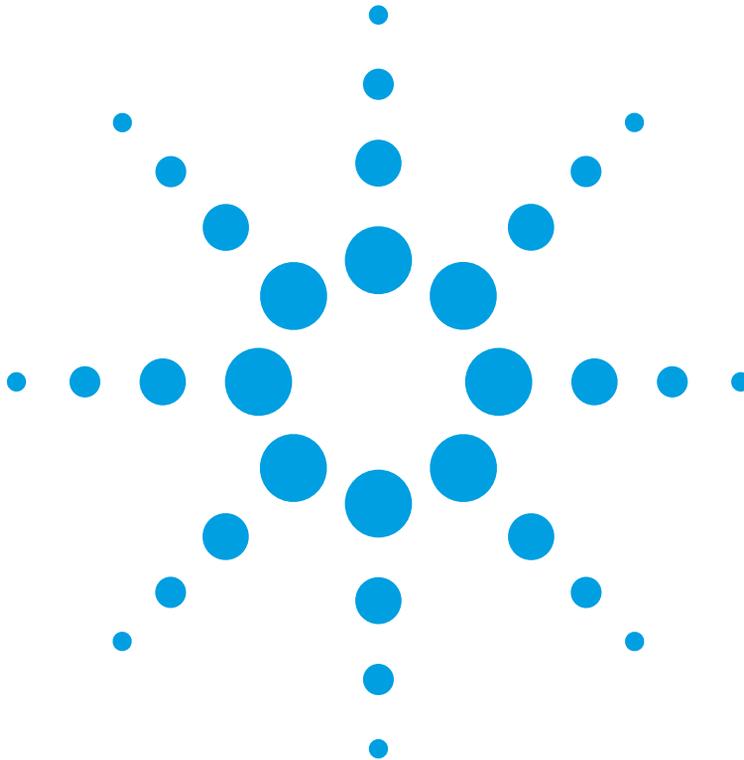


Agilent 54753A and 54754A  
TDR Plug-in Modules  
Programmer's Quick Reference



**Agilent Technologies**

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## Manual Part Number

54754-90013

## Edition

July 2004

Printed in Malaysia

Agilent Technologies, Inc.  
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## Safety Notices

### CAUTION

Caution denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in damage to or destruction of the product. Do not proceed beyond a caution sign until the indicated conditions are fully understood and met.

### WARNING

Warning denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a warning sign until the indicated conditions are fully understood and met.

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## Introduction

### **54750A/83480A Mainframes**

For controlling 54753A and 54754A TDR plug-in modules that are installed in a 54750A or 83480A mainframes, refer to the following books:

- This manual, the *54753A and 54754A TDR Plug-in Modules Programmer's Quick Reference*
- *54753A and 54754A Programmer's Guide* for detailed information.
- *54750A Oscilloscope and 83480A Analyzer Programmer's Guide* for information about programming the oscilloscope.
- *54753A and 54754A User's Guide* for general information about the operation of the TDR plug-in module.

### **86100-Series Mainframes**

For controlling 54753A and 54754A TDR plug-in modules that are installed in an 86100-series mainframe, refer to the following books:

- 86100-series programmer's guide.
- 86100-series online help.

### **Notational Conventions**

`computer type`. All characters appearing in `computer type` are key words and must be entered exactly as shown.

CAPITAL LETTERS. Capital letters indicate the short form of a command. The actual command is not case sensitive and can be entered in upper or lower case.

`<>`. Angular brackets enclose words or characters that symbolize a program code parameter or an GPIB command.

`:=` "is defined as." For example, `<A> ::= <B>` indicates that `<A>` can be replaced by `<B>` in any statement containing `<A>`.

`|` "or." Indicates a choice of one element from a list. For example, `<A> | <B>` indicates `<A>` or `<B>` but not both.

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

## Introduction

[ ] Square brackets indicate that the enclosed items are optional.

{ } When several items are enclosed by braces, one, and only one of these elements may be selected.

## Definitions

`d` ::= A single ASCII numeric character, 0-9.

`n` ::= A single ASCII non-zero, numeric character, 1-9.

`<NL>` ::= Newline or Linefeed (ASCII decimal 10).

`<sp>` ::= space character.

`<white_space>` ::= space(s) and tabs.

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**Command**           :BLANK {CHANnel<number> | WMEMory<number> |  
FUNction <number> | FFT | RESPonse<number> |  
HISTogram | PMEMory1}

Turns off an active channel, function, waveform memory, pixel memory, FFT, histogram, or TDR response. The VIEW command turns them on.

