TEK

Command Reference

THE CSA 803 & 11801A

P/O G43042

Tektronix

TEK Command Reference

070-7720-01
Product Group 47

THE CSA 803 & 11801A

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Printed in U.S.A.

Second Edition MAY 1990

Contents

Syntax and Conventions

This *Command Reference* contains complete descriptions of the commands available via the GPIB and RS-232-C interfaces for the CSA 803 Communications Signal Analyzer and the 11801A Digital Sampling Oscilloscope. Use this manual with the *CSA 803 and 11801A Programmer Reference*, which contains programmer tutorial and reference material, and with the *User Reference* for your instrument.

Syntax Definitions

This manual uses the following Backus-Naur Form (BNF) symbols:

BNF Symbols

Symbol	Meaning
< >	Defined element (e.g., <*arg*>)
::=	Is defined as (e.g., <*arg*> ::= argument)
|	Exclusive OR (e.g., PLUS|MINUS)
{ }	One of group is required (e.g., {ON|OFF})
[ ]	Optional item (e.g., [<*link*>:]<*arg*>)
. . .	Previous element(s) may be repeated

Data Element Definitions

The data element types are: numeric, global, and quoted strings. Each is defined as follows:

Numeric Data Types

Element	Meaning
<*ui*>	Unsigned integer, range is 1 through 65,535; no leading space permitted (e.g., 9999).
<*NR1*>	Signed integer value (e.g., –5).
<*NR2*>	Floating point value, without an exponent (e.g. 3.7).
<*NR3*>	Floating point value, with an exponent (e.g. 2.2E–3).
<*NRx*>	{<*NR1*> | <*NR2*> | <*NR3*>}. Range is: –1E ± 300, 0, 1E ± 300, to 15 significant digits.

Global Data Types

Element	Meaning
<asc curve>	ASCII-formatted trace data for one or more data points, in the form: *<NR1>* [{, *<NR1>* }...]
<bblock>	Binary block formatted trace or setting data, in the form: % *<byte count>* *<data>* [{ *<data>* }...] *<checksum>* (Refer to the CURVE and SET? commands for a full explanation.)

Quoted String Data Type

Element	Meaning
<qstring>	Quoted string data. This element can be any character(s) defined in the ASCII or expanded character sets, enclosed by apostrophes or quotation marks, and following these rules: ■ You must use the same delimiter type open and close the string; you cannot open with an apostrophe and close with a quotation mark or vice versa. ■ You can use an apostrophe or quotation mark within the string if you follow the above rule and you enter the enclosing delimiter twice (i.e., "double "" quote") ■ You can use a maximum string length of 127 characters, unless otherwise noted. ■ You cannot use strings that include an embedded ASCII NULL character (0). However, carriage returns and line feeds can be included as text in a string.

Command Conventions

Note: For a complete discussion of command conventions, refer to the *CSA 803 and 11801A Programmer Reference.*

The instrument accepts both upper and lower case letters; it is not case sensitive.

All parts of a command entry can be preceded by "white space," which is defined:

- For RS-232-C—as blanks and carriage returns or line feeds that precede a header
- For GPIB with the EOI terminator—as any combination of blanks, carriage returns, or line feeds
- For GPIB with the EOI and line feed terminator—as any combination of blanks or carriage returns

Commands can be abbreviated to the minimum spelling shown in bold capitals in the syntax blocks. Responses are returned with the full spelling unless the LONGFORM command is set to OFF. Examples in this book use abbreviated command spellings; responses are in long form.

Any combination of set and query commands can be concatenated (joined together) with semicolons.

Commands can be renamed or new commands can be created from concatenated strings of commands using the DEF command.

Measurement (<*meas*>) Commands

The symbol <*meas*> represents one or more of the instrument measurements. For example, <*meas*>? represents a measurement query, such as RMS?. Each <*meas*>? measurement has its own entry in the command set. Refer to the <*meas*>? entry for a list of all the measurements. Refer to the *CSA 803 and 11801A Programmer Reference* or the *User Reference* for your instrument for a complete explanation of the measurement system.

The STAT? query returns measurement statistics (mean and standard deviation) for the measurement selected with the STATISTICS MODE command. See the <*meas*>? entry for a list of measurements.

Waveforms and Traces

The terms waveform and trace both pertain to signals acquired or stored by the instrument; but are not interchangeable in command syntax. Some headers begin with WFM*xxx* (e.g., WFMPRE, WFMSCALING); other headers, links, or arguments use TRACE<*ui*> (e.g., TRACE3) form.

Syntax Key

The following figure summarizes how command information is shown in this manual. The full spelling of the header, link, or argument is given with the minimum spelling in bold capitals.

HEAder [[<*link*> :] <*arg*>]

[<*link*>:]	<*arg*>	[Range, if applicable]

A three-space syntax block contains link-argument or argument-only information. Range is provided for numeric arguments.

? <*link*>	(Response — i.e., ON | OFF)

A two-space syntax block contains a query-only link and its range of responses.

Command Syntax Key

Set Commands and Queries

Set commands modify instrument functions. Queries return the current value(s) of functions. Most commands can be both set and queried. For these commands, only the set form is shown unless the query response differs from the set form. (For example, the query response is included if the links are returned in a different order than presented.)

Query-only commands contain a question mark appended to the header. The words **Query Only** appear in bold at the beginning of the text.

Query-only links contain a question mark preceding the link in the syntax box, and include the words **Query Only** in bold at the beginning of the text. As with any query, append the question mark to the header when querying the link.

A few commands and links can only be set. These commands include the words **Set Only** in bold at the beginning of the text description.

Examples

Examples are included for most headers and links. Examples are shown in shaded boxes, like this:

```
COMMANDS YOU ENTER ARE BOLD
SYSTEM RESPONSE IS REGULAR TYPE
```

Command Set

This section is an alphabetical listing of instrument commands. For information on the functional command groups listed with each command, see the *CSA 803and 11801A Programmer Reference*.

ABBwfmpre {**ON**|**OFF**}

Data Transfer Commands

ABBWFMPRE determines whether the response to a WFMPRE? query is abbreviated or includes all links. When ABBWFMPRE is set to ON (i.e., abbreviated), the WFMPRE? response is:

WFMPRE NR.PT:<*NR1*>,
PTFMT:<*arg*>,XINCR:<*NR3*>,
XMULT:<*NR3*>,XZERO:<*NR3*>,
YMULT:<*NR3*>,YZERO:<*NR3*>

When ABBWFMPRE is set to OFF, the WFMPRE? response includes all 18 links of the WFMPRE command. The power-on default setting is ABBWFMPRE OFF.

```
ABB ON
```

ABSTouch <*NRx*>,<*NRx*>

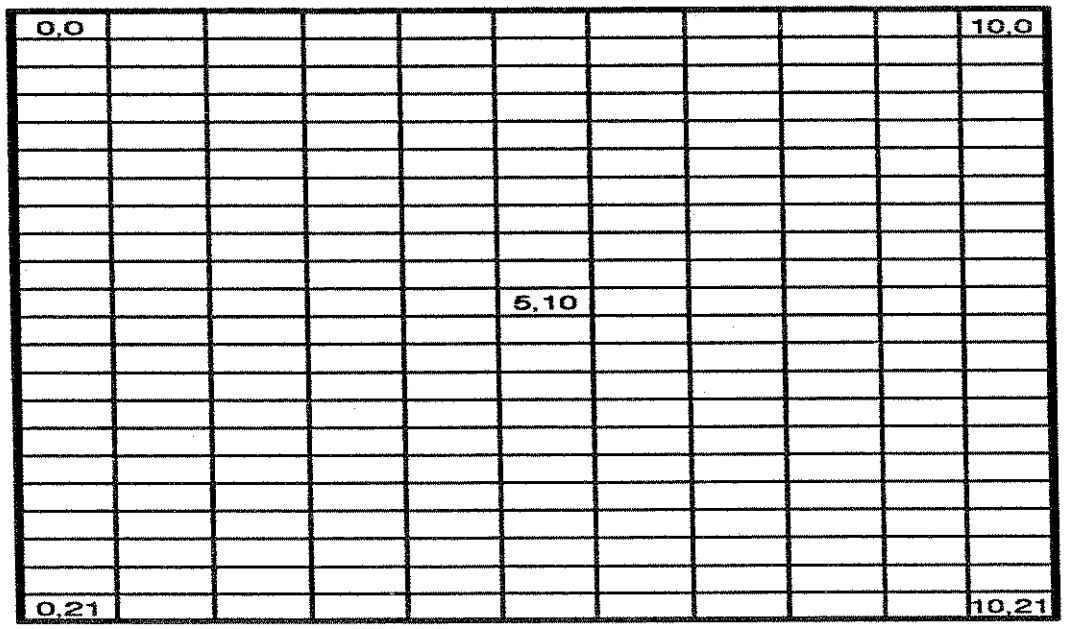
Miscellaneous/System Commands

ABSTOUCH activates a location on the front panel by giving its X,Y coordinates. ABSTOUCH always works, regardless of the state of the front panel (FPANEL ON/OFF) or touch panel button. Touch coordinates, whether from ABSTOUCH or from the front panel, are stored in a last in, first out (LIFO) buffer. You can access the LIFO with the ABSTOUCH? query.

ABSTouch <NRx>,<NRx> (cont.)

	<NRx>,<NRx>	X=0 to11; Y=0 to 21

X,Y touch panel screen coordinates range from 0,0 (upper left) to 10,21 (lower right):



X, Y Touch Panel Screen Coordinates

Coordinates of the front panel buttons are listed in the following table:

Front Panel Button X,Y Coordinates

Button	X,Y	Button	X,Y
Waveform	11,0	Utility/ Enhanced Accuracy	11,5
Trigger	11,1	Touch Panel	11,6
Measure	11,2	Acquisition Run/Stop	11,7
Display Modes	11,3	Autoset	11,8
Store/Recall	11,4	Hardcopy	11,9
		Sequence Setting	11,10

Note: ABSTOUCH cannot be used to touch a sampling head channel button.

```
ABS 11,0
```

ABStouch {**CLE**ar | <*NRx*>, <*NRx*> } **(cont.)**

Query Note: Every front panel touch, whether from ABSTOUCH or the front panel, is stored in a 20-deep LIFO buffer. ABSTOUCH? returns the oldest touch coordinates and removes them from the buffer. If no touches are in the buffer, ABSTOUCH? returns:

ABSTOUCH −1, −1

```
ABS?
ABSTOUCH 11,6
```

ACQNum?

Acquisition Commands

Query Only. ACQNUM? returns the total number of acquisition systems. An acquisition system contains four channels.

```
ACQN?
ACQN 1
```

ACQuisition { **RUN** | **STOP** }

Acquisition Commands

ACQUISITION starts and stops unconditional trace acquisition.

```
ACQ RUN
```

ADJtrace <*ui*> <*link*> : <*arg*>

Trace and Settings Commands

Adjusts the displayed position of the specified trace without modifying the time base or sampling unit parameters. Range of <*ui*> is 1 to 8.

COLor:	(See below for range)

COLOR sets the front panel color for the specified trace to one of the predefined trace colors as seen in the front panel Color pop-up menu. The specified color can be any of the following predefined trace colors;

Color Number	Color Function
1	Trace 1 Color
2	Trace 2 Color
3	Trace 3 Color
4	Trace 4 Color
5	Window Color

The trace colors are used to display new traces in their order of creation. The Window color is used for all created window traces. These trace colors can be set to any absolute color with the COLOR command described on page 2-22.

```
ADJ3 COL:2
```

GRLocation:	**UPP**er | **LOW**er	

Positions the selected trace to the upper or lower graticule pair.

```
ADJ2 GRL:LOW
```

ADJtrace <*ui*> <*link*>:<*arg*> (cont.)

HMAg:	<*NRx*>	1, 2, 2.5, 4, 5, 10

Sets the trace horizontal magnification factor when PANZOOM is ON. The HMAG value depends on the record LENGTH of TBMAIN or TBWIN.

Record LENgth	Valid HMAg Value(s)
512	1
1024	1, 2
2048	1, 2, 4
4096	1, 2.5, 5, 10
5120	1, 2.5, 5, 10

```
ADJ2 HMA:2
```

HPOsition:	<*NRx*>	0 to 9728

Sets the trace horizontal position when PANZOOM is ON. HPOSITION range is in trace points.

```
ADJ2 HPO:300
```

PANzoom:	ON | OFF	

Sets pan/zoom mode to ON or OFF. PANZOOM is always ON for stored or scalar traces, but cannot be ON for XY traces.

```
ADJ2 PAN:ON
```

TRSep:	<*NRx*>	−5.0 to +5.0

Sets the window trace separation in graticule divisions only if the trace is not XY and was created on the Window time base in integer mode (TRACE WFMCALC:FAST).

```
ADJ3 TRS:-2.2
```

VPOsition:	<*NRx*>	−1E+15 to 1E+15

Sets the trace vertical graphical position only if the trace was created in floating-point mode (TRACE WFMCALC:HIPREC).

```
ADJ4 VPO:-8.9E-6
```

VSIze:	<*NRx*>	1E−15 to 1E+15

Sets the trace vertical graphical size only if the trace was created in floating-point mode.

```
ADJ4 VSI:4.5E-2
```

Query Notes: ADJ <*dui*>? returns its links and arguments in the following order:

ADJTRACE <*ui*> PANZOOM:<*arg*>,
HMAG:<*NR3*>,HPOSITION:<*NR1*>,
VPOSITION:<*NR3*>,VSIZE:<*NR3*>
TRSEP:<*NR3*>,GRLOCATION:<*arg*>,
COLOR:<*NR1*>

ADJTRACE? returns the same information as ADJTRACE <*ui*>? for all defined taces in low-to-high trace order.

ADJ? Predefined Responses: Several ADJtrace links can only be set under restricted conditions, but can be queried at any time. These links return the following predefined values if queried while they cannot be set:

HMAg	−1.0E+0
HPOsition	1.0E+16
TRSep	1.0E+16
VPOsition	1.0E+16
VSIze	−1.0E+0

ALTinkjet *<link>:<arg>*

External I/O Commands

ALTINKJET specifies printing parameters for HP Thinkjet and LaserJet printers operating in HP graphics mode.

Note: ALTINKJET does not support Thinkjet and LaserJet printers operating in Epson emulation mode.

DIRection:	**HOR**iz | **VER**t	

DIRECTION selects the printing orientation. HORIZ prints rows left-to-right and top-to-bottom. VERT prints columns bottom-to-top and left-to-right.

```
ALT DIR:HOR
```

FORMat:	**DRA**ft | **HIR**es | **RED**uced	

FORMAT selects the printing format. HIRES shows front panel intensified regions; DRAFT prints selected fields in reverse video. REDUCED is a quarter the size of DRAFT, but does not show intensified regions.

Note: Due to graphics imaging constraints on standard LaserJet printers, HIRES format may not generate a suitable copy on a standard Laser-Jet printer

```
ALT FORM:DRA
```

PORt:	**CENTR**onics | **GPI**b | **RS232**	

PORT specifies the output port for the printer.

```
ALT POR:RS232
```

AMPlitude?

Measurement Commands

Query Only. AMPLITUDE returns the trace amplitude expressed as the difference of Topline-Baseline. AMPLITUDE is available only when MMODE is set to either SOFT or STAT.

```
AMP?
```

AUTOSet [<*link*>:]<*arg*>

Acquisition Commands

AUTOSET controls vertical, horizontal, and trigger automatic ranging and positioning of input signals on the selected trace for both acquired and stored traces. For acquired signals, the vertical size is set and the time base is adjusted. For stored traces, the display is scaled.

HORiz:	**ON** | **OFF**	

Sets autoset to ON or OFF for the horizontal parameters. See the MODE link.

```
AUTOS HOR:ON
```

MODe:	**EDG**e | **PER**iod	

Selects mode for Main traces. EDGE centers the first transition and spreads the 20% to 80% transition region over 2 to 5 divisions. PERIOD attempts to place 2 to 5 periods of the trace on the display.

```
AUTOS MOD:EDG
```

	STARt	

Set Only. Begins autosetting of the selected trace.

```
AUTOS STAR
```

AUTOSet [<*link*>:]<*arg*> (cont.)

TRIgger:	ON | OFF	

Sets autoranging to ON or OFF for the trigger signal.

```
AUTOS TRI:ON
```

	UNDO	

Set Only. Cancels a previous autoset and returns to the settings in effect before the last AUTOSet STARt.

```
AUTOS UNDO
```

VERt:	ON | OFF	

Sets autoset to ON or OFF for the vertical parameters.

```
AUTOS VER:ON
```

Query Note: AUTOSet? returns its links and arguments in the following order:

AUTOS HOR:<*arg*>,VER:<*arg*>, TRI:<*arg*>, MOD:<*arg*>

AVG {ON|OFF}

AVG sets averaging ON or OFF for the vertical expression component (<*y exp*>) of the trace description of the selected trace.

- When <*y exp*> is *not* enclosed with ENV and AVG is set to ON, <*y exp*> is enclosed with AVG().
- When <*y exp*> is enclosed with ENV and AVG is set to ON, AVG() replaces ENV().
- When <*y exp*> is enclosed with AVG() and AVG is set to OFF, the enclosing AVG() is removed.

Note: You cannot set AVG OFF when <*y exp*> is not enclosed with AVG(). You cannot set AVG to ON if the selected trace is XY or has only stored and/or scalar components.

Examples Using AVG

<*y exp*> **Before**	**Command**	<*y exp*> **After**
M2	**AVG ON**	AVG(M2)
M1	**AVG OFF**	–error–
ENV(M1–M2)	**AVG ON**	AVG(M1–M2)
AVG(M3)	**AVG OFF**	M3
AVG(M4)	**AVG ON**	AVG(AVG(M4))

Query Note: AVG? returns the state of averaging for the entire <*y exp*>. AVG ON means the entire <*y exp*> is enclosed by AVG. AVG OFF means the entire <*y exp*> is not enclosed, although an AVG function may be embedded within the description.

B

BCOrrection { ON | OFF }

Miscellaneous/System Commands

BCORRECTION sets baseline correction to ON or OFF for all acquired traces. When ON the mainframe attempts to keep the selected trace at the same vertical screen position even though the input signal changes. This is useful in TDR applications.

```
BCO ON
```

BITMap <*link*>:<*arg*>

External I/O Commands

BITMAP specifies printing parameters for screen captures, in which data from the front panel display is processed by an external computer. Screen capture data include a title block and a pixel block.

BITMAP Title Block. The title block contains three ASCII strings terminated by new line characters. The first string includes the mainframe name, time and date, and the serial number. The second string contains the number of pixels per raster line. The third string gives the number of raster lines.

When BITMAP DATAFORMAT is set to BINARY, the title block is terminated with an ASCII NULL character following the third new line character. When BITMAP DATAFORMAT is set to BINHEX, the title block is terminated with the third new line character.

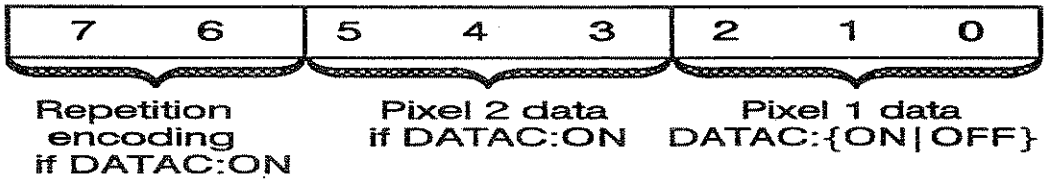
BITMAP Pixel Block. The pixel block is a stream of data bytes. The DATACOMPRESS and DATAFORMAT links determine the format (data compression scheme).

DATACompress:	**ON | OFF**	

DATACOMPRESS specifies the pixel block data compression mode. When OFF, each byte contains one 3-bit pixel value in the three least-significant bits. When ON, each byte contains two 3-bit pixel values, with the first pixel in the least-significant three bits (see the illustration below). Also, when DATACOMPRESS is set to ON, the two most-significant bits in the byte encode the data repetition pattern, which is discussed below.

```
BITM DATAC:ON
```

Pixel Block Data Byte. The following figure shows the bits in a pixel block data byte:



Bits in a Pixel Block Data Byte

Repetition Encoding. The table below lists the binary repetition encoding in bits 7 and 6 of the pixel data byte.

Data Repetition Encoding

Bit 7	Bit 6	Meaning
0	0	Following byte(s) contain repetition count
0	1	Data pattern repeats once
1	0	Data pattern repeats twice
1	1	Data pattern repeats three times

When bits 7 and 6 encode the values 1 (01), 2 (10), or 3 (11), the pixel data is repeated one, two, or three times, respectively.

When bits 7 and 6 have the value 0 (00), the next one or two data bytes contain the repetition count. If the next byte has the decimal value 4 to 255, that is the pattern repetition count. If the next byte has the decimal value 1 to 3, these are the high-order bits of a 10-bit repetition count and the following byte contains the lower eight bits.

BITMap <*link*>:<*arg*> (cont.)

DATAFormat:	BINary | BINHex	

DATAFORMAT specifies the pixel block data format. BINARY data are output in a stream without delimiters. BINHEX data are output as ASCII hexidecimal bytes and each raster line is terminated with a new line character.

```
BITM DATAF:BIN
```

DIRection:	HORiz | VERt	

DIRECTION selects the printing orientation. HORIZ prints rows left to right and from top to bottom. VERT prints columns bottom to top and from left to right.

```
BITM DIR:HOR
```

FORMat:	DIThered | DRAft | HIRes | REDuced | SCReen	

FORMAT selects print formatting. DITHERED reduces saturation for icon and text backgrounds to improve print contrast for the TEK4692 and TEK 4696 printers. HIRES dithers icon and text backgrounds and increases foreground saturation to improve contrast for monochrome printers with limited gray-scale capability. DRAFT prints black-on-white background except for selected icons or text which are printed white-on-black background. REDUCED prints black-on-white background only. SCREEN is a one-to-one mapping of 3-bit pixel information.

```
BITM FORM:DIT
```

PORt:	CENTRonics | GPIb | RS232	

PORT specifies the output port for the printer.

```
BITM POR:GPI
```

BYT.or {LSB|MSB}

Data Transfer Commands

BYT.OR selects whether the least significant byte (LSB) or most significant byte (MSB) of binary trace data (<*bblock*>) is transmitted first during a data transfer. BYT.OR sets the byte order for CURVE, HISTOGRAM? DATA, DISPLAY? DATA, and VPCURVE data transfers. BYT.OR affects the same data transfer commands affected by the data encoding command ENCDG. Power-on default is MSB; LSB has a faster data transfer rate. Correct byte order depends on the controller.

```
BYT. LSB
```

C

CALibrate <*alpha*> <*ui*> <*link*>: <*arg*>

Calibration Commands

Note: Possible alpha values for the 11801A are A through D, for SM-11 Multi-channel Units, and M for the mainframe. The Alpha value for the CSA 803 is always M, for mainframe.

Performs manual or automatic calibration of the specified sampling head channel.

AUTO:	**BLO**wby | **DAD**j | **LOO**pgain | **OFFS**et | **ONU**II | **TDRA**mplitude	

Set Only. AUTO performs an automated calibration for the specified parameter on the specified channel. Each of these arguments is discussed as a link for the CALIBRATE command.

AUTO:OFFSET is available only if the installed sampling head has probe-tip offset capability (for example, the SD-23 sampling head has probe tip offset capability).

```
CALM4 AUTO:DAD
```

BLOwby:	<*NRx*>	(Range specified by sampling head)

BLOWBY sets blowby compensation.

```
CALM4 BLO:1.43E-3
```

CSTore:	**ALL** | **BLO**wby | **LOO**pgain | **OFFS**et | **ONU**ll | **TDRA**mplitude

Set Only. CSTORE stores the specified parameter (or ALL) as a user setting in sampling head EEPROM. TDR amplitude values are stored for both positive and negative polarity. Offset null values are stored for both states of smoothing (on and off). The DADJ value is not stored.

Offset stores the user offset calibration values in the sampling head EEPROM. CSTORE:OFFSET is available only if the installed sampling head has probe-tip offset capability (for example, the SD-23 sampling head has probe tip offset capability).

```
CALM4 CST:LOO
```

DADj:	<*NRx*>	0 to 100

DADJ sets the target measurement for delay adjustment. If you adjust either channel in a two-channel head, both channels are set.

```
CALM2 DAD:50
```

DREcall:	**ALL** | **BLO**wby | **LOO**pgain | **OFFS**et | **ONU**ll | **TDRA**mplitude

Set Only. DRECALL recalls from the sampling head EEPROM the factory default setting for the specified parameter.

Offset recalls the factory default offset calibration values from the sampling head. DRECALL:OFFSET is available only if the installed sampling head has probe-tip offset capability (for example, the SD-23 sampling head has probe tip offset capability).

```
CALM1 DRE:ALL
```

CALibrate <*alpha*> <*ui*> <*link*>:<*arg*> (cont.)

LOOpgain:	<*NRx*>	(Range specified by sampling head)

LOOPGAIN sets the calibration loop gain.

```
CALM3 LOO:1.2
```

ONUll:	<*NRx*>	(Range specified by sampling head)

ONULL sets offset nulling for the current state of smoothing for a channel.

```
CALM7 ONU:0.23
```

TDRAmplitude:	<*NRx*>	(Range specified by sampling head)

TDRAMPLITUDE sets the TDR amplitude for the current state of polarity of the specified channel.

```
CALM7 TDRA:3.5E-4
```

CALibrate <*alpha*> <*ui*> <*link*>:<*arg*> (cont.)

UREcall:	**ALL** | **BLO**wby | **LOO**pgain | **OFFS**et | **ONU**II | **TDRA**mplitude

Set Only. URECALL recalls user settings from the sampling head EEPROM that were saved with CSTORE link.

Offset recalls the user offset calibration values from the sampling head. URECALL:OFFSET is available only if the installed sampling head has probe-tip offset capability (for example, the SD-23 sampling head has probe tip offset capability).

```
CALM32 URE:ONU
```

Query Note: CAL<*alpha*><*ui*>? returns its links and arguments in the following order:

CAL<*alpha*><*ui*> BLO:<*NR3*>,LOO: <*NR3*>, ONU:<*NR3*>,TDRA:<*NR3*>, DAD: <*NR1*>

CH <*alpha*> <*ui*> <*link*>:<*arg*>

Channel Commands

Note: Possible alpha values for the 11801A are A through D, for SM-11 Multi-channel Units, and M for mainframe. The Alpha value for the CSA 803 is always M, for mainframe.

Sets and queries the vertical parameters of channels. The <alpha> component will always be M and the <ui> component will be a channel number.

? **ATT**enuation	X1 | X2 | X5 | X10

Query Only. ATTENUATION returns the combined probe and head attenuation factor.

```
CHM6? ATT
CHM6 ATT:X1
```

CH <*alpha*> <*ui*> <*link*>:<*arg*> (cont.)

CDElay:	<*NRx*>	(Range specified by sampling head

CDELAY sets the delay between channels for dual-channel sampling heads with channel delay but without TDR capability (for example, the SD-23 sampling head).

```
CHM6 CDE:10
```

DATAType:	**REP**etitive	**RAN**dom

In the sampling head DATATYPE sets the sampling loop to either RANDOM, for random data, or REPETITIVE, for high-precision device characterization. If DATATYPE is set to RANDOM for either channel in the sampling head, the instrument turns smoothing off and displays a warning. However, if DATATYPE is RANDOM and smoothing is turned on, the instrument displays the following error message: Error 2003, "Smoothing is not permitted when either channel in a head is in Random Data mode."

```
CHM6 DATAT:REP
```

EXTAttenuation:	<*NRx*>	(See below for range)

EXTATTENUATION sets channel external attenuation to a user-specified value (for example, 100 sets channel external attenuation to x100 external attenuation). Range is zero (no attenuation) to 1E+6.

```
CHM6 EXTA:100
```

OFFSet:	<*NRx*>	(See below for range)

OFFSET sets the input vertical offset for channel with acquisition capability. Range in integer mode is −2V to +2V. Range in floating-point mode is −1E+15 to 1E+15.

```
CHM5 OFFS:-0.9
```

SENsitivity:	<*NRx*>	(See below for range)

SENSITIVITY sets the input vertical sensitivity (gain) for a channel with acquisition capability. Range is 2.0E−3 to 2.55E−1 volts.

```
CHM3 SENS:1.5E-3
```

SMOothing:	**ON** | **OFF**	

SMOOTHING sets smoothing to ON or OFF for a head with smoothing capability.

```
CHM4 SMO:ON
```

TDRDelay:	<*NRx*>	(Range specified by sampling head)

TDRDELAY sets the relative delay of the output pulse between the channels of a dual-channel head with TDR capability.

```
CHM4 TDRD:3.1E-6
```

TDRPolarity:	**PLU**s | **MINU**s	

TDRPOLARITY selects positive- or negative-going TDR output pulses for channels with switchable-polarity TDR.

```
CHM7 TDRP:PLU
```

CH <alpha> <ui> <link>:<arg> (cont.)

TDRState:	**ON | OFF**	

TDRSTATE sets the TDR generator to ON or OFF for channels with TDR capability.

```
CHB12 TDRS:ON
```

TOFfset:	<NRx>	(Range specified by sampling head)

TOFFSET sets the termination offset voltage for a channel with termination offset capability.

```
CHM4 TOF:1.0E-3
```

Query Notes: CH <alpha> <ui>? returns the links and arguments for the specified channel in the following order:

CH<alpha><ui> EXTA:<NRx>, OFFS:<NRx>, SEN:<NRx>, SMO:<arg>, TDRD:<NRx>, TDRP:<arg>, TDRS:<arg>, ATT:<arg>

CH <alpha>? returns the same information as CH <alpha> <ui>?, for all installed channels of the specified unit, in low-to-high numeric order. Channels without heads installed are not included in the response.

CH? returns the same as CH <alpha> <ui>?, for all installed channels. The response is in low-to-high numeric order for M1 to M8, followed by units A through D, if installed. Channels or multichannel units that are not installed are not included in the CH? response.

CLEar {**ALL**Trace | <*qstring*> | **TRA**ce <*ui*>}

Trace and Settings Commands

Set Only. CLEAR discards acquired data for all displayed traces, the specified labeled trace, or for the specified trace. (Refer also to the REMOVE command.)

	ALLTrace | <*qstring*> | **TRA**ce <*ui*>	1 to 8

No error is reported for sending CLEAR ALLTRACE when no traces are defined. Wildcard characters are valid with <*qstring*>. (Refer to Label Wildcard Characters on page 2-86 for wildcard definitions.)

```
CLE TRA5
```

COLor <*ui*> <*link*>:<*arg*>

Display and Color Commands

COLOR <*ui*> controls the front panel colors. The <*ui*> range is 0 to 7, and specifies the color index:

Color Indexes

<*ui*>	**Color Specified**
0	Background
1	Trace Color1
2	Trace Color2
3	Trace Color3
4	Trace Color4
5	Window traces
6	Graticule and Selectors
7	Cursors and Measurement Annotation

COLor <*ui*> <*link*>:<*arg*> (cont.)

Note: Refer to the *Tektronix Color Standard HLS* coordinate system for the definitions of hue, saturation, and lightness.

