



Remote Control Manual WaveJet Touch Oscilloscopes



WaveJet Touch Remote Control Manual

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Overview

Remote control enables you to control the WaveJet Touch user interface (front panel and touch screen controls) from an external controller (usually a computer).

In addition, you may use it to:

- Transfer waveform data, screen data, panel setups, etc. directly to the computer without using USB memory
- Configure Measurement functions

Remote control can be performed via USB, TCP/IP, or GPIB connection. All are provided as standard-equipped features.

Setting Up Remote Connections

Install WaveStudio Software

WaveStudio™ is a free, remote control software from Teledyne LeCroy. Not only does it provide all the functions necessary to complete the interface, it can be used as a remote terminal to read/write queries and commands.

Download WaveStudio from teledynelecroy.com/support/softwaredownload/ under Oscilloscope > Software Utilities. Install it on the controller computer.

NOTE: WaveStudio is only available for Microsoft Windows® 32- and 64-bit platforms.

After setting the remote control interface on the oscilloscope, complete the configuration in WaveStudio.

If you want to send program messages containing multiple commands, we recommend using **ActiveDSO™**, another free utility from Teledyne LeCroy that automates the interface to the oscilloscope. You can download ActiveDSO from the same page as WaveStudio. The ActiveDSO application contains a Help file documenting its features.

USB-based Remote Control

NOTE: When utilizing a USB connection in a noisy environment, a noise-resistant cable may be necessary.

OSCILLOSCOPE SETTINGS:

1. Connect the WaveJet Touch to the controller from the back panel USB port using a USB2.0 A-B type cable.
2. Press the front panel **UTILITIES** button.
3. From the Utilities touch menu, choose **Remote** and Interface **USB**.

WAVESTUDIO SETTINGS:

1. On the controller, go to the **Device Manager** and expand the **Ports** folder. Find the entry for **Virtual COM port for Teledyne LeCroy WaveJet DSOs** and note the number assigned to this COM port.
2. Launch the WaveStudio application.
3. Click the **Add Scope** button on the toolbar.
4. On the Add Device pop-up, choose **RS232**.
5. Change the **COM port** setting to the number you found in the Device Manager. You do not need to change any other settings.
6. Click **OK**.
7. After completing the settings, WJ3x4T should appear as a device in the My Scope Explorer at the far left of the WaveStudio window. Select **WJ3x4T** to activate the connection.
8. If you wish, click **Terminal** in the bottom part of the My Scope Explorer window to enter and send remote commands to the WaveJet.

TCP/IP-based Remote Control

The oscilloscope can accept a dynamic IP address via DHCP or be configured with a static IP address. If assigning a static IP address, consult your Network Administrator regarding the oscilloscope's address, subnet mask, and default gateway prior to making your remote control settings.

OSCILLOSCOPE SETTINGS:

1. Connect the WaveJet Touch to your network from the rear panel Ethernet port.

NOTE: Use a cross-coupling Ethernet cable when connecting directly to the controller, rather than over a network.

2. Press the front panel **UTILITIES** button.
3. From the Utilities touch menu, choose **Remote**, and Interface **TCP/IP**.
4. Turn **DHCP** On or Off, depending on your network configuration.
5. If DHCP is Off, touch **IP Address**. On the IP Address pop-up, enter the oscilloscope's address:
 - Turn the **ADJUST knob** to change the value in each segment; push **ADJUST** to enter the value and move to the next segment.
 - On the Remote touch menu, touch the **down-arrow cell** to move down to the **Subnet Mask**, and enter the mask using the same procedure as for the IP Address.
 - Enter the **Default Gateway** address the same as you did the Subnet Mask.
6. On the Remote menu, touch **Enter** to complete the setup.
7. Reboot the oscilloscope after changing network settings.

NOTE: You will need the oscilloscope's IP Address to complete set up. If you have just turned on DHCP, go back to the Remote > TCP/IP menu to find the address.

WAVESTUDIO SETTINGS:

1. Launch the WaveStudio application.
2. Click the **Add Scope** button on the toolbar.
3. On the Add Device pop-up, choose **TCP/IP**.
4. Enter the oscilloscope's **IP Address**. You do not need to change any other settings.
5. Click **OK**.
6. After completing the settings, WJ3x4T should appear as a device in the My Scope Explorer at the far left of the WaveStudio window. Select **WJ3x4T** to activate the connection.
7. If you wish, click Terminal in the bottom part of the My Scope Explorer window to enter and send remote commands to the WaveJet.

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OTHER CONTROLLER SETTINGS:

Set up communications for control software as shown below

Item	Set Value
TCP/IP port number (connects to)	1864
Delimiter (transmit) ¹	CR, LF, or CR+LF
Delimiter (receive) ²	LF

1 The controller transmits data to the oscilloscope.

2 The controller receives data from the oscilloscope.

NETWORK:

The default gateway is assigned to "192.168.1.1". If this gateway is not being used by the network, then the computer and oscilloscope must exist on the same sub net.

GPIB-based Remote Control

OSCILLOSCOPE SETTINGS:

1. Connect the oscilloscope to the controller from the back panel GPIB interface using a GPIB cable.
2. Press the front panel **UTILITIES** button.
3. From the Utilities touch menu, choose **Remote**, and Interface **GPIB**.
4. Touch **Address** and enter the GPIB address you wish to assign to the oscilloscope. Turn the ADJUST knob to change the default value.

WAVESTUDIO SETTINGS:

1. Launch the WaveStudio application.
2. Click the **Add Scope** button on the toolbar.
3. On the Add Device pop-up, choose **GPIB**.
4. Enter the **GPIB Address** number you entered on the oscilloscope. You do not need to change any other settings.
5. Click **OK**.
6. After completing the settings, WJ3x4T should appear as a device in the My Scope Explorer at the far left of the WaveStudio window. Select **WJ3x4T** to activate the connection.
7. If you wish, click **Terminal** in the bottom part of the My Scope Explorer window to enter and send remote commands to the WaveJet.

OTHER CONTROLLER SETTINGS:

Set up communications for control software as shown below

Item	Set Value
Delimiter (transmit) ¹	LF+EOI, or LF+EOI
Delimiter (receive) ²	LF, EOI

¹ The controller transmits data to the oscilloscope.

² The controller receives data from the oscilloscope.

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INTERFACE FUNCTIONS

The following IEEE488.1 remote interface functions have been implemented.

Table 1: IEEE488.1 Interface Functions Implemented

Subset	Function
SH1	Includes all source handshaking functions
AH1	Includes all acceptor handshaking functions.
T6	Does not include a talk-only function to specify or cancel talker specifications in basic talker, serial polling, and MLA.
TE0	Does not include an extended talker function.
L4	Does not include a function to specify or cancel listener specifications in basic listener and MTA.
LE0	Does not include an extended listener function.
SR1	Includes all service request functions.
RL2	Includes all remote local functions but not the local lockout function.
PP0	Does not include a parallel polling function.
DC1	Includes all device clear functions.
DT1	Includes all device trigger functions.
C0	Does not include a controller function.

Remote Command Standards

Remote commands used with the oscilloscope comply with the IEEE 488.2 General Purpose Interface Bus (GPIB) standard. All applicable parts of the TCP/IP interface and USB interface are similar to the GPIB interface.

In this manual, the elements stipulated by the IEEE488.2 standard appear as shown below.

- <PROGRAM MESSAGE>
- <CHARACTER PROGRAM DATA>
- <DECIMAL NUMERIC PROGRAM DATA>
- <SUFFIX PROGRAM DATA>
- <STRING PROGRAM DATA>
- <ARBITRARY BLOCK PROGRAM DATA>
- <RESPONSE MESSAGE>
- <CHARACTER RESPONSE DATA>
- <NR1 NUMERIC RESPONSE DATA>
- <NR3 NUMERIC RESPONSE DATA>
- <STRING RESPONSE DATA>
- <DEFINITE LENGTH ARBITRARY BLOCK RESPONSE DATA>
- <ARBITRARY ASCII RESPONSE DATA>

Input Buffer (All Interfaces)

The oscilloscope has a 512-byte input buffer.

Even when the input buffer is not yet full, if the delimiter is received, the oscilloscope begins to interpret the commands in the buffer. During command interpretation and execution, subsequent messages are not received.

When the input buffer becomes full, any data exceeding 512 bytes is discarded. Do not attempt to send any message longer than 512 bytes. However, waveform data transfers longer than 512 bytes may be sent and received.

Status Register Configuration

This section describes the *STB? query response for all interfaces. Serial polling is described only for the GPIB interface.

Status Byte Register (*STB?)

This register can be read only by an *STB? query or a serial polling operation (via GPIB interface only). It is positioned at the last level of this product's multi-level status information.

The register has an 8-bit configuration and includes the following.

Bit	Description
(Bit 7)	Always 0.
RQS (Bit 6)	With serial polling operations, this is returned as Bit 6 of the status byte. Other bits in the status byte register (ESB, MAV, ..., SWE) are set when a 0→1 change is set by the logical OR result among all masked bits in the service request register. This bit is cleared at power-on or during serial polling operations.
MSS (Bit 6)	This is returned as Bit 6 of the *STB? query response. Other bits in the status byte register (ESB, MAV, ..., SWE) reflect the logical OR result among all masked bits in the service request register.
ESB (Bit 5)	This is returned as Bit 5 of the serial poll or *STB? query response. It is a summary message for the standard event status register.
MAV (Bit 4)	This is returned as Bit 4 of the serial poll or *STB? query response. It is a summary message for the output queue.
(Bit 3)	Always 0.
(Bit 2)	Always 0.
(Bit 1)	Always 0.
TESB (Bit 0)	This is returned as Bit 0 of the serial poll or *STB? query response. It is a summary message for the trigger event status register.

Service Request Enable Register

This register is used to mask the status byte register. Either the RQS or MSS bit is set, according to the masked result. Therefore, it affects service request. The mask pattern can be set using the *SRE command and read using the *SRE? query. The register contents are cleared (to 0) when the power is turned ON. Device clearing and the *CLS command are not affected by this.

Standard Event Status Register

This register is specified under the IEEE488.2 standard. It can be read by the *ESR? query. The register contents are reflected in real time in the ESB bit of the status byte register, as the logical OR result of all masked bits in the standard event status enable register. The register contents can be read using a *CLS command or *ESR? query, which they are cleared (to 0).

The register has an 8-bit configuration, and includes the following.

Bit	Description
PON (Bit 7)	1 is set at power-on.
(Bit 6)	Always 0.
CME (Bit 5)	1 is set when a command-execution error occurs. It indicates an error in the command syntax.
EXE (Bit 4)	1 is set when an execution error has occurred. It indicates that command execution failed or did not end normally.
DDE (Bit 3)	1 is set when a device-specific error has occurred. It indicates an error that is specific to this oscilloscope.
QYE (Bit 2)	1 is set when a query error has occurred. It indicates an error such as when the controller attempts to read a message from this device without sending a query command, or when it sent the next message before completely reading the response message.
(Bit 1)	Always 0.
OPC (Bit 0)	1 is set when an operation is complete. The *OPC command supports the controller/device synchronization function.

Standard Event Status Enable Register

This register is used to mask the standard event status register. The ESB bit in the status byte register is set according to the masked result. The mask pattern can be set using the *ESE command and read using the *ESE? query. The register contents are cleared (to 0) when the power is turned ON. Device clearing and the *CLS command are not affected by this.

Output Queue

The output queue is the output buffer used to store response messages sent to the controller. Response messages for various types of queries are stored in the output queue. As long as there is at least 1 byte of data in the output queue, the MAV bit is set to 1 in the status byte register. The output queue is cleared (emptied) by a device clear operation and at power-on. If a new program message is sent before the controller has read all of the data bytes and while the output queue is not yet empty, a query error occurs and the output queue is cleared.

Trigger Event Status Register

This event register is used to report completion of single measurements. The contents of this register reflect in real time in the SWE bit of the status byte register the logical OR result among all masked bits of the trigger event status enable register. The register uses the lower bit. The other bit is always 0. Use TESR? to query this register. The register contents are cleared (to 0) when the power is turned ON.

The register has an 8-bit configuration, and includes the following.

Bit	Description
(Bit 7)	Always 0.
(Bit 6)	Always 0.
(Bit 5)	Always 0.
(Bit 4)	Always 0.
(Bit 3)	Always 0.
(Bit 2)	Always 0.
(Bit 1)	Always 0.
SWE (Bit 0)	This is returned as Bit 0 of the serial poll or *STB? query response. It is a summary message for the trigger event status register.

Trigger Event Status Enable Register

This register is used to mask the trigger event status register. The SWE bit in the status byte register is set according to the masked result. The mask pattern can be set using the TESE command and read using the TESE? query. The register contents are cleared (to 0) when the power is turned ON. Device clearing and the *CLS command are not affected by this.

Format of Data Blocks

<CHARACTER PROGRAM DATA>/<CHARACTER RESPONSE DATA>

<CHARACTER PROGRAM DATA>/<CHARACTER RESPONSE DATA> is data comprised of combinations of ASCII code and alphanumeric characters (A to Z and 0 to 9).

C1: TRA ON

In the above example, the TRA command parameter "ON" is <CHARACTER PROGRAM DATA>.

When the oscilloscope creates <CHARACTER RESPONSE DATA> as a <RESPONSE MESSAGE>, it always uses all capital letters.

<DECIMAL NUMERIC PROGRAM DATA>/<NUMERIC RESPONSE DATA>

When used in data, numerical values are handled in any of three formats: integer (NR1), real number (NR2), or exponent (NR3).

For example, if the message is "C1:VDIV 50mV", the "50mV" part is the numerical value program data. All of the following numerical values are interpreted as being the same.