<number>   For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For pixel memories (PMEMory): 1. For TDR response: 1, 2, 3, or 4.

**Command**           :COMMENTS {PLUGIn<number>, <comments>}

Sets the comments field for the plugin. This field is used to describe options included in the plugin, or for user commands about the plugin.

<number>   Represents the plugin slot numbered 1 through 4.

<comments> Represents the unquoted string.

**Command** :DIGitize [<waveform\_name>] [, <waveform\_name>]

Invokes a special mode of data acquisition that is more efficient than using the RUN command. This command initializes the selected channels, functions, responses, or FFT to “unacquired,” then acquires them according to the current instrument settings. When all signals are completely acquired, the instrument is stopped.

<waveform\_name> {CHANnel<number> | FUNction<number> | FFT | RESPonse<number>}

<number> For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For responses: 1, 2, 3, or 4.

**Command** :MENU {APPLication | CHANnel<number> | ACQuire | TIMEbase | TRIGger | DISK | DISPlay | MARKer | MEASure | MATH | WAVeform | SETup | PRINT | HELP | UTILity | FFT | LTEST | HISTogram | MTEST | MEYE | TDR<number> | MTDR<number>}

<number> For channels, indicates the slot (1 through 4) in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced.  
For TDR, controls the TDR/TDT menus for channels 2 and 4.  
For MTDR, controls the TDR/TDT menus for channels 2 and 4.

**Command**                   :STORe:WAVEform {CHANnel<number> |  
 FUNction<number> | WMEMory<number> | HISTogram |  
 FFT | RESPonse<number>}, {WMEMory<number>}

Copies a channel, function, stored waveform, histogram, TDR response, or FFT to a waveform memory. The first parameters specifies the source of the copy and can be any channel, function, waveform memory, histogram, TDR response, or the FFT. The second parameter is the destination of the copy, and can be any waveform memory.

<number>   For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For responses: 1, 2, 3, or 4.

**Command**                   :VIEW {CHANnel<number> | WMEMory<number> |  
 FUNction<number> | FFT | RESPonse<number> |  
 HISTogram | PMEMory1}

Turns on a channel, function, pixel memory, waveform memory, TDR response, histogram, or FFT. Use the BLANK command to turn these off.

<number>   For channels: integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4. For pixel memories (PMEORY): 1.

## Command

`:ACquire:BESt[?] {THRuput | FLATness}`

When averaging is enabled with `ACquire:AVERage`, the `FLATness` option improves the step flatness by using a signal processing algorithm within the instrument. You should use this option when performing TDR measurements or when step flatness is important. The `THRuput` option improves the instrument's throughput and should be used whenever best flatness is not required.

**Command**            `:CALibrate:SAMPLers[?] {DISable | ENABle}`

Enables or disables the samplers in the plug-in.

**Command** :CHANnel<number>:OFFSet [?] <offset\_value>

For TDR and TDT applications, you may change the offset to magnify offset in some circumstances. This command is used to set the magnify offset as well as the offset.

<number> An integer, 1-4, indicating the slot in which the channel resides.

<offset\_value> Offset value at center screen; can be volts, amperes, or other units.

**Command** :CHANnel<number>:RANGe [?] <range\_value>

For TDR and TDT applications, you may change the range to magnify range in some circumstances. This command is used to set the magnify range as well as the range.

<number> An integer, 1-4, indicating the slot in which the channel resides.

<range\_value> Full-scale voltage of the specified channel number.

**Command** :CHANnel<number>:SCALe [?] <scale\_value>

For TDR and TDT applications, you may change the scale to magnify scale in some circumstances. This command is used to set the magnify scale as well as the scale.

<number> An integer, 1-4, indicating the slot in which the channel resides.

<scale\_value> Vertical scale of the channel in units per division.

**Command**                   :CHANnel<number>:TDRSkew <percent> [%]

This command sets the TDR skew for the given channel. The TDR skew control moves the TDR step relative to the trigger position. The control may be set from -100 to 100 percent of the allowable range. This command is only applicable to TDR channels.

<number>    An integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced.

<percent>   A number between -100 and 100, used to set the step position.

**Command**                   :CHANnel<number>:UNITs[?] {VOLT | AMPere | WATT | UNKNown | OHM | REFlect | GAIN}

For TDR and TDT applications, you can select the units OHM, REFlect, and GAIN. OHM and REFlect may be selected for TDR channels, while GAIN may be selected for TDT channels. You must perform a normalization and a reference plane calibration to select these units.

