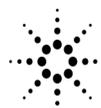
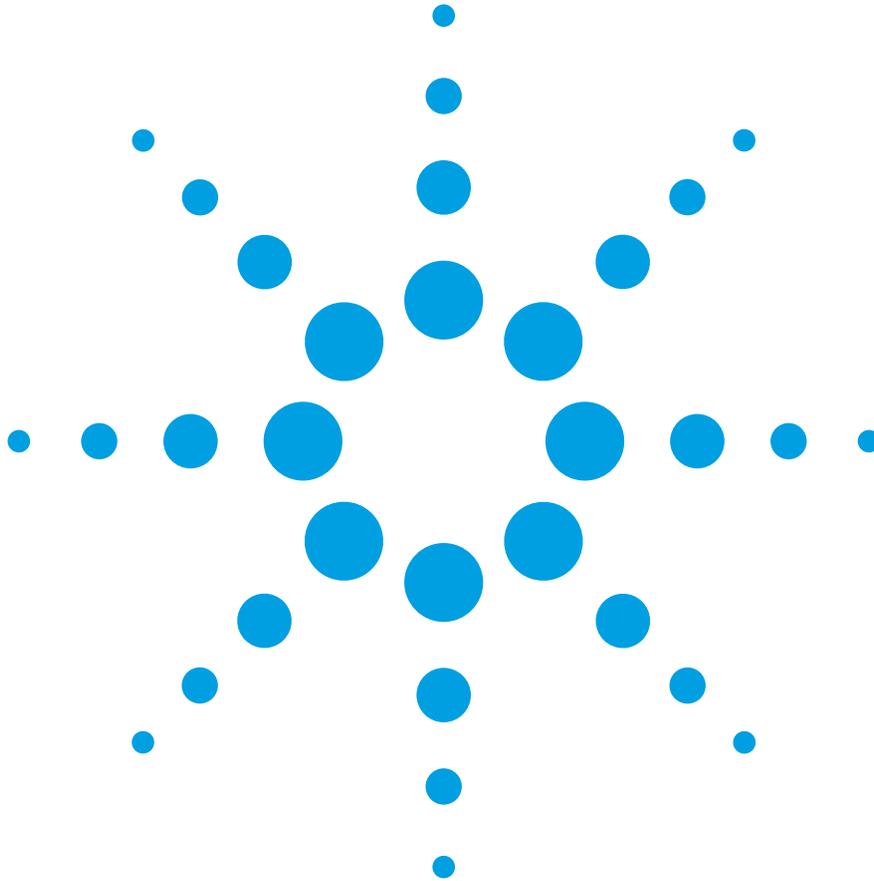




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Manual Change Supplement

Agilent 86100A



Agilent Technologies

Introduction

This supplement contains corrections for the 86100A manuals that are listed in the following table. This information was not available at the time that these manuals were printed. The corrections include errata and changes due to product redesign.

Note

The information in this supplement applies to instruments that have software version 2.0 or *higher*.

Manuals Affected by this Change Supplement

Manual	Part Number
Programmer's Guide	86100-90017

Programmer's Guide

Introduction

Page 1-12

Change the following file name extensions table and descriptions:

Table 1-1. File Name Extensions

File Type	File Name Extension
Screen image	.bmp, .eps, .gif, .pcx, .ps, .jpg, .tif

If you do not specify an extension when storing a file, or specify an incorrect extension, it will be corrected automatically according to the following rules:

- No extension specified: add the extension for the file type.
- Extension does not match file type: retain the filename (including the current extension) and add the appropriate extension.

You do not need to use an extension when loading a file if you use the optional destination parameter. For example, :DISK:LOAD "STM1_OC3",SMASK will automatically add .msk to the file name.

Note

For .gif and .tif file formats, this instrument uses LZW compression/decompression licensed under U.S. patent No 4,558,302 and foreign counterparts. End user should not modify, copy, or distribute LZW compression/decompression capability.

For .jpg file format, this instrument uses the .jpg software written by the Independent JPEG Group.

Page 1-13

Change the following default file locations table:

Table 1-3. Default File Locations (Storing Files)

File Type	Default Location
Mask	C:\Scope\masks (standard masks) C:\User Files\masks (user-defined masks)

Page 1-18

Add the following note to the DIGITIZE command description:

Introduction

Note

The execution of the DIGITIZE command is subordinate to the status of ongoing limit tests. (See commands ACQUIRE:RUNTil , MTEST:RUNTil, and LTEST.) The DIGITIZE command will not capture data if the stop condition for a limit test has been met.

Status Reporting

Page 4-5

Change the following status reporting bit definitions table:

Table 4-1. Status Reporting Bit Definition

Bit	Description	Definition
UNLK	UNloCKed	Indicates that an unlocked or trigger loss condition has occurred in the Clock Recovery Module.
LOCK	LOCKed	Indicates that a locked or trigger capture condition has occurred in the Clock Recovery Module.

Page 4-14***Clock Recovery Event Register (CRER)***

Change the Bit 0 (UNLK) and Bit 1 (LOCK) descriptions to read:

Bit 0 (UNLK) of the Clock Recovery Event Register is set when Clock Recovery module becomes unlocked or trigger loss has occurred for the 83494A family of modules.

Bit 1 (LOCK) of the Clock Recovery Event Register is set when Clock Recovery module becomes locked or a trigger capture has occurred for the 83494A family of modules.

Programming Conventions

Pages 5-6 to 5-8

Change the following command trees:

Programming Conventions

Command Trees

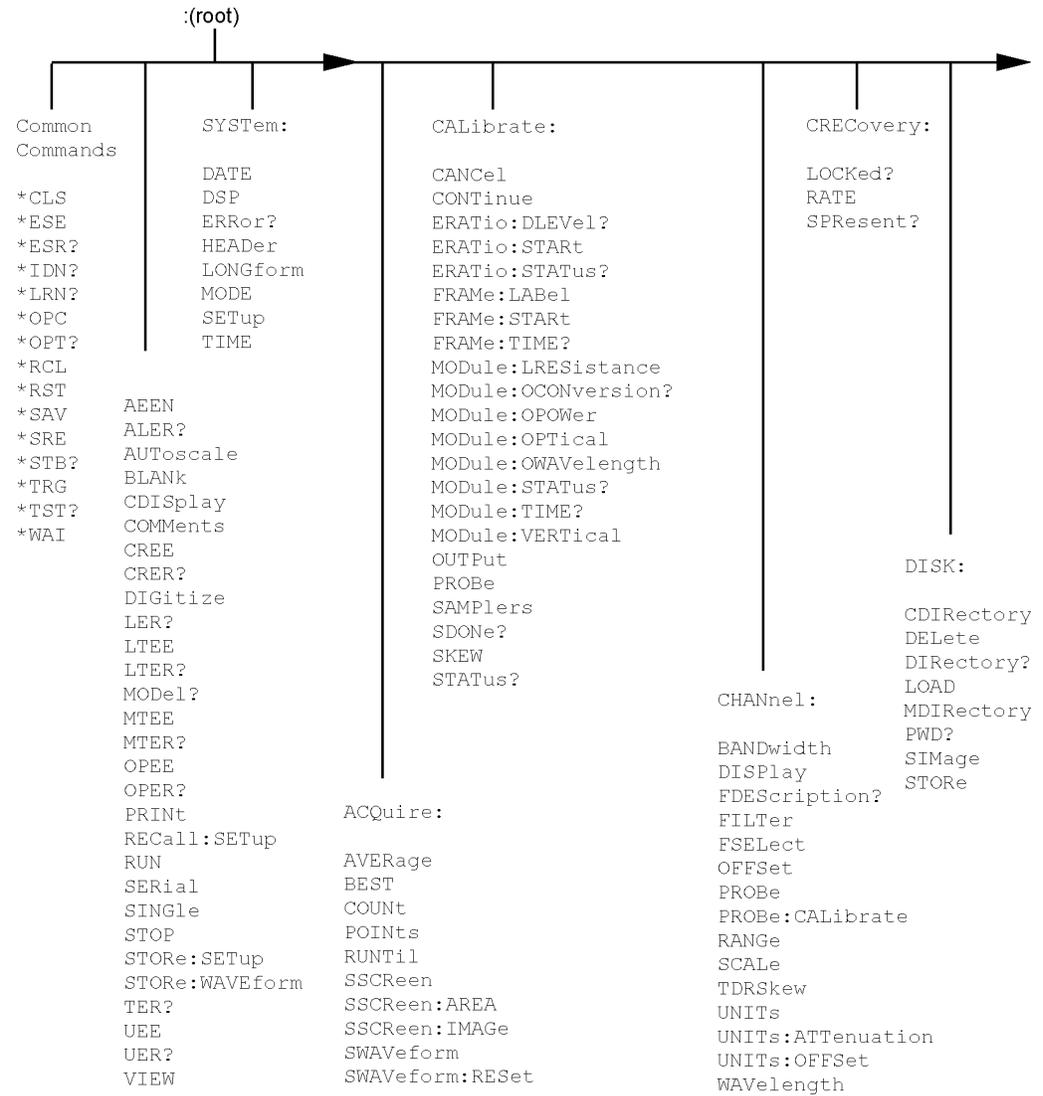
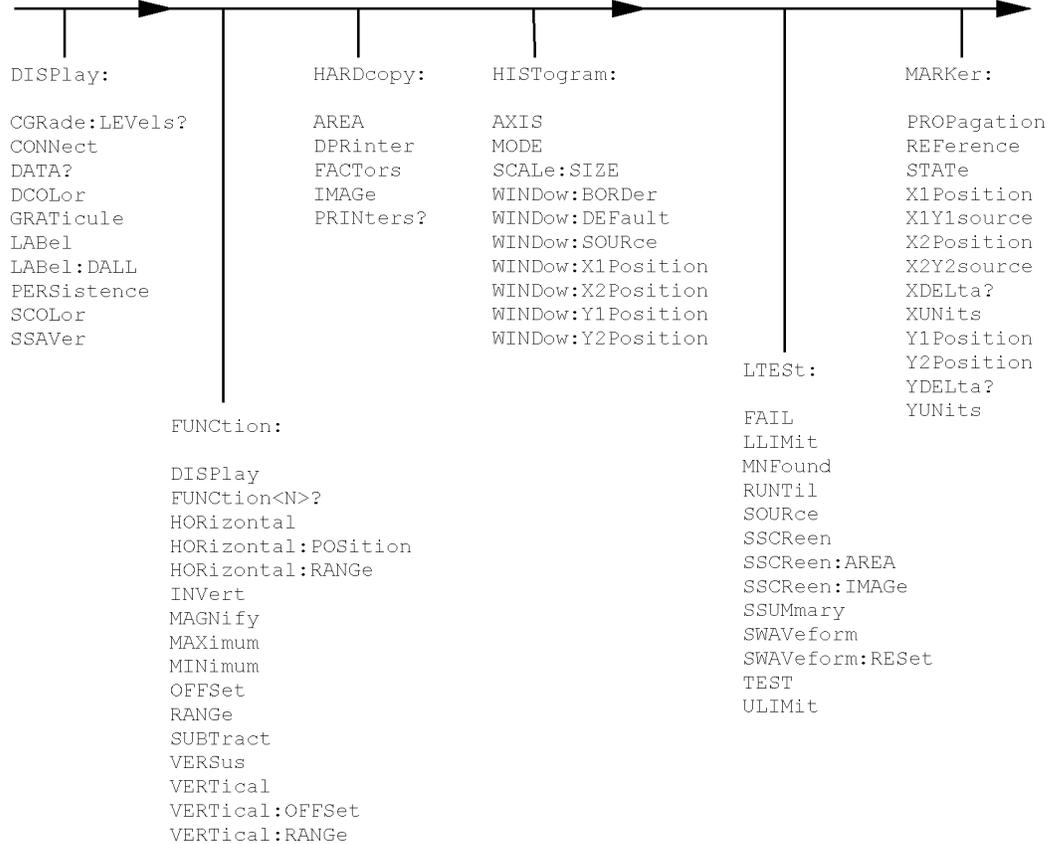