$0.05 = 50\text{E-}3 = 5\text{e-}2 = 5\text{E} - 2 \text{ V} = 50 \text{ mV}$

Remote Function Constraints

Remote control operation restricts the following functions:

- **Front Panel and Touch Screen.** Once remote control is in process, except to clear the Panel Lock, no front panel or touch screen operations are possible.
- **Print** (connected printer). A hardcopy printer utilizes the same interface as remote control, and these functions are mutually exclusive. The following behavior will occur:
 - If the Utilities > Config. > Remote > Interface setting is ON, Utilities > Print > Device can only be set to USB Memory.
 - If Utilities > Print > Device is set to Printer and a printer has been connected to the back panel USB port, Utilities > Remote > Interface can only be set to OFF.
 - If Utilities > Print > Device is set to Printer and a printer has *not* been connected to the back panel USB port, then the Device setting will be forced to USB Memory unless Utilities > Remote > Interface is set to OFF.

Remote Commands

This section describes the remote commands and queries in alphabetical order.

Conventions

The following syntactical conventions apply:

- **Common commands.** Command names that start with an asterisk (*) are all common commands as defined in IEEE Std.488.2.
- **Channel and Math waveforms.** In command syntax, waveforms are denoted by C1, C2, C3, C4, and M1 rather than CH1, etc., **when used as command prefixes** (i.e., before the colon). When used as setup parameters, they may be entered as CHx and MATH. Follow the command syntax as shown.

ACAL Command and Query (On/Off of automatic calibration)

The ACAL command switches on/off of an automatic calibration. When an automatic calibration is set to ON, a calibration is done as soon as the command is received.

The ACAL? query returns the status (on or off) of an automatic calibration.

COMMAND SYNTAX

ACAL <state>

<state> := {ON, OFF}

QUERY SYNTAX

ACAL?

RESPONSE FORMAT

<state>

REMARKS

Automatic calibration is normally performed immediately after powering on the oscilloscope. Regularly transmitting "ACAL ON" can maintain the performance of the AD convertor.

Auto Calibration settings are not retained. Auto Calibration is turned ON whenever the oscilloscope is powered on, even if you turned off this feature when last powering off.

ACQ Command and Query (Acquisition Mode Selection)

The ACQ command selects the acquisition mode. For the ACQ? query, the currently selected acquisition mode is returned.

COMMAND SYNTAX

ACQ <mode>

<mode> := {NORMAL, PEAK, AVERAGE, HIGH_RES } when XYDS is YT

<mode> := {NORMAL, AVERAGE, HIGH_RES } when XYDS is XYTRG

<mode> := {NORMAL} when XYDS is XY

QUERY SYNTAX

ACQ?

RESPONSE FORMAT

<mode>

REMARKS

For ACQ AVERAGE, Roll mode is forced OFF.

ASET Command (Auto Setup)

The ASET command starts auto setup.

COMMAND SYNTAX

ASET

AVGCNT Command and Query (Average Count Setting)

The AVGCNT command sets the average count. The AVGCNT? query returns the currently set count number.

COMMAND SYNTAX

AVGCNT <number>

<number> := {2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048, 4096, 8192, 16384, 32768, 65536}

QUERY SYNTAX

AVGCNT?

RESPONSE FORMAT

<number>

REMARKS

If ACQ is not AVERAGE, the AVGCNT command returns a device-specific error (DDE).

BWL Command and Query (Bandwidth Limits (Low Pass Filter) ON/OFF)

The BWL command changes the bandwidths of the bandwidth limits (low pass filter) set for the specified input channel. The BWL? query returns the selected <mode>.

COMMAND SYNTAX

<CHannel>:BWL <mode>

<CHannel> := {C1, C2, C3, C4}

<mode> := {FULL, 100M, 20M, 2M, 200K}

QUERY SYNTAX

<CHannel>:BWL?

RESPONSE FORMAT

<mode>

<mode> is used to identify the current bandwidth limits (low pass filter).

***CLS Command (Status Clear)**

The *CLS command clears the entire status data register.

COMMAND SYNTAX

*CLS

CLSWP Command (Clear Sweeps)

The CLSWP command clears (reinitializes) the following items:

- Waveform Replay function
- Waveform averaging
- Waveform persistence
- Measure result values
- Statistics Min (Minimum), Max (Maximum), and Num (Number of Pass/Fail)
- Result and number of Pass/Fail judgments
- Log entries

COMMAND SYNTAX

CLSWP

CMSR?, CMSR2? Query (Cursor Measurement Value)

The CMSR?, CMSR2? query returns the currently displayed cursor measurement value.

QUERY SYNTAX

CMSR?

CMSR2?

RESPONSE FORMAT

<measure1>, <measure2>, <measure3>, <measure4>, <measure5>, <measure6>, <measure7>

REMARKS

In <measure1> to <measure7>, the current cursor measurement value is output in <NR3 Numeric Response Data> format.

When cursor type is OFF, or when data cannot be measured, this query returns +9.9100000E+37. Regardless of what cursor type has been selected, seven cursor measurement results are output in comma-separated format.

Table 2 to Table 4 on the following pages show the relation between a YT display and an XY display in terms of the cursor type setting and the query response results in <measure1> to <measure7>. Terms used in these tables are defined as follows.

OFF:	Cursor type is not set.
DH:	Two cursors in the vertical direction and the time difference between them is shown.
DV:	Two cursors in the horizontal direction and the interval between them is shown.
DHDV:	Four cursors (DV and DH) are shown with the interval and time difference between the respective pairs of cursors.
VATH:	One cursor in the vertical direction is shown with the value of the waveform intersect point during the period.
t:	Time along the axis of one cursor in the vertical direction.
Δt :	Time difference between two cursors in the vertical direction.
ΔV :	Interval between two cursors in the horizontal direction.
V@t:	Value of the waveform intersect point during the period, for one cursor in the vertical direction.
f:	Frequency along the axis of one cursor in the vertical direction.
Δf :	Frequency difference between two cursors in the vertical direction.
ΔV_x :	Interval between two cursors in the horizontal direction of XY display.
ΔV_y :	Interval between two cursors in the vertical direction of XY display.
ΔdB_m :	Interval between two cursors in an FFT waveform for a MATH operation.
dBm:	Value of the waveform intersect point at the frequency of one vertical cursor of an FFT waveform for a MATH operation

Table 2: Cursor Type Setting and Query Response Results
(When FFT waveform is not shown in YT display)

	Setting	OFF	DH	DV	DHDV	VATH
CMSR? Query response results	<measure1>	9.9100000E+37	9.9100000E+37	CH1 ΔV	CH1 ΔV	CH1 V@t1
	<measure2>	9.9100000E+37	9.9100000E+37	CH2 ΔV	CH2 ΔV	CH2 V@t1
	<measure3>	9.9100000E+37	9.9100000E+37	CH3 ΔV	CH3 ΔV	CH3 V@t1
	<measure4>	9.9100000E+37	9.9100000E+37	CH4 ΔV	CH4 ΔV	CH4 V@t1
	<measure5>	9.9100000E+37	9.9100000E+37	MATH ΔV	MATH ΔV	MATH V@t1
	<measure6>	9.9100000E+37	Δt	9.9100000E+37	Δt	t1
	<measure7>	9.9100000E+37	1/Δt	9.9100000E+37	1/Δt	9.9100000E+37
CMSR2? Query response results	<measure1>	9.9100000E+37	9.9100000E+37	9.9100000E+37	9.9100000E+37	CH1 V@t2
	<measure2>	9.9100000E+37	9.9100000E+37	9.9100000E+37	9.9100000E+37	CH2 V@t2
	<measure3>	9.9100000E+37	9.9100000E+37	9.9100000E+37	9.9100000E+37	CH3 V@t2
	<measure4>	9.9100000E+37	9.9100000E+37	9.9100000E+37	9.9100000E+37	CH4 V@t2
	<measure5>	9.9100000E+37	9.9100000E+37	9.9100000E+37	9.9100000E+37	MATH V@t2
	<measure6>	9.9100000E+37	9.9100000E+37	9.9100000E+37	9.9100000E+37	t2
	<measure7>	9.9100000E+37	9.9100000E+37	9.9100000E+37	9.9100000E+37	9.9100000E+37

Table 3: Cursor Type Setting and Query Response Results
(When FFT waveform is shown in YT Display)

	Setting	OFF	DH	DV	DHDV	VATH
CMSR? Query response results	<measure1>	9.9100000E+37	9.9100000E+37	CH1 ΔV	CH1 ΔV	CH1 V@t1
	<measure2>	9.9100000E+37	9.9100000E+37	CH2 ΔV	CH2 ΔV	CH2 V@t1
	<measure3>	9.9100000E+37	9.9100000E+37	CH3 ΔV	CH3 ΔV	CH3 V@t1
	<measure4>	9.9100000E+37	9.9100000E+37	CH4 ΔV	CH4 ΔV	CH4 V@t1
	<measure5>	9.9100000E+37	9.9100000E+37	MATH ΔdBm	MATH ΔdBm	MATH dBm1
	<measure6>	9.9100000E+37	Δt	9.9100000E+37	Δt	t1
	<measure7>	9.9100000E+37	Δ f	9.9100000E+37	Δ f	f1
CMSR2? Query response results	<measure1>	9.9100000E+37	9.9100000E+37	9.9100000E+37	9.9100000E+37	CH1 V@t2
	<measure2>	9.9100000E+37	9.9100000E+37	9.9100000E+37	9.9100000E+37	CH2 V@t2
	<measure3>	9.9100000E+37	9.9100000E+37	9.9100000E+37	9.9100000E+37	CH3 V@t2
	<measure4>	9.9100000E+37	9.9100000E+37	9.9100000E+37	9.9100000E+37	CH4 V@t2
	<measure5>	9.9100000E+37	9.9100000E+37	9.9100000E+37	9.9100000E+37	MATHdBm2
	<measure6>	9.9100000E+37	9.9100000E+37	9.9100000E+37	9.9100000E+37	t2
	<measure7>	9.9100000E+37	9.9100000E+37	9.9100000E+37	9.9100000E+37	f2

**Table 4: Cursor Type Setting and Query Response Results
(XY Display)**

	Cursor	OFF	DH	DV	DHDV
CMSR? Query response results	<measure1>	9.9100000E+37	ΔV_x	9.9100000E+37	ΔV_x
	<measure2>	9.9100000E+37	9.9100000E+37	ΔV_y	ΔV_y
	<measure3>	9.9100000E+37	9.9100000E+37	9.9100000E+37	9.9100000E+37
	<measure4>	9.9100000E+37	9.9100000E+37	9.9100000E+37	9.9100000E+37
	<measure5>	9.9100000E+37	9.9100000E+37	9.9100000E+37	9.9100000E+37
	<measure6>	9.9100000E+37	9.9100000E+37	9.9100000E+37	9.9100000E+37
	<measure7>	9.9100000E+37	9.9100000E+37	9.9100000E+37	9.9100000E+37
CMSR2? Query response results	<measure1>	9.9100000E+37	9.9100000E+37	9.9100000E+37	9.9100000E+37
	<measure2>	9.9100000E+37	9.9100000E+37	9.9100000E+37	9.9100000E+37
	<measure3>	9.9100000E+37	9.9100000E+37	9.9100000E+37	9.9100000E+37
	<measure4>	9.9100000E+37	9.9100000E+37	9.9100000E+37	9.9100000E+37
	<measure5>	9.9100000E+37	9.9100000E+37	9.9100000E+37	9.9100000E+37
	<measure6>	9.9100000E+37	9.9100000E+37	9.9100000E+37	9.9100000E+37
	<measure7>	9.9100000E+37	9.9100000E+37	9.9100000E+37	9.9100000E+37

COPY Command (Hard Copy)

The COPY command copies current screen data to USB memory.

COMMAND SYNTAX

COPY

CPL Command and Query (Coupling Setup)

The CPL command sets the coupling mode for the specified input channel. The CPL? query returns the selected coupling mode.

COMMAND SYNTAX

<CHannel>:CPL <coupling>

<CHannel> := {C1, C2, C3, C4}

<coupling> := {AC1M, GND, DC1M, DC50}

QUERY SYNTAX

<CHannel>:CPL?

RESPONSE FORMAT

<coupling>

CURM Command and Query (Cursor Type Setup)

The CURM command sets the cursor type. The CURM? query returns the currently set cursor type.

COMMAND SYNTAX

CURM <mode>

<mode> := {OFF, DV, DH, DHDV, VATH}

OFF: Cursor type is not set.

DV: Two cursors are shown in the horizontal direction, and the interval between the two cursors is shown.

DH: Two cursors are shown in the vertical direction, and the time difference between the two cursors is shown.

DHDV: The four cursors in DV and DH above are shown, and the interval and time difference between the respective pairs of cursors are shown.

VATH: One cursor is shown in the vertical direction, and the value of the waveform intersect point during the period is shown.

QUERY SYNTAX

CURM?

RESPONSE FORMAT

<mode>

DATE Command and Query (Date and Time Setup)

The DATE command defines the date and time.

The DATE? query reads the currently defined date and time.

COMMAND SYNTAX

DATE <day>,<month>,<year>,<hour>,<minute>,<second>

<day> := Numerical value from 1 to 31

<month> := {JAN, FEB, MAR, APR, MAY, JUN, JUL, AUG, SEP, OCT, NOV, DEC}

<year> := Integer value from 2000 to 2099

<hour> := Integer value from 0 to 23

<minute> := Integer value from 0 to 59

<second> := Integer value from 0 to 59

QUERY SYNTAX

DATE?

RESPONSE FORMAT

<day>,<month>,<year>,<hour>,<minute>,<second>

DIRM Command and Query (Measurement Number Setup for Auto Measure)

For the WaveJet Touch, there are four available measurement numbers: A, B, C, and D.

The DIRM command sets A, B, C, or D as the Auto Measure measurement number.

This DIRM command must be set before using any of the following commands or queries to run Auto Measure: MSEL/MSEL?, SKLV/SKLV?, TPRM/TPRM?

The DIRM? query returns the currently set Auto Measure measurement number (A, B, C, or D).

