to the same value allows only those codes to be entered into the Event Queue and summarized on the ESB bit (bit 5) of the Status Byte Register. Use the *ESE command to set the ESER.

Example 1
DESE 209

This sets the DESER to binary 11010001, which enables the PON, URQ, EXE and OPC bits.

Example 2
DESE?

This query might return :DESE 186, showing that the DESER contains the binary value 10111010.
EVENT?

Description
This query-only command returns an event code from the Event Queue that provides information about the results of the last *ESR? read. EVENT? also removes the returned value from the Event Queue.

Group
Status and Error
Related Commands
ALLEv? (see page 329), *CLS (see page 318), DESE (see page 331), *ESE (see page 319), *ESR? (see page ), EVMsg? (see page 333), *SRE (see page 326), *STB? (see page 327)

Syntax
EVENT?

Example
EVENT?

This query might return :EVENT 110, showing that there was an error in a command header.
**EVMsg?**

**Description**
This query-only command removes a single event code from the Event Queue that is associated with the results of the last *ESR?* read and returns the event code along with an explanatory message. For more information, see Event Handling on page 530.

**Group**
Status and Error

**Related Commands**
ALLEv? (see page 329), *CLS (see page 318), DESE (see page 331), *ESE (see page 319), *ESR? (see page ), EVENT? (see page 332), *SER (see page 326), *STB? (see page 327)

**Syntax**
EVMsg?

**Returns**
The event code and message in the following format:

```
<Event Code><Comma><Qstring>[<Event Code><Comma><Qstring>…]
<Qstring>::= <Message>;<[<Command>]
```

where `<Command>` is the command that caused the error and may be returned when a command error is detected by the oscilloscope. As much of the command will be returned as possible without exceeding the 60 character limit of the `<Message>` and `<Command>` string combined. The command string is right-justified.

**Example**
EVMsg?

This query might return :EVMSG 110, "Command header error"
**EVQty?**

**Description**
This query-only command returns the number of event codes that are in the Event Queue. This is useful when using the ALLEv? query, since it lets you know exactly how many events will be returned.

**Group**
Status and Error

**Related Commands**
ALLEv? (see page 329), EVENT? (see page 332), EVMsg? (see page 333)

**Syntax**
EVQty?

**Example**
EVQty?
This query might return :EVQTY 3, indicating the number of event codes in the Event Queue.
Trigger Command Group

Trigger Overview

You use the commands in the Trigger Command Group to control all aspects of triggering for the oscilloscope.

There are two triggers: A and B. Where appropriate, the command set has parallel constructions for each trigger.

You can set the A or B triggers to edge mode. Edge triggering lets you display a waveform at or near the point where the signal passes through a voltage level of your choosing.

You can also set A triggers to pulse and logic modes. Pulse triggering lets the oscilloscope trigger whenever it detects a pulse of a certain width or height. Logic triggering lets you logically combine the signals on one or more channels. The oscilloscope then triggers when it detects a certain combination of signal levels.
### Trigger Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRIGger?</td>
<td>Returns current trigger parameters for the oscilloscope</td>
</tr>
<tr>
<td>TRIGger</td>
<td>Forces a trigger event to occur</td>
</tr>
<tr>
<td>TRIGger:A?</td>
<td>Returns current A trigger parameters</td>
</tr>
<tr>
<td>TRIGger:A</td>
<td>Sets A trigger level to 50%</td>
</tr>
<tr>
<td>TRIGger:A:EDGE?</td>
<td>Returns the source, coupling and source for the A edge trigger</td>
</tr>
<tr>
<td>TRIGger:A:EDGE:COUPling?</td>
<td>Returns the type of coupling for the A edge trigger</td>
</tr>
<tr>
<td>TRIGger:A:EDGE:COUPling</td>
<td>Sets the type of coupling for the A edge trigger</td>
</tr>
<tr>
<td>TRIGger:A:EDGE:SLOpe?</td>
<td>Returns the slope for the A edge trigger</td>
</tr>
<tr>
<td>TRIGger:A:EDGE:SLOpe</td>
<td>Sets the slope for the A edge trigger</td>
</tr>
<tr>
<td>TRIGger:A:EDGE:SOUrce?</td>
<td>Returns the source for the A edge trigger</td>
</tr>
<tr>
<td>TRIGger:A:EDGE:SOUrce</td>
<td>Sets the source for the A edge trigger</td>
</tr>
<tr>
<td>TRIGger:A:HOLDoff?</td>
<td>Returns the A trigger holdoff parameters</td>
</tr>
<tr>
<td>TRIGger:A:HOLDoff:ACTUal?</td>
<td>Returns the holdoff time actually used by the A trigger</td>
</tr>
<tr>
<td>TRIGger:A:HOLDoff:BY?</td>
<td>Returns the type of holdoff for the A trigger</td>
</tr>
<tr>
<td>TRIGger:A:HOLDoff:BY</td>
<td>Sets the type of holdoff for the A trigger</td>
</tr>
<tr>
<td>TRIGger:A:HOLDoff:TIMe?</td>
<td>Returns the A trigger holdoff time</td>
</tr>
<tr>
<td>TRIGger:A:HOLDoff:TIMe</td>
<td>Sets the A trigger holdoff time</td>
</tr>
<tr>
<td>TRIGger:A:LEVel?</td>
<td>Returns the level for the A trigger</td>
</tr>
<tr>
<td>TRIGger:A:LEVel</td>
<td>Sets the level for the A trigger</td>
</tr>
<tr>
<td>TRIGger:A:LOGIc?</td>
<td>Returns all of the A trigger logic parameters</td>
</tr>
<tr>
<td>TRIGger:A:LOGIc:CLAss?</td>
<td>Returns the type of A trigger logic</td>
</tr>
<tr>
<td>TRIGger:A:LOGIc:CLAss</td>
<td>Sets the type of A trigger logic</td>
</tr>
<tr>
<td>TRIGger:A:LOGIc:FUNCtion?</td>
<td>Returns the logical combination of the input</td>
</tr>
<tr>
<td>Command</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>TRIGger:A:LOGic:FUNCTION</td>
<td>Sets the logical combination of the input channels for the A logic trigger</td>
</tr>
<tr>
<td>TRIGger:A:LOGic:INPUT:CH&lt;x&gt;?</td>
<td>Returns the input settings for the specified logic trigger channel</td>
</tr>
<tr>
<td>TRIGger:A:LOGic:INPUT:CH&lt;x&gt;</td>
<td>Specifies the input settings for the specified logic trigger channel</td>
</tr>
<tr>
<td>TRIGger:A:LOGic:INPUT:CH4?</td>
<td>Returns the A logic trigger input for channel 4</td>
</tr>
<tr>
<td>TRIGger:A:LOGic:INPUT:CH4</td>
<td>Sets the A logic trigger input for channel 4</td>
</tr>
<tr>
<td>TRIGger:A:LOGic:INPUT?</td>
<td>Returns the condition for generating the A logic pattern trigger</td>
</tr>
<tr>
<td>TRIGger:A:LOGic:INPUT:WHen?</td>
<td>Sets the condition for generating the A logic pattern trigger</td>
</tr>
<tr>
<td>TRIGger:A:LOGic:INPUT:WHen</td>
<td>Sets the condition for generating the A logic pattern trigger</td>
</tr>
<tr>
<td>TRIGger:A:LOGic:INPUT:WHen:LESsLimit?</td>
<td>Returns the maximum time that the selected pattern may be true and still generate an A logic pattern trigger</td>
</tr>
<tr>
<td>TRIGger:A:LOGic:INPUT:WHen:LESSLimit</td>
<td>Sets the maximum time that the selected pattern may be true and still generate an A logic pattern trigger</td>
</tr>
<tr>
<td>TRIGger:A:LOGic:INPUT:WHen:MORELimit?</td>
<td>Returns the minimum time that the selected pattern may be true and still generate an A logic pattern trigger</td>
</tr>
<tr>
<td>TRIGger:A:LOGic:INPUT:WHen:MORELimit</td>
<td>Sets the minimum time that the selected pattern may be true and still generate an A logic pattern trigger</td>
</tr>
<tr>
<td>TRIGger:A:LOGic:SETHold?</td>
<td>Returns clock edge polarity, voltage threshold and source; data voltage threshold and source; and setup/hold times for violation triggering</td>
</tr>
<tr>
<td>TRIGger:A:LOGic:SETHold:CLOCk?</td>
<td>Returns clock edge polarity, voltage threshold and source input for setup/hold triggering</td>
</tr>
<tr>
<td>TRIGger:A:LOGic:SETHold:CLOCk:EDGE?</td>
<td>Returns the clock edge polarity for setup and hold triggering</td>
</tr>
<tr>
<td>TRIGger:A:LOGic:SETHold:CLOCk:EDGE</td>
<td>Sets the clock edge polarity</td>
</tr>
<tr>
<td>Command</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>TRIGger:A:LOGic:SETHold:CLOCK:SOUrce?</td>
<td>Returns the clock source for the A logic trigger setup and hold input</td>
</tr>
<tr>
<td>TRIGger:A:LOGic:SETHold:CLOCK:SOUrce</td>
<td>Sets the clock source for the A logic trigger setup and hold input</td>
</tr>
<tr>
<td>TRIGger:A:LOGic:SETHold:CLOCK:THReshold?</td>
<td>Returns the clock voltage threshold for setup and hold trigger</td>
</tr>
<tr>
<td>TRIGger:A:LOGic:SETHold:CLOCK:THReshold</td>
<td>Sets the clock voltage threshold for setup and hold trigger</td>
</tr>
<tr>
<td>TRIGger:A:LOGic:SETHold:DATa?</td>
<td>Returns the voltage threshold and data source for the setup/hold trigger</td>
</tr>
<tr>
<td>TRIGger:A:LOGic:SETHold:DATa:SOUrce?</td>
<td>Returns the data source for the setup and hold trigger</td>
</tr>
<tr>
<td>TRIGger:A:LOGic:SETHold:DATa:SOUrce</td>
<td>Sets the data source for the setup and hold trigger</td>
</tr>
<tr>
<td>TRIGger:A:LOGic:SETHold:DATa:THReshold?</td>
<td>Returns the data voltage threshold for setup and hold trigger</td>
</tr>
<tr>
<td>TRIGger:A:LOGic:SETHold:DATa:THReshold</td>
<td>Sets the data voltage threshold for setup and hold trigger</td>
</tr>
<tr>
<td>TRIGger:A:LOGic:SETHold:HOLDTime?</td>
<td>Returns the hold time for the setup and hold violation triggering</td>
</tr>
<tr>
<td>TRIGger:A:LOGic:SETHold:HOLDTime</td>
<td>Sets the hold time for the setup and hold violation triggering</td>
</tr>
<tr>
<td>TRIGger:A:LOGic:SETHold:SETTime?</td>
<td>Returns the setup time for setup and hold violation triggering</td>
</tr>
<tr>
<td>TRIGger:A:LOGic:SETHold:SETTime</td>
<td>Sets the setup time for setup and hold violation triggering</td>
</tr>
<tr>
<td>TRIGger:A:LOGic:STATE?</td>
<td>Returns the data input and trigger criteria for the A logic trigger</td>
</tr>
<tr>
<td>TRIGger:A:LOGic:STATE:INPut:CH4?</td>
<td>Returns the slope for channel 4 of the A logic state trigger</td>
</tr>
<tr>
<td>TRIGger:A:LOGic:STATE:INPut:CH4</td>
<td>Sets the slope for channel 4 of the A logic state trigger</td>
</tr>
<tr>
<td>TRIGger:A:LOGic:STATE:WHEn?</td>
<td>Returns the condition for generating an A logic state trigger</td>
</tr>
<tr>
<td>TRIGger:A:LOGic:STATE:WHEn</td>
<td>Sets the condition for generating an A logic state trigger</td>
</tr>
<tr>
<td>TRIGger:A:LOGic:THReshold?</td>
<td>Returns the threshold voltage for all channels in A logic trigger</td>
</tr>
</tbody>
</table>
TRIGger:A:LOGic:THReshold:CH<x>?
Returns the A logic trigger threshold voltage for the specified channel.

TRIGger:A:LOGic:THReshold:CH<x>
Sets the A logic trigger threshold voltage for the specified channel.

TRIGger:A:MODe?
Returns the A trigger mode.

TRIGger:A:MODe
Sets the A trigger mode.

TRIGger:A:PULse?
Returns the A pulse trigger parameters.

TRIGger:A:PULse:CLAss?
Returns the type of pulse on which to trigger.

TRIGger:A:PULse:CLAss
Sets the type of pulse on which to trigger.

TRIGger:A:PULse:GLItch?
Returns the current A glitch pulse trigger parameters.

TRIGger:A:PULse:GLItch:POLarity?
Returns the polarity for the A pulse glitch trigger.

TRIGger:A:PULse:GLItch:POLarity
Sets the polarity for the A pulse glitch trigger.

TRIGger:A:PULse:GLItch:TRIGIF?
Returns the acceptance or rejection of pulse glitch trigger, based on width.

TRIGger:A:PULse:GLItch:TRIGIF
Sets the acceptance or rejection of pulse glitch trigger, based on width.

TRIGger:A:PULse:GLItch:WIDth?
Returns the width for the A pulse glitch trigger.

TRIGger:A:PULse:GLItch:WIDth
Sets the width of the A pulse glitch trigger.

TRIGger:A:PULse:RUNT?
Returns the current A runt pulse trigger parameters.

TRIGger:A:PULse:RUNT:POLarity?
Returns the polarity for the A pulse runt trigger.

TRIGger:A:PULse:RUNT:POLarity
Sets the polarity for the A pulse runt trigger.

TRIGger:A:PULse:RUNT:THReshold?
Returns the upper and lower thresholds for the A pulse runt trigger.

TRIGger:A:PULse:RUNT:THReshold:BOTh
Sets the upper and lower switching thresholds for the A pulse runt trigger.

TRIGger:A:PULse:RUNT:THReshold:HIGH?
Returns the upper limit for the A pulse runt trigger.

TRIGger:A:PULse:RUNT:THReshold:HIGH
Sets the upper limit for the A pulse runt trigger.

TRIGger:A:PULse:RUNT:THReshold:LOW?
Returns the lower limit for the A pulse runt trigger.

TRIGger:A:PULse:RUNT:THReshold:LOW
Sets the lower limit for the A pulse runt trigger.

TRIGger:A:PULse:RUNT:WHEn?
Returns the type of pulse.
width the trigger checks for when it uncovers a runt

TRIGger:A:PULse:RUNT:WHEn
Sets the type of pulse width the trigger checks for when it uncovers a runt

TRIGger:A:PULse:RUNT:WIDth?
Returns the minimum width for a pulse runt trigger

TRIGger:A:PULse:RUNT:WIDth
Sets the minimum width for a pulse runt trigger

TRIGger:A:PULse:SOURce?
Returns the source for the pulse trigger

TRIGger:A:PULse:SOURce
Sets the source for the pulse trigger

TRIGger:A:PULse:TIMEOut?
Returns the parameters for the pulse timeout trigger

TRIGger:A:PULse:TIMEOut:POLarity?
Returns the polarity for the pulse timeout trigger

TRIGger:A:PULse:TIMEOut:POLarity
Sets the polarity for the pulse timeout trigger

TRIGger:A:PULse:TIMEOut:TIMe?
Returns the pulse timeout trigger time

TRIGger:A:PULse:TIMEOut:TIMe
Sets the pulse timeout trigger time

TRIGger:A:PULse:TRANsition?
Returns the delta time, polarity, and both upper and lower threshold limits for the transition time trigger

TRIGger:A:PULse:TRANsition:DeltaTime?
Returns the delta time used in calculating the transition value

TRIGger:A:PULse:TRANsition:DeltaTime
Sets the delta time used in calculating the transition value

TRIGger:A:PULse:TRANsition:POLarity?
Returns the polarity for the pulse transition trigger

TRIGger:A:PULse:TRANsition:POLarity
Sets the polarity for the pulse transition trigger

TRIGger:A:PULse:TRANsition:THReshold?
Returns the upper and lower threshold limits for the transition time trigger

TRIGger:A:PULse:TRANsition:THReshold:BOTh
Sets the upper and lower thresholds for the pulse transition trigger

TRIGger:A:PULse:TRANsition:THReshold:HIGH?
Returns the upper transition trigger threshold

TRIGger:A:PULse:TRANsition:THReshold:HIGH
Sets the upper transition trigger threshold

TRIGger:A:PULse:TRANsition:THReshold:LOW?
Returns the lower transition trigger threshold

TRIGger:A:PULse:TRANsition:THReshold:LOW
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TRIGger

Description
This command forces a trigger event to occur and the query returns current trigger parameters for the oscilloscope.

Group
Trigger

Syntax 1
TRIGger FORCe

Syntax 2
TRIGger?

Argument
• FORCe

This creates a trigger event. If TRIGger:STATE is set to READy, the acquisition will complete. Otherwise, this command will be ignored. This is equivalent to selecting A Event (Main) Trigger Setup from the Trig menu and then clicking Force Trigger.

Example 1
TRIGger FORCe
This command forces a trigger event to occur.

Example 2
TRIGger?
This query might return:

:TRIGGER:A:MODE AUTO;TYPE EDGE;
LEVEL 0.0000;HOLDOFF:BY DEFAULT;TIME 250.0000E-9;
:TRIGGER:A:EDGE:SOURCE CH1;COUPLING DC;SLOPE RISE;
:TRIGGER:A:LOGIC:CLASS PATTERN;FUNCTION AND;WHEN TRUE;
:THRESHOLD:CH1 1.4000;CH2 1.4000;CH3 1.4000;CH4 1.4000;

:TRIGGER:B:STATE 0;TYPE EDGE;LEVEL 0.0000;BY EVENTS;
:EDGE:SOURCE CH1;SLOPE RISE;COUPLING DC;

:TRIGGER:B:

TIME 16.0000E-9;EVENTS:COUNT 2
TRIgger:A

Description
This command sets the A trigger level automatically to 50% of the minimum/maximum value of the trigger input signal. The query returns current A trigger parameters. TRIgger:A? is a composite of TRIgger:A:EDGE?, TRIgger:A:LOGIc?, and TRIgger:A:PULSE? The trigger level is the voltage threshold through which the trigger source signal must pass to generate a trigger event. This command is equivalent to pushing the LEVEL knob on the front-panel.

Group
Trigger

Related Commands

Syntax 1
TRIgger:A SETLevel

Syntax 2
TRIgger:A?

Argument
• SETLevel
  This sets the A trigger level to 50% of minimum and maximum.

Example 1
TRIgger:A SETLevel

This command sets the A trigger level to 50% of minimum and maximum.

Example 2
TRIgger:A?

This query might return:

;TRIGGER:A:MODE AUTO;TYPE EDGE
;LEVEL 0.0000;HOLDOFF:BY DEFAULT;TIME 250.0000E-9;
;TRIGGER:A:EDGE:SOURCE CH1;COUPLING DC;SLOPE RISE;
;TRIGGER:A:LOGIC:CLASS PATTERN;FUNCTION AND;WHEN TRUE
;THRESHOLD:CH1 1.4000;CH2 1.4000
;CH3 1.4000;CH4 1.4000;:TRIGGER:A:LOGIC:INPUT:CH1 HIGH
;CH2 X;CH3 X;:TRIGGER:A:LOGIC:PATTERN:INPUT:CH4 X;
;TRIGGER:A:LOGIC:INPUT:CH1 HIGH;CH2 X;CH3 X;
;TRIGGER:A:LOGIC:PATTERN:WHEN TRUE;WHEN LESS LIMIT
5.0000E-9;MORE LIMIT 5.0000E-9;:TRIGGER:A:LOGIC:SETHOLD
:CLOCK:EDGE RISE;THRESHOLD 1.4000;SOURCE CH2;:TRIGGER
:A:LOGIC:SETHOLD:DATA:THRESHOLD 1.4000;SOURCE CH1;
;TRIGGER:A:LOGIC:SETHOLD:HOLDTIME 2.0000E-9;SETTIME
3.0000E-9;:TRIGGER:A:LOGIC:STATE:INPUT:CH4 RISE;
GLITCH;SOURCE CH1;GLITCH:WIDTH 2.0000E-9;TRIGIF ACCEPT
;POLARITY POSITIVE;:TRIGGER:A:PULSE:RUNT:POLARITY
 POSITIVE;THRESHOLD:HIGH 1.2000;LOW 800.0000E-3;:TRIGGER
:A:PULSE:RUNT:WHEN OCCURS;WIDTH 2.0000E-9;:TRIGGER:A
;PULSE:TRANSITION:DELTATIME 2.0000E-9;POLARITY POSITIVE
;THRESHOLD:HIGH 1.2000;LOW 800.0000E-3;:TRIGGER:A:PULSE
;TRANSITION:WHEN SLOWERTHAN;:TRIGGER:A:PULSE:WIDTH
;LOWLIMIT 2.0000E-9;HIGHLIMIT 2.0000E-9;WHEN WITHIN
;POLARITY POSITIVE;:TRIGGER:A:PULSE:TIMEOUT:POLARITY
STAYISHIGH;TIME 2.0000E-9
TRIGger:A:EDGE?

Description
This query-only command returns the trigger source, coupling and slope for the A edge trigger. This command is equivalent to selecting Edge Setup from the Trig menu and then viewing the current setups.

Group
Trigger

Related Commands
TRIGger:A:PULse? (see page 380), TRIGger:A:LOGIc? (see page 354)

Syntax
TRIGger:A:EDGE?

Example
TRIGger:A:EDGE?

This query might return :TRIGGER:A:EDGE:SOURCE CH1;COUPLING DC;SLOPE RISE, indicating the trigger source, coupling and slope for the A edge trigger.
TRIGger:A:EDGE:COUPling

Description
This command sets or queries the type of coupling for the A edge trigger. This command is equivalent to selecting A Event (Main) Trigger Setup from the Trig menu and then choosing from the Coupling drop-down list.

Group
Trigger

Related Commands
TRIGger:A:EDGE:SOUrce (see page 348), TRIGger:A:EDGE:SLOpe (see page 347)

Syntax 1
TRIGger:A:EDGE:COUPling {AC|DC|HFRej|LFRej|NOISErej}

Syntax 2
TRIGger:A:EDGE:COUPling?

Arguments
• AC
  This selects AC trigger coupling.

• DC
  This selects DC trigger coupling.

• HFRej
  This coupling removes the high frequency components of the DC signal.

• LFRej
  This coupling removes the low frequency components of the AC signal.

• NOISErej
  This selects DC low sensitivity. It requires added signal amplitude for more stability and less false triggering.

Example 1
TRIGger:A:EDGE:COUPling DC
This command sets the A edge trigger coupling to DC.

Example 2
TRIGger:A:EDGE:COUPling?
This query might return :TRIGGER:A:EDGE:COUPLING DC, indicating that the A edge trigger coupling is set to DC.
TRIGger:A:EDGE:SLOpe

Description
This command sets or queries the slope for the A edge trigger. This command is equivalent to selecting A Event (Main) Trigger Setup from the Trig menu and then choosing the desired Slope.

Group
Trigger

Related Commands
TRIGger:A:EDGE:SOUrce (see page 348), TRIGger:A:EDGE:COUPling (see page 346)

Syntax 1
TRIGger:A:EDGE:SLOpe {RISe|FALL}

Syntax 2
TRIGger:A:EDGE:SLOpe?

Arguments
• RISe
  This specifies to trigger on the rising or positive edge of a signal.

• FALL
  This specifies to trigger on the falling or negative edge of a signal.

Example 1
TRIGger:A:EDGE:SLOpe?
This query might return :TRIGGER:A:EDGE:SLOPE FALL, indicating that the A edge trigger slope is negative.

Example 2
TRIGger:A:EDGE:SLOpe RISe
This command sets the A edge trigger slope to positive, which triggers on the rising edge of the signal.
TRIGger:A:EDGE:SOUrce

Description
This command sets or queries the source for the A edge trigger. This command is equivalent to selecting A Event (Main) Trigger Setup from the Trig menu and then choosing from the Source drop-down list.

Group
Trigger

Related Commands
TRIGger:A:EDGE:SLOpe (see page 347), TRIGger:A:EDGE:COUPling (see page 346)

Syntax 1
TRIGger:A:EDGE:SOUrce {AUXiliary|CH<x>|LINE}

Syntax 2
TRIGger:A:EDGE:SOUrce?

Arguments
- AUXiliary
  This specifies an external trigger using the Auxiliary Trigger Input connector located on the rear panel of the oscilloscope.
- CH<x>
  This specifies one input channel as the A edge trigger source.
- LINE
  This specifies AC line voltage.

Example 1
TRIGger:A:EDGE:SOUrce?

This query might return :TRIGGER:A:EDGE:SOURCE CH1, indicating that channel 1 is the A edge trigger source.

Example 2
TRIGger:A:EDGE:SOUrce CH1

This command specifies channel 1 as the A edge trigger source.
TRIGger:A:HOLDoff?

Description
This query-only command returns the A trigger holdoff parameters. These parameters specify the time period during which the trigger circuitry is not looking to generate a trigger event. This command is equivalent to selecting Holdoff from the Trig menu and then viewing the current settings.

Group
Trigger

Related Commands
TRIGger:A:HOLDoff:ACTUal? (see page [350]), TRIGger:A:HOLDoff:BY (see page [351]), TRIGger:A:HOLDoff:TIMe (see page [352])

Syntax
TRIGger:A:HOLDoff?

Example
TRIGger:A:HOLDoff?

This query might return :TRIGGER:A:HOLDOFF:TIME 900.0000E-09;BY DEFAULT, indicating that the A edge trigger holdoff time is set 900 ns.
TRIGger:A:HOLDoff:ACTUal?

Description
This query-only command returns the holdoff time actually used (expressed in seconds) by the A trigger. This command is equivalent to selecting Holdoff from the Trig menu and then viewing the current Trig Holdoff value.

Group
Trigger

Related Commands
TRIGger:A:HOLDoff? (see page 349), TRIGger:A:HOLDoff:BY (see page 351), TRIGger:A:HOLDoff:TIMe (see page 352)

Syntax
TRIGger:A:HOLDoff:ACTUal?

Example
TRIGger:A:HOLDoff:ACTUal?
This query might return :TRIGGER:A:HOLDOFF:ACTUAL 4.0000E-06, showing that the holdoff time is set to 4 µs.
TRIGger:A:HOLDoff:BY

Description
This command sets or queries the type of holdoff for the A trigger. Holdoff types are expressed as either user-specified time (TIMe) or by an internally calculated minimum time value (DEFault). This command is equivalent to selecting Holdoff from the Trig menu and then viewing or setting the Holdoff type.

Group
Trigger

Related Commands
TRIGger:A:HOLDoff:TIMe (see page 352)

Syntax 1
TRIGger:A:HOLDoff:BY {TIMe|DEFault}

Syntax 2
TRIGger:A:HOLDoff:BY?

Arguments
• TIMe
  This enables you to set the holdoff time via the TRIGger:A:HOLDoff:TIMe command.

• DEFault
  This automatically calculates a holdoff time to use. This time is typically equivalent to the greater of 1/2 screen (5 divisions) of time or 250 ns. The maximum value is 12 s. For example, if the oscilloscope is set to 1 ms/division then the default holdoff will be 1 ms/division x 25 divisions = 25 ms.

Example 1
TRIGger:A:HOLDoff:BY?
This query might return :TRIGGER:A:HOLDOFF:BY TIME, indicating that you will set the holdoff time.

Example 2
TRIGger:A:HOLDoff:BY TIMe
This command sets the holdoff to the "by time" setting. This enables you to set the holdoff time.
TRIGger:A:HOLDoff:TIMe

Description
This command sets or queries the A trigger holdoff time. This command is equivalent to selecting Holdoff from the Trig menu and then choosing the desired Trig Holdoff.

Group
Trigger

Related Commands
TRIGger:A:HOLDoff:BY (see page 351)

Syntax 1
TRIGger:A:HOLDoff:TIMe <NR3>

Syntax 2
TRIGger:A:HOLDoff:TIMe?

Argument
• <NR3>
  This specifies the holdoff time in seconds. The range is from 250 ns through 12.0 s.

Example 1
TRIGger:A:HOLDoff:TIME?
This query might return :TRIGGER:A:HOLDOFFTIME 1.2000E-06, indicating that the A trigger holdoff time is set to 1.2 µs.

Example 2
TRIGger:A:HOLDoff:TIMe 10
This command sets the trigger A holdoff time to 10 s.
**TRIGger:A:LEVel**

**Description**
This command sets or queries the level for the A trigger. This command is equivalent to selecting Holdoff from the Trig menu and then viewing or setting the trigger Level.

**Group**
Trigger

**Syntax 1**
TRIGger:A:LEVel {ECL|TTL|<NR3>}

**Syntax 2**
TRIGger:A:LEVel?

**Arguments**
- **ECL**
  This specifies the ECL high level.
- **TTL**
  This specifies the TTL high level.
- **<NR3>**
  This specifies the trigger level in user units (usually volts).

**Example 1**
TRIGger:A:LEVel?
This query might return :TRIGGER:A:LEVel 1.3000E+00, indicating that the A edge trigger is set to 1.3 V.

**Example 2**
TRIGger:A:LEVel TTL
This command sets the A edge trigger to TTL high level, which is 1.4 V.
**TRIGger:A:LOGic?**

**Description**
This query-only command returns all of the A logic trigger parameters.

**Group**
Trigger

**Related Commands**
TRIGger:A:LOGic:CLAss (see page 355)

**Syntax**
TRIGger:A:LOGic?

**Example**
TRIGger:A:LOGic?

This query might return:

```
;TRIGGER:A:LOGIC:CLASS PATTERN
;FUNCTION AND;WHEN TRUE;THRESHOLD:CH1 1.4000;CH2 1.4000
;CH3 1.4000;CH4 1.4000;:TRIGGER:A:LOGIC:INPUT:CH1 HIGH
;CH2 X;CH3 X;:TRIGGER:A:LOGIC:PATTERN:INPUT:CH4 X;
;TRIGGER:A:LOGIC:PATTERN:WHEN TRUE;WHEN:LESSLIMIT
5.0000E-9;MORELIMIT 5.0000E-9;:TRIGGER:A:LOGIC:SETHOLD
:CLOCK:EDGE RISE;THRESHOLD 1.4000;SOURCE CH2;:TRIGGER:A
:LOGIC:SETHOLD:DATA:THRESHOLD 1.4000;SOURCE CH1;
;TRIGGER:A:LOGIC:SETHOLD:HOLDTIME 2.0000E-9;SETTIME
3.0000E-9;:TRIGGER:A:LOGIC:STATE:INPUT:CH4 RISE;:TRIGGER
:A:LOGIC:STATE:WHEN TRUE
```
**TRIGger:A:LOGIc:CLAss**

**Description**
This command sets or queries the class of the Logic Trigger. Used in concert with TRIGger:A:TYPe, this command is equivalent to selecting Logic Pattern, Logic State or Setup/Hold Setup from the Trig menu.

**Group**
Trigger

**Related Commands**
TRIGger:A:TYPe (see page 412), TRIGger:A:PULse:CLAss (see page 381)

**Syntax 1**
TRIGger:A:LOGIc:CLAss \{PATtern|STATE|SETHold\}

**Syntax 2**
TRIGger:A:LOGIc:CLAss?

**Arguments**
- **PATtern**
  This means that the oscilloscope triggers when the specified logical combinations of channels 1, 2, 3 and 4 are met.
- **STATE**
  This means that the oscilloscope triggers when the specified conditions of channels 1, 2, and 3 are met after the channel 4 condition is met.
- **SETHold**
  This means that the oscilloscope will trigger on the setup and hold violations between a data source and a clock source.