Figure 5-2. Command Tree



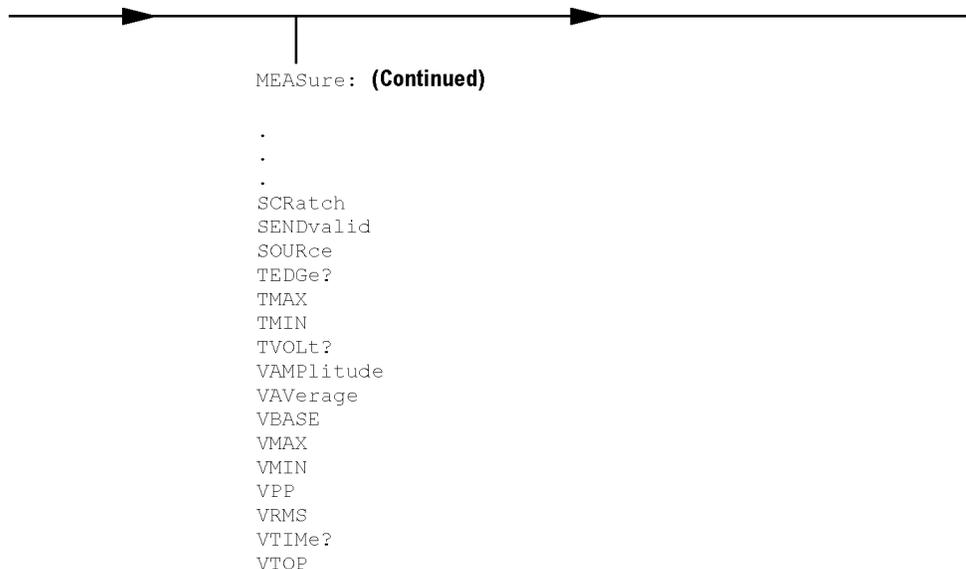
Command Tree (Continued)

Programming Conventions

MTEST:	MEASure:	TIMEbase:	WAVEform:	WMEMory:
ALIGN	ANNotation	BRATe	BANDpass?	DISPlay
AMETHod	APOWer	POSition	BYTeorder	LOAD
COUNT:FAILures?	CGRade:AMPLitude	RANGE	COUNT?	SAVE
COUNT:FSAMples?	CGRade:BITRate	REFerence	DATA	XOFFset
COUNT:HITS?	CGRade:COMplete	SCALE	FORMat	XRANge
COUNT:SAMPles?	CGRade:CRATio	UNITS	POINts?	YOFFset
COUNT:WAVEforms?	CGRade:CROSSing		PREAmble	YRANge
DELeTe	CGRade:DCDistortion		SOURce	
EXIT	CGRade:DCYClE		TYPE?	
LOAD	CGRade:EHEight		XDISplay?	
MASK:DELeTe	CGRade:ERATio		XINCrement?	
MMARgin:PERCent	CGRade:ESN		XORigin?	
MMARgin:STATe	CGRade:EWIDth		XRANge?	
RUNtil	CGRade:JITTer		XREFerence?	
SCALE:DEFault	CGRade:OFACtor		XUNits?	
SCALE:SOURce?	CGRade:OLEVel		YDISplay?	
SCALE:X1	CGRade:PEAK?		YINCrement?	
SCALE:XDELta	CGRade:PWIDth		YORigin?	
SCALE:Y1	CGRade:ZLEVel		YRANge?	
SCALE:Y2	CLEar		YREFerence?	
SCALE:YTRack	DEFine		YUNits?	
SSCReen	DELtatime			
SSCReen:AREA	DUTYcycle		TRIGger:	
SSCReen:IMAGe	FALLtime		ATTenuation	
SSUMmary	FREQuency		BWLimit	
START	HISTogram:HITS?		GATed	
SWAVEform	HISTogram:M1S?		HYSTeresis	
SWAVEform:RESet	HISTogram:M2S?		LEVel	
TEST	HISTogram:M3S?		SLOPe	
TITLE?	HISTogram:MEAN?	TDR:	SOURce	
	HISTogram:MEDian?			
	HISTogram:PP?	PRESet		
	HISTogram:PPOSITION?	RATE		
	HISTogram:SCALE?	RESPonse		
	HISTogram:STDDev?	RESPonse:CALibrate		
	NWIDth	RESPonse:CALibrate:CANcel		
	OVERshoot	RESPonse:CALibrate:CONTinue		
	PERiod	RESPonse:HORIZontal		
	PWIDth	RESPonse:HORIZontal:POSition		
	REsults?	RESPonse:HORIZontal:RANge		
	RISetime	RESPonse:RISetime		
	.	RESPonse:TDRDest		
	.	RESPonse:TDRTDT		
		RESPonse:TDTDest		
		RESPonse:VERTical		
		RESPonse:VERTical:OFFSet		
		RESPonse:VERTical:RANge		

(Continued)

Command Tree (Continued)



Command Tree (Continued)

Common Commands

Page 7-9

Add the following note to the *OPC (Operation Complete) command:

Note

Three commands are available for the synchronization between remote command scripts and the instrument:

- The *OPC command: This command sets a bit in the Standard Event Status Register when all pending device operations have finished. It is useful to verify the completion of commands that could take a variable amount of time or commands executed in parallel with other commands, such as PRINT, and the limit test commands (ACQUIRE:RUNtil, MTEST:RUNtil, and LTEST). It does not stop the execution of the remote script.
- The *OPC query: This query allows synchronization between the computer and the instrument by using the message available (MAV) bit in the Status Byte, or by reading the output queue. Unlike the *OPC command, the *OPC query does not affect the OPC event bit in the Standard Event Status Register. The execution of the remote script is halted and therefore the *OPC query should be used judiciously. For example, the command ":MTEST:RUNtil FSAMPLES,100"; *OPC?" will lock the remote interface until 100 failed samples are detected, which could take a very long time. Under these circumstances, the user must send a device clear or power down to re-start the instrument.
- The *WAI command: This command is similar to the *OPC? query as it will also block the execution of the remote script until all pending operations are finished. It is particularly useful if the host computer is connected to two or more instruments. This command will not block the GPIB bus, allowing the computer to continue issuing commands to the instrument not executing the *WAI command.

