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# Programmer's Reference

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## Agilent 3000 Series Oscilloscopes

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## In This Book

This book is your guide to programming the 3000 Series Oscilloscopes.

Chapter 1 contains information on the installation and use of the I/O Module.

Chapters 2 and 3 give you an introduction to programming the oscilloscopes, along with necessary conceptual information. These chapters describe basic program communications, interface, and syntax.

Chapters 3 through 10 describe the commands used to program the oscilloscopes. Each chapter describes the set of commands that belong to an individual subsystem, and explains the function of each command.

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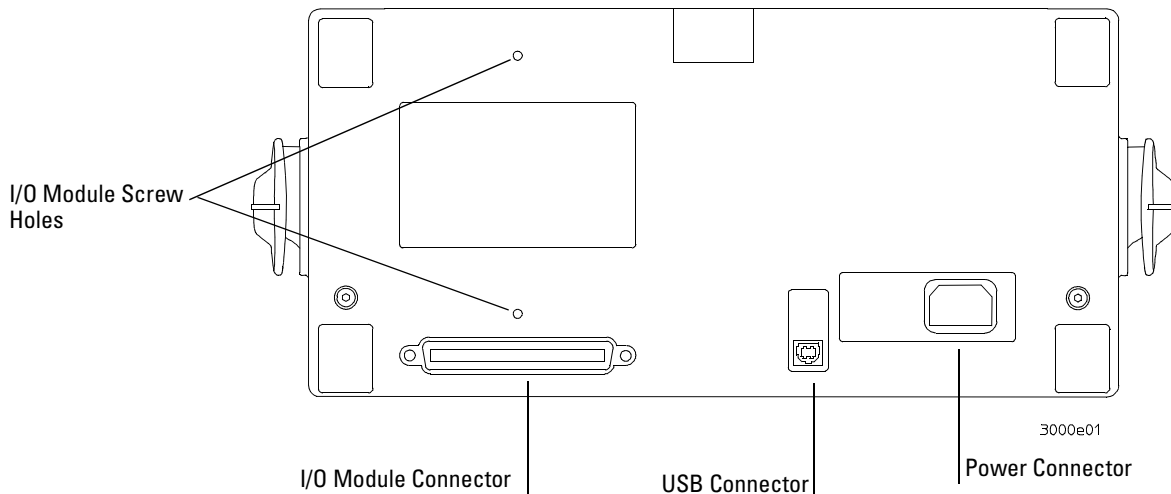
## I/O Module Installation and Configuration

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## I/O Module Installation

The I/O module (N2861A) provides an RS-232 serial port and a GPIB port that can be used to remotely program the 3000 Series oscilloscopes. Figure 1-1 shows the back panel installation location for the I/O module.

**Figure 1-1**

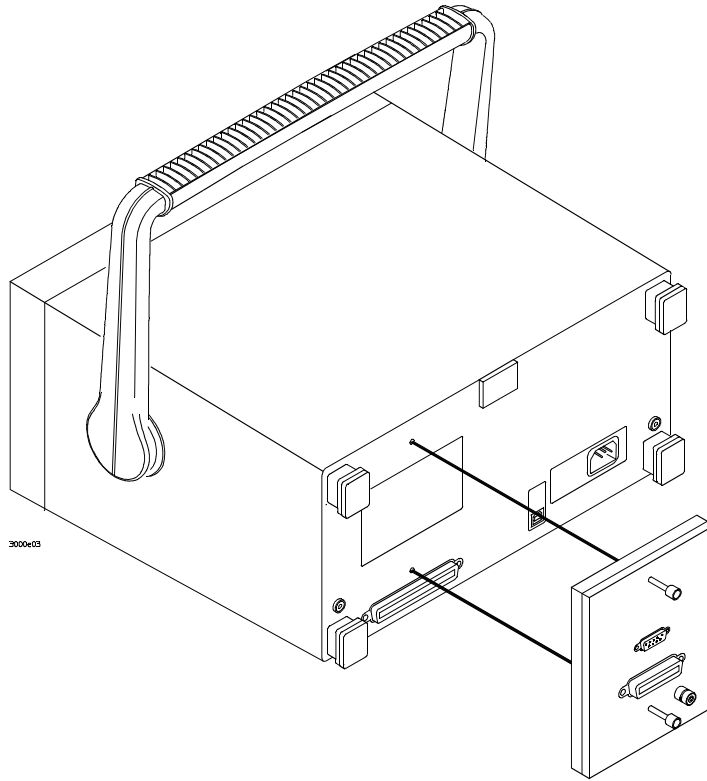


**Back Panel**

Be sure to turn off the power before installing the I/O module.