<number>    An integer, 1-4, indicating the slot in which the channel resides.

**Command** :DISK:LOAD "<filename>", <source>

Loads a setup, waveform, database, mask, TDR/TDT calibration, or pixel memory from the disk. The filename does not include a suffix. The suffix supplied by the instrument depends on the source and file format specified. The TDR/TDT option is a file type choice used to load TDR/TDT calibration values into the instrument.

<source> {DATAbase | MASK | PMEMory 1 | SETup |  
WMEMory<number> | TDR/TDT}

<filename> Is an MS-DOS compatible file name up to 8 characters long.

<number> Represents waveforms 1, 2, 3, or 4.

**Command** :DISK:STORE <source>, "<filename>" [,<format>]

Stores a setup, waveform, database, mask, TDR response, TDR/TDT calibration, or pixel memory to the disk. The filename does not include a suffix. The suffix is supplied by the instrument depending on the source and file format specified. The database may only be saved in internal format.

<source> {DATAbase | MASK | PMEMory 1 | SETup |  
WMEMory<number> | TDR/TDT}

<filename> Is an MS-DOS compatible file name up to 8 characters long.

<number> Represents waveforms 1, 2, 3, or 4.

<format> {TEXT [,YVALues | VERBose] | INTernal}

**Command**           :DISPlay:ASSign[?] {CHANnel<number> |  
                      FUNction<number> | RESPonse<number> |  
                      WMEMory<number> | FFT}, {UPPer | LOWer}

Assigns the specified channel, waveform, function, TDR response, or FFT to a particular portion of the waveform area on the screen. This command has no effect when the graticule format is single.

<number>   For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

**Command**                   :FUNCTION{1 | 2}:ADD <source>[, <source>]

Defines a function that takes the algebraic sum of two defined operands.

<source>    {CHANnel<number> | FUNction<number> |  
RESPonse<number> | WMEMory<number> |  
<float\_value>}

<number>    For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

<float\_value>    A real number.

**Command**                   :FUNCTION{1 | 2}:BWLimit {{CHANnel<number> |  
FUNction<number> | RESPonse<number> |  
WMEMory<number>}, <bandwidth>}

Provides a bandwidth limit filter function. You can use this function on waveforms to limit the bandwidth of the signal. In TDR or TDT applications where the accuracy of normalization is not required, you can use this to simulate a bandlimited signal through a device under test.

<number>    For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

<bandwidth>    Real number indicating frequency limit for the specified function.

**Command**           :FUNCTION{1 | 2}:DIFFERENTIATE {CHANNEL<number> |  
FUNCTION<number> | RESPONSE<number> |  
WMEMORY<number> | <float\_value>}

Computes the discrete derivative of the defined operand's waveform.

<number>           For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1. For waveform memories (WMEMORY): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

<float\_value>      A real number.

**Command**           :FUNCTION{1 | 2}:DIVIDE <source>[,<source>]

Defines a function that divides the first operand by the second operand.

<source>           {CHANNEL<number> | FUNCTION<number> |  
RESPONSE<number> | WMEMORY<number> |  
<float\_value>}

<number>           For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1. For waveform memories (WMEMORY): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

<float\_value>      A real number.

**Command**           :FUNCTION{1 | 2}:FFTMAGNITUDE {CHANNEL<number> |  
FUNCTION<number> | RESPONSE<number> |  
WMEMORY<number> | <float\_value>}

Defines a function that computes the FFT magnitude.

<number>           For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1. For waveform memories (WMEMORY): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

<float\_value>      A real number.

**Command**           :FUNCTION{1 | 2}:INTEgrate {CHANnel<number> |  
FUNCTION<number> | RESPonse<number> |  
WMEMory<number> | <float\_value>}

Defines a function that computes the integral of the defined operand's waveform.

<number>           For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

<float\_value>     A real number.

**Command**           :FUNCTION{1 | 2}:INVert {CHANnel<number> |  
FUNCTION<number> | RESPonse<number> |  
WMEMory<number> | <float\_value>}

Defines a function that inverts the defined operand's waveform by multiplying by -1.

<number>           For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

<float\_value>     A real number.

**Command**           :FUNCTION{1 | 2}:MAGNify {CHANnel<number> |  
FUNCTION<number> | RESPonse<number> |  
WMEMory<number> | <float\_value>}

Defines a function that is a copy of the operand. The magnify function is a software magnify. No hardware settings are altered as a result of using this function. It is useful for scaling channels, another function, TDR/TDT responses and memories with the RANGE and OFFSET commands in this subsystem.