Page 7-20

Add the following note to the *WAI (Wait-to-Continue) command:

Root Level Commands

Note

Three commands are available for the synchronization between remote command scripts and the instrument:

- The *OPC command: This command sets a bit in the Standard Event Status Register when all pending device operations have finished. It is useful to verify the completion of commands that could take a variable amount of time or commands executed in parallel with other commands, such as PRINT, and the limit test commands (ACQUIRE:RUNtil, MTEST:RUNtil, and LTEST). It does not stop the execution of the remote script.
- The *OPC query: This query allows synchronization between the computer and the instrument by using the message available (MAV) bit in the Status Byte, or by reading the output queue. Unlike the *OPC command, the *OPC query does not affect the OPC event bit in the Standard Event Status Register. The execution of the remote script is halted and therefore the *OPC query should be used judiciously. For example, the command ":MTEST:RUNtil FSAMPLES,100"; *OPC?" will lock the remote interface until 100 failed samples are detected, which could take a very long time. Under these circumstances, the user must send a device clear or power down to re-start the instrument.
- The *WAI command: This command is similar to the *OPC? query as it will also block the execution of the remote script until all pending operations are finished. It is particularly useful if the host computer is connected to two or more instruments. This command will not block the GPIB bus, allowing the computer to continue issuing commands to the instrument not executing the *WAI command.

Root Level Commands

Page 8-7

Change the CRER? query, Bit 0 (UNLK), and Bit 1 (LOCK) descriptions to read:

This query returns the current value of the Clock Recovery Event Register as a decimal number and also clears this register. Refer to the ":CRECOVERY:SPResent?" query in Chapter 13 for more detailed information on receiver one and receiver two.

Bit 0 (UNLK) of the Clock Recovery Event Register is set when the clock recovery module becomes unlocked or trigger loss has occurred for the 83494A family of modules.

Bit 1 (LOCK) of the Clock Recovery Event Register is set when the clock recovery module becomes locked or a trigger capture has occurred for the 83494A family of modules.

Page 8-8

Add the following note to the :DIGitize command description:

Note

As with the RUN command, the DIGitize command will not be executed if the stop condition for an ongoing limit test has been satisfied. The stop condition is specified by commands ACQUIRE:RUNtil, MTEST:RUNtil, or LTEST.

Page 8-13

Example

Change the :PRINT example to read:

This example outputs a copy of the screen to a printer or a disk file. See *OPC (Operation Complete) command for synchronization of PRINT operations.

```
10 OUTPUT 707;":PRINT"  
20 END
```

Page 8-13

Add the following note to the :Run command:

Note

The execution of the RUN command is subordinate to the status of ongoing limit tests. (see commands ACQUIRE:RUNTil, MTEST:RUNTil, and LTEST). The .RUN command will not start data acquisition if the stop condition for a limit test has been met.

Page 8-15

Command

Change the STORE:WAVEform command to read:

:STORE:WAVEform {CHANnel<N> | FUNCtion<N> | WMEMory<N> | RESPonse<N>},{WMEMory<N>}

Acquire Commands

Page 10-6

<filename>

Change the :ACQUIRE:SSCREEN <filename> description to read:

An ASCII string enclosed in quotation marks. If no filename is specified, a default filename is assigned. This filename will be *AcqLimitScreenX.bmp*, where X is an incremental number assigned by the instrument.

Note

The save screen options established by the commands ACQUIRE:SSCREEN DISK, ACQUIRE:SSCREEN:AREA, and ACQUIRE:SSCREEN:IMAG are stored in the instrument's memory and will be employed in consecutive save screen operations, until changed by the user. This includes the <filename> parameter for the ACQUIRE:SSCREEN DISK command. If the results of consecutive limit tests must be stored in different files, omit the <filename> parameter and use the default filename instead. Each screen image will be saved in a different file named *AcqLimitScreenX.bmp*, where X is an incremental number assigned by the instrument.

The *filename* field encodes the network path and the directory in which the file will be saved, as well as the file format that will be used. The following is a list of valid filenames.

Valid Filenames

Filename	File Saved in Directory...
"Test1.gif"	C:\User Files\Screen Images\
"A:test2.pcx"	A:\
"\\computer-ID\d\$\test3.bmp"	File saved in drive D: of computer "computer-ID", provided all permissions are set properly.
"E:test4.eps"	File saved in the instrument's drive E:, that could be mapped to any disk in the network.

If a filename is specified without a path, the default path will be C:\User Files\screen images. The default file type is a bitmap (.bmp). The following graphics formats are available by specifying a file extension: PCX files (.pcx), EPS files (.eps), Postscript files (.ps), JPEG files (.jpg), TIFF files (.tif), and GIF files (.gif).

Page 10-9

Add the following note to the :ACQUIRE:SWAVEform <filename> description:

Note

If the selected waveforms of consecutive limit tests are to be stored in individual files, omit the <file-name> parameter. The waveforms will be stored in the default format (INTERNAL) using the default naming scheme.

Calibration Commands

Page 11-7

Add the following command:

MODUle:LRESistance

Command	:CALibrate:MODUle:LRESistance <resistance_value> This command sets the load resistance value used during vertical calibration of a TDR module. The accuracy of the calibration is improved by specifying the exact resistance value of the load that is connected to the TDR module during the calibration process.
<resistance_value>	The resistance of the load from 47 to 53 ohm. The default value is the target value of 50 ohm.
Example	This example sets the load resistance value to 49.9 ohms. 10 OUTPUT 707;":CALIBRATE:MODULE:LRESISTANCE 49.9" 20 END
Query	:CALibrate:MODUle:LRESistance? The query returns the resistance value in ohms for the load used during vertical calibration of a TDR module.
Returned Format	[:CALibrate:MODUle:LRESistance] <resistance_value><NL>

Page 11-9

Change the :CALibrate:MODUle:STATus?{LModule | RModule} query description to read:

This query returns the status of the vertical calibration (electrical channels) and optical calibration (optical channels) as either CALIBRATED or UNCALIBRATED. It will return UNKNOWN if the module does not have calibration capability. Queries to modules with two electrical channels (including TDR modules) will return the status of vertical calibration only.

Change the returned format to read:

Returned Format	[:CALibrate:MODUle:STATus] {<status vertical calibration>,<status optical calibration> CALIBRATED UNCALIBRATED UNKNOWN} <NL>
-----------------	--

Page 11-11

Change the :CALibrate:SKEW <skew_value> description to read:

<skew_value>	A real number, 0 s to 100 μs
--------------	------------------------------

Page 11-12

Change the :CALibrate:STATus? query description and <status> description to read:

This query returns the calibration status of the analyzer. These are nine comma-separated integers, with 1 or 0. A "1" indicates calibrated; a "0" indicates uncalibrated. This matches the status in the Calibration dialog box in the Calibrate menu.

<status>	<Mainframe/Horizontal Status>, <Channel1 Vertical>, 0, <Channel2 Vertical>, 0, <Channel3 Vertical>,0, <Channel4 Vertical>, 0
----------	--

The values that always return “0” are used to make the returned format compatible with the Agilent 83480A and 54750A.

Channel Commands

Page 12-4

Query

Change the FDEscription? query description to read:

This query returns the number of filters and a brief description of each filter for channels with one or more internal low-pass filters.

Change the returned format to read:

Returned Format

[:CHANnel<N>:FDEscription]<n><filter1_description>,<filter2_description>,<filter3_description>,<filter4_description><NL>

Page 12-5

Command

Change the FSElect command and <filter_number> descriptions to read:

This command selects which filter is controlled by on/off for channels with more than one filter selection.

<filter_number>

The filter number is an integer from 1 to 4. In the **Channel** dialog box, filter number 1 is the first filter listed in the **Filter** box.

Change the returned format to read:

Returned Format

[:CHANnel<N>:FSElect]{FILT<filter_number>}<NL>

Page 12-6

Change the :CHANnel<N>:OFFSet command description to read:

This command sets the voltage that is represented at the center of the display for the selected channel. Offset parameters are probe and vertical scale dependent.

For TDR and TDT applications, when the TDR stimulus is set to differential or common mode, the instrument will change offset to magnify offset. This command is used to set the magnify offset as well as the offset.

Page 12-6

Query

Change the :CHANnel<N>:PROBe? query description to read:

CHANnel<N>:PROBe?

When the TDR stimulus is set to differential or common mode, the instrument will change offset to magnify offset. This command is used to set the magnify offset as well as the offset.

Page 12-8

Change the :CHANnel<N>:SCALE command description to read:

This command sets the vertical scale, or units per division, of the selected channel. This command is the same as the front-panel channel scale.

For TDR and TDT applications, when the TDR stimulus is set to differential or common mode, the instrument will change scale to magnify scale. This command is used to set the magnify scale as well as the scale.

Page 12-9

Add the following note to the :CHANnel<N>:TDRSkew command description:

Note

This command is enabled only if a stimulus is currently active and if the module has differential capability.

Clock Recovery Commands

Page 12-10

Command	Change the :CHANnelN:WAVelength command to read: :CHANnel<N>:WAVelength {WAVelength1 WAVelength2 USER}
Query	Change the :CHANnelN:WAVelength query to read: :CHANnel<N>:WAVelength?
Returned Format	The query returns the currently selected wavelength for the channel. [:CHANnel<N>:WAVelength] {WAV1 WAV2 USER}<NL>

Clock Recovery Commands

Page 13-3

Change the :CRECovery{1|3}:LOCKed? query description to read:
The query returns the locked or triggered status of the clock recovery module.
Locked or triggered status returns 1, unlocked or trigger loss status returns 0. When a clock rate is selected, unlocked status indicates clock recovery cannot be established and trigger output to the mainframe is disabled. In bypass mode (TOD) status is always 0 and trigger output to the mainframe is not disabled.