**Example 1**
TRIGger:A:TYPe LOGIc
TRIGger:A:LOGIc:CLAss?
This query might return :TRIGGER:A:LOGIC:CLASS PATTERN

**Example 2**
TRIGger:A:LOGIc:CLAss PATtern
This command sets the trigger A logic class to PATtern, which causes the oscilloscope to trigger when the specified logical combinations of channels 1, 2, 3, and 4 are met.
TRIGger:A:LOGIc:FUNCtion

Description
This command sets or queries the logical combination of the input channels for the A pattern and A state logic triggers. This command is equivalent to selecting A Event (Main) Trigger Setup from the Trig menu and then setting or viewing the Pattern Type.

Group
Trigger

Related Commands
TRIGger:A:LOGIc:PASe (see page 351), TRIGger:A:LOGIc:INPut:CH<x> (see page 358), TRIGger:A:LOGIc:THReshold:CH<x> (see page 378)

Syntax 1
TRIGger:A:LOGIc:FUNCtion {AND|NAND|NOR|OR}

Syntax 2
TRIGger:A:LOGIc:FUNCtion?

Arguments
• AND
  This specifies to trigger if all conditions are true.
• NAND
  This specifies to trigger if any of the conditions are false.
• NOR
  This specifies to trigger if all conditions are false.
• OR
  This specifies to trigger if any of the conditions are true.

Example 1
TRIGger:A:LOGIc:FUNCtion?
This query might return :TRIGGER:A:LOGIC:FUNCTION NAND

Example 2
TRIGger:A:LOGIc:FUNCtion AND
This command sets the logical combination of channels to be true when all conditions are true.
TRIGger:A:LOGic:INPut?

Description
This query-only command returns the A logic trigger input expected for channel 1, 2, and 3. Channel 4 is set or queried with the command TRIGger:A:LOGic:PAtrern:INPut:CH4. This command is equivalent to selecting A Event (Main) Trigger Setup and then viewing or setting the Input Threshold for channel 1 through 3.

Group
Trigger

Related Commands
TRIGger:A:LOGic:PAtrern:INPut:CH4 (see page 360)

Syntax
TRIGger:A:LOGic:INPut?

Example
TRIGger:A:LOGic:INPut?

This query might return :TRIGGER:A:LOGIC:INPUT:CH1 HIGH;CH2 X;CH3 X
TRIGger:A:LOGIC:INPut:CH<x>

Description
This command sets or queries the A logical input for the specified logic trigger channel, which ranges from CH1 through CH3. Note that CH4 cannot be set or queried with this command. For details about setting this channel, see TRIGger:A:LOGIC:PATTERN:INPut:CH4. This command is equivalent to selecting A Event (Main) Trigger Setup from the Trig menu and then choosing the desired logical input from the Ch<x> drop-down list, which is located in the Input Threshold group box.

Group
Trigger

Related Commands
TRIGger:A:LOGIC:PATTERN:INPut:CH4 (see page 360)

Syntax 1
TRIGger:A:LOGIC:INPut:CH<x> {HIGH | LOW | X}

Syntax 2
TRIGger:A:LOGIC:INPut:CH<x>?

Arguments
• HIGH
  This specifies the logic high.
• LOW
  This specifies the logic low.
• X
  This specifies a "do not care" state.

Example 1
TRIGger:A:LOGIC:INPut:CH1?
This query might return :TRIGGER:LOGIC:INPut:CH1 X, indicating that the setting for the A logic trigger input to channel 1 does not matter.

Example 2
TRIGger:A:LOGIC:INPut:CH2 HIGH
This command sets the A logic trigger input to logic HIGH for channel 2.
TRIGger:A:LOGic:PATtern?

Description
This query-only command returns the conditions used for generating an A logic pattern trigger, with respect to the defined input pattern, and identifies the maximum and minimum time that the selected pattern may be true and still generate the trigger. This command is equivalent to selecting Logic Pattern from the Trig menu and then viewing the current setups.

Group
Trigger

Related Commands

Syntax
TRIGger:A:LOGic:PATtern?

Example
TRIGger:A:LOGic:PATtern?

TRIGger:A:LOGic:PATtern:INPut:CH4

Description
This command sets or queries the A logic trigger input for channel 4. This command specifies the logic value used when the pattern trigger detects the threshold level. This command is equivalent to selecting Logic Pattern from the Trig menu and then choosing the desired logical input from the Ch4 drop-down list, which is located in the Input Threshold group box.

Group
Trigger

Related Commands
TRIGger:A:LOGic:FUNCtion (see page 356), TRIGger:A:LOGic:INPut:CH<x> (see page 358), TRIGger:A:LOGic:THReshold:CH<x> (see page 378)

Syntax 1
TRIGger:A:LOGic:PATtern:INPut:CH4 {HIGH|LOW|X}

Syntax 2
TRIGger:A:LOGic:PATtern:INPut:CH4?

Arguments
• HIGH
  This specifies the logic high.

• LOW
  This specifies the logic low.

• X
  This specifies a "do not care" state.

Example 1
TRIGger:A:LOGic:PATtern:INPut:CH4?

This query might return :TRIGGER:A:LOGIC:PATTERN:INPUT:CH4 HIGH, indicating that the logic input for channel 4 is logic high.

Example 2
TRIGger:A:LOGic:PATtern:INPut:CH4 HIGH

This command sets the A logic trigger input to logic high for channel 4 when the logic class is set to PATtern. When the threshold level is detected, High places a 1 on the channel 4 input to the selected function.
**TRIGger:A:LOGic:PATtern:WHEn**

**Description**
This command sets or queries the condition for generating an A logic pattern trigger with respect to the defined input pattern. This command is equivalent to selecting A Event (Main) Trigger Setup from the Trig menu and then choosing a trigger condition from the Pattern drop-down list, which is located in the Trigger When group box.

**Group**
Trigger

**Related Commands**

**Syntax 1**
TRIGger:A:LOGic:PATtern:WHEn {TRUe|FALSe|LESSThan|MORThan}

**Syntax 2**
TRIGger:A:LOGic:PATtern:WHEn?

**Arguments**
- **TRUe**
  This specifies to trigger when the pattern becomes true.
- **FALSe**
  This specifies to trigger when the pattern becomes false.
- **LESSThan**
  This specifies to trigger if the specific pattern is true less than the specified LESSLimit.
- **MORThan**
  This specifies to trigger if the specific pattern is true longer than the specified MORELimit.

**Example 1**
TRIGger:A:LOGic:PATtern:WHEn?
This query might return TRIGGER:A:LOGIC:PATTERN:WHEN TRUE, indicating that the A logic pattern will trigger when the pattern becomes true.

**Example 2**
TRIGger:A:LOGic:PATtern:WHEn FALSe
This command specifies to trigger the A logic pattern when the pattern becomes false.
**TRIGger:A:LOGIc:PATtern:WHEn:LESSLimit**

**Description**
This command sets or queries the maximum time that the selected pattern may be true and still generate an A logic pattern trigger. This command is equivalent to selecting A Event (Main) Trigger Setup from the Trig menu and then entering the following Trigger When settings: choose Less Than from the Pattern drop-down list, then enter a maximum value for Time.

**Group**
Trigger

**Related Commands**
TRIGger:A:LOGIc:PATtern:WHEn:MORELimit (see page 363)

**Syntax 1**
TRIGger:A:LOGIc:PATtern:WHEn:LESSLimit <NR3>

**Syntax 2**
TRIGger:A:LOGIc:PATtern:WHEn:LESSLimit?

**Argument**
• \(<NR3>\>

This specifies the amount of time to hold pattern true.

**Example 1**
TRIGger:A:LOGIc:PATtern:WHEn:LESSLimit?

This query might return :TRIGGER:A:LOGIC:PATTERN:WHEN:LESSLIMIT 5.0000E-09, indicating that the selected pattern may hold true for up to 5 ns and still generate an A logic pattern trigger.

**Example 2**
TRIGger:A:LOGIc:PATtern:WHEn:LESSLimit 10.0E+00

This command sets the maximum time that the selected pattern may hold true (and generate an A logic pattern trigger) to 10 s.
TRIGger:A:LOGic:PATtern:WHen:MORELimit

Description
This command sets or queries the minimum time that the selected pattern may be true and still generate an A logic pattern trigger. This command is equivalent to selecting A Event (Main) Trigger Setup from the Trig menu and then entering the following Trigger When settings: choose More Than from the Pattern drop-down list, then enter a minimum value for Time.

Group
Trigger

Related Commands
TRIGger:A:LOGic:PATtern:WHen:LESSLimit (see page 362)

Syntax 1

Syntax 2
TRIGger:A:LOGic:PATtern:WHen:MORELimit?

Argument
• <NR3>
  This specifies the amount of time to hold pattern true.

Example 1
TRIGger:A:LOGic:PATtern:WHen:MORELimit?
  This query might return :TRIGGER:A:LOGIC:PATTERN:WHEN:MORELIMIT 5.0000E-09, indicating that the selected pattern must hold true for at least 5 ns to generate an A logic pattern trigger.

Example 2
TRIGger:A:LOGic:PATtern:WHen:MORELimit 10.0E+00
  This command sets the minimum time that the selected pattern may hold true (and generate an A logic pattern trigger) to 10 s.
TRIGger:A:LOGIc:SETHold?

Description
This query-only command returns the clock edge polarity, voltage threshold and source input; data voltage threshold and source; and both setup and hold times for setup and hold violation triggering. This command is equivalent to selecting Setup/Hold Setup from the Trig menu and then viewing the current setups.

Group
Trigger

Related Commands
TRIGger:A:LOGIc:PAtern? (see page 359), TRIGger:A:LOGIc:STATE? (see page 374)

Syntax
TRIGger:A:LOGIc:SETHold?

Example
TRIGger:A:LOGIc:SETHold?

This query might return
;THRESHOLD 1.4000;SOURCE CH2;
:TRIGGER:A:LOGIC:SETHOLD:DATA
;THRESHOLD 1.4000;SOURCE CH1;
:TRIGGER:A:LOGIC:SETHOLD
:HOLDTIME 2.0000E-9;SETTIME 3.0000E-9
TRIGger:A:LOGIc:SETHold:CLOCk?

Description
This query-only command returns the clock edge polarity, voltage threshold and source input for setup and hold triggering. This command is equivalent to selecting Setup/Hold Setup from the Trig menu and then viewing the current clock setups.

Group
Trigger

Related Commands

Syntax
TRIGger:A:LOGIc:SETHold:CLOCk?

Example
TRIGger:A:LOGIc:SETHold:CLOCk?

This query might return :TRIGGER:A:LOGIC:SETHold:CLOCK:EDGE RISE;THRESHOLD 1.4000;SOURCE CH2, indicating the current clock settings for setup and hold triggering.
TRIGger:A:LOGic:SETHold:CLOCk:EDGE

Description
This command sets or queries the clock edge polarity for setup and hold triggering. This is equivalent to selecting Setup/Hold Setup from the Trig menu and then choosing the desired Clock Edge.

Group
Trigger

Related Commands
TRIGger:A:LOGic:SETHold:CLOCk:SOUrce (see page 367),
TRIGger:A:LOGic:SETHold:CLOCk:THReshold (see page 368)

Syntax 1
TRIGger:A:LOGic:SETHold:CLOCk:EDGE {FALL|RISe}

Syntax 2
TRIGger:A:LOGic:SETHold:CLOCk:EDGE?

Arguments
• FALL
  This specifies polarity as the clock falling edge.

• RISE
  This specifies polarity as the clock rising edge.

Example 1
TRIGger:A:LOGic:SETHold:CLOCk:EDGE?
This query might return :TRIGGER:A:LOGIC:SETHOLD:CLOCK:EDGE RISE, indicating that polarity is specified as the clock rising edge.

Example 2
TRIGger:A:LOGic:SETHold:CLOCk:EDGE RISE
This command specifies the polarity as the clock rising edge.
**TRIGger:A:LOGic:SETHold:CLOCK:SOURce**

**Description**
This command sets or queries the clock source for the A logic trigger setup and hold input. The channel is specified by x, which ranges from 1 through 4. This is equivalent to selecting A Event (Main) Trigger Setup from the Trig menu and then choosing the desired channel from the Clock Source drop-down list.

**Group**
Trigger

**Related Commands**
TRIGger:A:LOGic:SETHold:CLOCK:EDGE (see page 366),
TRIGger:A:LOGic:SETHold:CLOCK:THReshold (see page 368)

**Syntax 1**
TRIGger:A:LOGic:SETHold:CLOCK:SOURce CH<x>

**Syntax 2**
TRIGger:A:LOGic:SETHold:CLOCK:SOURce?

**Argument**
• CH<x>
  This specifies the input channel, which ranges from 1 through 4.

**Example 1**
TRIGger:A:LOGic:SETHold:CLOCK:SOURce?
This query might return :TRIGGER:A:LOGIC:SETHOLD:CLOCK:SOURCE CH4, indicating that channel 4 is the clock source for the A logic trigger's setup and hold input.

**Example 2**
TRIGger:A:LOGic:SETHold:CLOCK:SOURce CH1
This command specifies channel 1 as the A logic setup and hold input.
TRIGger:A:LOGic:SETHold:CLOCk:THReshold

Description
This command sets or queries the clock voltage threshold for setup and hold trigger. This command is equivalent to selecting Setup/Hold Setup from the Trig menu and then setting the desired Clock Level.

Group
Trigger

Related Commands

Syntax 1
TRIGger:A:LOGic:SETHold:CLOCk:THReshold {ECL|TTL|<NR3>}

Syntax 2
TRIGger:A:LOGic:SETHold:CLOCk:THReshold?

Arguments
- ECL
  This specifies a preset ECL high level of -1.3 V.
- TTL
  This specifies a preset TTL high level of 1.4 V.
- <NR3>
  This is the clock level, in volts.

Example 1
TRIGger:A:LOGic:SETHold:CLOCk:THReshold?
This query might return :TRIGGER:A:LOGIC:SETHOLD:CLOCK:THRESHOLD 1.2000E+00, indicating that the clock threshold for setup and hold trigger is 1.2 V.

Example 2
TRIGger:A:LOGic:SETHold:CLOCk:THReshold TTL
This command specifies the preset TTL value of 1.4 V as the clock threshold for setup and hold trigger.
TRIGger:A:LOGic:SETHold:DATa?

Description
This query-only command returns the voltage threshold and data source for setup and hold trigger. This command is equivalent to selecting Setup/Hold Setup from the Trig menu and then viewing the current data setups.

Group
Trigger

Related Commands
TRIGger:A:LOGic:SETHold:CLOCk? (see page 365)

Syntax
TRIGger:A:LOGic:SETHold:DATa?

Example
TRIGger:A:LOGic:SETHold:DATa?

This query might return :TRIGGER:A:LOGIC:SETHOLD:DATA:THRESHOLD 1.4000;SOURCE CH1, indicating the current trigger data settings.
TRIGger:A:LOGIC:SETHold:DATA:THReshold

Description
This command sets or queries the data voltage threshold for setup and hold trigger. This command is equivalent to selecting A Event (Main) Trigger Setup from the Trig menu and then setting the desired Data Level.

Group
Trigger

Related Commands
TRIGger:A:LOGIC:SETHold:DATA:SOUrce (see page 371)

Syntax 1
TRIGger:A:LOGIC:SETHold:DATA:THReshold {ECL|TTL<NR3>}

Syntax 2
TRIGger:A:LOGIC:SETHold:DATA:THReshold?

Arguments
- ECL
  This specifies the preset ECL high level of -1.3 V.
- TTL
  This specifies the preset TTL high level of 1.4 V.
- <NR3>
  This is the setup and hold data level, in V.

Example 1
TRIGger:A:LOGIC:SETHold:DATA:THReshold?
This query might return :TRIGGER:A:LOGIC:SETHOLD:DATA:THRESHOLD 1.2000E+00, indicating that 1.2 V is the current data voltage level for setup and hold trigger.

Example 2
TRIGger:A:LOGIC:SETHold:DATA:THReshold TTL
This command specifies the preset ECL high level of 1.4 V as the current data voltage level for setup and hold trigger.
TRIGger:A:LOGic:SETHold:DATa:SOURce

Description
This command sets or queries the data source for setup and hold trigger. This command is equivalent to selecting A Event (Main) Trigger Setup from the Trig menu and then choosing the desired channel from the Data Source drop-down list.

Group
Trigger

Related Commands
TRIGger:A:LOGic:SETHold:DATa:THReshold (see page 370)

Syntax 1
TRIGger:A:LOGic:SETHold:DATa:SOURce CH<x>

Syntax 2
TRIGger:A:LOGic:SETHold:DATa:SOURce?

Argument
• CH<x>
  This specifies the input channel, which ranges from 1 through 4.

Example 1
TRIGger:A:LOGic:SETHold:DATa:SOURce?
This query might return :TRIGGER:A:LOGIC:SETHOLD:DATA:SOURCe CH2, indicating that channel 2 is the current clock source for setup and hold trigger.

Example 2
TRIGger:A:LOGic:SETHold:DATa:SOURce CH1
This command sets channel 1 as the clock source for setup and hold trigger.
TRIGGER:A:LOGIC:SETHold:HOLDTime

Description
This command sets or queries the hold time for setup and hold violation triggering. This command is equivalent to selecting Setup/Hold Setup from the Trig menu and then setting the desired Hold Time.

Group
Trigger

Related Commands
TRIGGER:A:LOGIC:SETHold:SETTime (see page 373)

Syntax 1
TRIGGER:A:LOGIC:SETHold:HOLDTime <NR3>

Syntax 2
TRIGGER:A:LOGIC:SETHold:HOLDTime?

Argument
• <NR3>
  This specifies the hold time setting in seconds. Positive values for hold time occur after the clock edge. Negative values occur before the clock edge.

Example 1
TRIGGER:A:LOGIC:SETHold:HOLDTime?

This query might return :TRIGGER:A:LOGIC:SETHold:HOLDTIME 2.0000E-09, indicating that the current hold time for setup and hold trigger is 2 ns.

Example 2
TRIGGER:A:LOGIC:SETHold:HOLDTime 3.0E-3

This command sets the hold time for A logic setup and hold trigger to 3 ms.
**TRIGger:A:LOGIc:SETHold:SETTime**

**Description**
This command sets or queries the setup time for setup and hold violation triggering. This command is equivalent to selecting Setup/Hold Setup from the Trig menu and then setting the desired Hold Time.

**Group**
Trigger

**Related Commands**
TRIGger:A:LOGIc:SETHold:HOLDTime (see page 372)

**Syntax 1**
TRIGger:A:LOGIc:SETHold:SETTime <NR3>

**Syntax 2**
TRIGger:A:LOGIc:SETHold:SETTime?

**Argument**
• <NR3>
  This specifies the setup time for setup and hold violation triggering.

**Example 1**
TRIGger:A:LOGIc:SETHold:SETTime?
This query might return :TRIGGER:A:LOGIC:SETHOLD:SETTIME 2.0000E-09, indicating that the current hold time for setup and hold trigger is 2 ns.

**Example 2**
TRIGger:A:LOGIc:SETHold:SETTime 3.0E-6
This command specifies that the current hold time for setup and hold trigger is 3 µs.
TRIGger:A:LOGic:STATE?

Description
This query-only command returns the data input and trigger criteria for the A logic trigger. This command is equivalent to selecting Logic State from the Trig menu and then viewing the current logic state settings.

Group
Trigger

Related Commands

Syntax
TRIGger:A:LOGic:STATE?

Example
TRIGger:A:LOGic:STATE?

This query might return :TRIGGER:A:LOGIC:STATE:INPUT:CH4 RISE;
:TRIGGER:A:LOGIC:STATE:WHEN TRUE
**TRIGger:A:LOGIc:STATE:INPut:CH4**

**Description**
This command sets or queries the slope for channel 4 when the logic class is set to STATE. This command is equivalent to selecting Logic State from the Trig menu and then choosing the desired channel input (NEG or POS) from the Ch4 drop-down list.

**Group**
Trigger

**Related Commands**
TRIGger:A:LOGIc:STATE:WHen (see page 376)

**Syntax 1**
TRIGger:A:LOGIc:STATE:INPut:CH4 {FALL|RISe}

**Syntax 2**
TRIGger:A:LOGIc:STATE:INPut:CH4?

**Arguments**
- **FALL**
  - This specifies falling edge.
- **RISe**
  - This specifies rising edge.

**Example 1**
TRIGger:A:LOGIc:STATE:INPut:CH4?
This query might return :TRIGGER:A:LOGIC:STATE:INPUT:CH4 RISE, indicating that the A logic trigger input for channel 4 is the rising edge.

**Example 2**
TRIGger:A:LOGIc:STATE:INPut:CH4 RISE
This command specifies that the A logic trigger input for channel 4 is the rising edge.
**TRIGger:A:LOGic:STATE:WHen**

**Description**
This command sets or queries the condition for generating an A logic state trigger. This command is equivalent to selecting Logic State from the Trig menu and then choosing the desired condition from the Trigger When Pattern drop-down list.

**Group**
Trigger

**Related Commands**

**Syntax 1**
TRIGger:A:LOGic:STATE:WHen {TRUE|FALSE}

**Syntax 2**
TRIGger:A:LOGic:STATE:WHen?

**Arguments**
- **TRUE**
  This specifies that the trigger occurs when the clock transition on channel 4 occurs and the pattern of channels 1-3 are at the desired logic input states.

- **FALSE**
  This specifies that the trigger occurs when the desired clock transition on channel 4 occurs and the desired logic input states on channels 1-3 are not found.

**Example 1**
TRIGger:A:LOGic:STATE:WHen?
This query might return :TRIGGER:A:LOGIC:STATE:WHEN FALSE, indicating that the logic condition to trigger upon is false.

**Example 2**
TRIGger:A:LOGic:STATE:WHen TRUE
This command specifies that the logic condition to trigger upon is true.
TRIGger:A:LOGic:THReshold?

Description
This query-only command returns the threshold voltage for all channels in A logic trigger. This command query is equivalent to selecting A Event (Main) Trigger Setup from the Trig menu and then viewing the current Input Threshold voltage settings.

Group
Trigger

Related Commands
TRIGger:A:LOGic:THReshold:CH<x> (see page 378), TRIGger:A:LOGic:INPut? (see page 357), TRIGger:A:LOGic:INPut:CH<x> (see page 358)

Syntax
TRIGger:A:LOGic:THReshold?

Example
TRIGger:A:LOGic:THReshold?

This query might return :TRIGGER:A:LOGIC:THRESHOLD CH1 24.0000E-03;CH2 1.2000E+00;CH3 1.2000E+00;CH4 1.2000E+00, indicating the threshold voltages for the channels in A logic trigger are as follows: channel 1 = 24 mV; channel 2 = 1.2 V; channel 3 = 1.2 V; channel 4 = 1.2 V.
TRIGger:A:LOGic:THReshold:CH<x>

Description
This command sets or queries the A logic trigger threshold voltage for the channel, specified by x, which ranges from 1 through 4. This command is equivalent to selecting A Event (Main) Trigger Setup from the Trig menu and then setting the desired Input Threshold voltage for the desired channel.

Group
Trigger

Related Commands
TRIGger:A:LOGic:INPut? (see page 357)

Syntax 1
TRIGger:A:LOGic:THReshold:CH<x> <NR3>

Syntax 2
TRIGger:A:LOGic:THReshold:CH<x>?

Argument
• <NR3>
  This specifies the threshold voltage.

Example 1
TRIGger:A:LOGic:THReshold:CH3?

This query might return "TRIGGER:A:LOGIC:THRESHOLD:CH3 1.2000E+00", indicating that the A logic trigger threshold voltage for channel 3 is 1.2 V.

Example 2
TRIGger:A:LOGicTHReshold:CH2 3.0E-3

This command sets the A logic trigger threshold voltage for channel 2 to 3 mV.
**TRIGger:A:MODe**

**Description**
This command sets or queries the A trigger mode. This command is equivalent to selecting Mode from the Trig menu and then choosing the desired Trigger Mode.

**Group**
Trigger

**Related Commands**
TRIGger:A:LEVel (see page 353)

**Syntax 1**
TRIGger:A:MODe \{AUTO|NORMal\}

**Syntax 2**
TRIGger:A:MODe?

**Arguments**
- AUTO
  This generates a trigger if one is not detected within a specified time period.

- NORMal
  This waits for a valid trigger event.

**Example 1**
TRIGger:A:MODe?
This query might return :TRIGGER:A:MODE NORMAL, indicating that a valid trigger event must occur before a trigger is generated.

**Example 2**
TRIGger:A:MODe NORMAL
This command specifies that a valid trigger event must occur before a trigger is generated.
TRIGger:A:PULse?

Description
This query-only command returns the A pulse trigger parameters.

Group
Trigger

Related Commands
TRIGger:A:EDGE? (see page 345), TRIGger:A:LOGic? (see page 354)

Syntax
TRIGger:A:PULse?

Example
TRIGger:A:PULse?

This query might return:
TRIGger:A:PULse:CLAss

Description
This command sets or queries the type of pulse on which to trigger. This command is equivalent to selecting A Event (Main) Trigger Setup from the Trig menu and then choosing the desired pulse Trigger Type.

Group
Trigger

Related Commands

Syntax 1
TRIGger:A:PULse:CLAss {GLItch|RUNT|WIDth|TRANSition|TIMEOut}

Syntax 2
TRIGger:A:PULse:CLAss?

Arguments
• GLItch
  This triggers when a pulse is found that is of the specified polarity and width. These are set with the commands TRIGger:A:PULse:GLItch:POLarity and TRIGger:A:PULse:GLItch:WIDth.

• RUNT
  This triggers when a pulse crosses the first preset voltage threshold but does not cross the second preset threshold before re-crossing the first. The thresholds are set with the TRIGger:A:PULse:RUNT:THReshold:LOW and TRIGger:A:PULse:RUNT:THReshold:HIGH commands.

• WIDth
  This triggers when a pulse is found that has the specified polarity and is either inside or outside the limits as specified by TRIGger:A:PULse:WIDth:LOWLimit and TRIGger:A:PULse:WIDth:HIGHLimit. The polarity is selected using the TRIGger:A:PULse:WIDth:POLarity command.

• TRANSition
  This triggers when a pulse crosses both thresholds in the same direction as the specified polarity and the transition time between the two threshold crossings is greater or less than the specified time delta.

• TIMEOut
  This triggers when the pulse train stops in the selected state for longer than the specified time.

Example 1
TRIGger:A:PULse:CLAss?
This query might return :TRIGGER:A:PULSE:CLASS GLITCH, indicating that a pulse was found that is of the specified polarity and width.

Example 2
TRIGger:A:PULse:CLAss WIDth
This command specifies a width pulse for the A trigger.
TRIGger:A:PULse:GLItch?

Description
This query-only command returns the current A glitch pulse trigger parameters. This command query is equivalent to selecting Glitch Setup from the Trig menu and then viewing the current pulse glitch settings.

Group
Trigger

Related Commands

Syntax
TRIGger:A:PULse:GLItch?

Example
TRIGger:A:PULse:GLItch?

This query might return :TRIGGER:A:PULSE:GLITCH:WIDTH 2.0000E-09;FILTER ACCEPT;POLARITY POSITIVE
TRIGger:A:PULse:GLItch:POLarity

Description
This command sets or queries the polarity for A pulse glitch trigger. This command is equivalent to selecting Glitch Setup from the Trig menu and then choosing the desired Polarity.

Group
Trigger

Related Commands
TRIGger:A:LEVel (see page 353), TRIGger:A:PULse:GLItch:WIDth (see page 385)

Syntax 1
TRIGger:A:PULse:GLItch:POLarity {POSITIVe|NEGative|EITher}

Syntax 2
TRIGger:A:PULse:GLItch:POLarity?

Arguments
• POSITIVe
  This specifies that the oscilloscope will only trigger when the polarity of the glitch is positive.

• NEGative
  This specifies that the oscilloscope will only trigger when the polarity of the glitch is negative.

• EITher
  This specifies that the oscilloscope will trigger when the polarity of the glitch is either positive or negative.

Example 1
TRIGger:A:PULse:GLItch:POLarity?
This query might return :TRIGGER:A:PULSE:GLITCH:POLARITY POSITIVE, indicating that the polarity of the glitch must be positive for the trigger to occur.

Example 2
TRIGger:A:PULse:GLItch:POLarity EITHER
This command specifies that the polarity of the glitch can be either positive or negative for the trigger to occur.
**TRIGger:A:PULse:GLItch:TRIGIF**

**Description**
This command sets or queries the acceptance/rejection of the glitch pulse trigger, based on width. This command is equivalent to selecting Glitch Setup from the Trig menu and then choosing the desired Trig if Width setting.

**Group**
Trigger

**Related Commands**
TRIGger:A:PULse:GLItch:WIDth (see page 385)

**Syntax 1**
TRIGger:A:PULse:GLItch:TRIGIF {ACCept|REJect}

**Syntax 2**
TRIGger:A:PULse:GLItch:TRIGIF?

**Arguments**
- **ACCept**
  This specifies that the oscilloscope will only trigger on pulses that are narrower than the specified width, when the trigger type is set to pulse glitch. The width is specified using the TRIGger:A:PULse:GLItch:WIDth command.

- **REJect**
  This specifies that the oscilloscope will only trigger on pulses that are wider than the specified width, when the trigger type is set to pulse glitch. The width is specified using the TRIGger:A:PULse:GLItch:WIDth command.

**Example 1**
TRIGger:A:PULse:GLItch:TRIGIF?
This query might return :TRIGGER:A:PULSE:GLITCH:TRIGIF ACCEPT, indicating that the oscilloscope is set to trigger on pulses that are narrower than the specified width.

**Example 2**
TRIGger:A:PULse:GLItch:TRIGIF REJect
This command specifies that the oscilloscope triggers on pulses that are wider than the specified width.
TRIGger:A:PULse:GLItch:WIDth

Description
This command sets or queries the width for the A pulse glitch trigger. This command is equivalent to selecting Glitch Setup from the Trig menu and then setting the desired Width. For information about using the width value, refer to the TRIGger:A:PULse:GLItch:TRIGIF command.

Group
Trigger

Related Commands
TRIGger:A:LEVel (see page 353), TRIGger:A:PULse:GLItch:TRIGIF (see page 384)

Syntax 1
TRIGger:A:PULse:GLItch:WIDth <NR3>

Syntax 2
TRIGger:A:PULse:GLItch:WIDth?

Argument
• <NR3>
  This specifies the width of the glitch, in seconds.

Example 1
TRIGger:A:PULse:GLItch:WIDth?
This query might return :TRIGGER:A:PULSE:GLITCH:WIDTH 2.0000E-09, indicating that the width of the glitch is currently set at 2 ns.

Example 2
TRIGger:A:PULse:GLItch:WIDth 15E-6
This command sets the width of the glitch to 15 μs.
**TRIGger:A:PULse:RUNT?**

**Description**
This query-only command returns the current A runt pulse trigger parameters. This command query is equivalent to selecting Runt Setup from the Trig menu and then viewing the current settings.

**Group**
Trigger

**Related Commands**

**Syntax**
TRIGger:A:PULse:RUNT?

**Example**
TRIGger:A:PULse:RUNT?

This query might return:
TRIGger:A:PULse:RUNT:POLarity

**Description**
This command sets or queries the polarity for the A pulse runt trigger. This command is equivalent to selecting Runt Setup from the Trig menu and then choosing the Polarity setting.

