

Using ORM Remotely

This chapter lists the commands for performing remote programming of the Optical Recording Measurement package. Refer to your *Remote Control Manual* for a complete description of the oscilloscope's remote control capabilities.

CURSOR

CURSOR_MEASURE, CRMS Command/Query

DESCRIPTION

The CURSOR_MEASURE command specifies the type of cursor or parameter measurement to be displayed and is the main command for displaying parameters and pass/fail.

The CURSOR_MEASURE? query indicates which cursors or parameter measurements are currently displayed.

Notation	
ABS	absolute reading of relative cursors
CUST	custom parameters
FAIL	pass/fail: fail
HABS	horizontal absolute cursors
HPAR	standard time parameters
HREL	horizontal relative cursors
OFF	cursors and parameters off
PARAM	synonym for VPAR
PASS	pass/fail: pass
SHOW	custom parameters (old form)
STAT	parameter statistics
VABS	vertical absolute cursors



Notation	
VPAR	standard voltage parameters
VREL	vertical relative cursors

Note: The PARAM mode is turned OFF when the XY mode is ON.

COMMAND SYNTAX

CuRsor_MeaSure <mode>[,<submode>]
<mode> := {**CUST**, **FAIL**, **HABS**, **HPAR**, **HREL**, **OFF**, **PARAM**,
 PASS, **SHOW**, **VABS**, **VPAR**, **VREL**}
<submode> := {**STAT**, **ABS**}

Note 1: The keyword STAT is optional with modes CUST, HPAR, and VPAR. If present, STAT turns parameter statistics on. Absence of STAT turns parameter statistics off.

Note 2: The keyword ABS is optional with mode HREL. If it is present, ABS chooses absolute amplitude reading of relative cursors. Absence of ABS selects relative amplitude reading of relative cursors.

QUERY SYNTAX

CuRsor_MeaSure?

RESPONSE FORMAT

CuRsor_MeaSure <mode>

EXAMPLE (GPIB)

The following command switches on the vertical relative cursors:
CMD\$="CRMS VREL": CALL IBWRT(SCOPE%,CMD\$)

The following command determines which cursor is currently turned on:
**CMD\$="CRMS?": CALL IBWRT(SCOPE%,CMD\$):
CALL IBRD(SCOPE%,RD\$): PRINT RD\$**

Example of response message:
CRMS OFF

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RELATED COMMANDS CURSOR_SET, PARAMETER_STATISTICS,
PARAMETER_VALUE, PASS_FAIL_CLEAR,
PASS_FAIL_CONDITION, PASS_FAIL_DELETE,
PASS_FAIL_MASK

ADDITIONAL INFORMATION To turn off the cursors, parameter measurements or Pass/Fail tests, use:

CURSOR_MEASURE OFF

To turn on a cursor display, use one of the following four forms:

CURSOR_MEASURE HABS

CURSOR_MEASURE HREL

CURSOR_MEASURE VABS

CURSOR_MEASURE VREL

To turn on parameter measurements without statistics, use one of the following three forms:

CURSOR_MEASURE CUST

CURSOR_MEASURE HPAR

CURSOR_MEASURE VPAR

To turn on parameter statistics, add the keyword **STAT** to the above three forms.

To turn on Pass or Fail tests on parameter or mask tests, use:

CURSOR_MEASURE PASS

CURSOR_MEASURE FAIL

Use the command:

PASS_FAIL_CONDITION

to select parameters in the Custom mode, and to modify the test conditions in the Pass/Fail mode.

**CURSOR****CURSOR_SET, CRST**
Command/Query**DESCRIPTION**

The CURSOR_SET command allows you to position any one of the eight independent cursors at a given screen location. The positions of the cursors can be modified or queried even if the required cursor is not currently displayed on the screen.

When setting a cursor position, you must specify a trace, relative to which the cursor will be positioned.

The CURSOR_SET? query indicates the current position of the cursor(s). The values returned depend on the grid type selected.

Note: If the parameter display (or the pass/fail display or extended parameters display) is turned on, the parameters of the specified trace will be shown, unless the newly chosen trace is not displayed or has been acquired in sequence mode. These conditions will produce an environment error. If you change only the trace without repositioning the cursors, the CURSOR_SET command may be given with no argument (for example, TB:CRST).

Notation			
HABS	horizontal absolute	PREF	parameter reference
HDIF	horizontal difference	VABS	vertical absolute
HREF	horizontal reference	VDIF	vertical difference
PDIF	parameter difference	VREF	vertical reference

COMMAND SYNTAX

<trace> : **CuRsor_SeT** <cursor>,<position>[,<cursor>,<position>,<cursor>,<position>]

<trace> : = {**TA, TB, TC, TD, C1, C2, C3,C4**}

<cursor> : = {**HABS, VABS, HREF, HDIF, VREF, VDIF, PREF, PDIF**}

<position> : = 0 to 10 DIV (horizontal)

Remote Control Commands

<position> : = -29.5 to 29.5 DIV (vertical)

Note 1: The suffix DIV is optional.

Note 2: Parameters are grouped in pairs. The first parameter specifies the cursor to be modified, and the second one gives its new value. Parameters may be grouped in any order, and may be restricted to those items to be changed.