	DEFAult	

DEFAULT sets the factory default hue, lightness, and saturation for the specified color.

```
COL1 DEFA
```

HUE:	<*NRx*>	0 to 360 degrees

HUE sets the hue of the specified color.

```
COL4 HUE:120
```

LIGhtness:	<*NRx*>	0 to 100 percent

LIGHTNESS sets the lightness of the specified color.

```
COL4 LIG:30
```

SATuration:	<*NRx*>	0 to 100 percent

SATURATION selects the saturation of the specified color.

```
COL4 SAT:80
```

COLor **DEFA**ult

Display and Color Commands

COLOR DEFAULT sets all colors in the display to their factory-default values.

```
COL DEFA
```

COMpare {**ON**|**OFF**}

Measurement Commands

COMPARE controls the measurement comparison mode. When COMPARE is set to OFF, a measurement query returns the value of the measurement followed by an accuracy qualifier. COMPARE OFF is the normal measurement mode. When COMPARE is set to ON, a measurement query compares the measurement value with a reference value set with the REFSET command, and then returns the difference with an accuracy qualifier. If the reference measurement is undefined or the measurement qualifier is UN (uncertain), the returned comparison qualifier is also UN.

Note: For the list of measurement accuracy qualifiers and their definitions, refer to page 2-93.

```
COM ON
```

CONDacq *<link>:<arg>*

Acquisition Commands

CONDACQ sets the following conditions for trace acquisition: completion of a specified condition, continuous acquisition, or acquisition on a complete trace record.

Completion of any conditional acquisition TYPE (i.e., all types except CONTINUOUS) is signaled by event code 450, "Conditional acquire complete."

? REMAining	*<NR1>*

Query Only. REMAINING returns a value indicating how much of the selected acquisition TYPE must still be acquired to complete acquisition.

REMAINING Meanings for CONDACQ TYPE

TYPE	Meaning
AVG	Number of averages remaining
AVG.ENV	Number of averages and envelopes remaining
CONTINUOUS	Not meaningful; always returns 0
ENV	Number of envelopes remaining
GRADED	Number of points remaining
HIST.PT	Number of points remaining
RECORD	Not meaningful; always returns 0
WAVFRM	Number of complete trace records remaining

Note: When conditional acquisition is complete and acquisition has stopped, the REMAINING query always returns 0 (zero).

```
COND? REMA
CONDACQ REMAINING:22
```

CONDacq <*link*>:<*arg*> (cont.)

TYPe:	**AVG** | **AVG.**env | **CONTI**nuous | **ENV** | **GRAD**ed | **HIST.**pt | **MASK** | **RECO**rd | **WAV**frm

TYPE selects the acquisition type, as follows:

Acquisition Types

TYPE	Meaning
AVG	Acquires NAVG number of averages for all traces that include AVG in their description.
AVG.ENV	Acquires NAVG number of averages or NENV number of envelopes for all traces that include either AVG or ENV or both in their description.
CONTINUOUS	Acquires continuously until halted with ACQUISITION STOP.
ENV	Acquires NENV number of envelopes for all traces that include ENV in their description.
GRADED	Acquires until NGRADED points reach their maximum (65535) for all acquired traces when DISPLAY TYPE is GRADED.
HIST.PT	Acquires until NHIST.PT points are in the histogram for the selected trace.
MASK<*ui*>	**Set only.** Sets the conditional acquire type to stop when at least NMASK hits are acquired in MASK<*ui*>. The query MASK<*ui*>? NCOunt returns the hit count for the mask.
MASK	**Set only.** Sets the conditional acquire type to stop when at least NMASK hits are acquired in all masks combined. The query MASKSt? TOTAL returns the combined hit count for all masks.
RECORD	Acquires a trace until its trace record is filled.
WAVFRM	Acquires NWAVFRM number of complete trace records forthe selected trace.

CONDacq *<link>:<arg>* (cont.)

Note: For all acquisition types, selecting CONDACQ TYPE immediately begins conditional acquisition. Set the display or acquisition mode on and set its parameters, such as NAVG for AVG, before starting conditional acquisition with a CONDACQ TYPE command.

```
COND TYP:ENV
```

	WAIT	

Set Only. Causes the instrument to stop accepting and processing commands to the ASCII interfaces until the current conditional acquisition is complete.

Note: When used with GPIB, the controller's timeout must be set to infinite, or the command could time out and produce a GPIB error.

```
COND WAIT
```

COPy [*<link>*:] *<arg>*

External I/O Commands

COPY sends a copy of the front panel display to the port specified in the appropriate printer command.

	ABOrt	

Set Only. ABORT terminates the hardcopy output in process and clears the queue of copy requests.

```
COP ABO
```

COPy [<*link*>:] <*arg*> (cont.)

FORMat:	**DIT**hered | **DRA**ft | **HIR**es | **RED**uced | **SCR**een	

Set Only. COPY FORMAT selects the output format for the currently selected printer.

DITHERED improves print contrast for TEK4692 and TEK4696 printers by reducing saturation for icon and text backgrounds. HIRES improves contrast for monochrome printers with limited gray-scale capability by dithering icon and text backgrounds and increasing saturation of the foregrounds. DRAFT prints black-on-white background except for selected icons or text, which are printed white-on-black background. REDUCED is a quarter-size version of DRAFT and prints black-on-white background only. SCREEN is a one-to-one mapping of 3-bit pixel information. (Refer to the BITMAP command.)

Note: The COPY FORMAT link is included for backward compatibility. For new applications, use the FORMAT link of the appropriate printer command.

```
COP FORM:HIR
```

	KILl	

Set Only. KILL terminates the hardcopy in progress and clears the queue of all copy requests.

```
COP KIL
```

PRInter:	**ALT**inkjet | **BITM**ap | **HPG**l | **PIN8** **PIN24** | **TEK4692** | **TEK4696** **TEK4697**	

PRINTER selects the target printer. Refer to the individual printer commands to select the printer parameters.

```
COP PRI:TEK4696
```

COPy [<*link*>:] <*arg*> (cont.)

	[STARt]	

Set Only. COPY START initiates a front panel copy, spooling the data into memory even if another copy request is printing or spooling.

Note: If you enter COPY with no argument when no other copy request is printing or spooling, a copy is started. However, if a copy request is spooling, entering COPY aborts the spooling copy and does not initiate a copy.

```
COP STAR
```

? STAtus	IDLe | PRINting | SPOoling

Query Only. STATUS returns the printing status of front-panel copies. IDLE means no copies are printing or spooling; ABORTING, PRINTING, and SPOOLING are self-explanatory.

```
COP? STA
COPY STATUS:IDLE
```

CROss?

Measurement Commands

Query Only. CROSS? returns the time from the trigger point to a specified reference level crossing, followed by an accuracy qualifier. (Refer to page 2-93 for qualifier definitions.) The reference level is set with the REFLEVEL command. The crossing slope is set with the MSLOPE command.

```
CRO?
CROSS 6.9284065E-8,EO
```

CURSor <*link*>:<*arg*>

CURSOR sets cursor operating characteristics for the selected trace, such as the cursor type (dot or bar), the reference cursor, and whether front panel readouts are displayed.

? MODE:	ABSolute | RELative	

Query only. Indicates whether horizontal readout is relative to the trigger point (ABSolute) or relative to a chosen horizontal value (RELative). Command SETZero sets the reference value.

```
CURS MODE:ABS
```

READout:	ON | OFF	

READOUT controls whether front panel cursors and their corresponding knob readouts are displayed and active from the front panel. When READOUT is set to OFF, the cursors and their values in the Cursors menu are not displayed. However, cursors can be set or queried with remote commands regardless of the READOUT setting.

```
CURS REA:ON
```

REFErence:	TRAce <*ui*>	1 to 8

REFERENCE selects the reference trace for split cursors. When the specified REFERENCE trace is not the selected trace, the CURSOR TYPE is automatically set to SPLIT. When the CURSOR TYPE is set to PAIRED, the REFERENCE trace is set to the selected trace. The default REFERENCE for a newly-created trace is itself.

XY Note: You cannot change the REFERENCE trace to an XY trace.

CURSor <*link*>:<*arg*> (cont.)

Note: It is not an error if you specify a REFERENCE trace that is not yet defined. The REFERENCE trace is only checked when CURSOR READOUT is set ON or at a DOT2ABS? query. If the REFERENCE trace is then undefined, it is changed to the selected trace.

```
CURS REFE:TRA5
```

SETZero	**CUR1** | **CLEar**	

Set only. Specifies the horizontal reference point used. CUR1 sets the reference value to the current position of Cursor 1 (CURS? Returns REL). CLEar sets the reference value to the trigger point (CURS? Returns ABS).

```
CURS SETZ:CUR1
```

TYPe:	**PAIred** | **SPLit** | **VBArs** | **HBArs**	

TYPE selects the cursor type. Setting the TYPE to PAIRED automatically sets the REFERENCE trace to the selected trace.

XY Note: SPLIT cursors are not permitted on XY traces.

```
CURS TYP:VBA
```

? XUNit	DIVS | FEEt | INChes | METers | SEConds | VOLts

Query Only. XUNIT returns the horizontal units of the selected trace.

```
CURS? XUN
CURSOR XUNIT:SECONDS
```

CURSor <*link*>:<*arg*> (cont.)

? YUNit	DIVS | RHO | VOLts

Query Only. YUNIT returns the vertical units of the selected trace.

```
CURS? YUN
CURSOR YUNIT:VOLTS
```

? ZEROPoint:	<*NRx*>

Query Only. Returns the position of the horizontal reference point on the selected trace.

```
CURS? ZEROP
CURS ZEROPOINT:5.260805E-6
```

Query Note: CURS? returns its links and arguments in the following order:

CURS REA:<arg>, REFE:<arg>, TYP:<arg>,
MODE:<arg>, ZEROPOINT:<arg>,
XUN:<arg>, YUN:<arg>

CURVe [CRVId: <arg> ,] <curve data>

Data Transfer Commands

CURVE transfers unscaled trace data to and from the controller in binary or ASCII format. Each trace that is transferred has an associated trace preamble that contains information such as scaling factors and the number of data points transferred. Refer to the WFMPRE command for the trace preamble.

The *query* form retrieves data *from* the instrument. The data source is specified by the OUTPUT command. The entire CURVE? response can be sent back to the instrument as a set command.

The *set* form sends data *to* the instrument from the controller. An incoming trace is always stored; it is never active or acquired. The STO (store) location for the data is specified by the INPUT command. The power-on default INPUT location is STO1.

[CRVId:{STO | TRAce} <ui>]	<curve data>

CRVid link is generated by a CURVe? query to identify the data source; it is ignored in the set form.

<Curve data> can be in ASCII (<asc curve>) or binary (<bblock>) format. The format is set by the ENCDG WAVFRM command.

Trace Header. Trace record data sent in ASCII or binary formats are prefixed with the same ASCII header:

CURVE CRVID:{STO | TRACE} <ui>*,(trace data)*

When the LONGFORM command is set OFF, the ASCII header is shortened to *CURV CRVI:{STO | TRA}* <*ui*>,.

The following example is an excerpt from an ASCII-formatted data transfer. (The shortest data transfer contains 512 points.)

```
CURV?
CURVE CRVID:TRA2,4022,3130,2756,129
7,709,1073,822,685,1112,777,1666,2249,3615,4
180,4231,4113,988,-2241,-5609,-128,-3076,-9
924,-8434,-8112, ...
```

CURVe <curve data> (cont.)

ASCII Transfer. Data transferred as an <asc curve> use the following format:

<asc curve> ::= <NR1> [,<NR1>] ...

where <NR1> values are data points within the range −32768 to +32767.

For most YT traces, each <NR1> value represents one data point in the trace record. For enveloped YT traces, every two <NR1> values represent one min/max pair in the trace record. For XY traces, every two consecutive <NR1> values represents one X,Y coordinate pair in the trace record. (The X-coordinate is the first point in the pair.) The command WFMPRE? PT.FMT indicates which data format will be used.

Binary Transfer. Data transferred as a binary block (<bblock> [, <bblock>]) use the format:

<bblock> ::= %<byte cnt><bin pt>...<checksum>

where <byte cnt> is a two-byte binary integer (MSB first) giving the length in bytes of the remainder of the binary block, including checksum; <bin pt> is a two-byte binary data point in the range −32768 to +32767; <checksum> is an 8-bit, twos complement of the modulo 256 sum of <byte cnt> and all <bin pt> data.

The transmission order for data points is set by the BYT.OR command. There are no separators (such as commas) between data points.

The figure on the following page illustrates binary data transfer.

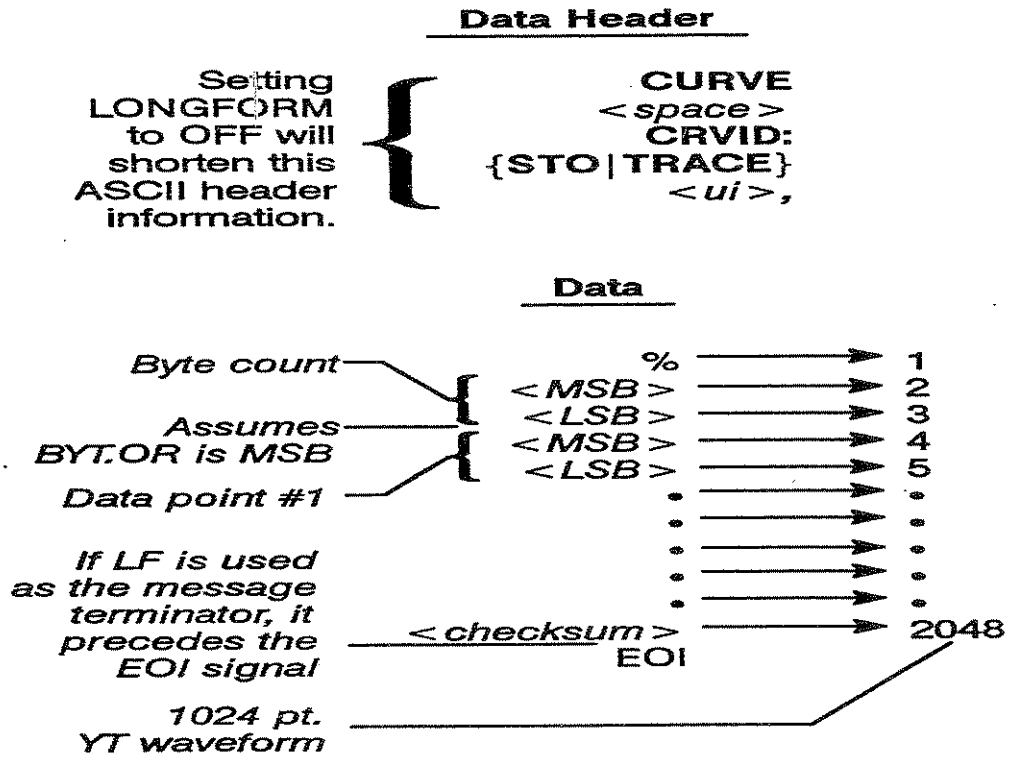
Predefined CURVE? Data Values. The following data point values are predefined for CURVE?:

Predefined CURVE? Data Values

Data Value	Meaning
+32767	Vertical Overrange. Data point is high off-screen and cannot be displayed with current scaling parameters.
−32767	Vertical Underrange. Data point is low off-screen and cannot be displayed with current scaling parameters.
−32768	Null Data. Data point that has not been acquired.

CURVe <curve data> (cont.)

The figure below illustrates binary data transfer:



Binary Data Transfer

Trace Scaling. CURVE transfers unscaled trace data which must be scaled in order to be analyzed. The following formulas use values from the trace preamble (see the WFMPRE command) to scale the coordinate values of each point transferred.

There are two scaling formulas for **YT** traces:

$$Xn = XZERO + XINCR * n$$
$$Yn = YZERO + YMULT * data\_pt\_n$$

where X*n* is the scaled horizontal coordinate of the *n*th data point in XUNITs; Y*n* is the scaled vertical coordinate of the *n*th data point in YUNITs; XZERO, XINCR, YZERO, and YMULT are values from the WFMPRE command; *n* is the sequence number of the *n*th retrieved data point (range is 0 to WFMPRE NR.PT – 1); *data_pt_n* is the value of the *n*th unscaled point (as retrieved by CURVE?).

There are two scaling formulas for **XY** traces:

$$Xn = XZERO + XMULT * data\_pt\_nx$$
$$Yn = YZERO + YMULT * data\_pt\_ny$$

where *Xn* is the scaled X-coordinate of the *n*th unscaled X,Y pair in XUNITs; *Yn* is the scaled Y-coordinate of the *n*th unscaled X,Y pair in YUNITs; XZERO, XMULT, YZERO, and YMULT are values from the WFMPRE command; *data_pt_nx* is the value of the *n*th unscaled X-coordinate (as retrieved by CURVE?); *data_pt_ny* is the value of the *n*th unscaled Y-coordinate.

Sending a Trace Without a Preamble. It is possible to send a trace to the instrument without supplying a preamble. If a stored trace exists at the INPUT STO location, it is overwritten and its preamble is used with the new trace. If no stored trace exists at the INPUT STO location, the following default preamble is used with the new trace:

Default Preamble Parameters

<link>:	*<arg>*	*<link>*:	*<arg>*
NR.PT:	512	YUNIT:	–current–
PT.FMT:	Y	YZERO:	0.0
XINCR:	5.0E–7	LABEL:	"" (null)
XZERO:	0.0		
YMULT:	1.5625E–4		

These are the power-on default values. When any of these links are modified (set) with the WFMPRE command, the new values are used.

D

DAFiltering <*alpha*> <*ui*>:<*NR1*>

Calibration Commands

Note: Possible Alpha values for the 11801A are A through D, for SM-11 Multi-channel Units, and M for the mainframe. The Alpha value for the CSA 803 is always M.

DAFILTERING (Delay Adjust Filtering) sets the hardware filtering constant used by CALibrate DADj for the specified sampling head.

<*alpha*> <*ui*>:	<*NR1*>	1 to 7

```
DAF M7:2
```

DAMeasref <*alpha*> <*ui*>

Calibration Commands

Note: Possible Alpha values for the 11801A oscilloscope are A through D. The Alpha value for the instrument is always m.

Set Only. DAMEASREF (Delay Adjust Measurement Reference) sets the inter-head delay to mid-range for the specified channel.

Note: Channel must be connected to the calibrator output before issuing the DAMEASREF command.

```
DAM M5
```

DATE <qstring>

Miscellaneous/System Commands

DATE sets or queries the date on the internal calendar.

	<qstring>	"<dd>-<mon>-<yy>"

where <dd> is the day of the month, <mon> is the first three letters of the month, and <yy> is the last two digits of the year.

```
DATE "18-JUL-89"
```

DCOmp { ON | OFF}

Calibration Commands

Sets continuous strobe delay calibration to ON or OFF. When ON, the instrument continuously measures the inter-head delay and adjusts hardware to achieve target value set by CALibrate DADj and DAMeasref.

```
DCO OFF
```

DEBug *<link>:<arg>*

External I/O Commands

DEBUG copies input data from the specified interface to the front panel display for program development troubleshooting. The incoming ASCII commands are displayed on the top four lines of the screen.

Note: Setting DEBUG to ON for either interface slows system throughput considerably.

GPIb:	**ON | OFF**	

GPIB sets DEBUG to ON or OFF for the GPIB interface.

```
DEB GPI:OFF
```

RS232:	**ON | OFF**	

RS232 sets DEBUG to ON or OFF for the RS-232-C interface.

```
DEB RS232:ON
```

DEFine *<qstring>,<qstring>*
[**?**[*<qstring>*]]

Miscellaneous/System Commands

DEFINE defines a logical name to substitute for any instrument command string.

	<qstring>,<qstring>	

The first *<qstring>* is the logical name; the second *<qstring>* is the expansion command string that is executed.

```
DEF 'TB?','TBM?;TBW?'
```

Once the logical name has been defined with DEFINE, you enter the logical name without quotes the same as any other command.

```
TB?
TBMAIN TIME:5.0E-3,LENGTH:1024,
XINCR:1.0E-10;TBWIN TIME:1.0E-3,
LENGTH:512,XINCR:5.0E-10
```

DEF Usage. Here are some rules and suggestions for using DEFINE:

- The first character of the logical name must be alphabetic. Case is ignored.
- You cannot use logical names in *< qstring >* input; they may be interpreted as commands.
- You cannot have an expansion string that is null (i.e., ''). Also, the first character of an expansion string cannot be any of the following six characters:

Restricted Expansion String Characters

Character	Character
colon (:)	space (octal 40)
comma (,)	linefeed (octal 12)
semicolon (;)	carriage return (octal 15)

- You can define a short name for a group of concatenated commands, or you can rename a command to one or two letters. However, do not redefine the character **M**. This character represents the mainframe in various commands. If this letter is redefined, the commands that contain it will always return a syntax error. Be careful when redefining the reserved words listed in Appendix B of the *CSA 803 and 11801A Programmer Reference.*
- Recursive DEFINE logical names are acceptable only when recursion occurs to the right of an unquoted semicolon. All other recursive definitions are illegal.

DEFine <*qstring*>, <*qstring*> [?[<qstring>]] (cont.)

Acceptable and Illegal Recursion

Acceptable Recursion	Illegal Recursion
DEF 'z','tbmain?;z' DEF 'j','abstouch 3,10;j'	DEF 'z','z?' DEF 'j','text j'

Note: A valid recursive logical name causes an infinite command processing loop. Thus, once a recursive logical name is transmitted, the instrument will not respond to command input until a DCL (Device Clear) signal is sent to the port that received the recursive logical name. (Refer also to the FEOI command.)

Note: Logical names and expansion strings are not stored in nonvolatile RAM. Therefore they are lost when the instrument is powered off.

Predefined Logical Names. Each time the instrument is turned on, the following two logical names are automatically placed in the definition table:

Predefined Logical Names

Logical Name	Expansion String
e	RS232 ECHO:ON
v	RS232 VERBOSE:ON

DELete [< *link* > :] < *arg* >

Set Only. DELETE removes stored front panel setting(s) or stored traces from memory.

Note: You cannot delete a stored trace that is a combined component of an active trace. (However, you can delete a stored trace if it is the only component of an active trace.)

	ALLFps | ALLSTD | ALLSTO	

Set Only. ALLFps deletes all stored front panel settings. ALLSTO deletes all stored trace. It is not an error if DEL ALLFps or DEL ALLSTO is issued when no traces or settings are stored.

ALLSTD *(11801A only)* deletes all saved trace descriptions. It is not an error to issue DEL ALLSTD when there are no saved trace descriptions.

```
DEL ALLSTO
```

	FPS < *ui* >	1 to 10

Set Only. FPS < *ui* > deletes the specified front panel setting.

```
DEL FPS2
```

	< *qstring* >	

Set Only. < *qstring* > deletes the stored trace or front panel setting that matches the label. Wildcard characters are interpreted; refer to page 2-86 for wildcard definitions. If the label matches both a stored trace and a front panel setting, the stored trace is deleted. To delete the labeled front panel setting, you must send DELETE < *qstring* > again. (You cannot delete only the labeled FPS label when both the stored trace label and FPS match.)

```
DEL "TRIGGER39"
```

DELete [<*link*>:]<*arg*> (cont.)

	STD <*ui*>	9 to MAXTRANUM

Set Only. STD <*ui*> deletes the specified saved trace description. *(11801A only.)*

	STO <*ui*>	1 to 256

Set Only. STO <*ui*> deletes the specified stored trace.

```
DEL STO150
```

DIAg?

Diagnostics Commands

Query Only. DIAG? returns pass/fail information from Self-tests Diagnostics or Extended Diagnostics. Power-on Diagnostics are always performed unless bypassed with hardware jumpers. DIAG? returns pass/fail/bypassed information and a list of the tests which were not performed.

The passing DIAG? response is:

DIAg PASsed:"{NONe | <*omitted test*>}"

where:

NONE	means no tests were omitted
<*omitted test*>	is a comma-delimited list of tests that were not performed because of missing (optional) hardware

```
DIA?
DIAG PASSED:"NONE"
```

The failing DIAG? response is:

DIAg FAIled:"{<*failed test*> | <*omitted test*>}"

where:

<*failed test*>	is a comma-delimited list of tests that failed diagnostics

```
DIA?
DIAG FAILED:"DI211,,a????"
```

Note: The DIAG? FAILED response can include both failed and omitted tests. In the preceding example, DI211 is a failed tests and a???? is an omitted test.

Refer to the *Service Reference* for your instrument for information on the syntax and meaning of omitted tests and failed tests.

The bypassed test DIAG? response is:

```
DIAg BYPassed
```

where:

BYPASSED	means Self-tests Diagnostics were bypassed with hardware jumpers at power-on

```
DIA?
DIAG BYPASSED
```

DISPlay *<link>:<arg>*

Display and Color Commands

DISPLAY sets a variety of display options including persistence and the number of graticules.

CLEar		

Set Only. CLEAR removes all trace and histogram data from the display and restarts all acquisitions. CLEAR is equivalent to the CLEAR ALLTRACE command.

```
DISP CLE
```

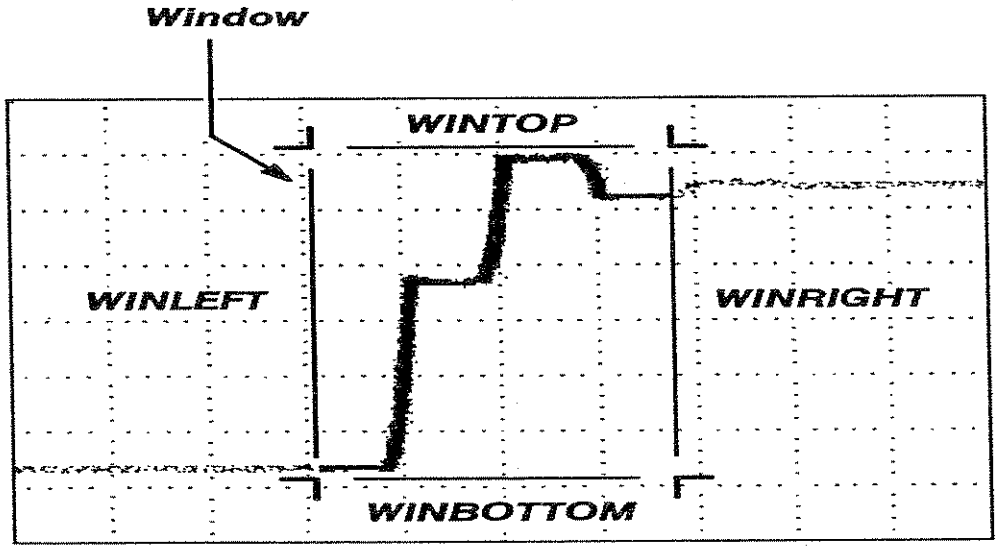
C.WIN Bottom:	*<NRx>*	(See below for range)

C.WINBOTTOM specifies the bottom edge of a data selection window that is used when the DISPLAY? DATA command is issued. The following three C.WIN links specify the other three sides of the data selection window in scale units. The following illustration shows the data window parameters.

DISPlay <*link*>:<*arg*> (cont.)

The data selection window defines the area of the screen from which pixel bins will be transferred. The data window is not visible or definable from the front panel. The window lets you to limit the amount of data transferred with the DISPLAY? DATA command.

The C.WIN links specify the sides in the current vertical and horizontal scale units (i.e., volts, seconds, rho, feet, etc.) of the selected trace. The D.WIN links specify the window in absolute divisions independent of the current scale settings.



Data Window Parameters

C.WINBOTTOM is a vertical value in units of the vertical scale for the selected trace. The range is defined by the graticule limits. The default is the graticule bottom. C.WINBOTTOM can never be greater than C.WINTOP.

```
DISP C.WINB:-2.5
```

C.WINLeft:	<*NRx*>	(See below for range)

C.WINLEFT specifies the left edge of a data selection window that is used when the DISPLAY? DATA command is issued.

C.WINLEFT is a horizontal value in units of the horizontal scale for the selected trace. The range is defined by the end points of the trace record. C.WINLEFT can never be greater than C.WINRIGHT.

```
DISP C.WINL:1.15
```

C.WINRight:	<*NRx*>	(See below for range)

C.WINRIGHT specifies the right edge of a data selection window that is used when the DISPLAY? DATA command is issued.

C.WINRIGHT is a horizontal value in units of the horizontal scale for the selected trace. The range is defined by the end points of the trace record. C.WINRIGHT can never be less than C.WINLEFT.

```
DISP C.WINR:4.05
```

C.WINTop:	<*NRx*>	(See below for range)

C.WINTOP specifies the top edge of a data selection window that is used when the DISPLAY? DATA command is issued.

C.WINTOP is a vertical value in units of the vertical scale. The range is defined by the graticule limits. C.WINTOP can never be less than C.WINBOTTOM.

```
DISP C.WINT:1.5
```

DISPlay <*link*>:<*arg*> (cont.)

? DATA		

Query Only. DATA transfers the bin count for each pixel on a color graded display to the controller in binary or ASCII format. The pixel bin count is sent from a specified screen region (or window) that is initially set to the full height of the selected graticule and the full width of the trace record. The window can be sized with the C.WIN and D.WIN links. The size of the window will determine how much data is sent.

Pixel bin counts are sent as 16-bit values, a row at a time, starting from the upper left of the screen. <*Pixel data*> can be in ASCII (<*asc bin*>) or binary (<*bblock*>) format. The format is set by the ENCDG DISPLAY command. Use the DISPLAY? NR.PT query to get the number of pixel bin values to expect from the DATA query.

ASCII Transfer. Data transferred as an <*asc curve*> use the following format:

<*asc bin*> ::= <*NR1*> [,<*NR1*>] ... EOI

where <*NR1*> values are pixel bin counts within the range 1 to 65535.

Binary Transfer. Data is transferred as comma seperated binary blocks in the format:

(<*bblock*> [, <*bblock*>, ...]) EOI

where

<*bblock*> ::= % <*byte cnt*> <*bin pt*> ...
<*checksum*>

<*bin pt*> is a two-byte unsigned binary integer (MSB first) and <*byte cnt*> is an arbitrary number of binary bytes. This binary format is identical to that used for trace transfers with the CURVE command which is discussed on page 2-34.

The order of bytes within a bin count value is set with the BYT.OR command. You can specify whether the least (LSB) or most (MSB) significant byte is sent first. There are no separators (such as commas) between data points.

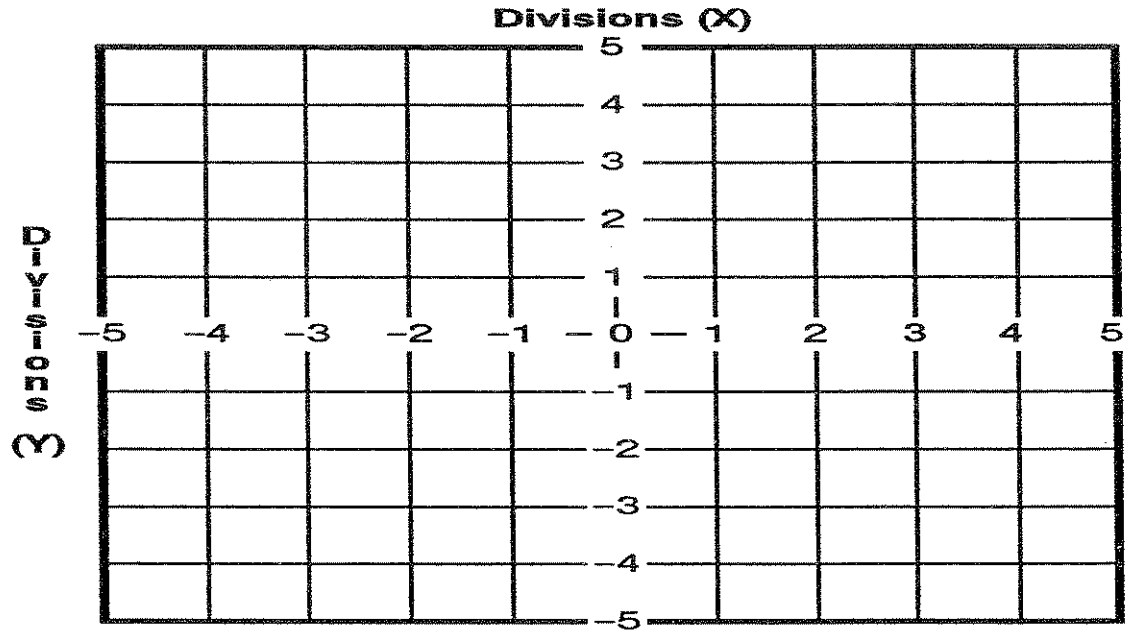
```
DISP? DATA
```

D.WINBottom:	<NRx>	(See below for range)

D.WINBOTTOM specifies the bottom edge of a data selection window that is used when the DISPLAY? DATA command is issued. The following three D.WIN links specify the other three sides of the data selection window in divisions.