Figure 1-2 shows how to install the I/O module.

**Figure 1-2**



**Installing the I/O Module**

After installation is complete, restart the oscilloscope. The system will automatically detect the I/O module. For example, "EM5-CM module installed" means the EM5-CM had been installed, while the "No module installed" means there is no extension module, please check again if the module is installed correctly.

## I/O Module Configuration

After installing the I/O module, the port that you are going to for remotely programming the oscilloscope must be configured. To configure the I/O module, press the front panel **UTILITY** key. In the UTILITY menu select the **IO Setting** menu key.

### RS-232 Configuration

The baud rate can be set to one of the following values.

- 300
- 2400
- 4800
- 9600
- 19200
- 38400

**Table 1-1**

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### RS-232 Data Format

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<b>Function</b>	<b>Setting</b>
Data bit	8 bit
Flow control	Not available
Stop bit	1
Odd and even calibration	Not available
Stop character	0D (Hex)

### Testing the RS-232 Interface

- 1** Connect the oscilloscope to a computer using the appropriate RS-232 cable.
- 2** On the PC, run a terminal-emulator program. Make sure the PC serial port is set as follows:



**Table 1-2**

---

<b>PC RS-232 Setup</b>	
<b>Function</b>	<b>Setting</b>
Data bit	8 bit
Flow control	Not available
Stop bit	1
Odd and even calibration	Not available

---

- 3** Turn on the oscilloscope.
- 4** Press front panel **UTILITY** key.
- 5** Select the I/O Setting menu key.
- 6** Set the **RS-232 Baud** menu to the same baud rate as that of the PC.
- 7** Start the terminal-emulator program.
- 8** Send the \*IDN? query.  
The oscilloscope responds by returning the identification string of the oscilloscope.
- 9** Attach a probe between channel 1 and the probe calibration connector.
- 10** From the terminal-emulator program, send the AUTO command.  
The oscilloscope responds by displaying the 3V square wave on the screen.

#### **RS-232 Troubleshooting**

If the oscilloscope does not respond, check the following items.

- 1** Check the I/O module for proper installation.
- 2** Check the RS-232 cable for proper installation and that the RS-232 cable is connected tightly to the PC and oscilloscope.
- 3** Check baud rate, data bit, stop bit, flow control, odd and even calibration is correct is correctly set on the PC.
- 4** Check the RS-232 baud rate of the oscilloscope is the same as the PC.
- 5** Verify that the RS-232 cable is correct as shown in Table 1-3.

**Table 1-3**

---

**RS-232 Cable Definition**

---

<b>Pin</b>	<b>Connection</b>
1	NC (No connection)
2	RxD (Receive data)
3	TxD (Transmit data)
4	NC (No connection)
5	GND (Signal ground)
6	NC (No connection)
7	NC (No connection)
8	NC (No connection)
9	NC (No connection)

**GPIB Configuration**

The GPIB address can be set to any value from 0 to 30.

**GPIB Interface Testing**

GPIB is the standard for 8 bit parallel communication. The oscilloscope can communicate with a computer, a controller, or a terminal.

The character that is used to terminate a command or query is a new line (0x0A hex) character.

- 1** Connect the oscilloscope to the computer using a suitable GPIB cable.
- 2** Run the control terminal software in the computer
- 3** Turn on the oscilloscope.
- 4** Press **UTILITY** front panel key.
- 5** Select the **I/O SETUP** menu key.
- 6** Set the **GPIB Address** menu to the address you want to use.  
Make sure that this address is exclusive and do not used by other equipment.
- 7** Send the **\*IDN?** query.  
The oscilloscope responds by returning the identification strings of the oscilloscope.
- 8** Attach a probe between channel 1 and the probe calibration connector.
- 9** From the terminal-emulator program, send the **AUTO** command.  
The oscilloscope responds by displaying the 3V square wave on the screen.