QUERY SYNTAX

<trace> : **CuRsor_SeT?** [<cursor>,...<cursor>]

<cursor> : = {**HABS, VABS, HREF, HDIF, VREF, VDIF, PREF, PDIF, ALL**}

RESPONSE FORMAT

<trace> : **CuRsor_SeT** <cursor>,<position>[, <cursor>,<position>,...<cursor>,<position>]

If <cursor> is not specified, ALL will be assumed. If the position of a cursor cannot be determined in a particular situation, its position will be indicated as UNDEF.

AVAILABILITY

<trace> : {C3, C4} available only on four-channel oscilloscopes.

EXAMPLE (GPIB)

The following command positions the VREF and VDIF cursors at +3 DIV and -7 DIV respectively, using Trace A as a reference:

```
CMD$="TA:CRST VREF,3DIV,VDIF,-7DIV":  
CALL IBWRT(SCOPE%,CMD$)
```

RELATED COMMANDS

CURSOR_MEASURE, CURSOR VALUE,
PARAMETER_VALUE, PER_CURSOR_SET,
XY_CURSOR_SET



CURSOR		CURSOR_VALUE?, CRVA? Query													
DESCRIPTION	The CURSOR_VALUE? query returns the values measured by the specified cursors for a given trace. (The PARAMETER_VALUE? query is used to obtain measured waveform parameter values.)														
	<table><tr><th colspan="4">Notation</th></tr><tr><td>HABS</td><td>horizontal absolute</td><td>VABS</td><td>vertical absolute</td></tr><tr><td>HREL</td><td>horizontal relative</td><td>VREL</td><td>vertical relative</td></tr></table>			Notation				HABS	horizontal absolute	VABS	vertical absolute	HREL	horizontal relative	VREL	vertical relative
Notation															
HABS	horizontal absolute	VABS	vertical absolute												
HREL	horizontal relative	VREL	vertical relative												
QUERY SYNTAX	<pre><trace> : CuRsor_VAlue? [<mode>, ...<mode>] <trace> : = {TA, TB, TC, TD, C1, C2, C3, C4} <mode> : = {HABS, HREL, VABS, VREL, ALL}</pre>														
RESPONSE FORMAT	<pre><trace> : CuRsor_VAlue HABS, <abs_hori>, <abs_vert> <trace> : CuRsor_VAlue HREL, <delta_hori>, <delta_vert>, <absvert_ref>, <absvert_dif> <trace> : CuRsor_VAlue VABS, <abs_vert> <trace> : CuRsor_VAlue VREL, <delta_vert></pre> For horizontal cursors, both horizontal as well as vertical values are given. For vertical cursors only vertical values are given. <i>Note: If <mode> is not specified or equals ALL, all the measured cursor values for the specified trace are returned. If the value of a cursor cannot be determined in the current environment, the value UNDEF will be returned.</i>														
AVAILABILITY	<pre><trace> : = {C3, C4}</pre> available only on four-channel oscilloscopes.														
EXAMPLE (GPIB)	The following query reads the measured absolute horizontal value of the cross-hair cursor (HABS) on Channel 2: <pre>CMD\$="C2:CRVA? HABS": CALL IBWRT(SCOPE%,CMD\$): CALL IBRD(SCOPE%,RSP\$): PRINT RSP\$</pre> Response message: <pre>C2:CRVA HABS,34.2E- 6 S, 244 E- 3 V</pre>														

Remote Control Commands

RELATED COMMANDS

CURSOR_SET, PARAMETER_VALUE,
PER_CURSOR_VALUE, XY_CURSOR_VALUE



FUNCTION	DEFINE, DEF Command/Query
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DESCRIPTION The DEFINE command specifies the mathematical expression to be evaluated by a function. This command is used to control all functions in the standard oscilloscope and WPOX processing packages.

COMMAND SYNTAX <function> : **DEFine EQN**, '<equation>'
[,<param_name>,<value>,...]

Note 1: Parameters are grouped in pairs. The first in the pair names the variable to be modified, <param_name>, while the second one gives the new value to be assigned. Pairs can be given in any order and can be restricted to the variables to be changed.

Note 2: Space (blank) characters inside equations are optional.

QUERY SYNTAX <function> : **DEFine?**

RESPONSE FORMAT <function> : **DEFine EQN**, '<equation>'[,**MAXPTS**,<max_points>]
[,**SWEEPS**,<max_sweeps>][,**WEIGHT**,<weight>][,**BITS**,<bits>]

<param_name>	<value>	Description
EQN	'<equation>'	Function equation as defined below
MAXPTS	<max_points>	Max. number of points to compute
Parameters To Support Additional Functions in WP01		
BITS	<bits>	Number of ERES bits
UNITS	<units>	Physical units
WEIGHT	<weight>	Continuous Average weight

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Parameters To Support Additional Functions in WP02		
WINDOW	<window_type>	FFT window function
Parameters To Support Additional Functions in WP03 or DDM		
MAXBINS	<bins>	Number of bins in histogram
MAX_EVENTS	<max_values>	Max. no. of values in histogram
CENTER	<center>	Horizontal center position for histogram display.
WIDTH	<width>	Width of histogram display
VERT	<vert_scale>	Vertical scaling type
Parameters To Support Additional Functions in PRML		
LENGTH	<length>	No. points to use from first waveform
START	<start>	Starting point in second waveform
Function Equations And Names Available On All Models		
<source>	Identity	
+<source>	Identity	
-<source>	Negation	
<source1> + <source2>	Addition	
<source1> - <source2>	Subtraction	
<source1><source2>	Multiplication	
<source1>/<source2>	Ratio	
AVGS(<source>)	Average Summed	
RESAMP(<source>)	Resample (deskew)	
SINX(<source>)	Sin(x)/x interpolator	
ZOOMONLY (<extended_source>)	Zoom only (No Math)	
Extended Functions Available On Instruments With WP01 Processing Firmware		
ABS(<source>)	Absolute Value	