COMMAND SYNTAX

DIRM <dir>

<dir> := {A, B, C, D}

QUERY SYNTAX

DIRM?

RESPONSE FORMAT

<dir>

<dir> indicates the current setting in Auto Measure measurement number A, B, C, or D.

DISP Command and Query (Screen Display)

The DISP command sets the on-screen waveform display ON or OFF. The DISP? query returns the ON/OFF status of the on-screen waveform display. When it is ON, a waveform is shown. When it is OFF, no waveforms are shown.

When it is OFF, this helps speed up remote operations such as waveform transfer. The following should be considered as conditions for setting OFF.

COMMAND SYNTAX

DISP <state>

<state> := {ON, OFF}

QUERY SYNTAX

DISP?

RESPONSE FORMAT

<state>

REMARKS

DISP can be set to OFF if all the following conditions are met.

TRMD is STOP	M1:TRA is OFF
XYDS is YT	CURM is not VATH
MDSP is OFF	ROLL is OFF
ACQ is not AVERAGE	EQU is OFF
PFOPE is OFF	REF is OFF

DISP is switched to ON when any of the following operations is performed.

Oscilloscope is started.	EQU is changed to ON.
Panel Lock is OFF.	M1:TRA is changed to ON.
XYDS is changed to XY or XYTRG.	CURM is changed to VATH.
TRMD is changed to AUTO or NORMAL.	MDSP is changed to ON.
ROLL is changed to ON.	ZOOM is changed on pushing the ZOOM button.
ASET is executed.	REF is changed on pushing the REF button.
ACQ is changed to AVERAGE.	PFOPE is changed to ON.

DMSK Command and Query (Sending and receiving of mask pattern)

The mask pattern used for the Pass / Fail judgment is transmitted to the oscilloscope and the DMSK command is set. DMSK? query acquires the mask pattern from the oscilloscope.

The data of the mask pattern acquired with DMSK? query is the same form as the mask which can be saved to USB memory from the oscilloscope.

COMMAND SYNTAX

DMSK<LF+EOI>#8<byte-length><binary-block>

<byte-length> := ASCII character string of eight digits. Fill with zeros at the head when fewer than eight digits. For example, if the number of bytes is 480, send #800000480.

<binary-block> := setting condition data in binary format. Use the DMSK? Query to determine how this command should be executed.

Transmit the DMSK command according to the following two-step procedure:

- Step1: Transmit the DMSK command without the parameter. This puts the oscilloscope into the state where it can receive mask pattern data.
- Step2: Send the mask data in #8< byte-length><binary-block> format.

QUERY SYNTAX

DMSK?

RESPONSE FORMAT

#8<byte-length><binary-block>

#8 indicates that the response message is in <Definite Length Arbitrary Block Response Data> format, and the subsequent <byte-length> consists of an 8-bit unsigned integer.

<byte-length> indicates the number of bytes to be entered in <binary-block>. It will always be an 8-bit unsigned integer. Zeros will be used to fill any unused positions.

<binary-block> consists of the setting condition data in binary format.

REMARKS

This command doesn't support the multi-commands.

DSKW Command and Query (Skew)

The DSKW command sets skew (Deskew) of specified input CH.

The DSKW? query returns skew (Deskew) of specified input CH.

COMMAND SYNTAX

<CHannel>:DSKW <deskew>

<CHannel> := {C1, C2, C3, C4}

<deskew> := Skew (Deskew)

QUERY SYNTAX

<CHannel>:DSKW?

RESPONSE FORMAT

<deskew>

<deskew> is skew (Deskew) of the specified input CH in <NR3 Numeric Response Data>format.

DTBORD Command and Query (Data Transfer)

The DTBORD command defines the byte order when waveform data is transferred (no effect when ASCII and BYTE data are transferred). The DTBORD? query returns the currently defined byte order.

COMMAND SYNTAX

DTBORD <order>

<order> := {H/L, L/H}

H/L := data is transferred in (MSB) high-order byte first order.

L/H := data is transferred in (LSB) low-order byte first order.

QUERY SYNTAX

DTBORD?

RESPONSE FORMAT

<order>

<order> is used to identify the byte order.

DTFORM Command and Query (Data Transfer Format Definition)

The DTFORM command defines the data format used when transferring waveform data. The DTWAVE? query transfers the waveform data. The DTFORM? query returns the currently defined waveform data transfer format. For description of waveform data transfer, see DTWAVE? Query.

COMMAND SYNTAX

DTFORM <form>

<form> := {ASCII, BYTE, WORD}

ASCII := Transfers waveform data in ASCII mode. The data transfer format of DTWAVE? when *DTFORMAT ASCII has been specified is:

Top part of screen grid: 32512

Center of screen grid: 0

Bottom part of screen grid: -32768

Voltage value = ASCII numerical value $\div$ 256 $\div$ 32 $\times$ voltage range + offset value

BYTE := Transfers waveform data in binary mode.

WORD := Transfers waveform data in binary mode. The order of bytes in this word can be specified by the DTBORD command.

QUERY SYNTAX

DTFORM?

RESPONSE FORMAT

<form>

<form> is used to identify the waveform data transfer format. Depending on the circumstances, the transfer format may be fixed regardless of the DTFORM setting. The following table shows a matrix of relations among WAVESRC, ACQ, and DTFORM.

WAVESRC (Source)	DTFORM = BYTE	DTFORM = WORD	DTFORM = ASCII
Channel waveform, ACQ = NORMAL, PEAK (data bits = 8)	Transfer in BYTE format	Transfer in WORD format (lower byte is zero-filled)	Transfer in ASCII format
Channel waveform, ACQ = AVERAGE, HIGH_RES (data bits = 16)	Transfer in BYTE format (lower 8 bits are truncated)	Transfer in WORD format	Transfer in ASCII format
Math waveform, operator = ADD, SUB (data bits = 16)	Transfer in WORD format	Transfer in WORD format	Transfer in ASCII format
Math waveform, operator = MULT, INTEGRAL, DERIVATIVE (data bits = 32)	Transfer in DWORD format	Transfer in DWORD format	Transfer in ASCII format
Math waveform, operator = FFT (data bits = 16)	Transfer in WORD format	Transfer in WORD format	Transfer in ASCII format

NOTE: In WORD format, one unit of data is transferred in two bytes. In DWORD format, one unit of data is transferred in four bytes.

DTINF? Query (Read Waveform Information)

The DTINF? query reads waveform information.

QUERY SYNTAX

DTINF?

RESPONSE FORMAT

See below.

REMARKS

This command does not support multi-commands.

FORMAT OF DTINF? RESULT

Items in the table below are returned in one line, separated by commas.

Item	Example Response	Description	Notes
1	ModelName = LeCroy WJ354T	Model name	
2	FileVersion = 1	Version of this information format	The version shown at left is the setup data version.
3	SaveTime = 2014/02/01 15:13:34	Date and time when this waveform information was generated	
4	[Channel1]	Category name for channel 1 vertical information	
5	Volts/div = 5.00 V	CH1 V/div when last waveform was acquired	Probe ratio and rescale are not considered.
6	Offset = 7.50 V	CH1 offset when last waveform was acquired	Probe ratio and rescale are not considered.
7	Waveform = Available	CH1 waveform data availability	Unavailable in some cases, such as when: - trace is OFF - not triggered yet
8	[Channel2]	Category name for channel 2 vertical information	
9	Volts/div = 100 mV	CH2 V/div when last waveform was acquired	Probe ratio and rescale are not considered.
10	Offset = -150 mV	CH2 offset when last waveform was acquired	Probe ratio and rescale are not considered.
11	Waveform = Unavailable	CH2 waveform data availability	
12	[Channel3]	Category name for channel 3 vertical information	This item and the three following items are generated only when the product has a Channel 3 (4CH model).
13	Volts/div = 100 mV	CH3 Volts/div when last waveform was acquired	Probe ratio and rescale are not considered.
14	Offset = 150 mV	CH3 offset when last waveform was acquired	Probe ratio and rescale are not considered.
15	Waveform = Unavailable	CH3 waveform data availability	
16	[Channel4]	Category name for channel 4 vertical information	This item and the three following items are generated only when the product has a Channel 4 (4CH model).
17	Volts/div = 100 mV	CH4 Volts/div when last waveform was acquired	Probe ratio and rescale are not considered.
18	Offset = 150 mV	CH4 offset when last waveform was acquired	Probe ratio and rescale are not considered.
19	Waveform = Unavailable	CH4 waveform data availability	

Item	Example Response	Description	Notes
20	[Horizontal]	Category name for vertical information	
21	Time/div = 500 ms	Time/div when last waveform was acquired	
22	Delay = +0.000000000000 s	Trigger delay (trigger position) when the last waveform was acquired	
23	[Acquisition]	Category name for acquisition information	
24	Memory Length = 500000	Actual memory length of acquired waveform	This value is not the maximum memory length setting, but rather the data length of the current waveform.
25	Average Count = 0	Average count of the last waveform	This value is the actual averaged count. It can be any numerical value from 0 to 256.
26	Wave Info = Peak Roll	Acquisition mode of the last waveform	This value is the acquired waveform information, as a combination of Normal, Peak, Average, Roll, Equ, and Interleave.
27	[Timebase Info]	Category name for timebase information	
28	Time Stamp = 15:13:34.7	Timestamp of last waveform acquisition	
29	Sampling = 100 kS	Sampling rate when last waveform was acquired	

DTPOINTS Command and Query (Amount of Transfer Waveform Data)

The DTPOINTS command defines the amount of transfer waveform data to be transferred.

The DTPOINTS? query returns the amount of transfer waveform data.

COMMAND SYNTAX

DTPOINTS <points>

<points> := 1 to (waveform data length - DTSTART)

Any values exceeding this range are rounded to the maximum or minimum permissible value, whichever is nearest.

QUERY SYNTAX

DTPOINTS?

RESPONSE FORMAT

<points>

<points> is used to identify the currently defined amount of waveform data to be transferred. The format is <NR1 Numeric Response Data>.

REMARKS

(Transfer start address) + (amount of transfer data) > (total amount of Waveform data)

When the above condition occurs with the DTPOINTS command, the transfer start address is rounded to a permissible value.

DTSTART Command and Query (Transfer Start Address)

The DTSTART command defines the start address for transfer of waveform data.

The DTSTART? query returns the currently defined transfer start address.

COMMAND SYNTAX

DTSTART <start>

<start> := 0 to (waveform data length – 1)

Any values exceeding this range are rounded to the maximum or minimum permissible value, whichever is nearest.

QUERY SYNTAX

DTSTART?

RESPONSE FORMAT

<start>

<start> is used to identify the currently defined start address for waveform data transfer. The format is <NR1 Numeric Response Data>.

REMARKS

(Transfer start address) + (amount of transfer data) > (total amount of Waveform data)

When the above condition occurs with the DTSTART command, the amount of transfer data is rounded to a permissible value.

DTSTUP Command and Query (W/R of setting condition data in binary form)

DTSTUP command transmits and sets the setting condition data in binary form to the oscilloscope. DTSTUP? query acquires the setting condition data in binary form from the oscilloscope. The setting condition data acquired with DTSTUP? query can be used to setup the oscilloscope with the DTSTUP command as long as the firmware is the same, or newer on the oscilloscope receiving the command

COMMAND SYNTAX

DTSTUP<LF+EOI>#8<byte-length><binary-block>

<byte-length> := ASCII character string of eight digits specifying the number of bytes in <binary-block>. Fill with zeros at the head when fewer than eight digits. For example, if the number of bytes is 480, send #800000480.

<binary-block> := setting condition data in binary format. Use the DTSTUP? query to determine how this command should be executed.

Transmit the DTSTUP command according to the following two-step procedure.

Step 1: Transmit the DTSTUP command without the parameter. This puts the oscilloscope into the state where it can receive the setting condition data block.

Step 2: Send the setup data block in #8 <byte-length><binary-block> format.

QUERY SYNTAX

DTSTUP?

RESPONSE FORMAT

#8<byte-length><binary-block>

#8 indicates that the response message is in <Definite Length Arbitrary Block Response Data> format, and the subsequent <byte-length> consists of an 8-bit unsigned integer.

<byte-length> indicates the number of bytes to be entered in <binary-block>. It will always be an 8-bit unsigned integer. Zeros will be used to fill any unused positions.

<binary-block> consists of the setting condition data in binary format.

REMARKS

This command does not support multi-commands.

DTWAVE? Query (Waveform Data Transfer)

The DTWAVE? query transfers waveform data.

QUERY SYNTAX

DTWAVE?

RESPONSE FORMAT

The following response formats are provided for settings in the DTFORM and DTBORD commands. The amount of data transferred varies according to settings in the DTSTART and DTPOINTS commands.

(1) When DTFORM command is set for BYTE/WORD (binary transfer):

#8 <byte-length> <binary-block>

#8 indicates that the response message is in <Definite Length Arbitrary Block Response Data> format and the subsequent <byte-length> consists of an 8-digit ASCII string.

<byte-length> indicates the number of bytes to be entered in <binary_block>. <byte_length> consists of an 8-bit unsigned integer that includes zeros.

<binary-block> indicates waveform data stored as binary code in the oscilloscope's internal memory.

8 0 0 0 0 1 0 2 4 D0 D1 - - - Dn

1024 bytes of binary data (D0, D1,..., Dn) is transferred.

The format of the data to be transferred varies according to the DTFORM command settings. For description of the format, see DTFORM Command and Query.

(a) BYTE format

Since one unit of data is transferred in one byte, the number of bytes matches the amount of transfer data specified in the DTPOINTS command.

8 0 0 0 0 1 0 2 4 D0 D1 - - - Dn

1024 bytes of binary data are transferred, and Di (i = 1, 2,..., n) corresponds to one unit of data.

(b) WORD format

Since one unit of data is transferred in two bytes, the number of bytes matches twice the amount of transfer data specified in the DTPOINTS command.