### **GPIB Troubleshooting**

If the oscilloscope does not respond, please check the following items.

- 1** Check identification condition. If "No module installed" display, please check if the extension module is connected firmly.
- 2** Check the GPIB cable for proper installation and that the GPIB cable is connected tightly to the PC and oscilloscope.
- 3** Make sure that the GPIB address is correct and exclusive.





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# Introduction to Programming

This chapter introduces the basics for remote programming of an oscilloscope. The programming commands provide the means of remote control.

Basic operations that you can do with a computer and an oscilloscope include:

- Set up the oscilloscope.
- Make measurements.
- Get data (waveforms and measurements) from the oscilloscope.

## Communicating with the Oscilloscope

Computers communicate with the oscilloscope by sending and receiving messages over a remote interface, such as a GPIB port or an RS-232 port. Commands for programming normally appear as ASCII character strings embedded inside the output statements of a “host” language available on your computer. The input commands of the host language are used to read responses from the oscilloscope.

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## Instruction Header

The instruction header is one or more command mnemonics separated by colons (:). They represent the operation to be performed by the oscilloscope. See the “Programming Conventions” chapter for more information.

Queries are formed by adding a question mark (?) to the end of the header. Many instructions can be used as either commands or queries, depending on whether or not you include the question mark. The command and query forms of an instruction usually have different program data. Many queries do not use any program data.

---

## Truncation Rule

The truncation rule is used to produce the short form (abbreviated spelling) for the mnemonics used in the programming commands, queries, and parameter arguments.

<b>Command Truncation Rule</b>
The mnemonic is the first four characters of the keyword, unless the fourth character is a vowel. Then the mnemonic is the first three characters of the keyword. If the length of the keyword is four characters or less, this rule does not apply, and the short form is the same as the long form.

Table 2-1 shows how the truncation rule is applied to commands.

**Table 2-1**

<b>Mnemonic Truncation</b>		
<b>Long Form</b>	<b>Short Form</b>	<b>How the Rule is Applied</b>
SCALE	SCAL	Short form is the first four characters of the keyword.
TRIGger	PATT	Short form is the first four characters of the keyword.
AUTO	AUTO	Short form is the same as the long form.
XORIGIN	XOR	Fourth character is a vowel; short form is the first three characters.

The convention used in this manual to display commands, queries, or parameter arguments is to use upper case letters to indicate the short form.



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## White Space (Separator)

White space is used to separate the instruction header from the program data. If the instruction does not require any program data parameters, you do not need to include any white space. In this manual, white space is defined as one or more spaces. ASCII defines a space to be character 32 in decimal.

---

## Braces

When several items are enclosed by braces, { }, only one of these elements may be selected. Vertical line ( | ) indicates "or". For example, {ON | OFF} indicates that only ON or OFF may be selected, not both.

---

## Ellipsis

... An ellipsis (trailing dots) indicates that the preceding element may be repeated one or more times.

---

## Square Brackets

Items enclosed in square brackets, [ ], are optional.

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## Program Message Terminator

The program instructions within a data message are executed after the program message terminator is received. The terminator may be either an NL (New Line) character, an EOI (End-Or-Identify) asserted in the GPIB interface, or a combination of the two. Asserting the EOI sets the EOI control line low on the last byte of the data message. The NL character is an ASCII linefeed (decimal 10).

### **New Line Terminator Functions Like EOS and EOT**

The NL (New Line) terminator has the same function as an EOS (End Of String) and EOT (End Of Text) terminator.





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# Common Commands

Common commands are defined by the IEEE 488.2 standard. They control generic device functions that are common to many different types of instruments. Common commands can be received and processed by the oscilloscope, whether they are sent over the GPIB as separate program messages or within other program messages.

This common query is implemented in the 3000 Series Oscilloscopes:

- \*CLS (Clear Status)
- \*IDN? (Identification Number)
- \*OPC? (Operation Complete)
- \*RST (Reset)

---

## **\*CLS (Clear Status)**

**Command**            \*CLS

The \*CLS command clears all status and error registers.