AVGC(<source>)	Continuous Average
DERI(<source>)	Derivative
ERES(<source>)	Enhanced Resolution
EXP(<source>)	Exponential (power of e)
EXP10(<source>)	Exponential (power of 10)
EXTR(<source>)	Extrema (Roof and Floor)
FLOOR(EXTR(<source>))	Floor (Extrema source only)
INTG(<source>[+, -] <addend>)]	Integral
LN(<source>)	Logarithm base e
LOG10(<source>)	Logarithm base 10
RESC([+, -][<multiplier>*<source>[+, -]<addend>)]	Rescale
ROOF(EXTR(<source>))	Roof (Extrema source only)
1/<source>	Reciprocal
SQR(<source>)	Square
SQRT(<source>)	Square Root
FFT Functions Available on Instruments with WP02 Processing Firmware <i>Note: The source waveform must be a time-domain signal, single segment.</i>	
FFT(<source>)	Fast Fourier Transform (complex result)
REAL(FFT(<source>))	Real part of complex result
IMAG(FFT(<source>))	Imaginary part of complex result
MAG(FFT(<source>))	Magnitude of complex result
PHASE(FFT(<source>))	Phase angle (degrees) of complex result
PS(FFT(<source>))	Power spectrum
PSD(FFT(<source>))	Power density
RESC([+, -][<multiplier>*<source>[+, -]<addend>])	Rescale

Remote Control Commands

Power Average Functions Available on Instruments with WP02 Processing Firmware		
Note: The source waveform must be another function defined as a Fourier transform.		
MAG(AVGP(<function>))	PS(AVGP(<function>))	PSD(AVGP(<function>))
Function Equations and Names Available on Instruments with WP03 or DDM Firmware		
HIST(<custom_line>)	Histogram of parameter on custom line	
Function Equations and Names Available on Instruments with PRML Firmware		
CORR(<source1>,<source2>)	Cross Correlation	

Source values

Note: The numbers in CUST1, CUST2, CUST3, CUST4, and CUST5 refer to the line numbers of the selected custom parameters.

<sourceN> : = {TA, TB, TC, TD, M1, M2, M3, M4, C1, C2, C3, C4}

<function> : = {TA, TB, TC, TD}

<custom_line> : = {CUST1, CUST2, CUST3, CUST4, CUST5}

<extended_source> : = {C1, C2, C3, C4, TA, TB, TC, TD, M1, M2, M3, M4}

Values to define number of points/sweeps

<max_points> : = 50 to 10 000 000

<max_sweeps> : = 1 to 1000 (For standard instruments)

<max_sweeps> : = 1 to 1 000 000 (For WP01 only)

<max_sweeps> : = 1 to 50 000 (WP02 Power Spectrum only)

Values for ORDATA Function

<OR_boost> : = 0 to 10 dB

<OR_fc> : = 10e3 to 800e6 Hz

<OR_gate> : = {NONE, TA, TB, TC, TD, M1, M2, M3, M4, C1, C2, C3, C4}

<OR_gate_state> : = {HIGH, LOW}

<OR_in> : = {RF, EQUALIZED}

<OR_OP> : = {NOOP, EQUALIZED, LEVELED, THRESHOLD, SLICED, EXTRACTED_CLOCK}

<OR_PLL_BW> : = 1e3 to 200e3 Hz

<OR_SLICER_bw> : = 1e3 to 200e3 Hz

AVAILABILITY

<sourceN> : = {C3, C4} available only on 4-channel scopes.

<extended_source>:= {C3, C4} available only on 4-channel scopes

Values for Resample Function

<delay> := -2e-6 to +2e-6 seconds

Values for Rescale Function

<addend> := 0.0 to 1e15

<multiplier> := 0.0 to 1e15

Values for Summation Average and ERES

<weight> := {1, 3, 7, 15, 31, 63, 127, 255, 511, 1023}

<bits> := {0.5, 1.0, 1.5, 2.0, 2.5, 3.0}

Values for FFT window function

<window_type> := {BLHA, FLTP, HAMM, HANN, RECT}

FFT Window Function Notation	
LHA	Blackman–Harris window
FLTP	Flat Top window
HABMM	Hamming window
HANN	von Hann window
RECT	Rectangular window

Remote Control Commands

Values for WP03 histogramming

<max_bins> : = {20, 50, 100, 200, 500, 1000, 2000}

<max_events> : = 20 to 2e9 (in a 1–2–5 sequence)

<center> : = –1e15 to 1e15

<width> : = 1e–30 to 1e30 (in a 1–2–5 sequence)

<vert_scale> : = {LIN, LOG, CONSTMAX}

Histogram Notation	
LIN	Use linear vertical scaling for histogram display
LOG	Use log vertical scaling for histogram display
CONSTMAX	Use constant maximum linear scaling for histogram display

Values for PRML correlation

<length> : = 0 to 10 divisions

<start> : = 0 to 10 divisions

AVAILABILITY

<sourceN> : = {C3, C4} only on four-channel instruments.