Magnify performs the same operation as the "ONLY" operator, and is the preferred operator of the two. "ONLY" is included in this instrument for compatibility with previous instruments.

<number> For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1. For waveform memories (WMEemory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

<float\_value> A real number.

**Command** :FUNCTION{1 | 2}:MAXimum {CHANnel<number> |  
FUNCTION<number> | RESPonse<number> |  
WMEemory<number> | <float\_value>}

Defines a function that computes the maximum value of the operand waveform in each time bucket.

<number> For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1. For waveform memories (WMEemory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

<float\_value> A real number.

**Command** :FUNCTION{1 | 2}:MINimum {CHANnel<number> |  
FUNCTION<number> | RESPonse<number> |  
WMEemory<number> | <float\_value>}

Defines a function that computes the minimum of each time bucket for the defined operand's waveform.

<number> For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1. For waveform memories (WMEemory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

<float\_value> A real number.

**Command**                   :FUNCTION{1 | 2}:MULTIPLY <source>[,<source>]

Defines a function that algebraically multiplies the first operand by the second operand.

<source>    {CHANnel<number> | FUNction<number> |  
RESPonse<number> | WMEMory<number> |  
<float\_value>}

<number>    For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

<float\_value> A real number.

**Command**                   :FUNCTION{1 | 2}:SUBTRACT <source>[,<source>]

Defines a function that algebraically subtracts the second operand from the first operand.

<source>    {CHANnel<number> | FUNction<number> |  
RESPonse<number> | WMEMory<number> |  
<float\_value>}

<number>    For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

<float\_value> A real number.

**Command**                   :FUNCTION{1 | 2}:VERSUS <source>[,<source>]

Defines a function for an X-versus-Y display. The first operand defines the Y axis and the second defines the X axis. The Y-axis range and offset are initially equal to that of the first operand and can be adjusted with the RANGE and OFFSET commands.

<source>           {CHANnel<number> | FUNction<number> |  
RESPonse<number> | WMEMory<number> |  
<float\_value>}

<number>           For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

<float\_value>      A real number.

**Command**           :HIStogram:WINDow:SOURce[?] {CHANnel<number> |  
                      FUNction<number> | RESPonse<number> |  
                      WMEMory<number> | FFT}

Selects the source of the histogram window. The histogram window will track the source's vertical and horizontal scale.

<number>   For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR response: 1, 2, 3, or 4.

**Command**            `:LTEST:SWAVEform[?]  
<source>, <destination>, [, <filename> [, <format>]]`

Saves waveforms from a channel, function, histogram, TDR response, or waveform memory in the event of a failure detected by the limit test. Each waveform source can be individually specified, allowing multiple channels or functions to be saved to disk or waveform memories. Setting a particular source to OFF removes any waveform save action from that source.

`<source>`            {CHANnel<number> | FUNction<number> | HISTogram  
                      | RESPonse<number> | WMEMory<number>}

`<destination>`      {OFF | WMEMory<number> | DISK}

When DISK is selected, a file name is required.

`<filename>`        A descriptive file prefix consisting of up to four characters. If no filename is specified, the prefix defaults to CH1A..CH4B, FN1, FN2, FFT, HIST, MEM1..MEM4, RSP1..RSP4.

`<format>`            {TEXT [,YVALues | VERBose] | INTernal}

**Command**           :MARKer:MODE[?] {OFF | MANual | WAVEform | MEASurement | HISTogram | TDR TDT}

Sets the marker mode.

**Command**           :MARKer:PROPagation[?] {DIElectric | METer | FEET} <propagation>

Sets the propagation velocity for TDR and TDT measurements. The propagation may be specified as a dielectric constant or in meters per second or feet per second. The value is used to determine the distance from the reference plane in TDR and TDT marker measurements.

<propagation>   Dielectric constant or propagation value.

**Command**           :MARKer:REFerence[?] {TRIGger | REFerence}

Specifies the marker reference for TDR and TDT style markers. If the reference is TRIGger, then all horizontal axis marker measurements are made with respect to the trigger point. If the reference is REFerence, then all horizontal axis marker measurements are made with respect to the reference plane. You must perform a normalization and reference plane calibration before using a reference plane reference. This feature is available only for TDR and TDT applications.