**Group**
Trigger

**Related Commands**
TRIGger:A:PULse:RUNT:THReshold? (see page 388)

**Syntax 1**
TRIGger:A:PULse:RUNT:POLarity {POSITIVE|NEGAtive|EITher}

**Syntax 2**
TRIGger:A:PULse:RUNT:POLarity?

**Arguments**
- **POSitive**
  This indicates that the rising edge crosses the low threshold and the falling edge re-crosses the low threshold without either edge ever crossing the high threshold.

- **NEGative**
  This indicates that the falling edge crosses the high threshold and the rising edge re-crosses the high threshold without either edge ever crossing the low threshold.

- **EITher**
  This indicates either negative or positive polarity.

**Example 1**
TRIGger:A:PULse:RUNT:POLarity?
This query might return :TRIGGER:A:PULSE:RUNT:POLARITY POSITIVE, indicating that the polarity of the A pulse runt trigger is positive.

**Example 2**
TRIGger:A:PULse:RUNT:POLarity NEGATIVE
This command specifies that the polarity of the A pulse runt trigger is negative.
TRIGger:A:PULse:RUNT:THReshold?

Description
This query-only command returns the upper and lower thresholds for the A pulse runt trigger. This command query is equivalent to selecting Runt Setup from the Trig menu and then viewing the runt trigger Upper Level and Lower Level settings.

Group
Trigger

Related Commands

Syntax
TRIGger:A:PULse:RUNT:THReshold?

Example
TRIGger:A:PULse:RUNT:THReshold?

This query might return :TRIGGER:A:PULSE:THRESHOLD:HIGH 2.0000E+00; LOW 8.0000E-01, indicating that the upper threshold is 2 V and that the lower threshold is 800 mV.
TRIGger:A:PULse:RUNT:THReshold:BOTh

Description
This command (no query form) sets the upper and lower switching thresholds for the A pulse runt trigger. This command is equivalent to selecting Runt Setup from the Trig menu and then setting the desired runt trigger Upper Level and Lower Level voltages.

Group
Trigger

Related Commands
TRIGger:A:PULse:RUNT:THReshold? (see page 388)

Syntax
TRIGger:A:PULse:RUNT:THReshold:BOTh {TTL|ECL}

Arguments
• TTL
  This sets the upper threshold to 1.8 V and the lower threshold to 800 mV, which are the nominal TTL voltage levels.

• ECL
  This sets the upper threshold to -1.1 V and the lower threshold to -1.5 V, which are the nominal ECL voltage levels.

Example
TRIGger:A:PULse:RUNT:THReshold:BOTh TTL

This command sets the threshold of the pulse runt trigger to the nominal TTL voltage levels.
TRIGger:A:PULse:RUNT:THReshold:HIGH

Description
This command sets or queries the upper limit for the A pulse runt trigger. This command is equivalent to selecting Runt Setup from the Trig menu and then setting the desired runt trigger Upper Level voltage.

Group
Trigger

Related Commands
TRIGger:A:PULse:RUNT:THReshold? (see page 388)

Syntax 1
TRIGger:A:PULse:RUNT:THReshold:HIGH <NR3>

Syntax 2
TRIGger:A:PULse:RUNT:THReshold:HIGH?

Argument
• <NR3>

This specifies the threshold value, in volts.

Example 1
TRIGger:A:PULse:RUNT:THReshold:HIGH?

This query might return :TRIGGER:A:PULSE:RUNT:THRESHOLD:HIGH 1.1000E+00, indicating that the upper limit of the pulse runt trigger is currently set to -1.1 V.

Example 2
TRIGger:A:PULse:RUNT:THReshold:HIGH 120E-3

This command sets the upper limit of the pulse runt trigger to 120 mV.
**TRIGger:A:PULse:RUNT:THReshold:LOW**

**Description**
This command sets or queries the lower limit for the A pulse runt trigger. This command is equivalent to selecting Runt Setup from the Trig menu and then setting the desired runt trigger Lower Level voltage.

**Group**
Trigger

**Related Commands**
TRIGger:A:PULse:RUNT:THReshold? (see page 388)

**Syntax 1**
TRIGger:A:PULse:RUNT:THReshold:LOW <NR3>

**Syntax 2**
TRIGger:A:PULse:RUNT:THReshold:LOW?

**Argument**
• <NR3>
  - This specifies the threshold value, in volts.

**Example 1**
TRIGger:A:PULse:RUNT:THReshold:LOW?
This query might return :TRIGGER:A:PULSE:RUNT:THRESHOLD:LOW 1.2000E-01, indicating that the lower limit of the pulse runt trigger is currently set to 120 mV.

**Example 2**
TRIGger:A:PULse:RUNT:THReshold:LOW 50E-3
This command sets the lower limit of the pulse runt trigger to 50 mV.
TRIGger:A:PULse:RUNT:WHEn

Description
This command sets or queries the type of pulse width the trigger checks for when it uncovers a runt. This is equivalent to selecting Runt Setup from the Trig menu and then choosing the desired Trigger When setting from the Runt drop-down list.

Group
Trigger

Related Commands
TRIGger:A:PULse:RUNT:WIDth (see page 393)

Syntax 1
TRIGger:A:PULse:RUNT:WHEn {OCCurs|WIDERthan}

Syntax 2
TRIGger:A:PULse:RUNT:WHEn?

Arguments
- **OCCurs**
  This specifies a trigger if a runt of any detectable width occurs.

- **WIDERthan**
  This specifies a trigger if a runt greater than the specified width occurs.

Example 1
TRIGger:A:PULse:RUNT:WHEn?

This query might return :TRIGGER:A:PULSE:RUNT:WHEN OCCURS, indicating that a runt trigger will occur if the oscilloscope detects a runt of any detectable width.

Example 2
TRIGger:A:PULse:RUNT:WHEn WIDERthan

This command sets the runt trigger to occur when the oscilloscope detects a runt in a pulse wider than the specified width.
TRIGger:A:PULse:RUNT:WIDth

Description
This command sets or queries the minimum width for a valid A pulse runt trigger. This command is equivalent to selecting Runt Setup from the Trig menu and then setting the desired Width.

Group
Trigger

Related Commands
TRIGger:A:PULse:RUNT:WHEn (see page 392)

Syntax 1
TRIGger:A:PULse:RUNT:WIDth <NR3>

Syntax 2
TRIGger:A:PULse:RUNT:WIDth?

Argument
• <NR3>
  This specifies the minimum width, in seconds.

Example 1
TRIGger:A:PULse:RUNT:WIDth?
This query might return :TRIGGER:A:PULSE:RUNT:WIDTH 2.0000E-09, indicating that the minimum width of a pulse runt trigger is 2 ns.

Example 2
TRIGger:A:PULse:RUNT:WIDth 15E-6
This command sets the minimum width of the pulse runt trigger to 15 µs.
TRIGger:A:PULse:TRANsition?

Description
This query-only command returns delta time, polarity, and both upper and lower threshold limits for the transition time trigger. This command is equivalent to selecting Transition Setup from the Trig menu and then viewing the current transition settings.

Group
Trigger

Related Commands

Syntax
TRIGger:A:PULse:TRANsition?

Example
TRIGger:A:PULse:TRANsition?

**TRIGger:A:PULse:TRANsition:DELTATime**

**Description**
This command sets or queries the delta time used in calculating the transition value. This is equivalent to selecting Transition Setup from the Trig menu and then setting the desired Time.

**Group**
Trigger

**Related Commands**
TRIGger:A:PULse:TRANsition:POLarity (see page 396), TRIGger:A:PULse:TRANsition:THReshold? (see page 397)

**Syntax 1**
TRIGger:A:PULse:TRANsition:DeltaTime <NR3>

**Syntax 2**
TRIGger:A:PULse:TRANsition:DeltaTime?

**Argument**
- `<NR3>`
  This specifies the delta time, in seconds.

**Example 1**
TRIGger:A:PULse:TRANsition:DeltaTime?

This query might return :TRIGGER:A:PULSE:TRANSITION:DELTATIME 2.0000E-09, indicating that the transition trigger's delta time is set to 2 ns.

**Example 2**
TRIGger:A:PULse:TRANsition:DeltaTime 15E-6

This command sets the delta time of the transition trigger to 15 µs.
TRIGger:A:PULse:TRANsition:POLarity

Description
This command sets or queries the polarity for the A pulse transition trigger. This command is equivalent to selecting Transition Setup from the Trig menu and then choosing from the Polarity pull-down list.

Group
Trigger

Related Commands
TRIGger:A:PULse:TRANsition:DELTATime (see page 395)

Syntax 1
TRIGger:A:PULse:TRANsition:POLarity {POSITIVE|NEGative|EITHER}

Syntax 2
TRIGger:A:PULse:TRANsition:POLarity?

Arguments
• POSITIVE
  This indicates that a pulse edge must traverse from the lower (most negative) to higher (post positive) level for transition triggering to occur.

• NEGative
  This indicates that a pulse edge must traverse from the upper (most positive) to lower (most negative) level for transition triggering to occur.

• EITHER
  This indicates either positive or negative polarity.

Example 1
TRIGger:A:PULse:TRANsition:POLarity?
This query might return :TRIGGER:A:PULSE:TRANSITION:POLARITY EITHER indicating that the transition can be either positive or negative.

Example 2
TRIGger:A:PULse:TRANsition:DeltaTime NEGative
This command sets the transition polarity to negative.
TRIGGER:A:PULSE:TRANSITION:THRESHOLD?

Description
This query-only command returns the upper and lower threshold limits for the transition time trigger. This command is equivalent to selecting Transition Setup from the Trig menu and then viewing the Upper Level and Lower Level voltage settings.

Group
Trigger

Related Commands

Syntax
TRIGGER:A:PULSE:TRANSITION:THRESHOLD?

Example
TRIGGER:A:PULSE:TRANSITION:THRESHOLD?

TRIGger:A:PULse:TRANsition:THReshold:BOTh

Description
This command (no query form) sets the upper and lower thresholds for pulse transition trigger. This command is equivalent to selecting Transition Setup from the Trig menu and then setting the desired Upper Level and Lower Level voltages.

Group
Trigger

Related Commands
TRIGger:A:PULse:TRANsition:THReshold:HIGH (see page 399),
TRIGger:A:PULse:TRANsition:THReshold:LOW (see page 400)

Syntax 1
TRIGger:A:PULse:TRANsition:THReshold:BOTh {TTL|ECL}

Arguments
- TTL
  This sets the upper threshold to 1.2 V and the lower threshold to 800 mV, which represent the nominal TTL voltage levels.

- ECL
  This sets the upper threshold to -1.1 V and the lower threshold to -1.5 V, which represent the nominal ECL voltage levels.

Example 1
TRIGger:A:PULse:TRANsition:THReshold:BOTh TTL
This command sets the thresholds of the pulse transition trigger to the nominal TTL voltage levels.
TRIGger:A:PULse:TRANsition:THReshold:HIGH

Description
This command sets or queries the upper (most positive) transition trigger threshold. This command is equivalent to selecting Transition Setup from the Trig menu and then setting the desired Upper Level voltage.

Group
Trigger

Related Commands
TRIGger:A:PULse:TRANsition:THReshold:LOW (see page 400)

Syntax 1
TRIGger:A:PULse:TRANsition:THReshold:HIGH <NR3>

Syntax 2
TRIGger:A:PULse:TRANsition:THReshold:HIGH?

Argument
• <NR3>
  This specifies the upper threshold, in volts.

Example 1
TRIGger:A:PULse:TRANsition:THReshold:HIGH?
This query might return :TRIGGER:A:PULSE:TRANSITION:THRESHOLD:HIGH 2.0000E+00, indicating that the upper limit of the pulse transition trigger is 2 V.

Example 2
TRIGger:A:PULse:TRANsition:THReshold:HIGH 120E-3
This command sets the upper limit of the pulse transition trigger to 120 mV.
**TRIGger:A:PULse:TRANsition:THReshold:LOW**

**Description**
This command sets or queries the lower (most negative) transition trigger threshold. This command is equivalent to selecting Transition Setup from the Trig menu and then setting the desired Lower Level voltage.

**Group**
Trigger

**Related Commands**
TRIGger:A:PULse:TRANsition:THReshold:HIGH (see page 399)

**Syntax 1**
TRIGger:A:PULse:TRANsition:THReshold:LOW <NR3>

**Syntax 2**
TRIGger:A:PULse:TRANsition:THReshold:LOW?

**Argument**

- **<NR3>**
  This specifies the lower threshold, in volts.

**Example 1**
TRIGger:A:PULse:TRANsition:THReshold:LOW?
This query might return :TRIGGER:A:PULSE:TRANSITION:THRESHOLD:LOW 50.0000E-03, indicating that the lower limit of the pulse transition trigger is 50 mV.

**Example 2**
TRIGger:A:PULse:TRANsition:THReshold:LOW 20E-3
This command sets the lower limit of the pulse transition trigger to 20 mV.
**TRIGger:A:PULse:TRANsition:WHEn**

**Description**
This command sets or queries whether to check for a transitioning signal that is faster or slower than the specified delta time. This is equivalent to selecting Transition Setup from the Trig menu and then choosing the desired Trigger When Transition Time setting.

**Group**
Trigger

**Related Commands**
TRIGger:A:PULse:TRANsition:DELTATime (see page 395), TRIGger:A:PULse:TRANsition:POLarity (see page 396), TRIGger:A:PULse:TRANsition:THReshold? (see page 397)

**Syntax 1**
TRIGger:A:PULse:TRANsition:WHEn {FASTERthan|SLOWERthan}

**Syntax 2**
TRIGger:A:PULse:TRANsition:WHEn?

**Arguments**
- **FASTERthan**
  This sets the trigger to occur when the transitioning signal is faster than the set volts/second rate.

- **SLOWERthan**
  This sets the trigger to occur when the transitioning signal is slower than the set volts/second rate.

**Example 1**
TRIGger:A:PULse:TRANsition:WHEn?
This query might return :TRIGGER:A:PULSE:TRANSITION:WHEN FASTERTHAN, indicating that the transition triggers when the transitioning signal is faster than the set volts/second rate.

**Example 2**
TRIGger:A:PULse:TRANSition:WHEn SLOWERthan
This command sets the transition trigger to work when the transitioning signal is slower than the set volts/second rate.
**TRIGger:A:PULse:SOUrce**

**Description**
This command sets or queries the source for the A pulse trigger. This source parameter applies to all classes of pulse trigger. This command is equivalent to selecting Transition Setup from the Trig menu and then choosing the desired channel from the Source pull-down list.

**Group**
Trigger

**Related Commands**
TRIGger:A:EDGE:SOUrce (see page 348)

**Syntax 1**
TRIGger:A:PULse:SOUrce CH<x>

**Syntax 2**
TRIGger:A:PULse:SOUrce?

**Argument**
• CH<x>
  This specifies one of the input channels, which range from 1 through 4.

**Example 1**
TRIGger:A:PULse:SOUrce?
This query might return :TRIGGER:A:PULSE:SOURCE CH2, indicating that channel 2 is the source for the A pulse trigger.

**Example 2**
TRIGger:A:PULse:SOUrce CH4
This command sets channel 4 as the source for the A pulse trigger.
TRIGger:A:PULse:TIMEOut?

Description
This query-only command returns the polarity and time-out duration for the A pulse time-out trigger. This command is equivalent to selecting Transition Setup from the Trig menu and then viewing the current Polarity and Time settings.

Group
Trigger

Related Commands
TRIGger:A:PULse:TIMEOut:POLarity (see page 404), TRIGger:A:PULse:TIMEOut:TIMe (see page 405)

Syntax
TRIGger:A:PULse:TIMEOut?

Example
TRIGger:A:PULse:TIMEOut?

This query might return :TRIGGER:A:PULSE:TIMEOUT:POLARITY STAYSHIGH;TIME 2.0000E-9, indicating that the A current polarity setting for the pulse trigger is STAYSHIGH (positive) and the current timeout duration is 2 ns.
**TRIgger:A:PULse:TIMEOut:POLarity**

**Description**
This command sets or queries the polarity for the A pulse time-out trigger. This command is equivalent to selecting Transition Setup from the Trig menu and then setting the desired Polarity.

**Group**
Trigger

**Related Commands**
TRIgger:A:PULse:TIMEOut? (see page 403)

**Syntax 1**
TRIgger:A:PULse:TIMEOut:POLarity {STAYSHigh|STAYSLow|EITher}

**Syntax 2**
TRIgger:A:PULse:TIMEOut:POLarity?

**Arguments**
- **STAYSHigh**
  This indicates that a pulse edge must stay high (positive) for the required time period to permit time-out triggering to occur. This is the default polarity.

- **STAYSLow**
  This indicates that a pulse edge must stay low (negative) for the required time period to permit time-out triggering to occur.

- **EITher**
  This indicates that the polarity of the time-out trigger can stay either high or low (positive or negative) for the required time period to permit time-out triggering to occur.

**Example 1**
TRIgger:A:PULse:TIMEOut:POLarity?

This query might return :TRIGGER:A:PULSE:TIMEOUT:POLARITY EITHER, indicating that the polarity of the A pulse time-out trigger can be either positive or negative.

**Example 2**
TRIgger:A:PULse:TIMEOut:POLarity STAYSHigh

This command sets the polarity of the A pulse time-out trigger to positive.
TRIGger:A:PULse:TIMEOut:TIMe

Description
This command sets or queries the pulse time-out trigger time, in seconds. This command is equivalent to selecting Transition Setup from the Trig menu and then setting the desired time-out Time.

Group
Trigger

Related Commands
TRIGger:A:PULse:TIMEOut? (see page 413)

Syntax 1
TRIGger:A:PULse:TIMEOut:TIMe <NR3>

Syntax 2
TRIGger:A:PULse:TIMEOut:TIMe?

Argument
• <NR3>
  This specifies the time-out time period, in seconds.

Example 1
TRIGger:A:PULse:TIMEOut:TIMe?
This query might return :TRIGGER:A:PULSE:TIMEOUT:TIME 2.0000E-9, indicating that the time-out time is currently set to 2 ns.

Example 2
This command sets the time-out time to 3.134 µs.
TRIGger:A:PULse:WIDth?

Description
This query-only command returns the width parameters for the A pulse width trigger. This command is equivalent to selecting Width Setup from the Trig menu and then viewing the current pulse width trigger Lower Limit, Upper Limit, Trig When and Polarity settings.

Group
Trigger

Related Commands

Syntax 1
TRIGger:A:PULse:WIDth

Example
TRIGger:A:PULse:WIDth?

This query might return :TRIGGER:A:PULSE:WIDTH:LOWLIMIT 2.0000E-9;HIGHLIMIT 2.0000E-9;WHEN WITHIN;POLARITY POSITIVE as the current A pulse trigger parameters.
TRIGger:A:PULse:WIDth:HIGHLimit

Description
This command sets or queries the upper limit for the A pulse width trigger. This command is equivalent to selecting Width Setup from the Trig menu and then setting the pulse width trigger Upper Limit.

Group
Trigger

Related Commands
TRIGger:A:PULse:WIDth? (see page 406)

Syntax 1
TRIGger:A:PULse:WIDth:HIGHLimit <NR3>

Syntax 2
TRIGger:A:PULse:WIDth:HIGHLimit?

Argument
• <NR3>
  This specifies the A pulse width trigger upper limit, in seconds.

Example 1
TRIGger:A:PULse:WIDth:HIGHLimit?
This query might return :TRIGGER:A:PULSE:WIDTH:HIGHLIMIT 2.0000E-9, indicating that the A pulse upper limit is set to 2 ns.

Example 2
TRIGger:A:PULse:WIDth:HIGHLimit 5.0E-6
This command sets the A pulse upper limit to 5 μs.
**TRIGger:A:PULse:WIDth:LOWLimit**

**Description**
This command sets or queries the lower limit for the A pulse width trigger. This command is equivalent to selecting Width Setup from the Trig menu and then setting the pulse width trigger Lower Limit.

**Group**
Trigger

**Related Commands**
TRIGger:A:PULse:WIDth? (see page 393)

**Syntax 1**
TRIGger:A:PULse:WIDth:LOWLimit <NR3>

**Syntax 2**
TRIGger:A:PULse:WIDth:LOWLimit?

**Argument**

- `<NR3>`
  This specifies the A pulse width trigger lower limit, in seconds.

**Example 1**
TRIGger:A:PULse:WIDth:LOWLimit?

This query might return TRIGGER:A:PULE:WIDTH:LOWLIMIT 1.0000E-9, indicating that the A pulse lower limit is set to 1 ns.

**Example 2**
TRIGger:A:PULse:WIDth:LOWLimit 2.0E-6

This command sets the A pulse lower limit to 2 µs.
TRIGger:A:PULse:WIDth:POLarity

Description
This command sets or queries the polarity for the A pulse width trigger. This command is equivalent to selecting Width Setup from the Trig menu and then selecting the pulse width trigger Polarity.

Group
Trigger

Related Commands
TRIGger:A:PULse:WIDth? (see page 406)

Syntax 1
TRIGger:A:PULse:WIDth:POLarity \{NEGAtive|POSITIVe\}

Syntax 2
TRIGger:A:PULse:WIDth:POLarity?

Arguments
• NEGAtive
  This specifies a negative pulse.

• POSITIVe
  This specifies a positive pulse.

Example 1
TRIGger:A:PULse:WIDth:POLarity?
This query might return :TRIGGER:A:PULSE:WIDTH:POLARITY POSITIVE, indicating a positive pulse.

Example 2
TRIGger:A:PULse:WIDth:POLarity NEGAtive
This command sets the pulse polarity to negative.
TRIGger:A:PULse:WIDth:WHEn

Description
This command sets or queries whether to trigger on a pulse width that falls outside (or within) the specified range of limits. You can define or query trigger pulse width upper and lower limits using the TRIGger:A:PULse:WIDth:HIGHLimit and TRIGger:A:PULse:WIDth:LOWLimit commands.

This command is equivalent to selecting Width Setup from the Trig menu and then choosing from the Trig When drop-down list.

Group
Trigger

Related Commands
TRIGger:A:PULse:WIDth:HIGHLimit (see page 407), TRIGger:A:PULse:WIDth:LOWLimit (see page 408)

Syntax 1
TRIGger:A:PULse:WIDth:WHEn {OUTside|WIThin}

Syntax 2
TRIGger:A:PULse:WIDth:WHEn?

Arguments
- OUTside
  This specifies a trigger when the duration of the pulse is greater than the high limit or less than the low limit specified. The high and low limits are specified with the TRIGger:A:PULse:WIDth:HIGHLimit and TRIGger:A:PULse:WIDth:LOWLimit commands respectively.

- WIThin
  This specifies a trigger when the duration of the pulse is within the high and low limits. The high and low limits are specified with the TRIGger:A:PULse:WIDth:HIGHLimit and TRIGger:A:PULse:WIDth:LOWLimit command respectively.

Example 1
TRIGger:A:PULse:WIDth:WHEn?
This query might return :TRIGGER:A:PULSE:WIDTH:WHEN OUTSIDE, indicating the conditions for generating a pulse trigger.

Example 2
TRIGger:A:PULse:WIDth:WHEn WIThin
This command specifies that the duration of the A pulse will fall within defined high and low limits.
**TRIGger:STATE?**

**Description**
This query-only command returns the current state of the triggering system. This command is equivalent to viewing the trigger status LEDs on the instrument front-panel.

**Group**
Trigger

**Related Commands**
TRIGger:A:MODe (see page 379)

**Syntax**
TRIGger:STATE?

**Outputs**
- **ARMed**
  This indicates that the oscilloscope is acquiring pretrigger information. All triggers are ignored when TRIGger:STATE is arming.

- **AUTO**
  This indicates that the oscilloscope is in the auto mode and acquires data even in the absence of a trigger.

- **DPO**
  This indicates that the oscilloscope is in DPO mode.

- **PARTial**
  This indicates that the A trigger has occurred and the oscilloscope is waiting for the B trigger to occur.

- **REAdy**
  This indicates that all pretrigger information has been acquired and that the oscilloscope is ready to accept a trigger.

- **SAVe**
  This indicates that the oscilloscope is in save mode and is not acquiring data.

- **TRIGger**
  This indicates that the oscilloscope has seen a trigger and is acquiring the post-trigger information.

**Example**
TRIGger:STATE?
This query might return :TRIGGER:STATE ARMED, indicating that the pre-trigger data is being acquired.
**TRIGger:A:TYPe**

**Description**
This command sets or queries the type of A trigger. The three types of triggers consist of Edge, Logic, and Pulse. Both Logic and Pulse triggers contain classes. Logic triggers consist of State and Pattern classes; Pulse triggers consist of Glitch, Runt, Width, Transition, and Timeout classes. Once you have set the trigger type, you may also need to identify the associated trigger class. For details on selecting Logic and Pulse trigger classes, see TRIGger:A:LOGIc:CLAss and TRIGger:A:PULse:CLAss respectively. This command is similar to selecting A Event (Main) Trigger Setup from the Trig menu and then selecting the desired Trigger Type.

**Group**
Trigger

**Related Commands**
TRIGger:A:EDGE? (see page 345), TRIGger:A:LOGIc:CLAss (see page 355), TRIGger:A:PULse:CLAss (see page 381)

**Syntax 1**
TRIGger:A:TYPe {EDGE|LOGIc|PULse}

**Syntax 2**
TRIGger:A:TYPe?

**Arguments**
- **EDGE**
  This is a normal trigger. A trigger event occurs when a signal passes through a specified voltage level in a specified direction and is controlled by the TRIGger:A:EDGE commands.
- **LOGIc**
  This specifies that a trigger occurs when specified conditions are met and is controlled by the TRIGger:A:LOGIc commands.
- **PULse**
  This specifies that a trigger occurs when a specified pulse is found and is controlled by the TRIGger:A:PULse commands.

**Example 1**
TRIGger:A:TYPe?
This query might return :TRIGGER:A:TYPE PULSE, indicating that the A trigger type is a pulse trigger.

**Example 2**
TRIGger:A:TYPe EDGE
This command sets the A trigger type to EDGE.
TRIGger:B

Description
This command sets the B trigger level to 50% of minimum and maximum. The query form of this command returns the B trigger parameters. This command is similar to selecting B Event (Delayed) Trigger Setup from the Trig menu and then viewing the current setups.

Group
Trigger

Related Commands
TRIGger:A (see page 343)

Syntax 1
TRIGger:B SETLevel

Syntax 2
TRIGger:B?

Argument
• SETLevel
This sets the B trigger level to 50% of MIN and MAX.

Example 1
TRIGger:B?
This query might return
:TRIGGER:B:STATE 0;TYPE EDGE;LEVEL -220.0000E-3;BY TIME;EDGE:SOURCE CH1;SLOPE RISE;COUPLING DC;:TRIGGER:B:TIME 16.0000E-9;EVENTS:COUNT 2

Example 2
TRIGger:B SETLevel
This command sets the B trigger level to 50% of MIN and MAX.
TRIGger:B:BY

**Description**
This command selects or returns whether the B trigger occurs after a specified number of events or a specified period of time after the A trigger. This is equivalent to selecting B Event (Delayed) Trigger Setup from the Trig menu, selecting the A→B Seq tab, and then choosing Trig After Time or Trig on nth event.

**Note:** The traditional Runs After functionality is now served by the Horizontal Delay function. For details, see the HORIZontal[:MAIN]:DELay:MODe and HORIZontal[:MAIN]:DELay:TIMe commands.

**Group**
Trigger

**Related Commands**
TRIGger:B:EVENTS:COUNt (see page 420), TRIGger:B:TIMe (see page 423), HORIZontal[:MAIN]:DELay:MODe (see page 184), HORIZontal[:MAIN]:DELay:TIMe (see page 185)

**Syntax 1**
TRIGger:B:BY {EVENTS|TIMe}

**Syntax 2**
TRIGger:B:BY?

**Arguments**
- **EVENTS**
  This sets the B trigger to take place following a set number of trigger events after the A trigger occurs. The number of events is specified by TRIGger:B:EVENTS:COUNt.

- **TIMe**
  This sets the B trigger to be ready to occur a set time after the A trigger event. The time period is specified by TRIGger:B:TIMe.

**Example 1**
TRIGger:B:BY?

This query might return :TRIGGER:B:BY EVENTS, indicating that the B trigger takes place following a set number of trigger events after the A trigger occurs.

**Example 2**
TRIGger:B:BY TIMe

This command sets the B trigger to be ready to occur a set time after the A trigger event.
TRIGger:B:EDGE?

Description
This query-only command returns the source, slope, and coupling for the edge type of B trigger. This command is equivalent to selecting B Event (Delayed) Trigger Setup from the Trig menu and then viewing the current Source, Slope, and Coupling settings.

Group
Trigger

Related Commands
TRIGger:B:EDGE:COUPling (see page 416), TRIGger:B:EDGE:SLOpe (see page 417), TRIGger:B:EDGE:SOUrce (see page 418)

Syntax
TRIGger:B:EDGE?

Example
TRIGger:B:EDGE?

This query might return :TRIGGER:B:EDGE:SOURCE CH1;SLOPE RISE;COUPLING DC
TRIGger:B:EDGE:COUPling

Description
This command sets or queries the type of coupling for the B trigger. This command is equivalent to selecting B Event (Delayed) Trigger Setup from the Trig menu and then choosing the desired setting from the Coupling drop-down list.

Group
Trigger

Related Commands
TRIGger:B:EDGE? (see page 415)

Syntax 1
TRIGger:B:EDGE:COUPling (DC|ATRIGger|NOISRej)

Syntax 2
TRIGger:B:EDGE:COUPling?

Arguments
- ATRIGger
  This sets the B trigger coupling to match the setting on the A trigger.

- DC
  This selects DC trigger coupling.

- NOISRej
  This selects DC low sensitivity.

Example 1
TRIGger:B:EDGE:COUPling?
This query might return :TRIGGER:B:EDGE:COUPLING ATRIGGER for the B trigger coupling.

Example 2
TRIGger:B:EDGE:COUPling DC
This command selects DC for the B trigger coupling.
**TRIGger:B:EDGE:SLOpe**

**Description**
This command sets or queries the slope for the B edge trigger. This command is equivalent to selecting B Event (Delayed) Trigger Setup from the Trig menu and then choosing the desired Slope.

**Group**
Trigger

**Related Commands**
TRIGger:B:EDGE? (see page 415)

**Syntax 1**
TRIGger:B:EDGE:SLOpe {RISe|FALL}

**Syntax 2**
TRIGger:B:EDGE:SLOpe?

**Arguments**
- **RISe**
  This specifies the trigger on the rising or positive edge of a signal.
- **FALL**
  This specifies the trigger in the falling or negative edge of a signal.

**Example 1**
TRIGger:B:EDGE:SLOpe?

This query might return :TRIGGER:B:EDGE:SLOPE RISE, indicating that the B edge trigger occurs on the rising slope.

**Example 2**
TRIGger:B:EDGE:SLOpe FALL

This command sets the B edge trigger to occur on the falling slope.
TRIGger:B:EDGE:SOURce

Description
This command sets or queries the source for the B edge trigger. This command is equivalent to selecting B Event (Delayed) Trigger Setup from the Trig menu and then choosing the desired setting from the Source drop-down list.

Group
Trigger

Related Commands
TRIGger:B:EDGE? (see page 415)

Syntax 1
TRIGger:B:EDGE:SOURce {AUXiliary|CH<x>}

Syntax 2
TRIGger:B:EDGE:SOURce?

Arguments
• AUXiliary
  This specifies an external trigger (using the Auxiliary Trigger Input connector, located on the rear panel of the oscilloscope) as the B trigger source.

• CH<x>
  This specifies one of the input channels as the delay trigger source. Input channels are specified by x, which can range from 1 through 4.

Example 1
TRIGger:B:EDGE:SOURce?