<extended_source> : = {C3, C4} only on four-channel instruments

SWEEPS is the maximum number of sweeps (Average and Extrema only).

Note: The pair SWEEPS, <max_sweeps>, applies only to the summed averaging (AVGS).

EXAMPLE (GPIB)

The following instruction defines Trace A to compute the summed average of Channel 1 using 5000 points over 200 sweeps:

```
CMD$="TA:DEF EQN, 'AVGS(C1)', MAXPTS, 5000, SWEEPS, 200":  
CALL IBWRT(SCOPE%, CMD$)
```

WP01 EXAMPLE

The following instruction sets up Trace A to compute the product of Channel 1 and Channel 2, using a maximum of 10 000 input points:

```
CMD$="TA:DEF EQN, 'C1*C2', MAXPTS, 10000":  
CALL IBWRT(SCOPE%, CMD$)
```



WP02 FFT EXAMPLE (GPIB) The following instruction sets up Trace A to compute the Power Spectrum of the FFT of Channel 1. A maximum of 1000 points will be used for the input. The window function is Rectangular.

```
CMD$="TA:DEF EQN, 'PS(FFT(C1))', MAXPTS, 1000, WINDOW,  
RECT": CALL IBWRT(SCOPE%, CMD$)
```

WP02 PS EXAMPLE (GPIB) The following instruction defines Trace B to compute the Power Spectrum of the Power Average of the FFT being computed by Trace A, over a maximum of 244 sweeps.

```
CMD$="TB:DEF EQN, 'PS(AVGP(TA))', SWEEPS, 244":  
CALL IBWRT(SCOPE%, CMD$)
```

WP03 EXAMPLE

The following command sets up Trace C to construct the histogram of risetime measurements made on source Channel 1. The risetime measurement is defined on custom line 2. The histogram has a linear vertical scaling, and the risetime parameter values are binned into 100 bins.

```
CMD$="PACU 2, RISE, C1":CALL IBWRT(SCOPE%, CMD$)  
CMD$="TC:DEF  
EQN, 'HIST(CUST2)', VERT, LIN, MAXBINS, 100":  
CALL IBWRT(SCOPE%, CMD$)
```

RELATED COMMANDS

FIND_CTR_RANGE, FUNCTION_RESET, INR?,
PARAMETER_CUSTOM, PARAMETER_VALUE?,
PASS_FAIL_CONDITION

Remote Control Commands

CURSOR

PARAMETER_CLR, PACL Command

DESCRIPTION

The PARAMETER_CLR command clears all the current parameters from the five-line list used in the Custom and Pass/Fail modes.

Note: This command has the same effect as the command PASS_FAIL_CONDITION, given without any arguments.

COMMAND SYNTAX

PAparameter**_C**lear

RELATED COMMANDS

PARAMETER_DELETE, PARAMETER_VALUE,
PASS_FAIL_CONDITION

**CURSOR****PARAMETER_CUSTOM, PACU**
Command/Query**DESCRIPTION**

The PARAMETER_CUSTOM command controls the parameters that have customizable qualifiers, (for example, *Dt@lev* or *r@level*) and may also be used to assign any parameter for histogramming.

Note: The measured value of a parameter setup with PACU may be read using PAVA?

COMMAND SYNTAX

Parameter_Custom <line>, <parameter>, <qualifier>
[, <qualifier>, ...]
<line> : = 1 to 5
<parameter> : = {a parameter from the table below or any parameter listed in the PAVA? command}
<qualifier> : = Measurement qualifier(s) specific to each <param>. See following table.

<param>	definition	<qualifier> list
Parameters available on instruments equipped with ORM processing firmware		
BEES	beginning and ending edge shift	<subject n>, <data source>, <data polarity>, <data threshold>, <clock source>, <clock edge>, <clock threshold>, <hysteresis>, <period>, <low n>, <high n>, <unit>
BES	beginning edge shift	<subject n>, <data source>, <data polarity>, <data threshold>, <clock source>, <clock edge>, <clock threshold>, <hysteresis>, <period>, <low n>, <high n>, <unit>,
BESS	beginning edge shift sigma	<subject n>, <data source>, <data polarity>, <data threshold>, <clock source>, <clock edge>, <clock threshold>, <hysteresis>, <period>, <low n>, <high n>, <unit>
EES	ending edge shift	<subject n>, <data source>, <data polarity>, <data threshold>, <clock source>, <clock edge>, <clock threshold>, <hysteresis>, <period>, <low n>, <high n>, <unit>