**Command**           :MARKer:X1Y1source[?] {CHANnel<number> |  
FUNction<number> | RESPonse<number> |  
WMEMory<number> | HISTogram | FFT}

Sets the source for the X1 and Y1 markers.

<number>   For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B indicating which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR response: 1, 2, 3, or 4.

**Command**           :MARKer:X2Y2source[?] {CHANnel<number> |  
FUNction<number> | RESPonse<number> |  
WMEMory<number> | HISTogram | FFT}

Sets the source for the X2 and Y2 markers.

<number>   For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B indicating which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR response: 1, 2, 3, or 4.

**Command**           :MARKer:XUNITs[?] {SECond | METer | FEET}

Sets the units for horizontal display in TDR and TDT applications. The units may be in seconds, meters, or feet relative to the trigger or reference plane. The marker mode must be TDR/TDT to use this feature. See the :MARKer:REFerence command for information on setting the reference point.

**Command**           :MARKer:YUNITs[?] {VOLT | OHM | REFlect}

Sets the units for vertical display in TDR and TDT applications. The units may be in volts, ohms, or % reflection. The marker mode must be TDR/TDT to use this features.

**Command**           :MTESt:AMASk:SOURce [?] {CHANnel<number> |  
 FUNction<number> | RESPOse<number> |  
 WMEMory<number> | FFT}

Selects the source for the interpretation of the AMASK:XDELta and AMASK:YDELta parameters when AMASK:UNITs is set to CURRent. When UNITs are CURRent, the XDELta and YDELta parameters are defined in terms of the measurement system of the selected source.

<number>   For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B indicating which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR response: 1, 2, 3, or 4.

**Command**           :MTESt:SWAVEform [?]  
 <source>, <destination> [, <filename> [, <format>]]

Saves waveforms from a channel, function, TDR response, histogram, or waveform memory in the event of a failure detected by the Mask Test. Each waveform source can be individually specified, allowing multiple channels or functions to be saved to disk or waveform memories. Setting a particular source to OFF removes any waveform save action from that source.

<source>   {CHANnel<number> | FUNction<number> |  
 RESPOse<number> | WMEMory<number> | HISTogram |  
 FFT}

<number>	For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.
<destination>	{OFF   WMEMory<number>   DISK}
<filename>	A descriptive file prefix consisting of up to four characters. If no filename is specified, the prefix defaults to CH1A..CH4B, FN1, FN2, FFT, HIST, MEM1..MEM4, RSP1..RSP4.
<format>	{TEXT [,YVALues   VERBoSe ]   INTernal}
<b>Command</b>	:MTESt:SCALe:SOURce [?] {CHANnel<number>   FUNction<number>   RESPonse<number>   WMEMory<number>}

Sets the source used by the mask subsystem for interpretation of the SCALE:Y1 and SCALE:Y2 parameters. SCALE:Y1 and SCALE:Y2 set the vertical boundaries of the coordinate system for mask testing, and are affected by the scaling of the selected source.

<number>	For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B indicating which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR response: 1, 2, 3, or 4.
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**Command** :MEASure:DELTime [?] [<source> [, <source>]]

Measures the delta time between two edges. If one source is specified, the delta time from the leading edge of the specified source to the trailing edge of the specified source is measured. If two sources are specified, the delta time from the leading edge on the first source to the trailing edge on the second source is measured.

<source> { CHANnel<number> | FUNction<number> |  
RESPonse<number> | WMEMory<number> }

<number> For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

**Command** :MEASure:DUTYcycle [?] [<source>]

Measures the ratio of the positive pulse width to the period.

<source> { CHANnel<number> | FUNction<number> |  
RESPonse<number> | WMEMory<number> }

<number> For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

**Command** :MEASure:FALLtime [?] [<source>]

Measures the time at the upper threshold of the falling edge, measures the time at the lower threshold of the falling edge, then calculates the fall time.

<source> {CHANnel<number> | FUNction<number> |  
RESPonse<number> | WMEMory<number>}

<number> For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

**Command** :MEASure:FREQuency [?] [<source>]

Measures the frequency of the first complete cycle on the screen using the mid-threshold levels of the waveform (50% levels if standard measurements are selected).

<source> {CHANnel<number> | FUNction<number> |  
RESPonse<number> | WMEMory<number>}

<number> For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

**Command** :MEASure:NWIDTh [?] [<source>]

Measures the width of the first negative pulse on the screen using the mid-threshold levels of the waveform (50% levels with standard measurements selected).