This query might return :TRIGGER:B:EDGE:SOURCE CH1, indicating that the current input source for the B trigger is channel 1.

Example 2
TRIGger:B:EDGE:SOURce CH4

This command sets channel 4 as the input source for the B trigger.
TRIGger:B:EVENTS?

Description
This query-only command returns the current B trigger events parameter. This command is equivalent to selecting B Event (Delayed) Trigger Setup from the Trig menu, selecting the A→B Seq tab, choosing Trig on nth event, and then viewing the Trig Event setting.

Group
Trigger

Related Commands
TRIGger:B:EVENTS:COUNt (see page 420)

Syntax
TRIGger:B:EVENTS?

Example
TRIGger:B:EVENTS?

This query might return :TRIGGER:B:EVENTS:COUNt 2, indicating that 2 events must occur before the B trigger occurs.
TRIGger:B:EVENTS:COUNt

Description
This command sets or queries the number of events that must occur before the B trigger (when TRIG:DELay:BY is set to EVENTS). This command is equivalent to selecting B Event (Delayed) Trigger Setup from the Trig menu, selecting the A→B Seq tab, choosing Trig on nth event, and then setting the desired Trig Event value.

Group
Trigger

Related Commands
TRIGger:B:EVENTS? (see page 419)

Syntax 1
TRIGger:B:EVENTS:COUNt <NR1>

Syntax 2
TRIGger:B:EVENTS:COUNt?

Argument
• <NR1>
  This is the number of B edge trigger events, which can range from 1 to 10,000,000.

Example 1
TRIGger:B:EVENTS:COUNt?
This query might return :TRIGGER:B:EVENTS:COUNT 2, indicating that two events must occur after the A trigger before the B trigger can occur.

Example 2
TRIGger:B:EVENTS:COUNt 4
This command specifies that the B trigger will occur four trigger events after the A trigger.
TRIGGER:B:LEVEL

Description
This command sets or queries the level for the B trigger. This command is equivalent to selecting B Event (Delayed) Trigger Setup from the Trig menu, selecting the A→B Seq tab, and then setting the B Trigger Level voltage.

Group
Trigger

Related Commands
TRIGGER:A:LEVEL (see page 353), TRIGGER:B (see page 413), TRIGGER:B:EDGE:SOURce (see page 418)

Syntax 1
TRIGGER:B:LEVEL {ECL|TTL|<NR3>}

Syntax 2
TRIGGER:B:LEVEL?

Arguments
• ECL
  This specifies a preset ECL level of -1.3 V.

• TTL
  This specifies a preset TTL level of 1.4 V.

• <NR3>
  This is the B trigger level, in volts.

Example 1
TRIGGER:B:LEVEL?
This query might return :TRIGGER:B:LEVEL 173.0000E-03, indicating that the B trigger level is currently set at 173 mV.

Example 2
TRIGGER:B:LEVEL ECL
This command sets the B trigger level to -1.3 V.
This command sets the B trigger level to 1.4 V.
TRIGger:B:STATE

Description
This command sets or queries the state of B trigger activity. If the trigger B state is on, the B trigger is part of the triggering sequence. If trigger B state is off, then only the A trigger causes the trigger event.

Group
Trigger

Related Commands
TRIGger:A:MODe (see page 379)

Syntax 1
TRIGger:B:STATE {ON|OFF|<NR1>}

Syntax 2
TRIGger:B:STATE?

Arguments
• ON
  This indicates that the B trigger is active and in conjunction with the A trigger causes trigger events.

• OFF
  This indicates that only the A trigger causes trigger events.

• <NR1>
  A 0 turns off the B trigger; any other value activates the B trigger.

Example 1
TRIGger:B:STATE?
This query might return :TRIGGER:B:STATE 0, indicating that the B trigger is inactive and that only the A trigger causes trigger events.

Example 2
TRIGger:B:STATE ON
This command sets the B trigger to active, making it capable of causing trigger events.
TRIGger:B:TIMe

Description
This command sets or queries trigger B delay time. Trigger B time applies only if TRIGger:B:BY is set to TIMe. This command is equivalent to selecting B Event (Delayed) Trigger Setup from the Trig menu, choosing the A→B Seq tab, and then setting Trig Delay.

Group
Trigger

Related Commands
TRIGger:B:BY (see page 414), TRIGger:B:EVENTS:COUNt (see page 420)

Syntax 1
TRIGger:B:TIMe <NR3>

Syntax 2
TRIGger:B:TIMe?

Argument
• <NR3>
  This is the B trigger time, in seconds.

Example 1
TRIGger:B:TIMe?
This query might return :TRIGGER:B:TIME 16.0000E−9, indicating that trigger B time is currently set to 16 ns.

Example 2
TRIGger:B:TIMe 4E−6
This command sets trigger B time to 4 µs.
TRIGger:B:TYPe

Description
This command sets or queries the type of B trigger. This command is equivalent to selecting B Event (Delayed) Trigger Setup from the Trig menu and then choosing Edge.

Group
Trigger

Related Commands
TRIGger:A:TYPe (see page 412)

Syntax 1
TRIGger:B:TYPe EDGE

Syntax 2
TRIGger:B:TYPe?

Argument

• EDGE
  This sets the B trigger type to edge.

Example 1
TRIGger:B:TYPe?
This query will return :TRIGGER:B:TYPE EDGE

Example 2
TRIGger:B:TYPe EDGE
This command sets the B trigger type to edge.
Vertical Command Group

Vertical Overview

You use the commands in the Vertical Command Group to control the vertical setup of all live (channel) waveforms for acquisition and to control the display of channel, reference, and math waveforms. This group contains commands to set up vertical parameters for electrical or optical signals, depending on the sampling module in use.

The `SELect:<wfm>` command also selects the waveform that many commands in other command groups use.

You may replace `VOLts` with `SCAle` in the vertical commands. This provides program compatibility with earlier models of Tektronix oscilloscopes.
## Vertical Commands

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<tr>
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<tr>
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</tr>
</tbody>
</table>
CH<x>? 

Description
This query-only command returns the vertical parameters for the specified channel. The channel is specified by x, which ranges from 1 through 4. This command is similar to selecting Vertical Setup from the Vertical menu.

Group
Vertical

Syntax
CH<x>?

Example
CH1?

This query might return:

```
:CH1:BANDWIDTH 1.0000E+09; COUPLING DC; DESKEW 0.0000E+00; OFFSET 0.0000E+00; POSITION 0.0000E+00; SCALE 5.0000E-01; TERMINATION 1.0000E+06; PROBCAL INIT; PROBE:GAIN 1.0000E+00; RESISTANCE 1.0000E+06; UNITS "V"; ID:TYPE "1X"; SERNUMBER "N/A"; :CH1:PROBEPUN:EXTATTEN 1.0000E+00; EXTUNITS "None"; :CH1:LABEL:NAME ""; XPOS 5; YPOS 5, showing the vertical parameters for channel 1.
```
**CH<x>:BANdwidth**

**Description**
This command sets or queries the selectable low-pass bandwidth limit filter of the specified channel. This is equivalent to selecting Bandwidth from the Vertical menu.

**Group**
Vertical

**Syntax 1**
CH<x>:BANdwidth \{TWEnty|TWOfifty|FULl|<NR3>\}

**Syntax 2**
CH<x>:BANdwidth?

**Arguments**
- **TWEnty**
  This sets the upper bandwidth limit to 20 MHz.
- **TWOfifty**
  This sets the upper bandwidth limit to 250 MHz.
- **FULl**
  This disables any optional bandwidth limiting. The specified channel operates at its maximum attainable bandwidth.
- **<NR3>**
  This represents a double-precision ASCII string, which is then rounded to available bandwidths using geometric rounding and sets the upper bandwidth.

**Example 1**
CH1:BANdwidth TWEnty

This command sets the bandwidth of channel 1 to 20 MHz.

**Example 2**
CH2:BANdwidth?

This query might return :CH2:BANDWIDTH 1.0000E+09, indicating that there is no bandwidth limiting on channel 2.
CH<x>:COUPling

Description
This command sets or queries the input attenuator coupling setting for the specified channel. This command is equivalent to selecting Coupling from the Vertical menu.

Group
Vertical

Syntax 1
CH<x>:COUPling {AC|DC|GND}

Syntax 2
CH<x>:COUPling?

Arguments

- **AC**
  This sets the specified channel to AC coupling.

- **DC**
  This sets the specified channel to DC coupling.

- **GND**
  This sets the specified channel to ground. Only a flat, ground-level waveform will be displayed.

Example 1
CH2:COUPling AC
This command sets channel 2 to AC coupling.

Example 2
CH3:COUPling?
This query might return :CH3:COUPling DC, indicating that channel 3 is set to DC coupling.
CH<x>:DESKew

Description
This command sets or queries the deskew time for the specified channel. The channel is specified by x, which can range from 1 through 4. This command is equivalent to selecting Deskew from the Vertical Setup menu.

You can adjust the deskew time to add an independent, channel-based delay time to the delay (set by the horizontal position control and common to all channels) from the common trigger point to first sample taken for each channel. This lets you compensate individual channels for different delays introduced by their individual input hook ups.

Group
Vertical

Syntax 1
CH<x>:DESKew <NR3>

Syntax 2
CH<x>:DESKew?

Argument
• <NR3>
  This is the deskew time for this channel, ranging from -25 ns to +25 ns with a resolution of 1 ps. Out-of-range values are clipped.

Example 1
CH4:DESKew 5.0E-9
This command sets the deskew time for channel 4 to 5 ns.

Example 2
CH2:DESKew?
This query might return :CH2:DESKEW 2.0000E-09, indicating that the deskew time for channel 2 is set to 2 ns.
**CH<x>:LABEL:NAMe**

**Description**
This command sets or queries the label attached to the displayed waveform for the specified channel. This command is equivalent to selecting Label from the Vertical menu.

**Group**
Vertical

**Syntax 1**
CH<x>:LABEL:NAMe <str>

**Syntax 2**
CH<x>:LABEL:NAMe?

**Argument**
- <str>
  This is an alphanumeric character string, ranging from 1 through 32 characters in length.

**Example 1**
CH2:LABEL:NAMe "Pressure"

This command changes the waveform label for the CH2 waveform to “Pressure”.

**Example 2**
CH3:LABEL:NAMe?

This query might return :CH3:LABEL:NAME "CH3", indicating that the waveform label for the CH 3 waveform is "CH3".
CH<x>::LABEL:XPOS

Description
This command sets or queries the X screen offset at which the label (attached to the displayed waveform of the specified channel) is displayed, relative to the left edge of the screen. Channels are specified by x, which ranges from 1 through 4. This command is equivalent to selecting Label from the Vertical menu and either viewing or setting X Pos.

Group
Vertical

Syntax 1
CH<x>::LABEL:XPOS <NR1>

Syntax 2
CH<x>::LABEL:XPOS?

Argument
• <NR1>
  This is the location (in pixels) where the waveform label for the selected channel is displayed, relative to the left edge of the screen. Arguments should be integers ranging from 0 through 500.

Example 1
CH3::LABEL:XPOS 50
This command moves the waveform label for the CH3 waveform, so that it begins 50 pixels to the right of the left edge of the screen.

Example 2
CH2::LABEL:XPOS?
This query might return :CH2::LABEL:XPOS 50, indicating that the waveform label for the CH2 waveform is currently 50 pixels to the right of the left edge of the screen.
**CH<x>:LABEL:YPOS**

**Description**
This command sets or queries the Y screen offset at which the label (attached to the displayed waveform of the specified channel) is displayed, relative to the top edge of the screen. Channels are specified by x, which ranges from 1 through 4. This command is equivalent to selecting Label from the Vertical menu and either viewing or setting Y Pos.

**Group**
Vertical

**Syntax 1**
CH<x>:LABEL:YPOS <NR1>

**Syntax 2**
CH<x>:LABEL:YPOS?

**Argument**

• <NR1>

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

**Example 1**
CH3:LABEL:YPOS -25

This command moves the waveform label for the CH3 waveform to just beneath (25 pixels below) the top of the screen.

**Example 2**
CH2:LABEL:YPOS?

This query might return CH2:LABEL:YPOS 0, indicating that the waveform label for the CH2 waveform is currently located just beneath the top of the screen.
CH<x>:OFFSet

Description
This command sets or queries the vertical offset for the specified channel. The channel is specified by x, which can range from 1 through 4. This command is equivalent to selecting Offset from the Vertical menu.

This command offsets the vertical acquisition window (moves the level at the vertical center of the acquisition window) for the selected channel. Visualize offset as scrolling the acquisition window towards the top of a large signal for increased offset values, and scrolling towards the bottom for decreased offset values. The resolution of the vertical window sets the offset increment for this control.

Offset adjusts only the vertical center of the acquisition window for channel waveforms to help determine what data is acquired. The instrument always displays the input signal minus the offset value. The channel reference marker will move to the vertical graticule position given by the negative of the offset value divided by the scale factor, unless that position is off-screen. If the computed coordinate for the reference mark is off-screen, the mark moves to the nearest screen limit and changes from a right-pointing arrow (→) to an arrow pointing in the appropriate off-screen direction.

The settable range of a channel offset is either ±100 V, ±10V or ±1.0 V, depending on the vertical scale factor.

Vertical Scale Adjust Factors

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<th>When Internal scale adjust gain is:</th>
<th>From 0.001 to 0.1</th>
<th>From 0.101 to 0.1</th>
<th>From 1.01 to 100.0</th>
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</thead>
<tbody>
<tr>
<td>Product of Offset range, probe gain and transducer gain is:</td>
<td>±1.0 V</td>
<td>±10.0 V</td>
<td>±100.0 V</td>
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</table>

**Note:** The above table describes oscilloscope behavior only when no probe is attached and when the external attenuation factor is 1.0.

Group
Vertical

Related Commands
CH<x>POSition (see page 437)

Syntax 1
CH<x>:OFFSet <NR3>

Syntax 2
CH<x>:OFFSet?

Argument
• <NR3>

This is the offset value for the specified channel, ranging from -1.6V through 1.6V.

Example 1
CH3:OFFSet 2.0E-3
This command sets the offset for channel 3 to 2mV.

Example 2
CH2:OFFSet?
This query might return :CH4:OFFSET 1.0000E-03, indicating that the offset for channel 4 is set to 1 mV.
**CH<x>:P**OSition**

**Description**
This command sets or queries the vertical position of the specified channel. The channel is specified by x, which ranges from 1 through 4. The position value is applied to the signal before it is digitized. This command is equivalent to selecting Position/Scale from the Vertical menu and either viewing or setting Position.

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

**Group**
Vertical

**Related Commands**
CH<x>:OFFSet (see page 436), REF<x>:P**OSition (see page 457), MATH<x>:POS**ition (see page 206)

**Syntax 1**
CH<x>:P**OSition <NR3>

**Syntax 2**
CH<x>:P**OSition?

**Argument**

• <NR3>
  This is the position value, in divisions from the center graticule, ranging from 8 to -8 divisions.

**Example 1**
CH2:POS**ition 1.3E+00
This command positions the Channel 2 input signal 1.3 divisions above the center graticule.

**Example 2**
CH1:POS**ition?
This query might return :CH1:POSITION -1.3000E+00, indicating that the current position of Channel 1 is 1.3 divisions below the center graticule.
CH<x>:PRObe?

Description
This query-only command returns all information concerning the probe that is attached to the specified channel. The channel is specified by x, which ranges from 1 through 4.

Group
Vertical

Related Commands
CALibrate:PRObestate:CH<x>? (see page 43), CH<x>:PROBECal? (see page 439)

Syntax
CH<x>:PROBE?

Example
CH2:PROBE?

This query might return :CH2:PROBE:GAIN 1.0000E-01; RESISTANCE 1.0000E+07;UNITS "V";ID:TYPE *10X";SERNUMBER "N/A" for a 10x probe, indicating that the attenuation factor for the probe attached to channel 2 is 100.0 mV (assuming that probe units are set to volts).
CH<x>-PROBECal?

Description
This query-only command returns the probe calibration state for the selected channel. The channel is specified by x, which ranges from 1 through 4. This command is equivalent to selecting Probe Cal from the Vertical menu.

Group
Vertical

Related Commands
CALibrate:PRObestate:CH<x>? (see page 43)

Syntax
CH<x>-PROBECal?

Outputs
• FAIL
  This signifies that the probe calibration has failed for the selected channel.
• INIT
  This signifies that the probe calibration has not yet been run for the selected channel.
• PASS
  This signifies the probe calibration has passed for the selected channel.

Example
CH2:PROBECal?
This query might return :CH2:PROBECAL PASS, indicating that the probe calibration has passed for channel 2.
**CH<x>:_PRObe:GAIN?**

**Description**
This query-only command returns the gain factor of the probe that is attached to the specified channel. The channel is specified by x, which ranges from 1 through 4. The "gain" of a probe is the output divided by the input transfer ratio. For example, a common 10x probe has a gain of 0.1.

**Group**
Vertical

**Related Commands**
CH<x>:_SCAlE (see page 449)

**Syntax**
CH<x>:_PRObe:GAIN?

**Example**
CH2:_PRObe:GAIN?

**Example**
This query might return :CH2:PROBE:GAIN 0.1000E+00, indicating that the attached 10x probe delivers 0.1 V to the channel 2 BNC for every 10 V applied to the probe input.
CH<x>:PRObe:ID?

Description
This query-only command returns the type and serial of the probe that is attached to the specified channel. The channel is specified by x, which ranges from 1 through 4.

Group
Vertical

Syntax
CH<x>:PRObe:ID?

Example
CH2:PRObe:ID?

This query might return :CH2:PROBE:ID:TYPE "10X"; SERNUMBER "N/A", indicating that a passive 10x probe of unknown serial number is attached to channel 2.
**CH<x>:PRObe:ID:TYPe?**

**Description**
This query-only command returns the type of probe that is attached to the specified channel. The channel is specified by x, which ranges from 1 through 4. Level 2 (or higher) probes supply their exact product nomenclature; for Level 0 or 1 probes, a generic 'type string' of "nnX" is returned.

**Group**
Vertical

**Syntax**
CH<x>:PRObe:ID:TYPe?

**Example**
CH1:PRObe:ID:TYPe?

This query might return :CH1:PROBE:ID:TYPE "P6203", indicating that P6203-type probe is attached to channel 1.
CH<x>:PRObe:ID:SERnumber?

Description
This query-only command returns the serial number of the probe that is attached to the specified channel. The channel is specified by x, which ranges from 1 through 4.

Note: For Level 0 and 1 probes, the serial number will be "N/A".

Group
Vertical

Syntax
CH<x>:PRObe:ID:SERnumber?

Example
CH1:PRObe:ID:SERnumber?

This query might return :CH1:PROBE:ID:SERNUMBER "B010289", indicating that the serial number of the probe attached to channel 1 is B010289.
**CH<x>:PRObe:RESistance?**

**Description**
This query-only command returns the resistance factor of the probe that is attached to the specified channel. The channel is specified by x, which ranges from 1 through 4.

**Group**
Vertical

**Syntax**
CH<x>:PRObe:RESistance?

**Example**
CH2:PRObe:RESistance?

This query might return :CH2:PROBE:RESISTANCE 10.0000E+06, indicating that the input resistance of the probe attached to Channel 2 is 10.0 megOhms.
CH<x>:PRObe:UNIts?

Description
This query-only command returns a string describing the units of measure for the probe attached to the specified channel. The channel is specified by x, which ranges from 1 through 4.

Group
Vertical

Related Commands
CH<x>:PROBEFunc:EXTUnits (see page 448)

Syntax
CH<x>:PRObe:UNIts?

Example
CH4:PRObe:UNIts?

This query might return "CH4:PROBE:UNITS "V", indicating that the units of measure for the probe attached to channel 4 are volts."
CH<x>:PROBEFunc:EXTatten

Description
This command instructs the oscilloscope when to make vertical settings (offset and scale) for the specified channel effective. The vertical settings become effective at the input of the external network or transducer (of a specified input/output transfer ratio) when the output is connected to the input of the probe attached to the channel.

The channel is specified by x, which ranges from 1 through 4. There is also a corresponding query, which returns the user-specified attenuation. Note that, as the name implies, this command deals with an attenuation factor, not a gain factor, unlike CH<x>:PRObe? (Note that this command returns a value independent of the External Attenuation). For example, if you specify a 20x attenuation factor for channel 1, then the commands return the following values (assuming that a 1x probe is presently attached, since the external attenuation is used in combination with the probe attenuation):

CH1:PRObe:EXTA? 20.00E+0
CH1:PRObe? 1.0E+0

This command is equivalent to selecting Attenuation from the Vertical command and then viewing or setting Ext Atten.

Group
Vertical

Related Commands
CH<x>:PROBEFunc:EXTDBatten (see page 447)

Syntax 1
CH<x>:PROBEFunc:EXTatten <NR3>

Syntax 2
CH<x>:PROBEFunc:EXTatten?

Argument
• <NR3>

This is the attenuation value, which is specified as a multiplier in the range from 1.00E-10 to 1.00E+10.

Example 1
CH1:PROBEFunc:EXTatten 167.00E-3

This command specifies an external 'gain of six' network, which is connected between the user's input signal and the input of the probe attached to channel 1.

Example 2
CH2:PROBEFunc:EXTatten?

This query might return:CH2:PROBEFUNC:EXTATTEN 1.0000E+00, indicating that the probe attached to channel 2 is connected directly to the user's signal.
CH<x>:PROBEFunc:EXTDBatten

Description
This command instructs the oscilloscope to make the vertical scale and offset settings for a specified channel effective at the input of an external network or transducer (with a specified input ÷ output transfer ratio in decibels). It is assumed that the input of the probe for the specified channel is connected to the output of this network or transducer. The channel is specified by x, which ranges from 1 through 4.

There is also a corresponding query, which returns the user-specified attenuation, in decibels. Note that 1X = 0 dB, 10X = 20 dB, 100X = 40 dB etc.

This command is equivalent to selecting Attenuation from the Vertical menu and then either viewing or setting Ext Att(dB).

Group
Vertical

Related Commands
CH<x>:PROBEFunc:EXTatten (see page 446)

Syntax 1
CH<x>:PROBEFunc:EXTDBatten <NR3>

Syntax 2
CH<x>:PROBEFunc:EXTDBatten?

Argument
- <NR3>
  This is the attenuation value, which is specified in the range from -200.00 to 200.00 dB.

Example 1
CH3:PROBEFunc:EXTDBatten 2.5
This command specifies an external 2.5 dB attenuator on channel 3.

Example 2
CH1:PROBEFunc:EXTDBatten?
This query might return :CH1:PROBEFunc:EXTDBatten 2.5000E+00, indicating that the attenuation for channel 1 is 2.5 dB.
CH<x>:PROBEFunc:EXTUnits

Description
This command sets the unit of measurement for the external attenuator of the specified channel. The channel is specified by x, which ranges from 1 through 4. There is also a corresponding query that returns the user-specified unit of measurement for the external attenuator. Unless these units are set to the factory default string value of "None", they become the attenuated units of measure for that channel. It is assumed that the probe connected to the specified channel is of the correct type to receive the output of the user's external transducer or network.

Group
Vertical

Related Commands
CH<x>:PRObe:UNIts? (see page 445)

Syntax 1
CH<x>:PROBEFunc:EXTUnits <str>

Syntax 2
CH<x>:PROBEFunc:EXTUnits?

Argument
• <str>
  This can contain a string of up to eight characters to indicate the attenuation unit of measurement for the specified channel. However, most oscilloscope attenuators only display the first two characters.

Example 1
CH4:PROBEFunc:EXTUnits "Pa"

This command sets the unit of measurement for the Channel 4 external attenuator.

Example 2
CH2:PROBEFunc:EXTUnits?

This query might return :CH2:PROBEFunc:EXTUNITS "Pa", indicating that the Channel 2 external attenuator units of measurement are pascals.
**CH<x>:SCAle**

**Description**
This command sets or queries the vertical scale of the specified channel. The channel is specified by x, which can range from 1 through 4. Sending this command is equivalent to selecting Vertical Setup from the Vertical menu and then viewing or setting the Scale.

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

Scale affects all waveforms, but affects channel waveforms differently from other waveforms:
- For channel waveforms, this setting controls the vertical size of the acquisition window as well as the display scale. The range and resolution of scale values depends on the probe attached and any other external factors you have specified.
- For reference and math waveforms, this setting controls the display only, graphically scaling these waveforms and having no affect on the acquisition hardware.

**Group**
Vertical

**Related Commands**
CH<x>OFFSet (see page 436), CH<x>:POSition (see page 437), REF<x>:SCAle (see page 458), MATH<x>:SCAle (see page 207)

**Syntax 1**

CH<x>:SCAle <NR3>

**Syntax 2**

CH<x>:SCAle?

**Argument**

- `<NR3>`
  This is the vertical channel scale in units per division.

**Example 1**

CH4:SCAle 100E-03

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

**Example 2**

CH2:SCAle?

This query might return :CH2:SCALE 1.0000E+00, indicating that the current scale setting of channel 2 is 1 volt per division.
CH<x>:TERmination

Description
This command sets the connected/disconnected status of a 50 ohm resistor, which may be connected between the specified channel’s coupled input and oscilloscope ground. The channel is specified by x, which ranges from 1 through 4. There is also a corresponding query that requests the termination parameter and translates this enumeration into one of the two float values. This command is equivalent to selecting Termination from the Vertical menu or toggling between termination values from the VERTICAL area of the front-panel.

Group
Vertical

Syntax 1
CH<x>:TERmination <NR3>

Syntax 2
CH<x>:TERmination?

Argument
• <NR3>
  This specifies the channel input resistance, which can be specified as 50 or 1,000,000.

Example 1
CH4:TERmination 50.0E+0
This command establishes 50 ohm impedance on channel 1.

Example 2
CH2:TERmination?
This query might return :CH2:TERMINATION 1.0000E+06, indicating that channel 2 is set to 1 MegOhm.
**MATH<x>:POSition?**

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

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

**Groups**
Math, Vertical

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

**Syntax 1**
MATH<x>:POSition <NR3>

**Syntax 2**
MATH<x>:POSition?

**Argument**
• <NR3>
  This is the desired position in divisions from the center graticule.

**Example 1**
MATH2:POSition 1.3E+00
This command positions the Math 2 input signal 1.3 divisions higher than a position of 0.

**Example 2**
MATH1:POSitioin?
This query might return :MATH1:POSITION -1.3000E+00, indicating that the current position of Math 1 is 1.3 divisions below the center graticule.
MATH<x>:SCAle

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

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

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

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

Group
Math, Vertical

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

Syntax 1
MATH<x>:SCAle <NR3>

Syntax 2
MATH<x>:SCAle?

Argument
• <NR3>
  This is the scale, in volts, amps or watts per division. The range is from 100.0E-36 through 100.0E+36.

Example 1
MATH4:SCAle 100E-03
This command sets the Math 4 scale to 100 mV per division.

Example 2
CH2:SCAle?
This query might return :MATH2:SCALE 1.0000E+00, indicating that the current scale setting of Math 2 is 1 volt per division.
REF<x>:LABel?

Description
This query-only command returns a branch query containing the waveform label name and the coordinates at which the label (attached to the displayed waveform of the specified reference) is displayed. References are specified by x, which ranges from 1 through 4. This command is equivalent to selecting Reference Waveforms from the File menu and then choosing Label from the drop-down list.

Group
Vertical

Related Commands
REF<x>:LABel:NAMe (see page 454), REF<x>:LABel:XPOS (see page 455), REF<x>:LABel:YPOS (see page 456)

Syntax
REF<x>:LABel?

Argument
None.

Example
REF1:LABel?

This query will return :REF1:LABel:NAMe "Myname";:XPOS -200;:YPOS 50.
REF<x>:LABel:NAMe

Description
This command sets or queries the label of the designated waveform. References are specified by x, which ranges from 1 through 4. This command is equivalent to selecting Reference Waveforms from the File menu and then choosing Reference Setup from the drop-down list. Then select the tab associated with the reference for which you want to create a label and then enter a label in the Label box.

Group
Vertical

Related Commands
REF<x>:LABel? (see page 453)

Syntax 1
REF<x>:LABel:NAMe <String>

Syntax 2
REF<x>:LABel:NAMe?

Argument
• <String>
  This is the character string that will be used for the reference waveform label name.

Example 1
REF3:LABel:NAMe?
  This query might return :REF3:LABEL:NAME "Signal2", indicating that the label name for Reference 3 is currently set to "Signal2".

Example 2
REF4:LABel:NAMe "My Reference"
  This command sets the label name of Reference 4 to "My Reference".
REF<x>:LABel:XPOS

Description
This command sets or queries the X screen offset at which the label (attached to the displayed waveform of the specified reference) is displayed, relative to the left edge of the screen. References are specified by x, which ranges from 1 through 4. This command is equivalent to selecting Reference Waveforms from the File menu and then choosing Reference Setup from the drop-down list. Then either view or set X Position.

Group
Vertical

Related Commands
REF<x>:LABel? (see page 453)

Syntax 1
REF<x>:LABel:XPOS <NR1>

Syntax 2
REF<x>:LABel:XPOS?

Argument
• <NR1>
  This is the location (in pixels) where the waveform label for the selected reference is displayed, relative to the left edge of the screen. Arguments should be integers ranging from 0 through 500.

Example 1
REF4:LABel:XPOS 10
This command moves the waveform label for the REF3 waveform, so that it begins 10 pixels to the right of the left edge of the screen.

Example 2
REF2:LABel:XPOS?
This query might return :REF2:LABEL:XPOS 150, indicating that the x-axis for the REF 2 waveform is currently 150 pixels to the right of the left edge of the screen.
REF<x>:LABel:YPOS

Description
This command sets or queries the Y screen offset at which the label (attached to the displayed waveform of the specified reference) is displayed, relative to the top edge of the screen. References are specified by x, which ranges from 1 through 4. This command is equivalent to selecting Reference Waveforms from the File menu and then choosing Reference Setup from the drop-down list. Then either view or set Y Position.

Group
Vertical

Related Commands
REF<x>:LABel? (see page 453)

Syntax 1
REF<x>:LABel:YPOS <NR1>

Syntax 2
REF<x>:LABel:YPOS?

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

Example 1
REF3:LABel:YPOS -10
This command moves the waveform label for the REF3 waveform to just beneath (10 pixels) the top of the screen.

Example 2
REF2:LABel:YPOS?
This query might return :REF2:LABEL:YPOS 0, indicating that the waveform label for the REF2 waveform is currently located just beneath the top of the screen.
REF<x>:POSITION

Description
This command sets or queries the vertical position of the specified reference waveform. The reference waveform is specified by x, which ranges from 1 through 4. This command is equivalent to selecting Reference Waveforms from the File menu, choosing Reference Setup from the drop-down list and then entering the desired Position value.

Increasing the position value of a waveform causes the waveform to move up, and decreasing the position value causes the waveform to move down. Position adjusts only the display position of a waveform. The position value determines the vertical graticule coordinate at which signal values are displayed. For example, if the position for Reference 3 is set to 2.0, the signal represented by that reference will be displayed at 2.0 divisions above the center of the screen.

Note: References are static. All position and scale changes are applied in a post-processing mode.

Group
Vertical

Related Commands
CH<x>:POSITION (see page 437), MATH<x>:POSITION (see page 206)

Syntax 1
REF<x>:POSITION <NR3>

Syntax 2
REF<x>:POSITION?

Argument
• <NR3>

This is the desired position, in divisions from the central graticule. The range is from -5 to 5 divisions.

Example 1
REF2:POSITION 1.3E+00

This command positions the Reference 2 input signal 1.3 divisions above the center graticule.