When byte order is specified as H or L by DTBORD command:

8 0 0 0 0 2 0 4 8 U0 L0 U1 L1 - - - Un Ln

When byte order is specified as L or H by DTBORD command:

8 0 0 0 0 2 0 4 8 L0 U0 L1 U1 - - - Ln Un

2048 bytes of binary data ($U_0, L_0, U_1, L_1, \dots, U_n, L_n$) is transferred.

U_i and L_i ($i = 1, 2, \dots, n$) correspond respectively to the upper and lower bytes in one unit of data.

When the waveform is a channel waveform that is not an averaged waveform, L_i ($i = 0, 1, \dots, n$) becomes 0.

(c) DWORD format

Since one unit of data is transferred in four bytes, the number of bytes matches quadruple the amount of transfer data specified in the DTPOINTS command.

When byte order is specified as H or L by DTBORD command :

8 0 0 0 0 4 0 9 6 A0 B0 C0 D0 - - - A_n B_n C_n D_n

When byte order is specified as L or H by DTBORD command:

8 0 0 0 0 4 0 9 6 D0 C0 B0 A0 - - - D_n C_n B_n A_n

4096 bytes of binary data ($A_0, B_0, C_0, D_0, A_1, B_1, C_1, D_1, \dots, A_n, B_n, C_n, D_n$) is transferred.

A_i, B_i, C_i , and D_i correspond respectively to the four bytes in the following data configuration of one unit of DWORD data.

DWORD (4 bytes)			
Higher		Lower	
A_i	B_i	C_i	D_i
(1 byte)	(1 byte)	(1 byte)	(1 byte)

(2) When DTFORM command is set for ASCII

<ascii_block> <delimiter>

<ascii_block> contains block data. The waveform data units that are stored in the oscilloscope's internal memory are described in <NR1 Numeric Response Data> format, and are separated respectively by commas.

$D_0, D_1, \dots, D_n$

D_i ($i = 0, 1, \dots, n$) is described in <NR1 Numeric Response Data> format.

REMARKS

This command does not support multi-commands.

Due to the limitations of the equipment, math waveforms that exceed 2.5 Mpoints cannot be read out using the DTWAVE query (DTPOINTS becomes 0). To reliably capture math waveforms with DTWAVE, set the Max Memory Length (MLEN) to 2.5 Mpoints or less.

EQU Command and Query (Equivalent Sampling ON/OFF)

The EQU command turns equivalent sampling ON or OFF. The EQU? query returns the state (ON or OFF) of the equivalent sample.

COMMAND SYNTAX

EQU <state>

<state> := {ON, OFF}

QUERY SYNTAX

EQU?

RESPONSE FORMAT

<state>

REMARKS

When XYDS is XY, equivalent sampling is turned OFF and EQU ON is ignored without any error.

*ESE Command and Query (Define/Read Event Status Enable Register (ESE))

The *ESE command defines the standard event status enable register (ESE). Users can use this command to connect multiple events in the ESR register to the ESB summary message bit (Bit 5) in the STB register. The *ESE? query reads the contents of the ESE register.

COMMAND SYNTAX

*ESE <value>

<value> := 0 to 255

QUERY SYNTAX

*ESE?

RESPONSE FORMAT

<value>

<value> is used to identify the current contents of the ESE register. The format is <NR1 Numeric Response Data>.

***ESR? Query (Read and Clear Event Status Register (ESR))**

The *ESR? query reads and clears the event status register (ESR). The binary code in register bits 0 to 7 are added and their sum is returned in response to the query.

The structures of the ESR register are briefly described in "Remarks" below.

QUERY SYNTAX

*ESR?

RESPONSE FORMAT

<value>

<value> is used to identify the current contents of the ESE register. The format is <NR1 Numeric Response Data>.

REMARKS

The following list shows the structure of the ESR register.

Description of bit weighting

7	128 PON:	Power ON.
6	64 URQ:	This bit is not used in this oscilloscope.
5	32 CME:	Command error.
4	16 EXE:	Execution error.
3	8 DDE:	Device-specific error.
2	4 QYE:	Query error.
1	2 RQC:	This bit is not used in this oscilloscope.
0	1 OPC:	Operation complete.

FCUT Command and Query (Cutoff Frequency of Digital Filter)

FCUT command sets the cutoff frequency of a digital filter for the specified input channel. FCUT? query returns the cutoff frequency to which a digital filter is set.

When the kind of a digital filter is set to low-pass filter (LPF) and high-pass filter (HPF), the cutoff frequency becomes effective.

COMMAND SYNTAX

<CHannel>:FCUT <cutoff>

<CHannel> := {C1, C2, C3, C4}

<cutoff> := Cutoff frequency of a digital filter in < DECIMAL NUMERIC PROGRAM DATA > format.

QUERY SYNTAX

<CHannel>:FCUT?

RESPONSE FORMAT

<cutoff>

<cutoff> is the cutoff frequency of a digital filter and is in <NR3 Numeric Response Data > format.

REMARKS

The range where the cutoff frequency can be set is different depending on the sampling rate.

FDELTA? Query (Frequency Resolution)

The FDELTA? query returns the delta f (frequency resolution) in Hz from the FFT results.

QUERY SYNTAX

FDELTA?

RESPONSE FORMAT

<value>

<value> := <NR3 Numeric Response Data> format.

<value> indicates the frequency resolution from the FFT results.

FHZPOS Command and Query (FFT Waveform Horizontal Position)

The FHZPOS command sets the frequency at the center of the screen in Hz, to set the horizontal position of the FFT waveform.

The FHZPOS? query returns the frequency (in Hz) of the FFT waveform at the center of the screen.

COMMAND SYNTAX

FHZPOS <fft_hpos>

<fft_hpos> is set in <DECIMAL NUMERIC PROGRAM DATA> format. Any value exceeding the setting range is rounded to the closest permissible value.

QUERY SYNTAX

FHZPOS?

RESPONSE FORMAT

<fft_hpos>

<fft_hpos> := <NR3 Numeric Response Data> format.

<fft_hpos> indicates the horizontal position of the FFT waveform.

FHZZOOM Command and Query (FFT Waveform Horizontal Zoom)

The FHZZOOM command sets horizontal zoom of the FFT waveform.

The FHZZOOM? query returns horizontal zoom of the FFT waveform.

COMMAND SYNTAX

FHZZOOM <fft_hzoom>

<fft_hzoom> := {1, 2, 5, 10}

Any value other than the one already specified is rounded to a larger permissible value.

QUERY SYNTAX

FHZZOOM?

RESPONSE FORMAT

<fft_hzoom>

<fft_hzoom> indicates horizontal zoom of the FFT waveform.

REMARKS

If the FHZZOOM command is executed when FFT trace is OFF, a command-execution error (CME) is reported.

FRQCNT? Query (Trigger Frequency)

The FRQCNT? query returns the trigger frequency result measured by the internal trigger frequency counter.

QUERY SYNTAX

FRQCNT?

RESPONSE FORMAT

<value>

<value> indicates the frequency of the trigger signal. It is given in <NR3 Numeric Response Data> format.

REMARKS

When TTYP is EDGEALT, OR, NOR, AND, or NAND, measurement is disabled. (+9.9100000E+37) is returned.

FTYP Command and Query (Setting Type of Digital Filter)

The FTYP command switches the type of a digital filter that limits the band of the specified input channel. FTYP? query returns the type of the digital filter.

The cutoff frequency when low-pass filter (LPF) and high-pass filter (HPF) are selected is set with FCUT command / query or is acquired.

COMMAND SYNTAX

<CHannel>:FTYP <type>

<CHannel> : = {C1, C2, C3, C4}

<type> : = {OFF, LPF, HPF, SMA }

OFF: = The band is not limited with a digital filter.

LPF: = The band is limited with low-pass filter.

HPF: = The band is limited with high-pass filter.

SMA: = Simple Moving Average filter is used to smooth waveforms.

QUERY SYNTAX

<CHannel>:FTYP?

RESPONSE FORMAT

<type>

REMARKS

When one or more of the following requirements are met, the digital filter is forced OFF. At such time, the FTYP command cannot set the digital filter.

- Acquisition mode is not normal sampling
- Memory length is less than 500 points.
- Roll Mode is ON.
- Equivalent Sampling is ON.

FWID Command/Query (Digital Filter processing width)

The FWID command sets the digital filter processing width for the specified input channel.

When the type of digital filter has been set to SMA (Simple Moving Average), the processing width becomes valid.

COMMAND SYNTAX

<CHannel> :FWID <width>

<CHannel> := {C1, C2, C3, C4}

<width> := 1 to 25

The simple moving average is calculated as (width x 2 + 1) points of width.

QUERY SYNTAX

<CHannel>:FWID?

RESPONSE FORMAT

<width>

This is the digital filter processing width. The format is <NR3 Numeric Response Data>.

FWINDOW Command and Query (FFT Window)

The FWINDOW command sets up the FFT window. The FWINDOW? query returns the FFT window.

COMMAND SYNTAX

FWINDOW <type>

<type> := {RECT, VONHANN, FLATTOP}

QUERY SYNTAX

FWINDOW?

RESPONSE FORMAT

<type>

REMARKS

If the MATH operation is not FFT, a device-specific error (DDE) is returned when the FWINDOW command is executed.

GRAT Command and Query (Graticule)

The GRAT command selects the graticule type as Grid, Axis, or Frame. The GRAT? query returns the current graticule type.

COMMAND SYNTAX

GRAT <type>

<type> := {GRID, AXIS, FRAME}

GRID:= Selects grid graticule type.

AXIS:= Selects axis graticule type.

FRAME:= Selects frame graticule type.

QUERY SYNTAX

GRAT?

RESPONSE FORMAT

<type>

GTL Command (Local Mode)

The GTL command sets the oscilloscope to local mode.

COMMAND SYNTAX

GTL

HCUR Command and Query (Cursor Position on Time Axis)

The HCUR command defines the position of the cursor on the time axis in "div" units. The HCUR? query returns the cursor position on the currently defined time axis.

COMMAND SYNTAX

HCUR <Cursor1>, <Cursor2>

<Cursor1> := -5.00 to +4.98 (when CURM is DH or DHDV)

<Cursor1> := -5.00 to +4.99 (when CURM is VATH)

<Cursor2> := -5.00 to +4.98 (when CURM is DH or DHDV)

<Cursor2> := -5.00 to +4.99 (when CURM is VATH)

<Cursor1> and <Cursor2> are used to indicate (in "div" units) the on-screen positions of Cursor1 and Cursor2. See "Remarks" below for description of the rounding method for values. The left edge of the screen corresponds to -5.00, the center to 0, and the right edge to +4.98 when CURM is DH or DHDV or +4.99 when CURM is VATH.

QUERY SYNTAX

HCUR?

RESPONSE FORMAT

<Cursor1>, <Cursor2>

<Cursor1> and <Cursor2> are used to identify the positions of the cursors on the current time axis. The format is <NR3 Numeric Response Data>.

REMARKS

When CURM is DH or DHDV, the resolution of <Cursor1> and <Cursor2> is 0.02, and when CURM is VATH, the resolution of <Cursor1> and <Cursor2> is 0.01. If another value is input, it is rounded to a value having a small absolute value.

If the cursor mode is set to Value at Cursor, the <Cursor1> setting is enabled. Although <Cursor2> is invalid, its setting is still required.

When CURM is not DH, DHDV, or VATH, executing the HCUR command returns a device-specific error (DDE).

HPREF Command and Query (Priority setting)

The HPREF command sets which within a number of waveform and the range of the skew adjustment that can be selected by the Replay function to be given priority.

The HPREF? query returns which within a number of waveform and the range of the skew adjustment that can be selected by the Replay function to be given priority.

COMMAND SYNTAX

HPREF <preference>

<preference> := {REPLAY, DESKEW}

REPLAY := The waveform number that can be selected by the Replay function is increased.

DESKEW := The range of the skew adjustment is made to become to 0 to 500ns with all the range of the time axis.

QUERY SYNTAX

HPREF?

RESPONSE FORMAT

<preference>

*IDN? Query (Product Information)

The *IDN? query references product information. The response includes four fields, and provides information about the product manufacturer, model name, serial number, and firmware revision number.

QUERY SYNTAX

*IDN?

RESPONSE FORMAT

LECROY,<model>,<serial_number>,<firmware-level>

<model> : 6 digits (Example: WJ354T)

<serial_number> : 11-digit serial number

<firmware_level> : one-digit number indicating release level and two-digit minor release level separated by a period (such as x.yy).

INV Command and Query (ON/OFF of Waveform Inverting)

The INV command switches on/off of waveform inverting.

The INV? query returns the status (ON / OFF) of waveform inverting.

COMMAND SYNTAX

```
<Channel>:INV <state>
```

<Channel> : = {C1, C2, C3, C4}

<state> : = {ON, OFF}

QUERY SYNTAX

```
<Channel>:INV?
```

RESPONSE FORMAT

```
<state>
```

MATH Command and Query (MATH Operation Type)

The MATH command defines the type of math operation to be used for waveform measurement. The MATH? query returns the currently defined MATH operation type.

COMMAND SYNTAX

```
MATH <operator>
```

<operator> := {ADD, SUB, MULT, FFT, FFT_ADD, FFT_SUB, FFT_MULT, INTEGRAL, INTEGRAL_ADD, INTEGRAL_SUB, INTEGRAL_MULT, DERIVATIVE, DERIVATIVE_ADD, DERIVATIVE_SUB, DERIVATIVE_MULT }

QUERY SYNTAX

```
MATH?
```

RESPONSE FORMAT

```
<mode>
```

<operator> is used to identify the currently defined MATH operation type.

REMARKS

The MATH operator is stopped if it XYDS is XY or XYTRG.

During roll mode data acquisition, the FFT waveform is not displayed. FFT is displayed after each acquisition has ended or after a STOP (TRMD STOP) command has been sent.