Common Commands  
**\*IDN? (Identification Number)**

---

**\*IDN? (Identification Number)**

**Query**

\*IDN?

The \*IDN? query returns the company name, oscilloscope model number, serial number, and software revision number.

**Returned Format**

AGILENT TECHNOLOGIES,<model>,<serial\_number>,<rev\_number> <NL>

<model> Oscilloscope model number.

<serial\_number> Specifies the serial number of the oscilloscope. The first four digits and letter are the serial prefix, which is the same for all identical oscilloscopes. The last five digits are the serial suffix, which is assigned sequentially, and is different for each oscilloscope.

<rev\_number> Specifies the software revision number of the oscilloscope.

---

## **\*OPC (Operation Complete)**

**Query**

**\*OPC?**

The **\*OPC?** query places an ASCII character “1” in the oscilloscope's output queue when all pending selected device operations have finished.

**Returned Format**

1<NL>

**\*RST (Reset)**

---

**\*RST (Reset)**

Command

\*RST

The \*RST command places the oscilloscope in a known state. This command loads the Factory setup.





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# Channel Commands

The CHANNEL subsystem commands control all vertical (Y axis) functions of the oscilloscope.

These CHANNEL commands and queries are implemented:

- DISPlay
- OFFSet
- SCALe

---

## DISPlay

**Command**           :CHANNEL<N>:DISPlay {ON | OFF}

The :CHANNEL<N>:DISPlay command turns the display of the specified channel on or off.

<N> 1 or 2

**Query**             :CHANNEL<N>:DISPlay?

The :CHANNEL<N>:DISPlay? query returns the current display condition for the specified channel.

**Returned Format**   {ON | OFF}<NL>

**OFFSet**

---

**OFFSet**

**Command**           :CHANNEL<N>:OFFSet <offset\_value>

The :CHANNEL<N>:OFFSet command sets the voltage that is represented at the center of the display for the selected channel.

<N> 1 or 2

<offset\_value> If the vertical scale is  $\leq 100$  mV/div then the range is -2 to 2.  
If the vertical scale is  $> 100$  mV/div then the range is -40 to 40.

**Query**               :CHANNEL<N>:OFFSet?

The :CHANNEL<N>:OFFSet? query returns the current offset value for the specified channel.

**Returned Format**   <offset\_value><NL>

---

## SCALE

**Command**            :CHANnel<N>:SCALE <scale\_value>

The :CHANnel<N>:SCALE command sets the vertical scale, or units per division, of the selected channel. This command is the same as the front-panel channel scale.

<N> 1 or 2

<scale\_value> A number in exponential format for the vertical scale of the channel in units per division.

**Query**                :CHANnel<N>:SCALE?

The :CHANnel<N>:SCALE? query returns the current scale setting for the specified channel.

**Returned Format**    [:CHANnel<N>:SCALE] <scale\_value><NL>





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# Measure Commands

The commands in the MEASure subsystem are used to make parametric measurements on displayed waveforms.

These MEASure commands and queries are implemented in the 3000 Series Oscilloscopes.

- FALLtime
- FREQuency
- NWIDth
- OVERshoot
- PDUTYcycle
- PERiod
- PREShoot
- PWIDth
- RISEtime
- SOURce
- VAMPLitude
- VAverage
- VBASE
- VMAX
- VMIN
- VPP
- VRMS
- VTOP



---

## FALLtime

**Query**                   :MEASure:FALLtime? [{CHANnel1 | CHANnel2}]

The :MEASure:FALLtime? query returns the fall time.

**Returned Format**       <value><NL>

<value> Time from the upper threshold time to the lower threshold time.

**FREQuency**

---

## FREQuency

**Query**                   :MEASure:FREQuency? [{CHANnel1 | CHANnel2}]

The :MEASure:FREQuency? query returns the measured frequency.

**Returned Format**       <value><NL>

<value> The frequency value in Hertz of the first complete cycle on the screen using the mid-threshold levels of the waveform.

---

## NWIDth

**Query**                    :MEASure:NWIDth? [{CHANne11 | CHANne12}]

The :MEASure:NWIDth? query returns the measured width of the first negative pulse.