Page 13-3

Change the :CRECovery{1|3}:RATE command to read:
:CRECovery{1 |3}:RATE {TOData | R155 | R622 | R1062 | R1250 | R2125 | R2488 | R2500 | R2666 | R9953 | R10664}
This command sets the clock recovery module data rate based on module slot position: left slot (1), right slot (3). The rates are: Trigger On Data (TOData), Rate 155, Rate 622, Rate 1062, Rate 1250, Rate 2125, Rate 2488, Rate 2500, Rate 2666, Rate 9953, and Rate 10664 in Mb/s.
Rate parameters are nominal and reflect front panel labels and not actual data rates.

Note

After setting a rate, locked or triggered status should be verified before executing any signal dependent GPIB commands, such as autoscale, or any measurements. This is required to allow the module/instrument enough time to establish a trigger. This can be achieved by querying locked status until locked or generating an event on the module lock.

As noted in the table below, not all modules support the same rates.

Data Rates vs. Model

Rate Parameter	Rate (Mb/s)	Module Model Number				
		83491	83492	83493	83494	83494 Option 106
TOData	—	X	X	X	X	X
R155	155.52	X	X	X	X	X
R622	622.08	X	X	X	X	X
R1062	1062.50	X	X			
R1250	1250.00	X	X	X		
R2125	2125.00	X	X			
R2488	2488.32	X	X	X	X	X
R2500	2500.00	X	X	X		

Data Rates vs. Model

Rate Parameter	Rate (Mb/s)	Module Model Number				
		83491	83492	83493	83494	83494 Option 106
R2666	2666.06					X
R9953	9953.28				X	
R10664	10664.23					X

Example	This example sets the module in the right slot to a data rate of 2488 Mb/s. 10 OUTPUT 707;":CRECOVERY3:RATE R2488" 20 END
Query	:CRECOVERY{1 3}:RATE? This query returns the current data rate of the clock recovery module in the specified module position.
Returned Format	[:CRECOVERY{1 3}:RATE] {TOData R155 R622 R1062 R1250 R2125 R2488 R2500 R2666 R9953 R10664}<NL>
Example	The following example checks the current data rate of the module in the left slot and places the result in the string variable, Rate\$. Then the program prints the contents of the variable to the controller's screen. 10 DIM Rate\${50} 20 OUTPUT 707;":CRECOVERY1:RATE?" 30 ENTER 707;Rate\$ 40 PRINT Rate\$ 50 END

Page 13-5

Add the following table to the :CRECOVERY{1|3}:SPResent? query description:

Signal Present Return Status vs. Receiver Number

Module Model	Receiver 1 Short Wavelength	Receiver 2 Long Wavelength
83491	0	0
83492 ^a	1/0	1/0
83493	0	1/0
83494	0	1/0
83494 Option 106	0	1/0

a. Only one receiver at a time can have a signal present.

Disk Commands**Page 14-2**

Change the DISK subsystem commands introductory description to include:
The DISK subsystem commands perform the disk operations as defined in the Disk menu. This allows storage and retrieval of waveforms and setups, remote screen captures, as well as formatting the disk.

Page 14-3

Change the :DISK:DELeTe command description and the example to read:

Display Commands

This command deletes a file from the disk. If no path is specified, it searches for the file using the present working directory. An error is displayed on the analyzer screen if the requested file does not exist. The file "C:\User Files" *cannot* be deleted.

Example

```
10 OUTPUT 707;";DISK:CDIRECTORY SETUPS"  
20 OUTPUT 707;";DISK:DELETE ""FILE1.SET""  
30 END
```

Page 14-6

Add the following command:

SIMage

Note

This command operates only on files and directories on "A:\", under "C:\User Files", or on any mapped network drive.

Command

:DISK:SIMage "<filename>"

This command remotely captures images of the screen.

<filename>

If a filename is specified without a path, the default path will be C:\User Files\screen images. The default file type is a bitmap (.bmp).

The *filename* field encodes the network path of the directory in which the file will be saved, as well as the file format that will be used. The following is a list of valid filenames.

Valid Filenames

Filename	File Saved in Directory...
"Test1.gif"	C:\User Files\Screen Images\
"A:test2.pcx"	A:\
"\computer-ID\d\$\test3.bmp"	File saved in drive D: of computer "computer-ID", provided all permissions are set properly.
"E:test4.eps"	File saved in the instrument's drive E:, that could be mapped to any disk in the network.

The following graphics formats are available by specifying a file extension: PCX files (.pcx), EPS files (.eps), Postscript files (.ps), JPEG files (.jpg), TIFF files (.tif), and GIF files (.gif).

Display Commands

Page 15-4

Query

Change the :DISPlay:DATA? query to read:

```
:DISPlay:DATA? [<format>[,<screen_mode> [<inversion>]]]
```

The query returns information about the captured data. If no options to the query are specified, the default selections are PCX file type, SCReen mode, and inversion set to NORMal.

<format>

The file format: BMP | PCX | EPS | PS | GIF | TIF | JPG.

<screen_mode>

The display setting: SCReen | GRATICule.

<inversion>

The inversion of the displayed file: NORMal | INVert | MONochrome.

Returned Format

```
[:DISPlay:DATA] <binary_block_data><NL>
```

<binary_block_data> Data in the IEEE 488.2 definite block format.

Function Commands

Page 16-3

Command

Change the :FUNCTION<N>:DISPlay command to read:

```
:FUNCTION<N>:DISPlay {{ON | 1} | {OFF | 0}}
```

Page 16-4

<operator>

Change the :FUNCTION<N>? query <operator> description and the example to read:

Active math operation for the selected function: INVert, MAGNify, MAXimum, MINimum, SUBTract, or VERSus.

```
10 :SYST:HEAD ON
20 :FUNC1:SUBTRACT CHAN1,CHAN2
30 :FUNC1? !returns :FUNC1:SUBTRACT CHAN1,CHAN2
40 :SYST:HEAD OFF
50 :FUNC1? !returns CHAN1,CHAN2
```

Page 16-4

Add the following note to the :FUNCTION<N>:HORizontal command description:

Note

This command applies only to the Magnify and Versus operators.

Page 16-5

Add the following note to the :FUNCTION<N>:HORizontal:POSition command description:

Note

This command applies only to the Magnify and Versus operators.

Query

Change the :FUNCTION<N>:HORizontal:POSition query and the example to read:

```
:FUNCTION<N>:HORizontal:POSition?
```

The query returns the current time value at center screen of the selected function.

Note

This query returns the current time value only when the respective function display is ON.

Example

This example places the current horizontal position setting for function 2 in the numeric variable, Value, then prints the contents to the computer's screen.

```
10 OUTPUT 707;";SYSTEM:HEADER OFF"           !Response headers off
20 OUTPUT 707;";FUNCTION2:DISPLAY ON"
30 OUTPUT 707;";FUNCTION2:HORIZONTAL:POSITION?"
40 ENTER 707:Value
50 PRINT Value
60 END
```

Page 16-5

Add the following note to the :FUNCTION<N>:HORizontal:RANGe command description:

Note

This command applies only to the Magnify and Versus operators.

Function Commands

Query Change the :FUNCTION<N>:HORizontal:RANGe query and the example to read:
 :FUNCTION<N>:HORizontal:RANGe?
 The query returns the current time range setting of the specified function.

Note

This query returns the current time range setting of the specified function only when the respective function display is ON.

Example This example places the current horizontal range setting of function 2 in the numeric variable, Value, then prints the contents to the computer's screen.

```
10 OUTPUT 707;";SYSTEM:HEADER OFF"            !Response headers off
20 OUTPUT 707;";FUNCTION2:DISPLAY ON"
30 OUTPUT 707;";FUNCTION2:HORIZONTAL:RANGE?"
40 ENTER 707;Value
50 PRINT Value
60 END
```

Page 16-7

Add the following commands:

MAXimum

Command :FUNCTION<N>:MAXimum <operand>

This command defines a function that computes the maximum value of the operand waveform in each time bucket.

<N> An integer, 1–4, representing the selected function.

<operand> {CHANnel<n> | FUNCTION<n> | WMEMory<n> | <float_value>}

<n> An integer from 1 to 4.

MINimum

Command :FUNCTION<N>:MINimum <operand>

This command defines a function that computes the minimum value of each time bucket for the defined operand's waveform.

<N> An integer, 1–4, representing the selected function.

<operand> {CHANnel<n> | FUNCTION<n> | WMEMory<n> | <float_value>}

<n> An integer from 1 to 4.

Page 16-7

Change the :FUNCTION<N>:OFFSet query and the example.

Query :FUNCTION<N>:OFFSet?

The query returns the current offset value for the selected function.

Note

This query returns the current offset value of the specified function only when the respective function display is ON.

Example This example places the current setting for offset on function 2 in the numeric variable, Value, then prints the result to the computer's screen.

```
10 OUTPUT 707;";SYSTEM:HEADER OFF"            !Response headers off
20 OUTPUT 707;";FUNCTION2:DISPLAY ON"
```

```
30 OUTPUT 707;":FUNCTION2:OFFSET?"
40 ENTER 707;Value
50 PRINT Value
60 END
```

Page 16-8

Query

Change the :FUNCTION<N>:RANGe query and the example to read:

```
:FUNCTION<N>:RANGe?
```

The query returns the current full scale range setting for the specified function.