The illustration on page 2-45 shows the data window parameters and their associated WIN link. The following illustration shows the coordinate system used to define D.WIN parameters. Because trace records extend slightly beyond the left and right graticule limits, the D.WIN limits slightly exceed the −5.12 and +5.10 values shown.

See the C.WINBOTTOM discussion on page 2-45 for more information on the data selection window.



Graticule X, Y Coordinates

The D.WINBOTTOM range is −5.12 to + 5.10 divisions, though D.WINBOTTOM can never be greater than D.WINTOP.

```
DISP D.WINB:-2.5
```

DISPlay <*link*>:<*arg*> (cont.)

D.WINLeft:	<*NRx*>	(See below for range)

D.WINLEFT specifies the left edge of a data selection window that is used when the DISPLAY? DATA command is issued.

D.WINLEFT is a horizontal value in divisions within the range of −5.12 to +5.10. D.WINLEFT can never be greater than D.WINRIGHT.

```
DISP D.WINL:-1.15
```

D.WINRight:	<*NRx*>	(See below for range)

D.WINRIGHT specifies the right edge of a data selection window that is used when the DISPLAY? DATA command is issued.

D.WINRIGHT is a horizontal value in divisions within the range of −5.12 to +5.10. D.WINRIGHT can never be less than D.WINLEFT.

```
DISP D.WINR:4.05
```

D.WINTop:	<*NRx*>	(See below for range)

D.WINTOP specifies the top edge of a data selection window that is used when the DISPLAY? DATA command is issued.

D.WINTOP is a vertical value in divisions within the range of −5.12 to +5.10. D.WINTOP can never be greater than D.WINBOTTOM.

```
DISP D.WINT:1.5
```

GRAticule:	**DUA**l | **SIN**gle	

GRATICULE selects dual or single graticules.

```
DISP GRA:SIN
```

GRADFirst:	**ON** | **OFF**	

If the screen is cleared when GRADFIRST is ON the screen is immediately redrawn. However, if the screen is cleared when GRADFIRST is OFF, the first trace is not drawn on the screen until the display refresh time (set with DISP REFRE <*NRx*>) elapses. This increases the number of traces processed into the graded database.

```
DISP GRADF:ON
```

? GRADScale:		

Query Only. GRADSCALE returns the current color boundaries when the display is color graded (using the DISPlay TYPe:GRADed command). Each number returned is an unsigned 16-bit value, <*ui*>, specifying the high cutoff of the number of hits in each boundary.

```
DISP? GRADS
```

INTENsity:	<*NRx*>	0 to 100 percent

INTENSITY sets the overall display intensity.

```
DISP INT:65
```

DISPlay <*link*>:<*arg*> (cont.)

MODe:	DOTs | VECtors	

MODE selects a DOTS or VECTORS type display. DOTS displays individual data points, while VECTORS connects adjacent data points.

Note: When more than 512 data points are acquired, the points are compressed to fit the 512-point scan line of the display. The largest and smallest adjacent vertical values are displayed as a single scan line connected with a vector. Thus to get a true dots display, you may need to set TBMAIN LENGTH or TBWIN LENGTH to 512.

```
DISP MOD:VEC
```

? NR.PT	<*NRx*>	

Query Only. NR.PT returns the number of pixel bins that will be returned by DISPLAY? DATA.

```
DISP? NR.PT
```

PERSistence:	<*NRx*>	200 ms to 20 s

PERSISTENCE sets the length of time that data points are displayed when variable persistence is selected (DISPLAY TYPE set to VARIABLE). The setting resolution is 200 ms.

```
DISP PERS:2.2E+0
```

DISPlay <*link*>:<*arg*> (cont.)

REFREsh:	0	<*NRx*>

REFRESH sets the time between display updates for histogram and color-graded displays in the range 5-180 seconds (1 second resolution) and zero. A zero value suppresses color-graded screen updates and the updates for histograms, histogram statistics, and measurements performed in statistics mode. A REFRESH value of zero does not affect mask counts.

Note: Screen updates for histogram information occur when the DSYS command is issued and when the histogram limits change. Screen updates for measurements performed in MMOde:STAT mode occur when the MSYS command is issued and when any measurement parameter (for example, mesial, proximal, or zone) is changed.

```
DISP REFRE:15
```

STATIstics :	**HIST**ogram	

STATISTICS selects whether HISTOGRAM or MASK statistics are displayed in the DISPLAY MODE menmu when a trace is defined. Selecting DISPLAY STATISTICS with no trace defined produces an error, Error 250: "No traces defined." When the last trace is removed DISPLAY STATISTICS is set to HISTOGRAM, the default value.

```
DISP STATI:HIST
```

DISPlay <*link*>:<*arg*> (cont.)

TYPe:	**INF**inite | **NOR**mal | **VAR**iable | **GRAD**ed

TYPE selects the type of display persistence for all displayed traces with channel components. INFINITE accumulates data points on the display indefinitely. VARIABLE leaves acquired data points on the display for a period of time specified by DISPLAY PERSISTENCE. GRADED produces a trace display similar to INFINITE but the data points are color graded to represent the number of hits on each data point.

Notes. The trace record length must be set to 512 points when using INFINITE, VARIABLE, and GRADED display types. If the record length is greater than 512 when a non-NORMAL type is selected, the record length will be set to 512, the new type will start, and Execution Warning Event 572 will be generated.

If Histogram or Mask testing is started when the display type is NORMAL or VARIABLE, the TYPE will change to INFINITE.

```
DISP TYP:VAR
```

? **XS**ize	<*NRx*>	

Query Only. XSIZE returns the number of pixel bins in the width defined by the data window.

```
DISP? XSIZE
```

? **YS**ize	<*NRx*>	

Query Only. YSIZE returns the number of pixel bins in the height defined by the data window.

```
DISP? YSIZE
```

DISPNum?

Trace and Setting Commands

DISPNUM returns the number of traces currently displayed on the screen.

```
DISPN?
DISPNUM 4
```

DIV2 { ON | OFF }

Calibration Commands

When set to ON, DIV2 halves the internal calibrator oscillation rate, providing a convenient signal source for adjusting loop gain.

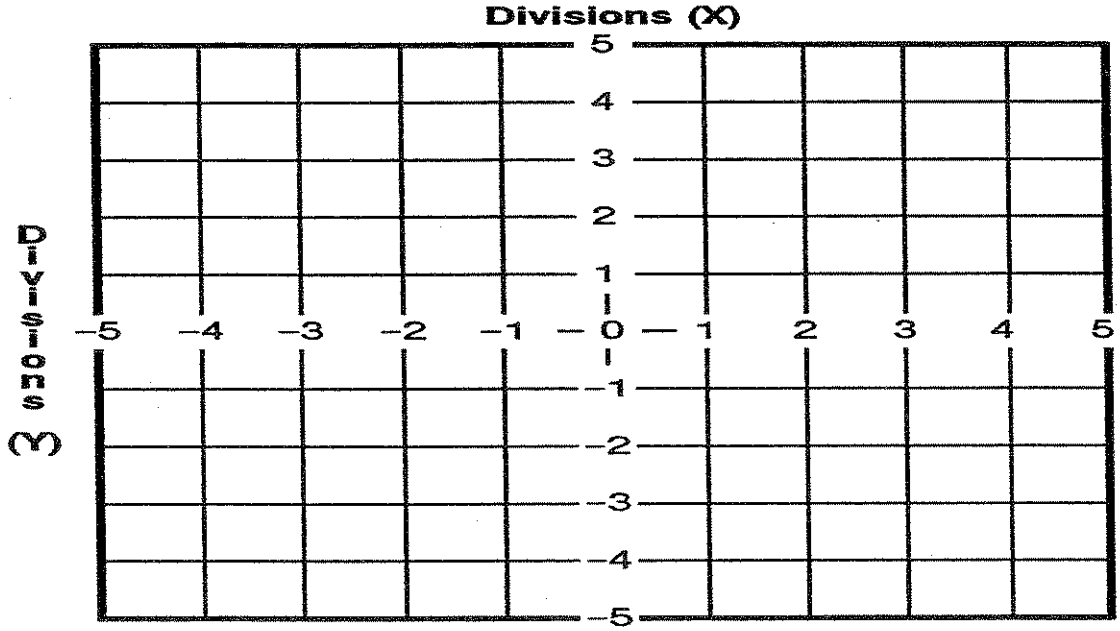
```
DIV2 ON
```

DOT1Abs <*link*>:<*arg*>;
DOT2Abs <*link*>:<*arg*>

Cursor Commands

DOT1ABS and DOT2ABS set absolute horizontal positions (with respect to the trace record) for split or paired (dot) cursors. DOT1ABS and DOT2ABS have the same parameters.

The following figure illustrates the graticule coordinates:



Graticule X, Y Coordinates

DOT1Abs <*link*>:<*arg*>;
DOT2Abs <*link*>:<*arg*> **(cont.)**

? OHMS:	<NR3>

Query Only. OHMS returns the vertical cursor value in ohms, when the scale units are set to RHO (GRATICULE YUNIT command).

```
DOT1A? OHMS
DOT1A OHMS:1.0E+2
```

? OQUal:	EQ | LT | GT | UN | ER

Query Only. Returns a qualifier indicating the accuracy and appropriateness of the value returned with the ?OHMS query link.

EQ	Returned value equals actual value.
LT	Returned value less than actual value.
GT	Returned value greater than actual value.
UN	Returned value is uncertain.
ER	Returned value is meaningless, not rho scale trace.

```
DOT1A? OQUAL
DOT1A OQUAL:EQ
```

PCTg:	<*NRx*>	0 to 100 percent

PCTG positions the first or second dot cursor as a percentage of the trace record.

XY Note: You should use the PCTG link to position the cursors for XY traces. Attempting to use XCOORD or XDIV will give unpredictable results.

```
DOT2A PCT:10
```

DOT1Abs <*link*>:<*arg*>;
DOT2Abs <*link*>:<*arg*> **(cont.)**

XCOord:	<*NRx*>	(See below for range)

XCOORD positions the first or second dot cursor with respect to horizontal units of the selected trace.

(The following range formulas assume ADJ-TRACE PANZOOM is set to OFF and the trace is acquired. Refer to the cursor positioning discussion on page 2-59 for calculating XCOORD range when PANZOOM is set to ON or the trace is unacquired. Refer to page 2-133 for formulas to calculate *duration*.)

XCOORD range when the selected trace record is MAIN:

MAINPOS to (MAINPOS + *main_duration*)

XCOORD range when the selected trace record is WIN:

WINPOS to (WINPOS + *win_duration*)

```
DOT1A XCO:1.2E-2
```

XDIv:	<*NRx*>	(See below for range)

XDIV positions the first or second dot cursor in graticule divisions (refer to the graticule illustration on page 2-55). Range depends on record (TBMAIN or TBWIN) LENGTH:

XDIV Ranges

Record LENGTH	XDIV Range
512	−5.12 to +5.10
1024	−5.12 to +5.10
2048	−5.12 to +5.10
4096	−5.12 to +3.07
5120	−5.12 to +5.10

DOT1Abs <*link*>:<*arg*>;
DOT2Abs <*link*>:<*arg*> **(cont.)**

These ranges are valid only when ADJTRACE PANZOOM is OFF and the selected trace is acquired. (Refer to the Range of Cursor Positioning discussion on page 2-59 for calculating XCOORD range when PANZOOM is set to ON or the trace is unacquired.)

```
DOT2A XDI:2.85
```

? **XQU**al	EQ | LT | GT | UN

Query Only. XQUAL returns the accuracy of XCOORD or XDIV positioning information. YT traces always return the EQ qualifier because the cursor horizontal position is always known.

Positioning Accuracy Qualifiers

Qualifier	Meaning
EQ	True position and response are equal
LT	True position is lower than response (i.e., the cursor is below the bottom of the screen)
GT	True position is greater than response (i.e., the cursor is above the top of the screen)
UN	True position is uncertain (i.e., the cursor is on an unacquired trace point)

```
DOT1A? XQU
DOT1ABS XQUAL:EQ
```

? **YCO**ord	<*NR3*>

Query Only. YCOORD returns the vertical position of the first or second dot cursor, in units of the selected trace.

```
DOT2A? YCO
DOT2ABS YCOORD:2.22E-4
```

DOT1Abs *<link>:<arg>;*
DOT2Abs *<link>:<arg>* **(cont.)**

? YDIv	*<NR3>*

Query Only. YDIV returns the vertical position of the first or second dot cursor in graticule divisions. (Refer to the graticule illustration on page 2-55.)

```
DOT1A? YDI
DOT1ABS YDIV:-1.4
```

? YQUal	EQ | LT | GT | UN

Query Only. YQUAL returns the accuracy of YCOORD or YDIV positioning information. Refer to the description of the link DOT1ABS XQUAL for the meanings of the qualifiers.

```
DOT1A? YQU
DOT1ABS YQUAL:EQ
```

Range of Cursor Positioning. Under some circumstances, such as when PANZOOM is set to ON, you cannot conveniently compute the valid range of cursor positions. However, you can force the cursors to their minimum and maximum values (use the PCTG:0 and PCTG:100 links) and then query the instrument for the cursor positions. These new positions constitute the valid range of cursor positions for that particular instrument setup.

The following example demonstrates this technique. This method applies to both dot and bar cursors and is always successful, regardless of instrument settings.

```
DOT1A PCT:0
DOT2A PCT:100
DOT1A? XCO;DOT2A? XCO
DOT1ABS XCOORD:-6.0E-6;
DOT2ABS XCOORD:5.055E-4
```

DOT1Rel *<link>:<arg>* ;
DOT2Rel *<link>:<arg>*

Set Only. DOT1REL and DOT2REL set the paired or split (dot) cursor position relative to (offset to the right of) the absolute cursor location. DOT1REL and DOT2REL have the same links.

PCTg:	*<NRx>*	(See DOT1A PCT range)

Set Only. PCTG positions the first or second dot cursor as a percentage of the trace record, relative to but not exceeding the DOT1ABS/DOT2ABS value.

```
DOT1R PCT:50
```

XCOord:	*<NRx>*	(See DOT1A XCO range)

Set Only. XCOORD positions the first or second dot cursor with respect to the units of the selected trace, relative to but not exceeding the DOT1ABS/DOT2ABS value.

```
DOT2R XCO:0.5
```

XDIv:	*<NRx>*	(See DOT1A XDI range)

Set Only. XDIV positions the first or second dot cursor in graticule divisions with respect to the selected trace, relative to but not exceeding the DOT1ABS/DOT2ABS value.

```
DOT2R XDI:2.85
```

DSYmenu?

Miscellaneous/System Commands

Query Only. DSYMENU? returns the major menu active on the front panel display.

CURSor	DISPLay_modes	ALL_wavfrm
MEAS	STORE_recall	UTIlity
TRIgger	WAVfrm	ENH_accuracy

Possible DSYMENU? Responses

Note: ALL_wavfrm is the "more..." trace status menu and ENH_accuracy is the "page..." second page of the Utility menu.

```
DSY?
DSYMENU CURSOR
```

DSYS

Display and Color Commands

DSYS enables the histogram and mask acquisition functions by selecting the DISPLAY MODES major menu on the front panel display.

	ON | OFF	

ON selects the Display Modes major menu. OFF selects the Waveform major menu. The query form DSYS? returns the current ON or OFF status.

```
DSYS?
DSYS ON
```

DUTy?

Measurement Commands

Query Only. DUTY? returns the percentage of a period that a trace spends above the MESIAL level, followed by an accuracy qualifier. (See page 2-93 for qualifier definitions.)

```
DUT?
DUTY 5.071E+1,EQ
```

E

ENCdg <*link*>:<*arg*>

Data Transfer Commands

ENCDG determines the data encoding for information returned by CURVE?, DISPLAY?, HISTOGRAM?, WAVFRM?, and SET? queries.

DISPlay:	**ASC**ii | **BIN**ary	

DISPLAY sets the encoding for pixel point counts transferred with the DISPLAY? DATA query.

```
ENC DISP:ASC
```

HISTogram:	**ASC**ii | **BIN**ary	

HISTOGRAM sets the encoding for data points in a histogram curve transferred with the HISTOGRAM? DATA query.

```
ENC HIST:ASC
```

SET:	**ASC**ii | **BIN**ary	

SET sets the encoding for front panel setting (FPS) transfers with the SET? query.

```
ENC SET:ASC
```

WAVfrm:	**ASC**ii | **BIN**ary	

WAVFRM sets the encoding for trace transfers with the CURVE? and WAVFRM? queries.

```
ENC WAV:BIN
```

ENV {ON|OFF}

Acquisition Commands

ENV sets enveloping ON or OFF for the vertical expression component <*y exp*> (e.g., "M1") of the trace description of the selected trace. (Refer also to the TRACE and AVG commands.)

- When <*y exp*> is not enclosed with AVG and ENV is set to ON, <*y exp*> is enclosed with ENV().
- When <*y exp*> is enclosed with AVG and ENV is set to ON , ENV() replaces AVG().
- When <*y exp*> is enclosed with ENV() and ENV is set to OFF, the enclosing ENV() is removed.

Note: You cannot set ENV to OFF when the <*y exp*> is not enclosed with ENV(). You cannot set ENV to ON if the selected trace is XY or has only stored and/or scalar components.

Examples of ENV Usage

<*y exp*> **Before**	**Command**	<*y exp*> **After**
M2	**ENV ON**	ENV(M2)
M1	**ENV OFF**	–error–
AVG(M1–M2)	**ENV ON**	ENV(M1–M2)
ENV(M1)	**ENV OFF**	M1
ENV(M4)	**ENV ON**	ENV(ENV(M4))

Query Note: ENV? returns the state of enveloping. ENV ON means the entire <*y exp*> is enclosed by ENV. ENV OFF means the entire <*y exp*> is not enclosed by ENV, though the ENV() function may be embedded within the description.

EVENT?

Status and Event Commands

Query Only. EVENT? returns the event code *<NR1>* if LONGFORM is set to OFF, or returns the event code and a descriptive *<qstring>* if LONGFORM is set to ON.

Refer to Event Reporting, later in this manual, for a list of event codes.

```
EVENT?
EVENT 269,"NO SUCH TRACE"
```

EXTInction?

Measurement Commands

Query Only. EXTINCTION returns the trace's extinction ratio expressed as the ratio of Topline/Baseline. EXTINCTION is available only when MMODE is set to either SOFT or STAT.

```
EXTI?
```

F

FALltime?

Measurement Commands

Query Only. FALLTIME? returns the transition time of a falling pulse edge, from the DISTAL to PROXIMAL level, followed by an accuracy qualifier. (Refer to page 2-93 for qualifier definitions.)

```
FAL?
FALLTIME 5.883E-9,EQ
```

FEOi

External I/O Commands

Set Only. FEOI forces the instrument to output a message terminator for any pending query response. (The message terminator for GPIB is an EOI signal with or without LF; the message terminator for RS232 is the EOL string. Refer to the *CSA 803 and 11801A Programmer Reference* or to the RS232 command for the EOL options.) FEOI is useful to force the output of a recursive query (created with the DEF command) onto individual lines.

Note: FEOI has no argument.

```
FEO
```

FPAnel {ON|OFF}

Miscellaneous/System Commands

FPANEL OFF functionally mimics the GPIB RWLS (Remote With Lockout State) and FPANEL ON mimics the GPIB LOCS (Local State).

When FPANEL is set to OFF, the front panel is locked out and only these controls are operable:

- RQS icon, if it was enabled (displayed) with the SRQMASK USER:ON command. (The RQS icon is not displayed at power on.) If enabled, you can disable the RQS icon with SRQMASK USER:OFF.

FPAnel {ON|OFF} (cont.)

Front panel controls can be locked out either by setting FPANEL to OFF or by using IEEE-488 interface commands to enter the GPIB RWLS state. If the instrument is in RWLS, the front panel will be inoperative even if FPANEL is set to ON.

When FPANEL is set to ON, all front panel controls are operable, assuming the **TOUCH PANEL ON/OFF** button is set to ON.

The differences between the FPANEL command and the **TOUCH PANEL ON/OFF** button are:

- FPANEL provides a way to lock out active front panel controls (knobs, buttons, and screen touches) from the remote interfaces. There is no front panel equivalent to FPANEL.
- The **TOUCH PANEL ON/OFF** button only locks out screen touches. No command mimics the effect of this button. However, you can use the ABSTOUCH command to simulate a touch to this button from the remote interfaces.

```
FPA ON
```

FPSList?

Trace and Settings Commands

Query Only. FPSLIST? returns a list of all front panel settings stored in nonvolatile RAM (NVRAM) identified by FPS number (1 to 10), and the amount of NVRAM used to store each setting. FPSLIST? returns EMPTY if no settings are stored.

FPSLIST FPS<*ui*>:<seq>,
<*len*>[{,FPS<*ui*>:<seq>,<*len*>}...]
| EMPty

```
FPSL?
FPSLIST FPS2,1,1056,FPS5,2,979
```

FPSNum?

Trace and Settings Commands

Query Only. FPSNUM? returns the number of front panel settings (FPS) stored in Nonvolatile RAM, in <*NR1*> form. The range is from 0 to 10.

```
FPSN?
FPSNUM 2
```

FPUpdate { ON | OFF }

Miscellaneous/System Commands

FPUDATE determines whether the front panel display readouts are updated following set command execution. The power-on default is FPU OFF.

With FPU ON, the front panel display is updated after each successful set command.

With FPU OFF, the front panel display is only updated when:

- the instrument receives DCL or SDC
- the instrument receives an incorrect query or set command
- the instrument input buffer is empty after a successful set or query execution.

Note: Throughput is much faster with FPUpdate set to OFF.

```
FPU OFF
```

FREq?

Measurement Commands

Query Only. FREQ? returns the frequency of the selected trace, followed by an accuracy qualifier. (Refer to page 2-93 for qualifier definitions.)

```
FRE?
FREQ 1.024E+6,EQ
```

GRAticule <*link*>:<*arg*>

Display and Color Commands

Sets X and Y axis units and scaling for displayed trace.

PROPvelocity:	<*NRx*>	0.1 to 1.0

Sets propagation velocity (a fraction of the speed of light in a vacuum). Used to scale X axis when XUNit is FEEt, INChes, or METers.

```
GRA PROP:0.365
```

REFAmplitude:	<*NRx*>	50 mV to 1 V

Sets the pulse amplitude used to scale the Y axis when YUNit is set to RHO.

```
GRA REFA:2.5E-1
```

XUNit:	**FEE**t | **INC**hes | **MET**ers | **SEC**onds

Selects scale units for the X axis.

```
GRA XUN:SEC
```

YUNit:	**VOL**ts | **RHO**	

Selects scale units for the Y axis.

```
GRA YUN:VOL
```

Query Note: GRA? returns its links and arguments in the following order:

GRA PROP:<*NR3*>, REFA:<*NRx*>,
XUN:<*arg*>,YUN:<*arg*>

H

H1Bar <*link*>:<*arg*>;
H2Bar <*link*>:<*arg*>

Cursor Commands

H1BAR and H2BAR set the absolute vertical position of horizontal bar cursors. H1BAR and H2BAR have the same parameters.

? OHMS:	<NR3>

Query Only. Returns the vertical cursor value in ohms, when that form of readout is appropriate.

```
H1B? OHMS
H1BAR OHMS:1.0E+2
```

? OQUal:	EQ | LT | GT | UN | ER

Query Only. Returns a qualifier indicating the accuracy and appropriateness of the value returned with the ?OHMS query link.

EQ	Returned value equals actual value.
LT	Returned value less than actual value.
GT	Returned value greater than actual value.
UN	Returned value is uncertain.
ER	Returned value is meaningless, not rho scale trace.

```
H2B? OQUAL
H2BAR OQUAL:EQ
```

H1Bar <*link*>:<*arg*>;
H2Bar <*link*>:<*arg*> **(cont.)**

YCOord:	<*NRx*>	(See below for range)

YCOORD positions the first or second horizontal bar cursor with respect to the units of the selected trace. The range depends on whether the trace was created in integer mode or floating-point mode.

Note: For information on trace modes, see the WFMSCALING command.

The YCOORD range for an integer mode trace is:

(SEN * −5.12 + OFFS) to (SEN * 5.10 + OFFS)

where SEN and OFFS are the channel sensitivity and offset (CH<*slot*><*ui*>? SEN,OFFS) of the channel(s) in the integer mode trace.

The YCOORD range for a floating-point mode trace is:

(VSI * −5.12 + VPO) to (VSI * 5.10 + VPO)

where VSI and VPO are the vertical size and vertical position (ADJ<*ui*>? VSI,VPO) of the floating-point trace.

```
H2B YCO:0.75
```

YDIv:	<*NRx*>	−5.12 to +5.10

YDIV positions the first or second horizontal bar cursor in graticule divisions.

```
H1B YDI:-4.0
```

HISTOgram *<link>:<arg>*

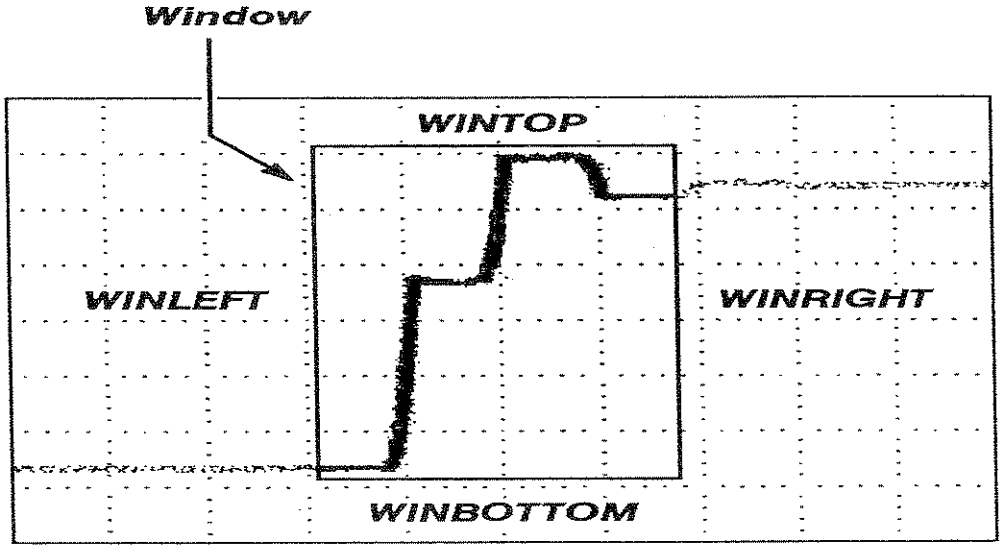
Display and Color Commands

HISTOGRAM initiates a vertical or horizontal histogram display for the selected trace. It also sets a variety of histogram parameters including the dimensions of a displayed histogram window.

The histogram window selects a portion of the trace on which to perform the histogram algorithm. The histogram window appears on the display when the TYPE is set to HORIZ or VERT and the DISPLAY MODES major menu is selected (see the DSYS command on page 2-61).

Each displayed trace has a unique histogram window and a unique histogram TYPE. Once a histogram is started on a trace, selecting another trace will activate the histogram window for that trace. Histograms started on a color graded display will calculate the histogram from the accumulated pixel bin data.

The C.WIN links specify the sides in the current vertical and horizontal scale units (i.e., volts, seconds, rho, feet, etc.) of the selected trace. The D.WIN links specify the window in absolute divisions independent of the current scale settings. The histogram window can be defined with C.WIN links then queried with D.WIN links, and vice versa. The following illustration shows the four histogram window parameters.



Histogram Window Parameters

The histogram window *is not* related to the data window defined with the DISPLAY command.

For more information on the use of the Histogram function, refer to the *User Reference* for your instrument.

CLEar		

CLEAR removes all trace and histogram data from the display and restarts all acquisitions. CLEAR is equivalent to the CLEAR ALLTRACE command.

```
HISTO CLE
```

C.WINBottom:	*< NRx >*	(See below for range)

C.WINBOTTOM specifies the bottom edge of the histogram window for the selected trace. C.WINBOTTOM is a vertical value in the curent units of the vertical scale. The range is defined by the vertical graticule limits. See the D.WINBOTTOM link for the default setting. C.WINBOTTOM can never be greater than C.WINTOP.

```
HISTO C.WINB:-2.5
```

C.WINLeft:	*< NRx >*	(See below for range)

C.WINLEFT specifies the left edge of the histogram window for the selected trace. C.WINLEFT is a horizontal value in units of the horizontal scale. The range is defined by the endpoints of the trace record. See the D.WINLEFT link for the default setting. C.WINLEFT can never be greater than C.WINRIGHT.

```
HISTO C.WINL:1.15
```

HISTOgram <*link*>:<*arg*> (cont.)

C.WINRight:	<*NRx*>	(See below for range)

C.WINRIGHT specifies the right edge of the histogram window for the selected trace. C.WINRIGHT is a horizontal value in units of the current horizontal scale. The range is defined by the endpoints of the trace record. See the D.WINLEFT link for the default setting. C.WINRIGHT can never be less than C.WINLEFT.

```
HISTO C.WINR:4.05
```

C.WINTop:	<*NRx*>	(See below for range)

C.WINTOP specifies the top edge of the histogram window for the selected trace. C.WINTOP is a vertical value in units of the vertical scale. The range is defined by the vertical graticule limits. See the D.WINTOP link for the default setting. C.WINTOP can never be less than C.WINBOTTOM.

```
HISTO C.WINT:1.5
```

? DATA		

Query Only. DATA transfers the value of each point on the histogram curve to the controller in binary or ASCII format. The histogram window determines what portion of the trace will be incorporated in the histogram. It also determines how much histogram data will be transferred.

Histogram data points are sent as unsigned 32-bit values starting from the left of the screen for horizontal histograms and from the bottom for vertical histograms. You can specify the data format to be either ASCII or binary with the ENCDG HISTOGRAM command.

<Histogram data> can be in ASCII (*<asc>*) or binary (*<bblock>*) format. The format is set by the ENCDG HISTOGRAM command. Use the HISTOGRAM? NR.PT query to get the number of histogram points to expect from the DATA query.

ASCII Transfer. Data transferred as an *<asc curve>* use the following format:

<asc bin> ::= *<NR1>* [,*<NR1>*] ... EOI

where *<NR1>* values are pixel bin counts within the range 1 to 4294967295.