**Returned Format**       <value><NL>

<value> The width of the first negative pulse on the screen using the mid-threshold levels of the waveform.

**OVERshoot**

---

## OVERshoot

**Query**                    :MEASure:OVERshoot? [{CHANnel1 | CHANnel2}]

The :MEASure:OVERshoot? query returns the measured overshoot.

**Returned Format**       <value><NL>

<value> Ratio of overshoot to amplitude, in percent.

---

## PDUTYcycle

**Query**                    :MEASure:PDUTYcycle? [{CHANnel1 | CHANnel2}]

The :MEASure:PDUTYcycle? query returns the measured positive duty cycle in percent (%).

**Returned Format**       <value><NL>

<value> The ratio (%) of the positive pulse width to the period.

**PERiod**

---

**PERiod**

**Query**                    :MEASure:PERiod? [{CHANnel1 | CHANnel2}]

The :MEASure:PERiod? query returns the measured period.

**Returned Format**        <value><NL>

<value> Period of the first complete cycle on the screen.

---

## PREShoot

**Query**                   :MEASure:PREShoot? [{CHANnel1 | CHANnel2}]

The :MEASure:PREShoot? query returns the measured preshoot.

**Returned Format**       <value><NL>

<value> Ratio of preshoot to amplitude, in percent.

**PWIDth**

---

**PWIDth**

**Query**                    :MEASure:PWIDth? [{CHANne11 | CHANne12}]

The :MEASure:PWIDth? query returns the measured width of the first positive pulse.

**Returned Format**        <value><NL>

<value>    Width of the first positive pulse on the screen in seconds.



---

## RISetime

**Query**                   :MEASure:RISetime? [{CHANnel1 | CHANnel2}]

The :MEASure:RISetime? query returns the rise time.

**Returned Format**       <value><NL>  
                          <value> Rise time in seconds.

**SOURce**

---

**SOURce**

**Command**            :MEASure:SOURce {CHANnel1 | CHANnel2}

The :MEASure:SOURce sets the channel used by all of the measurement queries.

**Query**                :MEASure:SOURce?

The :MEASure:SOURce? query returns the current channel selection.

**Returned Format**    {CHAN1 | CHAN2}><NL>

---

## VAMplitude

**Query**                   :MEASure:VAMplitude? [{CHANnel1 | CHANnel2}]

The :MEASure:VAMplitude? query returns the calculated difference between the top and base voltage.

**Returned Format**       <value><NL>

<value>   Calculated difference between the top and base voltage.

**VAVerage**

---

## VAVerage

**Query**                    :MEASure:VAVerage? [{CHANnel1 | CHANnel2}]

The :MEASure:VAVerage? query returns the calculated average voltage.

**Returned Format**       <value><NL>

<value> The calculated average voltage.

---

## VBASe

**Query**                   :MEASure:VBASe? [{CHANnel1 | CHANnel2}]

The :MEASure:VBASe? query returns the measured voltage value at the base.

**Returned Format**       <value><NL>

<value> Voltage at the base of the waveform.

**VMAX**

---

**VMAX**

**Query**                   :MEASure:VMAX? [{CHANnel1 | CHANnel2}]

The :MEASure:VMAX? query returns the measured absolute maximum voltage.

**Returned Format**       <value><NL>

<value> Absolute maximum voltage present on the waveform.

---

## VMIN

**Query**                   :MEASure:VMIN? [{CHANnel1 | CHANnel2}]

The :MEASure:VMIN? query returns the measured absolute minimum voltage.

**Returned Format**       <value><NL>

<value> Absolute minimum voltage present on the waveform.

**VPP**

---

**VPP**

**Query**                    :MEASure:VPP? [{CHANnel1 | CHANnel2}]

The :MEASure:VPP? query returns the peak-to-peak voltage.

**Returned Format**        <value><NL>

<value> Peak-to-peak voltage.



---

## VRMS

**Query**                    :MEASure:VRMS? [{CHANnel1 | CHANnel2}]

The :MEASure:VRMS? query returns the RMS voltage.

**Returned Format**       <value><NL>

<value> RMS voltage of the selected waveform.