<source> { CHANnel<number> | FUNction<number> |  
RESPonse<number> | WMEMory<number> }

<number> For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

**Command** :MEASure:OVERshoot [?] [<source>]

Measures the width of the overshoot of the first edge on the screen.

<source> { CHANnel<number> | FUNction<number> |  
RESPonse<number> | WMEMory<number> }

<number> For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

**Command** :MEASure:PERiod [?] [<source>]

Measures the period of the first complete cycle on the screen using the mid-threshold levels of the waveform (50% levels with standard measurements selected).

<source> { CHANnel<number> | FUNction<number> |  
RESPonse<number> | WMEMory<number> }

<number> For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

**Command** :MEASure:PREShoot [?] [<source>]

Measures the preshoot of the first edge on the screen.

<source> {CHANnel<number> | FUNction<number> |  
RESPonse<number> | WMEMory<number>}

<number> For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

**Command** :MEASure:PWIDth [?] [<source>]

Measures the width of the first positive pulse on the screen using the mid-threshold levels of the waveform (50% levels with standard measurements selected).

<source> {CHANnel<number> | FUNction<number> |  
RESPonse<number> | WMEMory<number>}

<number> For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

**Command** :MEASure:RISetime [?] [<source>]

Measures the rise time of the first displayed edge by measuring the time at the lower threshold of the rising edge, measuring the time at the upper threshold of the rising edge, then calculating the rise time.

<source> {CHANnel<number> | FUNction<number> |  
RESPonse<number> | WMEMory<number>}

<number> For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

**Command** :MEASure:SOURce [?] <source> [, <source>]

Selects the source for measurements. Two sources can be specified with this command. All measurements except MEASure:DELTatime are made on the first specified source. The delta time measurement uses two sources if two are specified. If only one source is specified, the delta time measurement uses that source for both of its parameters.

<source> {CHANnel<number> | FUNction<number> |  
RESPonse<number> | WMEMory<number> | HISTogram |  
FFT}

<number> For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

<b>Command</b>	<code>:MEASURE:TEDge[?] &lt;meas_thres_txt&gt;, &lt;slope&gt;&lt;occurrence&gt; [, &lt;source&gt;]</code>
	Measures the time interval between the trigger event and the specified threshold level and transition.
<code>&lt;meas_thres_txt&gt;</code>	{UPPer   MIDDle   LOWer}
<code>&lt;slope&gt;</code>	{- (minus) for falling   + (plus) (optional) for rising}
<code>&lt;occurrence&gt;</code>	Numeric value representing which edge of the occurrence should be used for the measurement.
<code>&lt;source&gt;</code>	{CHANnel<number>   FUNction<number>   RESPonse<number>   WMEMory<number>}
<code>&lt;number&gt;</code>	For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.
<b>Command</b>	<code>:MEASure:TMAX[?] [&lt;source&gt;]</code>
	Measures the first time at which the maximum voltage of the source waveform occurred. When FFT is the specified source, the frequency at which the first maximum value occurred is measured.
<code>&lt;source&gt;</code>	{CHANnel<number>   FUNction<number>   RESPonse<number>   WMEMory<number>   FFT}
<code>&lt;number&gt;</code>	For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

**Command** :MEASure:TMIN [?] [<source>]

Measures the time at which the first minimum voltage of the source waveform occurred. When FFT is the specified source, the frequency at which the first minimum value occurred is measured.

<source> {CHANnel<number> | FUNction<number> |  
RESPonse<number> | WMEMory<number> | FFT}

<number> For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

**Command** :MEASure:TVOLt [?] <voltage>,  
<slope><occurrence> [, <source>]

Measures the time interval between the trigger event and the defined voltage level and transition.

<voltage> Voltage level at which time will be measured.

<slope> The direction of the waveform change when the specified voltage is crossed, either rising (+) or falling (-).

<occurrence> The number of the crossing to be reported (if one, the first crossing is reported; if two, the second is reported, and so on).

<source> {CHANnel<number> | FUNction<number> |  
RESPonse<number> | WMEMory<number> }

<number> For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

**Command** :MEASure:VAMplitude [?] [<source>]

Calculates the difference between the top and base voltage of the specified source.

<source> {CHANnel<number> | FUNction<number> |  
RESPonse<number> | WMEMory<number>}

<number> For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

**Command** :MEASure:VAverage [?] {CYCLE | DISPlay}, [<source>]

Calculates the average voltage over the displayed waveform.