Binary Transfer. Data is transferred as a single binary block (*<bblock>*) in the format:

<bblock> EOI

where

<bblock> ::= %*<byte cnt>* *<bin pt>* ... *<checksum>*

<bin pt> is a four-byte unsigned binary integer (MSB first) and *<byte cnt>* is an arbitrary number of binary bytes. This binary format is similar to that used for trace transfers with the CURVE command which is discussed on page 2-34.

The order of bytes within a bin count value is set with the BYT.OR command. You can set either the least significant byte (LSB) to be sent first followed by bytes of greater significance or the most significant byte (MSB) first followed by bytes of lesser significance. There are no separators (such as commas) between binary bin counts.

```
HISTO? DATA
HISTOGRAM DATA:0,1,552,8580,32321,
110778,209786,442794,939335,..
```

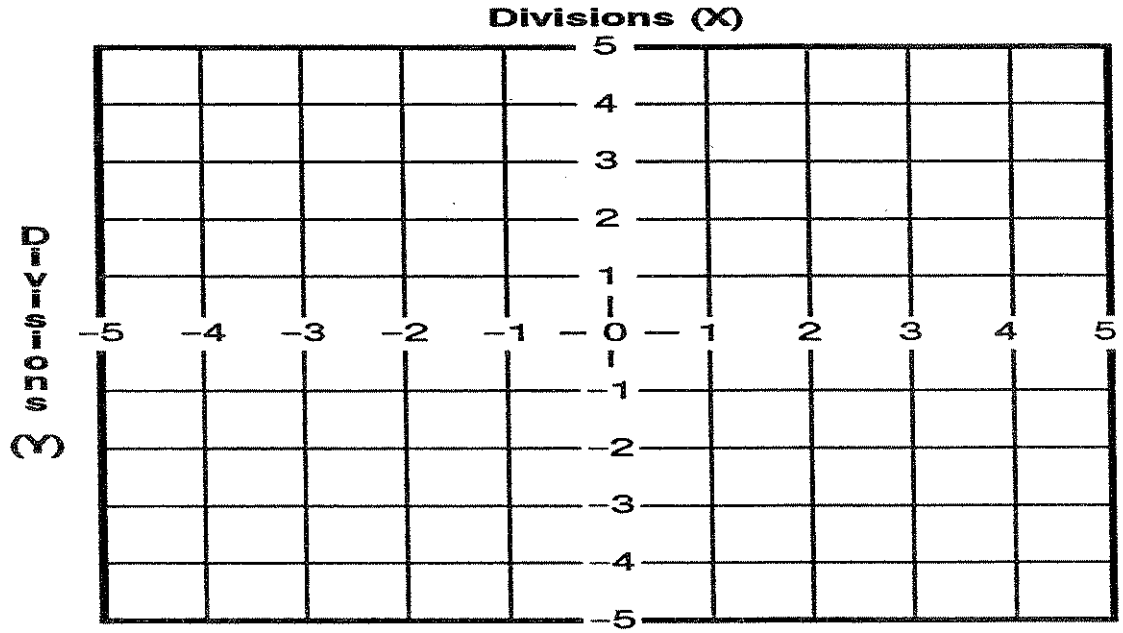
D.WIN Bottom:	*<NRx>*	(See below for range)

D.WINBOTTOM specifies the bottom edge of the histogram window for the selected trace. D.WINBOTTOM is a vertical value in divisions.

HISTOgram <*link*>:<*arg*> (cont.)

The following illustration shows the coordinate system used to define D.WIN parameters. Because trace records extend slightly beyond the left and right graticule limits, the D.WIN limits slightly exceed the −5.0 and +5.0 values shown. The illustration on page 2-71 shows the data window parameters and their associated WIN link.

See the histogram discussion on page 2-71 for more information on the data selection window.



Graticule X, Y Coordinates

The D.WINBOTTOM range is −5.12 to + 5.10 divisions, though D.WINBOTTOM can never be greater than D.WINTOP.

```
HISTO D.WINB:-2.5
```

D.WIN Left:	<*NRx*>	(See below for range)

D.WINLEFT specifies the left edge of the histogram window for the selected trace.

D.WINLEFT is a horizontal value in divisions within the range of −5.12 to +5.10. D.WINLEFT can never be greater than D.WINRIGHT.

```
HISTO D.WINL:-1.15
```

HISTOgram <*link*>:<*arg*> (cont.)

D.WINRight:	<*NRx*>	(See below for range)

D.WINRIGHT specifies the right edge of the histogram window for the selected trace.

D.WINRIGHT is a horizontal value in divisions within the range of −5.12 to +5.10. D.WINRIGHT can never be less than D.WINLEFT.

```
HISTO D.WINR:4.05
```

D.WINTop:	<*NRx*>	(See below for range)

D.WINTOP specifies the top edge of the histogram window for the selected trace.

D.WINTOP is a vertical value in divisions within the range of −5.12 to +5.10. D.WINTOP can never be greater than D.WINBOTTOM.

```
HISTO D.WINT:1.5
```

HISTScaling:	**LIN**ear | **LOG10**

HISTSCALING selects either linear or logarithm base 10 scaling for the histogram display. All traces are affected. The initial default is LINEAR.

```
HISTO HISTS:LOG10
```

? NR.PT	<*NRx*>	

Query Only. NR.PT returns the number of histogram curve points that will be returned by HISTOGRAM? DATA.

```
HISTO? NR.PT
HISTO? NR.PT:201
```

HISTOgram <*link*>:<*arg*> (cont.)

TYPe:	**HOR**iz | **VER**t | **NON**e

TYPE selects the type of histogram display for the selected trace. The selected trace must be an infinite persistence or color graded trace display.

HORIZ accumulates bin counts for each data point along the horizontal axis. VERT accumulates bin counts for each data point along the vertical axis. NONE disables the histogram function for the selected trace. A histogram TYPE can be specified for each trace. The histogram window (C.WIN and D.WIN links) determines what portion of the trace is included in the histogram calculation.

Select the Display Modes major menu with the DSYS ON command before issuing HISTOGRAM commands. HISTOGRAM commands are not allowed when any other major menu is active.

Notes. If Histogram is started when the display type is NORMAL or VARIABLE, the DISPLAY TYPE will change to INFINITE persistence.

```
HISTO TYP:VER
```

HPGl <*link*>:<*arg*>

External I/O Commands

HPGL specifies printing parameters for the Tek HC100 plotter or other devices that conform to the HPGL format.

COLor<*ui*>:	<*NRx*>	(Range below)

COLOR<*ui*> assigns plotter pens to the instrument color index. Pen range (<*NRx*>) is 1 to 8. COLOR<*ui*> range is 0 to 7. Refer to page 2-22 for the color index.

Note: Assigning pen 0 to the color index means that color is not plotted (no pen is assigned).

```
HPG COL3:1
```

HPGl <*link*>:<*arg*> (cont.)

COLor:	DEFAult	

Set Only. COLOR:DEFAULT assigns the following default pens to the color index:

Default Plotter Pen Assignments

Color Index	Pen No.	Color Index	Pen No.
0	0	4	4
1	1	5	5
2	2	6	6
3	3	7	7

```
HPG COL:DEFA
```

FORMat:	DRAft | HIRes | SCReen	

FORMAT selects the output format. HIRES plots the entire screen, including every trace point. SCREEN plots the entire screen, but includes only the min/max point-pairs of each YT trace column (XY and PA traces are not affected.) DRAFT is the same as SCREEN except the front panel status menu is not plotted.

Note: Pop-up menus are not plotted.

Note: Plotting variable and infinite persistence traces is very time-consuming and tends to wear down plotter pen points more rapidly than other types of plots. Each point is plotted seperately.

```
HPG FORM:DRA
```

PORt:	CENTRonics | GPIb | RS232	

PORT specifies the output port for the plotter.

```
HPG POR:CENTR
```

HREfpt {**LEF**t | **CEN**ter | **RIG**ht }

Trace and Setting Commands

HREFPT selects the horizontal point about which the trace expands when the horizontal size is adjusted for Main and Window traces.

```
HREFPT LEFT
```

ID?

Status and Event Commands

Query Only. ID? returns identifying information about the instrument and its firmware, delimited by commas. The list contains the following items:

- Instrument model number
- TEK Codes & Formats version number
- Time base processor (TBC) firmware version number
- Display Processor (DSY) firmware version number
- Executive Processor (EXP) firmware version number
- Acquisition processor (ACQM for the CSA 803, ACQM1-ACQD8 for the 11801A) firmware version numbers

ID TEK/CSA 803,V81.1,TBC/<*NR2*>, DSY/<*NR2*>, EXP/<*NR2*>, ACQM1/<*NR2*>

```
ID?
ID TEK/CSA 803,V81.1,TBC/1.0,
DSY/1.0,EXP/1.0,ACQM1/8.01,
```

INIt

Miscellaneous/System Commands

Set Only. INIT initializes the instrument to its factory-assigned default parameters and settings. Completion of INIT is signaled by event code 474, "INIT complete."

For both GPIB and RS-232-C, the defaults are:

- SRQMASK USER is OFF; this removes the RQS icon if it was displayed
- All pending events except Power On are discarded
- All user TEXT is cleared from the display
- For GPIB only, RQS is set to ON

Note: INIT has no argument.

Refer to the *User Reference* for your instrument for a complete list of INIT effects.

```
INI
```

INPut {**STO** <*ui*> | <*qstring*>}

Data Transfer Commands

INPUT selects the destination for preamble and trace data sent to the instrument by the WFMPRE and CURVE commands.

	STO <*ui*> | <*qstring*>	1 to 256

The power-on default INPUT location is STO1. <*qstring*> is a label that identifies the stored trace destination.

Query Note: INPUT? always returns STO <*ui*>, even if the location was specified with a label.

```
INP STO92
```

J

JITter?

Measurement Commands

Query Only. JITTER? returns the jitter calculated on the trace at JITLOCATION. JITTER? is available only when MMODE is set to STAT.

JIT?

L

LABAbs <*link*>:<*arg*>

Label and Text Commands

LABABS positions the label associated with the selected trace.

PCTg:	<*NRx*>	0 to 100 percent

PCTG sets the horizontal position of the label as a percentage of the trace record.

```
LABA PCT:50
```

XCOord:	<*NRx*>	(See below for range)

XCOORD sets the horizontal position of the label in horizontal units. The label maintains the specified position, tracking changes in the trace.

(The following range formulas assume ADJTRACE PANZOOM is set to OFF and the trace is acquired. Refer to the discussion on cursor positioning on page 2-59 for a method to calculate XCOORD range when PANZOOM is set to ON or the trace is unacquired. Refer to page 2-133 for formulas to calculate *duration*.)

The XCOORD range when the selected trace record is MAIN is calculated:

MAINPOS to (MAINPOS + *main_duration*)

The XCOORD range when the selected trace record is WIN is calculated:

WINPOS to (WINPOS + *win_duration*)

```
LABA XCO:0.5
```

YDIv:	*<NRx>*	−10.22 to +10.22

YDIV sets the vertical position of the label in divisions, relative to the point specified by the XCOORD link. The label maintains the specified vertical distance, tracking changes in the trace.

```
LABA YDI:2.85
```

LABel *<link>:<arg>*

Label and Text Commands

LABEL defines and deletes labels, and controls label display.

DELete:	**ALL** | **FPS**[*<ui>*] | *<qstring>* | **STO**[*<ui>*] | **TRA**ce[*<ui>*]	

Set Only. DELETE deletes labels for active traces, stored traces, stored settings, or ALL labels. Specifying FPS, STO, or TRACE with *<ui>* deletes the label associated with the specified argument. Specifying FPS, STO, or TRACE without *<ui>* deletes all labels associated with the argument type. Specifying *<qstring>* deletes that label. Wildcard characters are interpreted. (Refer to page 2-86 for wildcards.)

The range for FPS *<ui>* is from 1 to 10; for STO *<ui>* is 1 to 256; for TRACE *<ui>* is 1 to 8.

```
LAB DEL:TRA2
```

DISPlay:	**ON** | **OFF**	

DISPLAY controls the display of labels associated with active traces. When DISPLAY is set to ON, labels are displayed. When DISPLAY is set to OFF, labels are not displayed but all labels are retained. OFF is the default.

```
LAB DISP:ON
```

LABel <*link*>:<*arg*> (cont.)

FPS <*ui*>:	<*qstring*>	≤10 characters

FPS <*ui*> defines a label for a stored front panel setting. The range for <*ui*> is 1 to 10.

```
LAB FPS1:'SETUP1'
```

MODe:	**AUTO** | **MAN**ual	

MODE selects automatic or manual trace labeling. AUTO mode produces labels for new traces based on their trace descriptions. In MANUAL mode no labels appear on a traces unless you specifically assign them (LABEL TRACE <*ui*>). LABEL DISPLAY must be set ON for the labels to be visible on the front panel. MANUAL is the default mode.

```
LAB MOD:AUTO
```

STO <*ui*>:	<*qstring*>	≤10 characters

STO <*ui*> defines the label for a stored trace. The range for <*ui*> is from 1 to 256.

```
LAB STO1:'DATA1'
```

TRAce <*ui*>:	<*qstring*>	≤10 characters

TRACE <*ui*> defines the label for an active trace. The range for <*ui*> is 1 to 8.

```
LAB TRA1:'CLOCK'
```

LABel <*link*>:<*arg*> **(cont.)**

Label Wildcard Characters. For some commands that take labels, the characters **?** and ***** have a special meaning in a <*qstring*> when searching for a matching label. The **?** will match any single character. The ***** will match any number (including 0) of any character. To search for a literal ? or *, use a backslash \ in front of the ? or *.

a?c	matches	abc, axc, a2c, aEc, etc.
rep1?	matches	rep11, rep12, rep1b, etc.
rep*	matches	rep, rep65, rep1a92, repZZ, etc.
a*c	matches	abc, a3478c, axyzc, etc.
a*c	matches	a*c

Examples of Wildcard Usage

LABRel <*link*>:<*arg*>

Label and Text Commands

Set Only. LABREL positions the label of the selected trace relative to its position prior to the command.

PCTg:	<*NRx*>	(See LABA PCT range)

Set Only. PCTG changes the horizontal position of the label, relative to its previous horizontal position, in units of percent of record length, but not exceeding the LABABS PCTG range.

```
LABR PCT:50
```

XCOord:	<*NRx*>	(See LABA XCO range)

Set Only. XCOORD changes the horizontal position of the label, relative to its previous horizontal position, but not exceeding the LABABS XCOORD range.

```
LABR XCO:0.5
```

LABRel <*link*>:<*arg*> (cont.)

YDIv:	<*NRx*>	(See LABA YDI range)

Set Only. YDIV changes the vertical position of the label relative to its previous vertical position, but not exceeding the LABABS YDIV range.

```
LABR YDI:2.85
```

LONgform {ON|OFF}

Miscellaneous/System Commands

LONGFORM controls the return of the longer versions of query responses. With LONGFORM set to ON, queries respond with full header and link spellings; the EVENT? and RS232 VERB:ON commands return a descriptive <*qstring*> in addition to the event code. With LONGFORM set to OFF, query responses are in abbreviated form, and EVENT? and RS232 VERB:ON responses include only the event codes. The power-on default is LONGFORM ON.

```
LON ON
```

MAINPos <*NRx*>

Time Base/Horizontal Commands

MAINPOS sets the horizontal position of the Main trace record with respect to the Main trigger.

	<*NRx*>	<40 ns to 50 ms

The range depends upon the setting of HREfpt:

HREFPT	lower MAINPos	upper MAINPos
LEFT	40 ns	50 ms
CENTER	40 ns + *duration*/2	50 ms + *duration*/2
RIGHT	40 ns + *duration*	50 ms + *duration*

Note. The minimum MAINPOS setting is dependent on internal instrument calibration, but it will always be less than 40 ns. If a MAINPOS value is selected that is less than the instrument minimum, MAINPOS will be set to the minimum limit.

```
MAINP 7.9E-6
```

MASK <*ui*> <*link*>:<*arg*>

Display and Color Commands

MASK <*ui*> provides the means to create or delete any of 10 test masks available for trace analysis. The masks are polygons defined by up to 50 vertices each. Sample points falling within the masks are counted. MASK allows you to query the count for a specific mask. For more information on Mask Testing refer to the *User Reference* for your instrument.

The links C.POINT and D.POINT let you specify the mask vertices in current scale units and divisions, respectively. The specified vertices are automatically connected to form the polygon mask. Polygons with concave shapes are not supported.

MASK <*ui*> <*link*>:<*arg*> (cont.)

Mask testing is available with either infinite persistence or color graded displays. See the DISPLAY TYPE command. Refer to the MASKSTAT command for mask testing statistics, starting mask count, and other related functions.

C.Point:	<*mpoint*>	(See below for range)

C.POINT creates a set of XY coordinates that define a vertex of the mask. The coordinates are specified in the current horizontal and vertical scale units. The specified vertices are automatically connected to form the polygon mask. Note that the D.POINT link specifies coordinates in divisions.

MASK<ui> C.POINT:<xcord>,<ycord>
[,<xcord>,<ycord>...]

The <xcord> range is the duration of the selected trace record. You can use the left and right graticule limits as they are very close to the trace endpoints. The <ycord> range is the vertical displacement between the bottom and top graticule limits. The MASK?<*ui*> C.P query must be specified to read the mask definition.

The following example would define MASK2 as a rectangle two units wide by four units high.

```
MASK2 C.P:2.1,2,4.1,2,2.1,-2,4.1,-2
```

DELete		

DELETE removes the definition for MASK<*ui*>.

```
MASK7 DEL
```

MASK <*ui*> <*link*> : <*arg*> (cont.)

D.Point:	<*mpoint*>	(See below for range)

D.POINT creates a set of XY coordinates (<*mpoint*>) that define a vertex of the mask. The X and Y coordinates are specified in divisions. The specified vertices are automatically connected to form a polygon.

MASK<ui> D.POINT:<xcord>,<ycord>
[,<xcord>,<ycord>...]

The <xcord> and <ycord> ranges are based on the same coordinates used for the Histogram window and Cursors. Refer to the illustration on page 2-75 for the coordinates. The MASK? <*ui*> D.P query must be specified to read the mask definition.

The following example would define MASK2 as a rectangle two divisions wide by two divisions high.

```
MASK2 C.P:-2,2,2,2,2,-2,-2,-2
```

? NCOunt	<*NRx*>	

NCOUNT returns the point count for MASK <*ui*>.

```
MASK2? NCO
MASK2 NCOUNT:457
```

? NR.PT	<*NRx*>	

NR.PT returns the number of vertices or XY coordinates that define MASK <*ui*>.

```
MASK2? NR.PT
MASK2 NR.PT:4
```

MASKStat *< link > : < arg >*

Display and Color Commands

MASKSTAT starts mask testing and returns mask count statistics and status.

CLEar		

CLEAR clears all mask counts and removes all trace data from the display. Then all acquisitions are restarted and mask testing resumes. CLEAR is equivalent to the CLEAR ALLTRACE command.

```
MASKS CLE
```

COUnt:	**ON | OFF**	

COUNT starts counting sample point hits within all masks on all displayed traces when set ON. When COUNT is set to OFF new hits within masks are not counted but existing count statistics are retained and may be queried.

Note: DSYS must be set ON (Display Modes major menu selected) before COUNT can be set ON. Leaving the Display Modes major menu terminates mask counting functions.

```
MASKS COU:ON
```

? NWFm	*< NRx >*	

NWFM returns the number of traces processed to produce the count returned by the TOTAL query.

```
MASKS? NWF
MASKSTAT NWFM:234
```

? TOTal	*< NRx >*	

TOTAL returns the number of sample points that have fallen within all masks on all displayed traces. Sample points that fall where two masks overlap are counted only once.

```
MASKS? TOT
MASKSTAT TOTAL:735
```

MAX?

Measurement Commands

Query Only. MAX? returns the maximum amplitude (most positive peak voltage) of the selected trace, followed by an accuracy qualifier. (Refer to page 2-93 for qualifier definitions.)

```
MAX?
MAX 5.04E-1,EQ
```

MAXTranum?

Trace and Settings Commands

Query Only. MAXTRANUM? returns the largest acceptable trace number for the current configuration.

```
MAXT?
MAXT 8
```

MEAN?

Measurement Commands

Query Only. MEAN? returns the average amplitude (arithmetic mean voltage) of the selected trace, followed by an accuracy qualifier. (Refer to page 2-93 for qualifier definitions.)

```
MEAN?
MEAN 2.212E-1,EQ
```

MEAS[<*ui*> [TO <*ui*>]]?

Measurement Commands

Query Only. MEAS? executes the measurements (<*meas*>) in the current measurement list (MSLIST) of the specified trace or for the range of traces or all traces. MEAS? returns a scalar value followed by an accuracy qualifier (<*qual*>) for each measurement in the list. MEAS? returns EMPTY if MSLIST contains no measurements.

MEAS <*ui*> {<*meas*>:<*NR3*>,<*qual*> [,{<*meas*>:<*NR3*>,<*qual*>...}]} | EMPty

The <*qual*> accuracy qualifier indicates whether or not the underlying trace data contain null, overrange, or underrange values.

The measurement <*qual*> accuracy qualifiers are defined in the following table:

Software Measurement Accuracy Qualifiers (<qual>)

<*qual*>	Meaning
EQ	Measurement was successfully made
ER	Error
NF	Measurement not found
OR	Measurement was out of range

The UN qualifier is returned for the following conditions:

- Attempted any timing measurement when the measurement zone of the selected trace contained null (unacquired) values.
- Attempted a FALLTIME?, FREQ?, PERIOD?, RISETIME?, WIDTH?, or an area/energy measurement when the trace description for the selected trace is enveloped or contains enveloped components.
- Attempted a MEAN? or RMS? measurement when DAINT was set to SINGLE and the trace description of the selected trace was enveloped or contained enveloped components.

MEAS[<*ui*> [TO <*ui*>]]? (cont.)

The ER qualifier is returned for the following conditions:

- Attempted DUTY?, FREQ?, or PERIOD? measurement and no period was found within the specified measurement zone.
- Attempted a MEAN?, RMS?, YTPLS_AREA?, YTMNS_AREA?, or YTENERGY? measurement when DAINT was SINGLE and no period was found within the specified measurement zone.
- Attempted a CROSS? measurement and no transition of the specified slope was found.
- Attempted a CROSS? measurement and REFLEVEL did not fall within the computed MAX and MIN of the specified measurement zone.
- Attempted a RISETIME? measurement and the measurement system could not compute a valid PROXIMAL time, followed by a valid DISTAL time, within the specified measurement zone.
- Attempted a FALLTIME? measurement and the measurement system could not compute a valid DISTAL time followed by a valid PROXIMAL time, within the specified measurement zone.
- Attempted a WIDTH? measurement and two MESIAL crossings of opposite slope could not be found within the specified measurement zone.
- Attempted any measurement when the selected trace was an XY trace or in a display persistence mode.
- Attempted any measurement when no traces were displayed.

```
MEAS?
MEAS1 MEAN:7.3333E-4,EQ,
CROSS:7.6685E-4,EQ
```

< *meas* > ?

Measurement Commands

Query Only. < *meas* > ? is shorthand for a query of any of the measurements listed below. Querying a specific measurement executes the measurement and returns its value followed by an accuracy qualifier. (Refer to the MEAS? command for the list of qualifiers.) The < *meas* > measurements are listed by function below:

< *meas* > *Measurement Types*

Amplitude	Timing	Area/Energy
MAX	CROSS	YTENERGY
MEAN	DUTY	YTMNS_AREA
MID	FALLTIME	YTPLS_AREA
MIN	FREQ	
OVERSHOOT	PDELAY	
PP	PERIOD	
RMS	PHASE	
UNDERSHOOT	RISETIME	
	WIDTH	

All of the Timing measurements except DUTY and PHASE can be performed in the Hardware mode. Refer to each measurement entry for specific information.

```
MEAN?
MEAN 7.3333E-4,EQ
```

MID?

Measurement Commands

Query Only. MID? returns the amplitude midpoint, halfway between the maximum amplitude and the minimum amplitude of the selected trace, followed by an accuracy qualifier. (Refer to page 2-93 for qualifier definitions.)

```
MID?
MID 2.2E-1,EQ
```

MIN?

Measurement Commands

Query Only. MIN? returns the minimum amplitude (most negative peak voltage) of the selected trace, followed by an accuracy qualifier. (Refer to page 2-93 for qualifier definitions.)

```
MIN?
MIN -6.398E-2,EQ
```

MPAram <*ui*> <*link*>:<*arg*>

Measurement Commands

Defines the parameters for making measurements on the specified trace.

BASeline:	<*NRx*>	(Any legal value)

BASELINE sets the vertical baseline level for measurements when MTRACK (measurement tracking) is set to OFF.

BASELINE is ignored when MTRACK is set ON.

```
MPA6 BAS:-8.5E-1
```

DAInt:	**WHO**le | **SIN**gle	

DAINT sets the data measurement interval to a SINGLE period of the trace or to the WHOLE measurement interval set by the LMZONE and RMZONE links. DAINT is not used in the hardware measurement mode.

DAINT affects the MEAN?, RMS?, YTENERGY?, YTMNS_AREA?, and YTPLS_AREA? measurements. These measurements return an ER qualifier if DAINT is set to SINGLE and no period can be found.

Note: The measurement qualifiers are defined on page 2-93.

```
MPA6 DAI:WHO
```

MPAram <*ui*> <*link*>:<*arg*> (cont.)

DISPErsion:	**PP**	**RMSD**ev

DISPERSION selects the display of JITTER and NOISE calculation results as peak-to-peak or RMS deviation (Standard Deviation) values. If MMOde is set to HW or SW, DISPERSION is ignored.

```
MPA6 DISPE:PP
```

DISTal:	<*NRx*>	(See below for range)

DISTAL sets the distal (furthest from point of origin) level used by RISETIME and FALLTIME measurements.

The DISTAL range depends on the current argument to MLEVEL. When MLEVEL is set to RELATIVE, the DISTAL range is a percentage of the difference between the TOPLINE and BASELINE. When MLEVEL is set to ABSOLUTE, the DISTAL range for hardware and software modes are in vertical units of the selected trace:

MMOde:	**MLE**velmode: **REL**ative	**MLE**velmode: **ABS**olute
SW	0 % to 100 %	1E+15 to −1E+15
HW	0 % to 100 %	−2 V to +2 V

```
MPA6 DIST:85
```

JITTLOcation:	**CRO**ss	**MES**ial

JITTLOCATION selects the location of the jitter measurement on the trace. Jitter can be measured at a signal level crossing or at the middle (mesial) reference level of a trace. If MMOde is set to HW or SW, JITTLOCATION is ignored.

```
MPA6 JITTLO:CRO
```

MPAram <ui> <link>:<arg> (cont.)

MLEvelmode:	ABSolute | RELative	

MLEVELMODE selects the method used to determine DISTAL, MESIAL, PROXIMAL, REFLEVEL, and REFMESIAL and sets their the units of measure. In ABSOLUTE mode, these parameters are set by the user to absolute voltage levels. In RELATIVE mode, these parameters are calculated and expressed as a percentage of the difference between BASELINE and TOPLINE.

Measurement parameter tracking (MTRACK) is not active when ABSOLUTE mode is selected.

```
MPA6 MLE:REL
```

MMOde:	HW | SW | STAT	

MMODE selects either the hardware, software, or software statistical measurement mode. Software mode allows any measurements on the selected trace record. Hardware mode allows only timing measurements taken with precision timing circuits. The software statistical mode, for measuring random data, calculates measurement parameters using histograms.

```
MPA6 MMO:STAT
```

MSLOpe:	PLUs | MINUs	

MSLOPE sets the crossing slope that begins CROSS and PDELAY hardware measurements.

```
MPA6 MSLO:PLU
```

MPAram <*ui*> <*link*>:<*arg*> **(cont.)**

MTRack:	**ON** | **OFF**	

MTRACK sets measurement tracking to ON or OFF. When ON, a histogram is used to determine TOPLINE and BASELINE; when OFF, you set the TOPLINE and BASELINE values.

When MLEVELMODE is set to ABSOLUTE, tracking is *not* used to set TOPLINE and BASELINE.

```
MPA6 MTR:OFF
```

MTRANs:	<*NRx*>	1 to 15

MTRANS sets the number of the transition on which hardware measurements will begin. The transition is defineded by the SLOPE, LEVEL, and MFILTERING settings.

```
MPA6 MTRAN:3
```

NOISLocation:	**TOP**line	**BAS**eline

NOISLOCATION selects the measurement of noise at the topline or baseline of the trace. If MMOde is set to HW or SW, MOISLOCATION is ignored.

```
MPA6 NOISL:TOP
```

? NOIS.histpt:	<*NRx*>	

Query Only. NOIS,HISTPT returns the number of histogram points used on the trace to calculate noise. NOIS.HISTPT updates only if NOISE is in the measurement list for the trace, the trace is selected, or MEAS? is queried. If MMOde is set to HW or SW, NOIS.HISTPT is ignored.

```
MPA6 NOIS.:2
```

MPAram <*ui*> <*link*>:<*arg*> **(cont.)**

PROXimal:	<*NRx*>	(See DISTal for range)

Proximal sets the proximal (near to origin) level for RISETIME and FALLTIME measurements.

PROXIMAL range depends on the current argument to MLEVEL. When MLEVEL is RELATIVE, the range is a percentage of the difference between the TOPLINE and BASELINE. When MLEVEL is ABSOLUTE, the range is in vertical units of the selected trace.

```
MPA6 PROX:5
```

REFBaseline:	<*NRx*>	Any legal value

REFBASELINE sets the vertical baseline level on the reference trace when MTRACK (measurement tracking) is set to OFF. This is used for PDELAY and PHASE measurements.