Note

This query returns the current full scale range setting of the specified function only when the respective function display is ON.

Example

This example places the current range setting for function 2 in the numeric variable "Value," then prints the contents to the computer screen.

```
10 OUTPUT 707;":SYSTEM:HEADER OFF"      !Response headers off
20 OUTPUT 707;":FUNCTION2:DISPLAY ON"
30 OUTPUT 707;":FUNCTION2:RANGE?"
40 ENTER 707;Value
50 PRINT Value
60 END
```

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Query

Change the :FUNCTION<N>:VERTical:OFFSet query and the example to read:

```
:FUNCTION<N>:VERTical:OFFset?
```

The query returns the current offset value of the selected function.

Note

This query returns the current offset value of the specified function only when the respective function display is ON.

Example

This example places the current offset setting for function 2 in the numeric variable, Value, then prints the contents to the computer's screen.

```
10 OUTPUT 707;":SYSTEM:HEADER OFF"      !Response headers off
20 OUTPUT 707;":FUNCTION2:DISPLAY ON"
30 OUTPUT 707;":FUNCTION2:VERTICAL:OFFSET?"
40 ENTER 707;Value
50 PRINT Value
60 END
```

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Query

Change the :FUNCTION<N>:VERTical:RANGe query and the example to read:

```
:FUNCTION<N>:VERTical:RANGe?
```

The query returns the current range setting of the specified function.

Note

This query returns the current range setting of the specified function only when the respective function display is ON.

Example

This example places the current vertical range setting of function 2 in the numeric variable, Value, then prints the contents to the computer screen.

```
10 OUTPUT 707;":SYSTEM:HEADER OFF"      !Response headers off
```

Histogram Commands

```
20 OUTPUT 707;";FUNCTION2:DISPLAY ON"  
30 OUTPUT 707;";FUNCTION2:VERTICAL:RANGE?"  
40 ENTER 707;Value  
50 PRINT Value  
60 END
```

Histogram Commands

Page 18-5

Add the following command:

WINDow:BORDER

Command	:HISTogram:WINDow:BORDER {ON OFF}
	This command turns the histogram window border on or off.
Example	The following example enables the display of the histogram window border. 10 OUTPUT 707;";HISTOGRAM:WINDOW:BORDER ON" 20 END
Query	:HISTogram:WINDow:BORDER? The query returns the current histogram window border setting.
Returned Format	[:HISTogram:WINDow:BORDER] {ON OFF}<NL>

Limit Test Commands

Page 19-3

Change the following returned format for :LTEST:FAIL:
Returned Format [:LTEST:FAIL] {INSIDELIMITS| OUTSIDELIMITS| ALWAYSFAIL| NEVERFAIL}<NL>

Page 19-6

Add the following note to the :LTEST:RUNTil FAILures command description:

Note

To run for a number of waveforms or samples, refer to ACQUIRE:RUNTil command.

Page 19-7

Add the following note to the :LTEST:Source command description:

Note

As a measurement is activated, the associated measurement limit test is programmed according to default values expressed by the following script:

```
:LTEST:SOURce <n>  
:LTEST:FAIL OUTSide  
:LTEST:LLIMIT -10  
:LTEST:ULIMIT 10  
:LTEST:MNFound FAIL  
:LTEST:RUNTil FAILures, 1
```

Before a measurement limit test is initiated, you must make the necessary adjustments to the default values otherwise these values will be used during the limit test.

Page 19-7

Change the :LTEST:SSCREEN <filename> description to read:

<filename>

An ASCII string enclosed in quotations marks. If no filename is specified, a filename will be assigned. The default filename is *MeasLimitScreenX.bmp*, where X is an incremental number assigned by the instrument.

Note

The save screen options established by the commands LTEST:SSCReen DISK, LTEST:SSCReen:AREA, and LTEST:SSCReen:IMAG are stored in the instrument's memory and will be employed in consecutive save screen operations, until changed by the user. This includes the <filename> parameter for the LTEST:SSCReen DISK command. If the results of consecutive limit tests must be stored in different files, omit the <filename> parameter and use the default filename instead. Each screen image will be saved in a different file named *MeasLimitScreenX.bmp*, where X is an incremental number assigned by the instrument.

The *filename* field encodes the network path and the directory in which the file will be saved, as well as the file format that will be used. The following is a list of valid filenames.

Valid Filenames

Filename	File Saved in Directory...
"Test1.gif"	C:\User Files\Screen Images\
"A:test2.pcx"	A:\
"\\computer-ID\d\$\test3.bmp"	File saved in drive D: of computer "computer-ID", provided all permissions are set properly.
"E:test4.eps"	File saved in the instrument's drive E:, that could be mapped to any disk in the network.

If a filename is specified without a path, the default path will be C:\User Files\screen images. The default file type is a bitmap (.bmp). The following graphics formats are available by specifying a file extension: PCX files (.pcx), EPS files (.eps), Postscript files (.ps), JPEG (.jpg), TIFF (.tif) and GIF files (.gif).

Page 19-9

Add the following note to the :LTEST:SSUMmary <filename> description:

Note

If the summary of consecutive limit tests is to be stored in separate files, omit the <filename> parameter. Limit test summaries will be stored in files named *MeasLimitSummaryX.sum*, where X is an incremental number assigned by the instrument.

Change the <filename> example to read:

Example

The following example saves the summary to a disk file named *TEST.sum*.

```
10 OUTPUT 707;":LTEST:SSUMMARY DISK,TEST"
20 END
```

Change the returned format example to read:

Returned Format

The following example returns the current destination for the summary and prints the results to the controller's screen.

```
10 DIM SUMM$(50)
20 OUTPUT 707;":LTEST:SSUMMARY?"
30 ENTER 707;SUMM$
40 PRINT SUMM$
```

Marker Commands

50 END

Page 19-10

Add the following note to the :LTEST:SWAVEform <filename> description:

Note

If the selected waveforms of consecutive limit tests are to be stored in individual files, omit the <filename> parameter. The waveforms will be stored in the default format (INTERNAL) using the default naming scheme.

Page 19-11

Change the SWAVEform:RESet command and example to read:

Command

:LTEST:WAVEform:RESet

Example

10 OUTPUT 707;":LTEST:SWAVEform:RESet"

Marker Commands

Page 20-3

Remove the following command:

REFerence

Command

:MARKer:REFerence {TRIGger | REFPlane}

Page 20-7

Change the following command to read:

XUNITs

Change the :MARKer:XUNITs command description to read:

This command sets the units for horizontal display in TDR and TDT applications. the units may be in seconds or meters relative to the reference plane. The marker mode must be TDR TDT to use this feature.

Page 20-10

Change the following command to read:

YUNITs

Mask Test Commands

Page 21-10

Add the following note to the :MTEST:RUNTil command description:

Note

To run for a number of waveforms or samples, refer to ACQUIRE:RUNTil command.

Page 21-16

Change the :MTEST:SSCReen <filename> description to read:

<filename>

An ASCII string enclosed in quotations marks. If no filename is specified, a filename will be assigned. The default filename is *MaskLimitScreenX.bmp*, where X is an incremental number assigned by the instrument.

Note

The save screen options established by the commands MTEST:SSCReen DISK, MTEST:SSCReen:AREA, and MTEST:SSCReen:IMAG are stored in the instrument's memory and will be employed in consecutive save screen operations, until changed by the user. This includes the <filename> parameter for the MTEST:SSCReen DISK command. If the results of consecutive limit tests must be stored in different files, omit the <filename> parameter and use the default filename instead. Each screen image will be saved in a different file named *MaskLimitScreenX.bmp*, where X is an incremental number assigned by the instrument.

The *filename* field encodes the network path and the directory in which the file will be saved, as well as the file format that will be used. The following is a list of valid filenames.

Valid Filenames

Filename	File Saved in Directory...
"Test1.gif"	C:\User Files\Screen Images\
"A:test2.pcx"	A:\
"\computer-ID\d\$\test3.bmp"	File saved in drive D: of computer "computer-ID", provided all permissions are set properly.
"E:test4.eps"	File saved in the instrument's drive E:, that could be mapped to any disk in the network.

If a filename is specified without a path, the default path will be C:\User Files\screen images. The default file type is a bitmap (.bmp). The following graphics formats are available by specifying a file extension: PCX files (.pcx), EPS files (.eps), Postscript files (.ps), JPEG (.jpg), TIFF (.tif), and GIF files (.gif).

Page 21-18

Add the following note to the :MTEST:SSUMmary <filename> description:

Note

If the summary of consecutive limit tests is to be stored in separate files, omit the <filename> parameter. Limit test summaries will be stored in files named *MaskLimitSummaryX.sum*, where X is an incremental number assigned by the instrument.

Change the <filename> example to read:

Example

The following example saves the summary to a disk file named *TEST.sum*.

```
10 OUTPUT 707;":MTEST:SSUMMARY DISK,TEST"
20 END
```

Change the returned format example to read:

Returned Format

The following example returns the current destination for the summary and prints the results to the controller's screen.

```
10 DIM SUMM$[50]
20 OUTPUT 707;":MTEST:SSUMMARY?"
30 ENTER 707;SUMM$
40 PRINT SUMM$
50 END
```

Page 21-19

Add the following note to the :MTEST:SWAVEform <filename> description:

Note

If the selected waveforms of consecutive limit tests are to be stored in individual files, omit the <file-name> parameter. The waveforms will be stored in the default format (INTERNAL) using the default naming scheme.