## **VTOP**

---

### VTOP

**Query**                   :MEASure:VTOP? [{CHANnel1 | CHANnel2}]

The :MEASure:VTOP? query returns the measured voltage at the top.

**Returned Format**       <value><NL>

<value> Voltage at the top of the waveform.

---

## Root Level Commands

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# Root Level Commands

Root level commands control many of the basic operations of the oscilloscope that you can select by pressing the labeled keys on the front panel. These commands are always recognized by the parser if they are prefixed with a colon, regardless of the current tree position. After executing a root level command, the parser is positioned at the root of the command tree.

These root level commands and queries are implemented in the Infiniium Oscilloscopes:

- AUToscale
- RUN
- SINGle
- STOP

---

## AUToscale

Command           :AUToscale

The :AUToscale command causes the oscilloscope to evaluate all input waveforms and find the optimum conditions for displaying the waveform. It searches each of the channels for input waveforms and shuts off channels where no waveform is found. It adjusts the vertical gain and offset for each channel that has a waveform, and sets the time base on the lowest numbered input channel that has a waveform.

The trigger is found by first searching external trigger inputs, then searching each channel, starting with channel 1, then channel 2 until a trigger waveform is detected. If waveforms cannot be found on any vertical input, the oscilloscope is returned to its former state.

**RUN**

---

**RUN**

Command :RUN

The :RUN command starts the oscilloscope running. When the oscilloscope is running, it acquires waveform data according to its current settings. Acquisition runs repetitively until the oscilloscope receives a :STOP command, or until a single acquisition has occurred when the Trigger Sweep is set to Single.

---

## SINGle

**Command**            :SINGle

The :SINGle command causes the oscilloscope to make a single acquisition when the next trigger event occurs.

**STOP**

---

**STOP**

Command

:STOP

The :STOP command causes the oscilloscope to stop acquiring data. To restart the acquisition, use the :RUN or :SINGLE command.





---

# System Commands

These SYSTem commands and queries are implemented in the Oscilloscope:

- ERRor?

---

## ERRor?

**Query**                   :SYSTem:ERRor? [{NUMBER | STRing}]

The :SYSTem:ERRor? query outputs the next error number in the error queue over the GPIB. When either NUMBER or no parameter is specified in the query, only the numeric error code is output. When STRing is specified, the error number is output followed by a comma and a quoted string describing the error.

**Returned Format**       [:SYSTem:ERRor] <error\_number>[, <quoted\_string>]<NL>

<error\_number>   A numeric error code.

<quoted\_string>   A quoted string describing the error.

The oscilloscope has an error queue that is 30 errors deep and operates on a first-in, first-out (FIFO) basis. Successively sending the :SYSTem:ERRor? query returns the error numbers in the order that they occurred until the queue is empty. When the queue is empty, this query returns headers of 0, “No error.” Any further queries return zeros until another error occurs. Note that front-panel generated errors are also inserted in the error queue and the Event Status Register.

---

**Send \*CLS Before Other Commands or Queries**

Send the \*CLS common command to clear the error queue and Event Status Register before you send any other commands or queries.





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# Time Base Commands

The TIMEbase subsystem commands control the horizontal (X axis) oscilloscope functions. These TIMEbase commands and queries are implemented in the oscilloscope:

- :POSition
- :SCALE

---

## POSition

**Command**                   :TIMEbase:POSition <delay\_time>

The :TIMEbase:POSition sets the amount of time from the center of screen to the trigger point of the waveform.

<delay\_time> If the horizontal time base is set to greater than 20 ms/div then the delayed trigger time range is:

$$\text{delay\_time} = \pm 6\text{div} \times \text{time base setting}$$

If the horizontal time base is set to less than 50 ms/div then the delayed trigger time range is:

$$\text{delay\_time} = -14\text{div} \times \text{time base setting to 1s}$$

**Query**                       :TIMEbase:POSition?

The :TIMEbase:POSition? query returns the value of the delayed trigger.

**Returned Format**       <delay\_time><NL>

**SCALE**

---

**SCALE**

**Command**            :TIMEbase:SCALE <time>

The :TIMEbase:SCALE command sets the time base scale. This corresponds to the horizontal scale value displayed as Time on the oscilloscope screen.