Example 2
REF1:POSITION?

This query might return :REF1:POSITION -1.3000E+00, indicating that the current position of Reference 1 is 1.3 divisions below the center graticule.
REF<x>:SCAle

Description
This command sets or queries the vertical scale of the specified reference waveform. The reference is specified by x, which can range from 1 through 4.

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

Scale affects all waveforms, but affects reference and math waveforms differently from channel waveforms:
- For reference and math waveforms, this setting controls the display only, graphically scaling these waveforms and having no affect on the acquisition hardware.
- For channel waveforms, this setting controls the vertical size of the acquisition window as well as the display scale. The range and resolution of scale values depends on the probe attached and any other external factors you have specified.

Group
Vertical

Related Commands
CH<x>:SCAle (see page 449), MATH<x>:SCAle (see page 207)

Syntax 1
REF<x>:SCAle <NR3>

Syntax 2
REF<x>:SCAle?

Argument
• <NR3>
  This is the gain, in user units per division.

Example 1
REF4:SCAle 100E-03
This command sets the Reference 4 scale to 100 mV per division.

Example 2
CH2:SCAle?
This query might return :REF2:SCALE 1.0000E+00, indicating that the current scale setting of Reference 2 is 1 volt per division.
SELect?

**Description**
This query-only command returns the selected waveform that is affected by the front-panel controls and the display status (on or off) of all waveforms. This query command is equivalent to selecting Measurement Setup from the Measure menu and viewing the Source waveform setting.

**Group**
Vertical

**Syntax**
SELect?

**Example**
SELect?

This query might return: SELECT:CH1 1;CH2 0;CH3 0;CH4 0;MATH1 0;MATH2 0;MATH3 0;MATH4 0;REF1 0;REF2 0;REF3 0;REF4 0;CONTROL CH1
**SESelect:<wfm>**

**Description**
This command turns on a specified waveform. This action also resets the acquisition. The query returns whether the channel is on or off but does not indicate whether it is the selected waveform.

**Group**
Vertical

**Syntax 1**
SESelect:<wfm> {ON|OFF|<NR1>}

**Syntax 2**
SESelect:<wfm>?

**Arguments**
- **ON**
  This turns on the display of the specified waveform. This waveform also becomes the selected waveform.
- **OFF**
  This turns off the display of the specified waveform.
- **<NR1>**
  A 0 turns off the display of the specified waveform; any other value turns on the display of the specified waveform.

**Example**
SESelect:CH2 ON
This command turns the channel 2 display on and selects channel 2.
SESelect:REF1?
This query might return :SELECT:REF1, indicating that REF1 is the selected waveform.
SELect:CONTROl <wfm>

Description
This command sets or queries the waveform that is selected as the 'implied' recipient of channel-related commands that support legacy style programs. The command form also performs the equivalent of a SELECT:<wfm> ON command. This command is equivalent to selecting Measurement Setup from the Measure menu and either viewing or setting the Source waveform.

Group
Vertical

Syntax 1
SELect:CONTROl \( (CH^x|MATH^x|REF^x) \)

Syntax 2
SELect:CONTROl?

Arguments

- \( CH^x \)
  This selects the specified channel waveform as the waveform that is affected by the front-panel controls. The valid channel waveform range is from 1 through 4.

- \( MATH^x \)
  This selects the specified math waveform as the waveform that is affected by the front-panel controls. The valid math waveform range is from 1 through 4.

- \( REF^x \)
  This selects the specified reference waveform as the waveform that is affected by the front-panel controls. The valid reference waveform range is from 1 through 4.

Example 1
SELect:CONTROl CH2
This command resets acquisition, displays channel 2, and causes the selected waveform to be the implied object of waveform-manipulating commands.

Example 2
SELect:CONTROl?
This query might return :SELECT:CONTROL MATH3, indicating that math 3 is the implied object of waveform-manipulating commands.
Waveform Transfer Command Group

Waveform Transfer Overview

You use the commands in the Waveform transfer Command Group to transfer waveform data points to and from the instrument. Waveform data points are a collection of values that define a waveform. One data value usually represents one data point in the waveform record. When working with envelope waveforms, each data value is either the minimum or maximum of a min/max pair. Before you transfer waveform data, you must specify the data format, record length, and waveform source.

Data Formats

Acquired waveform data uses eight or more bits to represent each data point. The number of bits used depends on the acquisition mode specified when you acquired the data. Data acquired in SAMple or ENvelope mode uses eight bits per waveform data point. Data acquired in AVERage mode uses up to 14 bits per point.

The oscilloscope can transfer waveform data in either ASCII or binary format. You specify the format with the DATa:ENCdg command. The instrument uses signed, 4 byte integers and floating point values; it does not support unsigned floating point values.

ASCII data is represented by signed integer or floating point values. An example ASCII waveform data string may look like this:

```
CURVE<space>–110,–109,–110,–110,–109,–107,
–109,–107,–106,–105,–103,–100,–97,–90,–84,–80
```

Use ASCII to obtain more readable and easier to format output than binary. However, ASCII may require more bytes to send the same values than it does with binary. This may reduce transmission speeds.

Binary data can be represented by signed integer or floating point values. The range of the values depends on the byte width specified. When the byte width is one, signed integer data ranges from -128 to 127, and positive integer values range from 0 to 255. When the byte width is two, the values range from -32768 to 32767. When a MATH (or REF that came with a MATH) is involved, 32 bit floating point values are used that are four bytes in width.

The defined binary formats specify the order in which the bytes are transferred. The following are the four binary formats:

- RIBinary specifies signed integer data point representation with the most significant byte transferred first.
- SRIBinary is the same as RIBinary except that the byte order is swapped, meaning that the least significant byte is transferred first. This format is useful when transferring data to IBM-compatible PCs.
- RFBinary specifies floating point data point representation with the most significant byte transferred first.
- SRFBinary is the same as RFBinary except that the byte order is swapped, meaning that the least significant byte is transferred first. This format is useful when transferring data to IBM-compatible PCs.

Waveform Data and Record Lengths

You can transfer multiple points for each waveform record. You can transfer a portion of the waveform or you can transfer the entire record. You can use the DATa:STARt and DATa:STOP commands to specify the first and last data points of the waveform record.

When transferring data into the instrument, you must first specify the record length of the destination waveform record. You do this with the WFMInopre:NR_Pt command. Next, specify the first data point within the waveform record. For example, when you set DATa:STARt to 1, data points will be stored starting with the first point in the record. The instrument will ignore the value set by DATa:STOP when reading in data. It will stop reading data when there is no more data to read or when it has reached the specified record length.

When transferring data from the instrument, you must specify the first and last data points in the waveform record. Setting DATa:STARt to 1 and DATa:STOP to the record length will always return the entire waveform.

Waveform Data Locations and Memory Allocation

The DATa:SOURce command specifies the waveform source when transferring a waveform from the
oscilloscope. You can only transfer one waveform at a time. Waveforms sent to the instrument are always stored in one of the four reference memory locations. You use the DATa:DESTination command to specify a reference memory location.

**Waveform Preamble**

Each waveform that you transfer has an associated waveform preamble that contains information such as the horizontal scale, the vertical scale, and other settings in effect when the waveform was created. Refer to the individual WFMInpre and WFMOutpre commands for more information.

**Scaling Waveform Data**

Once you transfer the waveform data to the controller, you can convert the data points into voltage values for analysis using information from the waveform preamble.

**Transferring Waveform Data from the Oscilloscope**

You can transfer waveforms from the oscilloscope to an external controller using the following sequence:

1. Select the waveform source(s) using DATa:SOUrce.
2. Specify the waveform data format using DATa:ENCdg.
3. Specify the number of bytes per data point using WFMOutpre:BYT_Nr.
   - **Note:** MATH waveforms (and REF waveforms that came from a MATH) are always set to four bytes.
4. Specify the portion of the waveform that you want to transfer using DATa:STARt and DATa:STOP.
5. Transfer waveform preamble information using WFMOutpre?.
6. Transfer waveform data from the oscilloscope using CURVe?.

**Transferring Waveform Data to the Oscilloscope**

2. Set WFMInpre:NR_Pt to equal the number of data points to be sent.
3. Specify the waveform data format using WFMInpre:ENCdg.
4. Specify the number of bytes per data point using WFMInpre:BYT_Nr.
5. Specify first data point in the waveform record using DATa:STARt.
6. Transfer waveform preamble information using WFMInpre.
   - **Note:** FastAcq waveforms cannot be returned to the scope via the CURVe command.
## Waveform Transfer Commands

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WFMInpre:YMULT Sets the vertical scale factor, per digitizing level, of the incoming waveform points
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<td>WFMOutpre:YZEro</td>
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CURVe

Description
This command transfers waveform data to and from the oscilloscope. Each waveform that is transferred
has an associated waveform preamble that contains information such as data format and scale.
The CURVe? query transfers data from the instrument. The data source is specified by the
DATa:SOUrce command. The first and last data points that are specified by the DATa:STARt and
DATa:STOP commands.
The CURVe command transfers waveform data to the instrument. The data is stored in the reference
memory location specified by DATa:DESTination, starting with the data point specified by DATa:START.
Only one waveform can be transferred at a time. The waveform will only be displayed if the reference is
displayed.

Group
Waveform Transfer

Related Commands
DATa:DESTination (see page 469), DATa:SOUrce (see page 472), DATa:STARt (see page 473),
DATa:STOP (see page 474), WFMInpre? (see page 476), WFMInpre:BYT_Nr (see page 480),
WFMOutpre? (see page 493)

Syntax 1
CURVe {<Block>|<asc curve>}

Syntax 2
CURVe?

Arguments
• <Block>
  This is the waveform data in binary format. The waveform is formatted as:
  #<x><yyy><data><newline>, where
  <x> is the number of y bytes. For example, if <yyy>=500, then <x>=3).
  <yyy> is the number of bytes to transfer. If width is 1, then all bytes on the bus are single data
  points. If width is 2, then all bytes on the bus are 2-byte pairs. If width is 4, then all bytes on the
  bus are 4-byte pairs. Use the WFMInpre:BYT_Nr command to set the width.
  <data> is the curve data.
  <newline> is a single byte new line character at the end of the data.

• <asc curve>
  This is the waveform data in ASCII format. The format for ASCII data is <NR1>[<NR1>…], where each
  <NR1> represents a data point.

Example 1
CURVe?
This query with ASCII encoding, start and stop of 1 and 10 respectively, and a width set to 1 might return
;CURVE 61,62,61,60,60,-59,-59,-58,-58,-59

Example 2
CURVe <Block>
This command sets the format of the waveform data, transferred to and from the oscilloscope, to binary
format.
DATa

Description
This command sets or queries the format and location of the waveform data that is transferred with the CURVe command.

Group
Waveform Transfer

Related Commands
CURVe (see page 467), DATa:STARt (see page 473), DATa:STOP (see page 474), DATa:ENCdg (see page 470)

Syntax 1
DATa {INIT|SNAp}

Syntax 2
DATa?

Argument
• INIT
  This initializes the waveform data parameters to their factory defaults.

• SNAp
  This sets DATa:STARt and DATa:STOP to match the current V Bar/Paired/Split cursor positions.

Example 1
DATa?
This query might return :DATA:DESTINATION REF1:ENCDG RIBINARY; SOURCE CH1; START 1; STOP 500; WIDTH 1

Example 2
DATa INIT
This command initializes the waveform data parameters to their factory defaults.
**DATa:DESTination**

**Description**
This command sets or queries the reference memory location for storing waveform data that is transferred into the oscilloscope by the CURVe command.

**Group**
Waveform Transfer

**Related Commands**
CURVe (see page 467)

**Syntax 1**
DATa:DESTination REF<x>

**Syntax 2**
DATa:DESTination?

**Argument**
- **REF<x>**
  - This is the reference where the waveform will be stored. The reference number is specified by x, which ranges from 1 through 4.

**Example 1**
DATa:DESTination?

This query might return ":DATA:DESTINATION REF3", indicating that reference 3 is the currently selected reference memory location for waveform data.

**Example 2**
DATa:DESTination REF1

This command requests that incoming waveform data be stored in reference 1.
DATa:ENCdg

Description
This command sets or queries the format of outgoing waveform data. This command is equivalent to setting WFMOutpre:ENCdg, WFMOutpre:BN_FMT, and WFMOutpre:BYT_Or. Setting the DATa:ENCdg value causes the corresponding WFMOutpre values to be updated and visa versa.

Note: Values are constrained (for outbound data) to the format of the data specified by DATa:SOURce.

Group
Waveform Transfer

Related Commands
WFMOutpre:ENCdg (see page 494), WFMOutpre:BN_FMT (see page 496), WFMOutpre:BYT_Or (see page 497)

Syntax 1
DATa:ENCdg {ASCIi|FAStest|RIBinary|RPBinary|FPBinary|SRIBinary|SRPBinary|SFPbinary}

Syntax 2
DATa:ENCdg?

Argument

- ASCIi
  This specifies the ASCII representation of signed INT, FLOAT. If ASCII is the value, then :BN_FMT and :BYT_Or are ignored.

- FAStest
  This requests that the data be sent in the fastest possible manner consistent with maintaining accuracy and is interpreted with respect to the first waveform specified in the DATA:SOURce list.
  :ENCdg will always be BIN, :BYT_Or will always be MSB, but :BN_FMT and :BYT_Nr will depend on the first DATA:SOURce waveform. :BN_FMT will be RI unless the waveform is internally stored as a floating point number, in which case FP format will be used.

- RIBinary
  This specifies signed integer data-point representation with the most significant byte transferred first.
  When :BYT_Nr is 1, the range is from -128 through 127. When :BYT_Nr is 2, the range is from -32,768 through 32,767. When :BYT_Nr is 8, then the waveform being queried has been set to Fast Acquisition mode. Center screen is 0. The upper limit is one division above the top of the screen and the lower limit is one division below the bottom of the screen. This is the default argument.

- RPBinary
  This specifies the positive integer datapoint representation, with the most significant byte transferred first.
  When :BYT_Nr is 1, the range from 0 through 255. When :BYT_Nr is 2, the range is from 0 to 65,535. When :BYT_Nr is 8, then the waveform being queried has been set to Fast Acquisition mode. Center screen is 127. The upper limit is one division above the top of the screen and the lower limit is one division below the bottom of the screen.

- FPBinary
  This specifies the floating point (width = 4) data.
  The range is from $-3.4 \times 10^{38}$ to $3.4 \times 10^{38}$. Center screen is 0. The upper limit is one division above the top of the screen and the lower limit is one division below the bottom of the screen.

- SRIBinary
  This is the same as RIBinary except that the byte order is swapped, meaning that the least significant byte is transferred first. This format is useful when transferring data to IBM compatible PCs.

- SRPBinary
  This is the same as RPBinary except that the byte order is swapped, meaning that the least significant byte is transferred first. This format is useful when transferring data to IBM compatible PCs.
• **SFPbinary**

This specifies floating point data in IBM format.

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<tr>
<td>SFPbinary</td>
<td>BIN FP LSB 4</td>
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</tbody>
</table>

**Example 1**

```
DATa:ENCdg?
```

This query might return :DATa:ENCdg SRPBINARY for the format of the outgoing waveform data.

**Example 2**

```
DATa:ENGdg RPBinary
```

This command sets the data encoding format to be a positive integer where the most significant byte is transferred first.
DATa:SOURce

Description
This command sets or queries the location of waveform data that is transferred from the oscilloscope by the CURVe? Query.

Group
Waveform Transfer

Related Commands
CURVe? (see page 467)

Syntax 1
DATa:SOURce <wfm>[<,><wfm>]

Syntax 2
DATa:SOURce?

Argument
• <wfm>
  This is the location of the waveform data that will be transferred from the oscilloscope to the controller.

Example 1
DATa:SOURce?
This query might return :DATA:SOURce REF3, indicating the source for the waveform data that is transferred using a CURVe? query.

Example 2
DATa:SOURce CH1
This command specifies that the CH1 waveforms will be transferred in the next CURVe? query.
**DATa:STARt**

**Description**
This command sets or queries the starting data point for waveform transfer. This command allows for the transfer of partial waveforms to and from the oscilloscope.

**Group**
Waveform Transfer

**Related Commands**
DATa (see page 468), DATa:STOP (see page 474), WFMMnpre:NR_Pt (see page 482), WFMOutpre:NR_Pt (see page 492)

**Syntax 1**
DATa:STARt <NR1>

**Syntax 2**
DATa:STARt?

**Argument**

- `<NR1>`

  This is the first data point that will be transferred, which ranges from 1 to the record length. Data will be transferred from `<NR1>` to DATa:STOP or the record length, whichever is less. If `<NR1>` is greater than the record length, the last data point in the record is transferred.

  When DATa:STOP is less than DATa:STARt, the stop value will equal DATa:STARt + (DATa:STARt - DATa:STOP). For example, if DATa:STARt = 30 and DATa:STOP = 20, then the range of data points for the waveform transfer will equal 30 through 40.

**Example 1**
DATa:STARt?

This query might return :DATA:START 214, indicating that this is the first waveform data point that will be transferred.

**Example 2**
DATa:STARt 10

This command specifies that the waveform transfer will begin with data point 10.
DATa:STOP

Description
This command sets or queries the last data point that will be transferred when using the CURVe? query. This command allows for the transfer of partial waveforms to the controller.

Note: When using the CURVe command, DATa:STOP is ignored and WFMInpre:NR_Pt is used.

Group
Waveform Transfer

Related Commands
CURVe (see page 467), DATa (see page 468), WFMInpre:NR_Pt (see page 482)

Syntax 1
DATa:STOP <NR1>

Syntax 2
DATa:STOP?

Argument

• <NR1>
This is the last data point that will be transferred, which ranges from 1 to the record length. If <NR1> is greater than the record length, then data will be transferred up to the record length. If both DATa:STARt and DATa:STOP are greater than the record length, the last data point in the record is returned.

If you always want to transfer complete waveforms, just set DATa:STARt to 1 and DATa:STOP to the maximum record length.

When DATa:STOP is less than DATa:STARt, the stop value will equal DATa:STARt + (DATa:STARt - DATa:STOP). For example, if DATa:STARt = 30 and DATa:STOP = 20, then the range of data points for the waveform transfer will equal 30 through 40.

Example 1
DATa:STOP?
This query might return :DATA:STOP 14900, indicating that this is the last waveform data point that will be transferred.

Example 2
DATa:STOP 15000
This command specifies that the waveform transfer will stop at data point 15000.
WAVFrm?

Description
This query-only command returns WFMOutpre? and CURVe? data for the waveform as specified by the DATA:SOURce command. This command is equivalent to sending both WFMOutpre? and CURVe?, with the additional provision that the response to WAVFrm? is guaranteed to provide a synchronized preamble and curve.

Group
Waveform Transfer

Related Commands
CURVe (see page 467), DATA:SOURce (see page 472), WFMOutpre? (see page 493)

Syntax
WAVFrm?

Example
This query might return:
:WFMOUTPRE:BIT_NR 8;BN_FMT RI;BYT_NR 1;BYT_OR MSB;ENCDG ASC;NR_PT 500;PT_FMT Y;PT_ORDER LINEAR;PT_OFF 0;
:XINC 400.0000E-12;XZERO 0.0000;XUNIT "s";YMULT 4.0000E-3;YOFF 0.0000;YZERO 0.0000;YUNIT "V";WFID "Ch1,
DC coupling, 100.0mV/div, 200.0ns/div, 5000 points,
Sample mode?::CURVE 51,50,48,51,48,50,49,51,49,51,48,
49,49,51,48,50,49,51,48,49,51,48,49,51,48,49,51,48,
49,50,48,50,49,51,48,49,51,48,49,51,48,49,51,48,
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WFMInpre?

Description
This query-only command returns the waveform formatting specification to be applied to the next incoming CURVe command data.

Group
Waveform Transfer

Related Commands
CURVe (see page 467), WFMOutpre? (see page 493)

Syntax
WFMInpre?

Example
WFMInpre?

This query might return
:WFMINPRE:BIT_NR 8;BN_FMT RI;BYT_NR 1;BYT_OR MSB;ENCODG BIN;NR_PT 500;PT_FMT Y;PT_OFF 0;XINCR 2.0000E-6;XZERO 1.7536E-6;XUNIT "s";YMULT 1.0000E-3;YOFF 0.0000;YZERO 0.0000;YUNIT "V"
**WFMInpre:ENCdg**

**Description**
This command sets or queries the type of encoding for incoming waveform data.

**Group**
Waveform Transfer

**Related Commands**
WFMOutpre:ENCdg (see page 494)

**Syntax 1**
WFMInpre:ENCdg {ASC|BIN}

**Syntax 2**
WFMInpre:ENCdg?

**Arguments**
- **ASC**
  This specifies that the incoming data is in ASCII format.
- **BIN**
  This specifies that the incoming data is in a binary format whose further interpretation requires knowledge of BYT_NR, BIT_NR, BN_FMT, and BYT_OR.

**Example 1**
WFMInpre:ENCdg?
This query might return :WFMInpre:ENCdg BIN, indicating that the incoming waveform data will be in binary format.

**Example 2**
WFMInpre:ENCdg ASC
This command sets the format of incoming waveform data to ASCII format.
**WFMinpre:BN_Fmt**

**Description**
This command sets or queries the format of binary data for incoming waveforms.

**Group**
Waveform Transfer

**Related Commands**
WFMOutpre:BN_Fmt (see page 496)

**Syntax 1**
WFMinpre:BN_Fmt {RI|RP|FP}

**Syntax 2**
WFMinput:BN_Fmt?

**Arguments**
- **RI**
  This specifies signed integer datapoint representation.
- **RP**
  This specifies positive integer datapoint representation.
- **FP**
  This specifies single-precision binary floating point representation.

**Example 1**
WFMinpre:BN_Fmt?
This query might return :WFMINPRE:BN_FMT RI, indicating that the incoming data is currently interpreted as signed integers.

**Example 2**
WFMinpre:BN_Fmt FP
This command specifies that incoming data will be interpreted as single-precision binary floating point.
WFMinpre:BYT_Or

Description
This command sets or queries which byte of binary waveform data is transmitted first for incoming waveform data when data points require more than one byte. This specification only has meaning when WFMinpre:ENCdg is set to BIN and WFMinpre:BYT_Nr is greater than 1.

Group
Waveform Transfer

Related Commands
WFMinpre:ENCdg (see page), WFMinpre:BYT_Nr (see page 480), WFMOutpre:BYT_Or (see page 497)

Syntax 1
WFMinpre:BYT_Or {LSB|MSB}

Syntax 2
WFMinpre:BYT_Or?

Arguments
• LSB
  This specifies that the least significant byte will be transmitted first.

• MSB
  This specifies that the most significant byte will be transmitted first.

Example 1
WFMinpre:BYT_Or?
This query might return :WFMINPRE:BYT_Or LSB, indicating that the least significant incoming CURVe data byte will be transmitted first.

Example 2
WFMinpre:BYT_Or MSB
This command sets the most significant incoming byte of incoming waveform data to be transmitted first.
**WFMInpre:BYT_Nr**

**Description**
This command sets or returns the binary field data width for the first ordered waveform, as specified by the DATa:DESTination command. This specification is only meaningful when WFMInpre:ENCdg is set to BIN and WFMInpre:BN_Fmt is set to either RI or RP.

**Group**
Waveform Transfer

**Related Commands**
DATa:DESTination (see page 469), WFMInpre:BN_Fmt (see page 478), WFMInpre:ENCdg (see page 477), WFMInpre:BIT_Nr (see page 481), WMOutpre:BYT_Nr (see page 498)

**Syntax 1**
WFMInpre:BYT_Nr <NR1>

**Syntax 2**
WFMInpre:BYT_Nr?

**Argument**

- **<NR1>**
  This is the number of bytes per data point and can be 1, 2 (RI, RP) or 4 (FP).

**Example 1**
WFMInpre:BYT_Nr?

This query might return :WFMINPRE:BYT_NR 2, indicating that there are 2 bytes per incoming waveform data point.

**Example 2**
WFMInpre:BYT_Nr 1

This command sets the number of bytes per incoming waveform data point to 1, which is the default setting.
WFMInpre:BIT_Nr

Description
This command sets or returns the number of bits per binary waveform point for the waveform, as specified by the DATa:DESTination command. This specification is only meaningful when WFMInpre:ENCdg is set to BIN.

Group
Waveform Transfer

Related Commands
DATa:DESTination (see page 469), WFMInpre:ENCdg (see page 477), WFMInpre:BYT_Nr (see page 480), WFMOutpre:BIT_Nr (see page 495)

Syntax 1
WFMInpre:BIT_Nr <NR1>

Syntax 2
WFMInpre:BIT_Nr?

Argument
• <NR1>

This number of bytes per data point can be 8, 16 (RI, RP) or 32 (FP).

Example 1
WFMInpre:BIT_Nr?
This query might return :WFMINPRE:BIT_NR 8, indicating that incoming RI or RP binary format data uses 8 bits per waveform point.

Example 2
WFMInpre:BIT_Nr 16
This command sets the number of bits per waveform point to 16, for incoming RI and RP binary format data.
**WFMIpre:NR_Pt**

**Description**
This command sets or returns the number of points that are in the transmitted waveform record.

**Group**
Waveform Transfer

**Related Commands**
WFMIpre:PT_FMT (see page 483), WFMOutpre:NR_Pt? (see page 499)

**Syntax 1**
WFMIpre:NR_Pt <NR1>

**Syntax 2**
WFMIpre:NR_Pt?

**Argument**
- `<NR1>`
  - If WFMIpre:PT_FMT is set to Y, this is the number of data points; if WFMIpre:PT_FMT is set to ENV, this is the number of max-min pairs.

**Example 1**
WFMIpre:NR_Pt?
This query might return :WFMINPRE:NR_PT 8000, indicating that there are 8000 data points in the transmitted waveform record.

**Example 2**
WFMIpre:NR_Pt 5000
This command specifies that 5000 data points will be expected.
WFMINPRE:PT_FMT

Description
This command sets or queries the point format of the incoming waveform data. Regardless of the argument used, the scale, offset, etc. are interpreted similarly. When ENV is used, waveform data interpreted over the min/max pair; when Y is used, it is interpreted over a single point.

Group
Waveform Transfer

Related Commands
WFMOOutpre:PT_FMT? (see page 500)

Syntax 1
WFMINPRE:PT_FMT {ENV|Y}

Syntax 2
WFMINPRE:PT_FMT?

Arguments
• ENV
   This specifies that the waveform is transmitted as maximum and minimum point pairs. Only Y values are explicitly transmitted. Absolute coordinates are given by:
   \[
   X_n = X_{Zro} + XINcr (n-PT_{Off})
   \]
   \[
   Y_{nmax} = Y_{Zro} + YMUlt (ynmax - YOFf)
   \]
   \[
   Y_{nmin} = Y_{Zro} + YMUlt (ynmin - YOFf)
   \]

• Y
   This specifies a normal waveform where one ASCII or binary data point is transmitted for each point in the waveform record. Only Y values are explicitly transmitted. Absolute coordinates are given by:
   \[
   X_n = X_{Zro} + XINcr (N-PT_{Off})
   \]
   \[
   Y_n = Y_{Zro} + YMUlt (Yn - YOFf)
   \]

Example 1
WFMINPRE:PT_FMT ENV
This command sets the incoming waveform data point format to enveloped.

Example 2
WFMINPRE:PT_FMT?
This query might return :WFMINPRE:PT_FMT ENV, indicating that the waveform is transmitted as maximum and minimum point pairs.
WFMInpre:PT_Off

Description
This command specifies or returns the trigger point, within the waveform record, for the reference waveform specified by the DATa:DESTination command.

Group
Waveform Transfer

Related Commands
DATa:DESTination (see page 469), DATa:STARt (see page 473), WFMOutpre:PT_Off (see page 501)

Syntax 1
WFMInpre:PT_Off <NR1>

Syntax 2
WFMInpre:PT_Off?

Argument
• <NR1>
  This is (record length -1) to record length and is the position of the data point immediately following the actual trigger. <NR1> is expressed relative to DATa:STARt.

Example 1
WFMInpre:PT_Off 0
This command specifies that the trigger point is the first point in the waveform record, which is the default.

Example 2
WFMInpre:PT_Off?
This query might return :WFMINPRE:PT_OFF 0, indicating the incoming waveform trigger point.
**WFMInpre:WFId**

**Description**
This command (no query form) accepts but ignores the argument. This command is provided only to allow a waveform extracted from the oscilloscope to be more easily imported.

**Group**
Waveform Transfer

**Related Commands**
- DATa:DESTination (see page 469)
- WFMInpre:BN_Fmt (see page 478)
- WFMInpre:ENCdg (see page 477)
- WFMOutpre:WFid (see page 503)

**Syntax**
```
WFMInpre:WFId <String>
```

**Argument**
- `<String>`
  This must be a valid 488.2 string (but the contents are ignored).

**Example**
```
WFMInpre:WFId "Ch1, DC coupling, 2.000V/div, 400.0ns/div, 500 points, Sample mode"
```
This is a syntactically correct command.
WFMInpre:XINcr

Description
This command sets or queries the horizontal interval between incoming waveform points in units specified by WFMInpre:XUNit.

Group
Waveform Transfer

Related Commands
WFMInpre:XUNit (see page 488), WFMOutpre:XINcr (see page 505)

Syntax 1
WFMInpre:XINcr <NR3>

Syntax 2
WFMInpre:XINcr?

Argument
• <NR3>

This is the horizontal interval representation.

Example 1
WFMInpre:XINcr?
This query might return :WFMINPRE:XINCR 1.0000E-3, indicating that (assuming that WFMInpre:XUNit is set to "s") there is a 1 ms interval between incoming waveform points.

Example 2
WFMInpre:XINcr 3E-3
This command sets the interval between incoming waveform points to 3 ms.
**WFMInpre:XZEro**

**Description**  
This command sets or queries the (subsample) time between the trigger sample (designated by PT_OFF) and the occurrence of the actual trigger of the incoming waveform. This value is used to compute TTOFF for the incoming waveform, and is expressed in terms of WFMInpre:XUNit.

**Group**  
Waveform Transfer

**Related Commands**  
- WFMInpre:PT_Off (see page 484)  
- WFMInpre:XINcr (see page 486)  
- WFMInpre:XUnit (see page 488)  
- WFMOutpre:XZEro (see page 506)

**Syntax 1**  
WFMInpre:XZEro <NR3>

**Syntax 2**  
WFMInpre:XZEro?

**Argument**  
- `<NR3>`
  
  This is value that ranges from -WFMInpre:XINcr to 0.

**Example 1**  
WFMInpre:XZEro?

  This query might return :WFMInpre:XZEro 7.500E-6, indicating that the trigger occurs 7.5 µs before the sample designated by WFMInpre:PT_Off.

**Example 2**  
WFMInpre:XZEro 5.7E-6

  This command specifies that the trigger actually occurred 5.7 µs before the sample designated by WFMInpre:PT_Off.
**WFMInpre:XUNit**

**Description**
This command sets or returns the horizontal units of the incoming waveform.

**Group**
Waveform Transfer

**Related Commands**
WFMOutpre:XUNit (see page 507)

**Syntax 1**
WFMInpre:XUNit <String>

**Syntax 2**
WFMInpre:XUNit?

**Argument**
- <String>
  This contains a maximum of three alpha characters that represent the horizontal unit of measure for the incoming waveform.

**Example 1**
WFMInpre:XUNit?
This query might return :WFMNPRE:XUNIT "s", indicating that the horizontal units for the incoming waveform are expressed in seconds.