REFBASELINE is ignored when MTRACK is ON.

```
MPA6 REFB:-3.1415E-1
```

REFFiltering:	<*NRx*>	1 to 7

REFFILTERING sets the filtering constant on the reference trace for hardware measurements. REFFILTERING is the number of successive samples that must cross the threshold level (REFLEVEL) before a transition is valid (defaults to 3). This removes the effects of noise on measurements.

```
MPA6 REFF:5
```

REFLEvel:	<*NRx*>	(See DISTal for range)

REFLEVEL sets the reference level for CROSS, YTPLS_AREA, and YTMNS_AREA measurements.

```
MPA6 REFLE:55
```

MPAram <*ui*> <*link*>:<*arg*> **(cont.)**

REFLMzone:	<*NRx*>	0 to 100 percent

REFLMZONE sets the left measurement zone on the reference trace for PDELAY and PHASE measurements.

```
MPA6 REFLM:10
```

REFMesial:	<*NRx*>	(See DISTal for range)

REFMESIAL sets the mesial level on the reference trace for PDELAY and PHASE measurements.

```
MPA6 REFM:50
```

REFRmzone:	<*NRx*>	0 to 100 percent

REFRMZONE sets the right measurement zone on the reference trace for PDELAY and PHASE measurements.

```
MPA6 REFR:100
```

REFSLope:	**PLU**s | **MINU**s	

REFSLOPE is a hardware measurement mode parameter that sets the reference trace slope used to determine the PDELAY measurement endpoint.

```
MPA6 REFSL:PLU
```

MPAram <*ui*> <*link*>:<*arg*> **(cont.)**

REFSNratio:	<*NRx*>	1 to 99

REFSNRATIO sets the signal-to-noise ratio on the reference trace to provide a noise rejection band centered on the REFMESIAL level. This is used to qualify transitions for SW mode measurements. The reciprocal of the number selected is the fraction of the REFTOPLINE-to-REFBASELINE distance the noise rejection band extends above and below the REFMESIAL level.

```
MPA6 REFSN:33
```

REFTOpline:	<*NRx*>	Any legal value

REFTOPLINE sets the topline value of the reference trace for the PDELAY and PHASE measurements. This value is used only when tracking is off (MTRACK set to OFF).

```
MPA6 REFTO:3.1415E-1
```

REFTRace:	**TRA**ce <*ui*>	1 to MAXTranum

REFTRACE selects the reference trace which provides the endpoint for PDELAY and PHASE measurements. See page 2-92 for the value of MAXTRANUM.

```
MPA6 REFTR:TRA20
```

REFXsition:	<*NRx*>	1 to 15

REFXSITION is a hardware measurement mode parameter that sets the number of the transition on the reference trace on which the PDELAY measurement will end.

```
MPA6 REFX:6
```

MPAram <*ui*> <*link*>:<*arg*> **(cont.)**

RMZone:	<*NRx*>	0 to 100 percent

RMZONE sets the right measurement zone limiter as a percentage of the trace record in SW mode only.

```
MPA6 RMZ:75
```

SNRatio:	<*NRx*>	1 to 99

SNRATIO sets the signal-to-noise ratio to provide a noise rejection band centered on the MESIAL level. This is used qualify transitions for SW mode measurements. The reciprocal of the number selected is the fraction of the TOPLINE-to-BASELINE distance the noise rejection band extends above and below the MESIAL level.

```
MPA6 SNR:33
```

TOPline:	<*NRx*>	Any legal value

Sets the top vertical level for a measurement on the specified trace. This value is used only when MTRACK is OFF or MLEVELMODE is RELATIVE. TOPLINE is used to calculate absolute reference values for PROXIMAL, MESIAL, DISTAL, etc.

```
MPA6 TOP:2.0
```

Query Note: MPAram? returns the same parameters as MPAram <*ui*>? for all defined traces in numeric trace order. MPAram <*ui*>? returns the links and arguments for the specified trace in the following order:

MPARAM <*ui*> MMODE:<*arg*>,MLEVELMODE:<*arg*>,MTRACK:<*arg*>,BASELINE:<*NR3*>,TOPLINE:<*NR3*>,MESIAL:<*NR3*>,PROXIMAL:<*NR3*>,DISTAL:<*NR3*>,DAINT:<*arg*>,SNRATIO:<*NR3*>,LMZONE:<*NR1*>,RMZONE:<*NR1*>,MSLOPE:<arg>,MFILTERING:<*NR1*>,MTRANS:<*NR1*>,REFTRACE:<*arg*>,REFBASELINE:<*NR3*>,REFTOPLINE:<*NR3*>,REFMESIAL:<*NR3*>,REFSNRATIO:<*NR3*>,REFLMZONE:<*NR3*>,REFRMZONE:<*NR3*>,REFSLOPE:<*arg*>,REFFILTERING:<*NR3*>,REFXSITION:<*NR1*>,REFLEVEL:<*NR3*>

MSLIst <*ui*> <*meas*> [, <*meas*> ...]

Measurement Commands

Selects the <*meas*> (up to six) executed once at a MEAS<*ui*>? query or continuously executed while the Measurement menu is displayed, for the specified trace. Range of <*ui*> is 1 to MAXTranum.

```
MSLI8 PP,FRE,WID,PER
```

Query Note: MSLIst<*ui*>? returns the <*meas*> list for the specified trace, or EMPty if no <*meas*> have been selected. MSLIst? returns the <*meas*> list for all defined traces in numeric order.

MSNum[<*ui*>]?

Measurement Commands

Query Only. Returns the number of items in the current MSLIst, for the specified trace or for all traces. If MSLIst is EMPty, MSNum? returns 0.

```
MSN1?
MSNUM1 4
```

MSYs {**ON**|**OFF**}

Measurement Commands

MSYS sets the measurement system ON or OFF at the front panel display. In effect, MSYS ON presses the front panel **Measure** button. Whether MSYS is ON or OFF has no effect on measurements taken with MEAS? or if you query a specific measurement.

Set MSYS to ON when you need to use the front panel in conjunction with remote commands (e.g., semi-automatic ATE applications). Set MSYS to OFF for faster remote system throughput. OFF selects the waveform major menu.

```
MSYS OFF
```

N

NAVg <*NRx*>

Acquisition Commands

NAVG sets the number of trace samples to be averaged when averaging is enabled either in the trace description (refer to the TRACE command) or as an acquisition condition (refer to the CONDACQ command).

	<*NRx*>	2 to 4096

```
NAV 50
```

NENV <*NRx*>

Trace and Settings Commands

NENV sets the number of trace samples to be enveloped when enveloping is enabled either in the trace description (refer to the TRACE command) or as an acquisition condition (refer to the CONDACQ command).

	<*NRx*>	2 to 4096

```
NEN 300
```

NGRAded <*NRx*>

Acquisition Commands

NGRADED sets an overflow number that determines how many pixel bins on a color graded display must exceed their maximum count (65535) to stop conditional acquisition. The NGRADED value can equal either the number of pixel bins that have overflowed or the number of overflows for a particular bin or both combined. Once a pixel bin has overflowed, all subsequent hits on it add to the current overflow count. The overflow count is compared to the value NGRADED to determine when to halt conditional acquisition.

Refer to the CONDACQ TYPE:GRADED command to set this conditinal acquire mode.

	<*NRx*>	

```
NGRA 40
```

NHISt.pt <*NRx*>

Acquisition Commands

NHIST.PT sets the number of points that must be acquired in a histogram to stop conditional acquisition (refer to the CONDACQ TYPE:HIST.PT command).

	<*NRx*>	

```
NHIS 330
```

NMAsk <*NRx*>

Status and Event Commands

Sets the number of mask hits that must be acquired to stop the conditional acquisition set with CONDacq TYPe:MASK <*ui*>.

```
NMA5
```

NOIse?

Measurement Commands

Query Only. NOISE returns the noise measurement calculated at a point half way between the left and right crossings (or half way between the left and right measurement zones). NOISE is available only when MMODE is set to STAT.

```
NOI?
```

NVRam?

Trace and Settings Commands

Query Only. NVRAM? returns the number of bytes, in *<NR1>* form, of unallocated nonvolatile RAM (NVRAM) available for storing front panel settings.

```
NVR?
NVRAM 104723
```

NWAVfrm *<NRx>*

Acquisition Commands

NWAVFRM sets the number of traces that must be processed into histogram, color graded, and/or mask data to stop conditional acquisition (refer to the CONDACQ TYPE:WAVFRM command).

	<NRx>	

```
NWAV 1000
```

OUTput <*arg*>

Data Transfer Commands

OUTPUT selects the source of data returned by WFMPRE?, CURVE? or WAVFRM? queries. The source can be a stored trace (STO <*ui*>) or a displayed trace (TRACE <*ui*>); either source can be identified with a label (<*qstring*>). The power-on default is STO1.

	ALLSTO | **ALLT**race	

ALLSTO returns data for all existing stored traces. ALLTRACE returns data for all existing displayed traces plus traces generated from saved trace descriptions.

```
OUT ALLSTO
```

	STO <*ui*>	1 to 256

STO <*ui*> identifies the data source as the specified stored trace.

```
OUT STO55
```

	STO <*ui*> **TOSTO** <*ui*>	1 to 256

Returns data for the specified range of stored traces. Unassigned numbers within the range are ignored.

```
OUT STO51TOSTO60
```

	TRAce <*ui*>	1 to MAXTranum

TRACE returns data for the specified trace. See page 2-92 for the value of MAXTRANUM.

```
OUT TRA40
```

OUTput <*arg*> (cont.)

	TRAce <*ui*> **TOTRA**ce <*ui*>	1 to MAXT

Returns data for the specified range of traces. Unassigned numbers within the range are ignored.

```
OUT TRA2TOTRA15
```

	<*qstring*>	

<*qstring*> identifies the data source as the specified labeled trace. If the label matches both a stored trace and a displayed trace, the displayed trace is used by OUTPUT.

```
OUT 'CTRL44'
```

OVErshoot?

Measurement Commands

Query Only. OVERSHOOT? returns the difference between the maximum signal amplitude and the TOPLINE value. It is given as a percentage of the difference between the TOPLINE and BASELINE values and is followed by an accuracy qualifier. (Refer to page 2-93 for qualifier definitions.)

```
OVE?
OVERSHOOT 6.221E-1,EQ
```

P

PDElay?

Measurement Commands

Query Only. PDELAY? returns the propagation delay between MESIAL crossings of the selected trace and the trace specified with the MPARAM REFTRACE command, followed by an accuracy qualifier. (Refer to page 2-93 for qualifier definitions.)

```
PDE?
PDELAY 6.9E-11,EQ
```

PERiod?

Measurement Commands

Query Only. PERIOD? returns the time taken for one complete signal cycle, defined by the MESIAL crossing level, followed by an accuracy qualifier. (Refer to page 2-93 for qualifier definitions.) PERIOD is the reciprocal of the frequency (FREQ).

```
PER?
PERIOD 9.766E-7,EQ
```

PHAse?

Measurement Commands

Query Only. PHASE? returns the phase relationship (from 0 to 360 degrees) of the selected trace to the reference trace, followed by an accuracy qualifier. (Refer to page 2-93 for qualifier definitions.)

```
PHA?
PHASE 1.064E-2,EQ
```

PIN8 <*link*>:<*arg*>

External I/O Commands

PIN8 specifies parameters for printers that support standard Epson 8-pin Bit Image Graphics commands, such as the Tektronix 4644 and Epson EX-800.

FORMat:	**DRA**ft | **HIR**es | **RED**uced	

FORMAT selects the output format. HIRES shows front panel intensified regions by dithering icon and text backgrounds and increasing foreground saturation. DRAFT prints black-on-white background except for selected icons or text which are printed white-on-black background. REDUCED is a quarter-size version of DRAFT and prints black-on-white background only.

Note: Use FORMAT:HIRES for IBM Proprinter and Epson RX80 printers.

```
PIN8 FORM:DRA
```

PORt:	**CENTR**onics | **GPI**b | **RS232**	

PORT specifies the output port for the plotter.

```
PIN8 POR:CENTR
```

PIN24 <*link*>:<*arg*>

External I/O Commands

PIN24 specifies parameters for printers that support extended Epson 24-pin Dot Graphics commands, such as the Epson LQ-1500.

FORMat:	**DRA**ft | **HIR**es | **RED**uced	

FORMAT selects the output format. HIRES shows front panel intensified regions by dithering icon and text backgrounds and increasing foreground saturation. DRAFT prints black-on-white background except for selected icons or text which are printed white-on-black background. REDUCED is a quarter-size version of DRAFT and prints black-on-white background only.

```
PIN24 FORM:DRA
```

PORt:	**CENTR**onics | **GPI**b | **RS232**	

PORT specifies the output port for the plotter.

```
PIN24 POR:CENTR
```

POWeron?

Miscellaneous/System Commands

Query Only. POWERON? returns the total number of times the instrument has been powered on.

```
POW?
POWERON 149
```

PP?

Measurement Commands

Query Only. PP? returns the peak-to-peak voltage value (i.e., the difference between the MAX? and MIN? measurement values), followed by an accuracy qualifier. (Refer to page 2-93 for qualifier definitions.)

```
PP?
PP 5.72E-1,EQ
```

REMove {**ALL**Trace | **TRA**ce <*ui*> | <*qstring*>}

Set Only. REMOVE discards existing data and the trace definitions to remove traces from the display. If a trace is also stored in memory, the stored trace is not removed. (Use the DELETE command to remove stored traces.)

	ALLTrace	

ALLTRACE removes all displayed traces. It is not an error to specify ALLTRACE when no traces are defined.

```
REM ALL
```

	TRAce <*ui*>	1 to 8

TRACE <*ui*> removes the specified trace from the display only, not from memory.

```
REM TRA7
```

	<*qstring*>	

The <*qstring*> argument removes the trace labeled <*qstring*> from the display only, not from memory. Wildcard characters are interpreted. (Refer to page 2-86 for wildcard definitions.)

```
REM 'SAMPLE16'
```

RHOPos <*ui*> <*NRx*>

Channel/Vertical Commands

Sets the rho calconstant on the specified trace. RHOPOS is used only if you need to precisely adjust the YUNit conversion from volts to rho.

```
RHOP2 1.08
```

Query Note: RHOPOS <*ui*>? returns the rho calconstant for the specified trace in <*NR3*> form. RHOPOS? returns the rho calconstant for all defined traces in numeric order.

RHOZero

Cursor Commands

Set Only. Calibrates the rho scale of the selected trace. The average value of the points between the two cursors is used.

```
RHOZ
```

RISetime?

Measurement Commands

Query Only. RISETIME? returns the transition time of a rising– pulse edge, from the PROXIMAL to DISTAL level, followed by an accuracy qualifier. (Refer to page 2-93 for qualifier definitions.)

```
RIS?
RISETIME 7.922E-9,EQ
```

RMS?

Measurement Commands

Query Only. RMS? returns the true root mean square voltage, followed by an accuracy qualifier. (Refer to page 2-93 for qualifier definitions.)

```
RMS?
RMS 3.516E-1,EQ
```

RQS {ON|OFF}

Status and Event Commands

RQS determines the instrument response to events
detected during instrument operation. With RQS ON, the instrument asserts SRQ after an event; with RQS set to OFF, it does not. The power-on default for GPIB is RQS set to ON.

RQS is meaningless for the RS-232-C port; the RQS command is always set to OFF for RS-232-C.

```
RQS ON
```

RS232 <*link*>:<*arg*>

External I/O Commands

RS232 sets parameters for the RS-232-C interface.

BAUd:	<*NRx*>	110,150,300,600,1200, 2400,4800,9600,19200

BAUD sets both the transmit and receive baud rates.

Note: Set the baud rate on the instrument before setting the baud rate on the controller.

```
RS232 BAU:9600
```

DELAy:	<*NRx*>	0 to 60 seconds

Sets the minimum delay from receipt of a query to its response. Minimum granularity is 1 ms (1.0E–3).

```
RS232 DELA:5.0E-3
```

RS232 <link>:<arg> (cont.)

ECHo:	ON | OFF	

ECHO determines whether characters are echoed on the controller screen.

Note: You cannot send binary data to the instrument when ECHO is set to ON.

```
RS232 ECH:ON
```

EOL:	CR | CRLf | LF | LFCr	

EOL selects the end of line output message terminator:

CR	Carriage return
LF	Line feed
CRLF	Carriage return followed by line feed
LFCR	Line feed followed by carriage return

End of Line (EOL) Terminators

All of the above are accepted as an input message terminator.

```
RS232 EOL:CRL
```

FLAgging:	SOFt | HARd | OFF	

FLAGGING controls I/O flagging. SOFT uses XON (DC1) and XOFF (DC3) handshaking. HARD uses the DTR and CTS control lines. Both SOFT and HARD flagging halt input when the buffer is three-quarters full, and restart input when the buffer is one-quarter full. OFF means there is no transmission control.

Note: SOFT flagging is usually not used with binary transfers because the binary data may contain unintended XON or XOFF controls.

```
RS232 FLA:SOF
```

RS232 <link>:<arg> (cont.)

PARity:	**ODD** | **EVEN** | **NON**e	

PARITY sets the parity used for all RS-232-C data transfers. The instrument generates parity on output data and checks the parity on input data. An input parity error produces event code 653, "RS-232-C input parity error."

```
RS232 PAR:EVEN
```

STOPBits:	<NRx>	1, 1.5, 2

STOPBITS selects the number of transmission stop bits sent with each character to identify the end of data.

```
RS232 STOPB:1.5
```

VERBose:	**ON** | **OFF**	

When VERBOSE is set to ON, the instrument returns error and warning messages to the controller at the time they occur. When VERBOSE is set to OFF, the controller must query the instrument for event messages.

```
RS232 VERB:ON
```

S

SAMid?[< *alpha* > [< *ui* >]]

Status and Event Commands

Note: Possible Alpha values for the 11801A are A through D, for SM-11 Multi-channel units, and M for the mainframe. The Alpha value for the CSA 803 is always M, for mainframe.

Query Only. Returns the model number of the sampling head for all installed channels or for the channels of the specified mainframe. SAMid? returns the odd-numbered channel of each pair.

```
SAM? M
SAM M1:"SD-24",M3:"SD-24"
```

SELect {TRAce < *ui* > | < *qstring* > }

Trace and Settings Commands

SELECT specifies the trace used by AUTOSET, measurement and cursor commands. By default, the most recently created trace is the selected trace until changed with SELECT.

	TRAce < *ui* >	0 to 8

The valid SELECT TRACE < *ui* > *setting* range is 1 to 8. However, SELECT? returns TRACE0 when no traces are defined. You can send SELECT TRACE0 to the instrument without an error; it is ignored.

```
SEL TRA8
```

	< *qstring* >	

< *qstring* > designates the trace labeled with < *qstring* > as the selected trace.

```
SEL 'SAMPLE1'
```

SET?

Data Transfer Commands

Query Only. SET? returns front panel settings to the controller in ASCII or binary format, depending on the state of the ENCDG SET command.

Note: SET? is *not* query-only. You can send settings back to the instrument (with some restrictions) to restore a previously-defined instrument state. However, the header SET is used only when sending binary data.

ASCII SET? Response. SET? returns strings of instrument commands separated by semicolons. The following is an excerpt of a SET? response:

```
SET?
REMOVE ALLTRACE;GRATICULE XU-
NIT:SECONDS,YUNIT:VOLTS;
CHM1 OFFSET:0.0E+0,
SENSITIVITY:2.0E-1, SMOOTH-
ING:ON,TDRDELAY:-3.91552E-1, ...
```

Binary SET? Response. SET? returns binary data in the following format:

<bblock> ::= % <byte cnt> <settings> <checksum>

where *<byte cnt>* is a two-byte integer (MSB first) giving the length in bytes of the remainder of the binary block, including checksum; *<settings>* are binary-encoded data; and *<checksum>* is an 8-bit, twos complement of the modulo 256 sum of *<byte cnt>* and *<settings>* data.

Sending Settings Back to the Oscilloscope. Send settings as a complete set; do not edit or modify the data. For ASCII settings, simply send the entire set of strings. The binary SET? response returns the SET header at the beginning of the response; you must include the SET header when sending binary settings to the instrument.

SETSeq {**ON**|**OFF**}

Trace and Settings Commands

SETSEQ controls the sequencing of front panel settings. When SETSEQ is set to ON, the settings are sequenced and the RECALL FPNEXT command recalls the next set of stored front panel settings from memory.

Note: If SETSEQ is set to ON and all stored settings are deleted, SETSEQ is set to OFF.

```
SETS ON
```

SPEaker {**ON**|**OFF**}

Miscellaneous/System Commands

SPEAKER controls the instrument audio feedback (i.e., whether you hear a click when you touch the front panel).

```
SPE ON
```

SRQMask <*link*>:{**ON**|**OFF**}

Status and Event Commands

SRQMASK controls the reporting of selected classes of events, regardless of the state of the RQS command. If an SRQMASK link is set OFF, that class of events is not reported. At power-on, all SRQMASK links are set to ON except ABSTOUCH, IDPROBE, and USER. The following table lists all SRQMASK links, their meanings, and associated event code(s).

SRQMASK Links

Link	Meaning	Event Code(s)
CMDerr:	Controls reporting of command errors	100–199
EXErr:	Controls reporting of execution errors	200–299
EXWarn:	Controls reporting of execution warnings	500–599
INErr:	Controls reporting of internal errors	300–399
INWarn:	Controls reporting of internal warnings	600–699
OPCmpl:	Controls reporting of operation-complete events	450, 460–464, 473–475
USEr:	Controls whether the RQS icon is displayed and whether RQS icon touches are reported	403

```
SRQM ABS:ON
```

STAT? [MEAN | STDDev | NCUrrent]

Measurement Commands

Query Only. STAT returns for the <*meas*> specified by STATISTICS, the mean, standard deviation and number of <*meas*> samples used in the computation or optionally just one of these. A qualifier is returned at the end of the response. The qualifiers are:

EQ	All <*meas*> values used had an EQ qualifier
UN	Some <*meas*> values did not have an EQ qualifier
ER	Most or all <*meas*> values had an ER qualifier.

Note: <*meas*> values with an ER qualifier are not used to compute statistics.

```
STAT?
STAT MEAN:2.252E-10,EQ,STDD:
4.2E-13,EQ,NCU:128,EQ
```

STATHist <*link*>

Measurement Commands

STATHIST provides a number of query links to access the statistical information created by the Histogram function. Refer also to the HISTOGRAM command.

? **HIST**.pt		

HIST.PT returns the number of sample points processed into the histogram data.

```
STATH? HIST
STATHIST HIST:PT:79195239
```

? **NWF**m		

NWFM returns the number of traces processed into the histogram data.

```
STATH? NWF
STATHIST NWFM:197610
```

STATHist <*link*> (cont.)

? MEAN		

MEAN returns the statistical mean value for the histogram data.

```
STATH? MEAN
STATHIST MEAN:2.970E-3
```

? RMSDev		

RMSDEV returns the RMS (standard deviation) value for the histogram data.

```
STATH? RMSD
STATHIST RMSDEV:3.310822E-1
```

? PP		

PP returns the peak-peak measurement for the histogram data.

```
STATH? PP
STATHIST PP:7.999844E-1
```

? SIGMA1		

SIGMA1 returns the percentage of points in the histogram that are within the area that is one STD of the MEAN.

```
STATH? SIGMA1
STATHIST SIGMA1:2.931126E+1
```

? SIGMA2		

SIGMA2 returns the percentage of points in the histogram that are within the area that is two STDs of the MEAN.

```
STATH? SIGMA2
STATHIST SIGMA2:1.0E+2
```

STATHist <*link*> (cont.)

? SIGMA3		

SIGMA3 returns the percentage of points in the histogram that are within the area that is three STDs of the MEAN.

```
STATH? SIGMA3
STATHIST SIGMA3:1.0E+2
```

STATIstics <*link*>:<*arg*>

Measurement Commands

On the selected trace, specifies the <*meas*> and number of samples used to compute the mean and standard deviation. The <*meas*> must be on the MSLIST for the specified trace.

MEAS:	<*meas*> | NONe	

MEAS Selects the <*meas*> on which to compute statistics. NONE clears the selected measurement.

```
STATI MEAS:PP
```

N:	<*NRx*>	2 to 128

N Sets the number of samples on which to compute the mean and standard deviation.

```
STATI N:25
```

RESET		

Resets the statistics counter and begins collecting data again.

```
STATI RESET
```

STByte?

Status and Event Commands

Query Only, RS-232-C Only. STBYTE? enables an RS-232-C controller to read the status byte of the current RS-232-C event by mimicking a GPIB serial poll at the RS-232-C port. STBYTE? is not valid at the GPIB port.

Note: The status byte is defined in the section on Event Reporting later in this document

```
STB?
STBYTE 2
```

Note: In the above example, the 2 indicates an operation-complete event with RQS set to OFF.

STD[< *sui* >]? *(11801A only)*

Trace and Settings Commands

Query Only. STD < *sui* > ? returns the links and arguments of the four component commands required to define the saved trace description < *sui* > : TRACE, WIN, MSLIST, and MPARAM. If < *sui* > is not specified, the response is given in order of the saved trace description number. The range of < *sui* > is 9 to MAXTRANUM.

Note: Main record trace descriptions do not include the WIN response.
STD < *ui* > ? responds in the following order:

TRACE < *ui* > DESCRIPTION: < q*string* > ,
WFMCALC: < *arg* > ;

WIN < *ui* > MODE: < *arg* > , TRACK: < *arg* > ,
POS: < *NR3* > , LMODE: < *arg* > , LEVEL: < *NRx* > ,
TRANS: < *NR1* > , SLOPE: < *arg* > ,
FILTERING: < *NRx* > , TOPLINE: < *NRx* > ,
BASELINE: < *NR3* > , ABSLEVEL: < *NR3* > ;

MSLIST < *ui* > {EMPTY | < *meas* > [, < *meas* > . . .];

MPARAM < *ui* > MMODE: < *arg* > ,MLEVEL-
MODE: < *arg* > ,MTRACK: < *arg* > ,BASELINE:
< *NR3* > ,TOPLINE: < *NR3* > ,MESIAL: < *NR3* > ,
PROXIMAL: < *NR3* > ,DISTAL: < *NR3* > ,
DAINT: < *arg* > ,SNRATIO: < *NR3* > ,LMZONE:
< *NR1* > ,RMZONE: < *NR1* > ,MSLOPE: < arg > ,
MFILTERING: < *NR1* > ,MTRANS: < *NR1* > ,REF-
TRACE: < *arg* > ,REFBASELINE: < *NR3* > ,
REFTOPLINE: < *NR3* > ,REFMESIAL: < *NR3* > ,
REFSNRATIO: < *NR3* > ,REFLMZONE: < *NR3* > ,
REFRMZONE: < *NR3* > ,REFSLOPE: < *arg* > ,REF-
FILTERING: < *NR3* > ,REFXSITION: < *NR1* > ,RE-
FLEVEL: < *NR3* >

STOList?

Trace and Settings Commands

Query Only. STOLIST? returns a list of all stored traces, or EMPTY if there are no stored traces.

```
STOL?
STOLIST STO2,STO9,STO56,STO200
```

STONum?

Trace and Settings Commands

Query Only. STONUM? returns the number of traces stored in memory.

```
STON?
STONUM 4
```

STORe [<*link*> :] <*arg*>

Trace and Settings Commands

Set Only. STORE saves front panel settings (FPS) in nonvolatile RAM. STORE also copies a displayed trace to memory; the trace is not removed from the display.

STORE Constraints: You cannot store an XY trace. An existing STO <*ui*> location can be overwritten only if the record lengths of the new and stored traces are the same; the previous trace data is destroyed. If the previously stored trace was a component of a displayed trace, the displayed trace changes to include the newly stored trace.

FPS <*ui*> | <*qstring*>	1 to 10

Set Only. FPS <*ui*> stores the current front panel settings tagged with the specified number or <*qstring*> label. If <*ui*> is an existing FPS number, or if the label identifies an existing FPS number, the new data overwrites the previous data. If the label does not identify an existing FPS number, the data is stored in the next available FPS number with that label assigned to it. Wildcard characters are not interpreted. (Refer to page 2-86 for the definition of wildcards.)

```
STOR FPS5
```

STORe [<*link*>:]<*arg*> (cont.)

TRAce<*ui*>:	**STO**<*ui*> | <*qstring*> | **STD**<*ui*>	

Set Only. TRACE<*ui*> stores a copy of the TRACE<*ui*> trace in memory at the location specified either by STO<*ui*> or by the <*qstring*> label. Wildcard characters are not interpreted. If the label identifies an existing STO location, the new data overwrites the previous location. If the label does not identify an existing STO location, the data is stored in the next available STO location with that label assigned to it.

The TRACE<*ui*> range is 1 to 8. The STO<*ui*> range is 1 to 256.

For the *11801A only*, TRACE<*ui*>:STD<*ui*> creates a saved trace description with the characteristics of the specified TRACE<*ui*>. The range for STD<*ui*> is 9 to MAXTRANUM.

```
STOR TRA1:STO10
```

<*qstring*>:	**STO**<*ui*>	1 to 256

Set Only. <*qstring*> stores a copy of the labeled trace identified by <*qstring*> in memory at the location specified by STO<*ui*>. (Wildcard characters are not interpreted.)

TBCalmode { **FAS**t | **HIP**rec | **OFF** | **ONCE** }

Calibration Commands

Selects either a faster, lower precision on-line time base calibration procedure (FAST), or a slower, higher precision calibration (HIPREC). ONCE performs a single calibration in the last mode selected (either FAST or HIPREC) then sets the TBCALMODE to OFF. The initialized default is FASt mode.

```
TBC HIP
```

TBMain *<link>:<arg>*;
TBWin *<link>:<arg>*

Time Base/Horizontal Commands

TBMAIN sets the Main time base parameters and TBWIN sets the Window time base parameters. Both commands use the same links and arguments.

LENgth:	*<NRx>*	512, 1024 ... 4096 5120

LENGTH sets the selected time base to the specified record length, scaled in points per trace.

```
TBM LEN:1024; TBW 512
```

TIMe:	*<NRx>*	1E–12 to 5E–3

TIME sets the horizontal scale in 1 ps (1E–12) intervals. However, 1 ps/div is only possible when the record LENgth is 1024 or less. The range must also meet this formula:

min interval $\leq$ (TIMe * 10 / *round record length*) $\leq$ *max interval*

TBMain <*link*>:<*arg*>;
TBWin <*link*>:<*arg*> **(cont.)**

where *min interval* is 10 fs (10E–15), *max interval* is 100 µs (100E–6), and *round record length* is the nearest multiple of 500 to the current value of LENgth (except 4096 is rounded up to 5000.) The minimum value for TIMe is:

1 ps ≤ *min interval* * *round record length* / 10

The maximum value for TIMe is:

5 ms ≥ *max interval* * *round record length* / 10

Note: TBWin TIMe ≤ TBMain TIMe.

```
TBW TIM:5.0E-9
```

? XINcr	<*NR3*>

Query Only. Returns the sample interval of the selected time base. Units are seconds per point, feet per point, or meters per point.

```
TBW? XIN
TBWIN XINCR:1.0E-10
```

Calculating *Duration*. *Duration* is used when calculating the range of other commands, such as MAINPOS.

Use the following formula for *main duration*:

(TBMAIN XINCR) * (TBMAIN LENGTH – 1)

Use the following formula for *window duration*:

(TBWIN XINCR) * (TBWIN LENGTH – 1)

TEK4692

External I/O Commands

TEK4692 specifies parameters for the Tektronix 4692 color graphics copier and Tektronix 4693D color wax printer operating in 4692 emulation mode.

COLor:	**DEFA**ult	

Set Only. COLOR:DEFAULT assigns default copier colors to the instrument color index as shown below.

Default TEK4692 Color Assignments

Color Index	4692 Color	Color Index	4692 Color
0	4095 (0xFFF)	4	2364 (0x93C)
1	0 (0x000)	5	1020 (0x3FC)
2	3945 (0xF69)	6	2457 (0x999)
3	1776 (0x6F0)	7	3840 (0xF00)

Note: Refer to page 2-22 for the color index.

```
TEK4692 COL:DEFA
```

COLor <*ui*>:	<*NRx*>	(Range below)

COLOR <*ui*> assigns copier colors to the instrument color index. The COLOR <*ui*> range is 0 to 7. Copier color range (<*NRx*>) is 0 to 4095.

```
TEK4692 COL3:3840
```

TEK4692 (cont.)

Examples of 4692 Index Coding

4692 Color		Maps to
4095	(0xFFF)	White
240	(0x0F0)	Green
4080	(0xFF0)	Yellow
15	(0x00F)	Purple
0	(0x000)	Black
255	(0x0FF)	Blue
3840	(0xF00)	Red

Note: RGB color charts are included in the *4692 Color Graphics Copier Device Driver Development Guide* (Tektronix part no. 070-4818-00).

DIRection:	**HOR**iz | **VER**t	

DIRECTION selects the printing orientation. HORIZ prints rows left to right and from top to bottom. VERT prints columns bottom to top and from left to right.

```
TEK4692 DIR:VER
```

FORMat:	**DIT**hered | **DRA**ft | **HIR**es | **SCR**een	

Set Only. FORMAT selects the output format. DITHERED modifies print contrast for TEK4692. HIRES shows front panel intensified regions; DRAFT prints monochrome. SCREEN is a one-to-one mapping of 3-bit pixel information. (Use SCREEN for the 4693D printer in 4692 emulation mode.)

```
TEK4692 FORM:DIT
```

PORt:	**CENTR**onics | **GPI**b | **RS232**	

PORT specifies the output port for the printer.

```
TEK4692 POR:CENTR
```

TEK4696

External I/O Commands

TEK4696 specifies parameters for the Tektronix 4696 and Tektronix 4695 color inkjet printers.