Remote Control Commands

<param>	definition	<qualifier> list
		n>, <unit>

<param>	definition	<qualifier> list
EESS	ending edge shift sigma	<subject n>, <data source>, <data polarity>, <data threshold>, <clock source>, <clock edge>, <clock threshold>, <hysteresis>, <period>, <low n>, <high n>, <unit>
DP2C	delta pit to clock	<data source>, <data polarity>, <data threshold>, <clock source>, <clock edge>, <clock threshold>, <hysteresis>, <period>, <low n>, <high n>, <unit>
DP2CS	delta pit to clock sigma	<data source>, <data polarity>, <data threshold>, <clock source>, <clock edge>, <clock threshold>, <hysteresis>, <period>, <low n>, <high n>, <unit>
EDGSH	edge shift	<data source>, <data polarity>, <data threshold>, <hysteresis>, <period>, <low n>, <high n>, <unit>
LPER	local period	<clock source>, <clock edge>, <clock threshold>, <hysteresis>
PAA	pit average amplitude	<data source>, <data threshold>, <hysteresis>, <period>, <low n>, <high n>
PASYM	pit asymmetry	<data source>, <data threshold>, <hysteresis>, <period>, <low n>, <high n>
PBASE	pit base	<data source>, <data threshold>, <hysteresis>, <period>, <low n>, <high n>
PMAX	pit maximum	<data source>, <data threshold>, <hysteresis>, <period>, <low n>, <high n>
PMIDL	pit middle level	<data source>, <data threshold>, <hysteresis>, <period>, <low n>, <high n>
PMIN	pit minimum	<data source>, <data threshold>, <hysteresis>, <period>, <low n>, <high n>
PMODA	pit modulation amplitude	<data source>, <data threshold>, <hysteresis>, <period>, <low n>, <high n>



<param>	definition	<qualifier> list
PNUM	pit number	<data source>, <data polarity>, <data threshold>, <hysteresis>, <period>, <low n>, <high n>
PRES	pit resolution	<data source>, <data threshold>, <hysteresis>, <period>, <low n>, <high n>
PTOP	pit top	<data source>, <data threshold>, <hysteresis>, <period>, <low n>, <high n>
T@PIT	time at pit	<data source>, <data polarity>, <data threshold>, <hysteresis>, <period>, <low n>, <high n>
TIMJ	timing jitter	<data source>, <data polarity>, <data threshold>, <hysteresis>, <period>, <low n>, <high n>, <units>
PWID	pit width	<data source>, <data polarity>, <data threshold>, <hysteresis>, <period>, <low n>, <high n>, <units>
Histogram and Trend Parameters available on instruments equipped with ORM processing firmware		
AVG	average value	
FWHM	full width at half maximum	
FWXX	full width at xx% of max	<source>,<threshold>
HAMPL	histogram to minus histogram base	
HBASE	lower of two most probable histogram states	
HIGH	largest value	
HMEDI	median value	
HRMS	rms value	
HTOP	higher of two most probable histogram states	
LOW	lowest value	
MAXP	highest population in all histogram bins	

Remote Control Commands

<param>	definition	<qualifier> list
MODE	histogram bin with highest population	
PCTL	percentile	<source>,<threshold>
PKS	number of histogram peaks	
RANGE	range of histogram or trend	
SIGMA	standard deviation of histogram	
TOTP	total histogram population	
XAPK	x position at peak	<source>,<rank>

Where:

<sourceN> : = {C1, C2, C3, C4,TA, TB, TC, TD}
 <slopeN> : = {POS, NEG, FIRST}
 <edgeN> : = {POS, NEG}
 <clock edge> : = {POS, NEG, ALL}
 <levelN>, <low>, <high> : = 1 to 99 if level is specified in percent (PCT), or
 <levelN>, <low>, <high> : = Level in <sourceN> in the units of the waveform.
 <delay> : = -100 PCT to 100 PCT
 <freq> : = 10 to 1e9 Hz (Narrow Band center frequency).
 <hysteresis> : = 0.01 to 8 divisions
 <length> : = 1e-9 to 0.001 seconds
 <rank> : = 1 to 100
 <threshold> : = 0 to 100 percent
 <angular unit> = {PCT, DEG, RAD}

QUERY SYNTAX

Parameter_Custom? <line>

RESPONSE FORMAT

Parameter_Custom
 <line>, <parameter>, <qualifier>[, <qualifier>, ...]

AVAILABILITY

<sourceN> : = {C3, C4} only on four-channel instruments.

EXAMPLE 1

BEES

Command Example

PACU 1,BEES,3,TA,POS,0,TB,POS,0,1,231NS,4,4,TIME



Query/Response Examples	PACU? 1 returns: PACU 1,BEES,3,TA,POS,0E-6,TB,POS,0E-3,1 DIV,231E-9 S,4,4,TIME PAVA?CUST1 returns: TA:PAVA CUST1,-14.9E-9 S,OK
EXAMPLE 2	EES
Command Example	PACU 2,EES,3,TA,POS,0,TB,POS,0,1,231NS,3,11,%
Query/Response Examples	PACU? 2 returns: PACU 2,EES,3,TA,POS,0E-6,TB,POS,0E-3,1 DIV, 231E-9 S,3,11,PCT PAVA? CUST2 returns: TA:PAVA CUST2,-14.639 PCT,OK
EXAMPLE 3	PTOP
Command Example	PACU 3,PTOP,TA,0,1,231NS,3,11
Query/Response Examples	PACU? 3 returns: PACU 3,PTOP,TA,0E-6,1 DIV,231E-9 S,3,11 PAVA? CUST3 returns: TA:PAVA CUST3,28.8E-3 V,OK
RELATED COMMANDS	PARAMETER_DELETE, PARAMETER_VALUE, PASS_FAIL_CONDITION

Remote Control Commands

CURSOR

PARAMETER_DELETE, PADL
Command

DESCRIPTION

The PARAMETER_DELETE command deletes a parameter at a specified line from the list of parameters used in the Custom and Pass/Fail modes.