**Example 2**
WFMInpre:XUNit "Hz"
This command specifies that the horizontal units for the incoming waveform are hertz.
WFMInpre:YMUlt

Description
This command sets or queries the vertical scale factor (in units/digitizing level) for the reference waveform, specified by DATa:DESTination, upon a CURVe command.

Group
Waveform Transfer

Related Commands
DATa:DESTination (see page 469), WFMInpre:BYT_Nr (see page 480), WFMInpre:YUNit (see page 488)

Syntax 1
WFMInpre:YMUlt <NR3>

Syntax 2
WFMInpre:YMUlt?

Argument
• <NR3>
This is the vertical scale factor per digitizing level of the incoming waveform points.

Example 1
WFMInpre:YMUlt?
This query might return :WFMInpre:YMULT 40.0000E-3, indicating that the vertical scale is 40 mV/digitizing level (1V/div).

Example 2
WFMInpre:YMUlt 20E-3
This command specifies that (if WFMInpre:YUNit is "V" and WFMInpre:BYT_Nr is 1) the vertical scale is 20 mV/digitizing level (500 mV/div).
**WFMImpre:YOFf**

**Description**
This command sets or queries the vertical position of the incoming waveform in digitizing levels. Variations in this number are analogous to changing the vertical position of the waveform. For those formats in which WFMImpre:BYT_Nr is important (all nonfloating point formats), this command must take the location of the binary point implied by BYT_NR into consideration.

**Group**
Waveform Transfer

**Related Commands**
WFMImpre:BYT_Nr (see page 480), WFMImpre:YMUlt? (see page 489), WFMOutmpre:YOFf? (see page 509)

**Syntax 1**
WFMImpre:YOFf <NR3>

**Syntax 2**
WFMImpre:YOFf?

**Argument**
- <NR3>
  This is the vertical offset in digitizing levels.

**Example 1**
WFMImpre:YOFf?
This query might return :WFMINPRE:YOFF 25, indicating the vertical position of the incoming waveform in digitizing levels.

**Example 2**
WFMImpre:YOFf 50
This command specifies that the zero reference for the incoming waveform is 50 digitizing levels (2 divisions) above the center of the data range.
WFMInpre:YUNit

Description
This command sets or queries the vertical units of the incoming waveform.

Group
Waveform Transfer

Related Commands
WFMOutpre:YUNit (see page 510)

Syntax 1
WFMInpre:YUNit <String>

Syntax 2
WFMInpre:YUNit?

Argument
• <String>
  This contains a maximum of three alpha characters that represent the vertical unit of measure for the incoming waveform.

Example 1
WFMInpre:YUNit?
This query might return :WFMINPRE:YUNIT "s", indicating the vertical units for the incoming waveform are expressed in seconds.

Example 2
WFMInpre:YUNit "Pa"
This command specifies that the vertical units for the incoming waveform are pascal.
**WFMInpre:YZEro**

**Description**
This command sets or queries the offset of the incoming waveform in units specified by WFMInpre:YUNit. Variations in this number are analogous to changing the vertical offset of the waveform.

**Group**
Waveform Transfer

**Related Commands**
WFMInpre:YUNit (see page 491), WFMOutpre:YZEro (see page 511)

**Syntax 1**
WFMInpre:YZEro <NR3>

**Syntax 2**
WFMInpre:YZEro?

**Argument**

- `<NR3>`
  
  This is the offset in YUnits.

**Example 1**
WFMInpre:YZEro?

This query might return `:WFMInpre:YZEro 7.5000E-6`, indicating that the zero reference for the incoming waveform is 7.5 µV below the center of the data range (given that WFMInpre:YUNit is set to V).

**Example 2**
WFMInpre:YZEro 1.5E+0

This command specifies that the zero reference for the incoming waveform is 1.5 V below the center of the data range (given that WFMInpre:YUNit is set to V).
WFMOutpre?

Description
This query-only command returns the waveform formatting data for the waveform specified by the DATa:SOURce command. The preamble components are considered to be of two types; formatting and interpretation. The formatting components are: ENCdg, BN_FMT, BYT_Or, BYT_Nr, BIT_Nr. The interpretation components are derived from the DATa:SOURce specified waveform.

Group
Waveform Transfer

Syntax
WFMOutpre?

Example
WFMOutpre:?  
This query might return :WFMOUTPRE:BIT_NR 8;BN_FMT RI ;BYT_NR 1;BYT_Or MSB;ENCdg BIN;NR_PT 500;PT_FMT Y ;PT_ORDER LINEAR;PT_OFF 0;XINC 8.0000E-9 ;XZERO 4.8794E-9;XUNIT "s";YMULT -2000.0000E-3 ;YOFF -4999.9995E-3;YZERO 0.0000;YUNIT "V" ;WFID "Ch1, DC coupling, 2.000V/div, 400.0ns/div, 500 points, Sample mode"
WFMOutpre:ENCdg

Description
This command sets and queries the type of encoding for outgoing waveforms.

Group
Waveform Transfer

Related Commands
DATa:ENCdg (see page 470), WFMOutpre:BYT_Nr (see page 498), WFMOutpre:BYT_Or (see page 497), WFMOutpre:BIT_Nr (see page 495), WFMOutpre:BN_Fmt (see page 496)

Syntax 1
WFMOutpre:ENCdg {ASC|BIN}

Syntax 2
WFMOutpre:ENCdg?

Argument
- **ASC**
  This specifies that the outgoing data is to be in ASCII format. Waveforms internally stored as integers will be sent as <NR1> numbers while those stored as floats will be sent as <NR3> numbers.

- **BIN**
  This specifies that outgoing data is to be in a binary format whose further specification is determined by WFMOutpre:BYT_Nr, WFMOutpre:BIT_Nr, WFMOutpre:BN_Fmt and WFMOutpre:BYT_Or.

Example 1
WFMOutpre:ENCdg?
This query might return :WFMOUPRE:ENCdg BIN, indicating that outgoing waveform data will be sent in binary format.

Example 2
WFMOutpre:ENCdg ASC
This command specifies that the outgoing waveform data will be sent in ASCII format.
WFMOutpre:BIT_Nr

Description
This command sets and returns the number of bits per waveform point that outgoing waveforms contain, as specified by the DATa:SOUrce command. Note that values will be constrained according to the underlying waveform data. This specification is only meaningful when WFMOutpre:ENCdg is set to BIN and WFMOutpre:BN_Fmt is set to either RI or RP.

Group
Waveform Transfer

Related Commands
DATa:SOUrce (see page 472), WFMOutpre:BN_Fmt (see page 478), WFMOutpre:ENCdg (see page 494)

Syntax 1
WFMOutpre:BIT_Nr <NR1>

Syntax 2
WFMOutpre:BIT_Nr?

Argument
• <NR1>
  This number of bits per data point can be 8, 16, 32 or 64.

Example 1
WFMOutpre:BIT_Nr?
This query might return :WFMOUTPRE:BIT_NR 8, indicating that outgoing RI or RP binary; format data uses 8 bits per waveform point.

Example 2
WFMOutpre:BIT_Nr 16
This command sets the number of bits per waveform point to 16, for incoming RI and RP binary format data.
WFMOutpre:BN_FMT

Description
This command sets or queries the format of binary data for outgoing waveforms specified by the DATa:SOUrce command.

Group
Waveform Transfer

Related Commands
DATa:SOURce (see page 472)

Syntax 1
WFMOutpre:BN_FMT {RI|RP|FP}

Syntax 2
WFMOutput:BN_FMT?

Arguments
• RI
  This specifies signed integer datapoint representation.

• RP
  This specifies positive integer datapoint representation.

• FP
  This specifies single-precision binary floating point.

Example 1
WFMOutpre:BN_FMT?
This query might return :WFMOUTPRE:BN_FMT RI, indicating that the outgoing waveform data is currently in signed integer format.

Example 2
WFMOutpre:BN_FMT FP
This command specifies that outgoing waveform data will be in single-precision binary floating point format.
**WFMOutpre:BYT_Or**

**Description**
This command sets or queries which byte of binary waveform data is transmitted first, during a waveform data transfer, when data points require more than one byte. This specification only has meaning when WFMOutpre:ENCdg is set to BIN.

**Group**
Waveform Transfer

**Related Commands**
WFMOutpre:ENCdg (see page 494)

**Syntax 1**
WFMOutpre:BYT_Or {LSB|MSB}

**Syntax 2**
WFMOutpre:BYT_Or?

**Arguments**
- **LSB**
  This specifies that the least significant byte will be transmitted first.
- **MSB**
  This specifies that the most significant byte will be transmitted first.

**Example 1**
WFMOutpre:BYT_Or?
This query might return :WFMOUTPRE:BYT_OR LSB, indicating that the least significant data byte will be transmitted first.

**Example 2**
WFMOutpre:BYT_Or MSB
This command sets the most significant outgoing byte of waveform data to be transmitted first.
WFMOOutpre:BYT_Nr

Description
This command sets or returns the binary field data width for the waveform specified by the DATa:SOUrce command. Note that values will be constrained according to the underlying waveform data. This specification is only meaningful when WFMOOutpre:ENCdg is set to BIN and WFMOOutpre:BN_Fmt is set to either RI or RP.

Group
Waveform Transfer

Related Commands
DATa:SOUrce (see page 472), WFMOOutpre:BN_Fmt (see page 496), WFMOOutpre:ENCdg (see page 494)

Syntax 1
WFMOOutpre:BYT_Nr <NR1>

Syntax 2
WFMOOutpre:BYT_Nr?

Argument
• <NR1>
  This is the number of bytes per data point and can be 1, 2, 4 or 8. A value of 1 or 2 bytes per waveform point indicates channel data; 4 bytes per waveform point indicate math data; 8 bytes per waveform point indicate pixel map (DPO) data.

Example 1
WFMOOutpre:BYT_Nr?
This query might return :WFMOUPRE:BYT_NR 2, indicating that there are 2 bytes per outgoing waveform data point.

Example 2
WFMOOutpre:BYT_Nr 1
This command sets the number of bytes per outgoing waveform data point to 1, which is the default setting.
WFMOutpre:NR_Pt?

Description
This query-only command returns the number of points for the DATa:SOUrce waveform that will be transmitted in response to a CURVe? query.

Group
Waveform Transfer

Related Commands
CURVe? (see page 467), DATa:SOUrce (see page 472), DATa:STARt (see page 473), DATa:STOP (see page 474)

Syntax
WFMOutpre:NR_Pt?

Example
WFMOutpre:NR_Pt?

This query might return :WFMOUTPRE:NR_PT 5000, indicating that there are 5000 data points to be sent.
WFMOOutpre:PT_Fmt?

Description
This query-only command returns the point format for the waveform specified by the DATa:SOURce command. The format specifies a set of equations describing how the scale factors in the preamble are used to give meaning to the CURVe data points.

An error is reported if the DATa:SOURce waveform does not exist.

Group
Waveform Transfer

Related Commands
CURVe? (see page 467), DATa:SOURce (see page 472)

Syntax
WFMOOutpre:PT_Fmt?

Example
WFMOOutpre:PT_Fmt?

This query might return :WFMOOutpre:PT_Fmt ENV, indicating that the waveform data are a series of max-min pairs.
WFMOutpre:PT_Off?

Description
This query-only command returns the trigger point relative to DATa:STARt for the waveform specified by the DATa:SOURce command.

Note: This value is the point immediately following the actual trigger.

Group
Waveform Transfer

Related Commands
DATa:SOURce (see page 472), DATa:STARt (see page 473), WFMOutpre:XZEro? (see page 506)

Syntax
WFMOoutpre:PT_Off?

Example
WFMOoutpre:PT_Off?

This query might return :WFMOOUTPRE:PT_OFF 251, specifying that the trigger actually occurred between points 250 and 251.
WFMOutpre:PT_OR?

Description
This query-only command specifies whether the source waveform is Fast Acquisition. A Fast
Acquisition waveform is stored as a 200 (vertical) by 500 (horizontal) point bitmap. Each point
represents display intensity for that screen location. Only CURVe? query functions are allowed on Fast
Acquisition waveforms.

When the WFMOutpre:PT_OR query returns Column, this indicates that the source is a Fast
Acquisition waveform (and that each of 500 possible horizontal columns being transmitted contains
200 vertical points). When the WFMOutpre:PT_OR? query returns Linear, this indicates that the source
is not a Fast Acquisition waveform (and that each horizontal column being sent contains only one
vertical point). Note that waveform points are transmitted in the following order: top to bottom, then left
to right.

Group
Waveform Transfer

Related Commands
DATa:SOUrce (see page 472)

Syntax
WFMOutpre:PT_OR?

Example 1
WFMOutpre:PT_OR?
This query might return :WFMOUTPRE:PT_OR COL, specifying that the waveform designated by the
DATa:SOUrce waveform is a Fast Acquisition waveform.

Example 2
WFMOutpre:PT_OR?
This query might return :WFMOUTPRE:PT_OR LINEAR, specifying that the source pointed to is a non-
Fast Acquisition waveform.
WFMOutpre:WFId?

**Description**
This query-only command returns a string describing several aspects of the acquisition parameters for the waveform specified by the DATa:SOUrce command. An error is reported if the DATa:SOUrce waveform does not exist.

**Group**
Waveform Transfer

**Related Commands**
DATa:SOUrce (see page 472)

**Syntax**
WFMOutpre:WFId?

**Outputs**
<string> comprises the following comma-separated fields:

<table>
<thead>
<tr>
<th>Waveform Suffixes</th>
<th>Description</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source</td>
<td>Source identification string as it appears in the front panel scale factor readouts.</td>
<td>&quot;Ch1-4&quot; &quot;Math1-3&quot; &quot;Ref1-4&quot;</td>
</tr>
<tr>
<td>Coupling</td>
<td>A string describing the vertical coupling of the waveform (the Source 1 waveform in the case of Dual Waveform Math)</td>
<td>&quot;AC coupling&quot; &quot;DC coupling&quot; &quot;GND coupling&quot;</td>
</tr>
<tr>
<td>Vert Scale</td>
<td>A string giving the vertical scale factor of the unzoomed waveform. The numeric portion will always be 4 digits. The examples cover all known internal units.</td>
<td>&quot;100.0 mV/div&quot; &quot;20.00 dB/div&quot; &quot;45.00 deg/div&quot; &quot;785.4 mrad/div&quot; &quot;500.0 uVs/div&quot; &quot;10.00 kV/div&quot; &quot;200.0 mV/div&quot; &quot;50.00 unk/div&quot;</td>
</tr>
<tr>
<td>Horiz Scale</td>
<td>A string giving the horizontal scale factor of the unzoomed waveform. The numeric portion will always be four 4 digits. The examples cover all known internal units.</td>
<td>&quot;100.0 ms/div&quot; &quot;10.00 kHz/div&quot; &quot;50.00 c/div&quot;</td>
</tr>
<tr>
<td>Record Length</td>
<td>A string stating the number of waveform points available in the entire record. The numeric portion is given as an integer.</td>
<td>&quot;500 points&quot; &quot;500000 points&quot;</td>
</tr>
<tr>
<td>Acquisition Mode</td>
<td>A string describing the mode used to acquire the waveform.</td>
<td>&quot;Sample mode&quot; &quot;Pk Detect mode&quot; &quot;Hi Res mode&quot; &quot;Envelope mode&quot; &quot;Average mode&quot;</td>
</tr>
<tr>
<td>Primary Reference Offset</td>
<td>A string specifying the delta between the Primary Reference (typically, the A trigger) and the CURVe? zero reference location identified by a combination of PT_Off and XZErO in units of XUNits. For example, in Triggerable After Delay, this number would be the actual time between the A and B trigger. In the event that this number is not meaningful, the string will be exactly &quot;0&quot;.</td>
<td>&quot;57.2345 ms&quot; &quot;87.3 Hz&quot; &quot;0&quot;</td>
</tr>
</tbody>
</table>

**Example**
WFMOutpre:WFId?
This query might return: WFMOUTPRE:WFID "Ch1, DC coupling, 100.0mVolts/div, 500.0µs/div, 500 points, Hi Res mode"
WFMOutpre:XINcr?

Description
This query-only command returns the horizontal point spacing in units of WFMOutpre:XUNit for the waveform specified by the DATa:SOUrce command. This value corresponds to the sampling interval. An error is reported if the DATa:SOUrce waveform does not exist.

Group
Waveform Transfer

Related Commands
DATa:SOUrce (see page 472), WFMOutpre:XUNit? (see page 507)

Syntax
WFMOutpre:XINcr?

Example
WFMOutpre:XINcr?

This query might return :WFMOUTPRE:XINCR 10.0000E-6, indicating that the horizontal sampling interval was 10 µs/point (500 µs/div).
WFMOutpre:XZEro?

Description
This query-only command returns the (subsample) time between the trigger sample (designated by
PT_OFF) and the occurrence of the actual trigger for the waveform specified by the DATa:SOUrce
command. This value is in units of WFMOutpre:XUNit.
An error is reported if the DATa:SOUrce waveform does not exist.

Note: During stopped state operation (i.e., ACQuire:STATE OFF), this is the only preamble that changes
on each acquisition. If a query is run during steady state operation (i.e., all control changes have settled
and triggers are arriving on a regular basis), the XZEro value of the last stopped state is returned.

Group
Waveform Transfer

Related Commands
DATa:SOUrce (see page 472), WFMOutpre:XUNit? (see page 507)

Syntax
WFMOutpre:XZEro?

Example
WFMOutpre:XZEro?

This query might return :WFMOUTPRE:XZERO 5.6300E-9, indicating that the trigger actually occurred 5.63
ns before the trigger sample.
**WFMOutpre:XUNit?**

**Description**
This query-only command returns the horizontal units for the waveform specified by the DATa:SOUrce command.

An error is reported if the DATa:SOUrce waveform does not exist.

**Group**
Waveform Transfer

**Related Commands**
DATa:SOUrce (see page 472)

**Syntax**
WFMOutpre:XUNit?

**Example**
WFMOutpre:XUNit?

This query might return :WFMOUTPRE:XUNIT "Hz", indicating that the horizontal units for the waveform are measured in hertz.
WFMOutpre:YMUlt?

Description
This query-only command returns the vertical scale factor per digitizing level in units specified by the WFMOutpre:YUNit command for the waveform specified by the DATa:SOUrce command. For those formats in which WFMOutpre:BYT_Nr is important (all nonfloating point formats), WFMOutpre:YMUlt? must take the location of the binary point implied by BYT_NR into consideration.

An error is reported if the DATa:SOUrce waveform does not exist.

Group
Waveform Transfer

Related Commands
DATa:SOUrce (see page 472), WFMOutpre:BYT_Nr (see page 498), WFMOutpre:YUNit? (see page 510)

Syntax
WFMOutpre:YMUlt?

Example
WFMOutpre:YMUlt?

This query might return :WFMOUTPRE:YMULT 4.0000E-3, indicating that the vertical scale for the corresponding waveform was 100 mV/div.
**WFMOutpre:YOFF?**

**Description**
This query-only command returns the vertical offset in digitized levels for the waveform specified by the DATa:SOURce command. For those formats in which BYT_NR is important (all non-floating point formats), this command must take the location of the binary point implied by WFMOutpre:BYT_Nr into consideration.

An error is reported if the DATa:SOURce waveform does not exist.

**Group**
Waveform Transfer

**Related Commands**
DATa:SOURce (see page 472), WFMOutpre:BYT_Nr (see page 498)

**Syntax**
WFMOutpre:YOFF?

**Example**
WFMOutpre:YOFF?

This query might return :WFMOUTPRE:YOFF -50.0000E+0, indicating that the position indicator for the waveform was 50 digitizing levels (2 divisions) below center screen.
WFMOutpre:YUNit?

Description
This query-only command returns the vertical units for the waveform specified by the DATa:SOUrce command.
An error is reported if the DATa:SOUrce waveform does not exist.

Group
Waveform Transfer

Related Commands
DATa:SOUrce (see page 472)

Syntax
WFMOutpre:YUNit?

Example
WFMOutpre:YUNit?

This query might return :WFMOUTPRE:YUNIT "dB", indicating that the vertical units for the waveform are measured in decibels.
WFMOutpre:YZEro?

Description
This query-only command returns the vertical offset in units specified by WFMOutpre:YUNit for the waveform specified by the DATa:SOUrce command.

An error is reported if the DATa:SOUrce waveform does not exist.

Group
Waveform Transfer

Related Commands
DATa:SOUrce (see page 472), WFMOutpre:YUNit? (see page 510)

Syntax
WFMOutpre:YZEro?

Example
WFMOutpre:YUNit?

This query might return :WFMOUTPRE:YZERO -100.0000E-3, indicating that vertical offset was set to -100 mV.
Zoom Command Group

Zoom Overview

Zoom commands let you expand and position the waveform display horizontally and vertically without changing the time base or vertical settings.
## Zoom Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZOOM?</td>
<td>Returns the current vertical and horizontal positioning and scaling of the display</td>
</tr>
<tr>
<td>ZOOM</td>
<td>Sets the zoom transforms to default values for either live traces or all traces</td>
</tr>
<tr>
<td>ZOOM:MODE?</td>
<td>Returns the current zoom mode</td>
</tr>
<tr>
<td>ZOOM:MODE</td>
<td>Turns zoom mode on or off</td>
</tr>
<tr>
<td>ZOOM:VERTizontal:LOCK?</td>
<td>Returns the waveforms that the horizontal zoom parameters affect</td>
</tr>
<tr>
<td>ZOOM:VERTizontal:LOCK</td>
<td>Sets the waveforms that the horizontal zoom parameters affect</td>
</tr>
<tr>
<td>ZOOM:&lt;wfm&gt;:VERTizontal:POSITION?</td>
<td>Returns the zoom vertical position of the specified waveform</td>
</tr>
<tr>
<td>ZOOM:&lt;wfm&gt;:VERTizontal:POSITION</td>
<td>Sets the zoom vertical position of the specified waveform</td>
</tr>
<tr>
<td>ZOOM:&lt;wfm&gt;:VERTizontal:SCALE?</td>
<td>Returns the zoom vertical scale of the specified waveform</td>
</tr>
<tr>
<td>ZOOM:&lt;wfm&gt;:VERTizontal:SCALE</td>
<td>Sets the zoom vertical scale of the specified waveform</td>
</tr>
</tbody>
</table>
ZOOM

Description
This command resets the zoom transforms to default values for all traces or live traces. The ZOOM query returns the current vertical and horizontal positioning and scaling of the display.

Group
Zoom

Syntax 1
ZOOM {RESET|RESETLive}

Syntax 2
ZOOM?

Arguments
• RESET
  This resets the zoom transforms to default values for all traces.
• RESETLive
  This resets the zoom transforms to default values for live traces.

Example 1
ZOOM?
This query might return:

:ZOOM:MODE 0;GRATICULE:SIZE 50;:ZOOM:HORIZONTAL:LOCK ALL;
:ZOOM:CH1:HORIZONTAL:POSITION 50.0000;SCALE 2;
:ZOOM:CH1:VERTICAL:POSITION 0.0000;SCALE 1.0000;
:ZOOM:CH2:HORIZONTAL:POSITION 50.0000;SCALE 2;
:ZOOM:CH2:VERTICAL:POSITION 0.0000;SCALE 1.0000;
:ZOOM:CH3:HORIZONTAL:POSITION 50.0000;SCALE 2;
:ZOOM:CH3:VERTICAL:POSITION 0.0000;SCALE 1.0000;
:ZOOM:CH4:HORIZONTAL:POSITION 50.0000;SCALE 2;
:ZOOM:CH4:VERTICAL:POSITION 0.0000;SCALE 1.0000;
:ZOOM:MATH1:HORIZONTAL:POSITION 50.0000;SCALE 2;
:ZOOM:MATH1:VERTICAL:POSITION 0.0000;SCALE 1.0000;
:ZOOM:MATH2:HORIZONTAL:POSITION 50.0000;SCALE 2;
:ZOOM:MATH2:VERTICAL:POSITION 0.0000;SCALE 1.0000;
:ZOOM:MATH3:HORIZONTAL:POSITION 50.0000;SCALE 2;
:ZOOM:MATH3:VERTICAL:POSITION 0.0000;SCALE 1.0000;
:ZOOM:MATH4:HORIZONTAL:POSITION 50.0000;SCALE 2;
:ZOOM:MATH4:VERTICAL:POSITION 0.0000;SCALE 1.0000;
:ZOOM:REF1:HORIZONTAL:POSITION 50.0000;SCALE 2;
:ZOOM:REF1:VERTICAL:POSITION 0.0000;SCALE 1.0000;
:ZOOM:REF2:HORIZONTAL:POSITION 50.0000;SCALE 2;
:ZOOM:REF2:VERTICAL:POSITION 0.0000;SCALE 1.0000;
:ZOOM:REF3:HORIZONTAL:POSITION 50.0000;SCALE 2;
:ZOOM:REF3:VERTICAL:POSITION 0.0000;SCALE 1.0000;
:ZOOM:REF4:HORIZONTAL:POSITION 50.0000;SCALE 2;
:ZOOM:REF4:VERTICAL:POSITION 0.0000;SCALE 1.0000

Example 2
ZOOM RESET
This command resets the zoom transforms to default values for all traces.
**ZOOm:MODe**

**Description**
This command turns Zoom mode on or off. The Zoom query returns the current state of Zoom mode. This command is equivalent to pressing the **ZOOM** button located on the front panel.

**Group**
Zoom

**Syntax 1**
```
ZOOm:MODe {ON|OFF|<NR1>}
```

**Syntax 2**
```
ZOOm:MODe
```

**Arguments**
- **ON**
  This turns on Zoom mode.
- **OFF**
  This turns off Zoom mode.
- **<NR1>**
  A 0 turns off Zoom mode; any other value turns on Zoom mode.

**Example 1**
```
ZOOm:MODe?
```
This query might return **:WFMOUTPRE:ZOOM:MODE 1**, indicating that Zoom mode is currently turned on.

**Example 2**
```
ZOOm:MODe OFF
```
This command turns off Zoom mode.
ZOOm:HORizontal:LOCk

Description
This command sets or queries the waveforms that the horizontal zoom parameter affects. This is equivalent to setting Horizontal Lock in the Zoom side menu.

Group
Zoom

Syntax 1
ZOOm:HORizontal:LOCk \{ALL\|LIVE\|NONE\}

Syntax 2
ZOOm:HORizontal:LOCk?

Arguments
• ALL
  This specifies that all the (CH<x>, Ref<x>, Math<x>) waveforms will be horizontally positioned and scaled together.

• LIVE
  This specifies that all live (CH<x>) waveforms will be horizontally positioned and scaled together.

• NONE
  This specifies that only the selected waveform is positioned and scaled using the horizontal zoom parameters.

Example 1
ZOOm:HORizontal:LOCk?
This query might return :ZOOM:HORIZONTAL:LOCK ALL, indicating that all waveforms are positioned and scaled together.

Example 2
ZOOm:HORizontal:LOCk LIVE
This command horizontally positions and scales all live waveforms.
ZOOM:<wfm>:HORizontal:POSITION

Description
This command sets or queries the horizontal position of specified waveform. The setting of the ZOOM:HORIZONTAL:LOCk command determines the waveforms that are affected. For example, if ZOOM:HORIZONTAL:LOCk is set to LIVe, then only live (as opposed to reference) waveforms are affected.

Group
Zoom

Syntax 1
ZOOM:<wfm>:HORIZONTAL:POSITION <NR3>

Syntax 2
ZOOM:<wfm>:HORIZONTAL:POSITION?

Argument
• <NR3>
  This is a value from 0 to 100 and is the percent of the waveform that is to the left of screen center, when the zoom factor is 1x or greater.

Example 1
ZOOM:CH1:HORIZONTAL:POSITION?
This query might return :ZOOM:CH1:HORIZONTAL:POSITION 50.0000, indicating that the Zoom reference pointer for channel 1 is currently set at 50% of acquired waveform.

Example 2
ZOOM:CH1:HORIZONTAL:POSITION 50
This command sets the Zoom reference pointer for channel 1 at 50% of acquired waveform.
**ZOOM:<wfm>:HORIZONTAL:SCALE**

**Description**
This command sets or queries the zoom horizontal scale factor of the specified waveform.

**Group**
Zoom

**Syntax 1**
ZOOM:<wfm>:HORIZONTAL:SCALE <NR3>

**Syntax 2**
ZOOM:<wfm>:HORIZONTAL:SCALE?

**Argument**

- `<NR3>`

  This is the amount of expansion in the horizontal direction.

**Example 1**
ZOOM:CH2:HORIZONTAL:SCALE?

This query might return :ZOOM:CH2:HORIZONTAL:SCALE 1, indicating channel 2 has a horizontal scale factor of 1.

**Example 2**
ZOOM:CH1:HORIZONTAL:SCALE 5

This command sets the channel 1 horizontal scale factor to 5.
ZOOM:<wfm>:VERTical:POSition

Description
This command sets or queries the Zoom vertical position of the specified waveform.

Group
Zoom

Syntax 1
ZOOM:<wfm>:VERTical:POSition <NR3>

Syntax 2
ZOOM:<wfm>:VERTical:POSition?

Argument
• <NR3>
   This is the vertical position, expressed in divisions.

Example 1
ZOOM:CH1:VERTical:POSition?

This query might return :ZOOM:CH1:VERTical:POSitition 0.0000, indicating that the zoomed trace is centered at division 0 of the acquire trace.

Example 2
ZOOM:CH1:VERTical:POSitition 2

This command sets the vertical position to 2, which centers the zoom trace at the second division of the acquire trace.
ZOOm:<wfm>:VERTical:SCAle

Description
This command sets or queries the zoom vertical scale of the specified waveform.

Group
Zoom

Syntax 1
ZOOm:<wfm>:VERTical:SCAle <NR3>

Syntax 2
ZOOm:<wfm>:VERTical:SCAle?

Argument
• <NR3>

This is the amount of vertical expansion or compression, which operates on a 1 - 2 - 5 sequence (For example, 1, 2, 5, 10, 20, 50, 100…). Based on the value entered, this command uses the nearest scale factor. Setting the vertical scale to 1 indicates unity (no zoom).

Example 1
ZOOm:CH2:VERTical:SCAle?

This query might return :ZOOM:CH2:VERTICAL:SCALE 2.0000, indicating that the vertical scale is 2x.

Example 2
ZOOm:REF1:VERTical:SCAle 4

This command sets the vertical scale of REF1 to 5x.
Status and Events
The oscilloscope provides a status and event reporting system for the GPIB interface. This system informs you of certain significant events that occur within the oscilloscope.

The oscilloscope status handling system consists of five 8-bit registers and two queues. The remaining Status subtopics describe these registers and components. They also explain how the event handling system operates.
Registers

Overview

The registers in the event handling system fall into two functional groups:

- Status Registers contain information about the status of the oscilloscope. They include the Standard Event Status Register (SESR) and the Status Byte Register (SBR).

- Enable Registers determine whether selected types of events are reported to the Status Registers and the Event Queue. They include the Device Event Status Enable Register (DESER), the Event Status Enable Register (ESER), and the Service Request Enable Register (SRER).
Status

The Standard Event Status Register (SESR) and the Status Byte Register (SBR) record certain types of events that may occur while the oscilloscope is in use. IEEE Std 488.2-1987 defines these registers.

Each bit in a Status Register records a particular type of event, such as an execution error or message available. When an event of a given type occurs, the oscilloscope sets the bit that represents that type of event to a value of one. (You can disable bits so that they ignore events and remain at zero. See Enable Registers). Reading the status registers tells you what types of events have occurred.

**The Standard Event Status Register (SESR)** - The SESR records eight types of events that can occur within the oscilloscope. Use the *ESR? query to read the SESR register. Reading the register clears the bits of the register so that the register can accumulate information about new events.