COLor:	**DEFA**ult	

Set Only. COLOR assigns default inkjet colors to the instrument color index period:

Default Inkjet Colors Assigned by Color

Color Index	4696 Color	Color Index	4696 Color
0	0	4	5
1	8	5	1
2	4	6	8
3	3	7	6

Note: Refer to page 2-22 for definitions of the color index.

```
TEK4696 COL:DEFA
```

COLor <*ui*>:	<*NRx*>	(Range below)

COLOR assigns inkjet colors to the instrument color index. The COLOR <*ui*> range is 0 to 7. The Printer color range (<*NRx*>) is 0 to 12.

Tthe colors associated with each 4696 Printer color number are listed below:

Colors Associated With 4696 Color Numbers

4696 No.	Actual Color	4696 No.	Actual Color
0	white	7	purple
1	cyan	8	black
2	yellow	9	black & cyan
3	green	10	black & yellow
4	magenta	11	black, cyan, yellow
5	blue	12	black & magenta
6	red		

```
TEK4696 COL3:3
```

TEK4696 (cont.)

DIRection:	**HOR**iz | **VER**t	

DIRECTION selects the printing orientation. HORIZ prints rows left to right and from top to bottom. VERT prints columns bottom to top and from left to right.

```
TEK4696 DIR:HOR
```

FORMat:	**DIT**hered | **DRA**ft | **HIR**es | **RED**uced | **SCR**een	

Set Only. FORMAT selects the output format. DITHERED improves print contrast for TEK4696. HIRES shows front panel intensified regions; DRAFT prints monochrome. REDUCED is a quarter-size version of DRAFT. SCREEN is a one-to-one mapping of 3-bit pixel information.

```
TEK4696 FORM:SCR
```

PORt:	**CENTR**onics | **GPI**b | **RS232**	

PORT specifies the output port for the printer.

```
TEK4696 POR:RS232
```

TEK4697

TEK4697 specifies parameters for the Tektronix 4697 color graphics copier and Tektronix 4693D color wax printer operating in 4692 emulation mode.

COLor:	**DEFA**ult	

Set Only. COLOR:DEFAULT assigns default copier colors to the instrument color index as shown below.

Default TEK4697 Color Assignments

Color Index	4697 Color	Color Index	4697 Color
0	4095 (0xFFF)	4	2364 (0x93C)
1	0 (0x000)	5	1020 (0x3FC)
2	3945 (0xF69)	6	2457 (0x999)
3	1776 (0x6F0)	7	3840 (0xF00)

Note: Refer to page 2-22 for the color index.

```
TEK4697 COL:DEFA
```

COLor <*ui*>:	<*NRx*>	(Range below)

COLOR <*ui*> assigns copier colors to the instrument color index. The COLOR <*ui*> range is 0 to 7. Copier color range (<*NRx*>) is 0 to 4095.

```
TEK4697 COL3:3840
```

TEK4697 (cont.)

Examples of 4697 Index Coding

4697 Color		Maps to
4095	(0xFFF)	White
240	(0x0F0)	Green
4080	(0xFF0)	Yellow
15	(0x00F)	Purple
0	(0x000)	Black
255	(0x0FF)	Blue
3840	(0xF00)	Red

Note: RGB color charts are included in the *4697 Color Graphics Copier Device Driver Development Guide* (Tektronix part no. 070-4818-00).

DIRection:	**HOR**iz | **VER**t	

DIRECTION selects the printing orientation. HORIZ prints rows left to right and from top to bottom. VERT prints columns bottom to top and from left to right.

```
TEK4697 DIR:VER
```

FORMat:	**DIT**hered | **DRA**ft | **HIR**es | **SCR**een	

Set Only. FORMAT selects the output format. DITHERED modifies print contrast for TEK4692. HIRES shows front panel intensified regions; DRAFT prints monochrome. SCREEN is a one-to-one mapping of 3-bit pixel information. (Use SCREEN for the 4693D printer in 4697 emulation mode.)

```
TEK4697 FORM:DIT
```

PORt:	**CENTR**onics | **GPI**b | **RS232**	

PORT specifies the output port for the printer.

```
TEK4697 POR:CENTR
```

TESt [XTNd]

Diagnostics Commands

Set Only. TEST initiates the Self-tests diagnostics or, with the XTND argument, the Extended Diagnostics.

Completion of diagnostics is signaled with either event code 460 or 474, successful completion of tests, or event code 394, completion with failed tests.

Note: TEST destroys all stored traces and user-defined expansion strings created with the DEFINE command, resets the TEXT X:, Y: coordinates to 0,0, and removes user-entered text from the display.

```
TES XTN
```

TEXt [<*link*>:]<*arg*>

Display and Color Commands

Set Only. TEXT writes user defined character(s) to a selected area of the screen. The large selection of characters are shown in Appendix C.

Colored Text. Text can be written to the screen in any of the seven colors normally used for trace and information display. The eighth color is the background color and is not useful for text. The Escaped Character set provides this "color font" capability. Refer to the Escaped Character set in Appendix C.

The following default colors can be used when creating text. The escaped character is listed along with its associated color. The colors can be changed with the COLOR command. All colored text will change accordingly.

Escape Character Default Colors

Escape Character	Color
^[(space)	White
^[!	Rose
^["	Green
^[#	Purple
^[$	Lt Blue
^[%	Grey
^[&	Red

TEXt [<*link*> :] <*arg*> (cont.)

The following example would create a series of words across the screen each having its named color. Single quotes were used to delimit the string.

```
TEX X:1,Y:1,STRING:[ WHITE ^[!ROSE
^["GREEN ^[#PURPLE ^[$LTBLUE'
```

	CLEar	

Set Only. CLEAR removes all user-defined text from the display.

```
TEX CLE
```

STRing:	<*qstring*>	

Set Only. STRING specifies the text that is to be displayed at the X: and Y: coordinates.

```
TEX STR:'Select a tracei
```

X:	<*NRx*>	0 to 49

Set Only. X specifies the horizontal position (X coordinate) of a character in discrete character cells. The range is 0 (left edge of the graticule) to 49 (right edge of the graticule).

```
TEX X:10
```

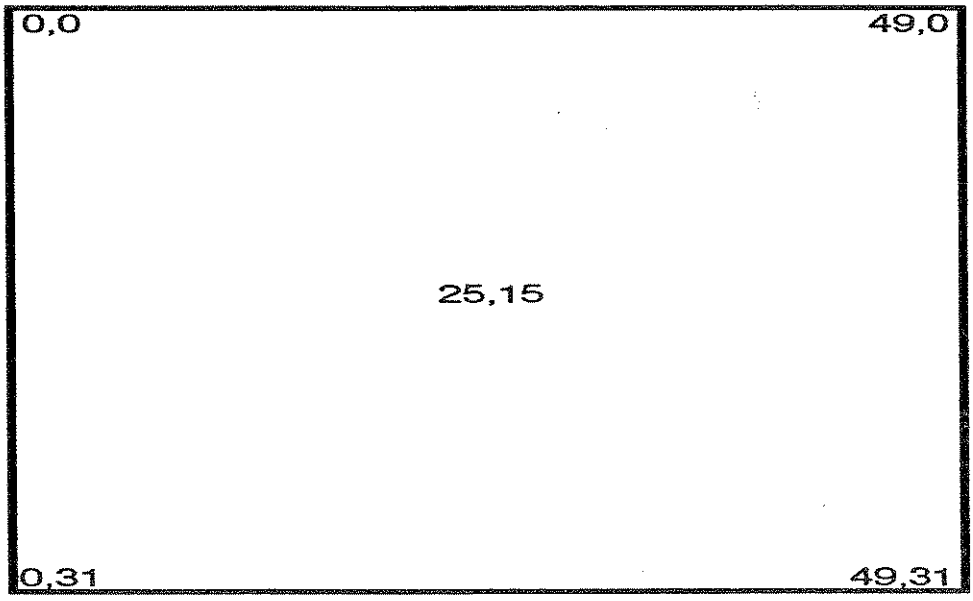
Y:	<*NRx*>	0 to 31

Set Only. Y specifies the vertical position (Y coordinate) of a character in discrete character cells. The range is 0 (top edge of the graticule) to 31 (bottom edge of the graticule).

```
TEX Y:20
```

The figure on the following page shows some TEXT X:,Y: cell coordinates.

TEXt [< *link* > :] < *arg* > **(cont.)**



TEXT X:,Y: Display Coordinates

TIMe < *qstring* >

Miscellaneous/System Commands

TIME sets the time of day on the internal clock.

	< *qstring* >	< *hh* > : < *mm* > : < *ss* >

where < *hh* > is the hour, < *mm* > is minutes, and < *ss* > is seconds in 24-hour format.

```
TIM '17:25:30'
```

TOPBase <*arg*>

Measurement Commands

Selects the method of determining topline and baseline.

	IEEE | **ALTE**rnate	

IEEE uses the standard IEEE histogram method. ALTErnate uses a method that smooths and differentiates trace data before calculations.

TRAce <*ui*> <*link*>:<*arg*>

Trace and Settings Commands

TRACE <*ui*> defines a trace and its characteristics. The range of <*ui*> is 1 to 8.

DEScription:	<*qstring*>	≤ 55 characters

DESCRIPTION defines the source expression(s) of the selected trace.

<*y exp*> [VS <*x exp*>] [ON <*time base*>]

where:

<*y exp*>, <*x exp*>	::=	Expressions
[VS <*x exp*>]	::=	Indicates an XY trace; if omitted, the trace is YT
[ON <*time base*>]	::=	Indicates time base—{MAIN|WIN}; if omitted, defaults to MAIN

<*alpha*> <*ui*>	Channel designator, e.g. M1
STO <*ui*>	Stored trace, the range is 1 to 256
<*NRx*>	Scalar number
<*function*>	Any of the following functions: ABS | AVG | DIFF | ENV | EXP | INTG | FILTER | LN | LOG | SIGNUM | SMOOTH | SQRT

Terms Available to Form Expressions

+ (addition)	* (multiplication)
− (subtraction, negation)	/ (division)

Operators Available to Form Expressions

Note: You cannot use a trace description that consists of only stored or scalar elements as the argument of an AVG or ENV function. You also cannot create a trace with only stored or scalar elements on the WIN1 or WIN2 time base.

```
TRA2 DES:'ENV(M2)';
TRA3 DES:'STO9+M1'
```

XY Trace Considerations. The instrument permits only one acquired XY trace or two unacquired XY traces to be displayed via TRACE <*ui*> DESCRIPTION. (An acquired XY trace description has at least one acquired signal component; an unacquired XY trace description has only stored or scalar components.)

Acquired XY Description	Unacquired XY Description
"M1 VS M2"	"STO50 VS STO12"
"M1 VS STO3"	"STO90 VS 200"

Components of XY Descriptions

In addition, the horizontal and vertical components (<*x exp*> and <*y exp*>) must have the same scaling mode; both must be integer mode or both floating-point mode traces.

? **WFM**Calc	FASt | HIPrec

Query Only. WFMCALC returns whether a trace was created in integer mode (FAST) or floating-point mode (HIPREC). Once a trace is created in one mode, you cannot change the trace to the other mode. (Refer to WFMSCALING command.)

```
TRA2? WFMC
TRACE2 WFMCALC:HIPREC
```

TRAce <*ui*> <*link*>:<*arg*> (cont.)

Query Note: TRACE <*ui*>? returns the links and arguments of the specified trace in the following order:

TRACE <*ui*> DESCRIPTION: <*qstring*>,

TRACE? returns the same information as TRACE <*ui*>? for all defined traces in low-to-high order.

TRAList?

Trace and Settings Commands

Query Only. Returns a list of all defined traces, displayed traces or EMPTY if no traces are defined.

```
TRAL?
TRAL TRA2,TRA3,
```

TRANUm?

Trace and Settings Commands

Query Only. TRANUM? returns the number of traces displayed on the front panel. Range is 0 to 8 in <*NR1*> form.

```
TRANU?
TRANUM 4
```

TRIgger <*link*>:<*arg*>

Trigger Commands

Sets trigger parameters.

HIFreq	**ON** | **OFF**	

When set to ON, HIFREQ selects the high-frequency (5 GHz) trigger. The instrument ignores this command if the trigger prescaler is not installed.

```
TRI HIF:ON
```

TRIgger <*link*>:<*arg*> (cont.)

LEVel:	<*NRx*>	(See below for range)

Sets trigger level only for the EXTernal trigger source or a channel with trigger source capability. Range for this link is normally −1 V to + 1 V. When ATTenuation is X10 and SOUrce is EXTernal, the range is −10 V to + 10 V.

Note: When using EXTCoupling:DC, set LEVel *after* the coupling. If you set the level first, the signal may become too far out of range to trigger. If this happens (i.e., no trigger), you can restore function by sending a DCL (Device Clear) signal.

```
TRI LEV:0
```

MODe:	**AUTO** | **NOR**mal	

Selects triggering mode In NORmal mode, the instrument acquires data only if a valid trigger is found. If not found, trace acquisition halts, freezing the display and halting trace calculation and measurement. In AUTO mode, the instrument is set to normal triggering at the beginning of each sweep. If a valid trigger is not found within 20 ms, the instrument switches to the internal clock. At the end of that sweep, it again waits 20 ms for a valid trigger and the process is repeated.

```
TRI MOD:AUTO
```

SLOpe:	**PLU**s | **MINU**s	

Selects the trigger slope only for an external or channel source.

```
TRI SLO:MINU
```

TRIgger <*link*>:<*arg*> (cont.)

SOUrce:	**EXT**ernal | **INT**ernal | **PRE**scaler | <*alpha*> <*ui*>

Selects the trigger source. EXTERNAL argument selects the external trigger input. INTERNAL selects the internal 200 kHz clock. PRESCALER selects the prescaler trigger input. If your instrument is configured without the prescaller trigger input an event error will be reported. <*alpha*> <*ui*> selects a sampling head channel for sampling heads that support trigger source.

```
TRI SOU:EXT
```

? STAtus	TRG | NOTrg

Query Only. Returns the trigger status. TRG means the time base is triggered. NOTrg means the time base is not triggered.

```
TRI? STA
TRI STA:TRG
```

Query Note: The TRIgger? query returns all links and their arguments, in the following order:

TRI MOD:<*arg*>,STA:<*arg*>, SOU:<*arg*>, LEV:<*NRx*>,SLO:<arg>

U

UID { <link> : <arg> }

Status and Event Commands

UID queries or sets the serial numbers of the instrument and its sampling heads.

? <alpha> <ui>	<qstring>

Query Only. Returns the serial number of the specified channel.

```
UID? M3
UID M3:"B010100"
```

? MAIn:	<qstring>	≤ 10 characters

MAIN queries the serial number of the instrument.

```
UID? MAI
UID MAIN:"B010400"
```

Query Note: The UID? query returns its links in the following order:

UID MAIN:<qstring>,M<ui>;<qstring>

UNDEF { <qstring> | ALL }

Miscellaneous/System Commands

Set Only. UNDEF removes from the list of logical names defined by DEF either the specified logical name or ALL defined logical names.

```
UNDEF 'TB?'
```

UNDershoot?

Measurement Commands

Query Only. UNDERSHOOT? returns the difference between the BASELINE value and the minimum signal amplitude, given as a percentage of the difference between the TOPLINE and BASELINE values, and followed by an accuracy qualifier. (Refer to page 2-93 for qualifier definitions.)

```
UND?
UNDERSHOOT 2.334E-9,EQ
```

UPTime?

Miscellaneous/ Commands

Query Only. UPTIME? returns the total number of hours the instrument has been powered on, in *<NR3>* form.

```
UPT?
UPTIME 1.243E+3
```

V

V1Bar <*link*>:<*arg*>;
V2Bar <*link*>:<*arg*>

Cursor Commands

V1BAR and V2BAR set the absolute position of the vertical bar cursors.

XCOord:	<*NRx*>	(See below for range)

XCOORD positions the first or second vertical bar cursor using the units of the selected trace.

The XCOORD range for a Main trace is from:

MAINPOS to (MAINPOS + 10.22 * TBMAIN TIME)

The XCOCRD range for a Window trace is from:

WINPOS to (WINPOS + 10.22 * TBWIN TIME)

```
V1B XCO:3.8E-4
```

XDIv:	<*NRx*>	−5.12 to +5.10

XDIV positions the first or second vertical bar cursor in graticule divisions. (−5.12 is the left edge of the display.)

```
V2B XDI:-4.1
```

VPCurve {?|NWFMS}

Query Only. VPCURVE transfers all trace records that make up a variable persistence trace. All trace records are transferred using the consecutive CURV? commands separated by semicolons. The EOI is sent after the last trace record. Refer to the CURVE command on page 2-33 for detailed data format information. Also refer to the ENCDG encoding command on page 2-62. VPCURVE? returns

```
VPCURVE NWFMS:<NRx>;CURVE ...;
CURVE...; CURVE...<EOI>
```

NWFMS		

NWFMS returns the current number of trace records that are used to create the variable persistence trace. This is also the number of trace records that would be returned by VPCURVE though more traces may be added to the NWFMS total after this query.

```
VPC? NWFMS
```

W

WAVfrm?

Data Transfer Commands

Query Only. WAVFRM? returns the trace preamble and data points for the trace specified by OUTPUT. WAVFRM? is equivalent to entering: WFMPRE?;CURVE?.

Refer to the WFMPRE and CURVE commands for information on what is returned by WAVFRM?

WFMPre <*link*>:<*arg*>

Data Transfer Commands

WFMPRE transmits a Tek Codes and Formats preamble for each trace sent to or from the controller. The preamble is generated by the instrument and provides scaling and other information for the trace data transferred with the CURVE command. The trace sent to the instrument with CURVE is specified with the INPUT command. The trace returned to the controller with CURVE? is specified with the OUTPUT command.

Note: Sending WFMPRE implicitly deletes any existing trace data at INPUT STO <*ui*> and replaces it with null (unacquired) data points. If STO <*ui*> is the sole component of a displayed trace (e.g., TRA3 DES:"STO22"), that trace is removed from the display. If STO <*ui*> is one component of a complex trace (e.g., TRA4 DES:"STO22+L1"), you cannot send a trace preamble to that INPUT STO <*ui*> location because you cannot delete a stored trace that is part of a complex trace.

XY Note: The instrument does not support stored XY traces. Therefore, although XY traces can be transferred to the controller, they cannot be sent back to the instrument.

WFMPre <link>:<arg> (cont.)

? BIT/nr	16

Query Only. BIT/NR returns the number of bits per binary trace point (always 16).

```
WFMP? BIT
WFMPRE BIT/NR:16
```

? BN.fmt	RI

Query Only. BN.FMT returns the Tek Codes and Formats binary number format, which is always RI (right-justified, twos-complement integers).

```
WFMP? BN.
WFMPRE BN.FMT:RI
```

? BYT/nr	2

Query Only. BYT/NR returns the binary data field width (which is always two bytes per binary trace point).

```
WFMP? BYT/
WFMPRE BYT/NR:2
```

? BYT.or	LSB | MSB

Query Only. BYT.OR returns the transmission order of binary trace data returned by CURVE?. The transmission order is set by the BYT.OR command.

```
WFMP? BYT
WFMPRE BYT.OR:LSB
```

WFMPre <*link*>:<*arg*> (cont.)

? **CRV**chk	CHKsm0 | NONe | NULl

Query Only. CRVCHK returns the type of checksum appended to the trace data after it is returned by a CURVE? query. The types are defined below.

Checksum Types

Type	Meaning
CHKSM0	Standard Tek Codes and Formats checksum. Returned when ENCDG WAVFRM is set to BINARY and OUTPUT is set to STO <*ui*>.
NONE	No checksum appended. Returned when ENCDG WAVFRM is set to ASCII.
NULL	Zero checksum value appended. Returned when ENCDG WAVFRM is set to BINARY and OUTPUT is set to TRACE <*ui*>.

```
WFM? CRV
WFMPRE CRVCHK:CHKSM0
```

? **ENC**dg	ASCii | BINary

Query Only. ENCDG returns the state of the data encoding set with the ENCDG command. This link is equivalent to an ENCDG? WAVFRM query.

```
WFMP? ENC
WFMPRE ENCDG:ASCII
```

LABel:	<*qstring*>	≤ 10 characters

LABEL is the optional label associated with the trace. If the trace has no label, querying WFMPRE? LABEL returns a null string (LABEL:" ")

```
WFMP LAB:'SAMPLE3'
```

WFMPre <*link*>:<*arg*> (cont.)

NR.pt:	**512 | 1024 | 2048 | 4096 | 5120**	

NR.PT specifies the number of points in the transmitted trace record. It is normally the same as {TBMAIN|TBWIN} LENGTH.

Note: If OUTPUT specifies a displayed trace when Pan/Zoom mode is set to ON and HMAG is greater than 1 for that trace, then the value returned by WFMPRE? NR.PT equals the number of points displayed on the front panel, rather than the value of {TBMAIN|TBWIN} LENGTH.

For example, under the following conditions the WFMPRE? NR.PT query returns 512:

```
TRACE1 DESCRIPTION:"M1 ON MAIN"
TBMAIN LENGTH:2048
ADJTRACE1 PANZOOM:ON,HMAG:4
OUTPUT TRACE1
```

```
WFMP NR.:1024
```

? PT.fmt:	**ENV | Y | XY**	

Query Only. PT.FMT indicates the point format of the trace data. ENV applies to YT traces transmitted as maximum-minimum point-pairs, with the maximum point transmitted first. Y indicates a YT trace, which returns one ASCII or binary data point for each point in the trace record. XY is an XY trace which returns an X, Y point-pair for each point in the trace record.

Note: You cannot send XY traces to the instrument.

```
WFMP PT.:Y
```

WFMPre <*link*>:<*arg*> (cont.)

RHOFactor:	<*NRx*>	

A generalization of the concept of TDR polarity. For trace expressions (i.e., M1–M2), RHOFactor produces rho values from –1 to + 1.

RHOPos:	<*NRx*>	

A calculated value used in the conversion from volts to rho. When the reference voltage changes, baseline correction will calculate a new RHOPos.

? WFId	STO <*ui*> | TRAce <*ui*>

Query Only. WFID identifies the source trace for this preamble. (The information returned by this link is the same as that returned by an OUTPUT? query for a single trace.)

```
WFMP? WFI
WFMPRE WFID:TRACE7
```

XINcr:	<*NRx*>	≥ 1.0E–14 sec / pt

XINCR specifies the horizontal sample interval of a YT trace. The range begins at 1 ps per point.

```
WFM XIN:1.0E-9
```

XMUlt	<*NRx*>

XMULT specifies the vertical scale factor, in XUNIT per unscaled data point value, of the horizontal component of an XY trace.

Note: For XMULT usage, refer to the trace scaling formulas in the CURVE entry.

```
WFMPRE XMULT:1.0E-1
```

WFMPre <link>:<arg> (cont.)

? XUN It	DIVS | FEEt | INChes | METers | SEConds | VOLts

Query Only. XUNIT returns the horizontal units (X-axis) of the trace data at the time of trace creation. For XY traces, XUNIT is the vertical units of the horizontal component. XUNIT returns DIVS when the units of the trace are indeterminate or undefined.

```
WFMP? XUN
WFMPRE XUNIT:SECONDS
```

XZEro:	<*NRx*>	-1E-15 to 1E+15

XZERO specifies the number of seconds of pre-trigger or post-trigger of a YT trace; or specifies the vertical offset of the horizontal component of an XY trace.

```
WFMP XZE:2.5E-2
```

YMUlt:	<*NRx*>	1E-15 to 1E+15

YMULT specifies the vertical scale factor, in YUNIT per unscaled data point value, of a YT trace, or specifies the vertical scale factor, in YUNIT per unscaled data point value, of the vertical component of an XY trace. (YMULT is equal to the vertical units-per-division, such as volts, divided by 6400.)

```
WFM YMU:1.5625E-4
```

YUNit	**DIVS | RHO | VOL**ts

YUNIT specifies the vertical units (Y-axis) of the trace data (YT or XY) to be transferred via the remote interfaces. Querying YUNIT returns DIVS when the units of the trace are indeterminate or undefined.

```
WFM YUN:VOL
```

WFMPre <*link*>:<*arg*> (cont.)

YZEro:	<*NRx*>	-1E+15 to 1E+15

YZERO specifies the vertical offset of a YT trace, or specifies the vertical offset of the vertical component of an XY trace.

```
WFM YZE:6.25E+1
```

Query Note: The WFMPRE? query returns its links in the following order:

WFMPRE,BIT/NR:16,
BN.FMT:RI,BYT/NR:2,BYT.OR:<*arg*>,
CRVCHK:<*arg*>,ENCDG:<*arg*>,
NR.PT:<*NR1*>,PT.FMT:<*arg*>,WFID:<*arg*>,
XINCR:<*NR3*>,XMULT:<*NR3*>,
XUNIT:<*arg*>,XZERO:<*NR3*>,
YMULT:<*NR3*>,YUNIT:<*arg*>,
YZERO:<*NR3*>,LABEL:<*qstring*>

WFMScaling {**FOR**ce | **OPT**ional}

Trace and Settings Commands

WFMSCALING determines whether a new trace is created in floating-point mode (FORCE) or integer mode when possible (OPTIONAL). When WFMSCALING is set to FORCE, all traces except single channel acquisitions (e.g., M1, M2), are created in floating-point mode. Integer mode implies that no floating-point operations are used to display or position traces. Certain trace types require floating-point mode or integer mode, regardless of the WFMSCALING setting. (For example, stored traces are stored in floating-point mode.)

Note: traces created in integer mode have faster display update rates.

You can display the following trace description types in integer mode:

Trace Types Displayable in Integer Mode

Description	Example
A channel (<*slot*> <*ui*>)	M1
Average of a channel	AVG(M1)
Envelope of a channel	ENV(M1)
Inversion of a channel	−M1
Addition of channels	M1 + M2
Subtraction of channels	M1−M2
Combinations of the above	AVG(M1 + M3)

The following are some of the trace types that you cannot display in integer mode:

Traces Not Displayable in Integer Mode

trace Type	Example
Stored trace	STO11
Scalar value	2.23
Stored trace plus scalar value	STO11 + 2.23
Any trace using division	M1 /M3
Any trace using multiplication	M1 * M2
Any trace using a floating-point function	DIFF(M4)

WFMS OPT

WIDth?

Measurement Commands

Query Only. WIDTH? returns the time a signal takes to go from one MESIAL voltage level crossing to the next MESIAL crossing of the opposite slope, followed by an accuracy qualifier. (Refer to page 2-93 for qualifier definitions.)

```
WID?
WIDTH 5.009E-7,EQ
```

WIN <*ui*> <*link*>:<*arg*>

Trace and Settings Commands

WIN sets and queries window parameters for the specified trace. WIN is not valid if the specified trace is a Main trace.

? ABS Level	<*NRx*>,<*qual*>

Query Only. ABSLEVEL returns the specified autowindow transition level in absolute units (volts or rho).

The <*qual*> qualifiers have the following meanings:

TF	Transition Found
OR	Out of Range
NF	Not Found

```
WIN2? ABSL
WIN2 ABSL:-1.7,TF
```

? BASeline	<*NRx*>

Query Only. BASELINE returns the baseline for an autowindow in non-tracking relative mode.

```
WIN2? BAS
WIN2 BAS:7.8E-1
```

WIN <ui> <link>:<arg> (cont.)

FILtering:	<*NRx*>	1 to 7

Sets the hardware filtering constant (the minimum number of adjacent samples which must cross the threshold level before a transition is considered valid) for autowindow placement.

```
WIN2 FIL:6
```

LEVel:	<*NRx*>	(See below for range)

Sets the transition level for autowindow placement. The range for LEVel when LMOde is RELative is 0% to 100%. When LMOde is ABSolute, the range is −2 V to +2 V.

```
WIN2 LEV:65
```

LMOde:	**ABS**olute | **REL**ative	

Selects the transition level mode for autowindow placement. In RELative mode, the transition level is a percent of the Main trace amplitude. In ABSolute mode, the transition level is specified in absolute units (volts).

```
WIN2 LMO:REL
```

LOCate		

Set Only. Causes the instrument to perform a one-time track of the specified trace, which must be a non-tracking autowindow.

```
WIN2 LOC
```

WIN <ui> <link>:<arg> (cont.)

MODe:	AUTO | MANual	

Selects the mode of setting the horizontal position. In AUTO mode, the instrument locates the window using the FILtering, LEVel, LMOde, SLOpe, and TRANS links. In MANual mode, the window position is specified by the POS link.

```
WIN2 MOD:AUTO
```

POS:	<NRx>	(See below for range)

Sets the horizontal position. The Window trace must be completely contained within the Main record. Therefore, the valid range for this link depends on HREfpt, MAINPos, *main duration* and *window duration*.

Range when HREfpt is LEFt:

MAINPos to
MAINPos + *main duration* − *win duration*

Range when HREfpt is CENter:

MAINPos − *main duration* /2 + *win duration* /2 to
MAINPos + *main duration* /2 − *win duration* /2

Range when HREfpt is RIGht:

MAINPos − *main duration* + *win duration* to
MAINPos

```
WIN2 POS:1.35E-1
```

SLOpe:	PLUs | MINUs	

Selects the slope of the transition for autowindow placement.

```
WIN2
```

WIN <ui> <link>:<arg> (cont.)

? TOPline	<NR3>

Query Only. Returns the topline for an autowindow in non-tracking relative mode.

```
WIN2? TOP
WIN2 TOP:1.5E+0
```

TRACK:	ON | OFF	

Sets autowindow tracking to ON or OFF. When ON, the Window position is determined by the instrument each time before it acquires the Window record. When tracking is OFF, the window is located only when MODe is changed to AUTO, or when the LOCate link is sent.

```
WIN2 TRACK:ON
```

TRANS:	<NRx>	1 to 15

Sets the number of the transition for autowindow placement.

```
WIN2
```

WINList?

Trace and Settings Commands

Query Only. Returns the trace number(s) of the defined Window traces.

```
WINL?
WINLIST WIN2,WIN6
```

WINNum?

Trace and Settings Commands

Query Only. Returns the number of defined Window traces.

```
WINN?
WINNUM 2
```

Y

YTEnergy?

Measurement Commands

Query Only. YTENERGY? returns the energy (in squared volts) under the curve of a YT trace, followed by an accuracy qualifier. (Refer to page 2-93 for qualifier definitions.)

```
YTE?
YTENERGY 8.442E-7,EO
```

YTMns_area?

Measurement Commands

Query Only. YTMNS_AREA? returns the difference between the area under a YT curve above a specified reference level, and the area under the curve below that level, followed by an accuracy qualifier. (Refer to page 2-93 for qualifier definitions.) The reference level is set with the REFLEVEL command.

```
YTM?
YTMNS_AREA 3.332E-7,EO
```

YTPls_area?

Measurement Commands

Query Only. YTPLS_AREA? returns the total, absolute value of all areas between a YT trace and a reference level set with REFLEVEL, followed by an accuracy qualifier. (Refer to page 2-93 for qualifier definitions.)

```
YTP?
YTPLS_AREA 1.052E-9,EO
```

Event Reporting

Status Byte Codes

Ten status conditions are reported in the status byte — five normal events and five error or warning events.