Measure Commands

Page 22-9

Add the following command:

CGRade:CRATio

Command	:MEASure:CGRade:CRATio <format> This command measures the contrast ratio of the RZ (Return-to-Zero) eye diagram on the color graded display. The dark level or dc offset of the input channel must have been previously calibrated. See “ERATio:STARt CHANNEL<N>” to perform a dark level calibration.
Mode	Eye mode only. Also ensure that the eye type is set to RZ. See “MEASure:DEFine”.
<format>	{RATio DECibel PERCent}
Example	The following example measures the contrast ratio. 10 OUTPUT 707;”:MEASURE:CGRADe:CRATIo PERCENT” 20 END
Query	:MEASure:CGRade:CRATio? <format> This query returns the contrast ratio of the color graded display.
Returned Format	[:MEASure:CGRade:CRATio]<value>[,<result_state>]<NL>
<value>	The contrast ratio.
<result_state>	If SENDvalid is ON, the result state is returned with the measurement result. Refer to “MEASure:RESults?” for a list of the result states.
Example	The following example places the current contrast ratio in the numeric variable, Value, then prints the contents of the variable of the controller screen. 10 OUTPUT 707;”:SYSTEM:HEADER OFF” !Response headers off 20 OUTPUT 707;”:MEASURE:CGRADe:CRATIo? PERCENT” 30 ENTER 707;Value 40 PRINT Value 50 END

Page 22-9

Change the :MEASure:CGRade:CROSSing mode description to read:

Mode Eye mode only. Also ensure that the eye type is set to NRZ. See “MEASure:DEFine”.

Page 22-10

Change the :MEASure:CGRade:DCDistortion mode description to read:

Mode Eye mode only. Also ensure that the eye type is set to NRZ. See “MEASure:DEFine”.

Page 22-11

Add the following command:

CGRade:DCYClE

Command	:MEASure:CGRade:DCYClE This command measures the duty cycle of the RZ (Return-to-Zero) eye diagram on the color graded display.
---------	--

Mode	Eye mode only. Also ensure that the eye type is set to RZ. See “MEASure:DEFine”.
Example	The following example measures the duty cycle of the color graded display. <pre>10 OUTPUT 707;":MEASURE:CGRADE:DCYCLE" 20 END</pre>
Query	:MEASure:CGRade:DCYCLE? This query returns the duty cycle of the color graded display.
Returned Format	[[:MEASure:CGRade:DCYCLE]<value>[,<result_state>]<NL>
<value>	The duty cycle.
<result_state>	If SENDvalid is ON, the result state is returned with the measurement result. Refer to “MEASure:RESults?” for a list of the result states.
Example	The following example places the current duty cycle in the numeric variable, Value, then prints the contents of the variable of the controller screen. <pre>10 OUTPUT 707;":SYSTEM:HEADER OFF" !Response headers off 20 OUTPUT 707;":MEASURE:CGRade:DCYCLE?" 30 ENTER 707;Value 40 PRINT Value 50 END</pre>

Page 22-11

Mode	Change the :MEASure:CGRade:EHEight mode and query descriptions to read: Eye mode only.
Query	:MEASure:CGRade:EHEight? [{RATio DECibel}] The query returns the eye height of the color grade display. RATio sets the eye height in amplitude units. DECibel sets the eye height in DB units.

Page 22-11

Mode	Change the :MEASure:CGRade:ERATio mode description to read: Eye mode only.
------	---

Page 22-12

Mode	Change the :MEASure:CGRade:ESN mode description to read: Eye mode only.
------	--

Page 22-13

Mode	Change the :MEASure:CGRade:EWIDth mode description to read: Eye mode only.
------	---

Page 22-14

Add the following command:

CGRade:OFACtor

Command	:MEASure:CGRade:OFACtor This command measures the opening factor of the RZ (Return-to-Zero) eye diagram on the color graded display.
Mode	Eye mode only. Also ensure that the eye type is set to RZ. See “MEASure:DEFine”.
Example	The following example measures the opening factor of the color graded display. <pre>10 OUTPUT 707;":MEASURE:CGRade:OFACtor" 20 END</pre>
Query	:MEASure:CGRade:OFACtor? This query returns the opening factor of the color graded display.
Returned Format	[[:MEASure:CGRade:OFACtor]<value>[,<result_state>]<NL>

Measure Commands

<value> The opening factor.

<result_state> If SENDvalid is ON, the result state is returned with the measurement result. Refer to "MEASure:RESults?" for a list of the result states.

Example The following example places the current opening factor in the numeric variable, Value, then prints the contents of the variable of the controller screen.

```
10 OUTPUT 707;":SYSTEM:HEADER OFF"           !Response headers off
20 OUTPUT 707;":MEASure:CGRade:OFACtor?"
30 ENTER 707;Value
40 PRINT Value
50 END
```

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Add the following command:

CGRade:PWIDth

Command :MEASure:CGRade:PWIDth
 This command measures the pulse width of the eye diagram on the color graded display.

Mode Eye mode only.

Example The following example measures the pulse width of the color graded display.

```
10 OUTPUT 707;":MEASure:CGRade:PWIDth"
20 END
```

Query :MEASure:CGRade:PWIDth?
 This query returns the pulse width of the color graded display.

Returned Format [:MEASure:CGRade:PWIDth]<value>[,<result_state>]<NL>

<value> The pulse width.

<result_state> If SENDvalid is ON, the result state is returned with the measurement results. Refer to "MEASure:RESults?" for a list of result states.

Example The following example places the current pulse width in the numeric variable, Value, then prints the contents of the variable of the controller screen.

```
10 OUTPUT 707;":SYSTEM:HEADER OFF"           !Response headers off
20 OUTPUT 707;":MEASure:CGRade:PWIDth?"
30 ENTER 707;Value
40 PRINT Value
50 END
```

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Change the :MEASure:DEFine command to read:

Command :MEASure:DEFine <meas_spec>

This command sets up the definition for measurements by specifying the delta time, threshold, or top-base values. Changing these values may affect other measure commands. The following table identifies the relationships between user-DEFined values and other MEASure commands.

<meas_spec> {THResholds, TOPBase, EWINDOW, CGRade, DELTatime}

:MEASure:DEFine Interactions

MEASure Commands	THResholds	TOPBase	EWINDOW	CGRade	DELTatime
RISEtime	x	x			
FALLtime	x	x			
PERiod	x	x			
FREQuency	x	x			

:MEASure:DEFine Interactions (Continued)

MEASure Commands	THResholds	TOPBase	EWINdow	CGRade	DELTatime
VTOP		X			
VBASe		X			
VAMPlitude		X			
PWIDth	X	X			
NWIDth	X	X			
OVERshoot	X	X			
DUTYcycle	X	X			
DELTatime	X	X			
VRMS	X	X			
PREShoot	X	X			
VLOWer	X	X			
VMIDdle	X	X			
VUPPer	X	X			
VAVerage	X	X			
VAREa	X	X			
DELTatime	X	X			X
CGRade:CRATio			X	X	
CGRade:CROSSing			X	X	
CGRade:DCDistortion	X			X	
CGRade:DUTYCycle	X			X	
CGRade:ERATio			X		
CGRade:EHEight			X		
CGRade:ESN			X		
CGRade:OFACtor				X	
CGRade:OLEVel			X		
CGRade:PWIDth	X				
CGRade:ZLEVel			X		

Command :MEASure:DEFine THResholds,{{STANdard}} | {PERCent,<upper_pct>,<middle_pct>,<lower_pct>} | {UNITs,<upper_volts>,<middle_volts>,<lower_volts>}}

<upper_pct>
<middle_pct>
<lower_pct>
An integer, -25 to 125.

<upper_units>
<middle_units>
<lower_units>
A real number specifying amplitude units.

Command :MEASure:DEFine TOPBase,{{STANdard}} | {<top_volts>,<base_volts>}}

<top_volts>
<base_volts>
A real number specifying voltage.

Command :MEASure:DEFine EWINdow,<ewind1pct>,<ewind2pct>

<ewind1pct>
<ewind2pct>
A real number, 0 to 100, specifying an eye window as a percentage of the bit period unit interval.

Command :MEASure:DEFine CGRade {RZ | NRZ}

This command defines the eye type.

Command :MEASure:DEFine DELTatime, <start edge_direction>,<start edge_number>,<start edge_position>,<stop edge_direction>,<stop edge_number>,<stop edge_direction>

This command is used to set up edge parameters for delta time measurement.

<edge_direction> {RISing | FALLing | EITHer}

Measure Commands

<edge_number>	An integer, from 1 to 20.
<edge_position>	{UPPer MIDDLE LOWer}
Query	:MEASure:DEFine? DELTatime
Query	:MEASure:DEFine? {EWINdow THResholds TOPBase CGRade DELTatime}
Returned Format	[[:MEASure:DEFine] CGRade,<signal_type><NL> [:MEASure:DEFine] THResholds {{STANdard} {PERcent,<upper_pct>,<middle_pct>,<lower_pct>} {VOLTag, <upper_volts>,<middle_volts>,<lower_volts>}}<NL> [:MEASure:DEFine] TOPBase {{STANdard} {<top_volts>,<base_volts>}}<NL> [:MEASure:DEFine] CGRade {{RZ NRZ}} [:MEASure:DEFine] DELTatime, {{<start edge_direction>,<start edge_number>,<start edge_position>,<stop edge_direction>,<stop edge_number>,<stop edge_direction>}}<NL>

Use the Suffix Multiplier Instead

Using "mV" or "V" following the numeric value for the voltage value will cause Error 138-Suffix not allowed. Instead, use the convention for the suffix multiplier as described in Chapter 3, "Message Communication and System Functions".