MATHS Command and Query (Source CH)

The MATHS command sets the source channels for the MATH waveform. The MATHS? query returns the source channels currently set to the MATH waveform.

COMMAND SYNTAX

MATHS <source1>,<source2>

<source1> := {CH1, CH2, CH3, CH4}

<source2> := {CH1, CH2, CH3, CH4}

QUERY SYNTAX

MATHS?

RESPONSE FORMAT

<source1>,<source2>

<source1> and <source2> are the currently set source channels for the current MATH waveform.

REMARKS

When specifying the source channel for FFT, use FSRC instead of MATHS.

MDSP Command and Query (Auto Measure ON/OFF)

The MDSP command turns Auto Measure ON or OFF. When Auto Measure is ON, the measurement results are displayed on the screen, and the MSRA?, MSRB, MSRC?, or MSRD? query can be used to read the data.

COMMAND SYNTAX

MDSP <function>

<function> := {ON, OFF}

QUERY SYNTAX

MDSP?

RESPONSE FORMAT

<function>

REMARKS

When XYDS is XY or XYTRG, MDSP is set to OFF.

MINMAX Command and Query (Auto Measure Maximum Value/ Minimum Value)

The MINMAX command switches ON or OFF of Auto Measure of maximum value or minimum value.

The MINMAX? query reads the Auto Measure status of the current maximum value or minimum value.

COMMAND SYNTAX

MINMAX <function>

<function> := {ON, OFF}

QUERY SYNTAX

MINMAX?

RESPONSE FORMAT

<function>

MLEN Command and Query (Max Memory Length)

The MLEN command sets the maximum memory length.

The MLEN? query returns the current maximum memory length.

COMMAND SYNTAX

MLEN <length>

<length> := {500, 1K, 5K, 10K, 50K, 100K, 500K, 1M, 2.5M, 5M }

<length> := {1K} (XYDS is XY)

QUERY SYNTAX

MLEN?

RESPONSE FORMAT

<length>

REMARKS

When XYDS is XY, maximum memory length is fixed at 1 K.

MSEL Command and Query (Auto Measure Item (A, B, C, or D))

The MSEL command selects an Auto Measure item (A, B, C, or D) as defined by the Auto Measure command DIRM. The MSEL? query returns the selected Auto Measure item.

COMMAND SYNTAX

MSEL <CH>, <mode>

<CH> := {OFF, CH1, CH2, CH3, CH4, MATH}

<mode> := {MAX, MIN, P-P, VRMS, CVRMS, VMEAN, CVMEAN, TOP, BASE, T-B, +OSHOT, -OSHOT, TR20-80, TF80-20, TR10-90, TF 90-10, FREQ, PERIOD, +PULSE, -PULSE, +WIDTH, -WIDTH, DUTY, INTEGRAL, SKEW, DELTAT}

* DELTAT is the skew @ level (Skew@Level) parameter of the Auto Measure item.

QUERY SYNTAX

MSEL?

RESPONSE FORMAT

<CH>, <mode>

<CH> is used to identify the selected Auto Measure channel.

<mode> is used to identify the Auto Measure item.

MSKDSP Command/Query (Mask Pattern Display ON/OFF)

The MSKDSP command sets whether or not to display mask patterns used for pass/fail judgments on the screen. The MSKDSP? query acquires whether or not mask patterns used for pass/fail judgments are being displayed on the screen.

COMMAND SYNTAX

MSKDSP <display>

<display> := {ON,OFF}

ON := Turns ON display of mask patterns used for pass/fail judgments.

OFF:= Turns OFF display of mask patterns used for pass/fail judgments.

QUERY SYNTAX

MSKDSP?

RESPONSE FORMAT

<display>

REMARKS

When mask patterns are not displayed on the screen, pass/fail judgments of waveforms using mask patterns cannot be performed.

MSRA?, MSRB?, MSRC?, and MSRD? Queries (Read Auto Measure Items A, B, C, D)

The MSRA?, MSRB?, MSRC?, and MSRD? queries read Auto Measure items A, B, C, and D respectively.

QUERY SYNTAX

MSRA? | MSRB? | MSRC? | MSRD?

RESPONSE FORMAT

<measure>

<measure> indicates the Auto Measure item (A, B, C, or D).

The format of <value>, <maximum_value>, and <minimum_value> is <NR3 Numeric Response Data> format. If Auto Measure is not possible, or not valid (such as when measurement is OFF), then +9.9100000E+37 is returned.

OFST Command and Query (Offset Setup)

The OFST command sets the offset of the specified input channel. The setting range varies depending on the vertical sensitivity.

The OFST? query returns the currently defined vertical position (offset).

This command and query are always available, regardless of whether trace is ON or OFF for the specified channel. The vertical position (offset) value to be set or queried takes into account the probe ratio and rescale.

COMMAND SYNTAX

<trace>:OFST <offset>

<trace> := {C1, C2, C3, C4, M1}

<offset> := Offset voltage

<DECIMAL NUMERIC PROGRAM DATA> format is basically used in <offset>, and the suffix is also valid. See "Remarks" for description of the setting range and rounding method.

QUERY SYNTAX

<trace>:OFST?

RESPONSE FORMAT

<offset>

<offset> is used to identify the current offset in <NR3 Numeric Response Data> format.

REMARKS

Setting range of OFST command (when probe attenuation ratio is 1:1)

Trace	Vertical Sensitivity	Offset Range
C1, C2, C3, C4	2 mV/div to 50 mV/div	±1 V
	100 mV/div to 500 mV/div	±10 V
	1 V/div to 10 V/div	±100 V
M1 (+, -, X)		±500 div
M1 (FFT)		-100 to +150 dBm

Any value outside the above range is rounded to the maximum or minimum permissible value, whichever is nearest. Also, some values may be rounded to a permissible smaller value.

When the probe attenuation ratio is 5:1, 10:1, 20:1, 50:1, 100:1, 200:1, 500:1, 1000:1, or 2000:1, the above range is multiplied by 5, 10, 20, 50, 100, 200, 500, 1000, or 2000 respectively.

When the probe attenuation ratio is set to AUTO, the above range is multiplied by 1, 10, 100, or 1000, depending on the detected probe ratio.

When rescale is used, the "x" in the rescale formula "ax + b" is the above range.

***OPC Command and Query (Operation Complete)**

The *OPC (operation complete) command sets (to 1) the OPC bit (Bit 0) of the standard event status register (ESR) once all preceding operations are completed. The *OPC? query returns "1" when a response is output after the all previous commands have been executed. For the *OPC? query, the OPC bit (Bit 0) of the ESR register is not affected by other operations.

COMMAND SYNTAX

*OPC

QUERY SYNTAX

*OPC?

RESPONSE FORMAT

1

PERS Command and Query (Persistence Time)

The PERS command sets the persistence time. The PERS? query returns the current persistence time.

COMMAND SYNTAX

PERS <time>

<time> := {OFF, 100MS, 200MS, 500MS, 1S, 2S, 5S, 10S, INFINITE}

OFF: = sets persistence time OFF.

INFINITE: = sets persistence time to infinity.

The various persistence time settings are 100MS, 200MS, 500MS, 1S, 2S, 5S, and 10S.

QUERY SYNTAX

PERS?

RESPONSE FORMAT

<time>

PFACT Command and Query (Execution of Event Based on Pass/Fail Judgment)

The PFACT command sets the event to be executed according to the result of a pass/fail judgment.

The PFACT? query acquires the setting for the event to be executed according to the result of a pass/fail judgment.

COMMAND SYNTAX

PFACT <stop>, <copy>, <wave>, <pulse>, <beep>

<stop> := {NONE, PASS, FAIL}

NONE := Nothing is done.

PASS := Stops waveform acquisition when judgment result is PASS.

FAIL := Stops waveform acquisition when judgment result is FAIL.

<copy> := {NONE, PASS, FAIL, ANY}

NONE := Nothing is done.

PASS := Screen is saved when judgment is PASS.

FAIL := Screen is saved when judgment is FAIL.

ANY := Screen is saved when judgment is either PASS or FAIL.

<wave> := {NONE, PASS, FAIL, ANY}

NONE := Nothing is done.

PASS := Waveform is saved when judgment is PASS.

FAIL := Waveform is saved when judgment is FAIL.

ANY := Waveform is saved when judgment is either PASS or FAIL.

<pulse> := {NONE, PASS, FAIL, ANY}

NONE := Nothing is done.

PASS := Pulse output from AUX OUT when judgment is PASS.

FAIL := Pulse output from AUX OUT when judgment is FAIL.

ANY := Pulse output from AUX OUT when judgment is either PASS or FAIL.

<beep> := {NONE, PASS, FAIL, ANY}

NONE := Nothing is done.

PASS := Beep sound occurs when judgment is PASS.

FAIL := Beep sound occurs when judgment is FAIL.

ANY := Beep sound occurs when judgment is either PASS or FAIL.

QUERY SYNTAX

PFACT?

RESPONSE FORMAT

<stop>, <copy>, <wave>, <pulse>, <beep>

PFCNT Query (Pass/Fail Judgment Count Acquisition)

The PFCNT? query acquires PASS and FAIL counts from pass/fail judgment results.

QUERY SYNTAX

PFCNT?

RESPONSE FORMAT

<pass>, <fail>

<pass> := Includes the PASS count from pass/fail judgment results. The format is
 <NR1 Numeric Response Data>.

<fail> := Includes the FAIL count from pass/fail judgment results. The format is
 <NR1 Numeric Response Data>.

REMARKS

The maximum count value for <pass> or <fail> is 100,000 times. If 100,000 times is exceeded, the response becomes 100,000.

PFJDG Command and Query (Set Target for Pass/Fail Judgment)

The PFJDG command sets a target for pass/fail judgment. The PFJDG? query acquires the pass/fail judgment target.

COMMAND SYNTAX

PFJDG <judge>

<judge> := {MEASURE, MASK}

MEASURE := Executes pass/fail judgment of Measure.

MASK:= Executes pass/fail judgment of waveform using mask pattern.

QUERY SYNTAX

PFJDG?

RESPONSE FORMAT

<judge>

PFMESA, PFMESB, PFMESC, PFMESD Command/Query (Pass/Fail Judgment Conditions for Auto Measure A, B, C, and D)

The PFMESA, PFMESB, PFMESC, and PFMESD commands set the respective pass/fail judgment conditions for Auto Measure A, B, C, and D when pass/fail judgment is performed for Auto Measure.

The PFMESA?, PFMESB?, PFMESC?, and PFMESD? queries capture the judgment conditions used for Auto Measure A, B, C, and D when pass/fail judgment is performed for Auto Measure.

COMMAND SYNTAX

PFMESA? | PFMESB? | PFMESC? | PFMESD? <passif>, <m>, <n>

<passif> := {ANY, M_V, V_M, M_V_N, V_M_N_V}

ANY := Judgment is PASS regardless of Auto Measure result.

M_V := Judgment is PASS when Auto Measure v meets the condition " $m \leq v$ ".

V_M := Judgment is PASS when Auto Measure v meets the condition " $v \leq m$ ".

M_V_N := Judgment is PASS when Auto Measure v meets the condition " $m \leq v \leq n$ ".

V_M_N_V := Judgment is PASS when Auto Measure v meets the condition " $v \leq m$ or $n \leq v$ ".

<m> := Parameter m used for judgment, specified in <DECIMAL NUMERIC PROGRAM DATA> format.

<n> := Parameter n used for judgment, specified in <DECIMAL NUMERIC PROGRAM DATA> format.

QUERY SYNTAX

PFMESA? | PFMESB? | PFMESC? | PFMESD?

RESPONSE FORMAT

<passif>, <m>, <n>

The condition for a PASS judgment result for Auto Measure A (or B, C, D) is specified in <passif>.

The parameters used for this judgment are specified in <m>, <n>. <m>, <n> have the format <NR3 NUMERIC RESPONSE DATA>.

REMARKS

The response to the PFRSLT? query is PASS only when the judgment results are all PASS for Auto Measure A, B, C, D.

If the PFMESA command specifies M_V_N, V_M_N_V in <passif>, <n> is rounded to a value equal to or less than <m>.

PFMSK Command and Query (Condition for Pass/Fail Judgment of Mask Pattern)

The PFMSK command sets the judgment condition for executing pass/fail judgment using a mask pattern, with a waveform as the target.

The PFMSK? query acquires the judgment condition for executing pass/fail judgment using a mask pattern, with a waveform as the target.

COMMAND SYNTAX

PFMSK <source>, <passif>

<source> := {CH1, CH2, CH3, CH4, MATH}

Trace used as judgment target is specified in <source>.

<passif> := {ALLIN, ALLOUT}

ALLIN := Judgment result is PASS when all parts of waveform are within mask.

ALLOUT := Judgment result is PASS when all parts of waveform are outside of mask.

QUERY SYNTAX

PFMSK?

RESPONSE FORMAT

<source>, <passif>

PFOPE Command and Query (Pass/Fail Judgment ON/OFF)

The PFOPE command sets whether or not to execute pass/fail judgments. The PFOPE? query acquires the pass/fail judgment ON/OFF setting.

COMMAND SYNTAX

PFOPE <operation>

<operation> := {ON, OFF}

ON := Executes pass/fail judgments.

OFF := Does not execute pass/fail judgments.

QUERY SYNTAX

PFOPE?

RESPONSE FORMAT

<operation>

PFRSLT Query (Acquire Pass/Fail Judgment Result)

The PFRSLT? query acquires pass/fail judgment results.

QUERY SYNTAX

PFRSLT?

RESPONSE FORMAT

<result>

<result> := {OFF, PASS, FAIL}

OFF := Pass/fail judgment cannot be executed.

PASS := Pass/fail judgment result is PASS.

FAIL := Pass/fail judgment result is FAIL.