### Standard Event Status Register (SESR)

<table>
<thead>
<tr>
<th>Bit</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>PON Power On. Shows that the oscilloscope was powered on. On completion, the diagnostic tests also set this bit.</td>
</tr>
<tr>
<td>6</td>
<td>URQ User Request. Shows that an Application menu button was pressed.</td>
</tr>
<tr>
<td>5</td>
<td>CME Command Error. Shows that an error occurred while the oscilloscope was parsing a command or query.</td>
</tr>
<tr>
<td>4</td>
<td>EXE Execution Error. Shows that an error occurred while the oscilloscope was parsing a command or query.</td>
</tr>
<tr>
<td>3</td>
<td>DDE Device Error. Shows that a device error occurred.</td>
</tr>
<tr>
<td>2</td>
<td>QYE Query Error. Shows that either an attempt was made to read the Output Queue when no data was present or pending, or that data in the Output Queue was lost.</td>
</tr>
<tr>
<td>1</td>
<td>RQC Request Control. This is not used.</td>
</tr>
<tr>
<td>0</td>
<td>OPC Operation Complete. Shows that the operation is complete. This bit is set when all pending operations complete following an *OPC command.</td>
</tr>
</tbody>
</table>

**The Status Byte Register (SBR)** - Records whether output is available in the Output Queue, whether the oscilloscope requests service, and whether the SESR has recorded any events.

Use a Serial Poll or the *STB? query to read the contents of the SBR. The bits in the SBR are set and cleared depending on the contents of the SESR, the Event Status Enable Register (ESER), and the Output Queue. When you use a Serial Poll to obtain the SBR, bit 6 is the RQS bit. When you use the *STB? query to obtain the SBR, bit 6 is the MSS bit. Reading the SBR does not clear the bits.
### Status Byte Register (SBR)

<table>
<thead>
<tr>
<th>Bit</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 (MSB)</td>
<td>Not used.</td>
</tr>
<tr>
<td>6</td>
<td>RQS</td>
</tr>
<tr>
<td>5</td>
<td>MSS</td>
</tr>
<tr>
<td>4</td>
<td>ESB</td>
</tr>
<tr>
<td>3</td>
<td>MAV</td>
</tr>
<tr>
<td>2</td>
<td>Not used.</td>
</tr>
<tr>
<td>1 – 0</td>
<td>Not used.</td>
</tr>
</tbody>
</table>
Enable

DESER, ESER, and SRER allow you to select which events are reported to the Status Registers and the Event Queue. Each Enable Register acts as a filter to a Status Register (the DESER also acts as a filter to the Event Queue) and can prevent information from being recorded in the register or queue.

Each bit in an Enable Register corresponds to a bit in the Status Register it controls. In order for an event to be reported to the bit in the Status Register, the corresponding bit in the Enable Register must be set to one. If the bit in the Enable Register is set to zero, the event is not recorded.

Various commands set the bits in the Enable Registers. The Enable Registers and the commands used to set them are described below.

The Device Event Status Enable Register (DESER) - This register controls which types of events are reported to the SESR and the Event Queue. The bits in the DESER correspond to those in the SESR. Use the DESE command to enable and disable the bits in the DESER. Use the DESE? query to read the DESER.

<table>
<thead>
<tr>
<th>Device Event Status Enable Register (DESER)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
</tr>
<tr>
<td>PON</td>
</tr>
</tbody>
</table>

The Event Status Enable Register (ESER) - This register controls which types of events are summarized by the Event Status Bit (ESB) in the SBR. Use the *ESE command to set the bits in the ESER. Use the *ESE? query to read it.

<table>
<thead>
<tr>
<th>Event Status Enable Register (ESER)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
</tr>
<tr>
<td>PON</td>
</tr>
</tbody>
</table>

The Service Request Enable Register (SRER) - This register controls which bits in the SBR generate a Service Request and are summarized by the Master Status Summary (MSS) bit. Use the *SRE command to set the SRER. Use the *SRE? query to read the register. The RQS bit remains set to one until either the Status Byte Register is read with a Serial Poll or the MSS bit changes back to a zero.

<table>
<thead>
<tr>
<th>Service Request Enable Register (SRER)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
</tr>
<tr>
<td>---</td>
</tr>
</tbody>
</table>
*PSC Command

The *PSC command controls the Enable Registers contents at power-on. Sending *PSC 1 sets the Enable Registers at power on as follows:

- DESER 255 (equivalent to a DESe 255 command)
- ESER 0 (equivalent to an *ESE 0 command)
- SRER 0 (equivalent to an *SRE 0 command)

Sending *PSC 0 lets the Enable Registers maintain their values in nonvolatile memory through a power cycle.

**Note:** To enable the PON (Power On) event to generate a Service Request, send *PSC 0, use the DESe and *ESE commands to enable PON in the DESER and ESER, and use the *SRE command to enable bit 5 in the SRER. Subsequent power-on cycles will generate a Service Request.
Queues

Overview

The oscilloscope status and event reporting system contains two queues: the Output Queue and the Event Queue.
Output Queue

The oscilloscope stores query responses in the Output Queue and empties this queue each time it receives a new command or query message after an <EOM>. The controller must read a query response before it sends the next command (or query) or it will lose responses to earlier queries.

Caution: When a controller sends a query, an <EOM>, and a second query, the oscilloscope normally clears the first response and outputs the second while reporting a Query Error (QYE bit in the ESER) to indicate the lost response. A fast controller, however, may receive a part or all of the first response as well. To avoid this situation, the controller should always read the response immediately after sending any terminated query message or send a DCL (Device Clear) before sending the second query.
Event Queue

The Event Queue stores detailed information on up to 33 events. If more than 32 events stack up in the Event Queue, the 32nd event is replaced by event code 350, "Queue Overflow."

Read the Event Queue with the EVENT? query (which returns only the event number), with the EVMSG? query (which returns the event number and a text description of the event), or with the ALLEV? query (which returns all the event numbers along with a description of the event). Reading an event removes it from the queue.

Before reading an event from the Event Queue, you must use the *ESR? query to read the summary of the event from the SESR. This makes the events summarized by the *ESR? read available to the EVENT? and EVMSG? queries, and empties the SESR.

Reading the SESR erases any events that were summarized by previous *ESR? reads but not read from the Event Queue. Events that follow an *ESR? read are put in the Event Queue but are not available until *ESR? is used again.
Messages

Overview

The information contained in the topic tabs above covers all the programming interface messages the oscilloscope generates in response to commands and queries.

For most messages, a secondary message from the oscilloscope gives more detail about the cause of the error or the meaning of the message. This message is part of the message string and is separated from the main message by a semicolon.

Each message is the result of an event. Each type of event sets a specific bit in the SESR and is controlled by the equivalent bit in the DESER. Thus, each message is associated with a specific SESR bit. In the message tables, the associated SESR bit is specified in the table title, with exceptions noted with the error message text.
No Event

The following table shows the messages when the system has no events or status to report. These have no associated SESR bit.

<table>
<thead>
<tr>
<th>Code</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No events to report; queue empty</td>
</tr>
<tr>
<td>1</td>
<td>No events to report; new events pending *ESR?</td>
</tr>
</tbody>
</table>

*ESR?
Command Error

The following table shows the command error messages generated by improper syntax. Check that the command is properly formed and that it follows the rules in the section on command Syntax.

<table>
<thead>
<tr>
<th>Code</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>Command error</td>
</tr>
<tr>
<td>101</td>
<td>Invalid character</td>
</tr>
<tr>
<td>102</td>
<td>Syntax error</td>
</tr>
<tr>
<td>103</td>
<td>Invalid separator</td>
</tr>
<tr>
<td>104</td>
<td>Data type error</td>
</tr>
<tr>
<td>105</td>
<td>GET not allowed</td>
</tr>
<tr>
<td>108</td>
<td>Parameter not allowed</td>
</tr>
<tr>
<td>109</td>
<td>Missing parameter</td>
</tr>
<tr>
<td>110</td>
<td>Command header error</td>
</tr>
<tr>
<td>111</td>
<td>Header separator error</td>
</tr>
<tr>
<td>112</td>
<td>Program mnemonic too long</td>
</tr>
<tr>
<td>113</td>
<td>Undefined header</td>
</tr>
<tr>
<td>114</td>
<td>Header suffix out of range</td>
</tr>
<tr>
<td>120</td>
<td>Numeric data error</td>
</tr>
<tr>
<td>121</td>
<td>Invalid character in number</td>
</tr>
<tr>
<td>123</td>
<td>Exponent too large</td>
</tr>
<tr>
<td>124</td>
<td>Too many digits</td>
</tr>
<tr>
<td>128</td>
<td>Numeric data not allowed</td>
</tr>
<tr>
<td>130</td>
<td>Suffix error</td>
</tr>
<tr>
<td>131</td>
<td>Invalid suffix</td>
</tr>
<tr>
<td>134</td>
<td>Suffix too long</td>
</tr>
<tr>
<td>138</td>
<td>Suffix not allowed</td>
</tr>
<tr>
<td>140</td>
<td>Character data error</td>
</tr>
<tr>
<td>141</td>
<td>Invalid character data</td>
</tr>
<tr>
<td>144</td>
<td>Character data too long</td>
</tr>
<tr>
<td>148</td>
<td>Character data not allowed</td>
</tr>
<tr>
<td>150</td>
<td>String data error</td>
</tr>
<tr>
<td>151</td>
<td>Invalid string data</td>
</tr>
<tr>
<td>158</td>
<td>String data not allowed</td>
</tr>
<tr>
<td>160</td>
<td>Block data error</td>
</tr>
<tr>
<td>161</td>
<td>Invalid block data</td>
</tr>
<tr>
<td>168</td>
<td>Block data not allowed</td>
</tr>
<tr>
<td>170</td>
<td>Command expression error</td>
</tr>
<tr>
<td>171</td>
<td>Invalid expression</td>
</tr>
<tr>
<td>178</td>
<td>Expression data not allowed</td>
</tr>
</tbody>
</table>
Execution Error

The following table lists the execution errors that are detected during execution of a command.
<table>
<thead>
<tr>
<th>Code</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>Execution error</td>
</tr>
<tr>
<td>201</td>
<td>Invalid while in local</td>
</tr>
<tr>
<td>202</td>
<td>Settings lost due to RTL</td>
</tr>
<tr>
<td>210</td>
<td>Trigger error</td>
</tr>
<tr>
<td>211</td>
<td>Trigger ignored</td>
</tr>
<tr>
<td>212</td>
<td>Arm ignored</td>
</tr>
<tr>
<td>219</td>
<td>Trigger delay not available</td>
</tr>
<tr>
<td>220</td>
<td>Parameter error</td>
</tr>
<tr>
<td>221</td>
<td>Settings conflict</td>
</tr>
<tr>
<td>222</td>
<td>Data out of range</td>
</tr>
<tr>
<td>223</td>
<td>Too much data</td>
</tr>
<tr>
<td>224</td>
<td>Illegal parameter value</td>
</tr>
<tr>
<td>225</td>
<td>Out of memory</td>
</tr>
<tr>
<td>230</td>
<td>Data corrupt or stale</td>
</tr>
<tr>
<td>240</td>
<td>Hardware error</td>
</tr>
<tr>
<td>241</td>
<td>Hardware missing</td>
</tr>
<tr>
<td>244</td>
<td>Invalid parameter selected</td>
</tr>
<tr>
<td>250</td>
<td>Mass storage error</td>
</tr>
<tr>
<td>251</td>
<td>Missing mass storage</td>
</tr>
<tr>
<td>252</td>
<td>Missing media</td>
</tr>
<tr>
<td>253</td>
<td>Corrupt media</td>
</tr>
<tr>
<td>254</td>
<td>Media full</td>
</tr>
<tr>
<td>255</td>
<td>Directory full</td>
</tr>
<tr>
<td>256</td>
<td>File name not found</td>
</tr>
<tr>
<td>257</td>
<td>File name error</td>
</tr>
<tr>
<td>258</td>
<td>Media Protected</td>
</tr>
<tr>
<td>260</td>
<td>Execution expression error</td>
</tr>
<tr>
<td>261</td>
<td>Math error in expression</td>
</tr>
<tr>
<td>2200</td>
<td>Measurement error, Measurement system error</td>
</tr>
<tr>
<td>2201</td>
<td>Measurement error, Zero period</td>
</tr>
<tr>
<td>2202</td>
<td>Measurement error, No period found</td>
</tr>
<tr>
<td>2203</td>
<td>Measurement error, No period, second waveform</td>
</tr>
<tr>
<td>2204</td>
<td>Measurement error, Low signal amplitude</td>
</tr>
<tr>
<td>2205</td>
<td>Measurement error, Low amplitude, second waveform</td>
</tr>
<tr>
<td>2206</td>
<td>Measurement error, Invalid gate</td>
</tr>
<tr>
<td>2207</td>
<td>Measurement error, Measurement overflow</td>
</tr>
<tr>
<td>2208</td>
<td>Measurement error, Waveform does not cross Mid Ref</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
</tr>
<tr>
<td>2209</td>
<td>Measurement error, No second Mid Ref crossing</td>
</tr>
<tr>
<td>2210</td>
<td>Measurement error, No Mid Ref crossing, second waveform</td>
</tr>
<tr>
<td>2211</td>
<td>Measurement error, No backwards Mid Ref crossing</td>
</tr>
<tr>
<td>2212</td>
<td>Measurement error, No negative crossing</td>
</tr>
<tr>
<td>2213</td>
<td>Measurement error, No positive crossing</td>
</tr>
<tr>
<td>2214</td>
<td>Measurement error, No crossing</td>
</tr>
<tr>
<td>2215</td>
<td>Measurement error, No crossing, second waveform</td>
</tr>
<tr>
<td>2216</td>
<td>Measurement error, No crossing, target waveform</td>
</tr>
<tr>
<td>2217</td>
<td>Measurement error, Constant waveform</td>
</tr>
<tr>
<td>2218</td>
<td>Measurement error, Unused</td>
</tr>
<tr>
<td>2219</td>
<td>Measurement error, No valid edge - No arm sample</td>
</tr>
<tr>
<td>2220</td>
<td>Measurement error, No valid edge - No arm cross</td>
</tr>
<tr>
<td>2221</td>
<td>Measurement error, No valid edge - No trigger cross</td>
</tr>
<tr>
<td>2222</td>
<td>Measurement error, No valid edge - No second cross</td>
</tr>
<tr>
<td>2223</td>
<td>Measurement error, Waveform mismatch</td>
</tr>
<tr>
<td>2225</td>
<td>Measurement error, No waveform to measure</td>
</tr>
<tr>
<td>2226</td>
<td>Measurement error, Null Waveform</td>
</tr>
<tr>
<td>2227</td>
<td>Measurement error, Positive and Negative Clipping</td>
</tr>
<tr>
<td>2228</td>
<td>Measurement error, Positive Clipping</td>
</tr>
<tr>
<td>2229</td>
<td>Measurement error, Negative Clipping</td>
</tr>
<tr>
<td>2230</td>
<td>Measurement error, High Ref &lt; Low Ref</td>
</tr>
<tr>
<td>2231</td>
<td>Measurement error, no statistics available</td>
</tr>
<tr>
<td>2241</td>
<td>Waveform request is invalid</td>
</tr>
<tr>
<td>2243</td>
<td>This meas cannot be performed on this type of wfm</td>
</tr>
<tr>
<td>2244</td>
<td>Source wfm is not active</td>
</tr>
<tr>
<td>2248</td>
<td>This ref cannot be activated</td>
</tr>
<tr>
<td>2249</td>
<td>Reference deletion error, Waveform in use for math</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
</tr>
<tr>
<td>-------</td>
<td>------------------------------------------------------------------</td>
</tr>
<tr>
<td>2250</td>
<td>Reference error, Waveform reference file is invalid</td>
</tr>
<tr>
<td>2251</td>
<td>Reference error, Waveform preamble does not match actual</td>
</tr>
<tr>
<td>2252</td>
<td>Reference error, Source wfm is not valid</td>
</tr>
<tr>
<td>2253</td>
<td>Reference error, Too many points received</td>
</tr>
<tr>
<td>2254</td>
<td>Reference error, Too few points received</td>
</tr>
<tr>
<td>2259</td>
<td>File too big</td>
</tr>
<tr>
<td>2261</td>
<td>Calibration error, wait for the warmup interval to expire before invoking SPC</td>
</tr>
<tr>
<td>2400</td>
<td>Not enough memory available</td>
</tr>
<tr>
<td>2401</td>
<td>This channel cannot be activated</td>
</tr>
<tr>
<td>2402</td>
<td>Math/Meas/Histo have circular definition</td>
</tr>
<tr>
<td>2410</td>
<td>Empty math string</td>
</tr>
<tr>
<td>2411</td>
<td>Syntax error in math string</td>
</tr>
<tr>
<td>2412</td>
<td>Semantic error in math string</td>
</tr>
<tr>
<td>2413</td>
<td>Math expression is too complex</td>
</tr>
<tr>
<td>2420</td>
<td>Histogram cannot be performed on this type of wfm</td>
</tr>
</tbody>
</table>
Device Error

The following table lists the device errors that can occur during oscilloscope operation. These errors may indicate that the oscilloscope needs repair.

<table>
<thead>
<tr>
<th>Code</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>Device-specific error</td>
</tr>
<tr>
<td>310</td>
<td>System error</td>
</tr>
<tr>
<td>311</td>
<td>Memory error</td>
</tr>
<tr>
<td>312</td>
<td>PUD memory lost</td>
</tr>
<tr>
<td>313</td>
<td>Calibration memory lost</td>
</tr>
<tr>
<td>314</td>
<td>Save/recall memory lost</td>
</tr>
<tr>
<td>315</td>
<td>Configuration memory lost</td>
</tr>
<tr>
<td>350</td>
<td>Queue overflow (does not set DDE bit)</td>
</tr>
</tbody>
</table>
System Event

The following table lists the system event messages. These messages are generated whenever certain system conditions occur.

<table>
<thead>
<tr>
<th>Code</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>Query event</td>
</tr>
<tr>
<td>401</td>
<td>Power on (PON bit 7 set)</td>
</tr>
<tr>
<td>402</td>
<td>Operation complete (OPC bit 0 set)</td>
</tr>
<tr>
<td>403</td>
<td>User request (URQ bit 6 set)</td>
</tr>
<tr>
<td>404</td>
<td>Power fail (DDE bit 3 set)</td>
</tr>
<tr>
<td>405</td>
<td>Request control</td>
</tr>
<tr>
<td>410</td>
<td>Query INTERRUPTED (QYE bit 2 set)</td>
</tr>
<tr>
<td>420</td>
<td>Query UNTERMINATED (QYE bit 2 set)</td>
</tr>
<tr>
<td>430</td>
<td>Query DEADLOCKED (QYE bit 2 set)</td>
</tr>
<tr>
<td>440</td>
<td>Query UNTERMINATED after indefinite response (QYE bit 2 set)</td>
</tr>
</tbody>
</table>
Execution Warning

The following table lists warning messages that do not interrupt the flow of command execution. These notify you that you may get unexpected results.

<table>
<thead>
<tr>
<th>Code</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>540</td>
<td>Measurement warning</td>
</tr>
<tr>
<td>541</td>
<td>Measurement warning, Low signal amplitude</td>
</tr>
<tr>
<td>542</td>
<td>Measurement warning, Unstable histogram</td>
</tr>
<tr>
<td>543</td>
<td>Measurement warning, Low resolution</td>
</tr>
<tr>
<td>544</td>
<td>Measurement warning, Uncertain edge</td>
</tr>
<tr>
<td>545</td>
<td>Measurement warning, Invalid in minmax</td>
</tr>
<tr>
<td>546</td>
<td>Measurement warning, Need 3 edges</td>
</tr>
<tr>
<td>547</td>
<td>Measurement warning, Clipping positive/negative</td>
</tr>
<tr>
<td>548</td>
<td>Measurement warning, Clipping positive</td>
</tr>
<tr>
<td>549</td>
<td>Measurement warning, Clipping negative</td>
</tr>
<tr>
<td>551</td>
<td>FASTAcq mode is active - deactivate to use math</td>
</tr>
</tbody>
</table>
Internal Warning

The following table shows internal errors that indicate an internal fault in the oscilloscope.

<table>
<thead>
<tr>
<th>Code</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td>Internal warning</td>
</tr>
<tr>
<td>630</td>
<td>Internal warning, 50 ohm overload</td>
</tr>
</tbody>
</table>
Event Handling Sequence

The figure below shows how to use the status and event handling system. In the explanation that follows, numbers in parentheses refer to numbers in the figure.

When an event occurs, a signal is sent to the DESER (1). If that type of event is enabled in the DESER (that is, if the bit for that event type is set to 1), the appropriate bit in the SESR is set to one, and the event is recorded in the Event Queue (2). If the corresponding bit in the ESER is also enabled (3), then the ESB bit in the SBR is set to one (4).

When output is sent to the Output Queue, the MAV bit in the SBR is set to one (5).

When a bit in the SBR is set to one and the corresponding bit in the SRER is enabled (6), the MSS bit in the SBR is set to one and a service request is generated (7). Bit 2 of the SBR (EAV) flags the presence of events in the queue.
Synchronization Methods

Overview

Although most GPIB commands are completed almost immediately after being received by the oscilloscope, some commands start a process that requires more time. For example, once a single sequence acquisition command is executed, it may be a few seconds before the hardcopy operation is complete. Rather than remain idle while the operation is in process, the oscilloscope will continue processing other commands. This means that some operations will not be completed in the order that they were sent.

Sometimes the result of an operation depends on the result of an earlier operation. A first operation must complete before the next one gets processed. The oscilloscope status and event reporting system provides ways to do this.

For example, a typical application might involve acquiring a single-sequence waveform and then taking a measurement on the acquired waveform. You could use the following command sequence to do this:

```plaintext
/** Set up conditional acquisition **/
ACQUIRE:STATE OFF
SELECT:CH1 ON
HORIZONTAL:RECORDLENGTH 500
ACQUIRE:MODE SAMPLE
ACQUIRE:STOPAFTER SEQUENCE

/** Acquire waveform data **/
ACQUIRE:STATE ON

/** Set up the measurement parameters **/
MEASUREMENT:IMMED:TYPE AMPLITUDE
MEASUREMENT:IMMED:SOURCE CH1

/** Take amplitude measurement **/
MEASUREMENT:MEAS1:VALUE?
```

The acquisition of the waveform requires extended processing time. It may not finish before the oscilloscope takes an amplitude measurement (see figure below). This can result in an incorrect amplitude value.

```
+-----------------+
|Acquire          |
|Waveform          |
|Data              |
|<----------------->|

Processing Time
```
To ensure the oscilloscope completes waveform acquisition before taking the measurement on the acquired data, you can synchronize the program.

You can use four commands to synchronize the operation of the oscilloscope with your application program: "WAI, BUSY?, *OPC, and *OPC?"
*WAI*

You can force commands to execute sequentially by using the *WAI* command. This command forces completion of the previous commands before processing new ones.

The same command sequence using the *WAI* command for synchronization looks like this:

/* Set up conditional acquisition */
ACQUIRE:STATE OFF
SELECT:CH1 ON
HORIZONTAL:RECORDLENGTH 500
ACQUIRE:MODE SAMPLE
ACQUIRE:STOPAFTER SEQUENCE

/* Acquire waveform data */
ACQUIRE:STATE ON

/* Set up the measurement parameters */
MEASUREMENT:IMMED:TYPE AMPLITUDE
MEASUREMENT:IMMED:SOURCE CH1

/* Wait until the acquisition is complete before taking the measurement */
*WAI*

/* Take amplitude measurement */
MEASUREMENT:IMMED:VALUE?

Though *WAI* is one of the easiest ways to achieve synchronization, it is also the most costly. The processing time of the oscilloscope is slowed since it is processing a single command at a time. This time could be spent doing other tasks.

The controller can continue to write commands to the input buffer of the oscilloscope, but the commands will not be processed by the oscilloscope until all operations in process are complete. If the input buffer becomes full, the controller will be unable to write more commands to the buffer. This can cause a timeout.
**BUSY?**

The BUSY? query allows you to find out whether the oscilloscope is busy processing a command that has an extended processing time such as single-sequence acquisition.

The same command sequence, using the BUSY? query for synchronization, looks like this:

```plaintext
/* Set up conditional acquisition */
ACQUIRE:STATE OFF
SELECT:CH1 ON
HORIZONTAL:RECORDLENGTH 500
ACQUIRE:MODE SAMPLE
ACQUIRE:STOPAFTER SEQUENCE

/* Acquire waveform data */
ACQUIRE:STATE ON

/* Set up the measurement parameters */
MEASUREMENT:IMMED:TYPE AMPLITUDE
MEASUREMENT:IMMED:SOURCE CH1

/* Wait until the acquisition is complete before taking the measurement */
While BUSY? keep looping

/* Take amplitude measurement */
MEASUREMENT:IMMED:VALUE?
```

This sequence lets you create your own wait loop rather than using the *WAI command. The BUSY? query helps you avoid time-outs caused by writing too many commands to the input buffer. The controller is still tied up, though, and the repeated BUSY? query will result in more bus traffic.
*OPC*

If the corresponding status registers are enabled, the *OPC* command sets the OPC bit in the Standard Event Status Register (SESR) when an operation is complete. You achieve synchronization by using this command with either a serial poll or service request handler.

**Serial Poll Method**: Enable the OPC bit in the Device Event Status Enable Register (DESER) and the Event Status Enable Register (ESER) using the DESE and *ESE commands.

When the operation is complete, the OPC bit in the Standard Event Status Register (SESR) will be enabled and the Event Status Bit (ESB) in the Status Byte Register will be enabled.

The same command sequence using the *OPC* command for synchronization with serial polling looks like this:

```plaintext
/* Set up conditional acquisition */
ACQUIRE:STATE OFF
SELECT:CH1 ON
HORIZONTAL:RECORDLENGTH 500
ACQUIRE:MODE SAMPLE
ACQUIRE:STOPAFTER SEQUENCE

/* Enable the status registers */
DESE 1
*ESE 1
*SRE 0

/* Acquire waveform data */
ACQUIRE:STATE ON

/* Set up the measurement parameters */
MEASUREMENT:IMMED:TYPE AMPLITUDE
MEASUREMENT:IMMED:SOURCE CH1

/* Wait until the acquisition is complete before taking the measurement. */
*OPC
While serial poll = 0, keep looping

/* Take amplitude measurement */
MEASUREMENT:IMMED:VALUE?
```

This technique requires less bus traffic than did looping on BUSY?.

**Service Request Method**: Enable the OPC bit in the Device Event Status Enable Register (DESER) and the Event Status Enable Register (ESER) using the DESE and *ESE commands.

You can also enable service requests by setting the ESB bit in the Service Request Enable Register (SRER) using the *SRE command. When the operation is complete, a Service Request will be generated.

The same command sequence using the *OPC* command for synchronization looks like this:

```plaintext
/* Set up conditional acquisition */
ACQUIRE:STATE OFF
SELECT:CH1 ON
```
HORIZONTAL:RECORDLENGTH 500
ACQUIRE:MODE SAMPLE
ACQUIRE:STOPAFTER SEQUENCE

/* Enable the status registers */
DESE 1
*ESE 1
*SRE 32

/* Acquire waveform data */
ACQUIRE:STATE ON

/* Set up the measurement parameters */
MEASUREMENT:IMMED:TYPE AMPLITUDE
MEASUREMENT:IMMED:SOURCE CH1

/* Wait until the acquisition is complete before taking the measurement */
*OPC
Program can now do different tasks such as talk to other devices. The SRQ, when it comes, interrupts those tasks and returns control to this task.

/* Take amplitude measurement */
MEASUREMENT:IMMED:VALUE?
This technique is more efficient but requires more sophisticated programming.
OPC?

The *OPC? query places a 1 in the Output Queue once an operation is complete. A time-out could occur if you try to read the output queue before there is any data in it.

The same command sequence using the *OPC? query for synchronization looks like this:

/* Set up conditional acquisition */
ACQUIRE:STATE OFF
SELECT:CH1 ON
HORIZONTAL:RECORDLENGTH 500
ACQUIRE:MODE SAMPLE
ACQUIRE:STOPAFTER SEQUENCE

/* Acquire waveform data */
ACQUIRE:STATE ON

/* Set up the measurement parameters */
MEASUREMENT:IMMED:TYPE AMPLITUDE
MEASUREMENT:IMMED:SOURCE CH1

/* Wait until the acquisition is complete before taking the measurement */
*OPC?
Wait for read from Output Queue.

/* Take amplitude measurement */
MEASUREMENT:IMMED:VALUE?

This is the simplest approach. It requires no status handling or loops. However, you must set the controller time-out for longer than the acquisition operation.
Programming Examples

Overview
The example programs illustrate methods you can use to control the oscilloscope from the GPIB interface. These programs are listed on your product CD and are auto-installed in an example directory for you.

The programs run on a PC compatible system equipped with a National Instruments GPIB board and associated drivers. For example, the GPIB programs work with a National Instruments AT-GPIB/TNT GPIB package (see Figure 4-1).

Compiling the Example GPIB Programs
All the example GPIB programs assume that the GPIB system recognizes the oscilloscope as DEV1 and the PC (controller) as GPIB0. You can assign these names using different methods depending on your operating system. In Windows NT, you can assign these names through the Control Panel → GPIB → Configure Button. In Windows 95/98, you can assign the GPIB name through the Control Panel → System Icon → Device Manager → Display → AT-GPIB/TNT → GPIB.

The example GPIB software includes:
- MEAS: measures a parameter of an oscilloscope waveform.
- TL: a talker/listener program.

The example programs diskette contains programs written in Microsoft Visual C++ 6.0. Visual C++ code is in V-CPLUS6. Within this directory, an executable version of the program is in the PROGRAMS subdirectory. Source versions are in the SOURCES subdirectory.

A README file in each directory has the latest documentation.

If you wish to develop code, you will need to use files that come with the GPIB system. Specifically, the Visual C++ programs use DECL_32.h and GPIB_32.obj.

Note: The GPIB programs you compile in the Sources directory work with the National Instruments AT-GPIB/TNT GPIB system. It may take extra steps or changes to get them to work with older Tektronix GURU and other GPIB systems.