The following table gives the status byte codes in binary and in decimal with both RQS set to ON and set to RQS OFF. The bits in the status byte are active high. Bits 1 through 4 are system status bits. Bit 5 is the busy status bit and is asserted only during diagnostics. Bit 6 is the error bit. Bit 7 ("R" in the table) indicates whether RQS is set to ON (high) or OFF (low). Bit 7 is low until specifically enabled with the RQS command. Bit 8 is always low.

Binary and Decimal Status Byte Codes

	BINARY		DECIMAL	
	Status Bits		RQS	RQS
Condition	**8765**	**4321**	**ON**	**OFF**
Normal:				
No Status to Report	0000	0000	0	0
Power On	0R00	0001	65	1
Operation Complete	0R00	0010	66	2
User Request	0R00	0011	67	3
Abnormal:				
Command Error	0R10	0001	97	33
Execution Error	0R10	0010	98	34
Internal Error	0R10	0011	99	35
Execution Warning	0R10	0101	101	37
Internal Warning	0R10	0110	102	38

Event Code Reporting

GPIB and RS-232-C controllers read event codes with the EVENT? query command. The query response depends on whether LONGFORM is set to ON or OFF. When LONGFORM is set to OFF, the event query returns:

EVENT <*NR1*>

where <*NR1*> is the event code.

When LONGFORM is set to ON, the event query returns:

EVENT <*NR1*>,<*qstring*>

where <*NR1*> is the event code and <*qstring*> is the description from the event table.

Formatting Codes

In some cases, the text in the tables contains formatting codes. The formatting codes expand as follows:

Formatting Symbols

Symbol	Expand With:
%a	Channel number or unsigned integer
%A	Argument name
%b	Mainframe indicator
%B	Mainframe verbose indicator
%O	Option description string
%t	Six words of data describing a mainframe malfunction intended for use by field and factory service.

For example, the following set command causes an execution warning, event code 550:

```
CHM1 OFFSET: 5000
```

Event code 550 has this entry in the table of Execution Warnings on page 3-9:

Code	Event Description
550	%A out of range–limit set

If LONGFORM is set to OFF, the event is reported:

```
EVENT? <EOI>
EVENT 550
```

If LONGFORM is set to ON, the response is:

```
EVENT? <EOI>
EVENT 550,"OFFSET OUT OF RANGE —
LIMIT SET"
```

Command Errors

The following table lists the error codes and descriptions for command errors (SRQMASK CMDERR:ON). The status byte for all command errors is **97** with RQS set to ON and **33** with RQS set to OFF.

Command Errors

Code	Event Description
108	Checksum error in binary block transfer
109	Illegal byte count value on a binary block transfer
154	Invalid number input
155	Invalid string input
156	Symbol not found
157	Syntax error
160	Expression too complex
161	Excessive number of points in binary CURVE data input
162	Excessive number of points in ASCII CURVE data input
163	No input terminator seen
164	Binary block input not allowed with ECHO ON
167	Insufficient data to satisfy binary block byte count
168	Unsupported constant
169	Unsupported function

Execution Errors

The following table lists the error codes and descriptions for execution errors (SRQMASK EXERR:ON). The status byte for all execution errors is **98** with RQS set to ON and **34** with RQS set to OFF.

Execution Errors

Code	Event Description
200	No masks defined
201	Display type not Color Graded
202	DC coupling not allowed
203	I/O buffers full
204	No selected measurement
205	%A out of range—value ignored
206	No mask point near enough to delete
207	No such mask
208	Illegal number of mask vertices
209	Mask point not on screen
210	Illegal mask number
211	Setting cursor 1 to zero not permitted on XY trace
212	Waveform not scaled in Rho units
213	Set zero Rho allowed only with Rho units
214	Invalid filter argument
215	Illegal color number
216	Unsupported printer function
217	Not enough memory for alternate topline–baseline calculations
218	No logical names defined
219	Logical name not defined
220	WFMPRE links not allowed with multiple trace output
221	That XY waveform has incompatible components
222	Record length too long for Non–Normal display type
223	Can not select Rho units
224	Selecting volts – baseline correction disabled
225	Baseline correction failed to find –1 rho point
226	Rho scaling failed to find –1 rho point – Can not calibrate rho scales
228	Waveform expression too long
229	No windows are defined

Execution Errors (Cont.)

Code	Event Description
230	Illegal window number
231	No such window
232	Measurements not available in current mode have been removed
233	Measurement not found in measurement list
234	Calculated or stored traces cannot be measured in hardware mode
235	Waveform cannot be measured in software mode
236	No reference channel selected
237	Waveform is not a non–tracking autowindow
238	Window is not an autowindow
239	Improper version number
240	Incompatible firmware versions
241	Too many acquisitions
242	Requested display type not allowed when calculating histograms, masks or statistical measurements
243	That function is disabled by a hardware strap
244	Histogram/mask system not active
245	No stored waveforms
246	Can't sequence settings
247	No settings defined
248	Misuse of AVG/ENV function
249	Illegal use of trace positioning function
250	No traces defined
251	Illegal trace number
252	Illegal stored settings number
253	Stored setting does not exist
254	Histograms and masks are not allowed on calculated or stored traces
255	Out of memory
256	Label not found
257	Illegal stored waveform number
258	Duplicate label
259	No labels defined
260	Label not defined
261	Trace is not a window
262	Waveform must have acquired components
263	Illegal channel number
264	No further XY waveforms may be defined

Execution Errors (Cont.)

Code	Event Description
265	Illegal DATE/TIME
266	DEF expansion overflow
267	Illegal DEF string
268	Illegal DEF recursion
269	No such trace
270	No such stored waveform
271	No such DEF
272	Channel %b%a is not capable of this function
273	No such FPS
274	Automatic window mode not allowed for calculated traces
275	%B not installed
276	No variable persistence traces defined
277	No histogram selected for trace
278	Measurement system not active
279	Bad trace description
280	Invalid smoothing argument
281	Can't delete active stored waveform
282	Can't store trace
283	Can't clear nonacquired waveform
284	Can't change setting for a tracking/autowindow
285	Can not perform measurements on XY waveforms
286	Too many measurements specified
287	Hardcopy absent or off line
288	Inappropriate trigger level units
289	Split cursors not permitted on XY trace
290	Current reference measurement failed
291	TEXT not permitted when acquired XY trace is active
292	No sampling heads are installed in %B
293	No sampling heads are installed
294	Dual graticules not permitted with XY trace
295	%O option not installed
296	Nonacquired XY waveforms not allowed in Non–Normal display type
297	Panzoom may not be enabled
298	Panzoom may not be disabled
299	CONDACQ function not available
2000	Statistical measurements only allowed in Color Graded mode

Execution Errors (Cont.)

Code	Event Description
2001	Only one waveform per axis can be measured in statistics mode
2002	%O not available
2003	Smoothing is not permitted when either channel in a head is in Random Data mode

Internal Errors

The following table lists the error codes and descriptions for internal errors (SRQMASK INERR:ON). The status byte for all internal errors is **99** with RQS set to ON and **35** with RQS set to OFF.

Internal Errors

Code	Event Description
386	Minor time base calibration problem: %a
387	Time base calibration failed: %a
388	Time base calibration failed at powerup: %a
390	Time base system error: %t
391	Time base processor interrupt: %t
393	Acquisition memory fault: %a
394	Test completed and failed
395	Error detected in acquisition system #%a: %t

System Events

This table lists the event codes, SRQMASK links, status byte values (with RQS set to ON and RQS set to OFF), and descriptions for normal system events; other than operation complete and calibration due events. Operation Complete events and Calibration Due events are described in separate tables.

System Events

Code	SRQM	Status Bytes		Event Description
400	–none–	0	0	System function normal
401	–none–	65	1	Power on
403	USE	67	3	Front panel RQS icon selected

System Events (Cont.)

Code	SRQM	Status Bytes		Event Description
441	USE	67	3	Store constants complete on selected channel
442	USE	67	3	Calibrate ONCE complete
443	USE	67	3	Blowby calibration complete
444	USE	67	3	Loop gain calibration complete
445	USE	67	3	Delay adjust calibration complete
446	USE	67	3	Delay adjust measurement on reference channel complete
447	USE	67	3	Offset null calibration complete
448	USE	67	3	TDR amplitude calibration complete
449	USE	67	3	All calibration complete on selected channel

Operation Complete Events

This table lists the codes and descriptions for Operation Complete events (SRQMASK OPCMPL:ON). The status byte is **66** with RQS set to ON and 2 with RQS set to OFF.

Operation Complete Events

Code	Event Description
450	Conditional acquire complete
451	Front panel setting recall complete
452	Initialization complete
460	Test completed and passed
461	Calibration completed and passed
462	Hardcopy complete
463	Measurements complete
464	Autoset complete
465	Locate complete
466	Color Graded traces cannot be output on an HPGL device
467	Offset calibration complete

Execution Warnings

This table lists the codes and descriptions for execution warnings (SRQMASK EXWARN:ON). The status byte is **101** with RQS set to ON and **37** with RQS set to OFF.

Execution Warnings

Code	Event Description
550	%A out of range — limit set
551	Insufficient data to satisfy binary block byte count
552	Checksum error in binary block transfer
553	Window trigger source set equal to main trigger source
554	No trace defined – Autoset terminated
555	Binary curve odd data byte discarded
556	No active acquisitions — acquisition remains stopped
557	Hardcopy aborted
558	Blowby Calibration failed – can't find reference step
559	Calibration failed – unable to achieve requested value on channel %b%a
560	Front panel setting incomplete: Out of memory or change in configuration
561	Offset null calibration failed – check channel termination
562	Delay adjust calibration failed – can't find transition
563	TDR amplitude calibration failed – can't find TDR pulse
564	Autoset failed, bad trigger level
565	Autoset vertical failed
566	Horizontal size set to default
567	Reftrace defaulted to selected trace
568	Reference trace invalid
569	Loop gain calibration failed – Can't find reference step
570	Delay adjust measurement on reference channel failed – Can't find transition
571	Nothing to abort

Execution Warnings (Cont.)

Code	Event Description
572	Waveform record length(s) reduced to 512 for Non–Normal display type
573	Persistence time reduced due to lack of memory
574	All front panel settings currently defined – setting not saved
575	Incompatible firmware versions
576	Smoothing has been turned off for both channels in the head; smoothing is incompatible with Random Data mode

Internal Warnings

This table lists the codes and descriptions for internal warnings (SRQMASK INWARN:ON). The status byte is **102** with RQS set to ON and **38** with RQS set to OFF.

Internal Errors

Code	Event Description
653	RS-232-C input parity error
654	RS-232-C input framing error
655	RS-232-C input buffer overrun
656	Internal table search failed
657	Nonvolatile RAM completely reset — probable battery failure
658	Nonvolatile RAM front panel settings lost — instrument ID data retained
661	Channel %b%a powered up during mainframe operation – Cycle power to utilize
662	Channel %b%a powered down during mainframe operation – Cycle power to continue
663	Change in channel %b%a configuration
664	Channel %b%a was not maintained at desired calibration delay value
665	Teksecure Erase Memory Status: Erased; Instrument ID, on–time, and number of power–ups retained
666	Nonvolatile RAM front panel settings and saved trace descriptions lost; instrument ID data retained

Index

This index contains all headers, links, and topics arranged alphabetically. Capital letters are listed ahead of lowercase letters. Links are followed by their command header in parentheses ( ). Query-only links show the query form of the header.

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MANUAL CHANGE INFORMATION

At Tektronix, we continually strive to keep up with the latest electronic developments by adding circuit and component improvements to our instruments as soon as they are developed and tested.

Sometimes, due to printing and shipping requirements, we can't get these changes immediately into printed manuals. Hence, your manual may contain new change information on the following pages.

A single change may affect several sections. Since the change information sheets are carried in the manual until all changes are permanently entered, some duplication may occur. If no such change pages appear following this page, your manual is correct as printed.

Tektronix CSA 803 and 11801A Functional Command Summary

Key

< >	::=	Defined item
{ }	::=	One item from group required
[ ]	::=	Optional item(s)
( )	::=	Grouped items
|	::=	Exclusive or
FPS	::=	Front Panel Setting
<*NR1*>	::=	Signed integer
<*NR2*>	::=	Floating point, no exponent
<*NR3*>	::=	Floating point with exponent
<*NRx*>	::=	{<*NR1*> | <*NR2*> | <*NR3*>}
<*ui*>	::=	Unsigned integer
<*alpha*>	::=	{M}
<*curve data*>	::=	Tek Codes&Formats binary block data (<*bblock*>) or ASCII data points (<*NR1*>[{,<*NR1*>}...])
<*qstring*>	::=	Quoted string
?	::=	Query-only header or link

HEAder	Header, link, or argument; minimum spelling in **CAP**s; links followed by **:**
RESponse	Query response; minimum spelling in CAPs

Commands are set/query unless otherwise noted. Query-only headers are followed by a **?**. Query-only links are indicated with a leading **?**; the argument(s) in parentheses after the colon show the response form. (**Note:** Do not enter the colon when querying a link.)

Acquisition Commands

ACQNum?
ACQuisition {**RUN**|**STOP**}
AUTOSet [<*link*>:]<*arg*>
  HORiz: {**ON**|**OFF**}
  MODe: {**EDG**e|**PER**iod}
  STARt *(Set-only)*
  TRIgger:{**ON**|**OFF**}
  UNDO *(Set-only)*
  VERt: {**ON**|**OFF**}
AVG {**ON**|**OFF**}
CONDacq <*link*>:<*arg*>
  ? REMAining: (<*NR1*>)
  TYPe: {**AVG**|**AVG**.env|**CONT**inuous|**ENV**|**GRAD**ed|**HIST**.pt|**MASK**|**RECO**rd|**WAV**frm}
  WAIT
ENV {**ON**|**OFF**}
NAVg <*NRx*>
NENv <*NRx*>
NGRAded <*NRx*>
NHISt.pt <*NRx*>
NWAVfrm <*NRx*>

Calibration Commands

CALibrate <*alpha*> <*ui*> <*link*>:<*arg*>
  AUTO:{**BLO**wby|**DAD**j|**LOO**pgain|**OFFS**et|**ONU**ll|**TDRA**mplitude} *(Set-only)*
  BLOwby: <*NRx*>
  CSTore:{**ALL**|**BLO**wby|**LOO**pgain|**OFFS**et|**ONU**ll|**TDRA**mplitude} *(Set-only)*
  DADj: <*NRx*>
  DREcall:{**ALL**|**BLO**wby|**LOO**pgain|**OFFS**et|**ONU**ll|**TDRA**mplitude} *(Set-only)*
  LOOpgain: <*NRx*>
  ONUll: <*NRx*>
  TDRAmplitude: <*NRx*>
  UREcall:{**ALL**|**BLO**wby|**LOO**pgain|**URE**calc|**ONU**ll|**TDRA**mplitude} *(Set-only)*
DAFiltering <*alpha*> <*ui*>:{**1**|**2**|**3**|**4**|**5**|**6**|**7**}
DAMeasref <*alpha*> <*ui*> *(Set-only)*
DCOmp {**ON**|**OFF**}
DIV2 {**ON**|**OFF**}
TBCalmode {**FAS**t|**HIP**rec|**OFF**|**ONCE**}

Channel/Vertical Commands

CH<*alpha*><*ui*> <*link*>:<*arg*>
  ? ATTenuation: (X1|X2|X5|X10)
  CDElay: <*NRx*>
  DATAType: {**REP**etitive|**RAN**dom}
  EXTAttention: <*NRx*>
  OFFSet: <*NRx*>
  SENsitivity: <*NRx*>
  SMOothing:{**ON**|**OFF**}
  TDRDelay: <*NRx*>
  TDRPolarity:{**PLU**s|**MINU**s}
  TDRState:{**ON**|**OFF**}
  TOFfset: <*NRx*>
RHOPos{<*ui*> <*NRx*>|**?**}

Cursor Commands

CURSor <*link*>:<*arg*>
  ? MODE: (**ABS**olute|**REL**ative)
  REAdout: {**ON**|**OFF**}
  REFErence: **TRA**ce<*ui*>
  SETZero: {**CUR1**|**CLE**ar} *(Set-only)*
  TYPe: {**HBA**rs|**PAI**red|**SPL**it|**VBA**rs}
  ? XUNit: (DIVS|FEEt|INCh es|METers|SEConds|VOLts)
  ? YUNit: (DIVS|RHO|VOLts)
  ? ZEROPoint: <*NRx*>
DOT1Abs; **DOT2A**bs <*link*>:<*arg*>
  ? OHMS: <*NR3*>
  ? OQUal: {EQ|LT|GT|UN|ER}
  PCTg: <*NRx*>
  XCOord: <*NRx*>
  XDIv: <*NRx*>
  ? XQUal: (EQ|LT|GT|UN)
  ? YCOord: (<*NR3*>)
  ? YDIv: (<*NR3*>)
  ? YQUal: (EQ|LT|GT|UN)
  PCTg: <*NRx*> *(Set-only)*
  XCOord: <*NRx*> *(Set-only)*
  XDIv: <*NRx*> *(Set-only)*
H1Bar; **H2B**ar <*link*>:<*arg*>
  ? OHMS: <*NR3*>
  ? OQUal: {EQ|LT|GT|UN|ER}
  YCOord: <*NRx*>
  YDIv: <*NRx*>
RHOZero *(Set-only)*
V1Bar; **V2B**ar <*link*>:<*arg*>
  ? OQUal: {EQ|LT|GT|UN|ER}
  XCOord: <*NRx*>
  XDIv: <*NRx*>

Data Transfer Commands

ABBwfmpre {**ON**|**OFF**}
BYT.or {**LSB**|**MSB**}
CURVe [**CRVI**d:{**STO**|**TRA**ce}<*ui*>,]<*curve data*>
ENCdg <*link*>:<*arg*>
  DISPlay: {**ASC**ii|**BIN**ary}
  HISTogram: {**ASC**ii|**BIN**ary}
  SET: {**ASC**ii|**BIN**ary}
  WAVfrm:{**ASC**ii|**BIN**ary}
INPut {**STO**<*ui*>|<*qstring*>}
OUTput {**ALLSTO**|**ALLTRA**ce|<*qstring*>|**STO**<*ui*>|**STO**<*ui*>**TOSTO**<*ui*>|**TRA**ce<*ui*>|**TRA**ce<*ui*>**TOTRA**ce<*ui*>}
SET{**?**|<*bblock*>}
VPCurve **?**[**NWFMS**]
WAVfrm?
WFMpre <*link*>:<*arg*>
  ? BIT/nr: (16)
  ? BN.fmt: (RI)
  ? BYT/nr: (2)
  ? BYT.or: (LSB | MSB)
  ? CRVchk: (CHKsm0| NONe| NULl)
  ? ENCdg: (ASCii| BINary)
  LABel: <*qstring*>
  NR.pt: <*NRx*>
  ? PT.fmt: (ENV|Y| XY)
  RHOFactor: <*NRx*>
  RHOPos: <*NRx*>
  ? WFId: (STO<*ui*>|TRAce<*ui*>)
  XINcr: <*NRx*>
  XMUlt: (<*NR3*>)
  XUNit: (DIVS|FEEt|INCh es|METers|SEConds|VOLts)
  XZEro: <*NRx*>
  YMUlt: <*NRx*>
  YUNit: {**DIVS**|**RHO**|**VOL**ts}
  YZEro: <*NRx*>

Diagnostic Commands

DIAg?
TESt [**XTN**d] *(Set-only)*

Display and Color Commands

COLor<*ui*> <*link*>:<*arg*>
  DEFAult
  HUE: <*NRX*>
  LIGhtness: <*NRx*>
  SATuration: <*NRx*>
COLor **DEF**Ault
DISPlay <*link*>:<*arg*>
  CLEar *(Set-only)*
  C.WIN Bottom; **C.WIN**Left; **C.WIN**Right; **C.WIN**Top: <*NRx*>
  ? DATA
  D.WIN Bottom; **D.WIN**Left; **D.WIN**Right; **D.WIN**Top: <*NRx*>
  GRADFirst: {**ON**|**OFF**}
  GRADScale?
  GRAticule: {**DUA**l|**SIN**gle}
  INTENsity: <*NRx*>
  MODe: {**DOT**s|**VEC**tors}
  ? NR.PT <*NRx*>
  PERSistence: <*NRx*>
  REFREsh: {**O**| <*NRx*>}
  STATistics: {**HIST**ogram|**MASK**}
  TYPe:{**INF**inite|**NOR**mal|**VAR**iable|**GRAD**ed}
  ? XSIze: <*NRx*>
  ? YSIze: <*NRx*>
DSYS {**ON**|**OFF**}
GRAticule <*link*>:<*arg*>
  PROPvelocity: <*NRx*>
  REFAmplitude: <*NRx*>
  XUNit:{**FEE**t|**INC**hes|**MET**ers|**SEC**onds}
  YUNit:{**VOL**ts|**RHO**}
HISTOgram <*link*>:<*arg*>
  CLEar *(Set-only)*
  C.WIN Bottom; **C.WIN**Left; **C.WIN**Right> **C.WIN**Top: <*NRx*>
  ? DATA
  D.WIN Bottom; **D.WIN**Left; **D.WIN**Right **D.WIN**Top: <*NRx*>
  HISTScaling: {**LIN**ear|**LOG10**}
  ? NR.PT <*NRx*>
  TYPe: {**HOR**iz|**VER**t|**NON**e}
MASK<*ui*> <*link*>:<*arg*>
  C.Points:{<*NRx*>,<*NRx*>[,<*NRx*>,<*NRx*>]}
  D.Points:{<*NRx*>,<*NRx*>[,<*NRx*>,<*NRx*>]}
  DELete *(Set-only)*
  D.Point:{<*NRx*>,<*NRx*>[<*NRx*>,<*NRx*>]}
  ? NCOunt: <*NRx*>
  ? NR.PT: <*NRx*>
MASK[<*ui*>]**?**
MASKStat <*link*>:<*arg*>
  CLEar *(Set-only)*
  COUnt: {**ON**|**OFF**}
  ? NWFm <*NRx*>
  ? TOTal <*NRx*>

External I/O Commands

ALTinkjet *<link>:<arg>*
- **DIRection:** {**HORiz**|**VERt**}
- **FORMat:** {**DRAft**|**HIRes**|**REDuced**}
- **PORt:** {**CENTRonics**|**GPIb**|**RS232**}

BITMap *<link>:<arg>*
- **DATACompress:** {**ON**|**OFF**}
- **DATAFormat:** {**BINary**|**BINHex**}
- **DIRection:** {**HORiz**|**VERt**}
- **FORMat:** {**DIThered**|**DRAft**|**HIRes**|**REDuced**|**SCReen**}
- **PORt:** {**CENTRonics**|**GPIb**|**RS232**}

COPy [*<link>:*]*<arg>*
- **ABOrt** *(Set-only)*
- **FORMat:** {**DIThered**|**DRAft**|**HIRes**|**REDuced**|**SCReen**}
- **KILl** *(Set-only)*
- **PRInter:** {**ALTinkjet**|**BITMap**|**HPGl**|**PIN8**|**PIN24**|**TEK4692**|**TEK4696**}
- **STARt** *(Set-only)*
- **? STAtus:** (IDLe|SPOoling|PRINTing)

DEBug {**GPIb**|**RS232**}:{**ON**|**OFF**}

FEOI *(Set-only)*

HPGl *<link>:<arg>*
- **COLor***<ui>*:*NRx*>
- **COLor: DEFAult**
- **FORMat:** {**DRAft**|**HIRes**|**SCReen**}
- **PORt:** {**CENTRonics**|**GPIb**|**RS232**}

PIN8; PIN24 *<link>:<arg>*
- **FORMat:** {**DRAft**|**HIRes**|**REDuced**}
- **PORt:** {**CENTRonics**|**GPIb**|**RS232**}

RS232 *<link>:<arg>*
- **BAUd:** *<NRx>*
- **DELAy:** *<NRx>*
- **ECHo:** {**ON**|**OFF**}
- **EOL:**{**CR**|**CRLf**|**LF**|**LFCr**}
- **FLAgging:**{**SOFt**|**HARd**|**OFF**}
- **PARity:**{**ODD**|**EVEN**|**NONe**}
- **STOPBits:***<NRx>*
- **VERBose:**{**ON**|**OFF**}

TEK4692 *<link>:<arg>*
- **COLor***<ui>*: *<NRx>*
- **COLor: DEFAult** *(Set-only)*
- **DIRection:** {**HORiz**|**VERt**}
- **FORMat:** {**DIThered**|**DRAft**|**HIRes**|**SCReen**}
- **PORt:** {**CENTRonics**|**GPIb**|**RS232**}

TEK4696 *<link>:<arg>*
- **COLor***<ui>*:*NRx*>
- **COLor: DEFAult** *(Set-only)*
- **DIRection:** {**HORiz**|**VERt**}
- **FORMat:** {**DIThered**|**DRAft**|**HIRes**|**SCReen**}
- **PORt:** {**CENTRonics**|**GPIb**|**RS232**}

Label and Text Commands

LABAbs *<link>:<arg>*
- **PCTg:** *<NRx>*
- **XCOord:***<NRx>*
- **YDIv:** *<NRx>*

LABel *<link>:<arg>*
- **DELete:**{**ALL**|**FPS**[*<ui>*]|*<qstring>*|**STO**[*<ui>*]|**TRAce**[*<ui>*]} *(Set-only)*
- **DISPlay:**{**ON**|**OFF**}
- **FPS**[*<ui>*:*<qstring>*]
- **MODe:** {**AUTO**|**MANual**}
- **STO**[*<ui>*:*<qstring>*]
- **TRAce**[*<ui>*:*<qstring>*]

LABREL *<link>:<arg>* *(Set-only)*
- **PCTg:***<NRx>* *(Set-only)*
- **XCOord:***<NRx>* *(Set-only)*
- **YDIv:***<NRx>* *(Set-only)*

TEXt [*<link>:*]*<arg>* *(Set-only)*
- **CLEar** *(Set-only)*
- **STRing:***<qstring>* *(Set-only)*
- **X:***<NRx>* *(Set-only)*
- **Y:***<NRx>* *(Set-only)*

Measurement Commands

AMPlitude?

EXTInction?

COMpare {**ON**|**OFF**}

JITter?

MEAS [*<ui>* [**TO***<ui>*]]?

<meas> ::= (**CROss**|**FALltime**|**FREq**|**MAX**|**MEAN**|**MID**|**MIN**|**OVErshoot**|**PDElay**|**PERiod**|**PHAse**|**PP**|**RISetime**|**RMS**|**UNDershoot**|**WIDth**|**YTEnergy**|**YTMns_area**|**YTPls_area**)

*<meas>***?**

MPAram*<ui>* *<link>:<arg>*
- **BASeline:** *<NRx>*
- **DAInt:** {**WHOle**|**SINgle**}
- **DISPERSION:** {**PP**|**RMS**dev}
- **DISTal:** *<NRx>*
- **JITT.HISTPT?** *<NRx>*
- **JITTLEvel?** *<NRx>*
- **JITTLOcation:** {**CROss**|**MESial**}
- **LMZone:** *<NRx>*
- **MESial:** *<NRx>*
- **MFIltering:** *<NRx>*
- **MLEvelmode:** {**ABSolute**|**RELative**}
- **MMOde:** {**HW** | **SW**}
- **MSLOpe:** {**PLUs** | **MINUs**}
- **MTRack:** {**ON** | **OFF**}
- **MTRANs:** *<NRx>*
- **NOIS.histpt?** *<NRx>*
- **NOISLocation:** {**TOPline**|**BASeline**}
- **PROXimal:** *<NRx>*
- **REFBaseline:** *<NRx>*
- **REFFiltering:** *<NRx>*
- **REFLEvel:** *<NRx>*
- **REFLMzone:** *<NRx>*
- **REFMesial:** *<NRx>*
- **REFRmzone:** *<NRx>*
- **REFSLope:** {**PLUs** | **MINUs**}
- **REFSNratio:** *<NRx>*
- **REFTOpline:** *<NRx>*
- **REFTRace: TRAce***<ui>*
- **REFXsition:** *<NRx>*
- **RMZone:** *<NRx>*
- **SNRatio:** *<NRx>*
- **TOPline:** *<NRx>*

MSLIst*<ui>* {**EMPty**|*<meas>*[, *<meas>*]}

MSNum[*<ui>*]**?**

MSYs {**ON**|**OFF**}

NOIse?

REFSEt {*<ui>* *<link>:<arg>*|**?**}
- **CURRent:**{*<meas>*|**ALL**} *(Set-only)*
- *<meas>*:*<NRx>*

STAT? [MEAN|STDDev|NCURrent]

STATHist *<link>*
- **? HIST.pt:** *<NRx>*
- **? NWFm:** *<NRx>*
- **? MEAN** *<NRx>*
- **? RMSDev** *<NRx>*
- **? PP** *<NRx>*
- **? SIGMA**{**1**|**2**|**3**} *<NRx>*

STATistics *<link>:<arg>*
- **MEAS:**{*<meas>*|**NONe**}
- **N:***<NRx>* *(Set-only)*
- **RESet** *(Set-only)*

TOPBase {**IEEE**|**ALTErnate**}

Miscellaneous/System Commands

ABSTouch *<NRx>*,*<NRx>*

BCOrrection {**ON**|**OFF**}

DATE *<qstring>* = *"dd-mon-yy"*

DEFine *<qstring>*,*<qstring>* *(Set-only)*

DSYmenu?

FPAnel {**ON**|**OFF**}

FPUpdate {**ON**|**OFF**}

INIt *(Set-only)*

LONgform {**ON**|**OFF**}

POWeron?

SPEaker {**ON**|**OFF**}

TIMe *<qstring>* = "hh:mm:ss"

UNDEF {*<qstring>*|**ALL**} *(Set-only)*

UPTime?

Status and Event Commands

EVENT?

ID?

NMAsk: *<NRx>*

RQS {**ON**|**OFF**}

SAMid? [*<alpha>*[*<ui>*]]

SRQMask *<link>:<arg>*
- **CMDerr:** {**ON** | **OFF**}
- **EXErr:** {**ON** | **OFF**}
- **EXWarn:** {**ON** | **OFF**}
- **INErr:** {**ON** | **OFF**}
- **INWarn:** {**ON** | **OFF**}
- **OPCmpl:** {**ON** | **OFF**}
- **USEr:** {**ON** | **OFF**}

STByte?

UID[**?***<alpha>* *<ui>*|[**?**]**MAIn:**]*<qstring>*

Time Base/Horizontal Commands

MAINPos *<NRx>*

TBMain; TBWin *<link>:<arg>*
- **LENgth:***<NRx>*
- **TIMe:***<NRx>*
- **? XINcr:** (*<NR3>*)

Trace and Settings Commands

ADJtrace*<ui>* *<link>:<arg>*
- **COLor:***<NRx>*
- **GRLocation:** {**UPPer**|**LOWer**}
- **HMAg:** *<NRx>*
- **HPOsition:** *<NRx>*
- **PANzoom:** {**ON**|**OFF**}
- **TRSep:** *<NRx>*
- **VPOsition:** *<NRx>*
- **VSIze:** *<NRx>*

ADJtrace[*<ui>*]**?**

CLEar {**TRAce***<ui>*|*<qstring>*|**ALLTrace**} *(Set-only)*

DELete *<arg>* *(Set-only)*
- {**FPS***<ui>*|*<qstring>*|**STO***<ui>*|**ALLps**|**ALLSTO**|**ALLSTD** *(11801A only)*|**STD***<ui>* *(11801A only)*}

DISPNum?