PROBE Command and Query (Probe Attenuation Ratio)

The PROBE command sets the probe attenuation ratio of the specified input channel. AUTO, 1, 5, 10, 20, 50, 100, 200, 500, 1000, or 2000 can be selected. The PROBE? query returns the selected probe's attenuation ratio.

COMMAND SYNTAX

<CHannel>:PROBE <probe_mode>, <probe>

<CHannel> := {C1, C2, C3, C4}

<probe_mode> := {AUTO, MANUAL}

<probe> := {1, 5, 10, 20, 50, 100, 200, 500, 1000, 2000}

"Remarks" below describes the meaning of combinations of items set for <probe_mode> and <probe>.

QUERY SYNTAX

<CHannel>:PROBE?

RESPONSE FORMAT

<probe_mode>, <probe>

When the probe attenuation ratio is 1:1, 5:1, 10:1, 20:1, 50:1, 100:1, 200:1, 500:1, 1000:1, or 2000:1, a value equal to the PROBE command parameter is returned.

When the probe attenuation ratio is set to AUTO, the auto detected probe attenuation ratio is returned to <probe>.

REMARKS

This table shows settings for <probe_mode> and <probe>.

Set Probe Attenuation Ratio	<probe_mode>	<probe>
AUTO	AUTO	1/10/100/1000
1:1	MANUAL	1
5:1	MANUAL	5
10:1	MANUAL	10
20:1	MANUAL	20
50:1	MANUAL	50
100:1	MANUAL	100
200:1	MANUAL	200
500:1	MANUAL	500
1000:1	MANUAL	1000
2000:1	MANUAL	2000

***RCL Command (Recall Front Panel Setup Data)**

The *RCL command recalls front panel setup data from any of five internal memory areas.

COMMAND SYNTAX

*RCL <panel_setup>

<panel_setup> =: {0, 1, 2, 3, 4, 5}

0:= recalls default setup.

1 to 5:= recalls setup from one of the five internal memory areas.

ROLL Command and Query (Roll Mode)

The ROLL command sets Roll mode ON or OFF. The ROLL? query returns the current Roll mode status.

COMMAND SYNTAX

ROLL <state>

<state> := {ON, OFF}

QUERY SYNTAX

ROLL?

RESPONSE FORMAT

<state>

REMARKS

When XYDS is XY or XYTRG, Roll mode is set to OFF.

RPLY Command and Query (Replay Screen Number of Acquired Waveform Data)

The RPLY command sets the replay screen number of the acquired waveform data to be displayed by the replay function. The RPLY? query returns the current replay screen number.

COMMAND SYNTAX

RPLY <number>

<number> := {0, 1 ... 2048}

QUERY SYNTAX

RPLY?

RESPONSE FORMAT

<number>

REMARKS

When the total number of replay screens is 2048 or less, sending RPLY 2048 selects the (most recent) waveform screen.

When TRMD is any value other than STOP, the RPLY? query always returns a 0. If the selected replay screen does not exist, the RPLY? query returns 0.

When the TRMD value is STOP, the number of replay screens is automatically set to the maximum value.

RSCA Command and Query (Rescale a)

The RSCA command sets the "a" value in rescale formula "ax + b". The RSCA? query returns this rescale "a" value.

COMMAND SYNTAX

<Channel>:RSCA <rsc_a>

<Channel> := {C1, C2, C3, C4}

<rsc_a> := 0.01E-6 to 1.00E+3

QUERY SYNTAX

<Channel>:RSCA?

RESPONSE FORMAT

<rsc_a>

REMARKS

The "b" in rescale formula "ax + b" is set by the RSCB command.

RSCB Command and Query (Rescale b)

The RSCB command sets the "b" value in rescale formula "ax + b". The RSCB? query returns this rescale "b" value.

COMMAND SYNTAX

<CHannel>:RSCB <rsc_b>

<CHannel> := {C1, C2, C3, C4}

<rsc_b> := Voltage value corresponding to -8div to +8div. Note, however, that RSCB is limited to the range of values that can be set as OFST for the channel selected by OFST + RSCB.

QUERY SYNTAX

<CHannel>:RSCB?

RESPONSE FORMAT

<rsc_b>

REMARKS

The "a" in rescale formula "ax + b" is set by the RSCA command.

RSCL Command and Query (Rescale ON/OFF)

The RSCL command sets rescale ON or OFF. The RSCL? query returns rescale ON or OFF.

COMMAND SYNTAX

<CHannel>:RSCL <state>

<CHannel> := {C1, C2, C3, C4}

<state> := {ON, OFF}

QUERY SYNTAX

<CHannel>:RSCL?

RESPONSE FORMAT

<state>

REMARKS

The "a" in rescale formula "ax + b" is set by the RSCA command, and the "b" by the RSCB command.

***RST Command (Reset and Recall Default Setup)**

The *RST command executes device reset. It also recalls the default setup.

COMMAND SYNTAX

*RST

***RUN Command (AUTO Trigger Mode)**

The RUN command sets TRMD to AUTO and starts waveform acquisition. It operates in the same way as TRMD AUTO.

COMMAND SYNTAX

RUN

***SAV Command (Save Front Panel Setup Data)**

The *SAV command saves the front panel setup data to non-volatile internal memory.

COMMAND SYNTAX

*SAV <panel_setup>

<panel_setup> : = {0, 1, 2, 3, 4, 5}

0:= No action

SETUP Command and Query (Write/Read Setting Condition Data in Text Form)

SETUP command transmits and sets the setting condition data in text form to the oscilloscope. DTSTUP? query acquires the setting condition data in text form from the oscilloscope. The setting condition data acquired with the DTSTUP? query can be used to set up the oscilloscope with the DTSTUP command as long as the firmware is the same, or newer on the oscilloscope receiving the command.

The text form of the setting condition data acquired with SETUP? query is the same as the Setup data that can be saved to the USB memory directly from the oscilloscope.

COMMAND SYNTAX

SETUP<LF+EOI>#8<byte-length><binary-block>

<byte-length> := ASCII character string of eight digits specifying the number of bytes in <binary-block>. Fill with zeros at the head when fewer than eight digits. For example, if the number of bytes is 480, send #800000480.

<binary-block> := setting condition data in binary format. Use the SETUP? query to determine how this command should be executed.

Transmit the SETUP command according to the following two-step procedure:

- Step 1: Transmit the SETUP command without the parameters. This puts the oscilloscope into the state to receive the setting condition data block.
- Step 2: Send the setup data block in #8 <byte-length><binary-block> format.

QUERY SYNTAX

SETUP?

RESPONSE FORMAT

#8<byte-length><binary-block>

#8 indicates that the response message is in <Definite Length Arbitrary Block Response Data> format, and the subsequent <byte-length> consists of an 8-bit unsigned integer.

<byte-length> indicates the number of bytes in <binary-block>. This will always be an 8-bit unsigned integer. Zeros will be used to fill unused positions.

<binary-block> consists of the setting condition data in text format.

REMARKS

This command does not support multi-commands.

SKLV Command and Query (Auto Measure SKEW Measurement Condition)

The SKLV command defines the measurement conditions of Auto Measure SKEW specified by the MSEL command.

The SKLV? query returns the currently defined measurement condition.

COMMAND SYNTAX

SKLV <level1>, <slope1>, <source2>, <level2>, <slope2>

<level1> := range from 10 to 90 in <DECIMAL NUMERIC PROGRAM DATA> format. It is assumed that the P-P of the waveform is 100%. Any value exceeding the setting range is rounded to a permissible value.

<slope1> := {RISE, FALL}

<source2> := {CH1, CH2, CH3, CH4}

<level2> := range from 10 to 90 in <DECIMAL NUMERIC PROGRAM DATA> format. It is assumed that the P-P of the waveform is 100%. Any value exceeding the setting range is rounded to a permissible value.

<slope2> := {RISE, FALL}

QUERY SYNTAX

SKLV?

RESPONSE FORMAT

<level1>, <slope1>, <source2>, <level2>, <slope2>

<level1> is used to identify parameter setting "Level1" for Auto Measure SKEW.

<slope1> is used to identify parameter setting "Slope1" for Auto Measure SKEW.

<source2> is used to identify parameter setting "Source2" for Auto Measure SKEW.

<level2> is used to identify parameter setting "Level2" for Auto Measure SKEW.

<slope2> is used to identify parameter setting "Slope2" for Auto Measure SKEW.

REMARKS

The SKLV command returns a device-specific error (DDE) when MSEL is not SKEW.

***SRE Command and Query (Service Request Enable (SRE) Register)**

The *SRE command defines the service request enable (SRE) register. This command allows the user to specify what STB register summary bit is used to create the service request (SRQ). If "1" is written to the corresponding bit location, the summary message bit is enabled. If "0" is written to the corresponding bit location, the service request is no longer created by the corresponding event. After the SRE register is cleared, the SRQ interrupt is set to OFF. When the value is converted into binary code, the *SRE? query returns the value that represents the bit setting in the SRE register.

COMMAND SYNTAX

*SRE <value>

<value> := 0 to 255

QUERY SYNTAX

*SRE?

RESPONSE FORMAT

<value>

<value> is used to identify the current SRE register settings in <NR1 Numeric Response Data> format.

***STB? Query (Read Status Register (STB) and Master Summary Status (MSS))**

The *STB? query reads the status register (STB) and master summary status (MSS) as currently defined in IEEE 488.1. The response includes the values specified in bits 0 to 7 of the status byte register.

The response to the *STB? query is almost the same as that for continuous polling, except that Bit 6 contains the MSS summary message instead of the RQS message.

Query Syntax

*STB?

Response Format

<value>

<value> is used to identify the current STB register settings in <NR1 Numeric Response Data> format.

STOP Command (Stop Acquisition)

The STOP command sets TRMD to STOP. It operates in the same way as TRMD STOP.

COMMAND SYNTAX

STOP

TCOUNT Command and Query (Pulse Count for Pulse Count Trigger)

The TCOUNT command defines the pulse count for the pulse count trigger (TTYP = COUNT).

The TCOUNT? query returns the pulse count set to the current pulse count trigger.

COMMAND SYNTAX

TCOUNT <number>

<number> := 1 to 9999

QUERY SYNTAX

TCOUNT?

RESPONSE FORMAT

<number>

REMARKS

If TTYP is not COUNT when the TCOUNT command is executed, a device-specific error (DDE) is returned.

TCPL Command and Query (Trigger Coupling)

The TCPL command defines the trigger coupling mode. The TCPL? query returns the currently defined trigger coupling.

COMMAND SYNTAX

TCPL <trig_coupling>

<trig_coupling>:= {AC, DC, HF, LF, NR}

QUERY SYNTAX

TCPL?

RESPONSE FORMAT

<trig_coupling>

<trig_coupling> is used to identify the current trigger's coupling.

REMARKS

If TSRC is LINE or TTYP is TV when the TCPL command is executed, a device-specific error (DDE) is reported. Also, the TCPL? query returns DC.

If TTYP is OR, NOR, AND, or NAND, the trigger source selected by TRSC becomes the target for the TCPL operation.

TDIV Command and Query (Set/Read time/div)

The TDIV command sets the Time/div value. The time/div setting uses either NS (nanosecond), US (microsecond), MS (millisecond), or S (second) as a suffix, or it specifies the exponential. If the specified value exceeds the allowable range, it is rounded to a permissible value. The TDIV? query returns the currently set time/div value.

COMMAND SYNTAX

TDIV <value>

<value> := {Time/div setup parameter}

The <DECIMAL NUMERIC PROGRAM DATA> format is used, and the suffix is also valid. Send commands within the valid ranges shown in the table below.

Model	Timebase	
	Lower Limit	Upper Limit
WaveJet 354T	500 ps/div	50 s/div
WaveJet 334T	1 ns/div	50 s/div

QUERY SYNTAX

TDIV?

RESPONSE FORMAT

<value>

<value>:= currently set time/div value in <NR3 NUMERIC RESPONSE DATA> format.

TDTM Command and Query (Dropout)

The TDTM command defines the dropout time for the dropout trigger (TTYP = DROPOUT). The TDTM query returns the current dropout time of the current dropout trigger.

COMMAND SYNTAX

TDTM <time>

<time>:= sets the dropout time. The available setting range is 50.0 ns to 50.0 s. The <NR3 NUMERIC RESPONSE DATA> format is used, and the suffix is also valid.

QUERY SYNTAX

TDTM?

RESPONSE FORMAT

<time>

The currently set dropout time is entered in <time>. The format is <NR3 NUMERIC RESPONSE DATA>.

REMARKS

If TTYP is not DROPOUT when the TDTM command is executed, a device-specific error (DDE) is returned.

TESE Command and Query (Trigger Event Status Enable Register)

The TESE command sets the trigger event status enable register by determining whether the summary message of the trigger event status register is connected to the status byte. The TESE? query reads the current setting in the trigger event status enable register.

COMMAND SYNTAX

TESE <value>

<value> := 0 to 255

QUERY SYNTAX

TESE?

RESPONSE FORMAT

<value>

<value> is used to identify the current setting in the trigger event status enable register. The format is <NR1 Numeric Response Data>.

TESR? Query (Read Trigger Event Status Register)

The TESR? query reads the trigger event status register. In other words, it determines whether or not a single measurement has been completed. After the status is read, the contents of the register are cleared.

Query syntax

TESR?

Response Format

<status>

Each bit in the trigger event status register is weighted by a power of two. The format is <NR1 Numeric Response Data> and values range from 0 to 255.

THTM Command and Query (Hold-off Time)

The THTM command defines the trigger hold-off time. The THTM? query returns the currently defined hold-off time.

COMMAND SYNTAX

THTM <holdoff>

<holdoff> := The <DECIMAL NUMERIC PROGRAM DATA> format is used, and the suffix is also valid. The available setting range is 0 to 50.0 s. If the specified hold-off is less than 200 ns, hold-off is set to OFF.

QUERY SYNTAX

THTM?