<source> {CHANnel<number> | FUNction<number> |  
RESPonse<number> | WMEMory<number>}

<number> For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

**Command** :MEASure:VBASe [?] [<source>]

Measures the statistical base of the waveform.

<source> {CHANnel<number> | FUNction<number> |  
RESPonse<number> | WMEMory<number>}

<number> For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

**Command** :MEASure:VLOWer [?] [<source>]

Measures the voltage value at the lower threshold of the waveform.

<source> { CHANnel<number> | FUNction<number> |  
RESPonse<number> | WMEMory<number> }

<number> For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

**Command** :MEASure:VMAX [?] [<source>]

Measures the absolute maximum voltage present on the selected source waveform. When FFT is the specified source, the maximum value in spectrum is measured.

<source> { CHANnel<number> | FUNction<number> |  
RESPonse<number> | WMEMory<number> | FFT }

<number> For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

**Command** :MEASure:VMIDdle [?] [<source>]

Measures the voltage value at the middle threshold of the waveform.

<source> { CHANnel<number> | FUNction<number> |  
RESPonse<number> | WMEMory<number> }

<number> For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

**Command** :MEASure:VMIN[?] [<source>]

Measures the absolute minimum voltage present on the selected source waveform. When FFT is the specified source, the minimum value in the spectrum is measured.

<source> {CHANnel<number> | FUNction<number> |  
RESPonse<number> | WMEMory<number> | FFT}

<number> For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

**Command** :MEASure:VPP[?] [<source>]

Measures the absolute maximum and minimum voltages on the selected source, then calculates the peak-to-peak voltage as the difference between the two voltages. When FFT is the specified source, the range of values in the spectrum is measured.

<source> {CHANnel<number> | FUNction<number> |  
RESPonse<number> | WMEMory<number> | FFT}

<number> For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

**Command** :MEASure:VRMS [?] {CYCLe | DISPlay}, {AC | DC}  
[, <source>]

Measures the RMS voltage of the selected waveform by subtracting the average value of the waveform from each data point on the display.

<source> {CHANnel<number> | FUNction<number> |  
RESPonse<number> | WMEMory<number>}

<number> For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

**Command** :MEASure:VTIME [?] <time>[, <source>]

Measures the voltage at the specified time. The time is referenced to the trigger event and must be on the screen. When FFT is the specified source, the value at the specified frequency is measured.

<time> Displayed time from the trigger in seconds, or frequency in Hertz for FFT.

<source> {CHANnel<number> | FUNction<number> |  
RESPonse<number> | WMEMory<number> | FFT}

<number> For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

**Command** :MEASure:VTOP [?] [<source>]

Measures the statistical top of the selected source waveform.

<source> {CHANnel<number> | FUNction<number> |  
RESPonse<number> | WMEMory<number>}

<number> For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

**Command** :MEASure:VUPper [?] [<source>]

Measures the voltage value at the upper threshold of the waveform.]

<source> {CHANnel<number> | FUNction<number> |  
RESPonse<number> | WMEMory<number>}

<number> For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

**Command**                   : TDR{2 | 4}:RESPonse{1 | 2 | 3 | 4}:CALibrate

Begins a TDR or TDT normalization and reference plane calibration. Which calibration is done (TDR or TDT) depends on the setting of the TDRTDT control.

**Command**                   : TDR{2 | 4}:RESPonse{1 | 2 | 3 | 4}:CALibrate  
:CANCEl

Activates the cancel softkey during a TDR or TDT normalization and reference plane calibration.

**Command**                   : TDR{2 | 4}:RESPonse{1 | 2 | 3 | 4}:CALibrate  
:CONTinue

Activates the continue softkey during a TDR or TDT normalization and reference plane calibration.

**Command**                   : TDR{2 | 4}:PRESet

Sets up the instrument for TDR or TDT measurements, based on the stimulus.

**Command**                   : TDR{2 | 4}:RATE[?] {AUTO | <rate>}

Sets the period of the TDR pulse generator. You should usually leave this set to AUTO unless you need to define a specific rate. In AUTO, the instrument will attempt to keep subsequent periods off screen when the timebase is changed.

<rate>           Period to which you want to set the generator, in Hertz. You can add a suffix to indicate that the rate is in Hertz (HZ, KHZ, MHZ, and so on).

**Command**                   : TDR{2 | 4}:RESPonse{1 | 2 | 3 | 4}[?] {OFF | DIFFerential | COMMONmode | NORMAlize}

Turns on or off the response of a TDR or TDT stimulus.