Notation		
1	line 1	of Custom or Pass/Fail display
2	line 2	of Custom or Pass/Fail display
3	line 3	of Custom or Pass/Fail display
4	line 4	of Custom or Pass/Fail display
5	line 5	of Custom or Pass/Fail display

COMMAND SYNTAX

PARameter_DeLete <line>

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

Note: This command has the same effect as the command PASS_FAIL_CONDITION <line>, given without any further arguments.

EXAMPLE (GPIB)

The following instruction deletes the third test condition in the list:

CMD\$="PADL 3": CALL IBWRT(SCOPE%,CMD\$)

RELATED COMMANDS

PARAMETER_CLR, PARAMETER_VALUE,
PASS_FAIL_CONDITION

**CURSOR****PARAMETER_LIST, PALI**

Command/Query

DESCRIPTION

The **PARAMETER_LIST** command controls the ORM parameters that have 'list by nT' calculation modes. *Only ORM package parameters shown here.*

COMMAND SYNTAX

PArAmeter_List <parameter>, <qualifier>, [<qualifier>,...]
<parameter> := {a parameter from the table below}
<qualifier> := Measurement qualifier(s) specific to each <param>. See the following table.

<param>	definition	<qualifier> list
Parameter Names (available on instruments equipped with ORM processing firmware)		
BES	Beginning edge shift	<subject n>, <data source>, <data polarity>, <data threshold>, <clock source>, <clock edge>, <clock threshold>, <hysteresis>, <period>, <low n>, <high n>, <unit>,
BESS	Beginning edge shift sigma	<subject n>, <data source>, <data polarity>, <data threshold>, <clock source>, <clock edge>, <clock threshold>, <hysteresis>, <period>, <low n>, <high n>, <unit>
DP2C	delta pit to clock	<data source>, <data polarity>, <data threshold>, <clock source>, <clock edge>, <clock threshold>, <hysteresis>, <period>, <low n>, <high n>, <unit>
DP2CS	delta pit to clock sigma	<data source>, <data polarity>, <data threshold>, <clock source>, <clock edge>, <clock threshold>, <hysteresis>, <period>, <low n>, <high n>, <unit>
EDGSH	edge shift	<data source>, <data polarity>, <data threshold>, <hysteresis>, <period>, <low n>, <high n>, <unit>
EES	Ending edge shift	<subject n>, <data source>, <data polarity>, <data threshold>, <clock source>, <clock edge>, <clock threshold>, <hysteresis>, <period>, <low n>, <high n>, <unit>

Remote Control Commands

<param>	definition	<qualifier> list
EESS	Ending edge shift sigma	<subject n>, <data source>, <data polarity>, <data threshold>, <clock source>, <clock edge>, <clock threshold>, <hysteresis>, <period>, <low n>, <high n>, <unit>
PAA	pit average amplitude	<data source>, <data threshold>, <hysteresis>, <period>, <low n>, <high n>
PBASE	pit base	<data source>, <data threshold>, <hysteresis>, <period>, <low n>, <high n>
PMAX	pit maximum	<data source>, <data threshold>, <hysteresis>, <period>, <low n>, <high n>
PMIDL	pit middle level	<data source>, <data threshold>, <hysteresis>, <period>, <low n>, <high n>
PMIN	pit minimum	<data source>, <data threshold>, <hysteresis>, <period>, <low n>, <high n>
PNUM	pit number	<data source>, <data polarity>, <data threshold>, <hysteresis>, <period>, <low n>, <high n>
PTOP	pit top	<data source>, <data threshold>, <hysteresis>, <period>, <low n>, <high n>
PWID	pit width	<data source>, <data polarity>, <data threshold>, <hysteresis>, <period>, <low n>, <high n>, <units>
TIMJ	timing jitter	<data source>, <data polarity>, <data threshold>, <hysteresis>, <period>, <low n>, <high n>, <units>

<data source>:= {C1, C2, C3, C4, TA, TB, TC, TD}

<clock source>:= {C1, C2, C3, C4, TA, TB, TC, TD}

<data polarity>:= {POS, NEG, ALL}

<clock edge>:= {POS, NEG, NEAR}

<data threshold>:= Level in <data source> in the units of the waveform.

<clock threshold>:= Level in <clock source> in the units of the waveform.

<hysteresis>:= {0.5, 1, 2, 5} divisions

<period>:= 1e-9 to 0.001 seconds

<low n>:= 1-25

<high n>:= 1-25

<units>:= {PCT, TIME}

<subject n>:= 1-25



QUERY SYNTAX	PParameter_List?
RESPONSE FORMAT	PParameter_List <parameter>, <qualifier>, [<qualifier>,...]
AVAILABILITY	<sourceN>:= {C3, C4} only on four-channel oscilloscopes.
EXAMPLES	DP2C
Command Example	PALI DP2C, C1, ALL, 20E-3, C2, NEAR, 0E-3, 0.5, 231.5E-9, 3, 11, TIME
Query/Response Examples	PALI? returns: PALI DP2C, C1, ALL, 0E-3, C2, NEAR, 0E-3, 0.5 DIV, 231.5E-9 S, 3, 11, TIME PALV? returns: PALV DP2C, 1.45E-9 S, 9.84E-9 S, -8.88E-9 S, 2.34E-9 S, -1E-9 S, 15.2E-9 S, -16.02E-9 S, 7.69E-9 S, -1.9E-9 S
Command Example	PWID PALI PWID, C1, POS, 25E 3, 1, 231.5E-9, 3, 11, PCT
Query/Response Examples	PALI? returns: PALI PWID, C1, POS, 0E-3, 1 DIV, 231.5E-9 S, 3, 11, PCT PALV? returns: PALV PWID, 289.402 PCT, 393.383 PCT, 497.709 PCT, 603.318 PCT, 698.435 PCT, 804.229 PCT, 905.015 PCT, 1.003959E+3 PCT, 1.110306E+3 PCT
RELATED COMMANDS	PARAMETER_DELETE, PARAMETER_VALUE, PARAMETER_LIST_VALUES, PARAMETER_CUSTOM, PASS_FAIL_CONDITION