Example This example returns the current setup for the measurement thresholds to the string variable, Setup\$, then prints the contents of the variable to the computer's screen.

```
10 DIM Setup${50} !Dimension variable
20 OUTPUT 707;":MEASURE:DEFINE? THRESHOLDS"
30 ENTER 707; Setup$
40 PRINT Setup$
50 END
```

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Add the following command:

DELTatime

Command	:MEASure:DELtAtime [<source>[,<source>]]
	This command measures the time delay between two edges. If no source is specified, then the sources specified using the :MEASure:SOURce command are used. If only one source is specified, then the edges used for computing delta time belong to that source. If two sources are specified, then the first edge used in computing to delta time belongs to the first source and the second edge belongs to the second source.
<source>	{CHANnel<number> FUNction<number> WMEMory<number>}
<number>	An integer, from 1 to 4.
Example	The following example measures the delta time between channel 1 and channel 2. 10 OUTPUT 707;":MEASURE:DELTATIME CHANNEL1,CHANNEL2" 20 END
Query	:MEASure:DELtAtime? [<source>[,<source>]]
	The query returns the measured delta time value.
Returned Format	[[:MEASure:DELtAtime] <value> [,<result_state>]<NL>
<value>	Delta time from the first specified edge on one source to the next specified edge on another source.
<result_state>	If SENDVALID is ON, the result state is returned with the measurement result. Refer to the Result States table in the Measure chapter for a list of the result states.

Example The following example places the current value of delta time in the numeric variable, Value, then prints the contents of the variable to the controller's screen. This example assumes the source was set using MEASure:SOURce.

```
10 OUTPUT 707;";SYSTEM:HEADER OFF"           !Response headers off
20 OUTPUT 707;";MEASURE:DELTATIME?"
30 ENTER 707:Value
40 PRINT Value
50 END
```

Turn Off Headers

When receiving numeric data into numeric variables, turn off the headers. Otherwise, the headers may cause misinterpretation of returned data.

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Remove the :MEASure:DUTYcycle [<source>] mode description.

Change the <source> and <N> descriptions to read:

<source> {CHANnel<N> | FUNcTion<N> | WMEMory<N>}

<N> For channels: Value is dependent on the type of plug-in and its location in the instrument. For functions: 1 or 2. For waveform memories (WMEMORY): 1, 2, 3, or 4.

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Add the following query:

HISTogram:PPOStion?

Query :MEASure:HISTogram:PPOStion? [<source>]

This query returns the position of the greatest peak of the histogram. If there is more than one peak, then it returns the position of the first peak from the lower boundary of the histogram window for vertical axis histograms. Otherwise, in the case of horizontal axis histograms, it returns the position of the first peak from the leftmost boundary of the histogram window. The optional parameter MEASure:SOURce command can be used to specify the source for the measurement. This query can only be applied to histogram data, therefore the histogram must be turned on in order to use this query.

<source> {HISTogram}

Returned Format [:MEASure:HISTogram:PPOStion] <value>[,<result_state>]<NL>

<value> The value of the greatest peak of the histogram.

<result_state> If SENDvalid is ON, the result state is returned with the measurement result. Refer to the MEASure:RESults command for a list of the result states.

```
Example 10 OUTPUT 707;";MEASURE:HISTOGRAM:PPOSITION? HISTOGRAM"
20 ENTER 707:HMaxVal
30 PRINT HMaxVal
40 END
```

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Add the following note to the MEASure:RESults? query description:

Note

In some cases, remote results on statistical measurements may display incorrect ASCII mapping, such as a ç symbol in lieu of Σ (sigma).

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Add the following note to the MEASure:TEDGE? query description:

Measure Commands

Note

TEDGe is measured for a value less than or equal to 20. A value greater than 20 returns data out of range.

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Add the following command:

TMAX

Command	:MEASure:TMAX [<source>] This command measures the first time at which the first maximum voltage of the source waveform occurred. The source is specified with the MEASure:SOURce command or with the optional parameter following the TMAX command.
<source>	{CHANnel<number> FUNction<number> WMEMory<number>}
<number>	An integer, from 1 to 4.
Query	:MEASure:TMAX? [<source>] The query returns the time at which the first maximum voltage occurred.
Returned Format	[:MEASure:TMAX] <time>[,<result_state>]<NL>
<time>	Time at which the first maximum voltage occurred.
<result_state>	If SENDVALID is ON, the result state is returned with the measurement result. Refer to the MEASure:RESults? section for a list of the result states.
Example	The following example returns the time at which the first maximum voltage occurred to the numeric variable, Time, then prints the contents of the variable to the controller's screen. <pre>10 OUTPUT 707;":SYSTEM:HEADER OFF" !Response headers off 20 OUTPUT 707;":MEASURE:TMAX?" 30 ENTER 707;Time 40 PRINT Time 50 END</pre>

Turn Off Headers

When receiving numeric data into numeric variables, turn off the headers. Otherwise, the headers may cause misinterpretation of returned data.

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Add the following command:

TMIN

Command	:MEASure:TMIN [<source>] This command measures the first time at which the first minimum voltage of the source waveform occurred. The source is specified with the MEASure:SOURce command or with the optional parameter following the TMIN command.
<source>	{CHANnel<number> FUNction<number> WMEMory<number>}
<number>	An integer, from 1 to 4.
Query	:MEASure:TMIN? [<source>] The query returns the time at which the first minimum voltage occurred.
Returned Format	[:MEASure:TMIN] <time>[,<result_state>]<NL>
<time>	Time at which the first minimum voltage occurred.

<result_state> If SENDVALID is ON, the result state is returned with the measurement result. Refer to the MEASure:RESults? section for a list of the result states.

Example The following example returns the time at which the first minimum voltage occurred to the numeric variable, Time, then prints the contents of the variable to the controller's screen.

```
10 OUTPUT 707;":SYSTEM:HEADER OFF"      !Response headers off
20 OUTPUT 707;":MEASURE:TMIN?"
30 ENTER 707;Time
40 PRINT Time
50 END
```

Turn Off Headers

When receiving numeric data into numeric variables, turn off the headers. Otherwise, the headers may cause misinterpretation of returned data.

Page 22-39

Add the following command:

VAVerage

Command	:MEASure:VAVerage {CYCLE DISPlay} [,<source>] This command calculates the average voltage over the displayed waveform. The source is specified with the MEASure:SOURce command or with the optional parameter following the VAVerage command.
CYCLE	The CYCLE parameter instructs the average measurement to measure the average voltage across the first period of the display.
DISPlay	The DISPlay parameter instructs the average measurement to measure all the data on the display.
<source>	{CHANnel<number> FUNction<number> WMEMory<number>}
<number>	An integer, from 1 to 4.
Example	The following example calculates the average voltage over the displayed waveform. 10 OUTPUT 707;":MEASURE:VAVERAGE DISPLAY" 20 END
Query	:MEASure:VAVerage? {CYCLE DISPlay}, [,<source>] The query returns the calculated average voltage of the specified source.
Returned Format	[:MEASure:VAVerage] <value> [,<result_state>]<NL>
<value>	The calculated average voltage.
<result_state>	If SENDVALID is ON, the result state is returned with the measurement result. Refer to the MEASure:RESults? section for a list of the result states.
Example	10 OUTPUT 707;":SYSTEM:HEADER OFF" !Response headers off 20 OUTPUT 707;":MEASURE:VAVERAGE? DISPLAY" 30 ENTER 707;Average 40 PRINT Average 50 END

TDR/TDT Commands

Page 23-3

Change the :TDR{2 | 4}:PREset command description to read:

TDR/TDT Commands

This command performs an automatic set up of the instrument for TDR or TDT measurements, based on the stimulus. This command does the following:

- Turn on TDR channels.
- If the stimulus is set to EXTernal (see the STIMulus command in this chapter), turn off channel 1 or 3 and turn on channel 2 or 4.
- If the TDT destinations are not shown, turn on the TDT destination channels. (See the TDT-Dest command in this chapter).
- Set the timebase to 500 ps/div and positions the incident edge on screen.
- Turn on averaging and set best flatness (see the ACQUIRE subsystem).
- For all channels that are on:
 - Set the attenuation units to ratio.
 - Set the attenuation to 1:1.
 - Set the bandwidth to low (12.4 GHz). (Set high for external stimulus.)
 - Set the units to volts.
 - Set the channel scale to 100 mV/div.
 - Set the channel offset to 200 mV or -200 mV for differential stimulus.

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Change the :TDR{2 | 4}:RESPonse{1 | 2 | 3 | 4} {OFF | ON | DIFFerential | COMMONmode} command description to read:

This command turns on or off a TDR or TDT normalized response.

The RESPonse <n> refers to the stimulus channel used to produce a response waveform, while the response waveforms are numbered based on the destination channel. For TDR commands, the response waveform numbers and RESPonse <n> refer to the same waveforms. This is not the case for TDT related commands.