FPSList?

FPSNum?

HREfpt {**CENter**|**LEFt**|**RIGht**}

MAXTranum?

NVRam?

RECall {**FPNext** | **FPS***<ui>*|*<qstring>*| **STD***<ui>*:**TRAce***<ui>* *(11801A only)* } *(Set-only)*

REMove {**TRAce***<ui>*|*<qstring>*|**ALLTrace**} *(Set-only)*

SELect {**TRAce***<ui>*|*<qstring>*}

SETSeq {**ON**|**OFF**}

STD? *(11801A only)*

STOList?

STONum?

STORe [*<link>:*]*<arg>* *(Set-only)*
- {**FPS***<ui>*|*<qstring>*| *(Set-only)*
- **TRAce***<ui>*:{**STO***<ui>*|*<qstring>*| *(Set-only)*
- *<qstring>*[:**STO***<ui>*]| *(Set-only)*
- **STD***<ui>* *(11801A only)*} *(Set-only)*

TRAce*<ui>* *<link>:<arg>*
- **DEScription:***<qstring>*
- **? WFMCalc:** (FASt| HIPrec)

TRAce[*<ui>*]**?**

TRAList?

TRANUm?

WFMScaling {**FORCe**|**OPTional**}

WIN {*<ui>*[*<link>:*]*<arg>*|**?**}
- **? ABSLevel:** (*<NR3>*, (TF|OR|NF))
- **? BASeline:** *<NR3>*
- **FILtering:***<NRx>*
- **LEVel:***<NRx>*
- **LMOde:**{**ABSolute**|**RELative**}
- **LOCate**
- **MODe:**{**AUTO**|**MANual**}
- **POS:***<NRx>*
- **SLOpe:** {**PLUs**| **MINUs**}
- **? TOPline:***<NR3>*
- **TRACK:** {**ON**| **OFF**}
- **TRANS:** *<NRx>*

WINList?

WINNum?

Triggering Commands

TRIgger *<link>:<arg>*
- **ATTenuation:**{**X1**|**X10**} *(11801A only)*
- **EXTCoupling:**{**AC**|**DC**} *(11801A only)*
- **LEVel:***<NRx>*
- **MODe:** {**AUTO**|**NORmal**}
- **SLOpe:** {**PLUs**| **MINUs**}
- **SOURce:** {**EXTernal**|**INTernal**|*<alpha>* *<ui>*|**PREscaler** *(CSA 803 only)*}
- **? STAtus:** (TRG| NOTrg)

Tektronix CSA 803 and 11801A Alphabetic Command Summary

Key

< >	::=	Defined item
{ }	::=	One item from group required
[ ]	::=	Optional item(s)
( )	::=	Grouped items
|	::=	Exclusive or
FPS	::=	Front Panel Setting
<*NR1*>	::=	Signed integer
<*NR2*>	::=	Floating point, no exponent
<*NR3*>	::=	Floating point with exponent
<*NRx*>	::=	{<*NR1*> | <*NR2*> | <*NR3*>}
<*ui*>	::=	Unsigned integer
<*alpha*>	::=	{M}
<*curve data*>	::=	Tek Codes&Formats binary block data (<*bblock*>) or ASCII data points (<*NR1*>[{,<*NR1*>}...])
<*qstring*>	::=	Quoted string
?	::=	Query-only header or link

HEAder	Header, link, or argument; minimum spelling in **CAP**s
RESponse	Query response; minimum spelling in CAPs

Commands are set/query unless otherwise noted. Query-only headers are followed by a **?**. Query-only links are indicated with a leading **?**; the argument(s) in parentheses after the colon show the response form. (**Note:** Do not enter the colon when querying a link.)

A

ABBwfmpre {**ON**|**OFF**}
ABSTouch <*NRx*>,<*NRx*>
ACQNum?
ACQuisition {**RUN**|**STOP**}
ADJtrace <*ui*> <*link*>:<*arg*>
  COLor:<*NRx*>
  GRLocation: {**UPP**er|**LOW**er}
  HMAg: <*NRx*>
  HPOsition: <*NRx*>
  PANzoom: {**ON**|**OFF**}
  TRSep: <*NRx*>
  VPOsition: <*NRx*>
  VSIze: <*NRx*>
ALTinkjet <*link*>:<*arg*>
  DIRection: {**HOR**iz|**VER**t}
  FORMat: {**DRA**ft|**HIR**es|**RED**uced}
  PORt: {**CENTR**onics|**GPI**b|**RS232**}
AMPlitude?
AUTOSet [<*link*>:]<*arg*>
  HORiz: {**ON**|**OFF**}
  MODe: {**EDG**e|**PER**iod}
  STArt *(Set-only)*
  TRIgger:{**ON**|**OFF**}
  UNDO *(Set-only)*
  VERt: {**ON**|**OFF**}
AVG {**ON**|**OFF**}

B

BCOrrection {**ON**|**OFF**}
BITMap <*link*>:<*arg*>
  DATACompress: {**ON**|**OFF**}
  DATAFormat: {**BIN**ary|**BINH**ex}
  DIRection: {**HOR**iz|**VER**t}
  FORMat: {**DIT**hered|**DRA**ft|**HIR**es|**RED**uced|**SCR**een}
  PORt: {**CENTR**onics|**GPI**b|**RS232**}
BYT.or {**LSB**|**MSB**}

C

CALibrate <*alpha*> <*ui*> <*link*>:<*arg*>
  AUTO:{**BLO**wby|**DAD**j|**LOO**pgain|**ONU**ll|**OFFS**et|**TDRA**mplitude} *(Set-only)*
  BLOwby:<*NRx*>
  CSTore:{**ALL**|**BLO**wby|**LOO**pgain|**OFFS**et|**ONU**ll|**TDRA**mplitude} *(Set-only)*
  DADj:<*NRx*>
  DREcall:{**ALL**|**BLO**wby|**LOO**pgain|**OFFS**et|**ONU**ll|**TDRA**mplitude} *(Set-only)*
  LOOpgain:<*NRx*>
  ONUll:<*NRx*>
  TDRAmplitude:<*NRx*>
  UREcall:{**ALL**|**BLO**wby|**LOO**pgain|**OFFS**et|**ONU**ll|**TDRA**mplitude} *(Set-only)*
CH<*alpha*> <*ui*> <*link*>: <*arg*>
  ? ATTenuation: (X1|X2|X5|X10)
  CDElay: <*NRx*>
  DATAtype: {**REP**etitive|**RAN**dom}
  EXTAttention: <*NRx*>
  OFFSet: <*NRx*>
  SENsitivity: <*NRx*>
  SMOothing:{**ON**|**OFF**}
  TDRDelay:<*NRx*>
  TDRPolarity:{**PLU**s|**MINU**s}
  TDRState:{**ON**|**OFF**}
  TOFfset:<*NRx*>
CLEar {**ALLT**race|<*qstring*>|**TRA**ce<*ui*>} *(Set-only)*
COLor<*ui*> <*link*>:<*arg*>
  DEFAult *(Set-only)*
  HUE: <*NRX*>
  LIGhtness: <*NRx*>
  SATuration: <*NRx*>
COLor **DEFA**ult *(Set-only)*
COMpare {**ON**|**OFF**}
CONDacq <*link*>:<*arg*>
  ? REMAining: (<*NR1*>)
  TYPe: {**AVG**|**AVG**.env|**CONT**inuous|**ENV**|**GRA**Ded|**HIST**.pt|**RECO**rd|**WAV**frm}
COPy [<*link*>:]<*arg*>
  ABOrt *(Set-only)*
  FORMat: {**DIT**hered|**DRA**ft|**HIR**es|**RED**uced|**SCR**een}
  KIL *(Set-only)*
  PORt: {**CENTR**onics|**GPI**b|**RS232**}
  PRInter: {**ALT**inkjet|**BITM**ap|**HPGI**|**PIN8**|**PIN24**|**TEK4696**|**TEK4692**}
  STArt *(Set-only)*
  ? STAtus: (IDLe|SPOoling|PRINTing)
CURSor <*link*>:<*arg*>
  ? MODE: (**ABS**olute|**REL**ative)
  REAdout: {**ON**|**OFF**}
  REFErence: **TRA**ce<*ui*>
  SETZero: {**CUR1**|**CLE**ar} *(Set-only)*
  TYPe: {**HBA**rs|**PAI**red|**SPL**it|**VBA**rs}
  ? XUNit: (DIVS|FEEt|INCh es|METers|SEConds|VOLts)
  ? YUNit: (DIVS|RHO|VOLts)
  ? ZERO Point: <*NRx*>
CURVe [**CRVI**d:{**STO**|**TRA**ce}<*ui*>,]<*curve data*>

D

DAFiltering <*alpha*> <*ui*>:{**1**|**2**|**3**|**4**|**5**|**6**|**7**}
DAMeasref <*alpha*> <*ui*> *(Set-only)*
DATE <*qstring*> = "<*dd*>-<*mon*>-<*yy*>"
DCOmp {**ON**|**OFF**}
DEBug {**GPI**b|**RS232**}:{**ON**|**OFF**}
DEFine {<*qstring*>,<*qstring*>|**?**|**?**<*qstring*>}
DELete <*arg*> *(Set-only)*
  {**FPS**<*ui*>|<*qstring*>|**STO**<*ui*>|**ALLF**ps|**ALLSTO**|**ALLSTD** *(11801A only)* |**STD**<*ui*> *(11801A only)* }
DIAg?
DISPlay <*link*>:<*arg*>
  CLEar *(Set-only)*
  C.WIN Bottom; **C.WINL**eft; **C.WINR**ight;
    C.WINTop: <*NRx*>
  ? DATA
  D.WIN Bottom; **D.WINL**eft; **D.WINR**ight;
    D.WINTop: <*NRx*>
  GRAticule: {**DUA**l|**SIN**gle}
  GRADFirst: {**ON**|**OFF**}
  ?GRADScale
  INTENsity: <*NRx*>
  MODe: {**DOT**s|**VEC**tors}
  ? NR.PT <*NRx*>
  PERSistence: <*NRx*>
  REFREsh: (0 <*NRx*>)
  STATIstics: {**HIST**ogram|**MASK**}
  TYPe: {**INF**inite|**NOR**mal|**VAR**iable|**GRA**Ded}
  ? XSIze: <*NRx*>
  ? YSIze: <*NRx*>
DISPNum?
DIV2 {**ON**|**OFF**}
DOT1 Abs; **DOT2**Abs <*link*>:<*arg*>
  ? OHMS: <*NR3*>
  ? OQUal: {EQ|LT|GT|UN|ER}
  PCTg: <*NRx*>
  XCOord: <*NRx*>
  XDIv: <*NRx*>
  ? XQUal: (EQ|LT|GT|UN)
  ? YCOord: (<*NR3*>)
  ? YQUal: (EQ|LT|GT|UN)
DOTTRel; DOT2Rel <*link*>:<*arg*> *(Set-only)*
  PCTg: <*NRx*> *(Set-only)*
  XCOord: <*NRx*> *(Set-only)*
  XDIv: <*NRx*> *(Set-only)*
DSYmenu?
DSYS {**ON**|**OFF**}

E – F

ENCdg <*link*>:<*arg*>
  DISPlay: {**ASC**ii|**BIN**ary}
  HISTogram: {**ASC**ii|**BIN**ary}
  SET: {**ASC**ii|**BIN**ary}
  WAVfrm: {**ASC**ii|**BIN**ary}
ENV {**ON**|**OFF**}
EVENT?
EXTInction?
FEOi *(Set-only)*
FPAnel {**ON**|**OFF**}
FPSList?
FPSNum?
FPUpdate {**ON**|**OFF**}

G – I

GRAticule <*link*>:<*arg*>
  PROPvelocity:<*NRx*>
  REFAmplitude:<*NRx*>
  XUNit:{**FEE**t|**INC**hes|**MET**ers|**SEC**onds}
  YUNit:{**VOL**ts|**RHO**}
H1Bar; **H2**Bar <*link*>:<*arg*>
  ? OHMS: <*NR3*>
  ? OQUal: {EQ|LT|GT|UN|ER}
  YCOord: <*NRx*>
  YDIv: <*NRx*>
HISTOgram <*link*>:<*arg*>
  CLEar *(Set-only)*
  C.WIN Bottom; **C.WINL**eft; **C.WINR**ight>
    C.WINTop: <*NRx*>
  ? DATA
  D.WIN Bottom; **D.WINL**eft; **D.WINR**ight
    D.WINTop: <*NRx*>
  HISTScaling: {**LIN**ear|**LOG10**}
  ? NR.PT <*NRx*>
  TYPe: {**HOR**iz|**VER**t|**NON**e}
HPGl <*link*>: <*arg*>
  COLor<*ui*>: <*NRx*>
  COLor: **DEFA**ult
  FORMat: {**DRA**ft|**HIR**es|**SCR**een}
  PORt: {**CENTR**onics|**GPI**b|**RS232**}
HREfpt {**CEN**ter|**LEF**t|**RIG**ht}
ID?
INIt *(Set-only)*
INPut {**STO**<*ui*>|<*qstring*>}

J

JITter?

L

LABAbs <*link*>:<*arg*>
  PCTg: <*NRx*>
  XCOord: <*NRx*>
  YDIv: <*NRx*>
LABel <*link*>:<*arg*>
  DELete: {**ALL**|**FPS**[<*ui*>]|<*qstring*>|**STO**[<*ui*>]|
    TRAce[<*ui*>]} *(Set-only)*
  DISPlay: {**ON**|**OFF**}
  FPS[<*ui*>:<*qstring*>]
  MODe: {**AUTO**|**MANual**}
  STO[<*ui*>:<*qstring*>]
  TRAce[<*ui*>:<*qstring*>]
LABRel <*link*>:<*arg*> *(Set-only)*
  PCTg: <*NRx*> *(Set-only)*
  XCOord: <*NRx*> *(Set-only)*
  YDIv: <*NRx*> *(Set-only)*
LONgform {**ON**|**OFF**}

M

MAINPos <*NRx*>
MASK<*ui*> <*link*>:<*arg*>
  C.Points:{<*NRx*>,<*NRx*>[,<*NRx*>,<*NRx*>]}
  D.Points:{<*NRx*>,<*NRx*>[,<*NRx*>,<*NRx*>]}
  DELete *(Set-only)*
  D.Point:{<*NRx*>,<*NRx*>[<*NRx*>,<*NRx*>]}
  ? NCOunt: <*NRx*>
  ? NR.PT: <*NRx*>
MASK[<*ui*>]?
MASKStat <*link*>:<*arg*>
  CLEar *(Set-only)*
  COUnt: {**ON**|**OFF**}
  ? NWFm <*NRx*>
  ? TOTal <*NRx*>
MAXTranum?
MEAS [<*ui*> [**TO**<*ui*>]]**?**
<*meas*> ::= (**CROss**|**FALltime**|**FREq**|**MAX**|
  MEAN|**MID**|**MIN**|**OVERshoot**|**PDElay**|**PERiod**|**PHAse**|
  PP|**RISetime**|**RMS**|**UNDershoot**|**WIDth**|**YTEnergy**|
    YTMns_area|**YTPls_area**)
<*meas*>**?**
MPAram<*ui*> <*link*>:<*arg*>
  BASeline: <*NRx*>
  DAInt: {**WHOle**|**SINgle**}
  DISPErsion: {**PP**|**RMSDev**}
  DISTal: <*NRx*>
  JITT.histpt:? <*NRx*>
  JITTLEvel? <*NRx*>
  JITTLOcation: {**CROSS**|**MESial**}
  LMZone: <*NRx*>
  MESial: <*NRx*>
  MFIltering: <*NRx*>
  MLEvelmode: {**ABSolute**|**RELative**}
  MMOde: {**HW** | **SW** | **STAT**}
  MSLOpe: {**PLUs** | **MINUs**}
  MTRack: {**ON** | **OFF**}
  MTRANs: <*NRx*>
  NOIS.histpt?
  NOISLocation: {**TOPline**|**BASeline**}
  PROXimal: <*NRx*>
  REFBaseline: <*NRx*>
  REFFiltering: <*NRx*>
  REFLEvel: <*NRx*>
  REFLMzone: <*NRx*>
  REFMesial: <*NRx*>
  REFRmzone: <*NRx*>
  REFSLope: {**PLUs** | **MINUs**}
  REFSNratio: <*NRx*>
  REFTOpline: <*NRx*>
  REFTRace: **TRAce**<*ui*>
  REFXsition: <*NRx*>
  RMZone: <*NRx*>
  SNRatio: <*NRx*>
  TOPline: <*NRx*>
MSLIst<*ui*> {**EMPty**|<*meas*>[,<*meas*>]}
MSNum[<*ui*>]**?**
MSYs {**ON**|**OFF**}

N – O

NAVg <*NRx*>
NENv <*NRx*>
NGRAded <*NRx*>
NHISt.pt <*NRx*>
NMAsk <*NRx*>
NOIse?
NVRam?
NWAVfrm <*NRx*>
OUTput {**ALLSTO**|**ALLTrace**|<*qstring*>|**STO**<*ui*>|
  STO<*ui*>**TOSTO**<*ui*>|**TRAce**<*ui*>|
  TRAce<*ui*>**TOTRAce**<*ui*>}

P

PIN8; **PIN24** <*link*>:<*arg*>
  FORMat: {**DRAft**|**HIRes**|**REDuced**}
  PORt: {**CENTRonics**|**GPIb**|**RS232**}
POWeron?

R

RECall { **FPNext**|**FPS**<*ui*>|<*qstring*>| *(Set-only)*
  STD<*ui*>**:TRAce**<*ui*> *(11801A only)*}
REFSEt{<*ui*> <*link*>:<*arg*>|**?**}
  CURRent: {<*meas*>|**ALL**.} *(Set-only)*
  <*meas*>:<*NRx*>
REMove {|<*qstring*>|**TRAce**<*ui*>|**ALLTrace**} *(Set-only)*
RHOPos{<*ui*> <*NRx*>|**?**}
RHOZero *(Set-only)*
RQS {**ON**|**OFF**}
RS232 <*link*>:<*arg*>
  BAUd: <*NRx*>
  DELAy: <*NRx*>
  ECHo: {**ON**|**OFF**}
  EOL: {**CR**|**CRLf**|**LF**|**LFCr**}
  FLAgging: {**SOFt**|**HARd**|**OFF**}
  PARity: {**ODD**|**EVEN**|**NONe**}
  STOPBits: <*NRx*>
  VERBose: {**ON**|**OFF**}

S

SAMid? [<*alpha*>[<*ui*>]]
SELect {**TRAce**<*ui*>|<*qstring*>}
SET{**?**|<*bblock*>}
SETSeq {**ON**|**OFF**}
SPEaker {**ON**|**OFF**}
SRQMask <*link*>:<*arg*>
  CMDerr: {**ON** | **OFF**}
  EXErr: {**ON** | **OFF**}
  EXWarn: {**ON** | **OFF**}
  INErr: {**ON** | **OFF**}
  INWarn: {**ON** | **OFF**}
  OPCmpl: {**ON** | **OFF**}
  USEr: {**ON** | **OFF**}
STAT? [MEAN|**STDDev**|**NCUrrent]**
STATHist <*link*>
  ? HIST.pt: <*NRx*>
  ? NWFm: <*NRx*>
  ? MEAN <*NRx*>
  ? RMSDev <*NRx*>
  ? PP <*NRx*>
  ? SIGMA{1|2|3} <*NRx*>
STATIstics <*link*>:<*arg*>
  MEAS:{<*meas*>|**NONe**}
  N:<*NRx*> *(Set-only)*
  RESET *(Set-only)*
STByte?
STD[<*sui*>]**?** *(11801A only)*
STOList?
STONum?
STORe [<*link*>:]<*arg*> *(Set-only)*
  {**FPS**<*ui*>|<*qstring*>} *(Set-only)*
  TRAce<*ui*>:{**STO**<*ui*>| *(Set-only)*
  <*qstring*>[:**STO**<*ui*>]| *(Set-only)*
  STD<*ui*> *(11801A only)*} *(Set-only)*

T

TBCalmode {**FASt**| **HIPrec**|**OFF**|**ONCE**}
TBMain; **TBWin** <*link*>:<*arg*>
  LENgth: <*NRx*>
  TIMe: <*NRx*>
  ? XINcr: (<*NR3*>)
TEK4692 <*link*>:<*arg*>
  COLor<*ui*>:<*NRx*>
  COLor: DEFAult *(Set-only)*
  DIRection: {**HORiz**|**VERt**}
  FORMat: {**DIThered**|**DRAft**|**HIRes**|**SCReen**}
  PORt: {**CENTRonics**|**GPIb**|**RS232**}
TEK4696 <*link*>:<*arg*>
  COLor<*ui*>:<*NRx*>
  COLor: DEFAult *(Set-only)*
  DIRection: {**HORiz**|**VERt**}
  FORMat: {**DIThered**|**DRAft**|**HIRes**|**REDuced**|**SCReen**}
  PORt: {**CENTRonics**|**GPIb**|**RS232**}
TESt [XTNd] *(Set-only)*
TEXt [<*link*>:]<*arg*> *(Set-only)*
  CLEar *(Set-only)*
  STRing: <*qstring*> *(Set-only)*
  X: <*NRx*> *(Set-only)*
  Y: <*NRx*> *(Set-only)*
TIMe <*qstring*> = "<*hh*>:<*mm*>:<*ss*>"
TOPBase {**IEEE**|**ALTErnate**}
TRAce<*ui*> <*link*>:<*arg*>
  DESCription:<*qstring*>
  ? WFMCalc: (FASt| HIPrec)
TRAce[<*ui*>]**?**
TRAList?
TRANUm?
TRIgger <*link*>:<*arg*>
  ATTenuation:{**X1**|**X10**} *(11801A only)*
  EXTCoupling:{**AC**|**DC**} *(11801A only)*
  LEVel:<*NRx*>
  MODe: {**AUTO**|**NORmal**}
  SLOpe: {**PLUs**| **MINUs**}
  SOUrce: {**EXTernal**|**INTernal**|<*alpha*><*ui*>
    |**PREscaler** *(CSA 803 only)*}
  ? STAtus: (TRG| NOTrg)

U – V

UID[**?**<*alpha*><*ui*>|[**?**]**MAIn:**]<*qstring*>
UNDEF {<*qstring*>|**ALL**} *(Set-only)*
UPTime?
V1Bar; V2Bar <*link*>:<*arg*>
  ? OQUal: {EQ|LT|GT|UN|ER}
  XCOord: <*NRx*>
  XDIv: <*NRx*>
VPCurve ?[NWFMS]

W

WAVfrm?
WFMpre <*link*>: <*arg*>
  ? BIT/nr: (16)
  ? BN.fmt: (RI)
  ? BYT/nr: (2)
  ? BYT.or: {LSB|MSB}
  ? CRVchk: (CHKsm0|NONe|NULl)
  ? ENCdg: (ASCii|BINary)
  LABel: <*qstring*>
  NR.pt: <*NRx*>
  ? PT.fmt: (ENV|XY|Y
  RHOFactor:<*NRx*>
  RHOPos:<*NRx*>
  ? WFId: (STO<ui>|TRAce<ui>)
  XINcr: <*NRx*>
  XMULt: (<*NR3*>)
  XUNit: (DIVS|FEEt|INCh es|METers|SEConds|VOLts)
  XZERo: <*NRx*>
  YMULt: <*NRx*>
  YUNit: {**DIVS**|**RHO**|**VOLts**}
  YZERo: <*NRx*>
WFMScaling {**FORCe**|**OPTional**}
WIN {<*ui*>[<*link*>:]<*arg*>|**?**}
  ? ABSLevel: (<*NR3*>, (TF|OR|NF))
  ? BASeline: <*NR3*>
  FILtering:<*NRx*>
  LEVel:<*NRx*>
  LMOde:{**ABSolute**|**RELative**}
  LOCate *(Set-only)*
  MODe:{**AUTO**|**MANual**}
  POS:<*NRx*>
  SLOpe: {**PLUs**| **MINUs**}
  ? TOPline:<*NR3*>
  TRACK: {**ON**| **OFF**}
  TRANS: <*NRx*>
WINList?
WINNum?

Escape Character Set

Bits B8 B7 B6 B5 / B4 B3 B2 B1	1 ø ø ø	1 ø ø 1	1 ø 1 ø	1 ø 1 1	1 1 ø ø	1 1 ø 1	1 1 1 1	1 ø ø ø
ø ø ø ø	0 0 Ä 0	20 10 Ñ 16	40 User Index 1 20 32	60 30 48	100 40 Π 64	120 50 π 80	140 60 ↓ 96	160 70 ··· 112
ø ø ø 1	1 1 ä 1	21 11 ñ 17	41 User Index 2 21 33	61 31 49	101 41 α 65	121 51 ϑ 81	141 61 ↑ 97	161 71 Ä 113
ø ø 1 ø	2 2 Ö 2	22 12 ȷ 18	42 User Index 3 22 34	62 32 50	102 42 γ 66	122 52 ρ 82	142 62 → 98	162 72 E 114
ø ø 1 1	3 3 ö 3	23 13 ¡ 19	43 User Index 4 23 35	63 33 51	103 43 δ 67	123 53 Σ 83	143 63 ← 99	163 73 R 115
ø 1 ø ø	4 4 Ü 4	24 14 Ã 20	44 User Index 5 24 36	64 34 52	104 44 Δ 68	124 54 τ 84	144 64 ∫ 100	164 74 T 116
ø 1 ø 1	5 5 ü 5	25 15 ã 21	45 User Index 6 25 37	65 35 53	105 45 ∈ 69	125 55 υ 85	145 65 ÷ 101	165 75 ┘ 117
ø 1 1 ø	6 6 à 6	26 16 Õ 22	46 User Index 7 26 38	66 36 54	106 46 φ 70	126 56 ν 86	146 66 ° 102	166 76 ┐ 118
ø 1 1 1	7 7 è 7	27 17 õ 23	47 27 39	67 37 55	107 47 Γ 71	127 57 ω 87	147 67 √ 103	167 77 ┌ 119
1 ø ø ø	10 8 á 8	30 18 ō 24	50 28 40	70 38 56	110 48 Θ 72	130 58 χ 88	150 68 ¬ 104	170 78 └ 120
1 ø ø 1	11 9 é 9	31 19 É 25	51 29 41	71 39 57	111 49 ι 73	131 59 ξ 89	151 69 ± 105	171 79 ┼ 121
1 ø 1 ø	12 A Å 10	32 1A Ø 26	52 2A 42	72 3A 58	112 4A Ψ 74	132 5A ζ 90	152 6A ≠ 106	172 7A ─ 122
1 ø 1 1	13 B å 11	33 1B ø 27	53 2B 43	73 3B 59	113 4B κ 75	133 5B Φ 91	153 6B ≤ 107	173 7B ├ 123
1 1 ø ø	14 C Æ 12	34 1C Œ 28	54 2C 44	74 3C 60	114 4C λ 76	134 5C Λ 92	154 6C ≥ 108	174 7C ┤ 124
1 1 ø 1	15 D æ 13	35 1D œ 29	55 2D 45	75 3D 61	115 4D μ 77	135 5D Ψ 93	155 6D © 109	175 7D ┴ 125
1 1 1 ø	16 E ç 14	36 1E Ç 30	56 2E 46	76 3E 62	116 4E η 78	136 5E σ 94	156 6E ® 110	176 7E ┬ 126
1 1 1 1	17 F ß 15	37 1F ∞ 31	57 2F 47	77 3F X̄ 63	117 4F Ω 79	137 5F Ξ 95	157 6F ≈ 111	177 7F │ 127

Key

Octal 17 / Hex F / 15 ß — Escape character / Decimal

ASCII & GPIB CODE CHART

B7 B6 B5 / BITS / B4 B3 B2 B1	0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
	CONTROL		NUMBERS SYMBOLS		UPPER CASE		LOWER CASE	
0 0 0 0	0 NUL 0 0	20 DLE 10 16	40 SP 20 32	0 60 30 48	100 @ 40 64	0 120 50 80	140 ` 60 96	160 p 70 112
0 0 0 1	1 GTL SOH 1 1	21 LLO DC1 11 17	41 ! 21 33	1 61 31 49	101 A 41 65	1 121 51 81	141 a 61 97	161 q 71 113
0 0 1 0	2 STX 2 2	22 DC2 12 18	42 " 22 34	2 62 32 50	102 B 42 66	2 122 52 82	142 b 62 98	162 r 72 114
0 0 1 1	3 ETX 3 3	23 DC3 13 19	43 # 23 35	3 63 33 51	103 C 43 67	3 123 53 83	143 c 63 99	163 s 73 115
0 1 0 0	4 SDC EOT 4 4	24 DCL DC4 14 20	44 $ 24 36	4 64 34 52	104 D 44 68	4 124 54 84	144 d 64 100	164 t 74 116
0 1 0 1	5 PPC ENQ 5 5	25 PPU NAK 15 21	45 % 25 37	5 65 35 53	105 E 45 69	5 125 55 85	145 e 65 101	165 u 75 117
0 1 1 0	6 ACK 6 6	26 SYN 16 22	46 & 26 38	6 66 36 54	106 F 46 70	6 126 56 86	146 f 66 102	166 v 76 118
0 1 1 1	7 BEL 7 7	27 ETB 17 23	47 ' 27 39	7 67 37 55	107 G 47 71	7 127 57 87	147 g 67 103	167 w 77 119
1 0 0 0	10 GET BS 8 8	30 SPE CAN 18 24	50 (28 40	8 70 38 56	110 H 48 72	8 130 58 88	150 h 68 104	170 x 78 120
1 0 0 1	11 TCT HT 9 9	31 SPD EM 19 25	51) 29 41	9 71 39 57	111 I 49 73	9 131 59 89	151 i 69 105	171 y 79 121
1 0 1 0	12 LF A 10	32 SUB 1A 26	52 * 2A 42	10 72 3A : 58	112 J 4A 74	10 132 5A Z 90	152 j 6A 106	172 z 7A 122
1 0 1 1	13 VT B 11	33 ESC 1B 27	53 + 2B 43	11 73 3B ; 59	113 K 4B 75	11 133 5B [91	153 k 6B 107	173 { 7B 123
1 1 0 0	14 FF C 12	34 FS 1C 28	54 , 2C 44	12 74 3C < 60	114 L 4C 76	12 134 5C \ 92	154 l 6C 108	174 | 7C 124
1 1 0 1	15 CR D 13	35 GS 1D 29	55 — 2D 45	13 75 3D = 61	115 M 4D 77	13 135 5D] 93	155 m 6D 109	175 } 7D 125
1 1 1 0	16 SO E 14	36 RS 1E 30	56 . 2E 46	14 76 3E > 62	116 N 4E 78	14 136 5E ^ 94	156 n 6E 110	176 ~ 7E 126
1 1 1 1	17 SI F 15	37 US 1F 31	57 / 2F 47	15 77 3F UNL ? 63	117 O 4F 79	15 137 5F UNT — 95	157 o 6F 111	177 DEL (RUBOUT) 7F 127
	ADDRESSED COMMANDS	UNIVERSAL COMMANDS	LISTEN ADDRESSES		TALK ADDRESSES		SECONDARY ADDRESSES OR COMMANDS (PPE)	(PPD)

KEY

octal 25 | PPU | GPIB code
NAK | ASCII character
hex 15 | 2

* ! on some keyboards or systems

78256

Tektronix®
COMMITTED TO EXCELLENCE