Remote Control Commands

CURSOR

PARAMETER_LIST_SET_NT, PALSNT Command/Query

DESCRIPTION

The PARAMETER_LIST_SET_NT command is used to set or query the subject nT of the AORM list parameter. It is only available with the AORM package. The command provides a way to change the subject nT without resetting statistics.

In order to remotely collect a table of edge shift data for a set of pit/space pairs over a range of pit sizes, it is necessary to issue a series of **PALV?** queries for a sequence of nT subject values. If the **PALI** command is used to change the nT subject value, statistics are reset. Not only is it impossible this way to collect accumulated data, but also each line of the table comes from a different acquisition.

The PALSNT command solves the problem by setting only the subject nT value for the list parameter and doesn't reset the accumulated data.

The only parameters for which this command is useful are BES, BESS, EES and EESS.

Note: It is possible for a trigger to occur during the collection of the table data. When accumulation is on, additional data shouldn't affect the values in the table if the number of sweeps is large. If it is important that the data read out by multiple queries be totally consistent, stop the trigger before issuing the queries.

Note: Measuring edge shifts in percent will cause data variation if the period is being determined from the data, and fluctuates.

Note: This command will not work when the ORM table is being displayed.

COMMAND SYNTAX

Parameter_List_Set_NT <subject nT value>

<subject nT value> = The value to set the subject nT, from 0 to 25.

QUERY SYNTAX

Parameter_List_Set_NT?



RESPONSE FORMAT

PALSNT <subject nT>

EXAMPLE (GPIB)

The following sequence of commands obtains the values for a 3x3 array of beginning edge shifts:

PALI BES,4,C1,POS,0E-3,C1,POS,0E-3,1 DIV,1E-9 S,3,5,TIME
Wait for the desired number of sweeps and then send:

```
PALSNT 3
PALV?
PALSNT 4
PALV?
PALSNT 5
PALV?
```

The output will appear as:

```
PALV BES,0.1E-9,-0.8E-9,-0.4E-9
PALV BES,-0.3E-9,-0.2E-9,0.9E-9
PALV BES,-1.1E-9,0.6E-9,1.3E-9
```

Remote Control Commands

CURSOR

PARAMETER_LIST_VALUES?, PALV? Query

DESCRIPTION	The PARAMETER_LIST_VALUES query returns the current value(s) of the ORM measurement parameter(s) configured for 'List by nT' mode. <i>Only ORM parameters are shown here.</i>
QUERY SYNTAX	Parameter_List_Values? <parameter> := See table of list parameter names under PALI command.
RESPONSE FORMAT	Parameter_List_Values <parameter>,<value>, [...,<value>] <value> := A decimal numeric value The number of values depends on the configuration, specifically the low n and high n specified. The number of values returned is: $high_n - low_n + 1$ $high_n \geq low_n$ The first value returned corresponds to the measurement calculated for the low n index, and the last value returned corresponds to the measurement calculated for the high n index.
EXAMPLE (GPIB)	The following query reads the pit middle levels (pmidl) parameter of channel 1 configured for 'list by nT' calculation mode previously using the PALI command. The parameter was configured for low_n = 3 and high_n = 11, so 9 values are returned: CMD\$="PALV?": CALL IBWRT(SCOPE%,CMD\$): CALL IBRD (SCOPE%,RD\$): PRINT RD\$ Response message: PALV PMIDL,1.9E-3 V,2.3E-3 V,1.8E-3 V,1.3E-3 V,1E-3 V,0.6E-3 V,0.9E-3 V,0.8E-3 V,0.7E-3 V
RELATED COMMANDS	CURSOR_MEASURE, CURSOR_SET, PARAMETER_LIST, PARAMETER_STATISTICS

**CURSOR****PARAMETER_STATISTICS?, PAST?**

Query

DESCRIPTION

The **PARAMETER_STATISTICS?** query returns the current values of statistics for the specified pulse parameter mode and the result type for all five lines of the pulse parameters display.