RESPONSE FORMAT

<holdoff>

<holdoff> is used to identify the currently set hold-off time. If the hold-off time is set to OFF, 0 is input to <holdoff>. The format is <NR3 NUMERIC RESPONSE DATA>.

REMARKS

If TTYP is not EDGE or EDGEALT when the THTM command is executed, a device-specific error (DDE) is returned.

TI2C Command/Query (I2C Trigger)

TI2C command sets parameters for the I2C Trigger.

The TI2C? query returns the current parameters of the I2C Trigger.

COMMAND SYNTAX

TI2C <trig>, <sclsrc>, <sdasrc>

<trig> := {START, STOP, NOACK, RESTART, EEPREAD, ADDAT7, ADDAT10}

<sclsrc> := {CH1, CH2, CH3, CH4, EXT, EXT10}

<sdasrc> := {CH1, CH2, CH3, CH4, EXT, EXT10}

QUERY SYNTAX

TI2C?

RESPONSE FORMAT

<trig>, <sclsrc>, <sdasrc>

REMARKS

This command sets conditions other than the I2C Trigger address and data. If the TSPI command has the same setting for <sclsrc> and <sdasrc>, <datsrc> it takes priority. At that time, the setting is changed automatically so that <sdasrc> and <sclsrc> do not overlap.

TIDAT Command/Query (I2C Trigger Address and Data Settings)

The TIDAT command sets the address and data for the I2C Trigger.

The TIDAT? query returns the current address and data of the I2C Trigger.

COMMAND SYNTAX

TIDAT <address>, <rw>, <length>, <data>

<address> := 00 to 7F (7 bit address), or 000 to 3FF (10 bit address)

<rw> := {READ, WRITE, RW}

<length> := {1, 2, 3, 4, 5}

<data> is specified as two-digit hexadecimal numbers that start with the data specifying the conditions for the I2C Trigger. X and 0 to F can be specified in each digit. The data length can be up to 5 bytes, according to the setting in <length>.

Example:

TIDAT 01, READ, 3, 0167AE

When a value that exceeds the bit specification is specified as the address, only valid bits are set.

Furthermore, an error occurs when a 7-bit value has more than two letters and when a 10-bit value has more than three letters.

An error also occurs when the data exceeds the value specified as the byte setting.

QUERY SYNTAX

TIDAT?

RESPONSE FORMAT

<address>, <rw>, <length>, <data>

TIEEP Command/Query (I2C Trigger Judgment Condition and Data Settings)

The TIEEP command sets the judgment conditions and data for the I2C Trigger.

The TIEEP? query returns the current judgment conditions and data of the I2C Trigger.

COMMAND SYNTAX

```
TIEEP <if>, <data>
```

<if> := {EQ, NE, GT, LT}

<data> is specified as 00 to FF, the value of the data that is the EEPROM Data Read condition for the I2C Trigger.

Example:

```
TIEEP EQ, 1A
```

QUERY SYNTAX

```
TIEEP?
```

RESPONSE FORMAT

```
<if>, <data>
```

TLVL Command and Query (Trigger Level)

The TLVL command sets the trigger level of the channel set by the trigger source. If a value exceeding the setting range is specified, it is rounded to the maximum value or minimum value.

The TLVL? query returns the trigger level of the channel specified by the trigger source.

COMMAND SYNTAX

TLVL <trig-level>

<trig-level> is the trigger level in <DECIMAL NUMERIC PROGRAM DATA> format. The suffix is also valid, but the command can be used without the suffix "V".

The setting range and resolution shown in <trig-level> is changed according to the vertical sensitivity.

(Trigger level range) = (–5 div to +5 div)

(Trigger level resolution) = (1 div / 50)

QUERY SYNTAX

TLVL?

RESPONSE FORMAT

<trig-level>

<trig-level>:= currently set trigger level in <NR3 NUMERIC RESPONSE DATA> format.

REMARKS

If TSRC is LINE or TTYP is TV when the TLVL command is executed, a device-specific error (DDE) is returned. The TLVL? query returns +0.0000000E+00.

If TTYP is EDGEOR, OR, NOR, AND, or NAND, the target of the TLVL operation is the trigger source selected by TSRC.

TPRM Command and Query (DELTAT Measurement Condition)

The TPRM command sets the measurement conditions for the Auto Measure item DELTAT set by the MSEL command. The TPRM? query returns the measurement conditions for the Auto Measure item DELTAT set by the MSEL command.

COMMAND SYNTAX

TPRM <from CH>, <from level>, <from edge>, <to CH>, <to level>, <to edge>

<from CH> := {OFF, CH1, CH2, CH3, CH4, MATH}

<from edge> := {RISE, FALL}

<from level> := level in <DECIMAL NUMERIC PROGRAM DATA> format. Assuming the ground level is 0 V, a voltage value in a range of –4 div to +4 div from the center of the screen is set.

<to CH> := {CH1, CH2, CH3, CH4, MATH}

<to edge> := {RISE, FALL}

<to level> := level in <DECIMAL NUMERIC PROGRAM DATA> format. Assuming the ground level is 0 V, a voltage value in a range of –4 div to +4 div from the center of the screen is set.

QUERY SYNTAX

TPRM?

RESPONSE FORMAT

<from CH>, <from level>, <from edge>, <to CH>, <to level>, <to edge>

<from level> shows a voltage value in a range of –4 div to +4 div from the center of the screen, assuming a ground level of 0 V, in <NR3 Numeric Response Data> format.

<to level> shows a voltage value in a range of –4 div to +4 div from the center of the screen, assuming a ground level of 0 V, in <NR3 Numeric Response Data> format.

When <from CH> is set to OFF, <from level> is returned, similar to when <from CH> is set to CH1.

If <from CH> or <to CH> is MATH and the type of math is FFT, <from level> or <to level> becomes +9.9100000E+37. This indicates invalid status.

TPTM Command and Query (Period Trigger)

The TPTM command defines the parameters for the period trigger (TTYP = PERIOD).

The TPTM? query returns the current parameter of the period trigger.

COMMAND SYNTAX

TPTM <when>, <m>

<when> := {M_T, T_M}

M_T:= sets period trigger interval time condition to "m <= t".

T_M:= sets period trigger interval time condition to "t <= m".

<m> := sets "m" time value. The available setting range is 40 ns to 50.0 s in <DECIMAL NUMERIC PROGRAM DATA> format. The suffix is also valid.

QUERY SYNTAX

TPTM?

RESPONSE FORMAT

<when>, <m>

The currently set condition is input to <when>.

The format is <CHARACTER RESPONSE DATA>.

The currently set period is input to <m>. The format is <NR3 NUMERIC RESPONSE DATA>.

REMARKS

If TTYP is not PERIOD when the TPTM command is executed, a device-specific error (DDE) is returned.

TRA Command and Query (Trace Display)

The TRA command sets trace display ON or OFF for the specified input channel.

The TRA? query returns the display status of the specified trace.

COMMAND SYNTAX

<trace>:TRA <mode>

<trace> := {C1, C2, C3, C4, M1}

<mode> := {ON, OFF}

QUERY SYNTAX

<trace>:TRA?

RESPONSE FORMAT

<mode>

<mode> is used to identify the current trace display status.

REMARKS

If XYDS is XY or XYTRG, C1 and C2 cannot be turned OFF, and C3 and C4 cannot be turned ON.

TRDL Command and Query (Trigger Point Position)

The TRDL command defines the trigger point position in time units. When the center of the screen is currently defined as zero, the continuous time from this zero point to the trigger point is set. The setting range is determined according to the timebase (TDIV). The TRDL? query returns the currently set horizontal position of the trigger point.

COMMAND SYNTAX

TRDL <value>

<value> := valid trigger point setup parameter (see ranges) in <DECIMAL NUMERIC PROGRAM DATA> . The suffix is also valid.

Ranges:

<value>:= -500 s to +5 div (Time/div:= 50 s/div to 10 ms/div)

<value>:= -5 s to +5 div (Time/div:= 5 ms/div to 10 us/div)

<value>:= -5 ms to +5 div (Time/div:= 5 us/div to 500 ps/div)

<value>:= -500 s to +750 s (trigger mode is STOP)

For details, see "Remarks" below.

QUERY SYNTAX

TRDL?

RESPONSE FORMAT

<value>

<value>:= currently set trigger delay in <NR3 NUMERIC RESPONSE DATA> format.

REMARKS

If <value> is not <DECIMAL NUMERIC PROGRAM DATA> when TRDL is executed, a command-execution error (CME) is returned.

For details, see below.

Range Setting

The setting range and rounding method for the TRDL command is defined as follows, according to the waveform acquisition and time axis range.

Trigger Mode	Time Axis Range	<value> Setting Range
SINGLE, NORMAL, AUTO	50 s/div to 10 ms/div	–500 s to +5 div
	5 ms/div to 10 us/div	–5 s to +5 div
	5 us/div to 500 ps/div	–5 ms to +5 div
STOP	–	–500 s to +750 s

The graticule value in the above setting range is calculated via the following equation:

$$(\text{Upper limit of setting range}) = +5 \text{ div} \times (\text{time axis range})$$

Values exceeding the above range are rounded to the maximum or minimum permissible value.

Set Resolution

The resolution changes according to the currently set time axis range. Resolution is calculated via the following equation.

$$(\text{Resolution of delay value}) = (\text{time axis range}) / 50$$

If the specified resolution does not match the one above, it is rounded to the permissible value having the smaller absolute value.

***TRG Command (Set Trigger Mode (SINGLE))**

The *TRG command sets the trigger mode to SINGLE and then sets RUN mode.

COMMAND SYNTAX

*TRG

REMARKS

When XYDS is XY, *TRG returns a device-specific error (DDE).

TRMD Command and Query (Select Trigger Mode)

The TRMD command selects the trigger mode. The TRMD? query returns the currently selected trigger mode.

COMMAND SYNTAX

TRMD <mode>

<mode> := {AUTO, NORMAL, SINGLE, STOP}

AUTO:= sets AUTO trigger mode when the oscilloscope is not operating in Roll mode. When Roll mode is ON and this product is within the operation range for Roll mode, AUTO starts ENDLESS Roll mode.

NORMAL:= sets NORMAL trigger mode when the oscilloscope is not operating in Roll mode. When Roll mode is ON and this product is within the operation range for Roll mode, NORMAL repeatedly starts TRIG'D Roll mode.

SINGLE:= sets SINGLE trigger mode when the oscilloscope is not operating in Roll mode. When Roll mode is ON and this product is within the operation range for Roll mode, SINGLE starts TRIG'D Roll mode once.

QUERY SYNTAX

TRMD?

RESPONSE FORMAT

<mode>

When not operating in Roll mode: AUTO, NORMAL, SINGLE, STOP

When operating in Roll mode: ENDLESS, TRIG'D, STOP

TSCRN? Query (Screen Data Format)

The TSCRN? query transfers screen data in TIFF, BMP, or PNG format.

QUERY SYNTAX

TSCRN? <type>

<type> := {TIFF, BMP, PNG}

RESPONSE FORMAT

#8<byte-length><binary-block>

#8 indicates that the response message is in the format <Definite Length Arbitrary Block Response Data>, and the subsequent <byte-length> consists of an 8-bit data.

<byte-length> is the number of bytes to be entered in <binary-block>. <byte-length> consists of an 8-bit unsigned integer. The first leading zero is not deleted.

<binary-block> contents are the binary data described in the specified screen data format.

REMARKS

This command does not support multi-commands.

TSDAT Command/Query (SPI Trigger data settings)

The TSDAT command sets the data for the SPI Trigger. The TSDAT? query returns the current data of the SPI Trigger.

COMMAND SYNTAX

TSDAT <bits>, <data>

<bits> := 4 to 64

<data> := 0, 1, or X for each bit of the condition data for the SPI Trigger, starting from the LSB. A data length of up to 64 bits can be specified, according to the setting in <bits>.

Example:

TSDAT 8, 00101001

An error occurs if the specified value exceeds the bits specification.

QUERY SYNTAX

TSDAT?

RESPONSE FORMAT

<bits>, <data>

TSLP Command and Query (Trigger Slope)

The TSLP command defines the trigger slope. The TSLP? query returns the trigger slope setting.

COMMAND SYNTAX

TSLP <slope>

<slope> := {POS, NEG}

QUERY SYNTAX

TSLP?

RESPONSE FORMAT

<slope>

<slope> is used to identify the currently defined trigger slope.

REMARKS

When TTP is EDGEALT, EDGEOR, OR, NOR, AND, or NAND when the TSLP command is used, a device-specific error (DDE) is returned. At that time, the response to the TSLP? query becomes POS.

TSPI Command/Query (SPI Trigger Settings Other Than Data)

The TSPI command sets conditions other than data for SPI Trigger. The TSPI? query returns the current conditions (other than data) for the SPI Trigger.

COMMAND SYNTAX

TSPI <clksrc>, <clkedg>, <datsrc>, <dstyp>, <cssrc>

<clksrc> := {CH1}

<clkedg> := {POS, NEG}

<datsrc> := {CH2, CH3, CH4, EXT, EXT10}

<dstyp> := {HIGH, LOW, TOUT}

<cssrc> := {CH2, CH3, CH4, EXT, EXT10}

QUERY SYNTAX

TSPI?

RESPONSE FORMAT

<clksrc>, <clkedg>, <datsrc>, <order>, <dstyp>

REMARKS

If this command has the same setting for <datsrc> and <cssrc>, <datsrc> takes priority. At that time, the setting is changed automatically so that <cssrc> and <datsrc> do not overlap.

TSRC Command and Query (Trigger Signal Source)

The TSRC command sets the trigger signal source.

The TSRC? query returns the signal source setting for the current trigger.

COMMAND SYNTAX

TSRC <source>

<source> := {CH1, CH2, CH3, CH4, EXT, EXT10, LINE}

QUERY SYNTAX

TSRC?