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Change the :TDR{2 | 4}:RESPonse{1 | 2 | 3 | 4}:CALibrate command description to read:

This command begins a TDR or TDT normalization and reference plane calibration. Which calibration is done (TDR or TDT) depends on the setting of the TDR/TDT control. See [“RESPonse:TDR/TDT” on page 23-11](#).

The RESPonse <n> refers to the stimulus channel used to produce a response waveform, while the response waveforms are numbered based on the destination channel. For TDR commands, the response waveform numbers and RESPonse <n> refer to the same waveforms. This is not the case for TDT related commands.

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Change the :TDR{2 | 4}:RESPonse{1 | 2 | 3 | 4}:CALibrate:CANCEl command description to read:

This command activates the cancel softkey during a TDR or TDT normalization and reference plane calibration.

This command is retained for backward compatibility with the 83480/54750. The preferred command is :CALibrate:CANCEl.

The RESPonse <n> refers to the stimulus channel used to produce a response waveform, while the response waveforms are numbered based on the destination channel. For TDR commands, the response waveform numbers and RESPonse <n> refer to the same waveforms. This is not the case for TDT related commands.

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Change the :TDR{2 | 4}:RESPonse{1 | 2 | 3 | 4}:CALibrate:CONTInue command description to read:

This command activates the continue softkey during a TDR or TDT normalization and reference plane calibration.

This command is retained for backward compatibility with the 83480/54750. The preferred command is :CALibrate:CONTinue.

The RESPonse <n> refers to the stimulus channel used to produce a response waveform, while the response waveforms are numbered based on the destination channel. For TDR commands, the response waveform numbers and RESPonse <n> refer to the same waveforms. This is not the case for TDT related commands.

Page 23-6

Change the :TDR{2 | 4}:RESPonse{1 | 2 | 3 | 4}:HORizontal {AUTO | MANual} command description to read:

This command specifies whether the TDR/TDT response should automatically track the source channel's horizontal scale (AUTO), or a user-defined scale specified with the HORizontal:POSItion and HORizontal:RANGe commands (MANual). AUTO is the usual setting.

Note

The keyword TSource may also be used. This command is compatible with the Agilent 83480/54750 and is equivalent to AUTO.

The RESPonse <n> refers to the stimulus channel used to produce a response waveform, while the response waveforms are numbered based on the destination channel. For TDR commands, the response waveform numbers and RESPonse <n> refer to the same waveforms. This is not the case for TDT related commands.

Page 23-7

Change the :TDR{2 | 4}:RESPonse{1 | 2 | 3 | 4}:HORizontal:POSition <position> command description to read:

This command specifies the horizontal position of the TDR/TDT response when horizontal tracking is set to manual. The position is always referenced to center screen.

The RESPonse <n> refers to the stimulus channel used to produce a response waveform, while the response waveforms are numbered based on the destination channel. For TDR commands, the response waveform numbers and RESPonse <n> refer to the same waveforms. This is not the case for TDT related commands.

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Change the :TDR{2 | 4}:RESPonse{1 | 2 | 3 | 4}:HORizontal:RANGe <range> command description to read:

This command specifies the range of the TDR/TDT response when the horizontal tracking is set to manual.

The RESPonse <n> refers to the stimulus channel used to produce a response waveform, while the response waveforms are numbered based on the destination channel. For TDR commands, the response waveform numbers and RESPonse <n> refer to the same waveforms. This is not the case for TDT related commands.

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Change the :TDR{2 | 4}:RESPonse{1 | 2 | 3 | 4}:RISetime <risetime> command description to read:

This command sets the risetime for the normalized response. The risetime setting is limited by the timebase settings and the record length. The normalize response function allows you to change the risetime of the normalized step.

TDR/TDT Commands

The RESPonse <n> refers to the stimulus channel used to produce a response waveform, while the response waveforms are numbered based on the destination channel. For TDR commands, the response waveform numbers and RESPonse <n> refer to the same waveforms. This is not the case for TDT related commands.

Page 23-11

Change the :TDR{2 | 4}:RESPonse{1 | 2 | 3 | 4}:TDRTDT {TDR | TDT} command description and the example to read:

This command controls the behavior of other :TDR{2 | 4}:RESPonse commands and queries. A response waveform is fully specified by the TDRTDT setting, as well as by the stimulus value that is part of a “TDR{2 | 4}:RESPonse” command.

The RESPonse <n> refers to the stimulus channel used to produce a response waveform, while the response waveforms are numbered based on the destination channel. For TDR commands, the response waveform numbers and RESPonse <n> refer to the same waveforms. This is not the case for TDT related commands.

Example

To turn on Response 1 waveform as TDR with stimulus = Chan1:

```
Set :TDR2:RESPonse1:TDRTDT to TDR
Set :TDR2:RESPonse1 to NORM
```

To turn on Response 2 waveform as TDT with stimulus = Chan1:

```
Set :TDR2:RESPonse1:TDTDest to Chan2
Set :TDR2:RESPonse1:TDRTDT to TDT
Set :TDR2:RESPonse1 to ON
```

Page 23-11

Change the :TDR{2 | 4}:RESPonse{1 | 2 | 3 | 4}:TDTDest {NONE | CHANnel<number>} command description to read:

This command selects a destination channel for a normalization measurement.

The RESPonse <n> refers to the stimulus channel used to produce a response waveform, while the response waveforms are numbered based on the destination channel. For TDR commands, the response waveform numbers and RESPonse <n> refer to the same waveforms. This is not the case for TDT related commands.

For differential and common mode stimuli, the TDT destination is implied as follows:

- The TDT destination for channel 1 is channel 3.
- The TDT destination for channel 2 is channel 4.
- The TDT destination for channel 3 is channel 1.
- The TDT destination for channel 4 is channel 2.

A channel is valid as a TDT destination if it meets the following criteria:

- Must be an electrical channel.
- Must not have an active TDR stimulus.
- Must not be the destination of another TDT measurement.
- Must not be the destination of a TDR measurement (external stimulus only).

You must select a valid TDT destination before setting the TDRTDT control to TDT.

Page 23-12

Change the :TDR{2 | 4}:RESPonse{1 | 2 | 3 | 4}:VERTical {AUTO | MANual} command description to read:

This command specifies whether the TDR/TDT response should automatically track the source channel's vertical scale (AUTO), or use a user-defined scale specified with the VERTICAL:OFFSet and VERTICAL:RANGe commands (MANual). AUTO is the usual setting.

Note

The keyword TSource may also be used. This command is compatible with the Agilent 83480/54750 and is equivalent to AUTO.

The RESPonse <n> refers to the stimulus channel used to produce a response waveform, while the response waveforms are numbered based on the destination channel. For TDR commands, the response waveform numbers and RESPonse <n> refer to the same waveforms. This is not the case for TDT related commands.

Page 23-13

Change the :TDR{2 | 4}:RESPonse{1 | 2 | 3 | 4}:VERTical:OFFSet <offset_value> command description to read:

This command sets the vertical position of the specified response when vertical tracking is set to MANual. The position is always referenced to center screen.

The RESPonse <n> refers to the stimulus channel used to produce a response waveform, while the response waveforms are numbered based on the destination channel. For TDR commands, the response waveform numbers and RESPonse <n> refer to the same waveforms. This is not the case for TDT related commands.

Change the <offset_value> description to read:

<offset_value>

Offset value in volts depending on the current channel UNITS. Suffix UNITS are ignored; only the scalar part is used (m in mv).

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Change the :TDR{2 | 4}:RESPonse{1 | 2 | 3 | 4}:VERTical:RANGe <range_value> command description to read:

This command specifies the vertical range of the TDR/TDT response when the vertical tracking mode is set to MANual.

The RESPonse <n> refers to the stimulus channel used to produce a response waveform, while the response waveforms are numbered based on the destination channel. For TDR commands, the response waveform numbers and RESPonse <n> refer to the same waveforms. This is not the case for TDT related commands.

Change the <range_value> description to read:

<range_value>

Vertical range in volts depending on the current UNITS setting and suffix supplied. (The suffix does not set the UNITS; it is ignored.)

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Change the :TDR{2 | 4}:STIMulus{OFF | ON | ON1 | ON2 | ON1AND2 | DIFFerential | COMMONmode | EXTernal | ON3 | ON4 | ON3AND4} command description to read:

This command turns the TDR/TDT stimulus on or off. This command is set before starting normalization to specify type of normalization or reference plane calibration to perform.

- The stimulus may be OFF, ON, or EXTernal.
- In slots 1 and 2, the stimulus may be OFF, ON1, ON2, ON1AND2, EXTernal, DIFFerential, or COMMONmode.
- In slots 3 and 4, the stimulus may be OFF, ON3, ON4, ON3AND4, EXTernal, DIFFerential, or COMMONmode.

Change the ON, ON1, ON3 mode description to read:

ON,ON1,ON2,
EXTernal

Turn on the channel 1 or channel 3 pulse generator for single-ended TDR or TDT measurements.

Error Messages

Page 29-7

Add the following error message descriptions to Table 29-1:

-224	Illegal parameter value	Used where exact value, from a list of possibles, was expected.
-241	Hardware missing	Indicates that a legal program command or query could not be executed because of missing device hardware; for example, an option was not installed, or current module does not have hardware to support command or query. Definition of what constitutes missing hardware is completely device-specific or module-specific.

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