**Command**                   : TDR{2 | 4}:RESPonse{1 | 2 | 3 | 4}:HORizontal[?] {TSOURCE, MANual}

Specifies whether the TDR/TDT response should track the source channel's horizontal scale (TSOURCE), or use a user-defined scale specified with the HORizontal:POSITION and HORizontal:RANGE commands (MANual). TSOURCE is the usual setting.

**Command**                   : TDR{2 | 4}:RESPonse{1 | 2 | 3 | 4}: HORizontal:POSITION[?] <position>

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

<position>       Offset from the center of the screen, in seconds.

**Command**                   : TDR{2 | 4}:RESPonse{1 | 2 | 3 | 4}: HORizontal:RANGE[?] <range>

Specifies the range of the TDR/TDT response when the horizontal tracking is set to manual.

<range>           Horizontal range in seconds.

**Command**           : TDR{2 | 4}:RESPonse{1 | 2 | 3 | 4}:RISetime[?]  
                          <risetime>

Sets the risetime for the normalized response. The risetime setting is limited by the timebase settings and the record length.

<risetime>   Risetime setting in seconds.

**Command**           : TDR{2 | 4}:RESPonse{1 | 2 | 3 | 4}:TDRDest[?]  
                          CHANnel<number>

Selects a TDR destination channel for an external stimulus. When you use an external stimulus, you must use this command to specify where the TDR channel is coming into the instrument.

<number>   An integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced.

**Command**           : TDR{2 | 4}:RESPonse{1 | 2 | 3 | 4}:TDRTDT[?]  
                          {TDR | TDT}

Sets the instrument to make either TDR or TDT measurements. When the setting is TDT, both TDR and TDT measurements can be made simultaneously. You must select a TDT destination channel before selecting TDT.

**Command**           : TDR{2 | 4}:RESPonse{1 | 2 | 3 | 4}:TDTDest[?]  
                          {NONE | CHANnel<number>}

Selects a destination channel for a normalization measurement.

<number>   An integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced.

- Command**            `:TDR{2 | 4}:RESPonse{1 | 2 | 3 | 4}:VERTical[?]  
{TSourCe | MANual}`
- Specifies whether the TDR/TDT response should track the source channel's vertical scale (TSourCe), or use a user-defined scale specified with the VERTical:OFFSet and VERTical:RANGe commands (MANual). TSourCe is the usual setting.
- Command**            `:TDR{2 | 4}:RESPonse{1 | 2 | 3 | 4}:  
VERTical:OFFSet [?] <offset_value>`
- Sets the vertical position of the specified response when vertical tracking is set to MANual. The position is always referenced to center screen.
- <offset\_value>      Offset value in volts, watts, or decibels, depending on the current channel UNITS. Suffix UNITS are ignored; only the scalar part is used ("m" in "mw").
- Command**            `:TDR{2 | 4}:RESPonse{1 | 2 | 3 | 4}:  
VERTical:RANGe [?] <range_value>`
- Specifies the vertical range of the TDR/TDT response when the vertical tracking mode is set to MANual.
- <range\_value>      Vertical range in volts, watts, or decibels, depending on the current UNITS setting and suffix supplied. (The suffix does not set the UNITS; it is ignored.)
- Command**            `:TDR{2 | 4}:STIMulus [?] {OFF | ON | ON1 | ON2 |  
ON1AND2 | DIFFerential | COMMONmode | EXTernal |  
ON3 | ON4 | ON3AND4}`
- Turns the TDR/TDT stimulus on or off.

**Command**           :WAVEform:SOURce[?] {CHANnel<number> |  
                      FUNction<number> | RESPonse<number> |  
                      WMEMory<number> | DATAbase | HISTogram | FFT}

Selects a channel, function, TDR response, waveform memory, database, histogram, or FFT as the waveform source.

<number>   For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEMory): 1, 2, 3, or 4. For TDR responses: 1, 2, 3, or 4.

**Command**                   :WMEmory<number>:SAVE {CHANnel<number> |  
FUNction<number> | RESPonse<number> |  
WMEmory<number> | HISTogram | FFT}

Stores the specific channel, waveform memory, function, histogram, or FFT to the waveform memory.

<number>   For channels: an integer, 1 through 4, indicating the slot in which the channel resides, followed by an optional A or B identifying which of two possible channels in the slot is being referenced. For functions: 1 or 2. For waveform memories (WMEmory): 1, 2, 3, or 4. Storing a waveform memory to itself does not change the memory. For TDR responses: 1, 2, 3, or 4.