Compiling and Linking Example Visual C++ Programs
To make an executable for any of the files (for example, AUTOSET project), perform the following steps:
1. Install Visual C++.
7. Install the National Instruments AT-GPIB/TNT GPIB board and drivers. Remember to identify the GPIB device as DEV1 (see GPIB Examples section for more information) and to reboot your PC to initialize the GPIB drivers.
8. Copy the files from the examples diskette to your hard disk. For example, if the current drive is hard disk C, you want to store the examples in drive C, and the examples diskette in drive B:
   a. Invoke the Microsoft Explorer program.
   b. Drag the b:\GPIB\V-CPLUS6\SOURCES folder onto the C drive.
9. Set up a project for each example. The example below creates a new project for the AUTOSET example program.
   a. Invoke Visual C++.
   b. Select "New" from the File menu.
   c. Choose "New Win32 Console Application".
   d. Give the project a name, for example, GeTwfm.
   e. Select "Empty Project".
   f. Add the following files to the project from the Project menu:
      getwfm.c
      gpibwrite.c
      gpiberr.c
      gpibread.c
      gpibwait.c
      decl-32.h (provided by National Instruments)
      gpib-32.obj (provided by National Instruments)
10. To compile and link your sample program, choose "BUILD ALL" from the Build menu.
11. To run the sample program, choose RUN from the "BUILD" menu.
## Appendix A: ASCII & GPIB Code Chart

<table>
<thead>
<tr>
<th>B7 B6 B5</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>1</th>
<th>1</th>
<th>0</th>
<th>1</th>
<th>1</th>
<th>1</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>B4 B3 B2 B1</td>
<td>CONTROL</td>
<td>NUMBERS</td>
<td>SYMBOLS</td>
<td>UPPER CASE</td>
<td>LOWER CASE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 0 0 0</td>
<td>0</td>
<td>NUL</td>
<td>40</td>
<td>L0</td>
<td>0</td>
<td>L10</td>
<td>1</td>
<td>A</td>
<td>40</td>
<td>S0</td>
</tr>
<tr>
<td>0 0 0 1</td>
<td>1</td>
<td>SOL</td>
<td>41</td>
<td>L1</td>
<td>0</td>
<td>L11</td>
<td>1</td>
<td>B</td>
<td>40</td>
<td>S1</td>
</tr>
<tr>
<td>0 0 1 0</td>
<td>2</td>
<td>STX</td>
<td>42</td>
<td>L2</td>
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<td>L20</td>
<td>1</td>
<td>C</td>
<td>40</td>
<td>T0</td>
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<td>0 0 1 1</td>
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<td>40</td>
<td>T1</td>
</tr>
<tr>
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<td>EOT</td>
<td>44</td>
<td>L4</td>
<td>0</td>
<td>L40</td>
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<td>E</td>
<td>40</td>
<td>T2</td>
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<td>0 1 0 1</td>
<td>5</td>
<td>ENQ</td>
<td>45</td>
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<td>0</td>
<td>L50</td>
<td>1</td>
<td>F</td>
<td>40</td>
<td>T3</td>
</tr>
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<td>0 1 1 0</td>
<td>6</td>
<td>ACK</td>
<td>46</td>
<td>L6</td>
<td>0</td>
<td>L60</td>
<td>1</td>
<td>G</td>
<td>40</td>
<td>T4</td>
</tr>
<tr>
<td>0 1 1 1</td>
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<td>BEL</td>
<td>47</td>
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<td>L70</td>
<td>1</td>
<td>H</td>
<td>40</td>
<td>T5</td>
</tr>
<tr>
<td>1 0 0 0</td>
<td>8</td>
<td>BS</td>
<td>48</td>
<td>L8</td>
<td>0</td>
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<td>110</td>
<td>I</td>
<td>40</td>
<td>X0</td>
</tr>
<tr>
<td>1 0 0 1</td>
<td>9</td>
<td>HT</td>
<td>49</td>
<td>L9</td>
<td>0</td>
<td>L90</td>
<td>110</td>
<td>J</td>
<td>40</td>
<td>X1</td>
</tr>
<tr>
<td>1 0 1 0</td>
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<td>LF</td>
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<td>L100</td>
<td>111</td>
<td>K</td>
<td>40</td>
<td>X2</td>
</tr>
<tr>
<td>1 0 1 1</td>
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<td>L110</td>
<td>111</td>
<td>L</td>
<td>40</td>
<td>X3</td>
</tr>
<tr>
<td>1 1 0 0</td>
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<td>FF</td>
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<td>CR</td>
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<td>L13</td>
<td>0</td>
<td>L130</td>
<td>115</td>
<td>N</td>
<td>40</td>
<td>X5</td>
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<td>1 1 1 1</td>
<td>15</td>
<td>SI</td>
<td>55</td>
<td>L15</td>
<td>0</td>
<td>L150</td>
<td>117</td>
<td>P</td>
<td>40</td>
<td>X7</td>
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</tbody>
</table>

### KEY
- `hex` = 5
- `decimal` = 5
- `PPC` = GPIB code (with ATN asserted)
- `ENG` = ASCII character

**Tektronix**
- REF: ANSI STD X.4-1977
- IEEE STD 488-1987
- ISO STD 646-1977

---

550
Reserved Words

Overview

This topic is a list of reserved words for the TDS7000 series oscilloscopes. Capital letters identify the required minimum spelling. For the most robust code use the full spelling, since spelling rules may change over time and from instrument model to instrument model.
<table>
<thead>
<tr>
<th>Command</th>
<th>Function</th>
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<tbody>
<tr>
<td>*CAL</td>
<td>*TRG</td>
</tr>
<tr>
<td>*CLS</td>
<td>*TST</td>
</tr>
<tr>
<td>*DDT</td>
<td>*WAI</td>
</tr>
<tr>
<td>*ESE</td>
<td>A</td>
</tr>
<tr>
<td>*ESR</td>
<td>ABSolute</td>
</tr>
<tr>
<td>*IDN</td>
<td>ACQuire</td>
</tr>
<tr>
<td>*LRN</td>
<td>ACTUal</td>
</tr>
<tr>
<td>*OPC</td>
<td>ALLas</td>
</tr>
<tr>
<td>*OPT</td>
<td>ALL</td>
</tr>
<tr>
<td>*PSC</td>
<td>ALLev</td>
</tr>
<tr>
<td>*PUD</td>
<td>AREA</td>
</tr>
<tr>
<td>*RCL</td>
<td>AUTOBright</td>
</tr>
<tr>
<td>*RST</td>
<td>AUTOSet</td>
</tr>
<tr>
<td>*SAV</td>
<td>AUXout</td>
</tr>
<tr>
<td>*SDS</td>
<td>B</td>
</tr>
<tr>
<td>*SRE</td>
<td>BANdwidth</td>
</tr>
<tr>
<td>*STB</td>
<td>BELi</td>
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## DIR to MAXimum

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<td>DIsplay</td>
<td>FILEName</td>
<td>HBArs</td>
<td>LAST</td>
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<td>DIvisions</td>
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<td>LENGth</td>
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<td>FIRST</td>
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<td>GATING</td>
<td>ID</td>
<td>MAIn</td>
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<td>EXTDBatten</td>
<td>GLItch</td>
<td>IMMed</td>
<td>MATH&lt;x&gt;</td>
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<td>GRATicule</td>
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**MEAN to SIZe**

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<td>PT_OR</td>
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<td>PATTern</td>
<td>PUMODE</td>
<td>SAVe</td>
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<td>PERCent</td>
<td>READFile</td>
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<td>SETTime</td>
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<td>VARPersist</td>
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<td>YOFF</td>
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<td>TIMESStamp</td>
<td>&lt;wfm&gt;</td>
<td>YPOS</td>
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<td>TRACK</td>
<td>WAVEform</td>
<td>YUNit</td>
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<td>TRANSition</td>
<td>WAVFrm</td>
<td>YZEro</td>
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<td>TRIGIF</td>
<td>WFMinpre</td>
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<td>TRIGT</td>
<td>WFMOutpre</td>
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<td>TYPE</td>
<td>WHEN</td>
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<td>WIDth</td>
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<td>UNLock</td>
<td>WINdow</td>
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<td>SUBSYS</td>
<td>UNWRap</td>
<td>WRITEFile</td>
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Factory Default Setup Values

Overview

This topic contains tables that list the default setup values by command group. These are the values that the instrument sets when you press the DEFAULT SETUP front-panel button or send the FACtory command. Only those commands that have values set by the DEFAULT SETUP function are listed in these tables.
Acquisition

<table>
<thead>
<tr>
<th>Command</th>
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<td>ACQuire:MODE</td>
<td>SAMPLE</td>
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<td>16</td>
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<tr>
<td>ACQuire:NUMEnv</td>
<td>10</td>
</tr>
<tr>
<td>ACQuire:REPEt</td>
<td>1 (ON)</td>
</tr>
<tr>
<td>ACQuire:STATE</td>
<td>1 (ON)</td>
</tr>
<tr>
<td>ACQuire:STOPAfter</td>
<td>STOP</td>
</tr>
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<td>FASTAcq:STATE</td>
<td>0 (OFF)</td>
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## Cursor

### Default Setup Values

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<th>Command</th>
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<td>CURSor:FUNCtion</td>
<td>VBArs</td>
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<tr>
<td>CURSor:HBArs:POSITION&lt;x&gt;</td>
<td>±300.0000E-9</td>
</tr>
<tr>
<td>CURSor:MODE</td>
<td>INDependent</td>
</tr>
<tr>
<td>CURSor:PAired:POSITION&lt;x&gt;</td>
<td>±800.0000E-9</td>
</tr>
<tr>
<td>CURSor:SOURce</td>
<td>CH1</td>
</tr>
<tr>
<td>CURSor:SPLIT:POSITION&lt;x&gt;</td>
<td>±800.0000E-9</td>
</tr>
<tr>
<td>CURSor:SPLIT:SOURCE2</td>
<td>CH1</td>
</tr>
<tr>
<td>CURSor:SPLIT:UNits</td>
<td>BASE</td>
</tr>
<tr>
<td>CURSor:STATE</td>
<td>OFF</td>
</tr>
<tr>
<td>CURSor:VBArs:POSITION&lt;x&gt;</td>
<td>±800.0000E-9</td>
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<tr>
<td>CURSor:VBArs:UNits</td>
<td>SECOnds</td>
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## Display

### Default Setup Values

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<td>DISPLAY:CLOCk</td>
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<tr>
<td>DISPLAY:COLOR:MATHCOLOR</td>
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<tr>
<td>DISPLAY:COLOR:PALETTE</td>
<td>NORMal</td>
</tr>
<tr>
<td>DISPLAY:COLOR:REFCOLOR</td>
<td>DEFAULT</td>
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<tr>
<td>DISPLAY:FILTER</td>
<td>SINX</td>
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<tr>
<td>DISPLAY:FORMAT</td>
<td>YT</td>
</tr>
<tr>
<td>DISPLAY:INTENSITY:AUTOBright</td>
<td>1 (ON)</td>
</tr>
<tr>
<td>DISPLAY:INTENSITY:SCREENSAVER</td>
<td>1 (ON)</td>
</tr>
<tr>
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</tr>
<tr>
<td>DISPLAY:INTENSITY:WAVEform</td>
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<tr>
<td>DISPLAY:PERSistence</td>
<td>OFF</td>
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<tr>
<td>DISPLAY:STYLE</td>
<td>VECTors</td>
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<tr>
<td>DISPLAY:TRIGBar</td>
<td>SHORT</td>
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<tr>
<td>DISPLAY:TRIGT</td>
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<tr>
<td>DISPLAY:VARPersist</td>
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## Default Setup Values

<table>
<thead>
<tr>
<th>Command</th>
<th>Default</th>
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</thead>
<tbody>
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<td>HARDCopy:FILENAME</td>
<td>~</td>
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<tr>
<td>HARDCopy:PORT</td>
<td>FILE</td>
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### Default Setup Values

<table>
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<tr>
<th>Command</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
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<td>30.0000, 25.1000, 70.0000, 75.2000</td>
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<tr>
<td>HIStogram:DISplay</td>
<td>0 (OFF)</td>
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<tr>
<td>HIStogram:FUNCTION</td>
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</tr>
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<td>HIStogram:SIZE</td>
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<td>HIStogram:SOURce</td>
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</tr>
<tr>
<td>HIStogram:STATE</td>
<td>0 (OFF)</td>
</tr>
<tr>
<td>Command</td>
<td>Default</td>
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<td>------------------------------------------</td>
<td>---------</td>
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<tr>
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<td>HORizontal:FASTframe:REF:FRAME</td>
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<tr>
<td>HORizontal:FASTframe:REF:SOURce</td>
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</tr>
<tr>
<td>HORizontal:FASTframe:SELECTED:&lt;wfm&gt;</td>
<td>CH1-4 2</td>
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<td>MATH1-4 2</td>
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<td>REF1-4 2</td>
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<td>HORizontal:FASTframe:STATE</td>
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<td>HORizontal:RESOLUTION</td>
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<td>HORizontal[:MAIN]:DELAY:MODE</td>
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<tr>
<td>HORizontal[:MAIN]:DELAY:TIME</td>
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<td>HORizontal[:MAIN]:POSITION</td>
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<tr>
<td>HORizontal[:MAIN]:SAMPLERate</td>
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<td>HORizontal[:MAIN]:SCALE</td>
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# Math

## Default Setup Values

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<td>MATH&lt;x&gt;::LABEL:NAME</td>
<td>&quot; &quot;</td>
</tr>
<tr>
<td>MATH&lt;x&gt;::LABEL:XPOS</td>
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</tr>
<tr>
<td>MATH&lt;x&gt;::LABEL:YPOS</td>
<td>MATH1 65, MATH2 80, MATH3 95, MATH4 110</td>
</tr>
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<td>MATH&lt;x&gt;::NUMavg</td>
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<td>MATH&lt;x&gt;::SCALE</td>
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<td>MATH&lt;X&gt;::SPECTral:LOCK</td>
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<tr>
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# Measurement

**Default Setup Values**

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<td>MEASurement:METHod</td>
<td>Histogram</td>
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<td>MEASurement:IMMed:TYPE</td>
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<tr>
<td>MEASurement:IMMed:SOURCE[1]</td>
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</tr>
<tr>
<td>MEASurement:IMMed:SOURCE2</td>
<td>CH1</td>
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<tr>
<td>MEASurement:IMMed:DELay:EDGE2</td>
<td>RISE</td>
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<tr>
<td>MEASurement:IMMed:DELay:DIREction</td>
<td>FORWards</td>
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<td>MEASurement:MEAS&lt;x&gt;:STATE</td>
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</tr>
<tr>
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</tr>
<tr>
<td>MEASurement:MEAS&lt;x&gt;:SOURCE2</td>
<td>CH1</td>
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<tr>
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<tr>
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<td>MEASurement:REFLevel:ABSolute:HIGh</td>
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<td>MEASurement:REFLevel:ABSolute:MID</td>
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<td>MEASurement:STATIsitics:MODe</td>
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<tr>
<td>MEASurement:STATIsitics:WEighting</td>
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</table>
**Miscellaneous**

<table>
<thead>
<tr>
<th>Default Setup Values</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Command</strong></td>
<td><strong>Default</strong></td>
</tr>
<tr>
<td>AUXout:EDGE</td>
<td>FALLing</td>
</tr>
<tr>
<td>AUXout:SOURce</td>
<td>ATRigger</td>
</tr>
<tr>
<td>CMDBatch</td>
<td>1 (ON)</td>
</tr>
<tr>
<td>HEADER</td>
<td>1 (ON)</td>
</tr>
<tr>
<td>LOCK</td>
<td>NONE</td>
</tr>
<tr>
<td>VERBose</td>
<td>1 (ON)</td>
</tr>
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</table>
## Trigger

<table>
<thead>
<tr>
<th>Command</th>
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</tr>
</thead>
<tbody>
<tr>
<td>TRIGger:A:MODe</td>
<td>AUTO</td>
</tr>
<tr>
<td>TRIGger:A:TYPe</td>
<td>EDGE</td>
</tr>
<tr>
<td>TRIGger:A:LEVel</td>
<td>0.0000</td>
</tr>
<tr>
<td>TRIGger:A:HOLDoff:BY</td>
<td>DEFault</td>
</tr>
<tr>
<td>TRIGger:A:HOLDoff:TIme</td>
<td>250.0000E-09</td>
</tr>
<tr>
<td>TRIGger:A:EDGE:SOURce</td>
<td>CH1</td>
</tr>
<tr>
<td>TRIGger:A:EDGE:COUPling</td>
<td>DC</td>
</tr>
<tr>
<td>TRIGger:A:EDGE:SLOpe</td>
<td>RISe</td>
</tr>
<tr>
<td>TRIGger:A:LOGIc:CLAss</td>
<td>PATtern</td>
</tr>
<tr>
<td>TRIGger:A:LOGIc:FUNCtion</td>
<td>AND</td>
</tr>
<tr>
<td>TRIGger:A:LOGIc:INPut:CH&lt;x&gt;</td>
<td>CH1 HIGH, CH2 X, CH3 X</td>
</tr>
<tr>
<td>TRIGger:A:LOGIc:INPut:CH4</td>
<td>X</td>
</tr>
<tr>
<td>TRIGger:A:LOGIc:INPut:WHen</td>
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</tr>
<tr>
<td>TRIGger:A:LOGIc:INPut:WHen:LESSLimit</td>
<td>5.0000E-09</td>
</tr>
<tr>
<td>TRIGger:A:LOGIc:INPut:WHen:MORELimit</td>
<td>5.0000E-09</td>
</tr>
<tr>
<td>TRIGger:A:LOGIc:SETHold:CLOCK:EDGE</td>
<td>RISe</td>
</tr>
<tr>
<td>TRIGger:A:LOGIc:SETHold:CLOCK:SOURce</td>
<td>CH2</td>
</tr>
<tr>
<td>TRIGger:A:LOGIc:SETHold:SOURce</td>
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</tr>
<tr>
<td>TRIGger:A:LOGIc:SETHold:HOLDTime</td>
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<tr>
<td>TRIGger:A:LOGIc:SETHold:SETHoldTime</td>
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</tr>
<tr>
<td>TRIGger:A:LOGIc:STATE:INPut:CH4</td>
<td>RISe</td>
</tr>
<tr>
<td>TRIGger:A:LOGIc:STATE:WHen</td>
<td>TRUE</td>
</tr>
<tr>
<td>TRIGger:A:PULse:CLASS</td>
<td>GLItch</td>
</tr>
<tr>
<td>TRIGger:A:PULse:SOURce</td>
<td>CH1</td>
</tr>
<tr>
<td>TRIGger:A:PULse:GLItch:WIDTH</td>
<td>2.0000E-09</td>
</tr>
<tr>
<td>TRIGger:A:PULse:GLItch:TRIGIF</td>
<td>ACCept</td>
</tr>
<tr>
<td>TRIGger:A:PULse:GLItch:POLarity</td>
<td>POSITIVe</td>
</tr>
<tr>
<td>TRIGger:A:PULse:RUNT:POLarity</td>
<td>POSITIVe</td>
</tr>
<tr>
<td>TRIGger:A:PULse:RUNT:THReshold:LOW</td>
<td>800.0000E-03</td>
</tr>
<tr>
<td>TRIGger:A:PULse:RUNT:WHen</td>
<td>OCCurs</td>
</tr>
<tr>
<td>TRIGger:A:PULse:RUNT:WHen:LOW</td>
<td>2.0000E-09</td>
</tr>
<tr>
<td>TRIGger:A:PULse:RUNT:WIDTH</td>
<td>2.0000E-09</td>
</tr>
<tr>
<td>TRIGger:A:PULse:TRANsition:DELTATime</td>
<td>2.0000E-09</td>
</tr>
<tr>
<td>TRIGger:A:PULse:TRANsition:POLarity</td>
<td>POSITIVe</td>
</tr>
<tr>
<td>TRIGger:A:PULse:TRANsition:THReshold:LOW</td>
<td>800.0000E-03</td>
</tr>
<tr>
<td>TRIGger:A:PULse:TRANsition:WHen</td>
<td>FASTERthan</td>
</tr>
<tr>
<td>TRIGger:A:PULse:WIDTH:LOWLimit</td>
<td>2.0000E-09</td>
</tr>
<tr>
<td>TRIGger:A:PULse:WIDTH:HIGHLimit</td>
<td>2.0000E-09</td>
</tr>
<tr>
<td>TRIGger:A:PULse:WHen</td>
<td>WITHIN</td>
</tr>
<tr>
<td>TRIGger:A:PULse:POLarity</td>
<td>POSITIVe</td>
</tr>
<tr>
<td>TRIGger:A:TIMEOut:POLarity</td>
<td>STAYSHigh</td>
</tr>
<tr>
<td>TRIGger:A:TIMEOut:TIMe</td>
<td>2.0000E-09</td>
</tr>
<tr>
<td>TRIGger:B:STATE</td>
<td>0 (OFF)</td>
</tr>
<tr>
<td>TRIGger:B:TYPe</td>
<td>EDGE</td>
</tr>
<tr>
<td>TRIGger:B:LEVel</td>
<td>0.0000</td>
</tr>
<tr>
<td>TRIGger:B:BY</td>
<td>EVENTS</td>
</tr>
<tr>
<td>TRIGger:B:EDGE:SOURce</td>
<td>CH1</td>
</tr>
<tr>
<td>TRIGger:B:EDGE:SLOpe</td>
<td>RISe</td>
</tr>
<tr>
<td>TRIGger:B:EDGE:COUPling</td>
<td>DC</td>
</tr>
<tr>
<td>TRIGger:B:TIme</td>
<td>16.0000E-09</td>
</tr>
<tr>
<td>TRIGger:B:EVENTS:COUNT</td>
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**Default Setup Values**

<table>
<thead>
<tr>
<th>Command</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH&lt;x&gt;:BANDwidth</td>
<td>CH1-4 1.0000E+09</td>
</tr>
<tr>
<td>CH&lt;x&gt;:COUPLing</td>
<td>CH1-4 DC</td>
</tr>
<tr>
<td>CH&lt;x&gt;:DESKew</td>
<td>CH1-4 0.0000</td>
</tr>
<tr>
<td>CH&lt;x&gt;:OFFSet</td>
<td>CH1-4 0.0000</td>
</tr>
<tr>
<td>CH&lt;x&gt;:POSITION</td>
<td>CH1-4 0.0000</td>
</tr>
<tr>
<td>CH&lt;x&gt;:SCALE</td>
<td>CH1-4 100.0000E-03</td>
</tr>
<tr>
<td>CH&lt;x&gt;:TERmination</td>
<td>CH1-4 1.0000E-06</td>
</tr>
<tr>
<td>CH&lt;x&gt;:PROBEFunc:EXTatten</td>
<td>CH1-4 1.0000</td>
</tr>
<tr>
<td>CH&lt;x&gt;:PROBEFunc:EXTUnits</td>
<td>CH1-4 &quot;None&quot;</td>
</tr>
<tr>
<td>CH&lt;x&gt;:LABEL:NAMe</td>
<td>CH1-4 &quot;&quot;</td>
</tr>
<tr>
<td>CH&lt;x&gt;:LABEL:XPOS</td>
<td>CH1-4 5</td>
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<tr>
<td>CH&lt;x&gt;:LABEL:YPOS</td>
<td>CH1 5</td>
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<tr>
<td></td>
<td>CH2 20</td>
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<tr>
<td></td>
<td>CH3 35</td>
</tr>
<tr>
<td></td>
<td>CH4 50</td>
</tr>
<tr>
<td>CURVe</td>
<td>REF1</td>
</tr>
<tr>
<td>DATa:DESTination</td>
<td>REF1</td>
</tr>
<tr>
<td>DATa:ENCdg</td>
<td>RIBinary</td>
</tr>
<tr>
<td>DATa:SOURce</td>
<td>CH1</td>
</tr>
<tr>
<td>DATa:START</td>
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<tr>
<td>DATa:STOP</td>
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</tr>
<tr>
<td>REF&lt;x&gt;:LABEL:NAMe</td>
<td>&quot;&quot;</td>
</tr>
<tr>
<td>REF&lt;x&gt;:LABEL:XPOS</td>
<td>REF1-4 5</td>
</tr>
<tr>
<td>REF&lt;x&gt;:LABEL:YPOS</td>
<td>REF1 125</td>
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<tr>
<td></td>
<td>REF2 140</td>
</tr>
<tr>
<td></td>
<td>REF3 155</td>
</tr>
<tr>
<td></td>
<td>REF4 170</td>
</tr>
<tr>
<td>REF&lt;x&gt;:SCALE</td>
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</tr>
<tr>
<td>REF&lt;x&gt;:POSITION</td>
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<tr>
<td>SELect:CH&lt;x&gt;</td>
<td>CH1 1</td>
</tr>
<tr>
<td></td>
<td>CH2 0</td>
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<tr>
<td></td>
<td>CH3 0</td>
</tr>
<tr>
<td></td>
<td>CH4 0</td>
</tr>
<tr>
<td>SELect:CONTROL</td>
<td>CH1</td>
</tr>
<tr>
<td>SELect:MATH&lt;x&gt;</td>
<td>MATH1-4 0</td>
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<tr>
<td>SELect:REF&lt;x&gt;</td>
<td>REF1-4 0</td>
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## Waveform

<table>
<thead>
<tr>
<th>Command</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>WFId</td>
<td>&quot;Ch1, DC coupling, 100.0mV/div, 2000.0ns/div, 5000 points, Sample mode&quot;</td>
</tr>
<tr>
<td>WFMinpre:BIT_Nr</td>
<td>8</td>
</tr>
<tr>
<td>WFMinpre:BN_Fmt</td>
<td>RI</td>
</tr>
<tr>
<td>WFMinpre:BYT_Nr</td>
<td>1</td>
</tr>
<tr>
<td>WFMinpre:BYT_Or</td>
<td>MSB</td>
</tr>
<tr>
<td>WFMinpre:ENCdg</td>
<td>BIN</td>
</tr>
<tr>
<td>WFMinpre:NR_Pt</td>
<td>500</td>
</tr>
<tr>
<td>WFMinpre:PTFmt</td>
<td>Y</td>
</tr>
<tr>
<td>WFMinpre:PTOff</td>
<td>0</td>
</tr>
<tr>
<td>WFMinpre:XINcr</td>
<td>2.0000E-06</td>
</tr>
<tr>
<td>WFMinpre:XUNit</td>
<td>&quot;s&quot;</td>
</tr>
<tr>
<td>WFMinpre:XZEro</td>
<td>0.000</td>
</tr>
<tr>
<td>WFMinpre:YMUlt</td>
<td>1.0000E-03</td>
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<tr>
<td>WFMinpre:YOff</td>
<td>0.0000</td>
</tr>
<tr>
<td>WFMinpre:YUNit</td>
<td>&quot;V&quot;</td>
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<tr>
<td>WFMOutpre:BIT_Nr</td>
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<tr>
<td>WFMOutpre:BN_Fmt</td>
<td>RI</td>
</tr>
<tr>
<td>WFMOutpre:BYT_Nr</td>
<td>1</td>
</tr>
<tr>
<td>WFMOutpre:BYT_Or</td>
<td>MSB</td>
</tr>
<tr>
<td>WFMOutpre:ENCdg</td>
<td>BIN</td>
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<tr>
<td>WFMOutpre:NR_Pt</td>
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<td>WFMOutpre:PTFmt</td>
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<td>WFMOutpre:PTOff</td>
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<tr>
<td>WFMOutpre:XINcr</td>
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<td>WFMOutpre:XUNit</td>
<td>&quot;s&quot;</td>
</tr>
<tr>
<td>WFMOutpre:XZEro</td>
<td>0.000</td>
</tr>
<tr>
<td>WFMOutpre:YMUlt</td>
<td>4.0000E-03</td>
</tr>
<tr>
<td>WFMOutpre:YOff</td>
<td>0.0000</td>
</tr>
<tr>
<td>WFMOutpre:YUNit</td>
<td>&quot;V&quot;</td>
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<tr>
<td>WFMOutpre:YZEro</td>
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</table>
# Zoom

<table>
<thead>
<tr>
<th>Default Setup Values</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Command</strong></td>
</tr>
<tr>
<td>ZOOM:MODE</td>
</tr>
<tr>
<td>ZOOM:HORIZONTAL:LOCK</td>
</tr>
</tbody>
</table>
| ZOOM:<wfm>:HORIZONTAL:POSITION | CH1-4: 50.0000  
                                  | MATH1-4: 50.0000  
                                  | REF1-4: 50.0000        |
| ZOOM:<wfm>:HORIZONTAL:SCALE  | CH1-4: 2  
                                  | MATH1-4: 2  
                                  | REF1-4: 2            |
| ZOOM:<wfm>:VERTICAL:POSITION | CH1-4: 0.0000  
                                  | MATH1-4: 0.0000  
                                  | REF1-4: 0.0000        |
| ZOOM:<wfm>:VERTICAL:SCALE   | CH1-4: 1.0000  
                                  | MATH1-4: 1.0000  
                                  | REF1-4: 1.0000        |
GPIB Interface Specifications

Overview

This topic describes details of the GPIB remote interface of the instrument. Normally, you will not need this information to use the instrument, but this information may be useful if you are connecting to controllers with unusual configurations.
GPIB Functions

The following table lists the GPIB interface functions and electrical functions subsets supported by this instrument with brief descriptions of each.
<table>
<thead>
<tr>
<th>Interface Function</th>
<th>Subset</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accepter Handshake</td>
<td>AH1</td>
<td>The instrument can receive multiline messages across the GPIB from other devices.</td>
</tr>
<tr>
<td>Controller</td>
<td>C0</td>
<td>No Controller capability; the instrument cannot control other devices.</td>
</tr>
<tr>
<td>Device Clear</td>
<td>DC1</td>
<td>The instrument can respond to both the DCL (Device Clear) interface message and to the Selected Device Clear (SDC) interface message when the instrument is listen-addressed.</td>
</tr>
<tr>
<td>Device Trigger</td>
<td>DT0</td>
<td>No Device Trigger capability; the instrument does not respond to the GET (Group Execute Trigger) interface message.</td>
</tr>
<tr>
<td>Electrical</td>
<td>E2</td>
<td>The instrument uses tri-state buffers, which are optimal for high-speed data transfer.</td>
</tr>
<tr>
<td>Listener</td>
<td>L4</td>
<td>The instrument becomes a listener when it detects its listen address being sent over the bus with the ATN line asserted. The instrument ceases to be a listener and becomes a talker when it detects its talk address being sent over the bus with the ATN line asserted.</td>
</tr>
<tr>
<td>Parallel Poll</td>
<td>PP0</td>
<td>No Parallel Poll capability; the instrument does not respond to PPC (Parallel Poll Configure), PPD (Parallel Poll Disable), PPE (Parallel Poll Enable), or PPU (Parallel Poll Unconfigure) interface messages, nor does it send a status message when the ATN and EOI lines are asserted simultaneously.</td>
</tr>
<tr>
<td>Remote/Local</td>
<td>RL1</td>
<td>The instrument can respond to both the GTL (Go To Local) and LLO (Local Lock Out) interface messages.</td>
</tr>
<tr>
<td>Service Request</td>
<td>SR1</td>
<td>The instrument can assert the SRQ line to notify the controller in charge that it requires service.</td>
</tr>
<tr>
<td>Source Handshake</td>
<td>SH1</td>
<td>The instrument can initiate multiline messages to send across the GPIB to other devices.</td>
</tr>
<tr>
<td>Talker</td>
<td>T5</td>
<td>The instrument becomes a talker when it detects its talk address being sent over the bus with the ATN line asserted. The instrument ceases to be a talker when it detects another device's talk address being sent over the data lines with ATN asserted.</td>
</tr>
</tbody>
</table>
## Interface Messages

The following table shows the standard interface messages that the instrument supports.

<table>
<thead>
<tr>
<th>Message</th>
<th>GPIB</th>
</tr>
</thead>
<tbody>
<tr>
<td>DCL</td>
<td>Yes</td>
</tr>
<tr>
<td>GET</td>
<td>Yes</td>
</tr>
<tr>
<td>GTL</td>
<td>Yes</td>
</tr>
<tr>
<td>LLO</td>
<td>Yes</td>
</tr>
<tr>
<td>PPC</td>
<td>No</td>
</tr>
<tr>
<td>PPD</td>
<td>No</td>
</tr>
<tr>
<td>PPE</td>
<td>No</td>
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<tr>
<td>PPU</td>
<td>No</td>
</tr>
<tr>
<td>SDC</td>
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<td>SPD</td>
<td>Yes</td>
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<td>SPE</td>
<td>Yes</td>
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<td>TCT</td>
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<td>UNL</td>
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<tr>
<td>UNT</td>
<td>Yes</td>
</tr>
<tr>
<td>Listen Addresses</td>
<td>Yes</td>
</tr>
<tr>
<td>Talk Addresses</td>
<td>Yes</td>
</tr>
</tbody>
</table>