<time> 1.0E-9, 2.0E-9, 5.0E-9, ..., 1.0E+00, 2.0E+00, 5.0E+00  
The time value is in a 1-2-5 sequence from 1 ns to 5 s.

**Query**               :TIMEbase:SCALE?

The :TIMEbase:SCALE? query returns the current horizontal time setting.

**Returned Format**    <time><NL>





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# Trigger Commands

The oscilloscope trigger circuitry helps you locate the waveform you want to view. Edge triggering identifies a trigger condition by looking for the slope and voltage level (trigger level) on the source you select.

The commands in the TRIGger subsystem define the conditions for triggering. The command set has been defined to closely represent the front-panel trigger menus.

These TRIGger commands and queries are implemented in the Infiniium Oscilloscopes:

- [:EDGE]:LEVel
- [:EDGE]:SLOPe
- [:EDGE]:SOURe
- :SWEep

---

## **[ :EDGE ] :LEVel**

**Command**                    :TRIGger [ :EDGE ] :LEVel <level> }

The :TRIGger[:EDGE]:LEVel command specifies the trigger level.

<level> A number in the range of +12 to -12.

**Query**                      :TRIGger [ :EDGE ] :LEVel ?

The query returns the trigger level.

**Returned Format**         <level><NL>

**[[:EDGE]:SLOPe**

---

**[[:EDGE]:SLOPe**

**Command**           :TRIGger[:EDGE]:SLOPe {NEGative | POSitive}

The :TRIGger[:EDGE]:SLOPe command specifies the slope of the edge used to trigger the oscilloscope.

**Query**             :TRIGger[:EDGE]:SLOPe?

The query returns the currently selected edge slope.

**Returned Format**   {NEGative | POSitive}<NL>

---

## **[ :EDGE ] :SOURe**

**Command**            :TRIGger [ :EDGE ] :SOURe {CHANnel1 | CHANnel2 | EXT | EXT5  
                         | EXT50o}

The :TRIGger[:EDGE]:SOURe command sets the source used for triggering.

**Query**                :TRIGger [ :EDGE ] :SOURe?

The query returns the currently selected trigger source.

**Returned Format**    {CHANnel1 | CHANnel2 | EXT | EXT5 | EXT50o}<NL>

**SWEep**

---

**SWEep**

**Command**                   :TRIGger:SWEep {AUTO | NORMal}

The :TRIGger:SWEep command selects the oscilloscope sweep mode.

<AUTO> When you select AUTO, if a trigger event does not occur within a time determined by the oscilloscope settings, the oscilloscope automatically forces a trigger which causes the oscilloscope to sweep. If the frequency of your waveform is 20 Hz or less, you should not use the AUTO sweep mode because it is possible that the oscilloscope will automatically trigger before your waveform trigger occurs.

<NORMal> When you select NORMal, if no trigger occurs, the oscilloscope will not sweep, and no waveform data will appear on the screen.

**Query**                     :TRIGger:SWEep?

The query returns the specified channel's sweep mode.

**Returned Format**       [:TRIGger:SWEep] {AUTO | NORMal}<NL>



---

# Waveform Commands

The WAVEform subsystem is used to transfer waveform data from the oscilloscope to a computer. It contains commands to transfer waveform information and waveform data from the oscilloscope. These WAVEform commands and queries are implemented in the 3000 Series Oscilloscopes:

- :DATA?
- :POINTs?
- :SOURce
- :XINCrement?
- :XORigin?
- :YINCrement?
- :YORigin?



---

## DATA?

**Query**                   :WAVeform:DATA?

The :WAVeform:DATA? query outputs waveform data to the computer over the selected interface. Use the :WAVeform:SOURce command to determine which channel waveform data is output.

**Returned Format**       <block\_data><NL>

**POINTs?**

---

**POINTs?**

**Query**                   :WAVeform:POINTs?

The :WAVeform:POINTs? query returns the points value in the current waveform preamble. The points value is the number of time buckets contained in the waveform selected with the :WAVeform:SOURce command.

**Returned Format**       <points><NL>

    <points> An integer.