RESPONSE FORMAT

<source>

<source> identifies the current trigger's signal source setting.

REMARKS

When TTYP is not EDGE, the TSRC LINE command is not executed and a device-specific error (DDE) is returned.

When TTYP is OR, NOR, AND, or NAND, <source> can be set as CH1, CH2, CH3, or CH4. If any other value is set, a device-specific error (DDE) is returned.

When TTYP is OR, NOR, AND, or NAND, the target for TSTA, TCPL, or TLVL becomes the trigger source set by TSRC.

*TST? Query (Self Test)

The *TST? query runs the internal self test, and returns a response indicating whether or not an error was detected by the test.

QUERY SYNTAX

*TST?

RESPONSE FORMAT

<status>

<status>:= +0000000 No error occurred in self test.

<status>:= -0000001 CH1 ACQ MEMORY CHECK ERROR (CH1 acquisition memory check error)

<status>:= -0000002 CH2 ACQ MEMORY CHECK ERROR (CH2 acquisition memory check error)

<status>:= -0000003 CH3 ACQ MEMORY CHECK ERROR (CH3 acquisition memory check error)

<status>:= -0000004 CH4 ACQ MEMORY CHECK ERROR (CH4 acquisition memory check error)

TSTA Command and Query (Pattern Trigger State)

The TSTA command sets the state of the trigger source selected by the TSRC command for a pattern trigger (EDGEOR, OR, NOR, AND, or NAND).

The TSTA? query returns the current status of the trigger source selected by the TSRC command.

COMMAND SYNTAX

TSTA <state>

<mode> := {DONTCARE, HIGH, LOW}

QUERY SYNTAX

TSTA?

RESPONSE FORMAT

<state>

REMARKS

If the TTP setting is not EDGEOR, ON, NOR, AND, or NAND when the TSTA command is executed, a device-specific error (DDE) is returned.

TSTO Command/Query (SPI Trigger timeout time setting)

The TSTO command sets the timeout time for the SPI Trigger.

The TSTO? query returns the current timeout time for the SPI Trigger.

COMMAND SYNTAX

TSTO <timeout>

<timeout> :=100E-9 to 10.0E+0

QUERY SYNTAX

TSTO?

RESPONSE FORMAT

<timeout>

REMARKS

If this command has the same setting for <datsrc> and <cssrc>, <datsrc> takes priority. At that time, the setting is changed automatically so that <cssrc> and <datsrc> do not overlap.

TTYP Command and Query (Trigger Type)

The TTYP command selects the trigger type.

The TTYP? query returns the currently selected trigger type.

COMMAND SYNTAX

TTYP <type>

<type> := {EDGE, EDGEALT, EDGEOR, COUNT, PULSE, PERIOD, DROPOUT, TV, OR, NOR, AND, NAND, UART, SPI, I2C }

QUERY SYNTAX

TTYP?

RESPONSE FORMAT

<type>

<type>:= currently set trigger type.

TUART Command/Query (UART Trigger Settings Other Than Data)

The TUART command sets conditions other than for UART Trigger data. The TUART? query returns the current conditions for the UART Trigger other than data conditions.

COMMAND SYNTAX

TUART <trig>, <source>, <rate>, <stop>, <parity>, <idle>, <order>

<trig> := {START, STOP, DATA, PERR}
<source> := {CH1, CH2, CH3, CH4, EXT, EXT10}
<rate> := 1000 to 1000000
<stop> := {1, 2}
<parity> := {NONE, EVEN, ODD}
<idle> := {LOW, HIGH}
<order> := {MSB, LSB}

QUERY SYNTAX

TUART?

RESPONSE FORMAT

<trig>, <source>, <rate>, <stop>, <parity>, <idle>, <order>

TUDAT Command/Query (UART Trigger Data Settings)

The TUDAT command sets UART Trigger data. The TUDAT? query returns the current UART Trigger data.

COMMAND SYNTAX

TUDAT <bits>, <data>

<bits> := {5, 6, 7, 8}
<data> := two-digit hexadecimal number that is the data condition for the UART Trigger.

Example:

TUDAT 8, 1A

QUERY SYNTAX

TUDAT?

RESPONSE FORMAT

<bits>, <data>

REMARKS

When a value that exceeds the bit specification is specified, only valid bits are set. An error occurs when a value exceeding one byte has been specified.

TVCUST Command and Query (Custom TV Trigger)

The TVCUST command defines the field frequency and number of scan lines for the custom TV trigger.

The TVCUST? query returns the currently defined field frequency and number of scan lines.

COMMAND SYNTAX

TVCUST <field>,<line>

<field> := 10 to 99. The field frequency is set to 1/<field>.

<line> := 100 to 3000. The number of scan lines is set to <line>.

QUERY SYNTAX

TVCUST?

RESPONSE FORMAT

<field>,<line>

REMARKS

If TTYPE is not TV or TVSTD is not CUSTOM when the TVSTD command is executed, a device-specific error (DDE) is returned.

TVSET Command and Query (TV Trigger)

The TVSET command sets the field sequence, number of fields, and number of lines.

The TVSET query returns the currently set field sequence, number of fields, and number of lines.

COMMAND SYNTAX

TVSET <seq>,<field>,<line>

<seq> := {1, 2, 4, 8} (Field sequences 1, 2, 4, or 8)
<field> := 0, 1 to 8 (0 = any fields)
<line> := 1 to 263 (when TVSTD is NTSC and <field> is an odd number)
 := 1 to 262 (when TVSTD is NTSC and <field> is an even number)
 := 1 to 313 (when TVSTD is PAL and <field> is an odd number)
 := 314 to 625 (when TVSTD is PAL and <field> is an even number)
 := 0 (0 = any lines)

QUERY SYNTAX

TVSET?

RESPONSE FORMAT

<seq>,<field>,<line>

REMARKS

If TTYPE is not TV when the TVSET command is executed, a device-specific error (DDE) is returned. The number of lines option is set automatically, as follows.

- NTSC: 263/262
- PAL: 625

TVSTD Command and Query (TV Standard for TV Trigger)

The TVSTD command selects the TV standard for TV trigger (TTYP = TV).

The TVSTD? query returns the currently selected TV standard.

COMMAND SYNTAX

TVSTD <type>

<type> := {NTSC, PAL, CUSTOM}

QUERY SYNTAX

TVSTD?

RESPONSE FORMAT

<type>

REMARKS

If TTYP is not TV when the TVSTD command is executed, a device-specific error (DDE) is returned.

TWTM Command and Query (Pulse Width Trigger)

The TWTM command defines the parameters for the pulse width trigger (TTYP = PULSE).

The TWTM? query returns the current parameter of the pulse width trigger.

COMMAND SYNTAX

TWTM <when>, <m>, <n>

<when> := {M_T, T_M, M_T_N, T_M_N_T}

M_T:= Sets pulse width trigger time condition to "m <= t".

T_M:= Sets pulse width trigger time condition to "t <= m".

M_T_N:= Sets pulse width trigger time condition to "m <= t <= n".

T_M_N_T:= Sets pulse width trigger time condition to "t <= m, n <= t".

<m> := sets "m" time value. The available setting range is 15 ns to 50.0 s. The <DECIMAL NUMERIC PROGRAM DATA> format is used, and the suffix is also valid.

<n> := sets "n" time value. The available setting range is 15 ns to 50.0 s. The <DECIMAL NUMERIC PROGRAM DATA> format is used, and the suffix is also valid.

QUERY SYNTAX

TWTM?

RESPONSE FORMAT

<when>, <m>, <n>

The currently set condition is output to <when>. The format is <CHARACTER RESPONSE DATA>.

The lower time of the currently set pulse width is output to <m> in <NR3 NUMERIC RESPONSE DATA>.

The higher time of the currently set pulse width is output to <n> in <NR3 NUMERIC RESPONSE DATA>.

REMARKS

If TTYP is not PULSE when the TWTM command is executed, a device-specific error (DDE) is returned.

If either the M_T_N or T_M_N_T condition has been used, the time values in <m> and <n> are set within the following range.

$$(m) \leq (n) \leq (m * 500)$$

If the specified time value (m, n, or both) exceeds this range, it is rounded to within this range.

VCUR Command and Query (Vertical Cursor)

The VCUR command defines the position of the vertical cursor.

The VCUR? query returns the currently defined position.

COMMAND SYNTAX

VCUR <Cursor1>,<Cursor2>

<Cursor1> := -3.97 to +3.95

<Cursor2> := -3.97 to +3.95

<Cursor1> and <Cursor2> respectively indicate the positions of vertical cursor Cursor1 and Cursor2 on the screen, in div units. For description of the rounding method, see "Remarks". The bottom edge of the screen corresponds to -3.97, the center to 0, and the top to +3.95.

QUERY SYNTAX

VCUR?

RESPONSE FORMAT

<Cursor1>,<Cursor2>

<Cursor1> and <Cursor2> are used to identify the vertical cursor's current position. The format is <NR3 Numeric Response Data>.

REMARKS

The resolution of <Cursor1> and <Cursor2> is 0.02. If another value is input, it is rounded to the nearest value having the smaller absolute value.

If CURM is not DV or DHDV when the VCUR command is executed, a device-specific error (DDE) is returned.

VDIV Command and Query (Vertical Axis Range: V/div)

The VDIV command sets the vertical axis range of the specified input channel in V/div units. If the specified value exceeds the allowable range, it is rounded according to the 1-2-5 step rule. The VDIV? query returns the currently defined vertical axis range. When the numerical value is returned in voltage units, the suffix is not returned.

COMMAND SYNTAX

<trace>:VDIV <v_gain>

<trace> := {C1, C2, C3, C4, M1}

<v_gain> := vertical axis range

<v_gain> is specified in <DECIMAL NUMERIC PROGRAM DATA> format. The suffix is also valid. The rounding rule for numerical values is described in "Remarks" below.

QUERY SYNTAX

<trace>:VDIV?

RESPONSE FORMAT

<v_gain>

<v_gain> is the currently defined vertical axis range in <NR3 Numeric Response Data> format.

The table below shows rounding in <v_gain> when probe ratio is 1:1.

Rounding Range	Set Vertical Axis Range
$v_gain \leq 2E-3$	2 mV/div
$2E-3 < v_gain \leq 5E-3$	5 mV/div
::	
$5 < v_gain$	10 V/div

When the probe attenuation ratio is 5:1, 10:1, 20:1, 50:1, 100:1, 200:1, 500:1, 1000:1, or 2000:1, the above range is multiplied by 5, 10, 20, 50, 100, 200, 500, 1000, or 2000 respectively.

When the probe attenuation ratio is set to AUTO, the above range is multiplied by 1, 10, 100, or 1000 depending on the detected probe attenuation ratio.

When rescale is used, the above range is multiplied by the "a" value in the rescale formula "ax + b".

Some values may be rounded to a permissible larger value.

VECT Command and Query (Data Interpolation)

The VECT command sets data interpolation ON or OFF.

The VECT? query returns the interpolation state.

COMMAND SYNTAX

VECT <state>

<state> := {ON, OFF}

ON:= waveform data is shown in interpolated lines.

OFF:= waveform data is shown in dots.

QUERY SYNTAX

VECT?

RESPONSE FORMAT

<state>

REMARKS

If XYDS is XY or XYTRG, VECT ON is ignored.

VUNI Command and Query (Unit of vertical axis)

The VUNI command sets the units of the vertical axis of the specified input channel.

The VUNI? query returns the selected units of the vertical axis.

COMMAND SYNTAX

`<Channel>:VUNI <unit>`

`<Channel>` := {C1, C2, C3, C4}

`<unit>` := {V, A, W, CEL, NOUNIT}

V := The unit of the vertical axis is set to unit V of the voltage.

A := The unit of the vertical axis is set to unit A of the current.

W := The unit of the vertical axis is set to unit W of the electric power.

CEL := The unit of the vertical axis is set to unit °C of the temperature.

NOUNIT := The unit of the vertical axis is set to none

QUERY SYNTAX

`<Channel>:VUNI?`

RESPONSE FORMAT

`<unit>`

*WAI Command (Wait)

The *WAI (WAIT) command is required by the IEEE 488.2 standard. Because processing by this command starts after execution of all previous commands for this product has been completed, the *WAI command does not affect other processing.

See WSGL? with regard to completing waveform acquisition in SINGLE mode.

COMMAND SYNTAX

`*WAI`

WAVESRC Command and Query (Target Trace for Waveform Data Transfer)

The WAVESRC command selects the trace to which waveform data is to be transferred.

When waveform data is transferred (DTWAVE? query), this command must be used to set the target trace for waveform data transfer.

The WAVESRC? query returns the selected channel.

COMMAND SYNTAX

WAVESRC <dir>

<dir> := {CH1, CH2, CH3, CH4, MATH}

QUERY SYNTAX

WAVESRC?

RESPONSE FORMAT

<dir>

<dir> is used to identify the target trace for waveform data transfer.

WSGL Command and Query (Set Trigger Mode (SINGLE))

The WSGL command sets TRMD to SINGLE.

The WSGL? query also sets TRMD to SINGLE. However, in this case, idle mode is set until SINGLE measurement is completed. The WSGL? query is used to synchronize the application program with completion of waveform data acquisition.

COMMAND SYNTAX

WSGL

QUERY SYNTAX

WSGL?

RESPONSE FORMAT

+0000001

REMARKS

If XYDS is XY when WSGL or WSGL? is executed, a device-specific error (DDE) is returned and execution fails.

XYDS Command and Query (YT, XY, XY (Triggered) Display)

The XYDS command selects YT, XY, or XY (Triggered) as the display type.

The XYDS? query returns the current display type.

COMMAND SYNTAX

XYDS <type>

<type> := {YT, XY, XYTRG}

YT:= selects display type YT.

XY:= selects display type XY.

XYTRG:= selects display type XY (Triggered).

QUERY SYNTAX

XYDS?

RESPONSE FORMAT

<type>

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