Notation	
AVG	average
CUST	custom parameters
HIGH	highest value
HPAR	horizontal standard parameters
LOW	lowest value
PARAM	parameter definition for each line
NUM_ACQ	number of contributing acquisitions
NUM_VALUES	number of measurements taken for parameter
SIGMA	sigma (standard deviation)
SWEEPS	number of sweeps accumulated for each line
VPAR	vertical standard parameters

QUERY SYNTAX

Parameter_Statistics? <mode>, <result>

<mode> := {**CUST**, **HPAR**, **VPAR**}

<result> := {**AVG**, **LOW**, **HIGH**, **NUM_ACQ**, **NUM_VALUES**, **SIGMA**, **SWEEPS**, **PARAM**}

*Note: If keyword **PARAM** is specified, the query returns the list of the five pairs <parameter_name>, <source>.*

EXAMPLE (GPIB)

The following query reads the average values of the five standard vertical parameters:

```
CMD$="PAST? VPAR, AVG": CALL IBWRT(SCOPE%,CMD$):  
CALL IBRD(SCOPE%,RD$): PRINT RD%
```

RESPONSE FORMAT

PAST VPAR, AVG, 13V, 26V, 47V, 1V, 0V

RELATED COMMANDS

PARAMETER_VALUE

Remote Control Commands

CURSOR

PARAMETER_VALUE?, PAVA? Query

DESCRIPTION

The PARAMETER_VALUE query returns the current value(s) of the pulse waveform parameter(s) and mask tests for the specified trace. Traces do not need to be displayed or selected to obtain the values measured by the pulse parameters or mask tests.

Parameters Available on All Models					
ALL	all parameters	DUTY	duty cycle	OVSP	positive overshoot
AMPL	amplitude	FALL	falltime	PER	period
AREA	area	FALL82	fall 80 to 20%	PKPK	peak-to-peak
BASE	base	FREQ	frequency	PNTS	points
CMEAN	mean for cyclic waveform	FRST	first point	RISE	risetime
CMEDI	median for cyclic waveform	LAST	last point	RISE28	rise 20 to 80%
CRMS	root mean square for cyclic part of waveform	MAX	maximum	RMS	root mean square
CSDEV	standard deviation for cyclic part of waveform	MEAN	mean	SDEV	standard deviation
CYCL	cycles	MEDI	median value	TOP	top
DLY	delay	MIN	minimum	WID	width
DUR	duration of acquisition	OVSN	negative overshoot		
Custom Parameters Defined using PARAMETER_CUSTOM Command ¹					
CUST1	CUST2	CUST3	CUST4	CUST5	
Parameters Available on Instruments with WP03 or DDM Processing Firmware					
AVG	average of distribution	HMEDI	median of a histogram	PKS	number of peaks
DATA	data values	HRMS	histogram rms value	RANGE	range of distribution
FWHM	full width at half max	HTOP	histogram top value	SIGMA	sigma of distribution
HAMPL	histogram amplitude	LOW	low of distribution	TOTP	total population

¹ The numbers in the terms CUST1, CUST2, CUST3, CUST4 and CUST5 refer to the line numbers of the selected custom parameters.



HBASE	histogram base	MAXP	maximum population		
HIGH	high of histogram	MODE	mode of distribution		
Parameter Computation States					
AV	averaged over several (up to 100) periods	OF	signal partially in overflow		
GT	greater than given value	OK	deemed to be determined without problem		
IV	invalid value (insufficient data provided)	OU	signal partially in overflow and underflow		
LT	less than given value	PT	window has been period truncated		
NP	no pulse waveform	UF	signal partially in underflow		
Mask Test Names					
ALL_IN	all points of waveform inside mask (TRUE = 1, FALSE = 0)	SOME_IN	some points of waveform inside mask (TRUE = 1, FALSE = 0)		
ALL_OUT	all points of waveform outside mask (TRUE = 1, FALSE = 0)	SOME_OUT	some points of waveform outside mask (TRUE = 1, FALSE = 0)		

QUERY SYNTAX

<trace> : **Parameter_VALUE?** [<parameter>,...,<parameter>]
 <trace> := {**TA, TB, TC, TD, C1, C2, C3, C4**}
 <parameter> : *See table of parameter names on previous page.*

Alternative forms of query for mask tests:

<trace> : **Parameter_VALUE?** <old_mask_test>
 <trace> : **Parameter_VALUE?** <mask_test>, <mask>
 <mask_test> := {**ALL_IN, SOME_IN, ALL_OUT, SOME_OUT**}
 <old_mask_test> := {**ALLI, ANYI, ALLO, ANYO**}
 <mask> := {**TA, TB, TC, TD**}

Note: Old mask test keywords ALLI, ANYI, ALLO, ANYO imply testing of <trace> against the mask waveform TD. Old mask test keywords INSIDE and OUTSIDE are equivalent to ALL_IN and SOME_OUT; they are only supported for compatibility with older-model instruments.

Remote Control Commands

RESPONSE FORMAT

`<trace> : Parameter_VAlue<parameter>, <value>,
<state> [, ..., <parameter>, <value>, <state>]
<value> : = A decimal numeric value
<state> : = {OK, AV, PT, IV, NP, GT, LT, OF, UF, OU}`

Note: If <parameter> is not specified, or is equal to ALL, all the standard voltage and standard time parameters followed by their values and states are returned.

AVAILABILITY

`<trace> : = {C3, C4}` only available on four-channel instruments.

EXAMPLE (GPIB)

The following query reads the risetime of Trace B (TB):

**CMD\$="TB:PAVA? RISE": CALL IBWRT(SCOPE%,CMD\$):
CALL IBRD (SCOPE%,RD\$): PRINT RD\$**

Response message:

TB:PAVA RISE,3.6E-9S,OK

RELATED COMMANDS

CURSOR_MEASURE, CURSOR_SET,
PARAMETER_CUSTOM, PARAMETER_STATISTICS

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