---

## SOURCE

**Command**            :WAVEform:SOURCE {CHANnel1 | CHANnel2}

The :WAVEform:SOURCE command selects a channel as the waveform source.

**Query**                :WAVEform:SOURCE?

The :WAVEform:SOURCE? query returns the currently selected waveform source.

**Returned Format**    {CHANnel1 | CHANnel2}<NL>

**XINCrement?**

---

## XINCrement?

**Query**                   :WAVeform:XINCrement?

The :WAVeform:XINCrement? query returns the time difference between consecutive data points for the currently specified waveform source. For time domain waveforms, this is the time difference between consecutive data points. For VERSus type waveforms, this is the duration between levels on the X axis. For voltage waveforms, this is the voltage corresponding to one level.

**Returned Format**       <value><NL>

<value> A real number representing the time between data points on the X axis.

---

## XORigin?

**Query**                   :WAVeform:XORigin?

The :WAVeform:XORigin? query returns the X-axis value of the first data point in the data record. For time domain waveforms, it is the time of the first point. For VERSus type waveforms, it is the X-axis value at level zero. For voltage waveforms, it is the voltage at level zero. The value returned by this query is treated as a double precision 64-bit floating point number.

**Returned Format**       <value><NL>

<value> A real number representing the X-axis value of the first data point in the data record.

**YINCrement?**

---

**YINCrement?**

**Query**                   :WAVeform:YINCrement?

The :WAVeform:YINCrement? query returns the y-increment voltage value for the currently specified source. This voltage value is the voltage difference between two adjacent waveform data digital codes. Adjacent digital codes are codes that differ by one least significant bit. For example, the digital codes 24680 and 24681 vary by one least significant bit.

**Returned Format**       <real\_value><NL>  
                          <real\_value> A real number in exponential format.

---

## YORigin?

**Query**                   :WAVeform:YORigin?

The :WAVeform:YORigin? query returns the y-origin voltage value for the currently specified source. The voltage value returned is the voltage value represented by the waveform data digital code 00000.

**Returned Format**       <real\_value><NL>

<real\_value> A real number in exponential format.





---

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# Safety Notices

This apparatus has been designed and tested in accordance with IEC Publication 1010, Safety Requirements for Measuring Apparatus, and has been supplied in a safe condition. This is a Safety Class I instrument (provided with terminal for protective earthing). Before applying power, verify that the correct safety precautions are taken (see the following warnings). In addition, note the external markings on the instrument that are described under "Safety Symbols."

## Warnings

- Before turning on the instrument, you must connect the protective earth terminal of the instrument to the protective conductor of the (mains) power cord. The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. You must not negate the protective action by using an extension cord (power cable) without a protective conductor (grounding). Grounding one conductor of a two-conductor outlet is not sufficient protection.
- Only fuses with the required rated current, voltage, and specified type (normal blow, time delay, etc.) should be used. Do not use repaired fuses or short-circuited fuseholders. To do so could cause a shock or fire hazard.
- If you energize this instrument by an auto transformer (for voltage reduction or mains isolation), the common terminal must be connected to the earth terminal of the power source.

- Whenever it is likely that the ground protection is impaired, you must make the instrument inoperative and secure it against any unintended operation.

- Service instructions are for trained service personnel. To avoid dangerous electric shock, do not perform any service unless qualified to do so. Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

- Do not install substitute parts or perform any unauthorized modification to the instrument.

- Capacitors inside the instrument may retain a charge even if the instrument is disconnected from its source of supply.

- Do not operate the instrument in the presence of flammable gasses or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

- Do not use the instrument in a manner not specified by the manufacturer.

## To clean the instrument

If the instrument requires cleaning: (1) Remove power from the instrument. (2) Clean the external surfaces of the instrument with a soft cloth dampened with a mixture of mild detergent and water. (3) Make sure that the instrument is completely dry before reconnecting it to a power source.

## Safety Symbols



Instruction manual symbol: the product is marked with this symbol when it is necessary for you to refer to the instruction manual in order to protect against damage to the product..



Hazardous voltage symbol.



Earth terminal symbol: Used to indicate a circuit common connected to grounded chassis.

---

# Notices

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Agilent Technologies, Inc.  
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